

Plots created using the 'r4ss' package in R

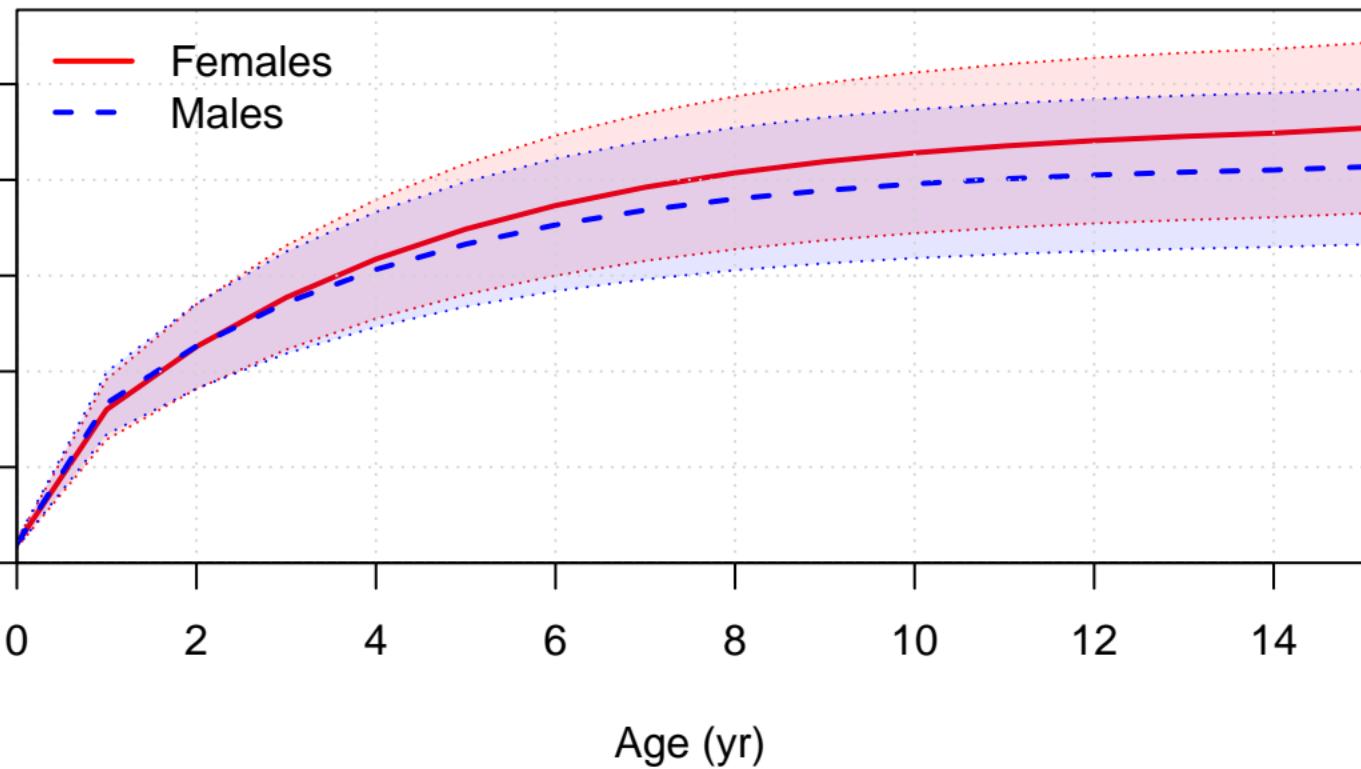
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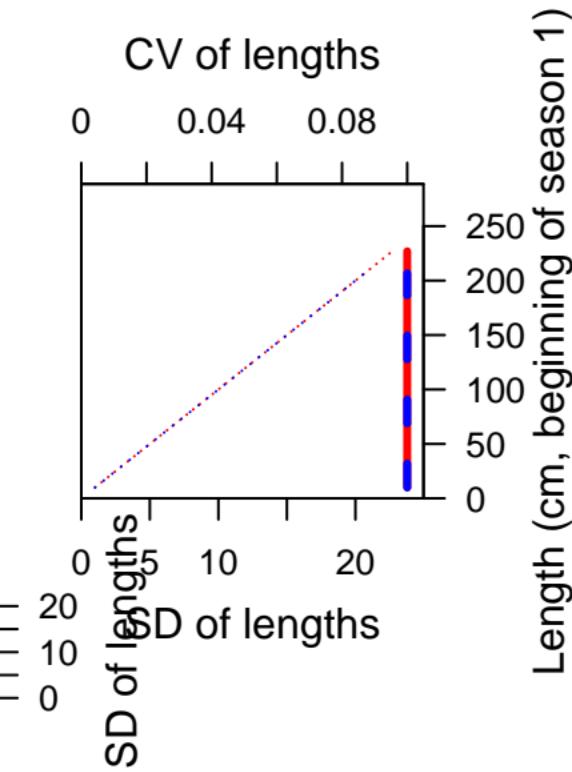
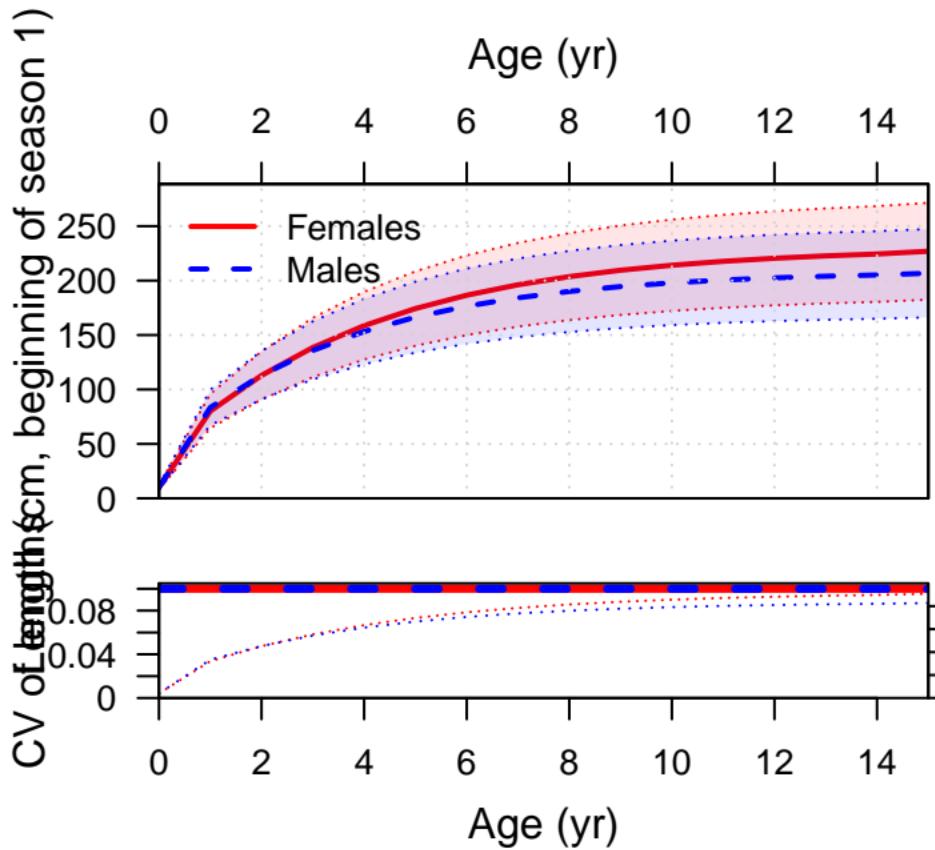
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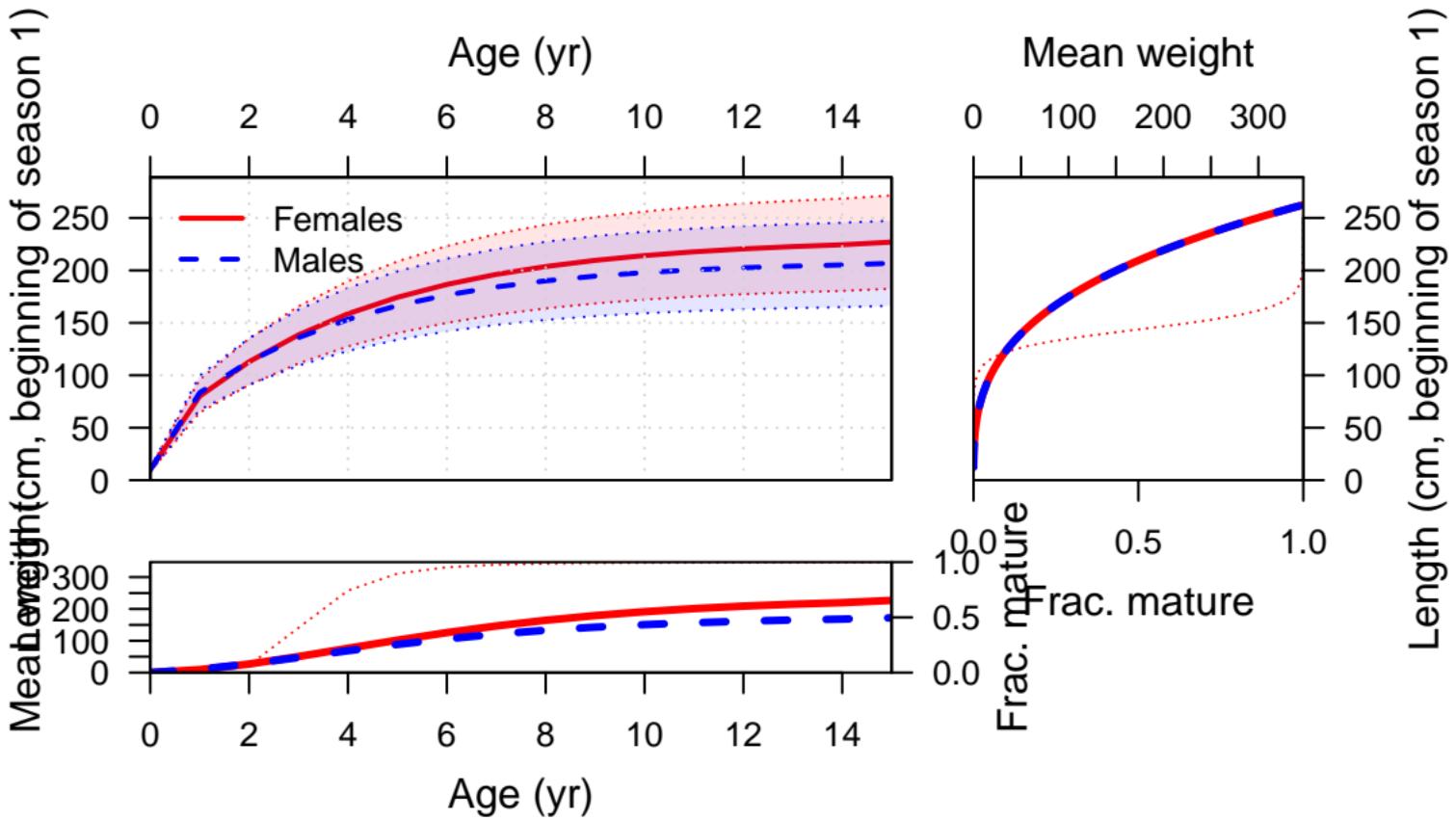
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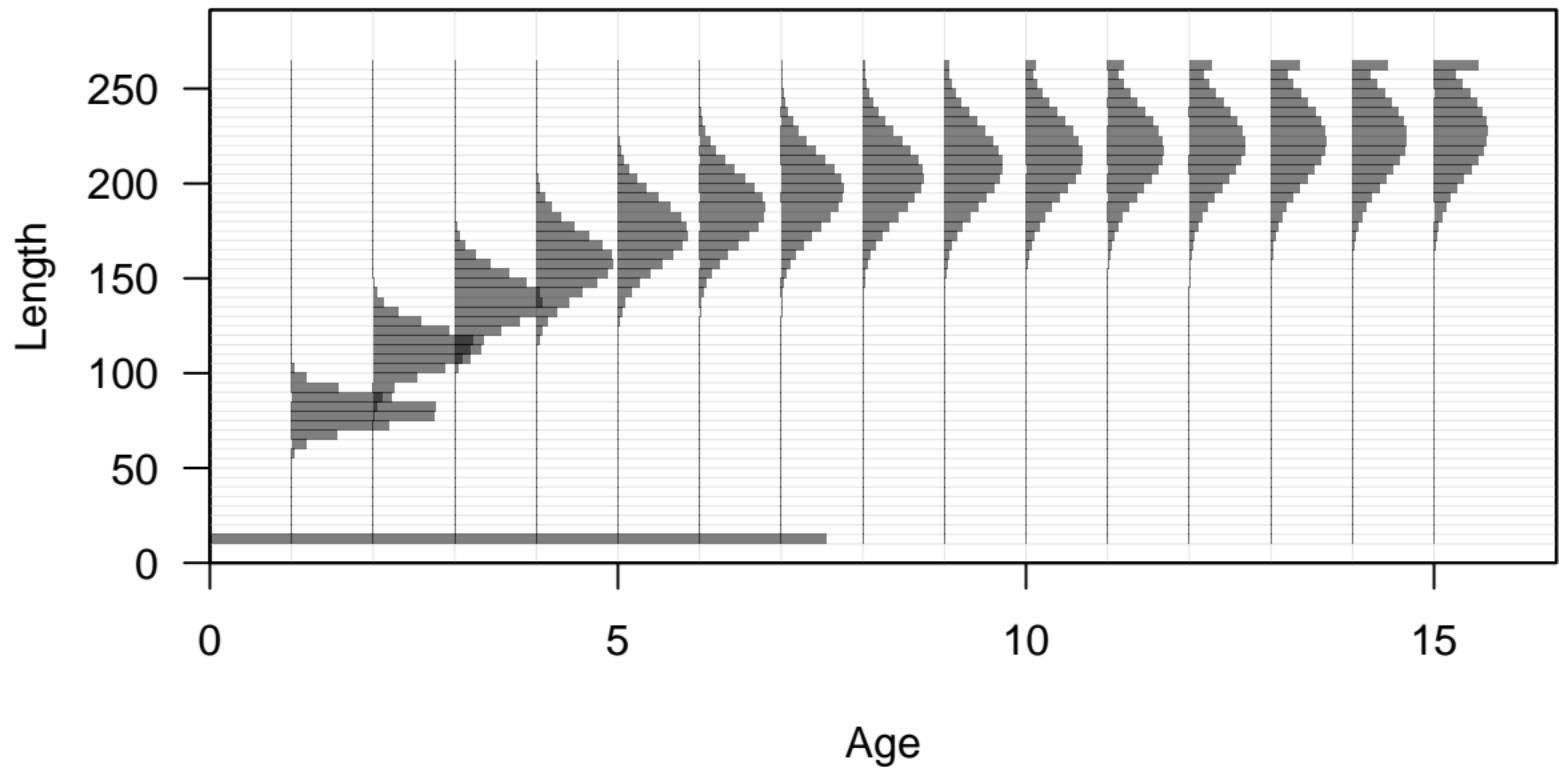
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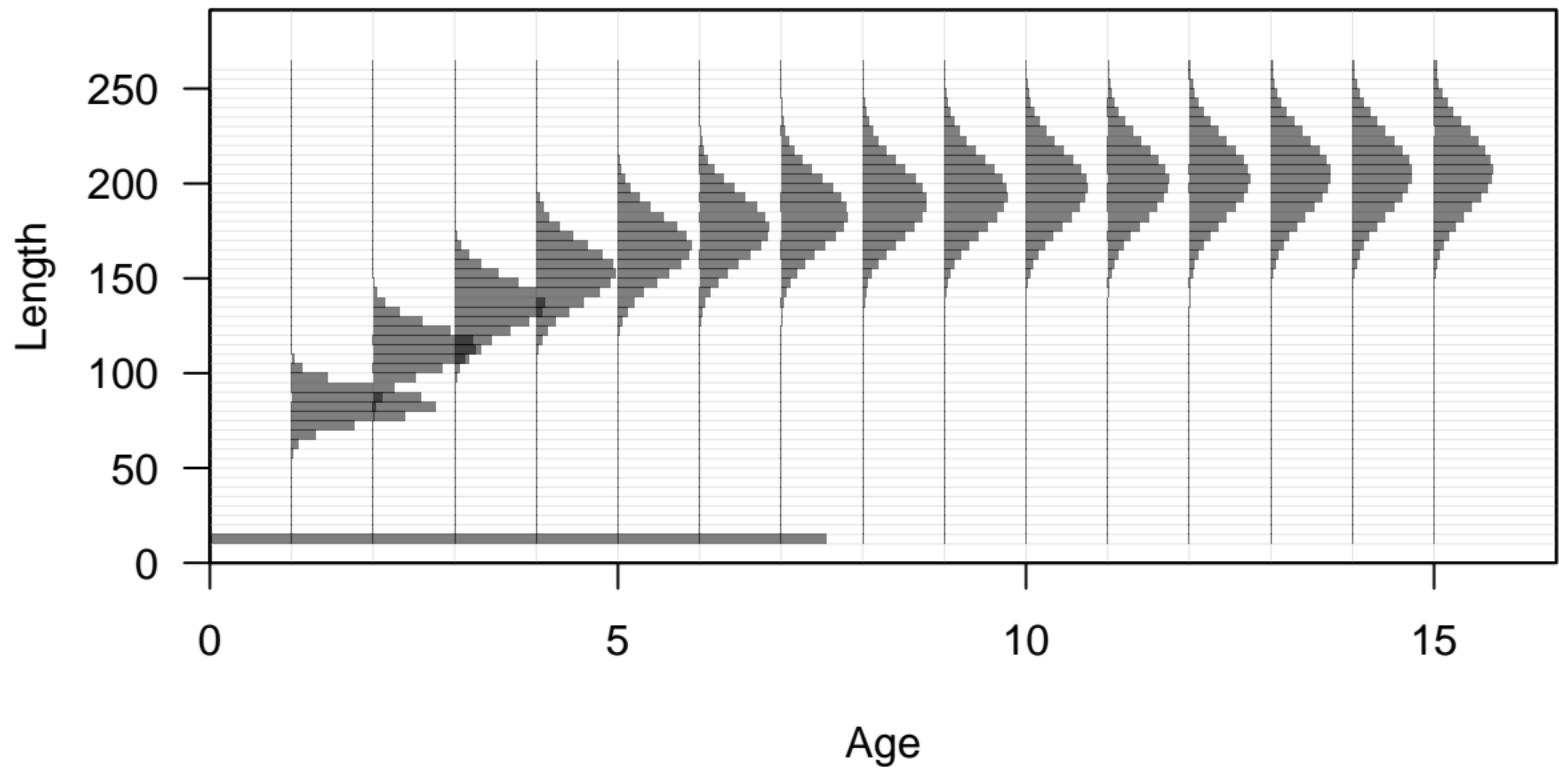
Length (cm, beginning of season 1)

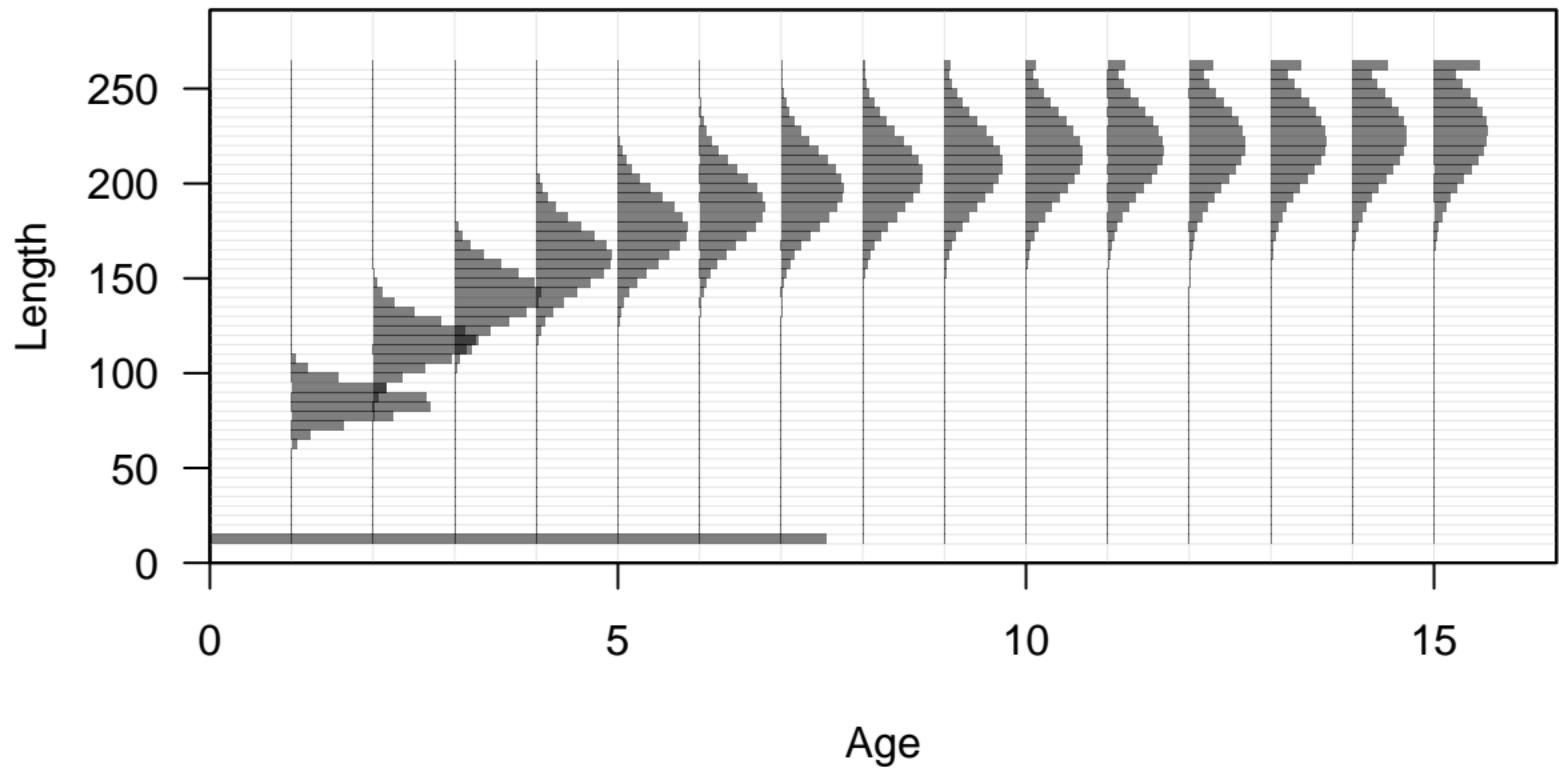


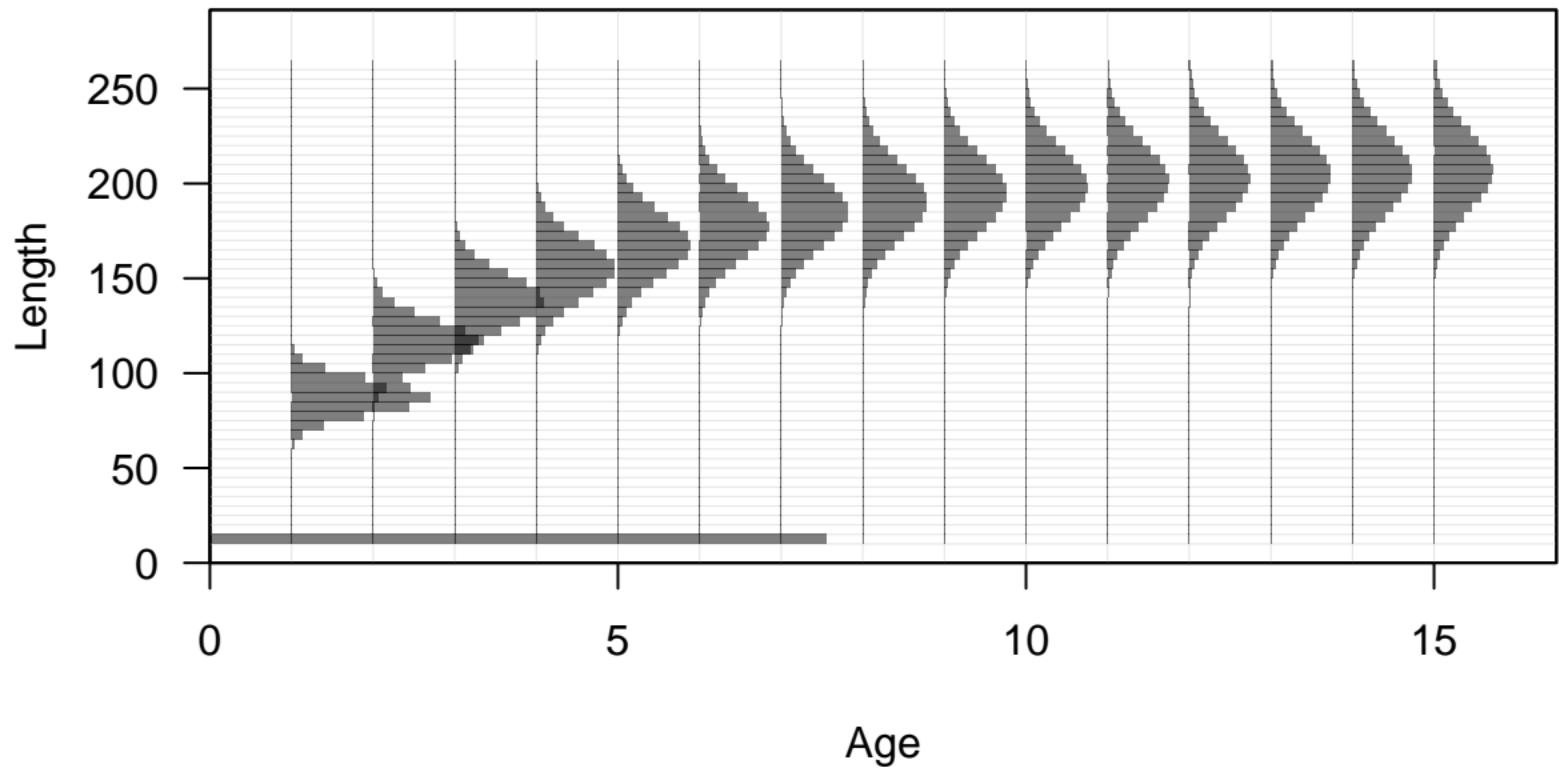


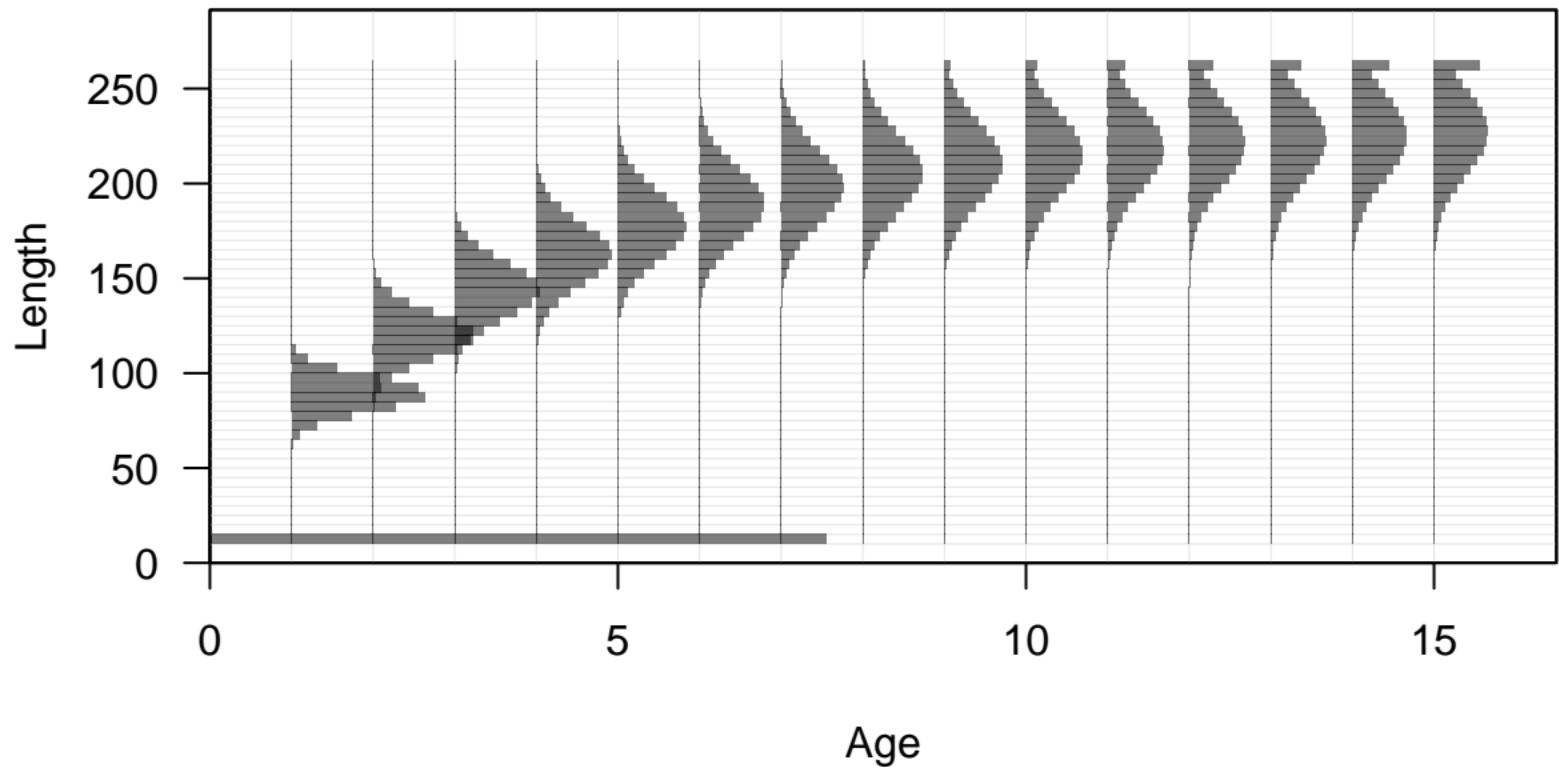


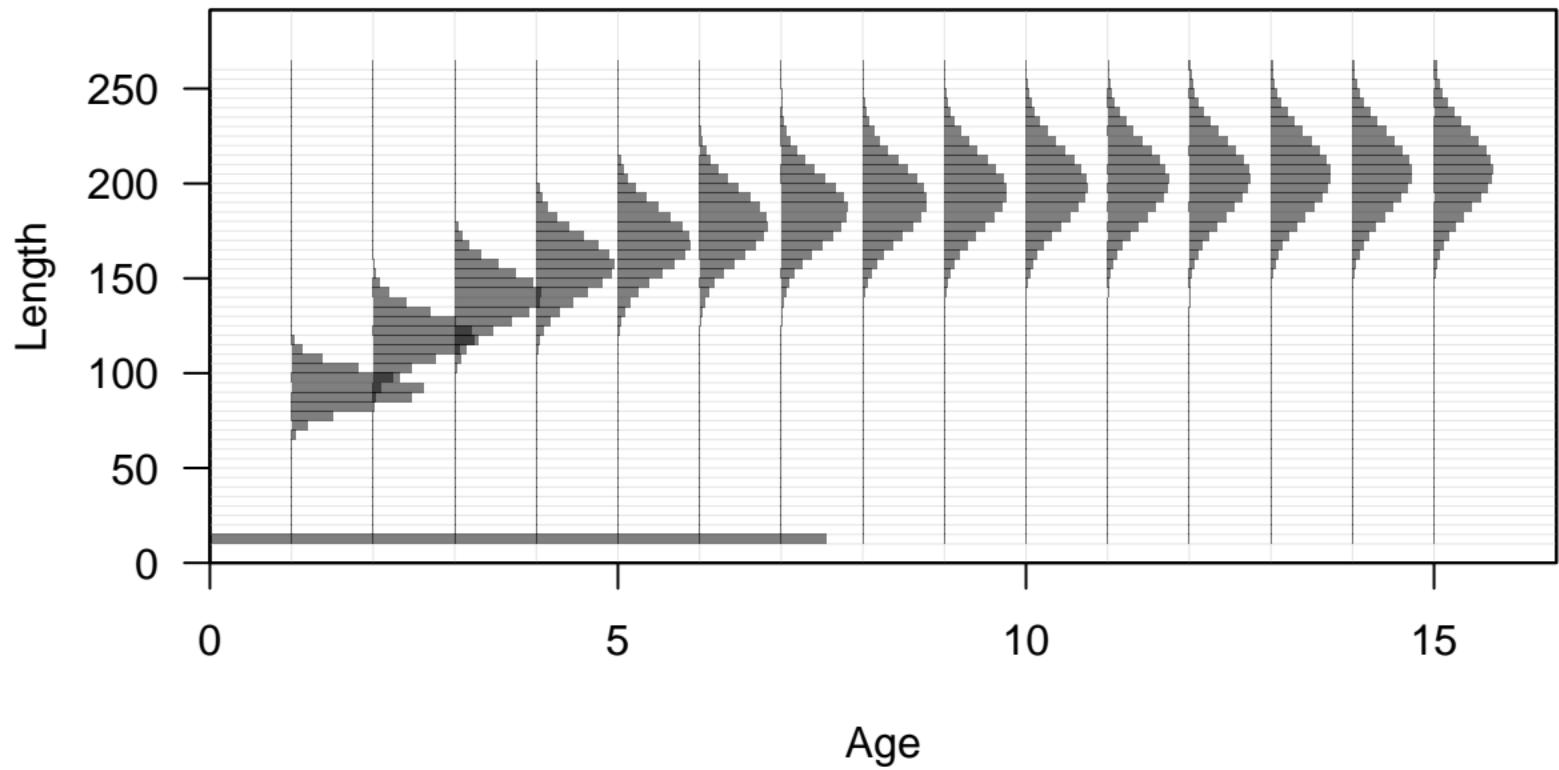


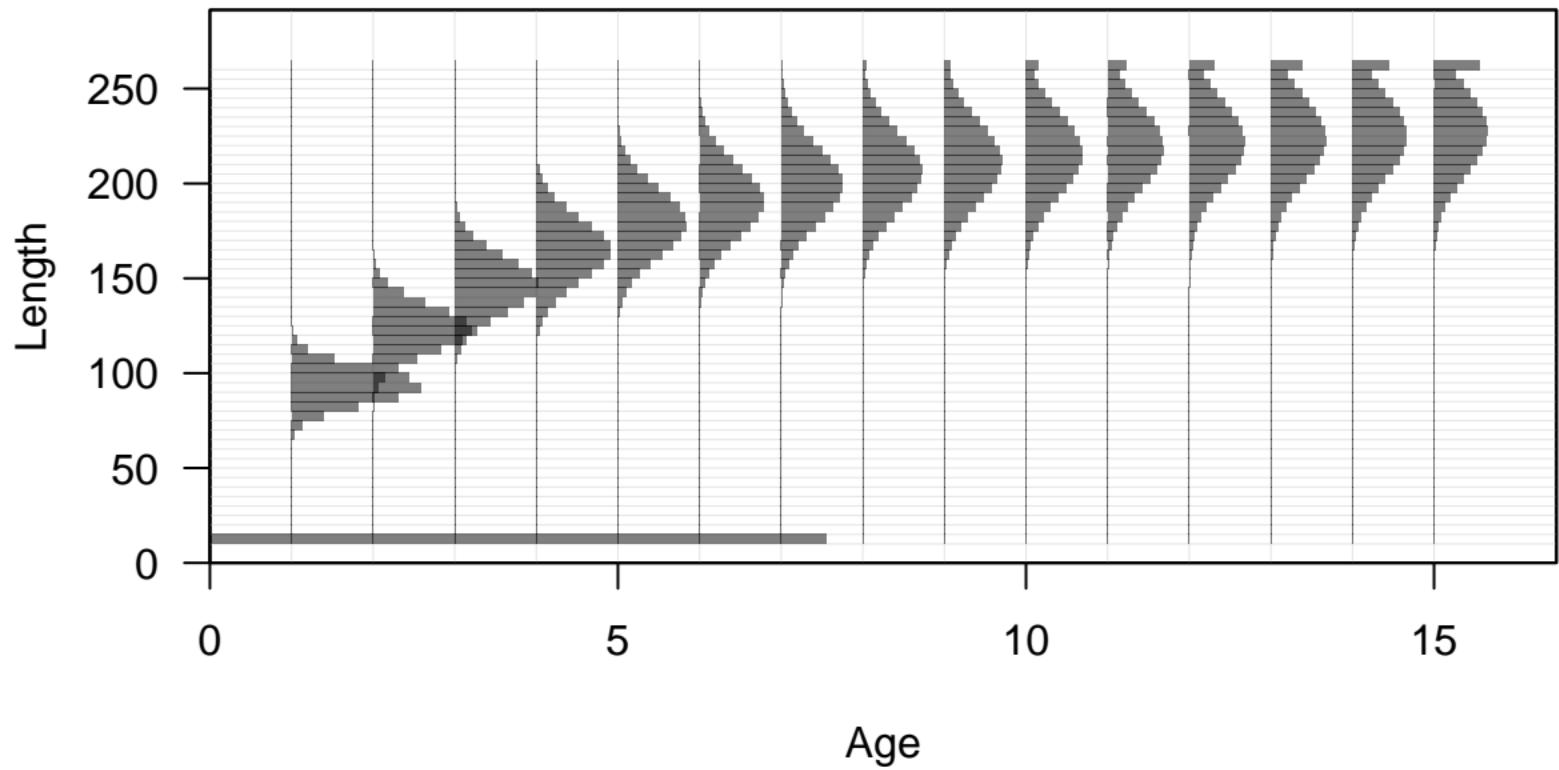


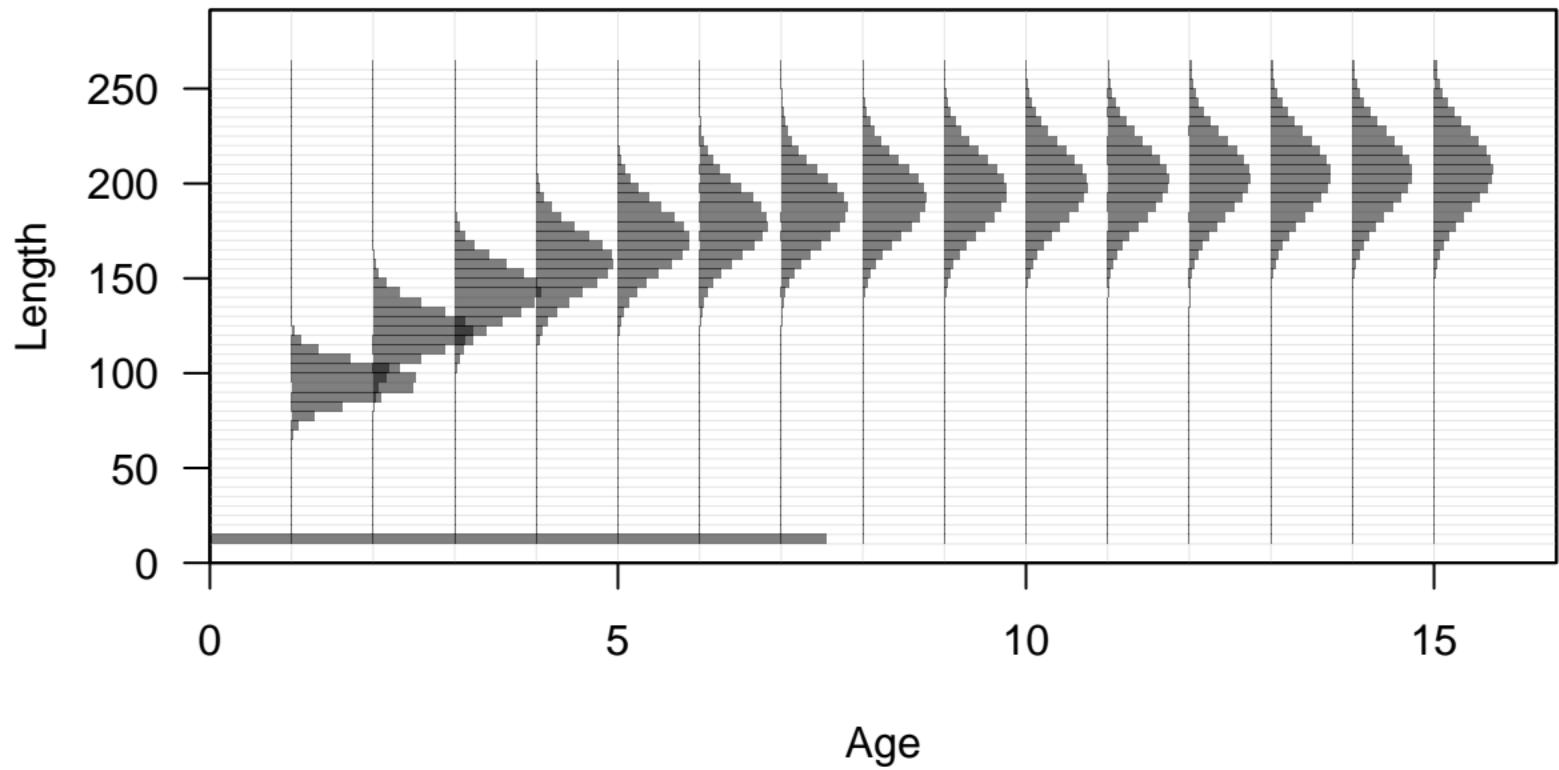


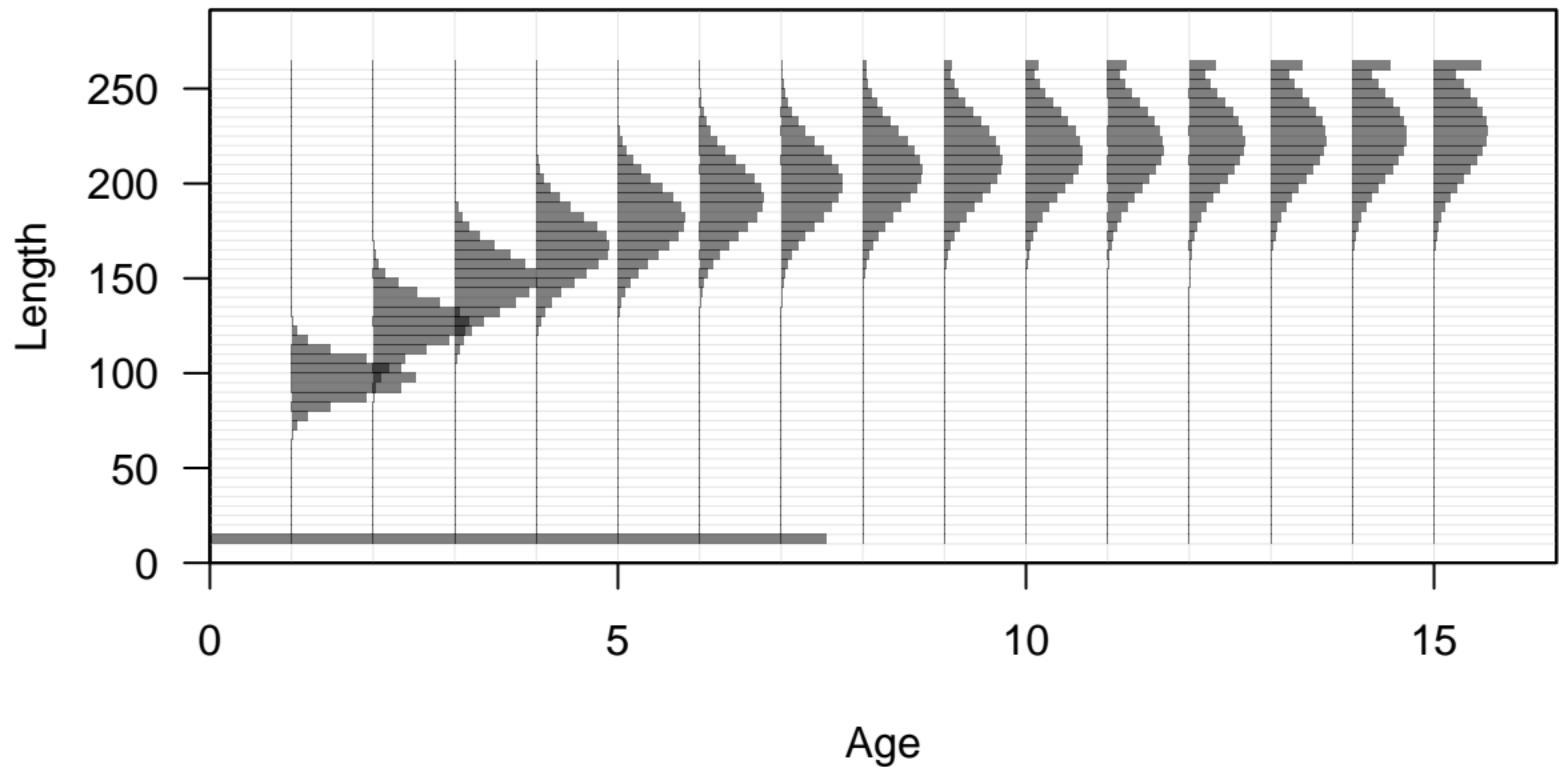


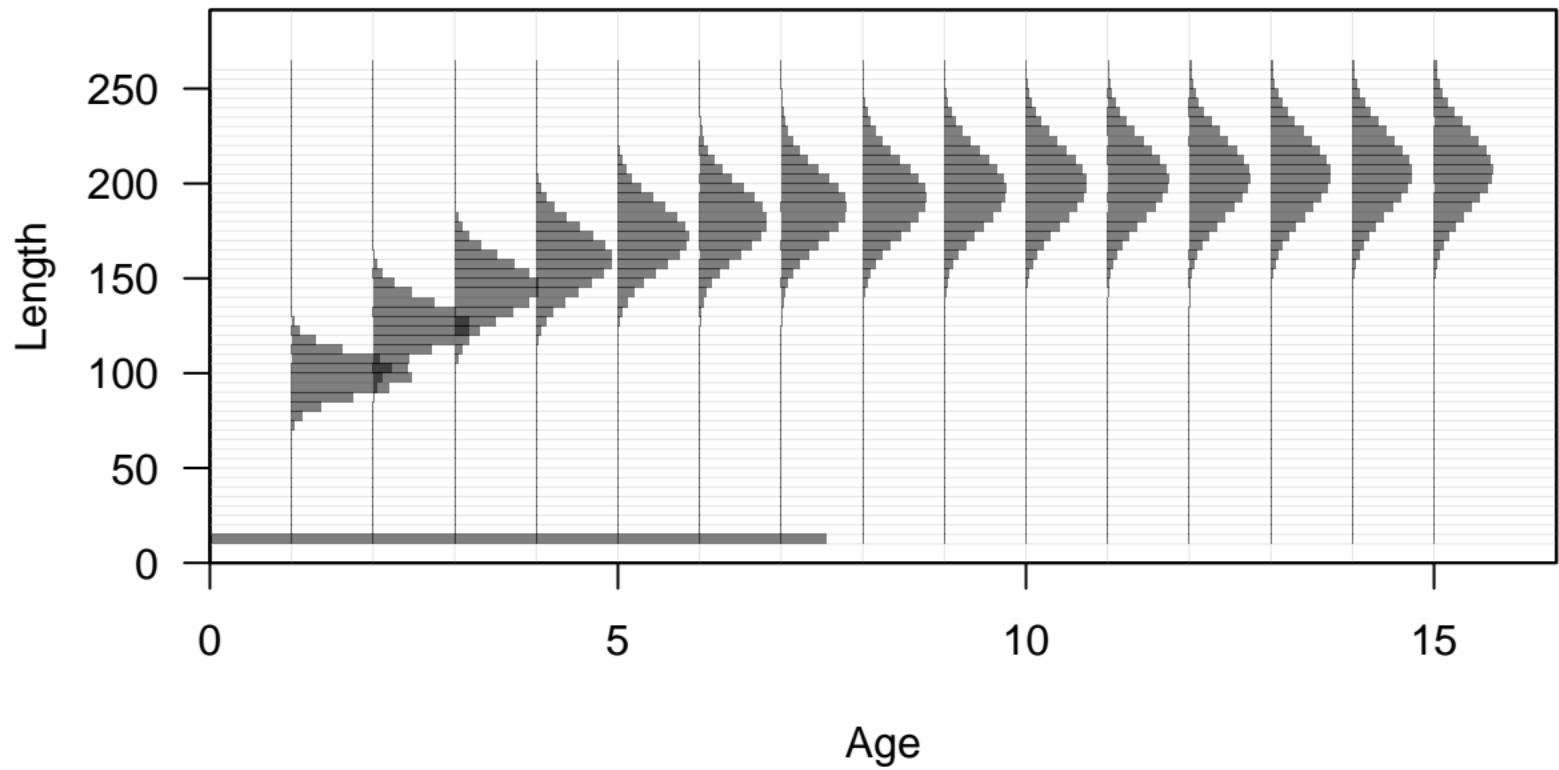


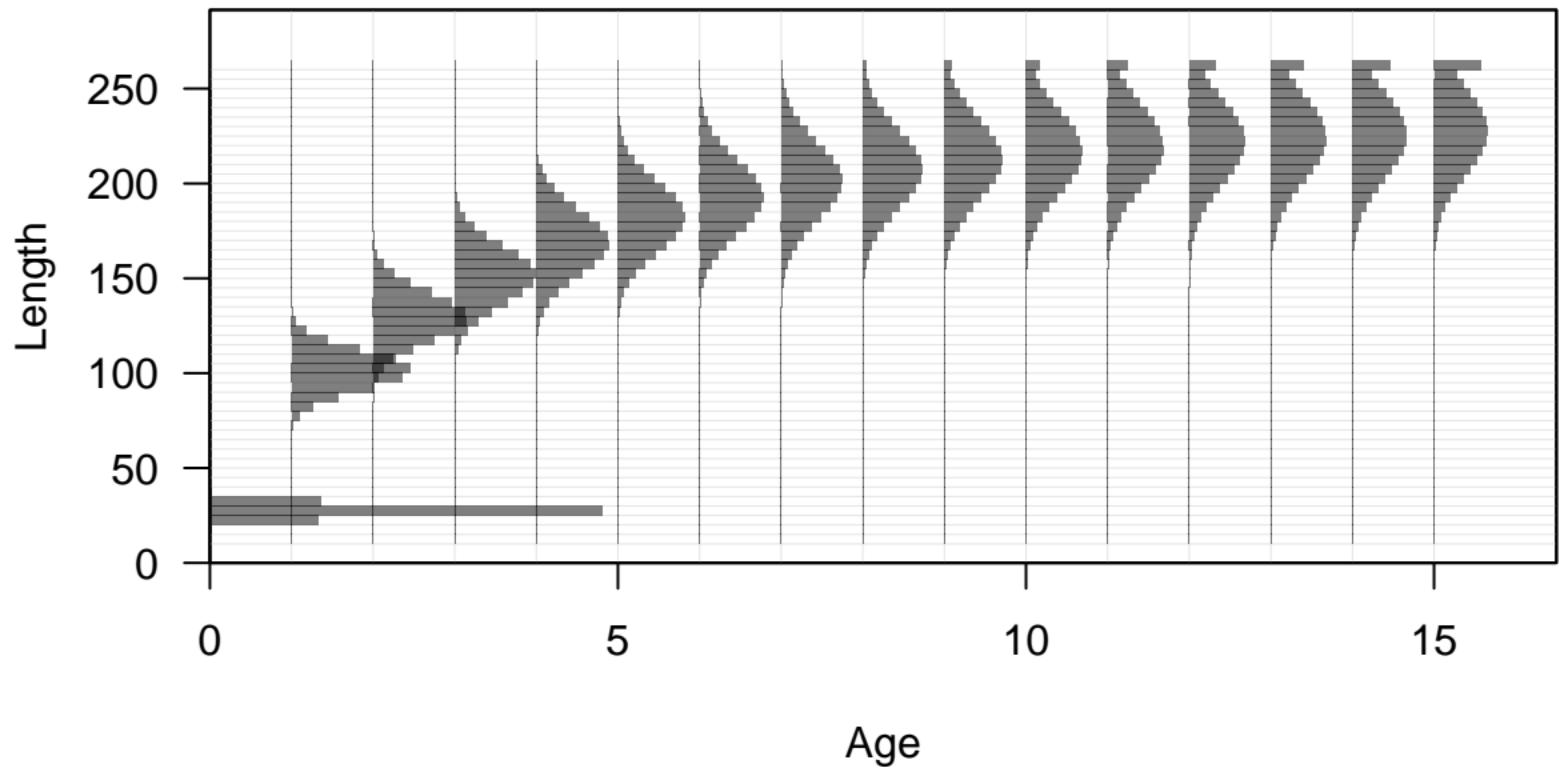


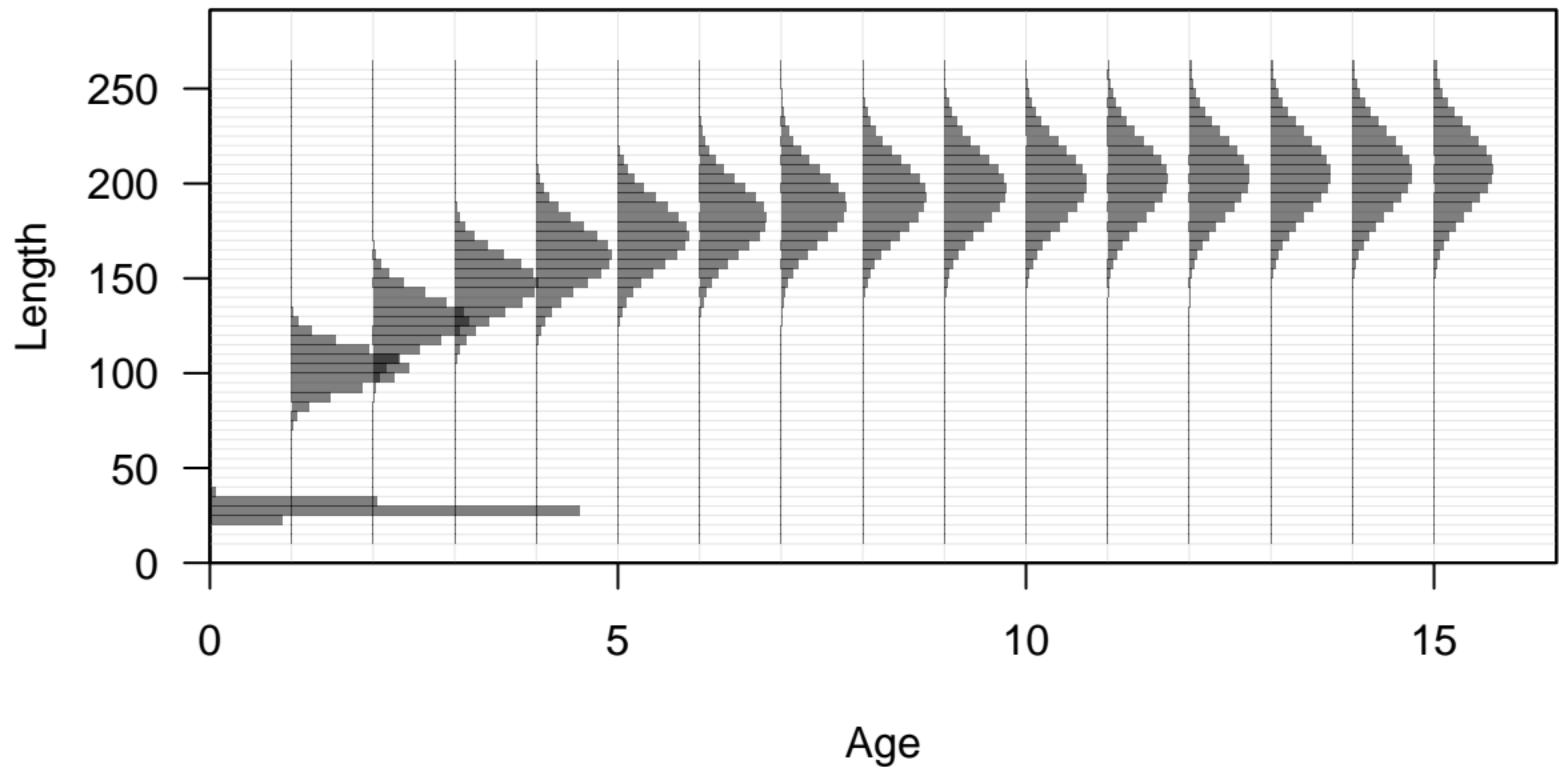


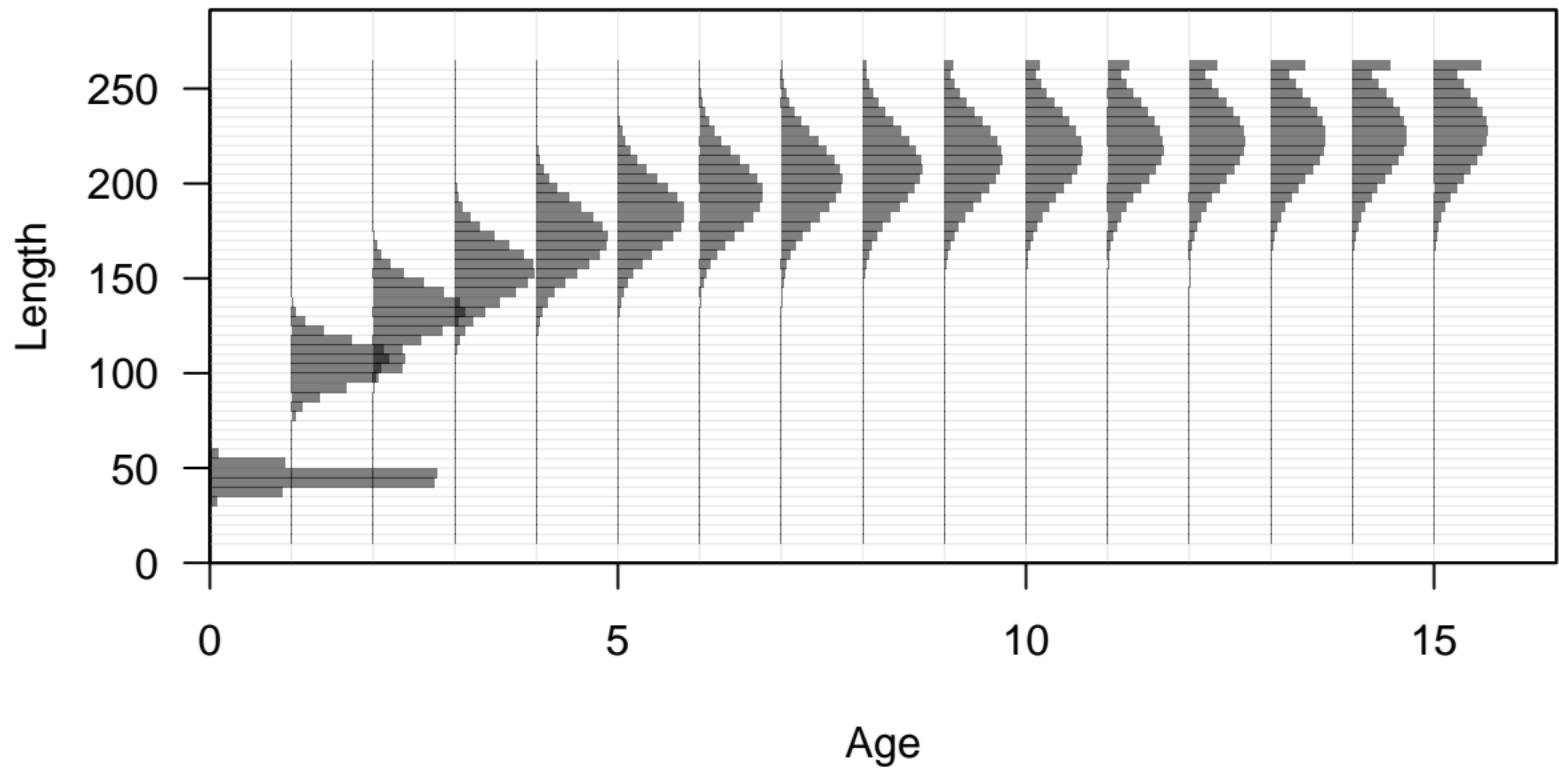


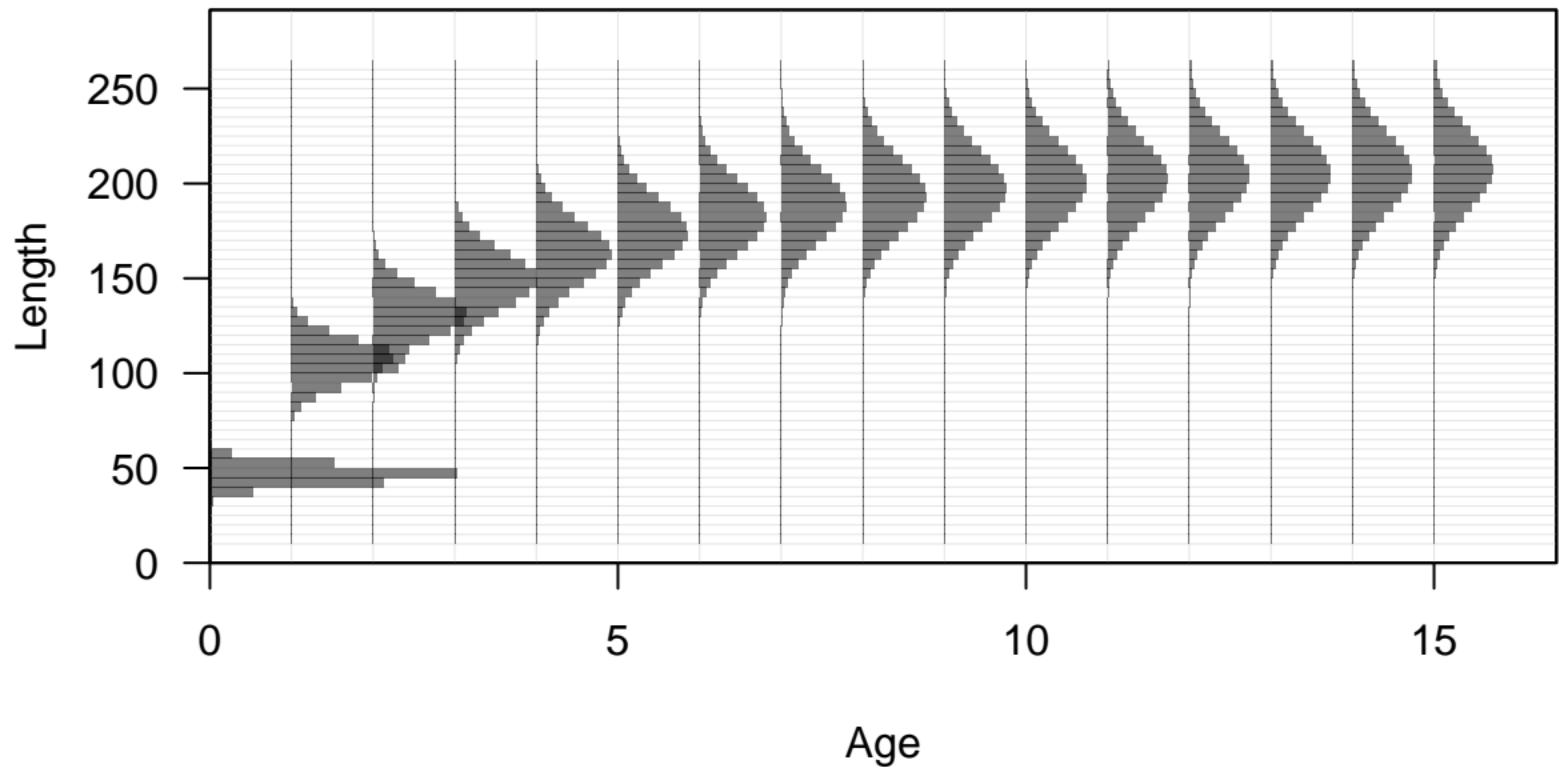


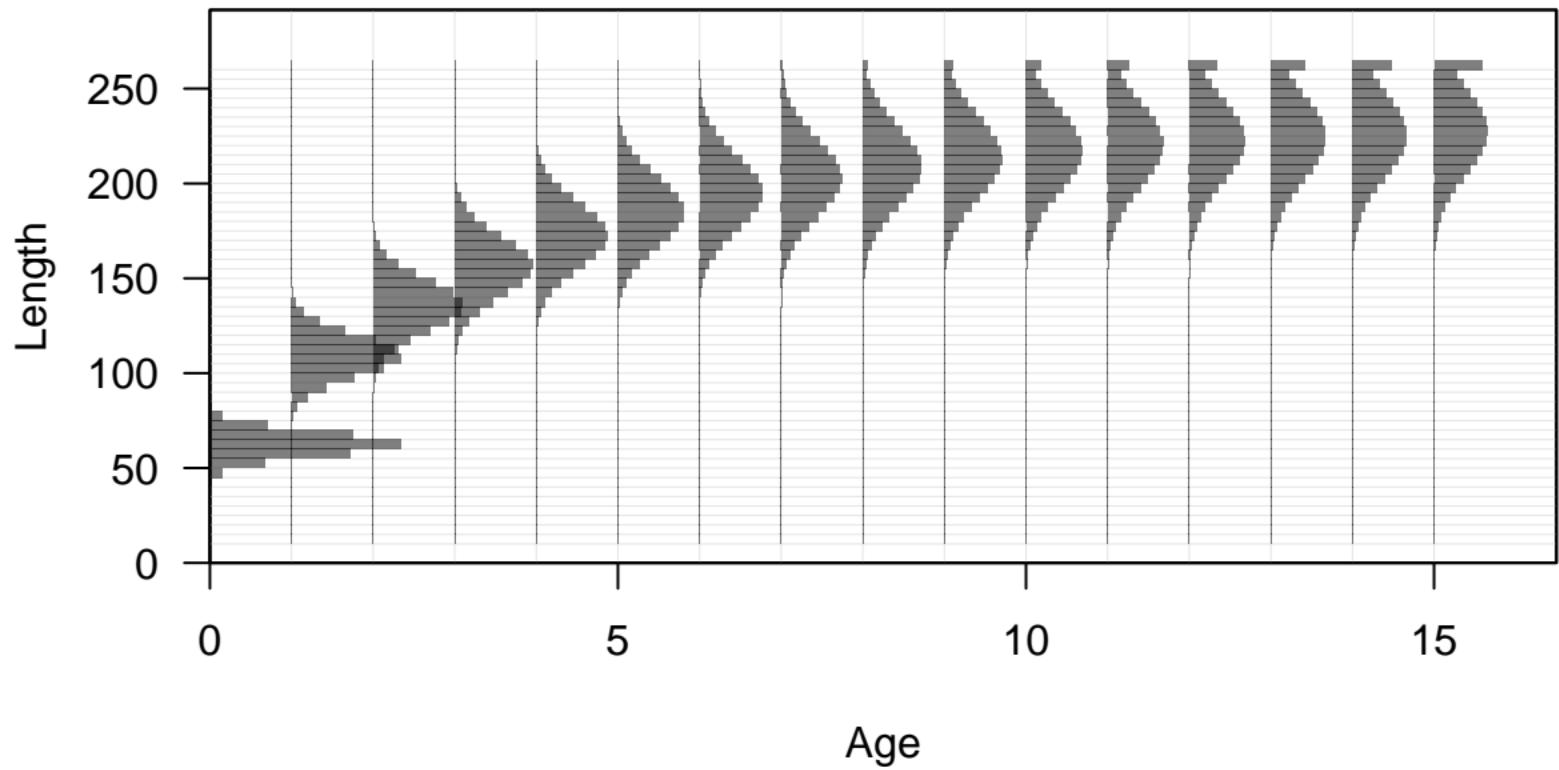


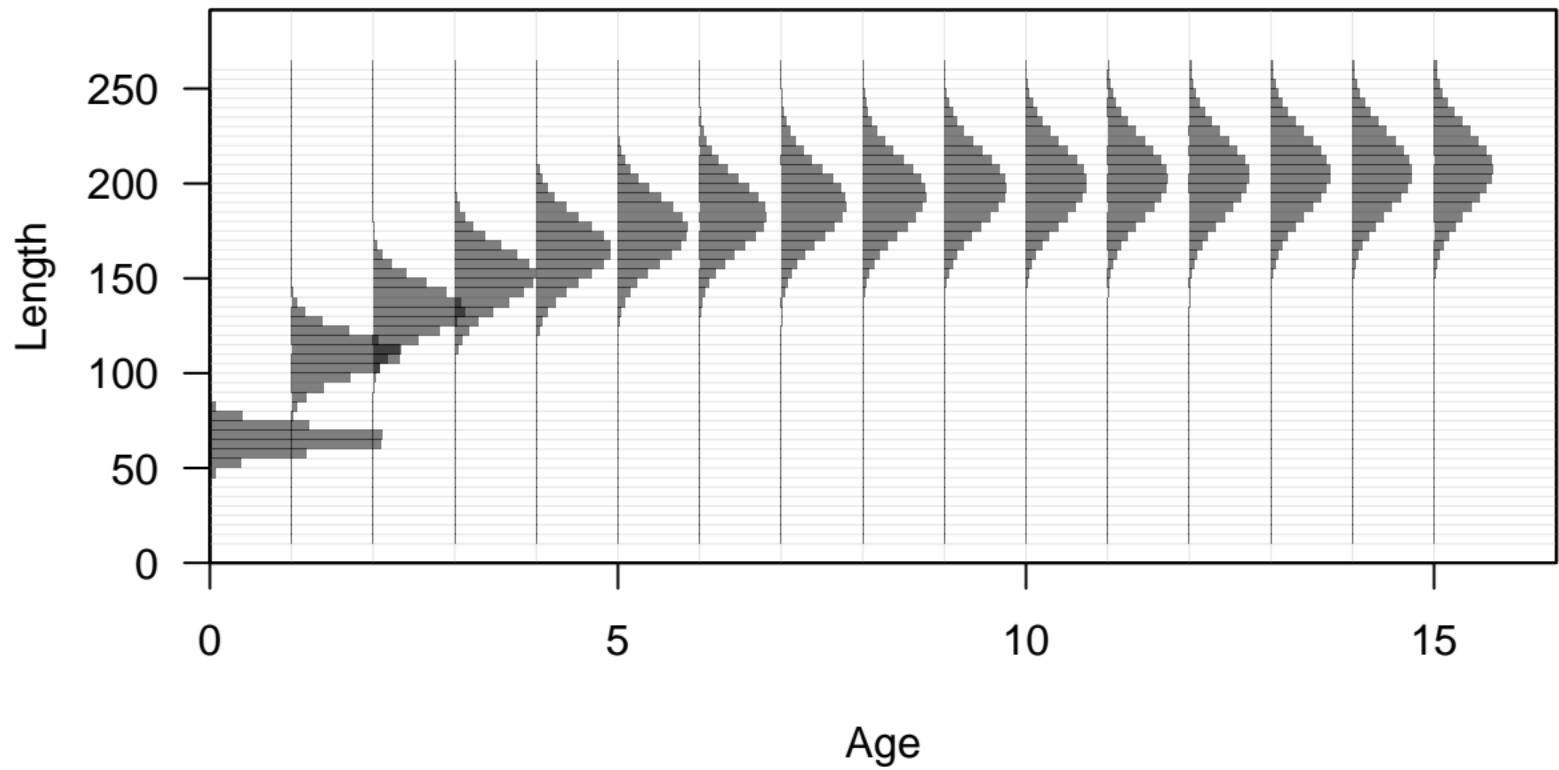


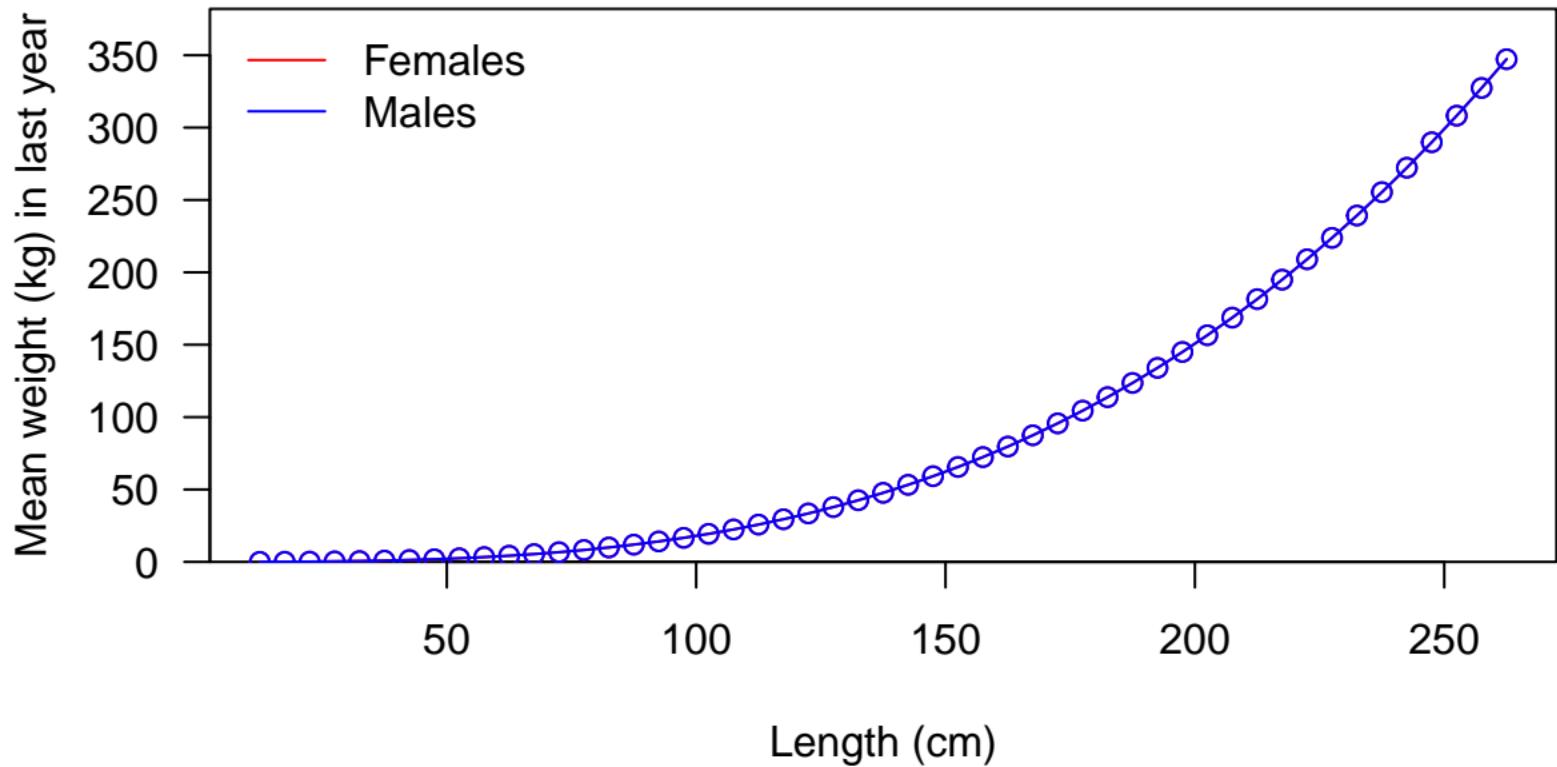


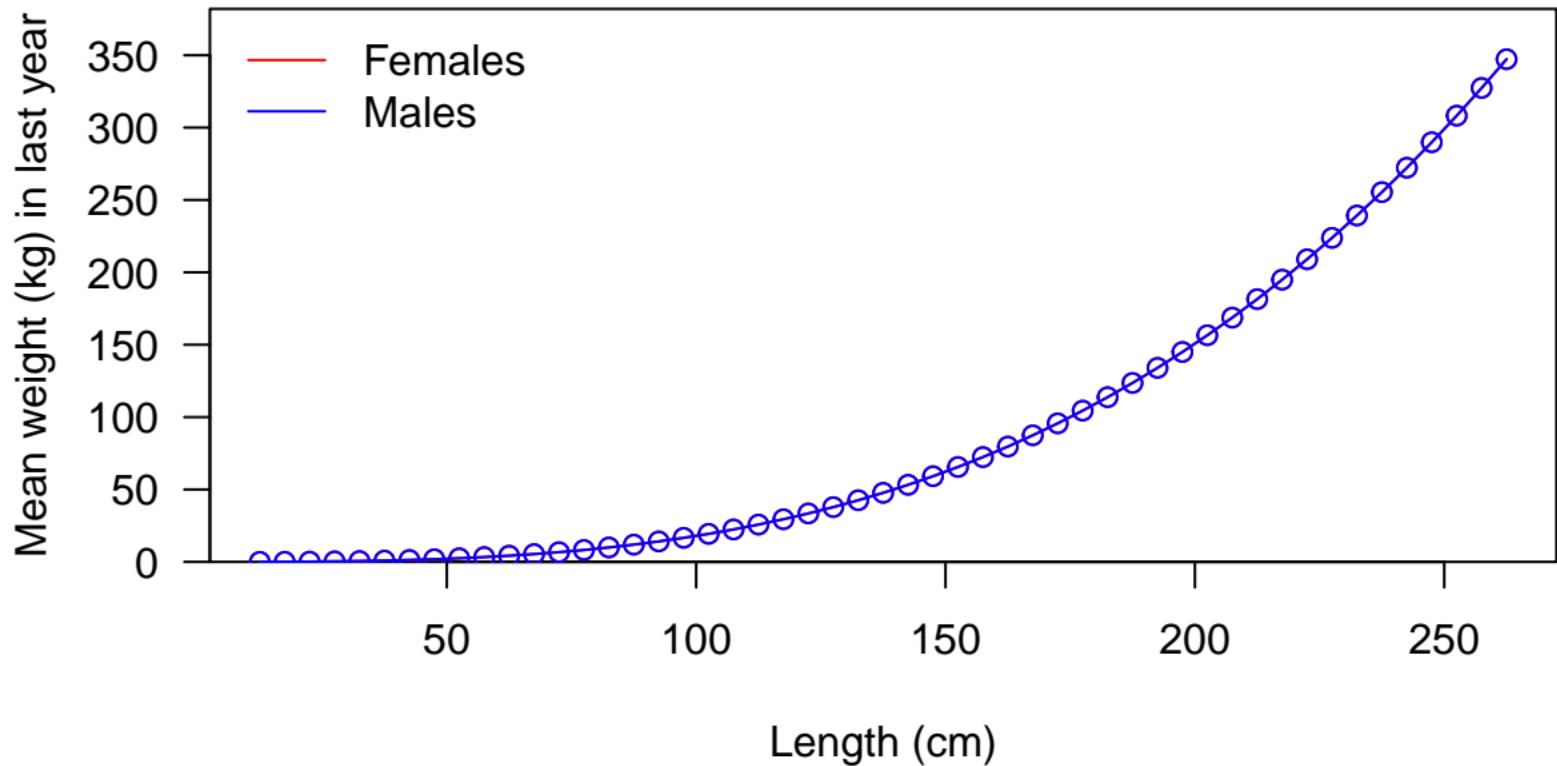


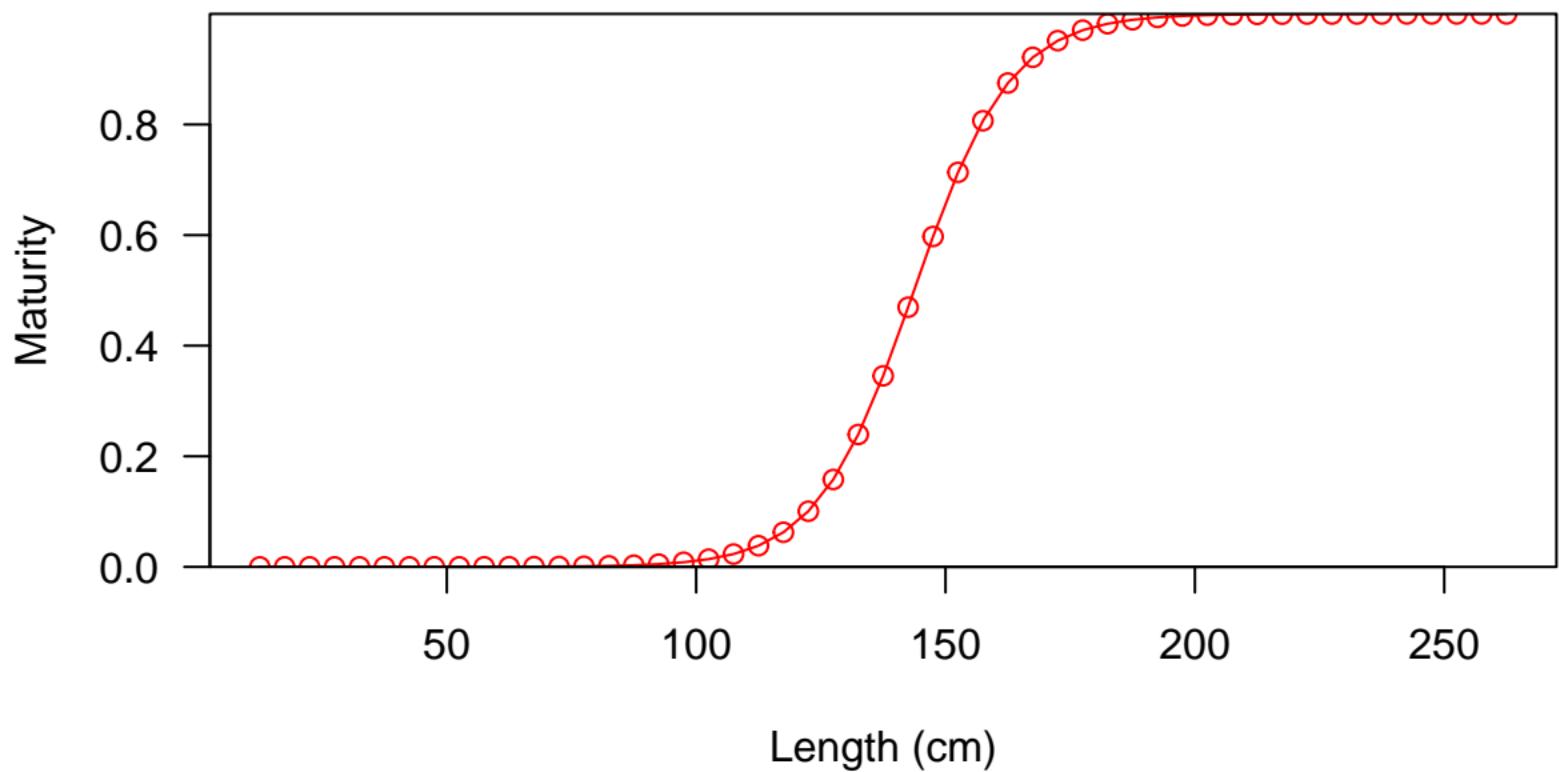


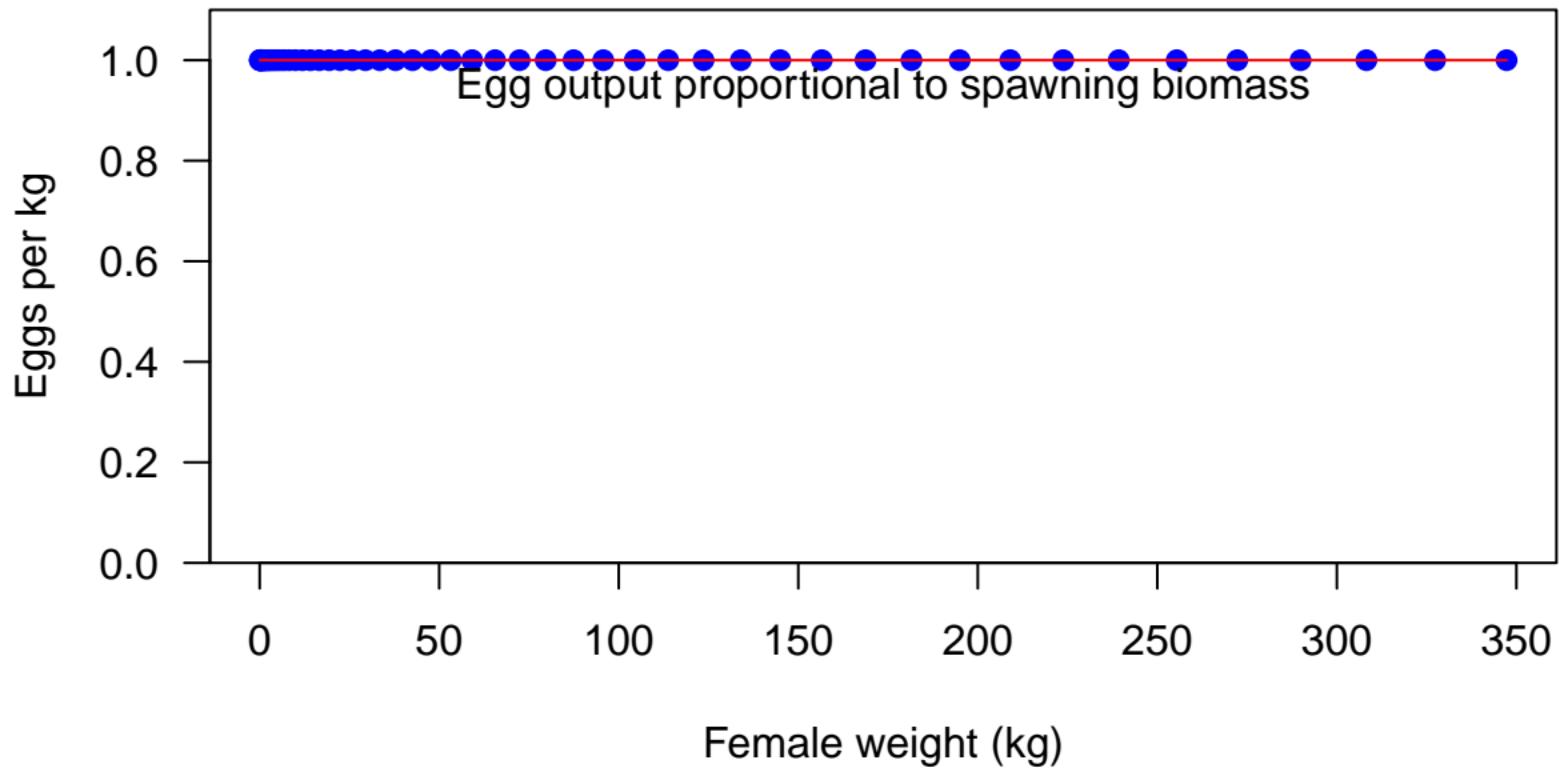


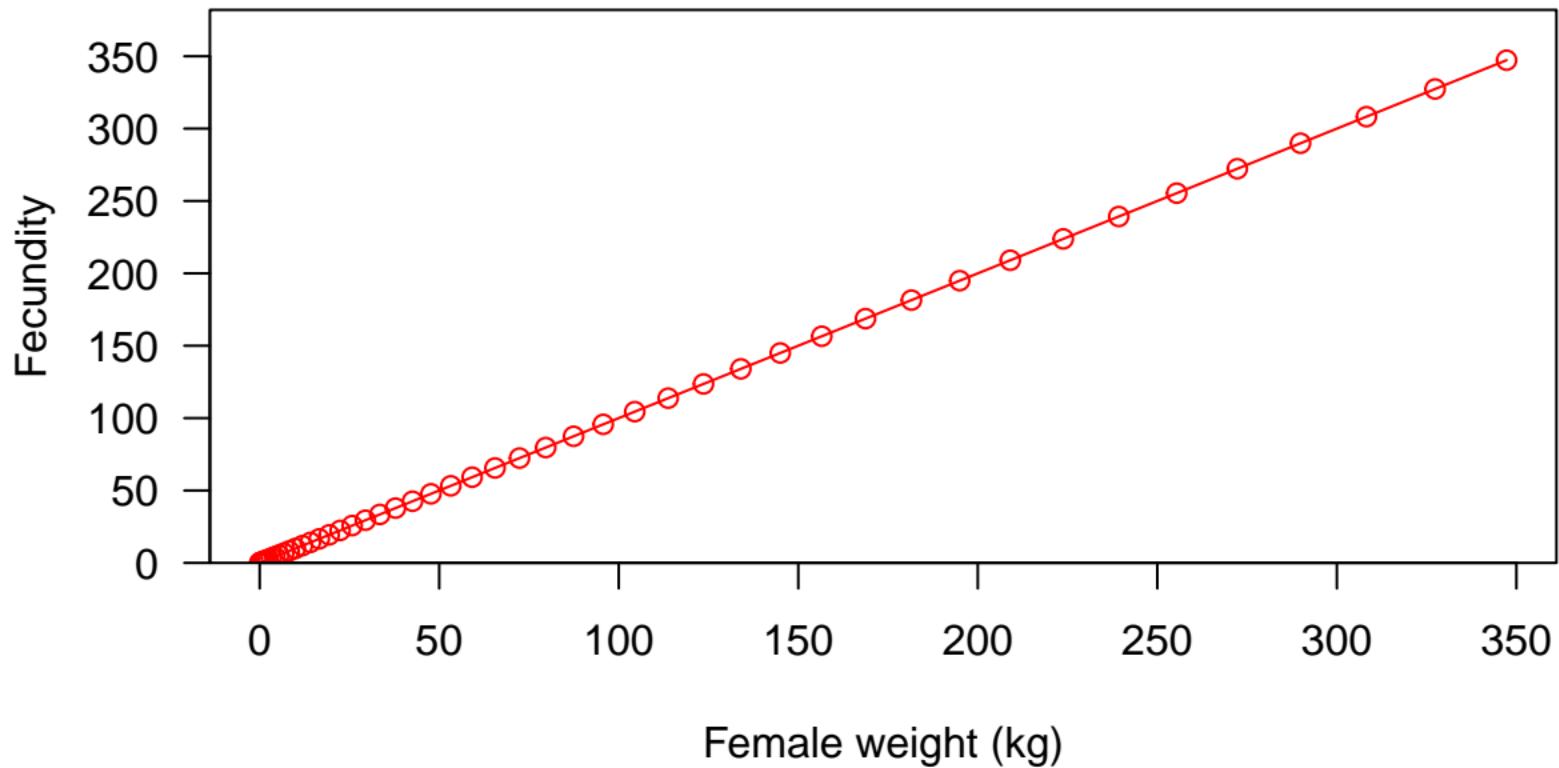


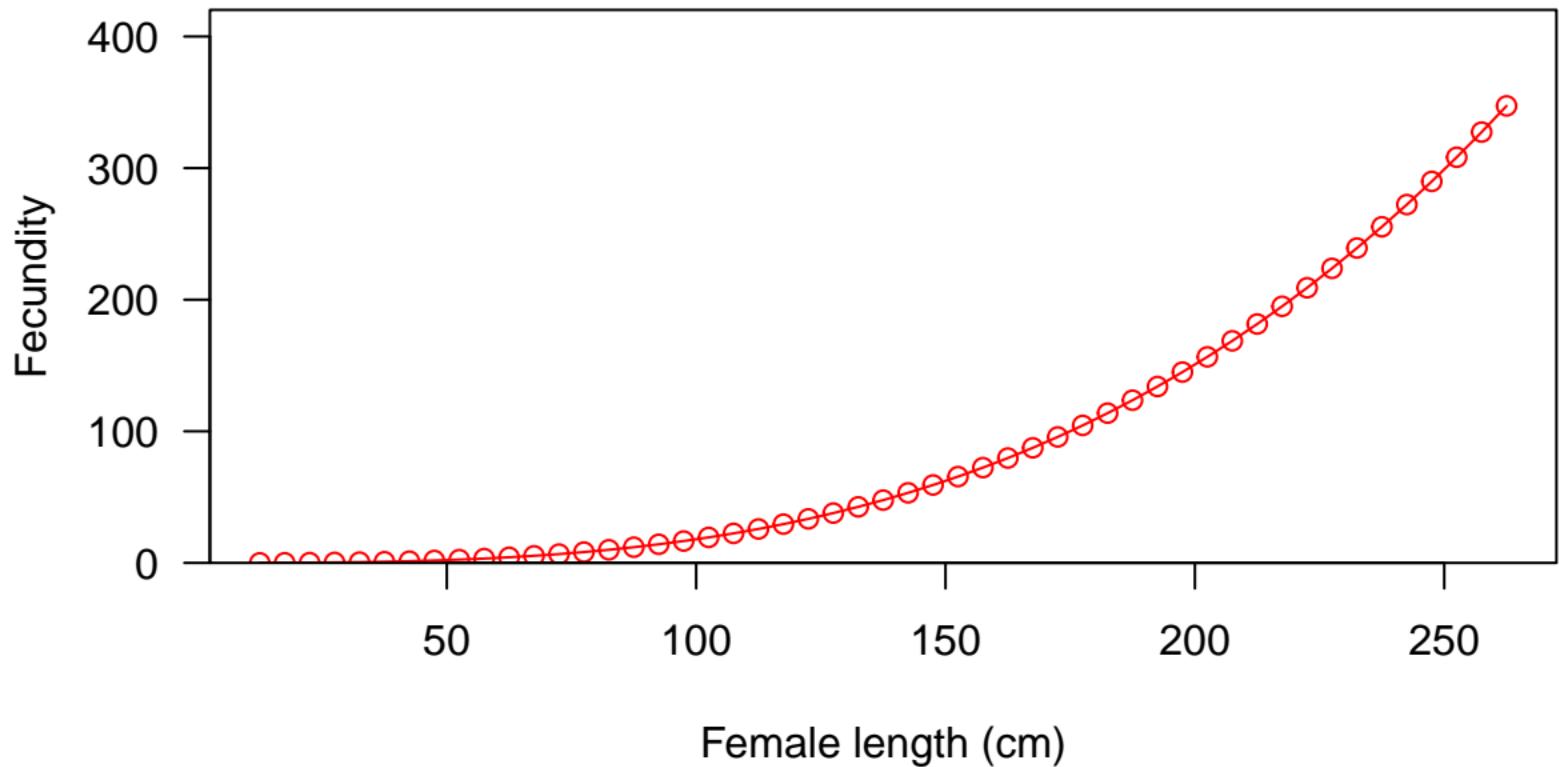


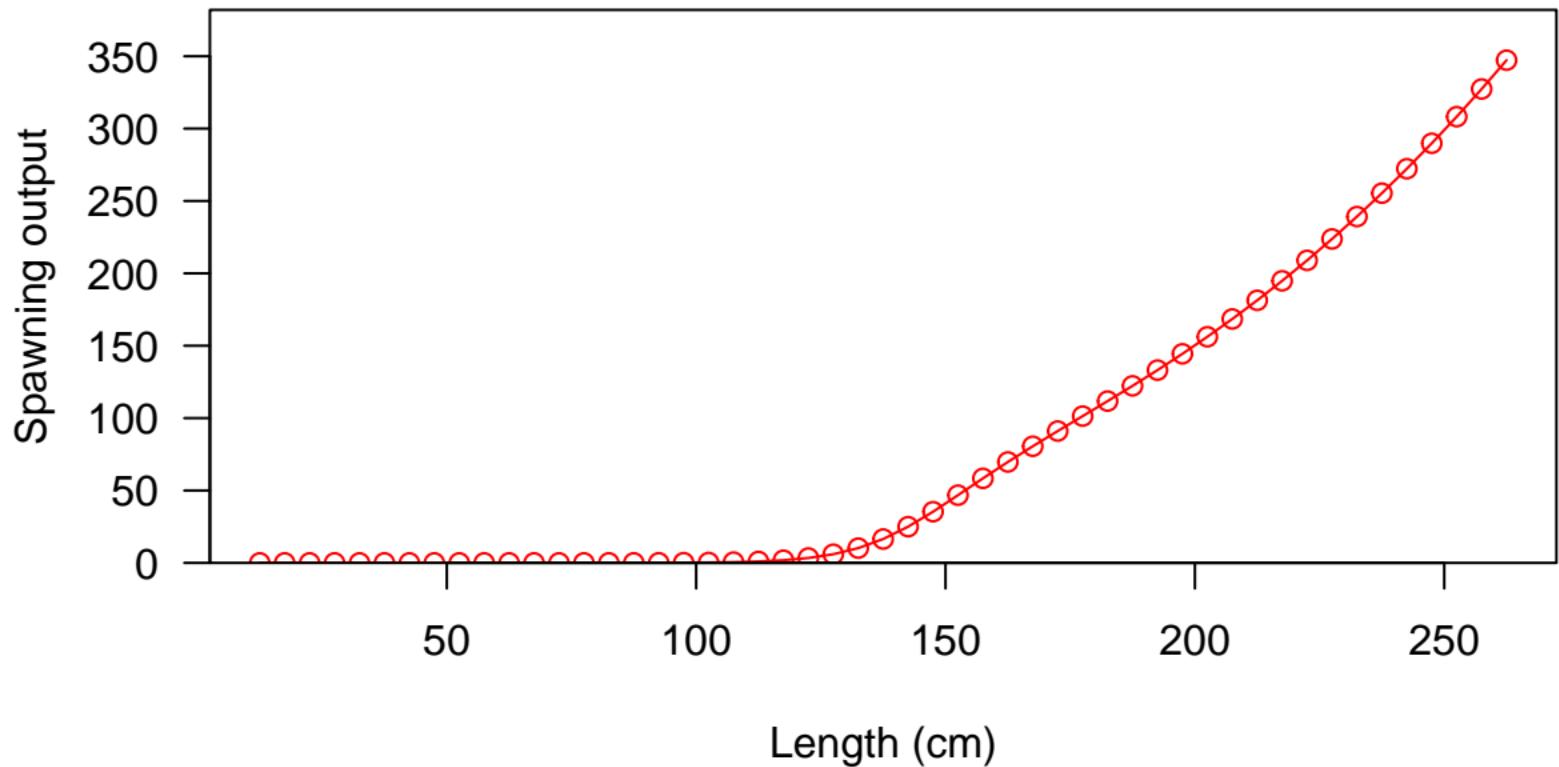


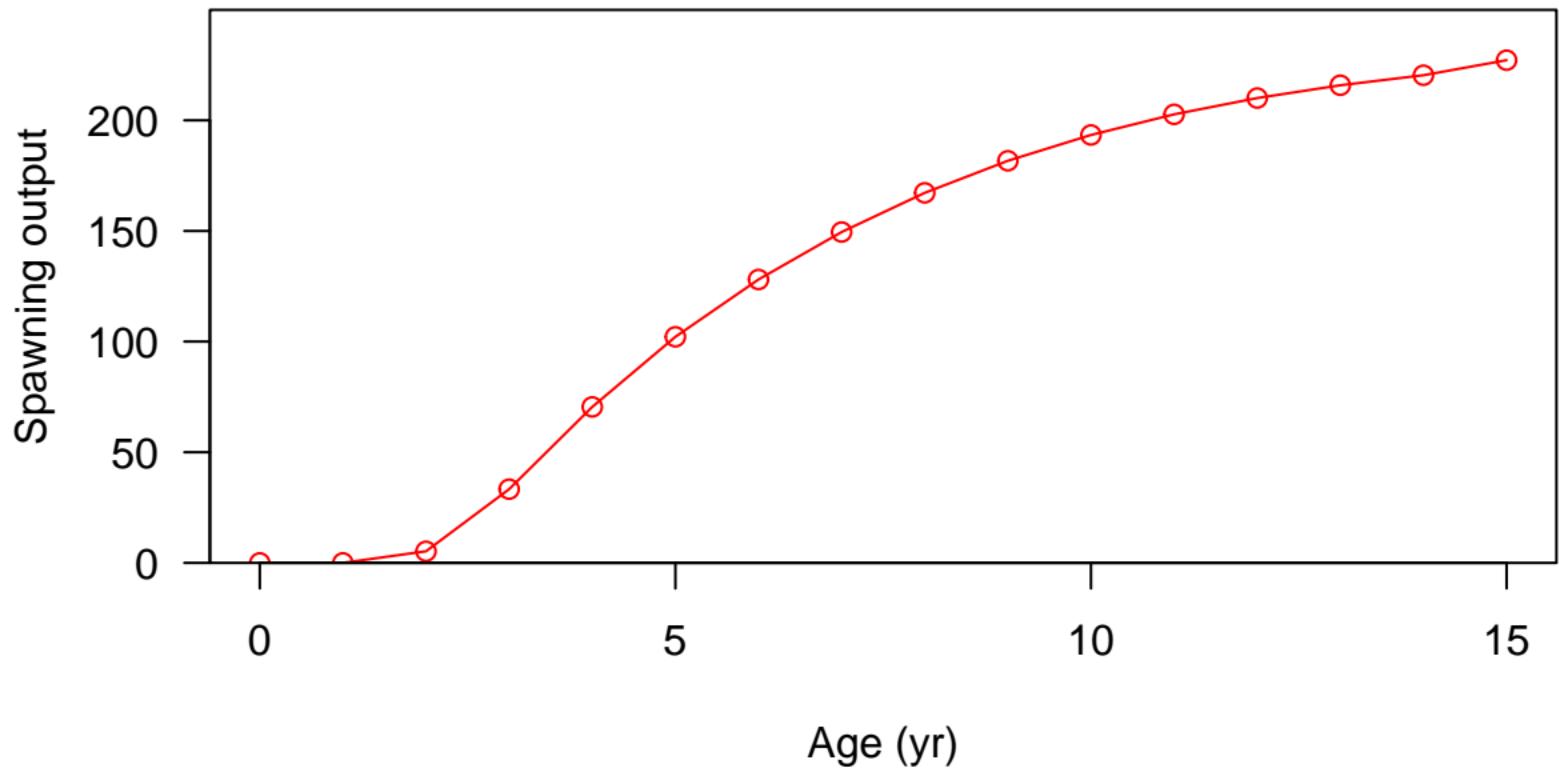


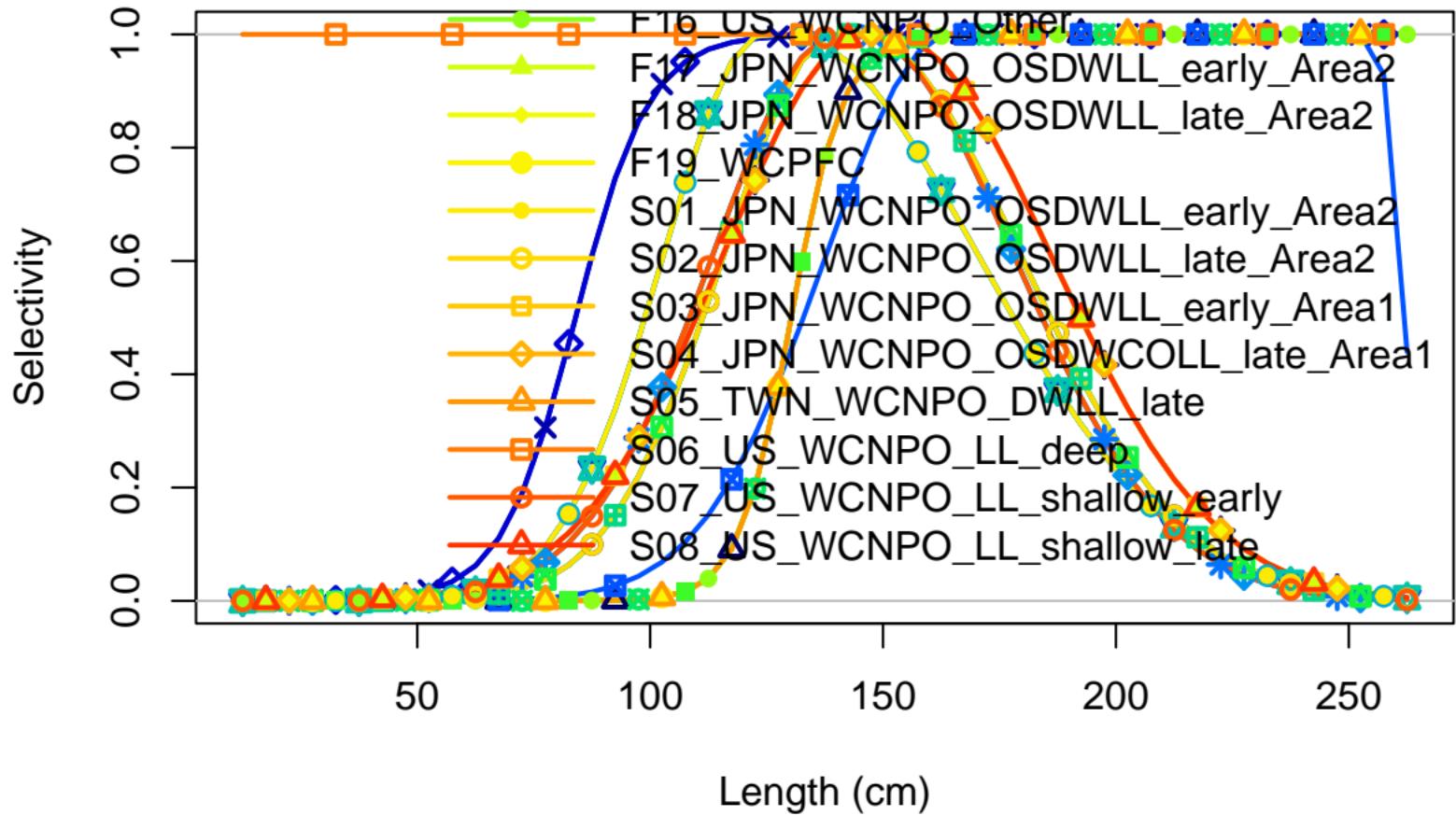


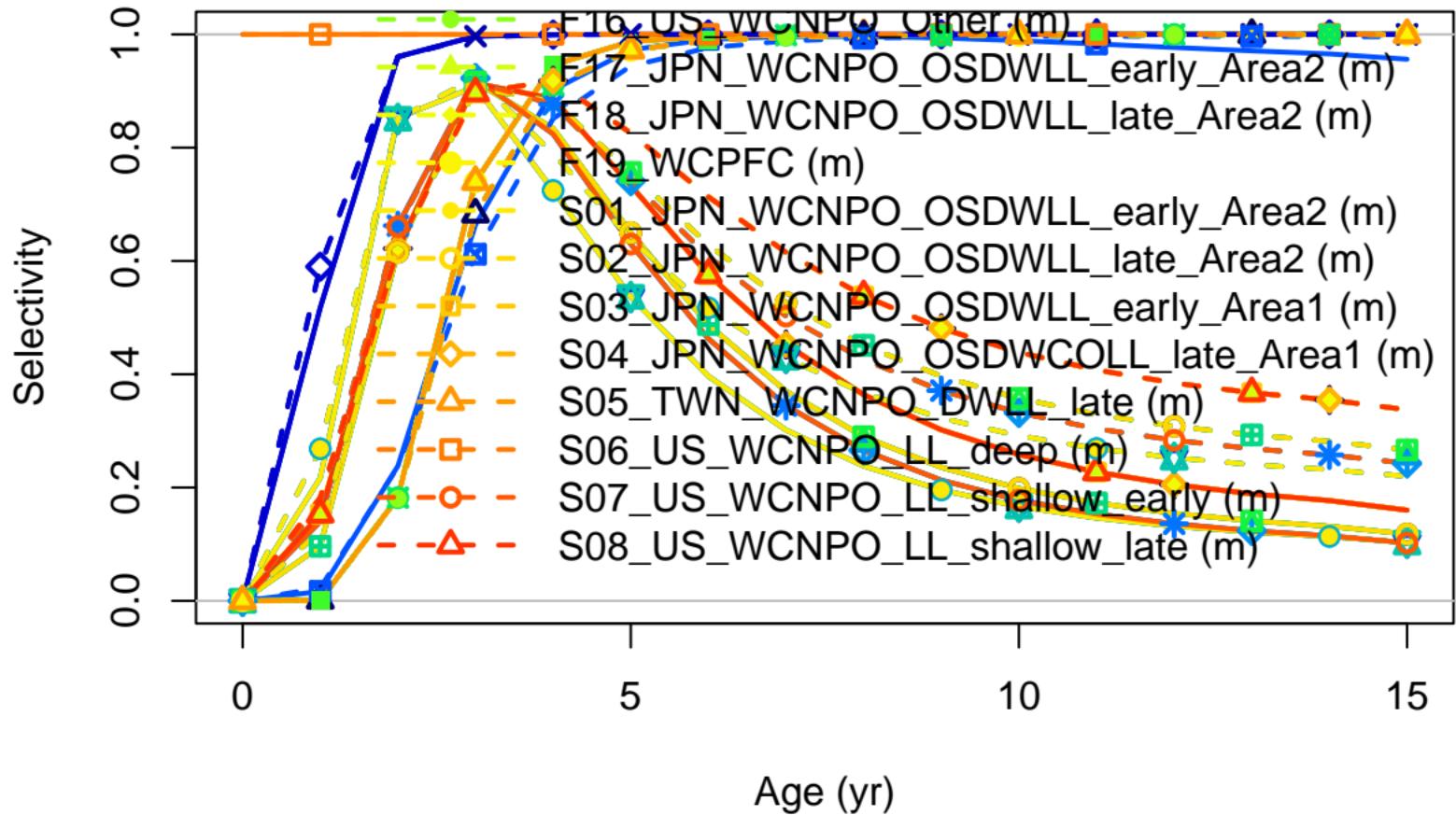


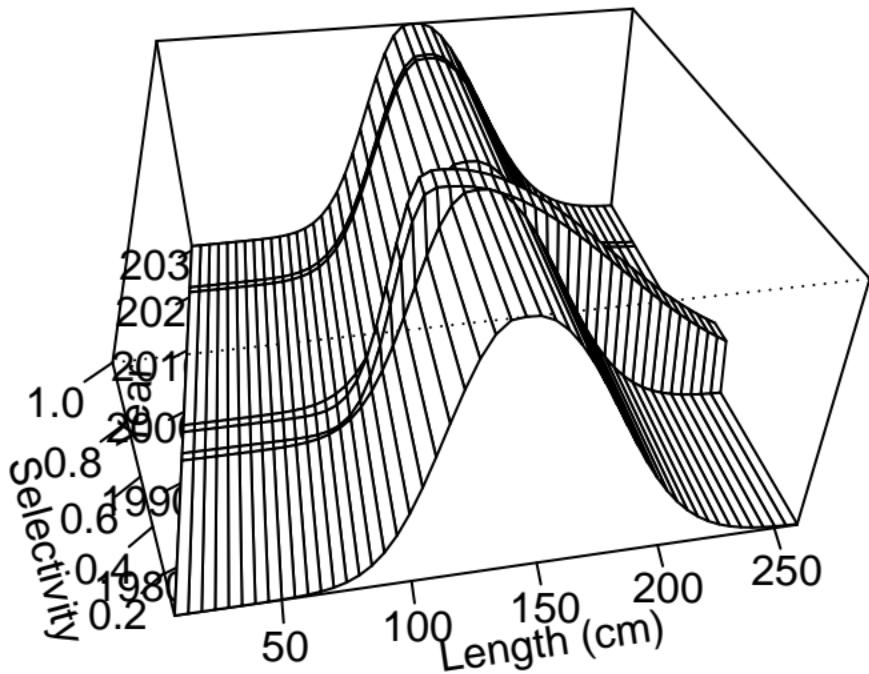


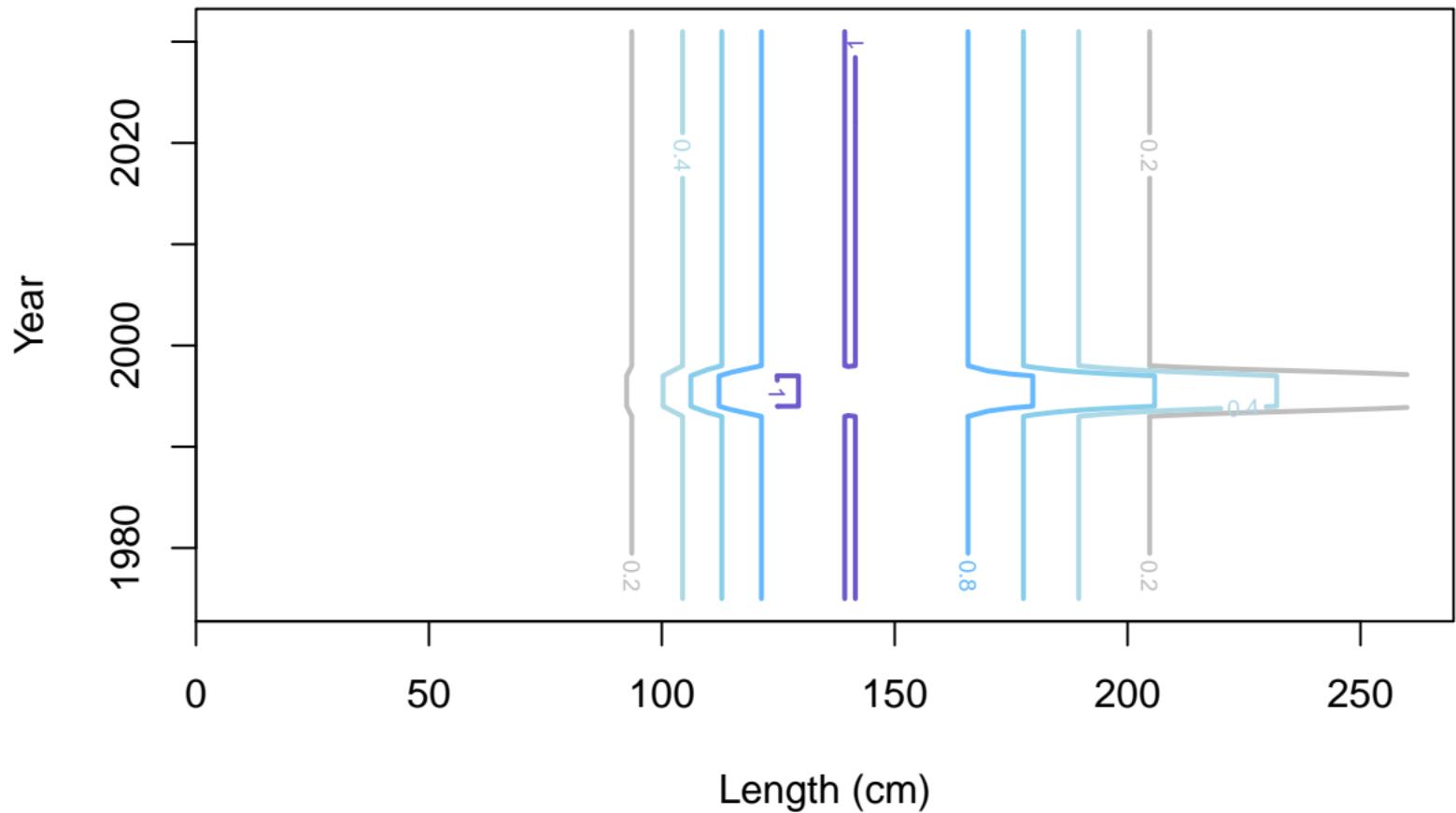


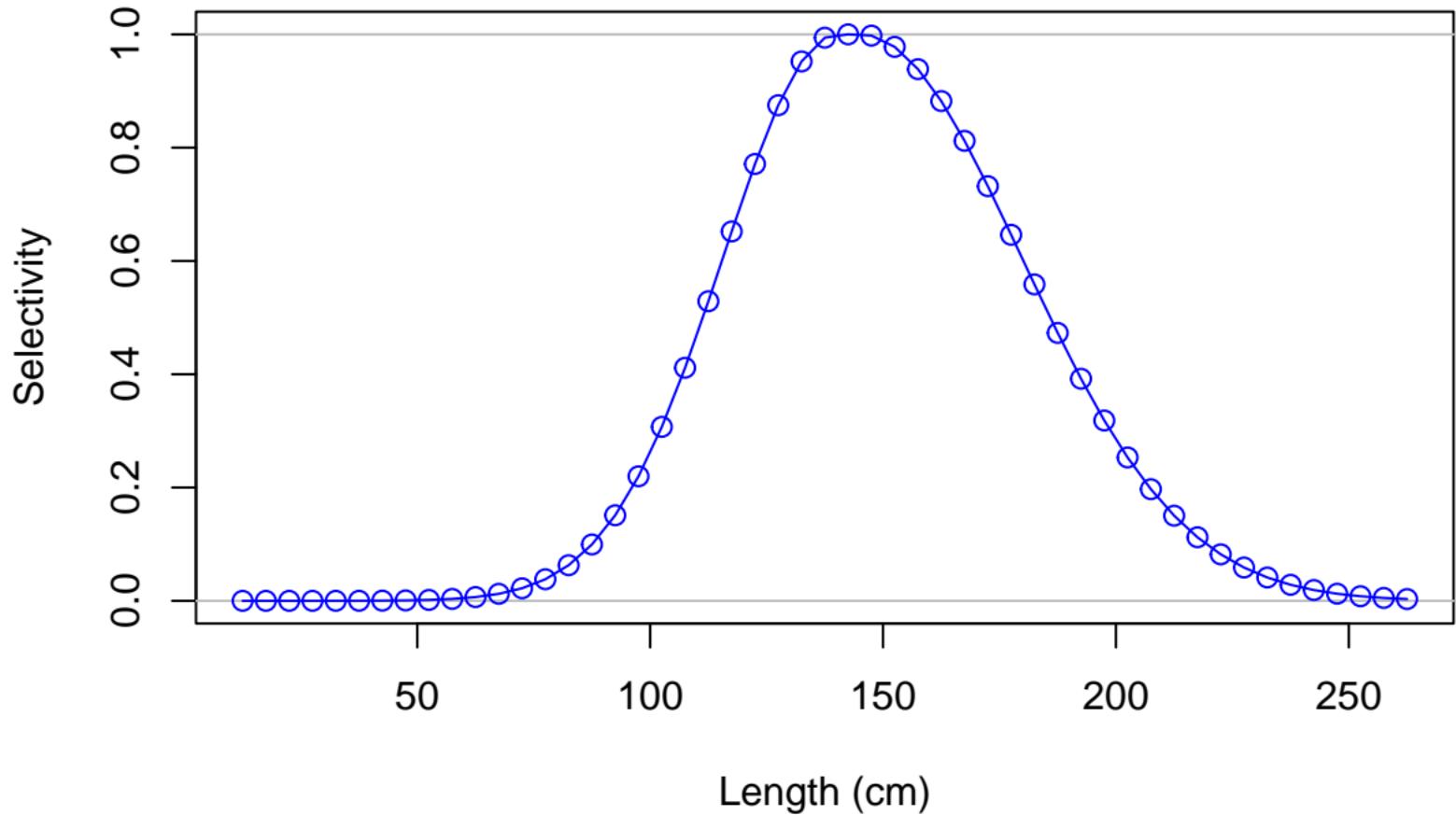


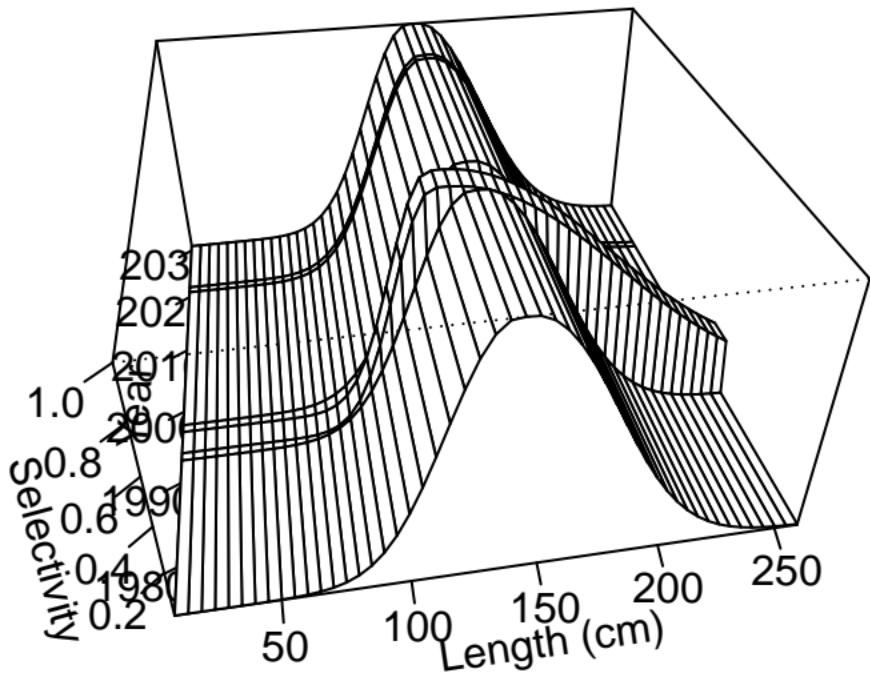


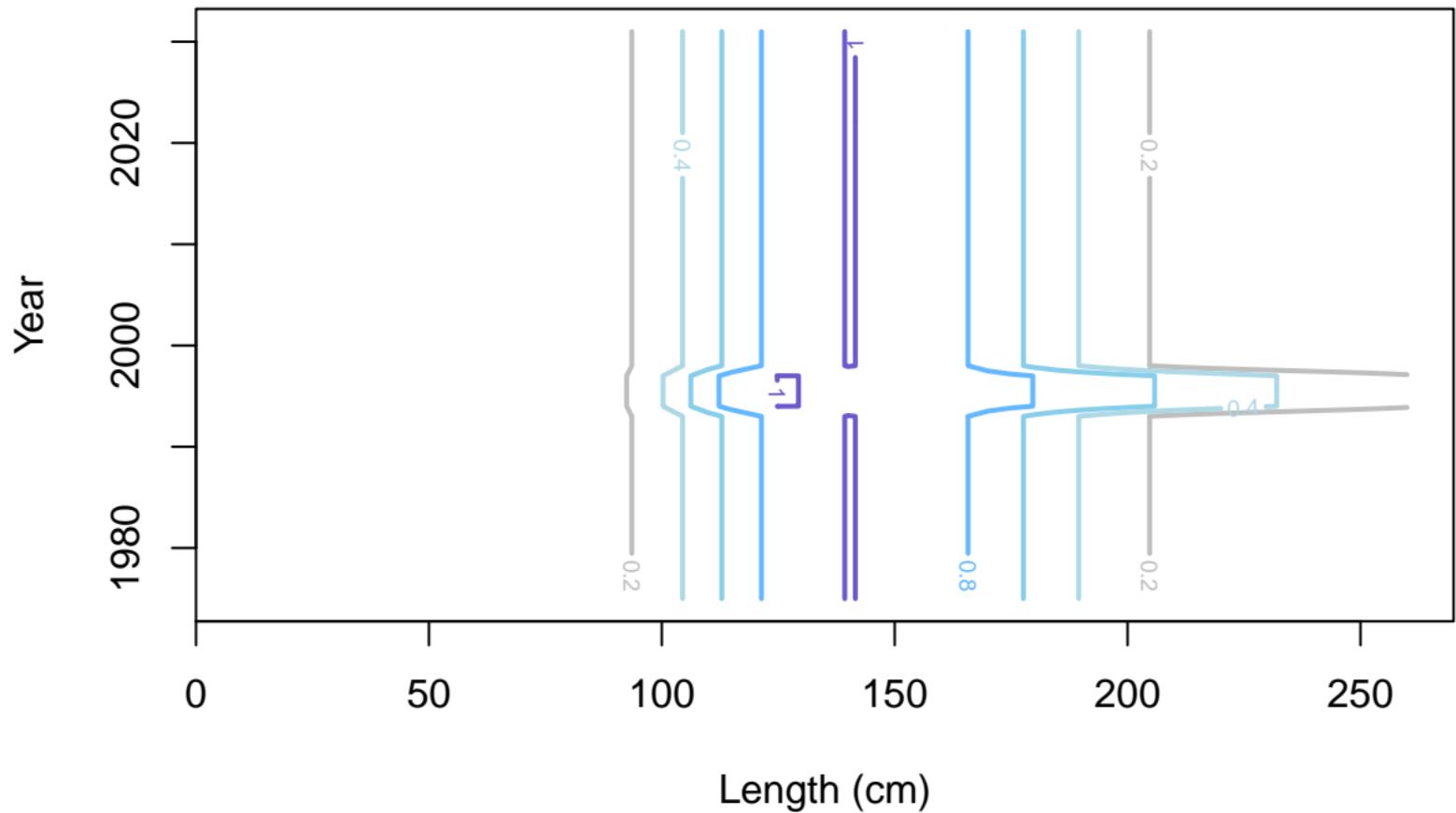


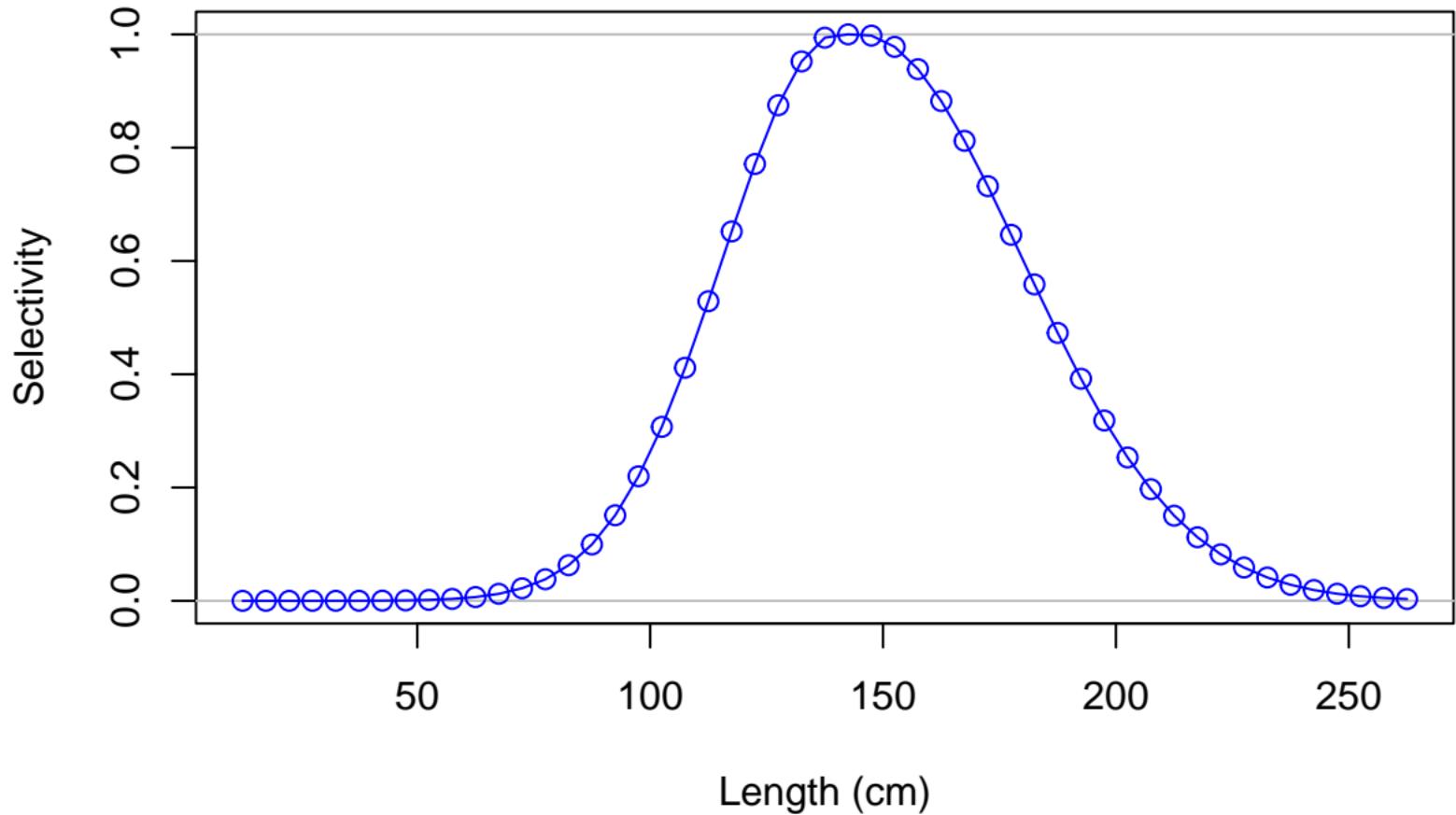


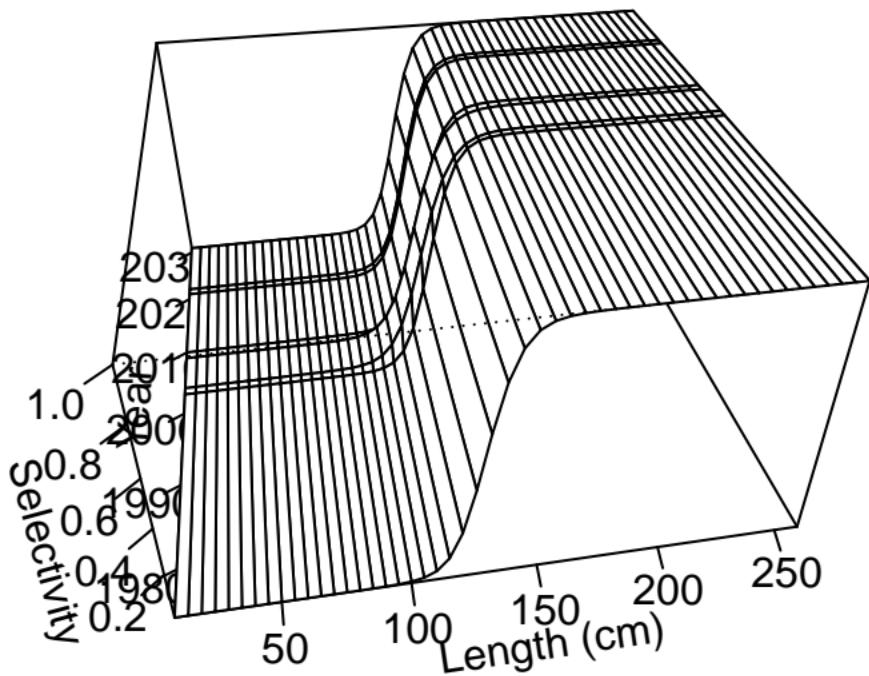












Year

2020

2000

1980

0

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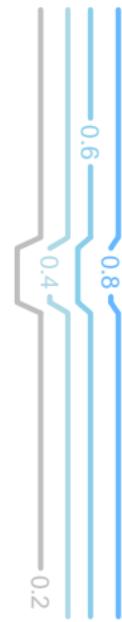
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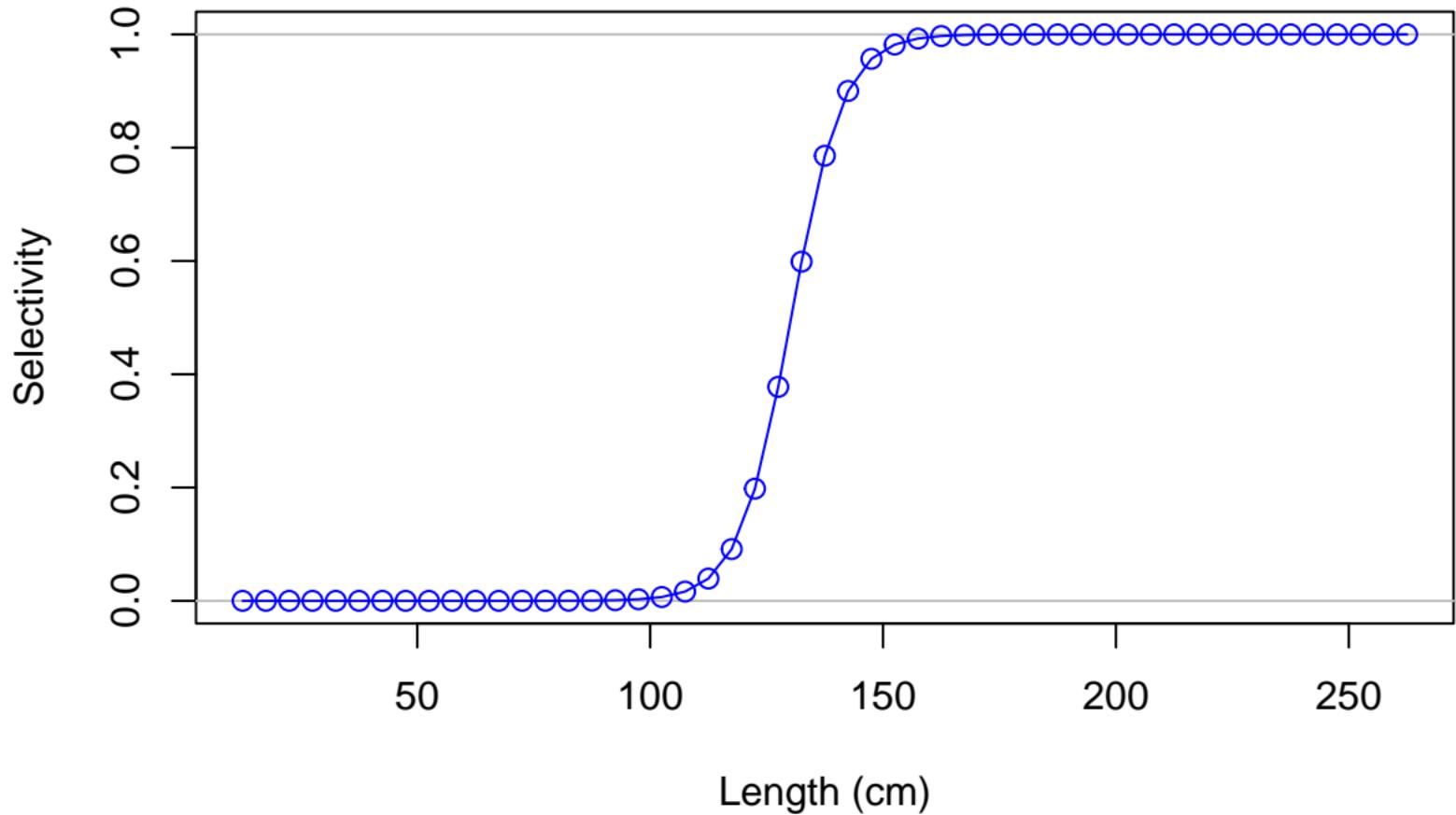
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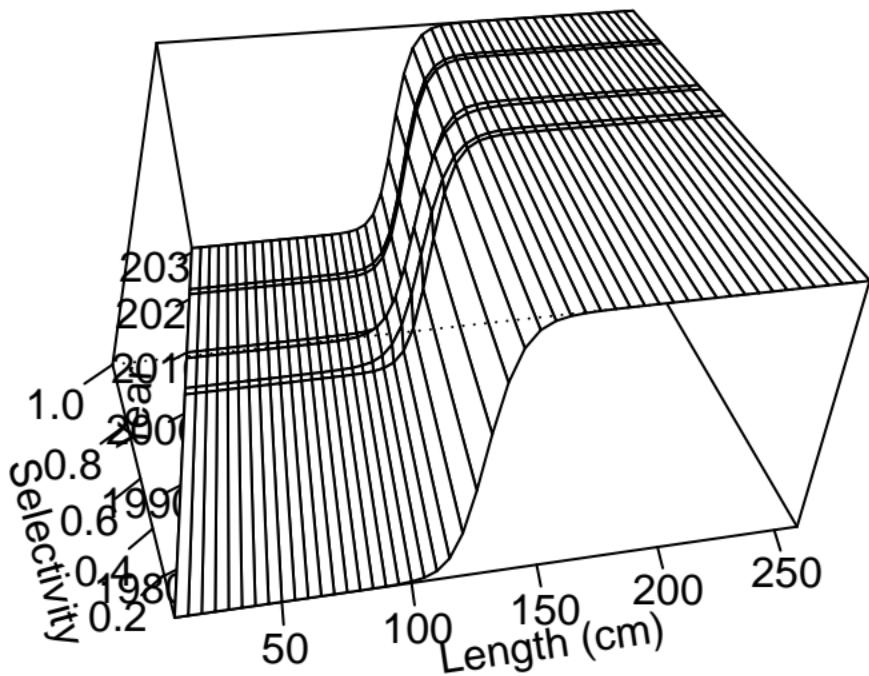
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250

Length (cm)







Year

1980 2000 2020

0

50

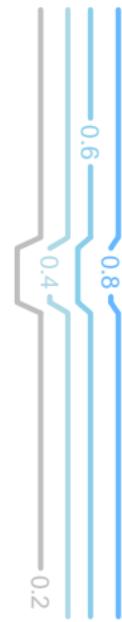
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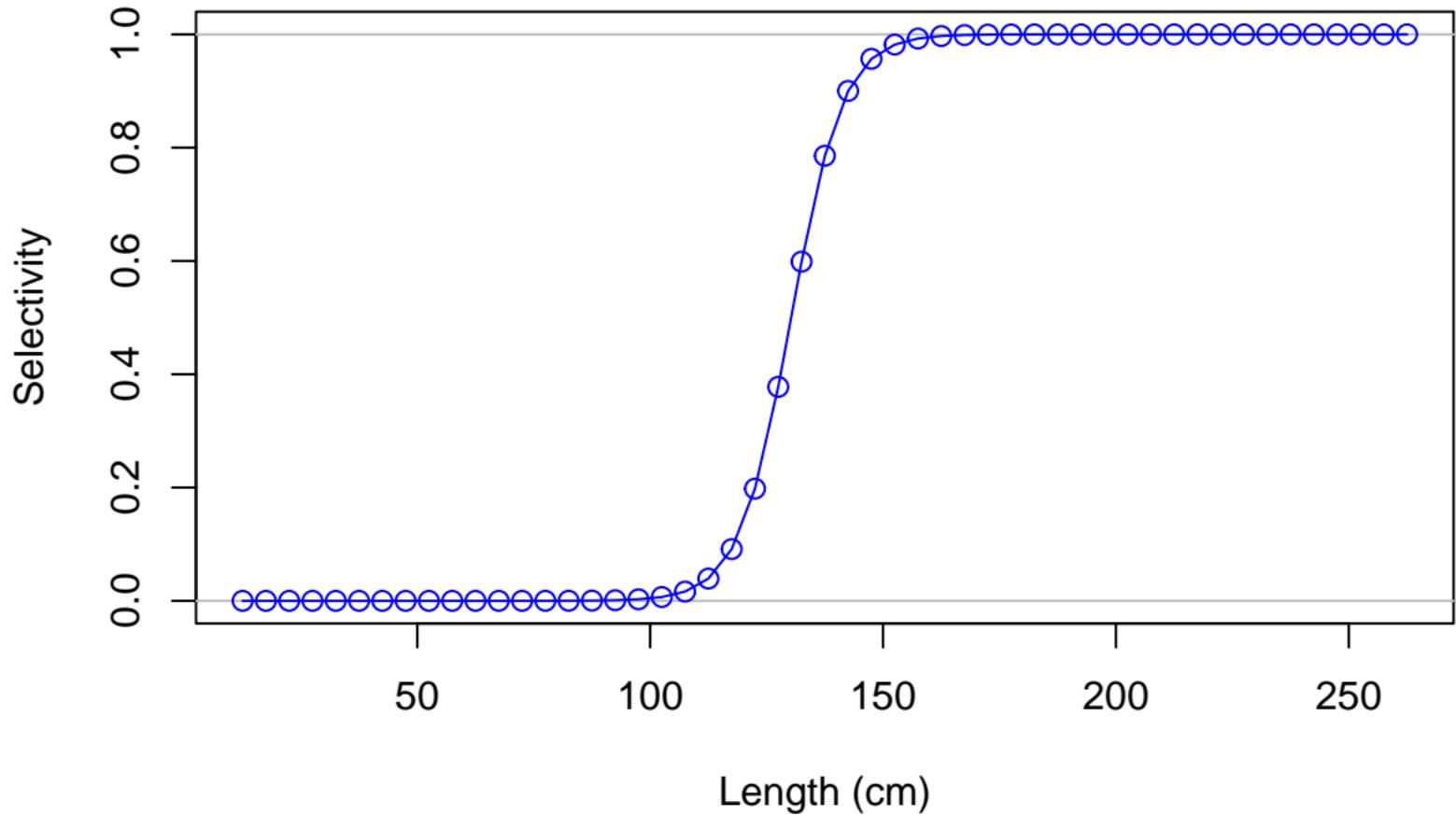
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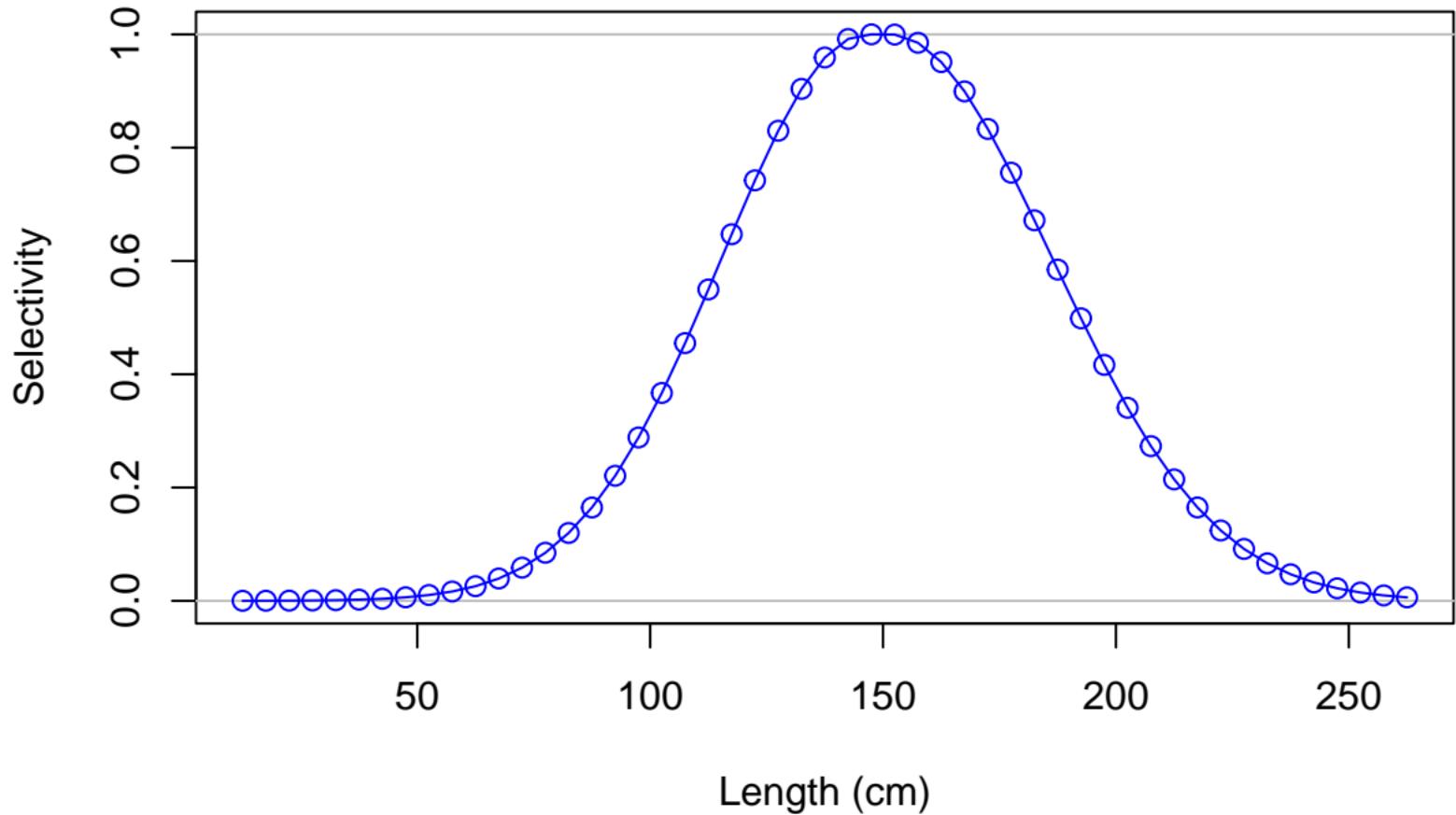
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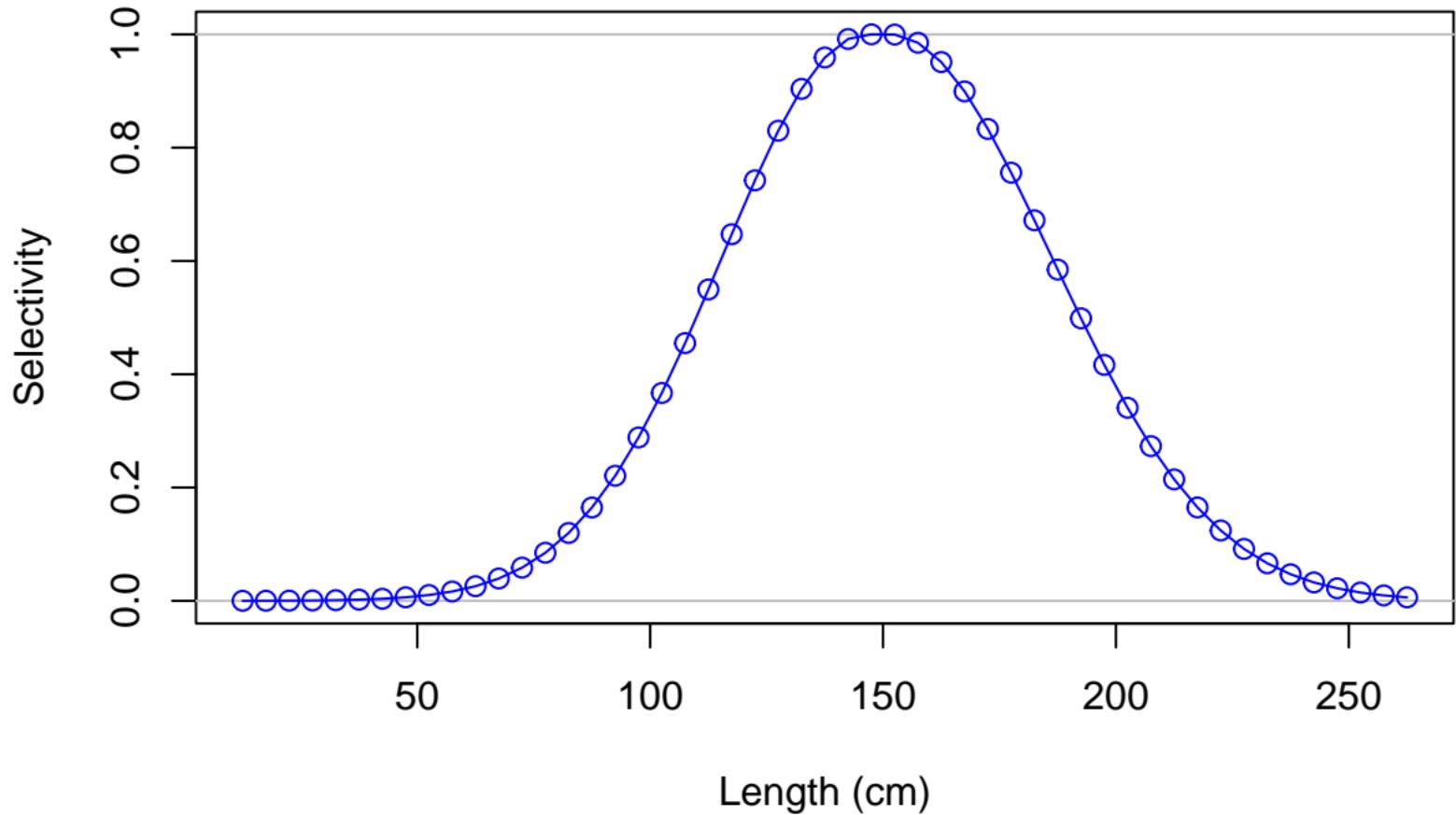
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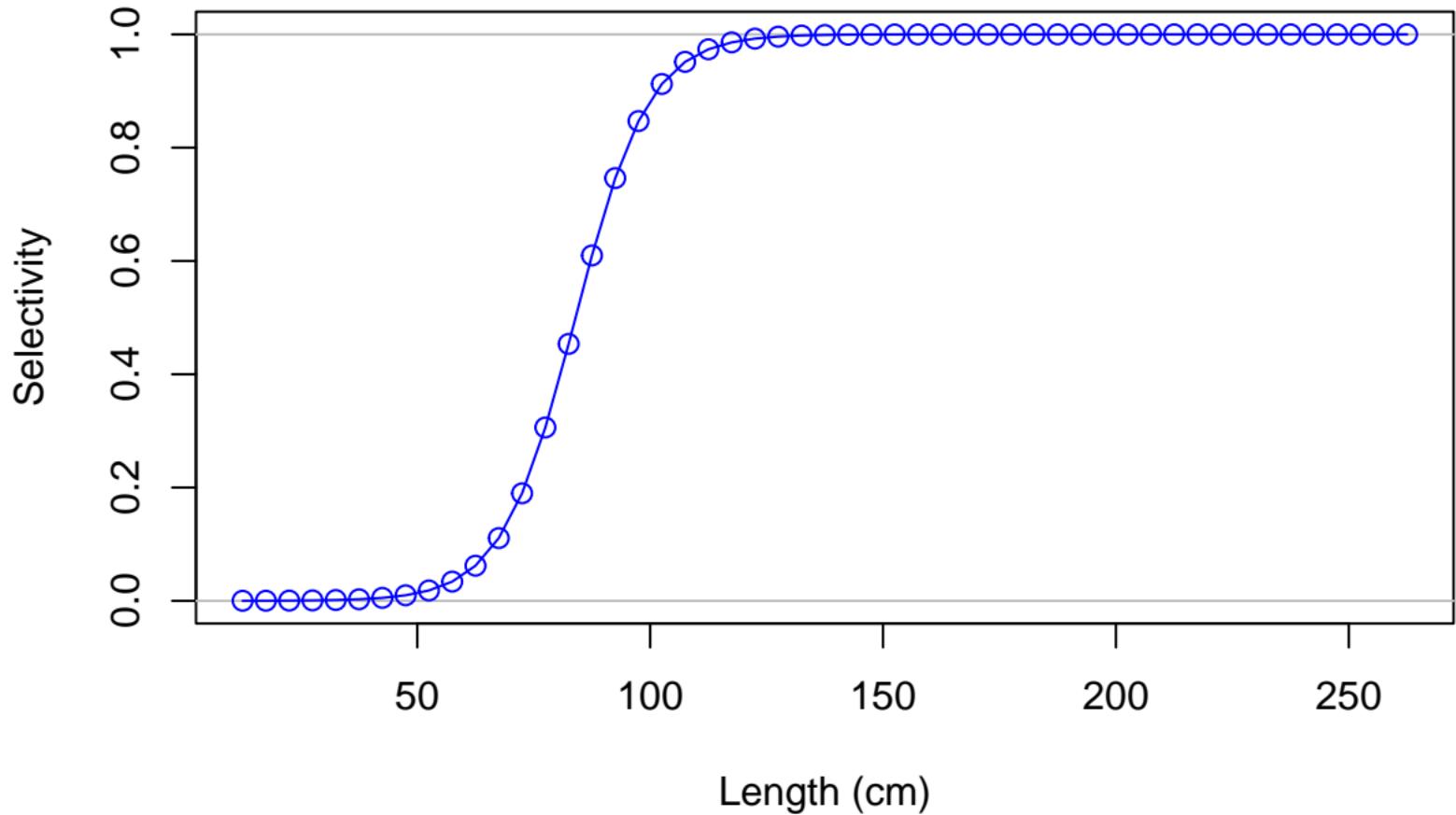
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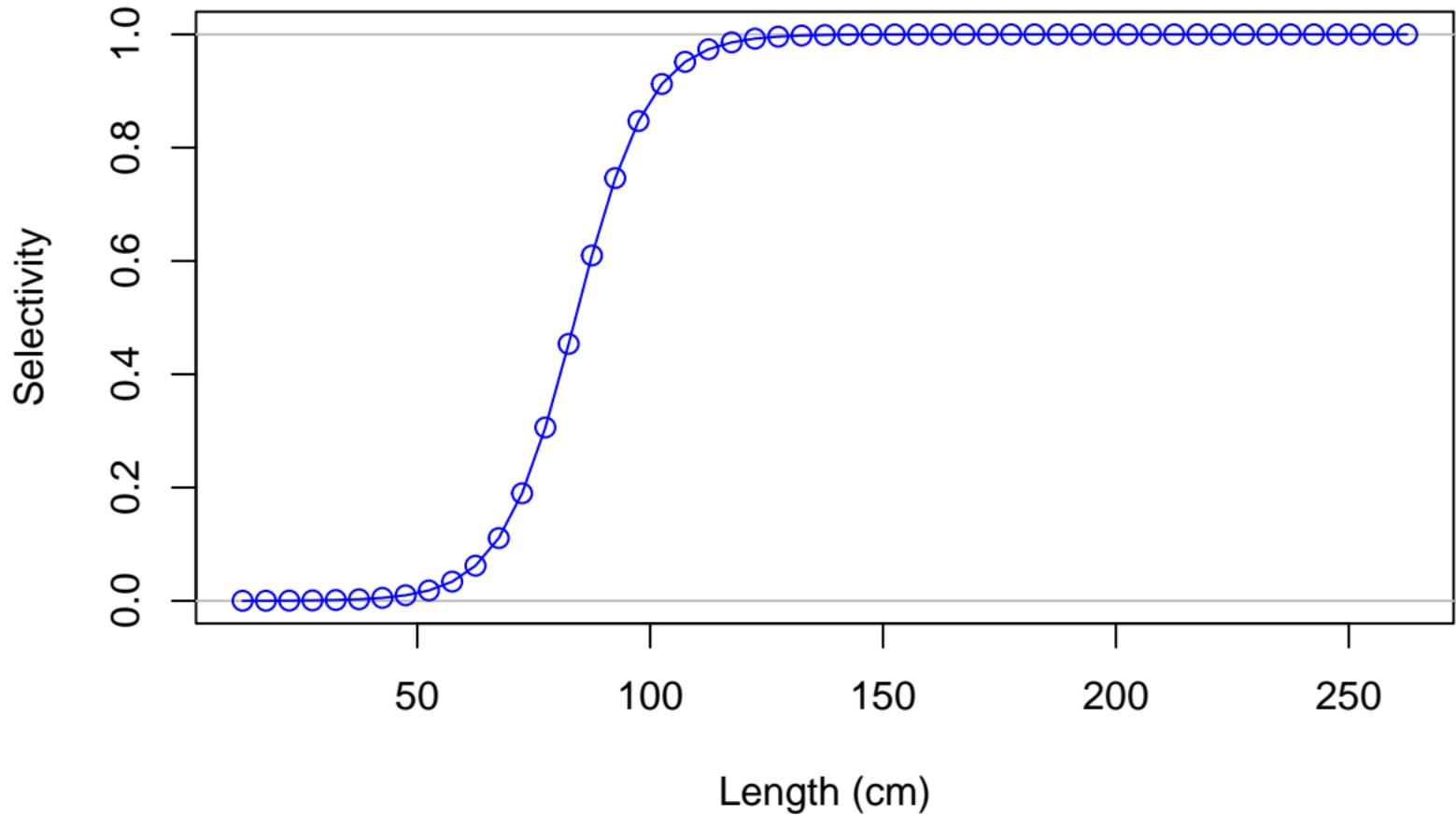


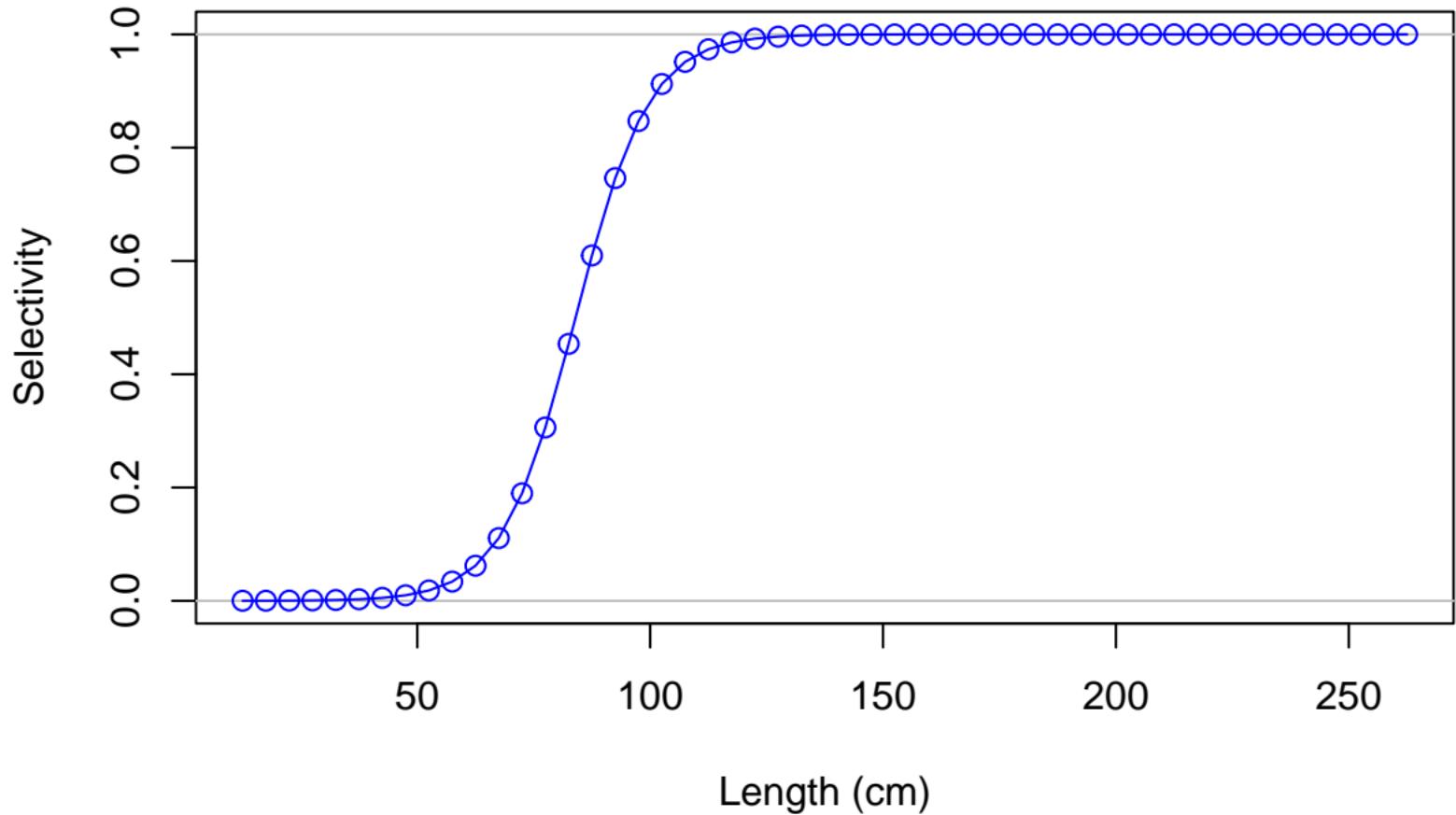


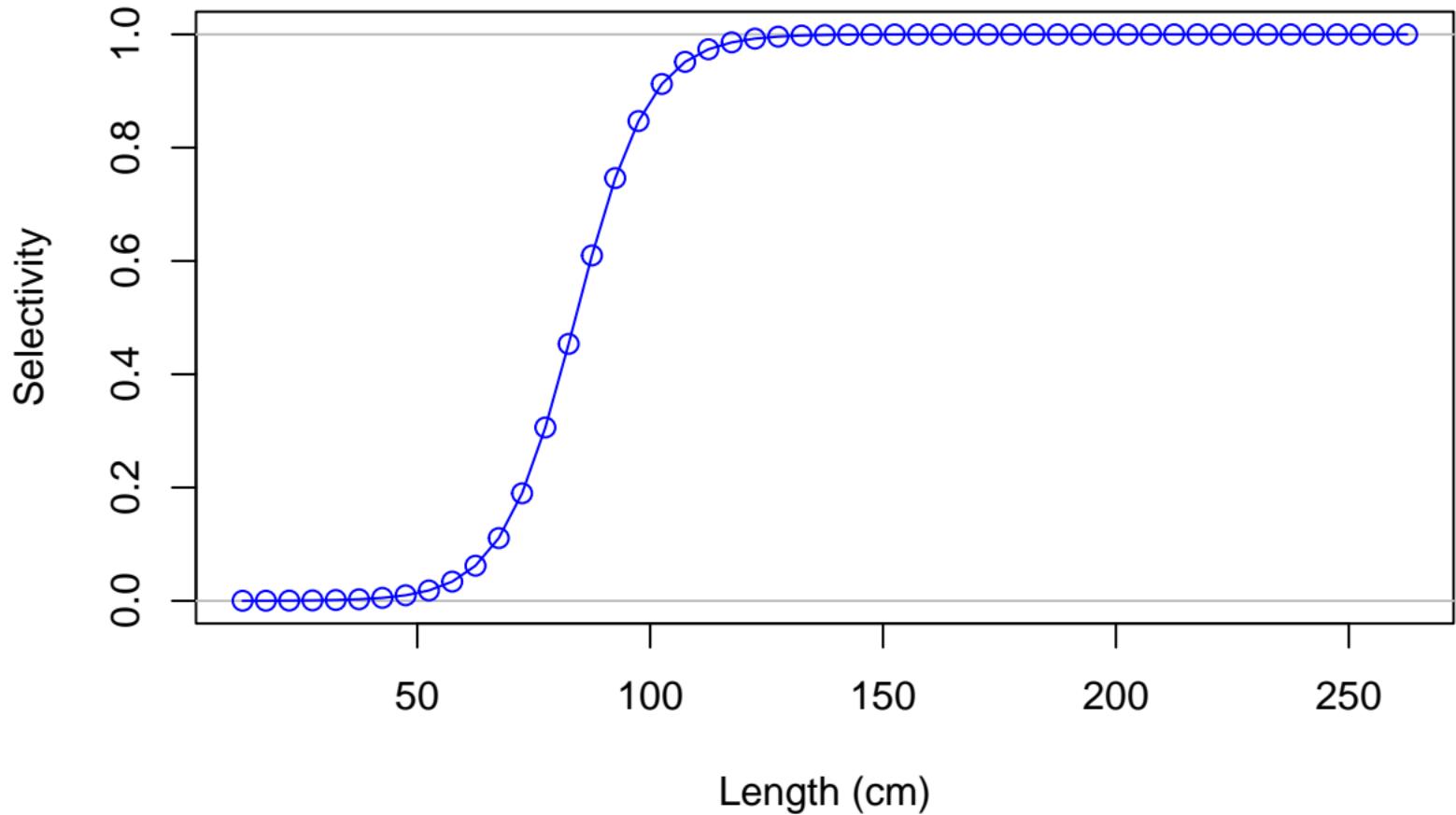


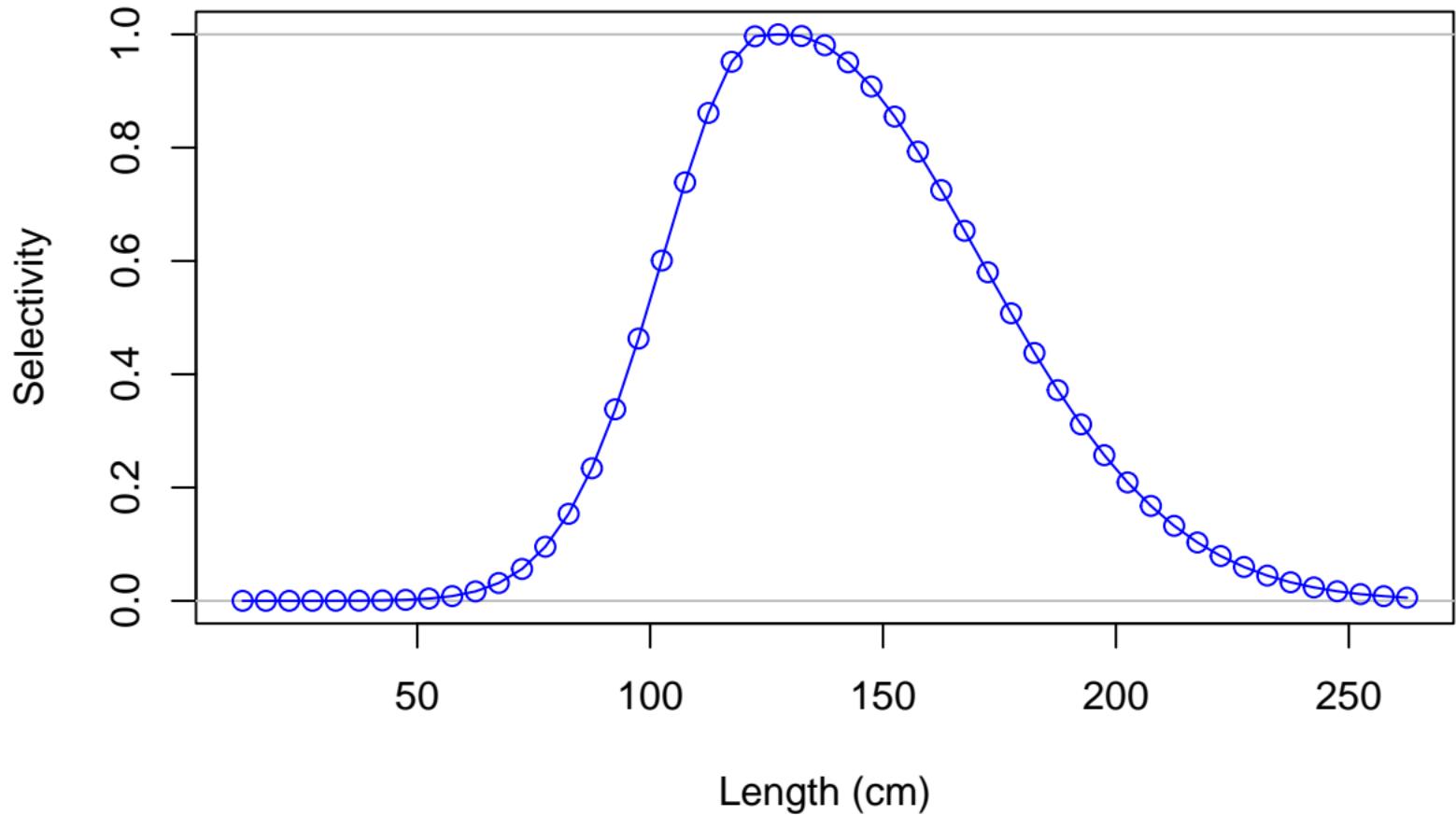


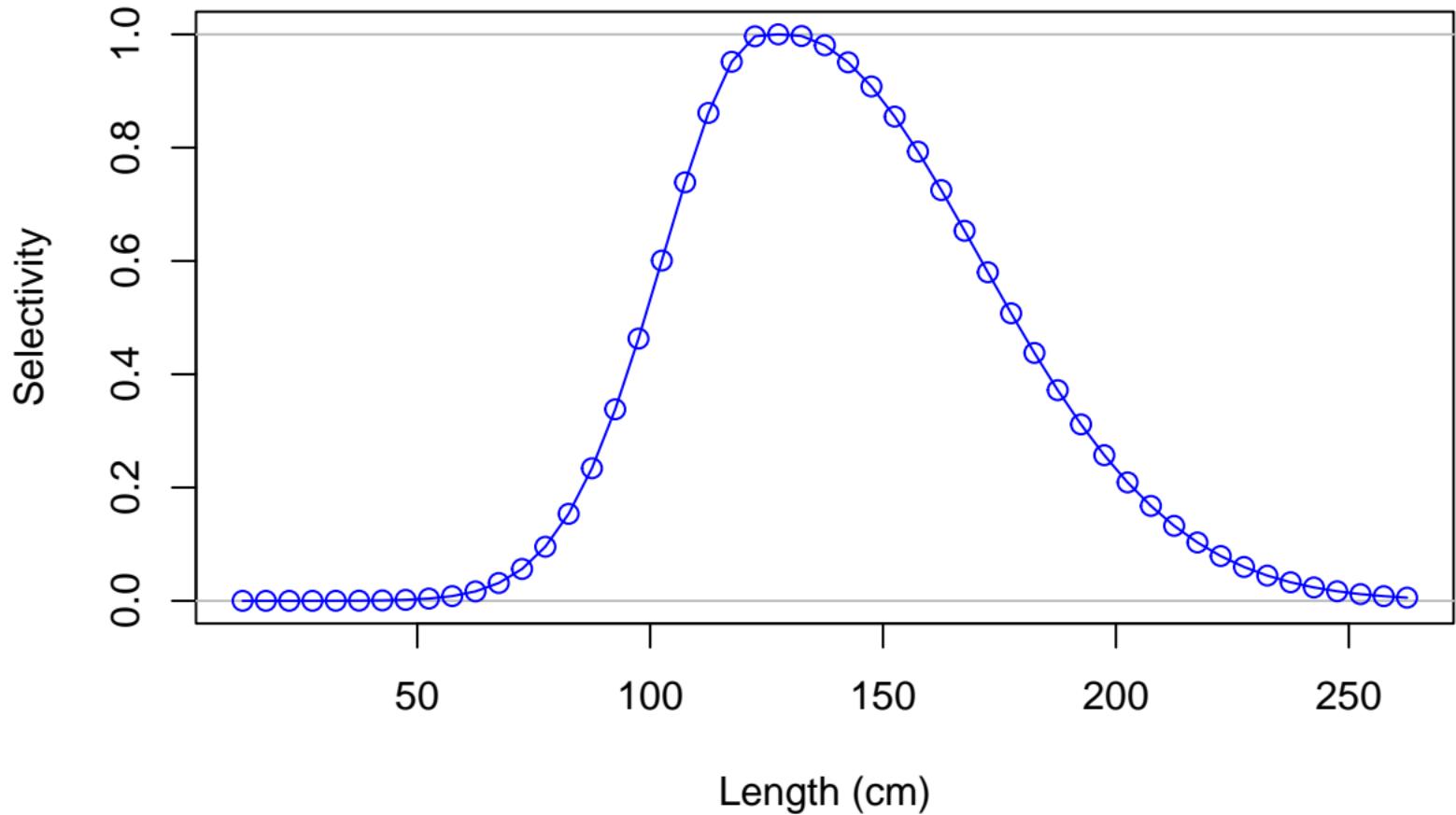


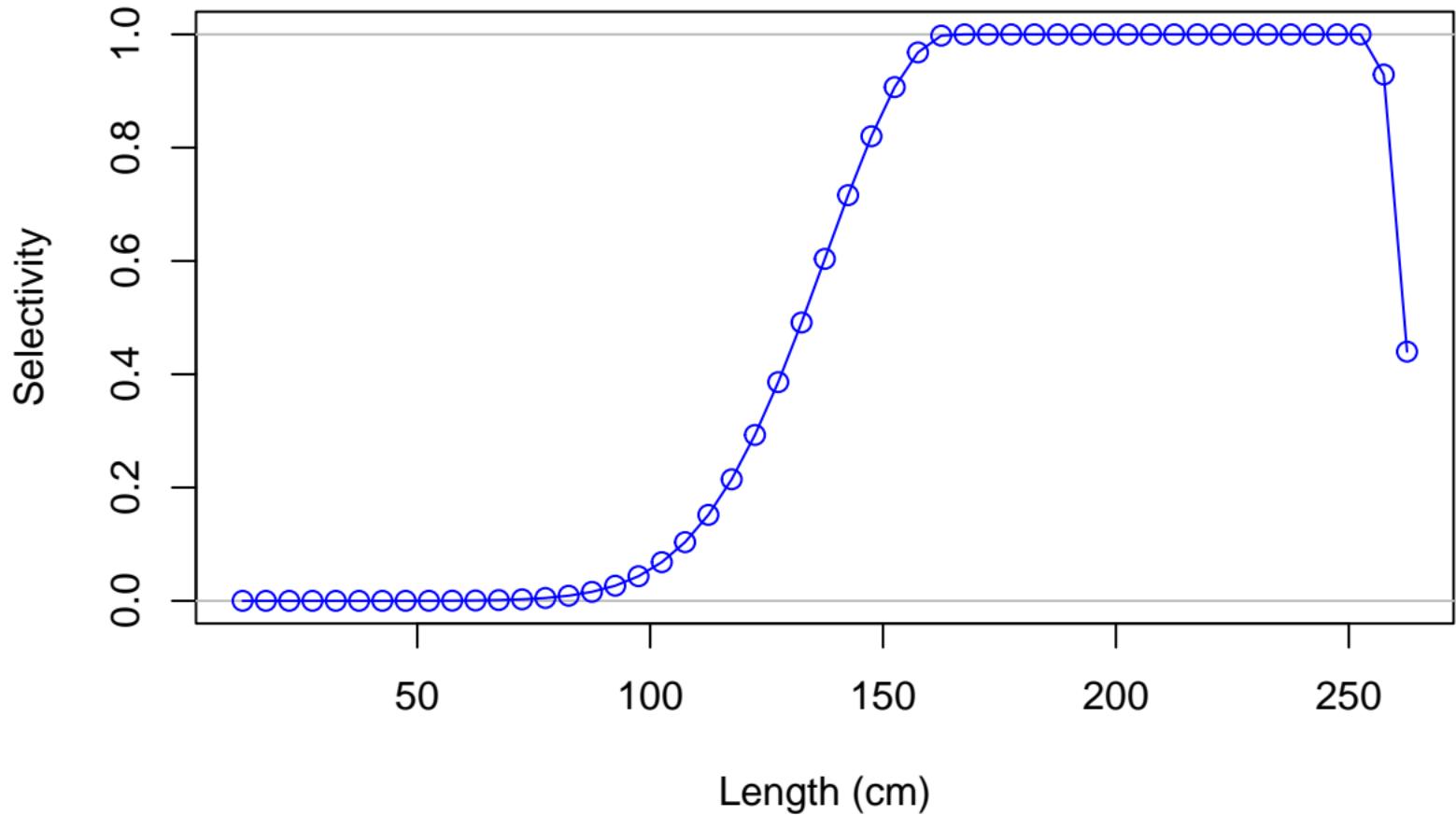


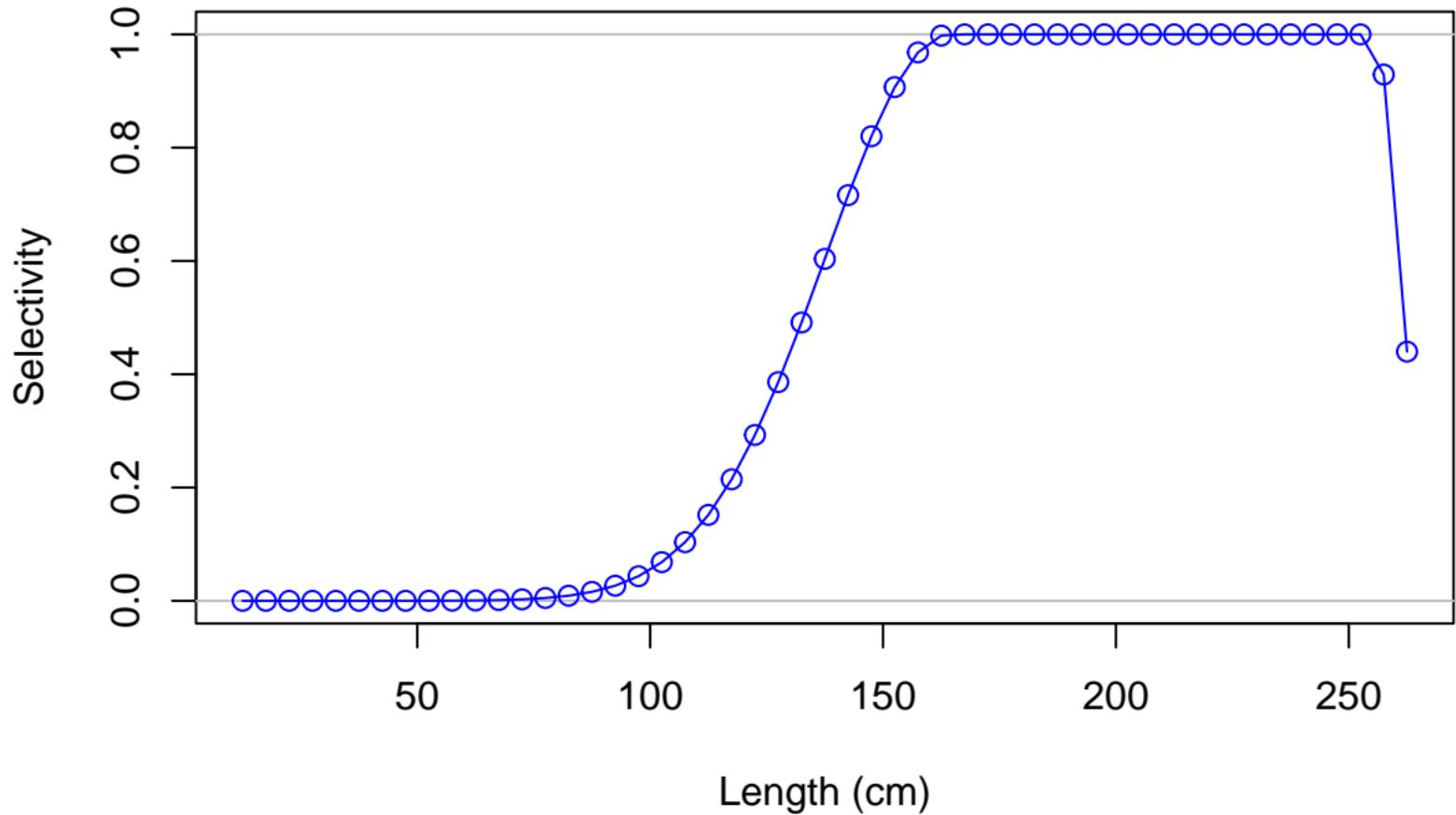


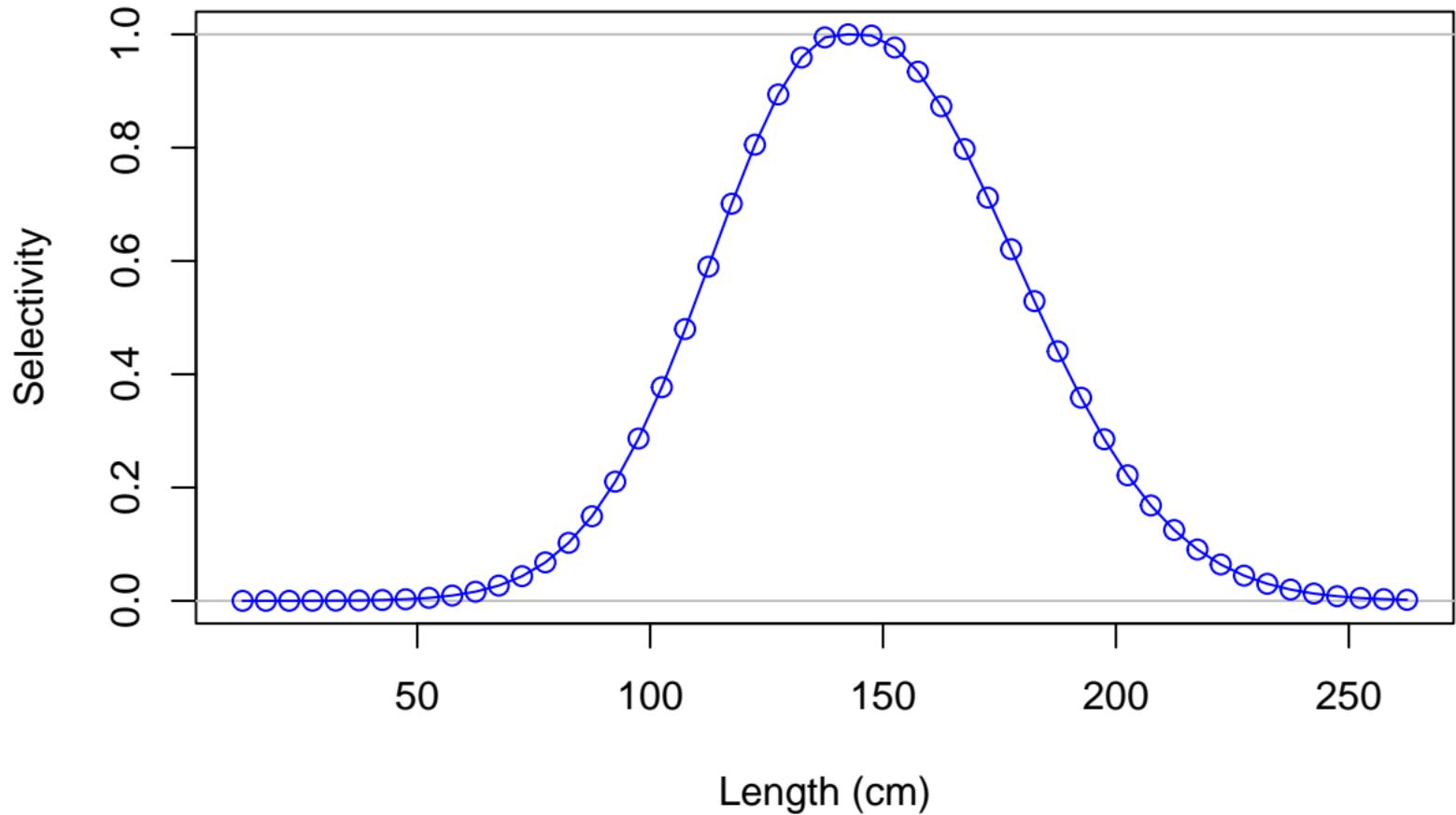


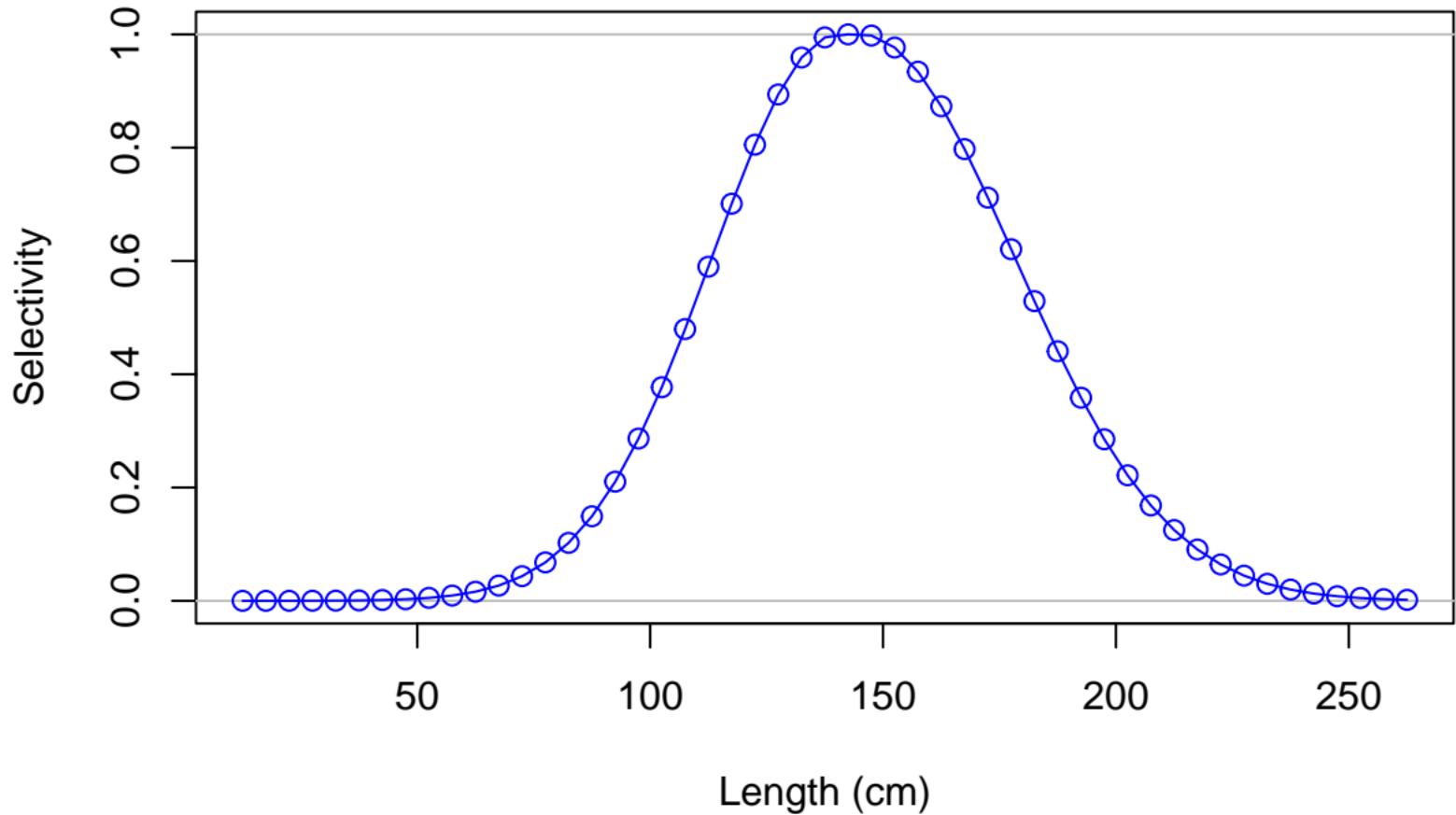


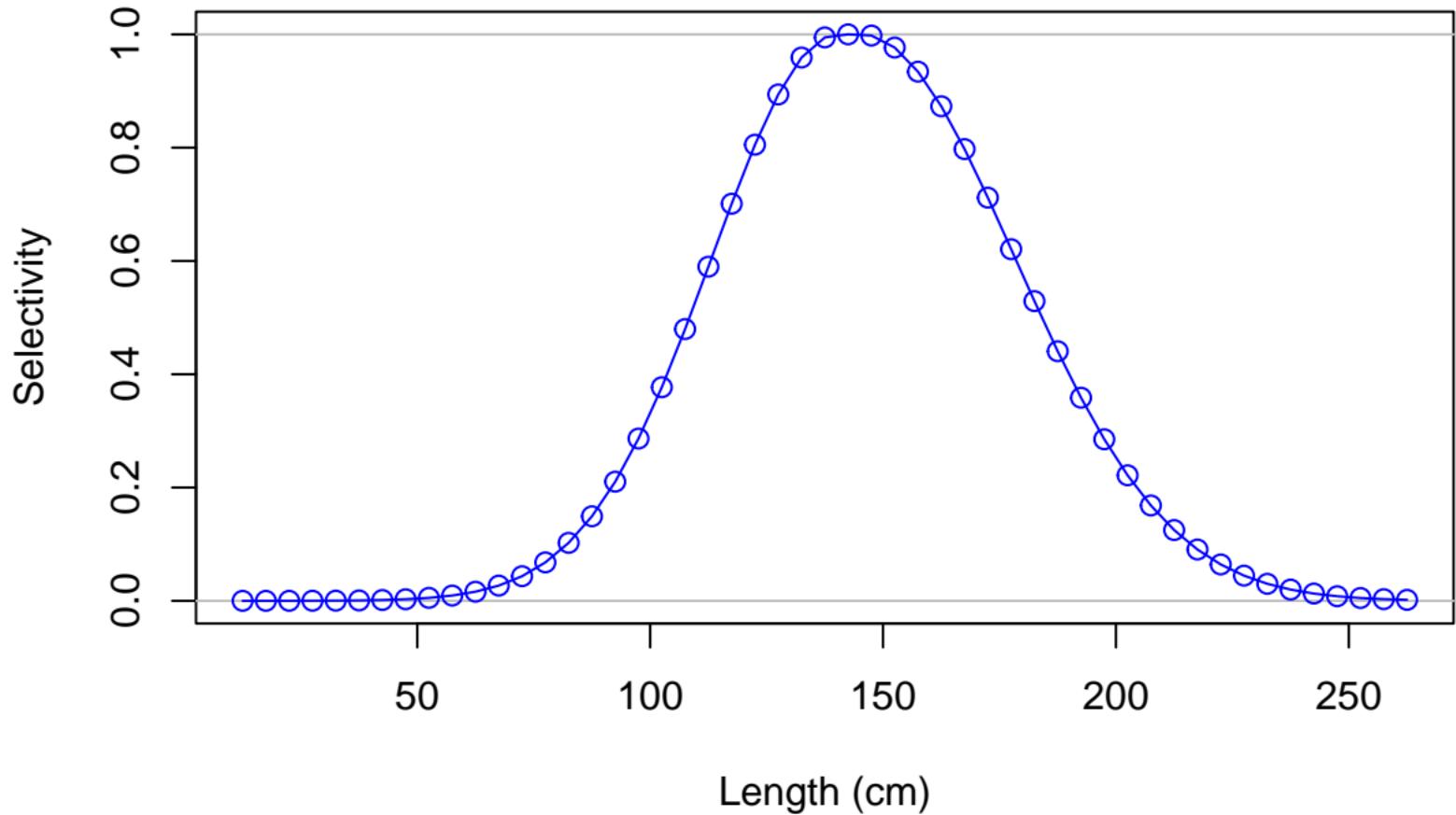


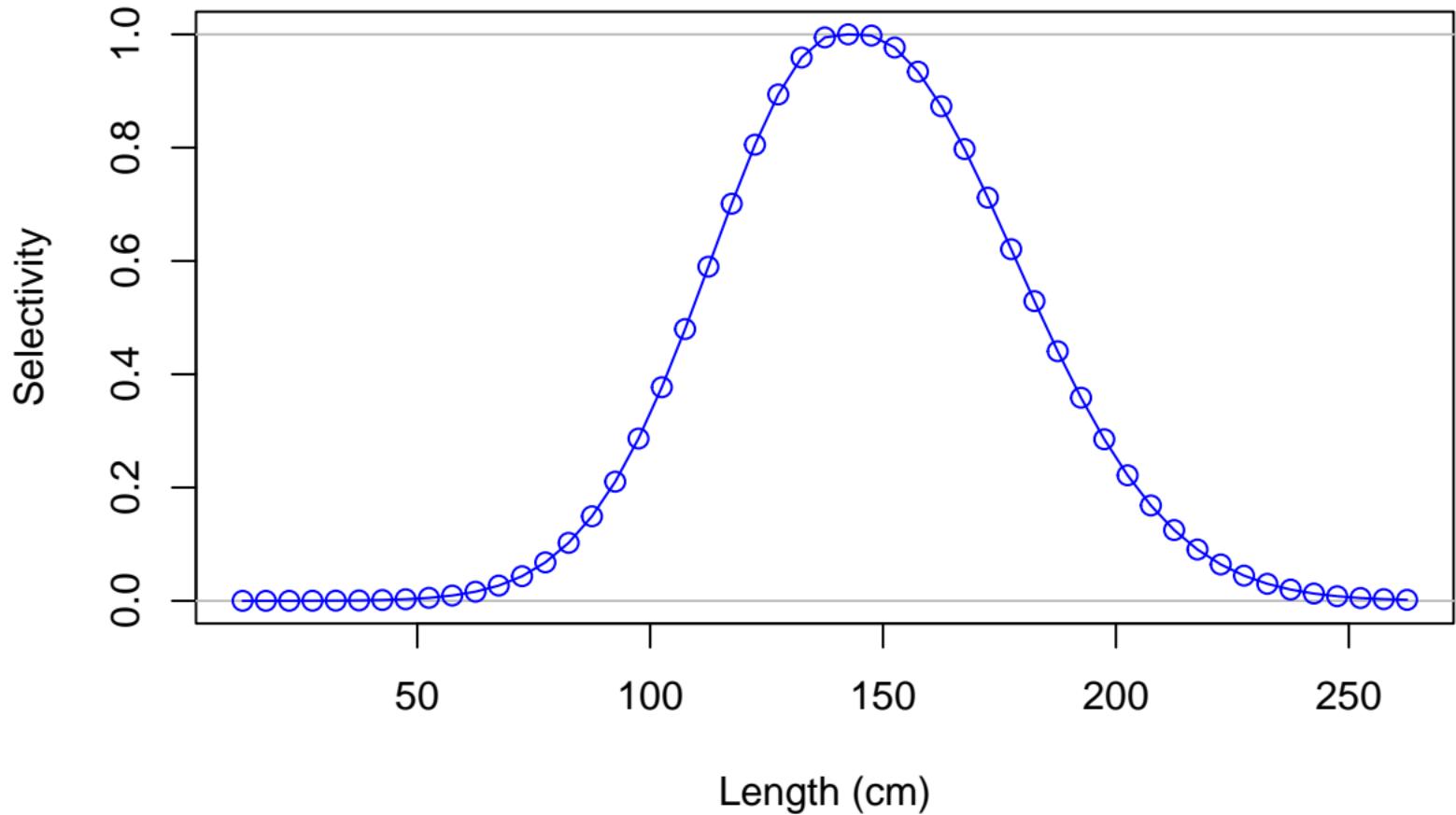


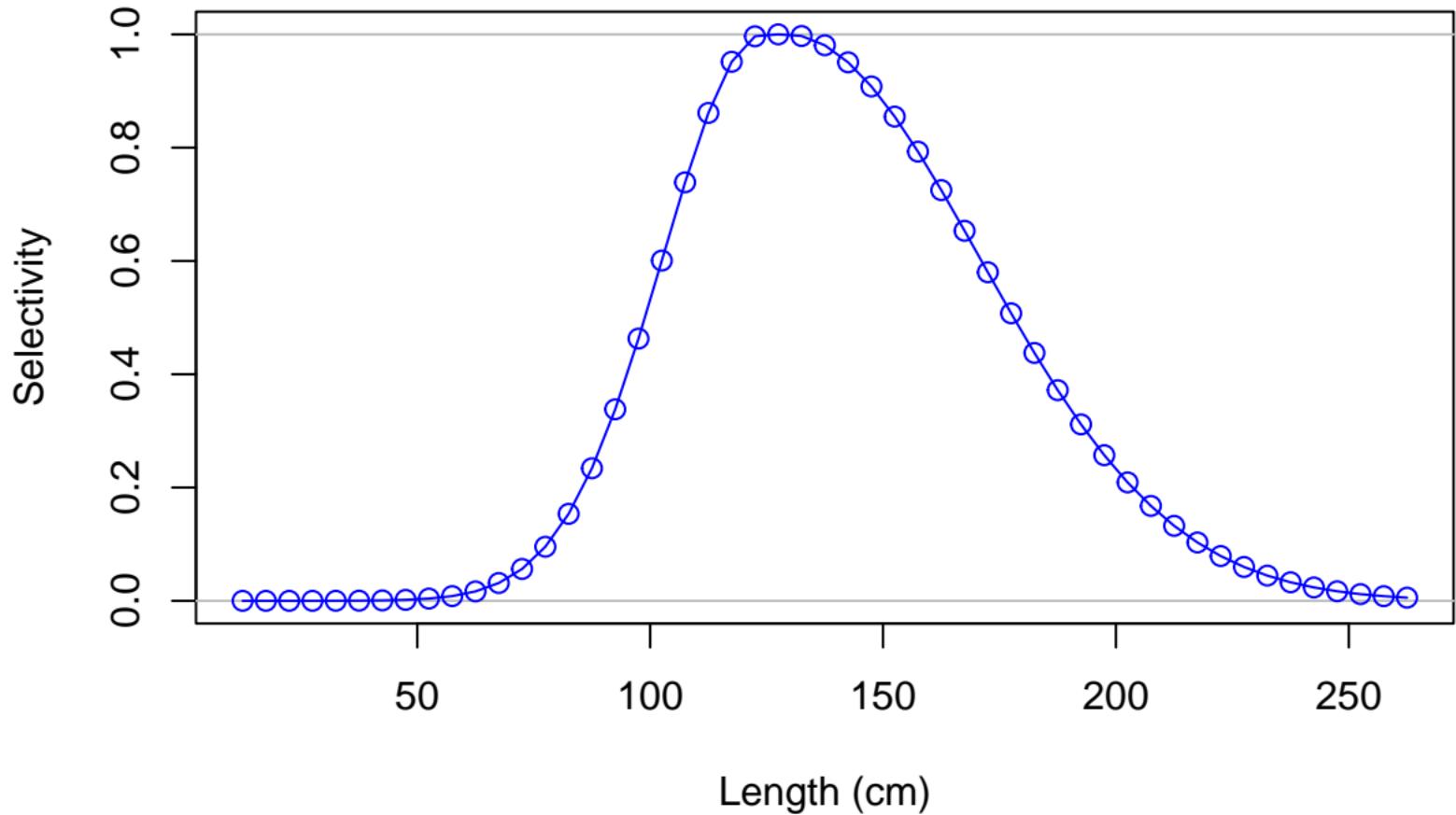


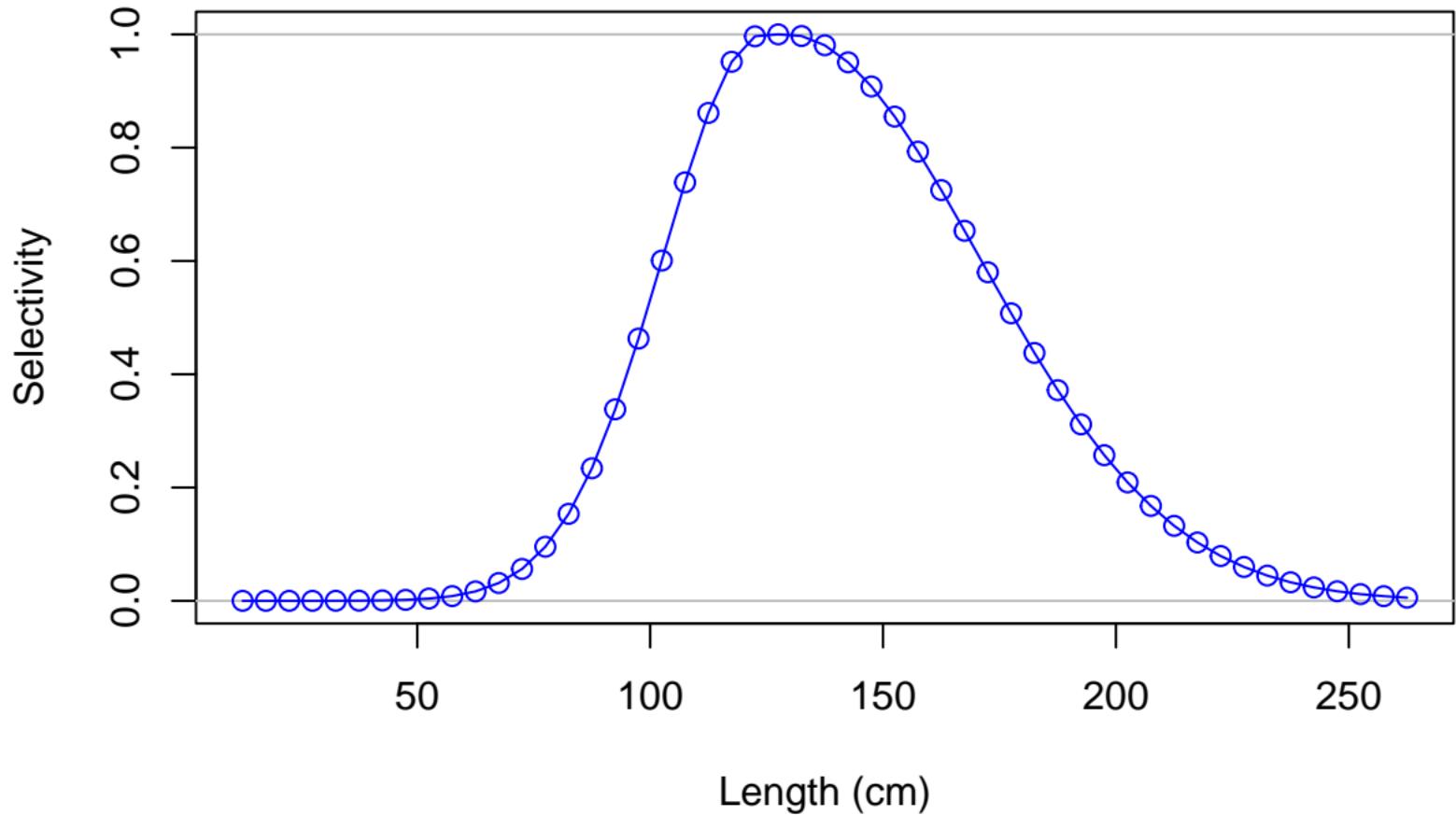


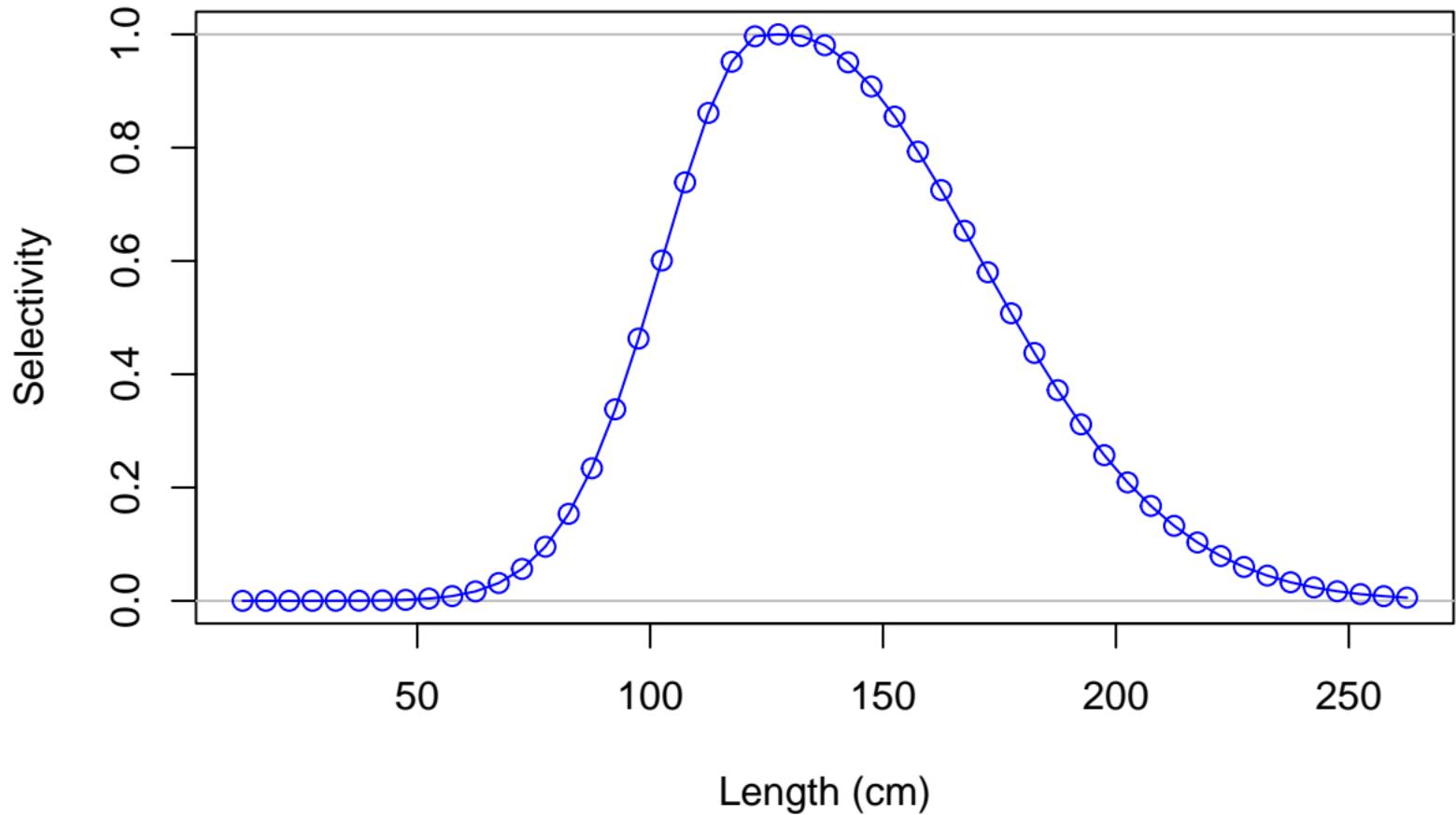


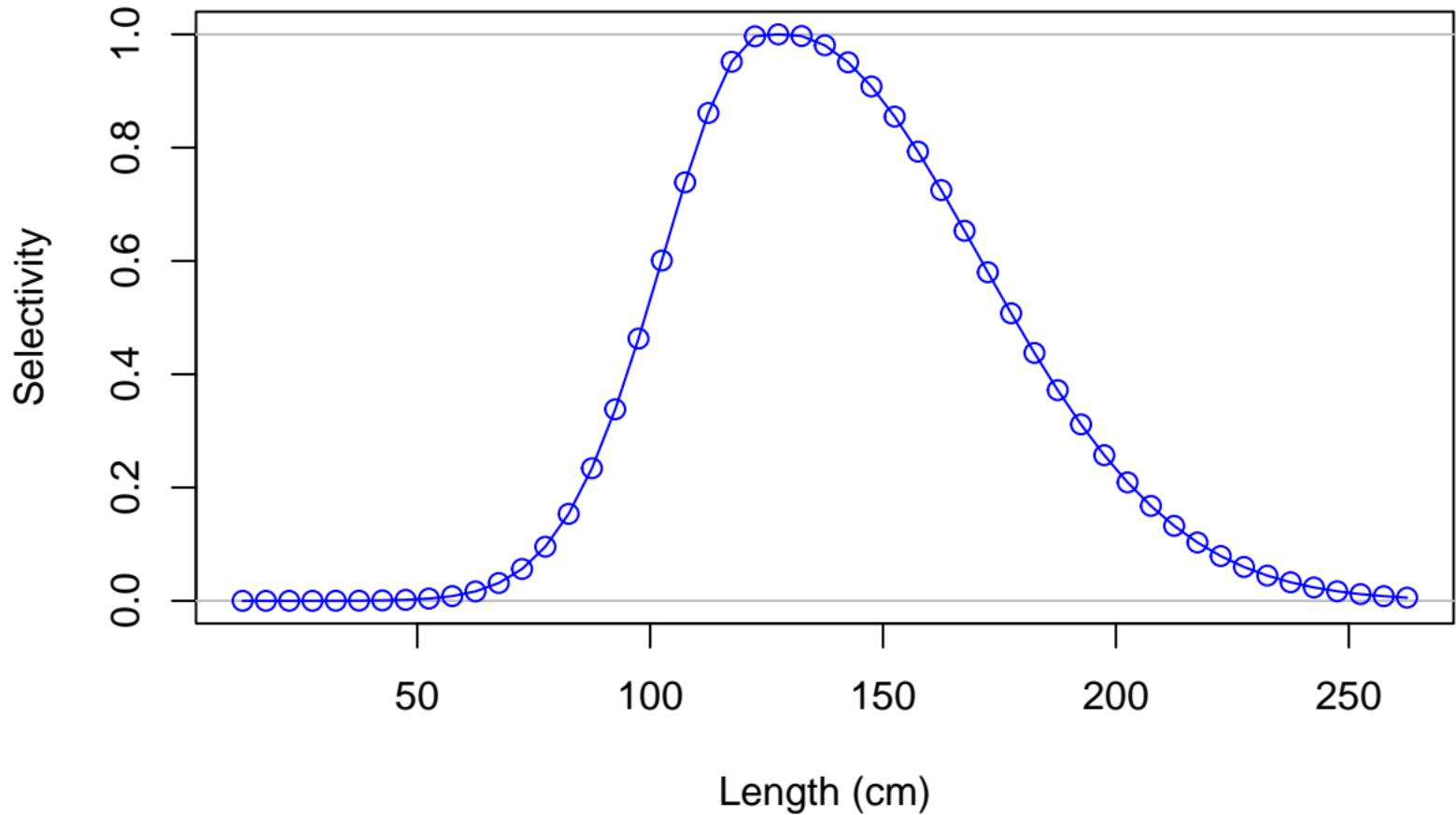


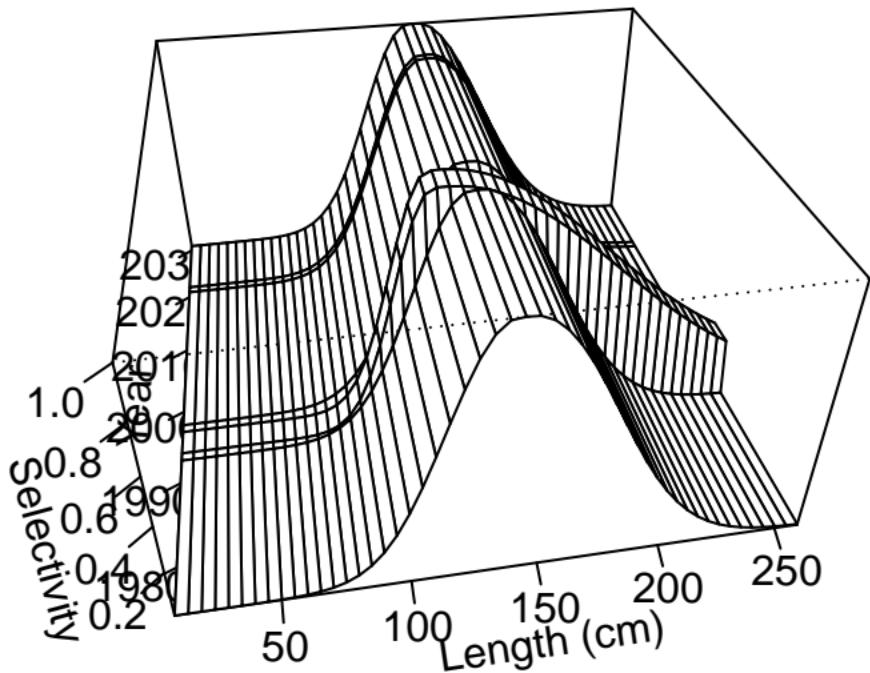


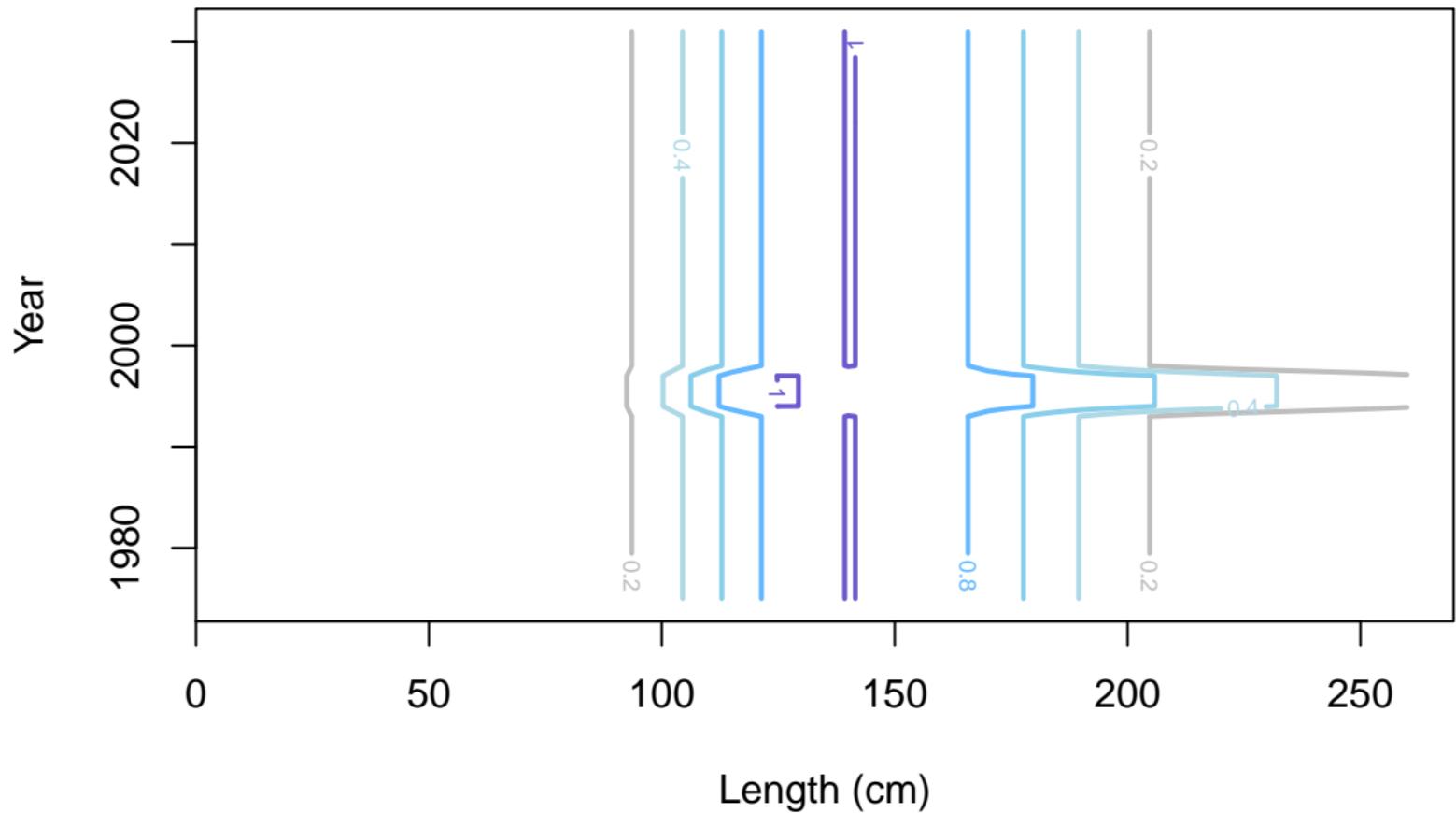


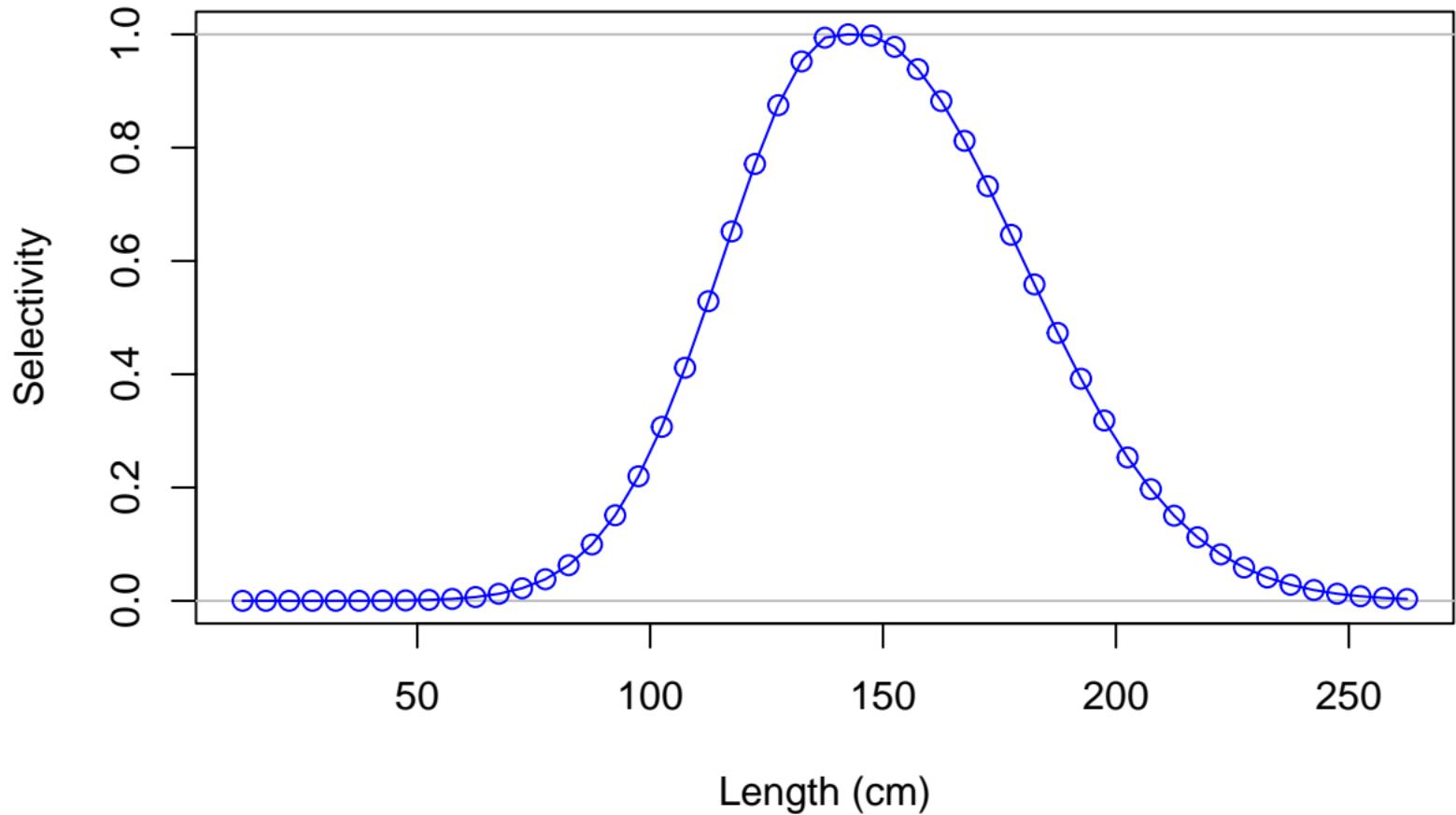


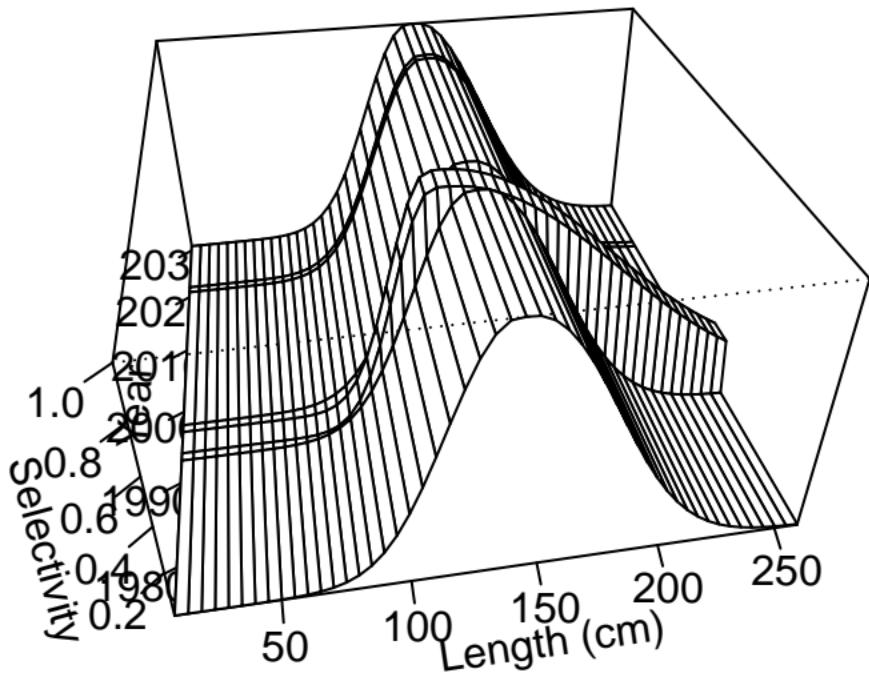


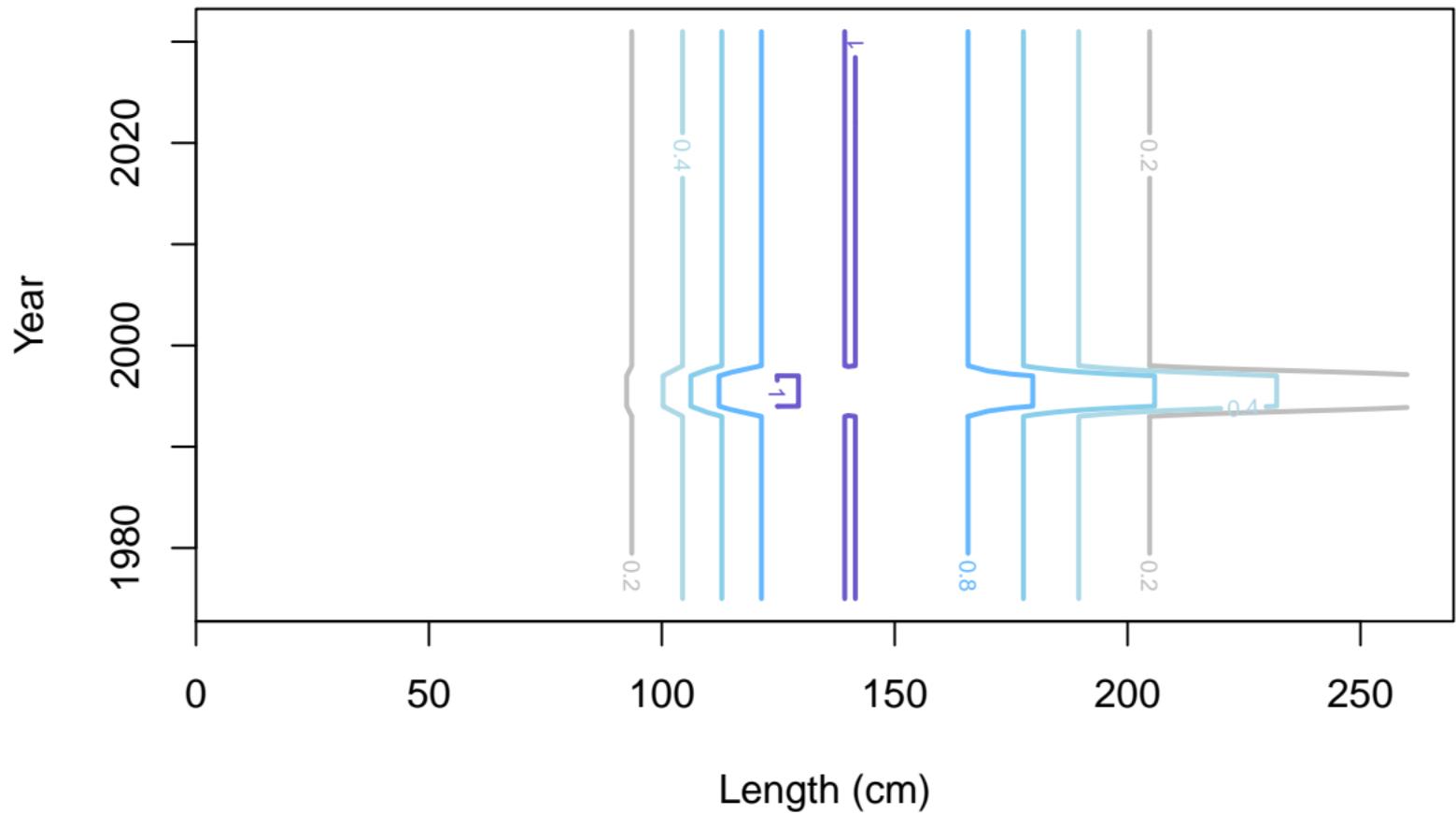


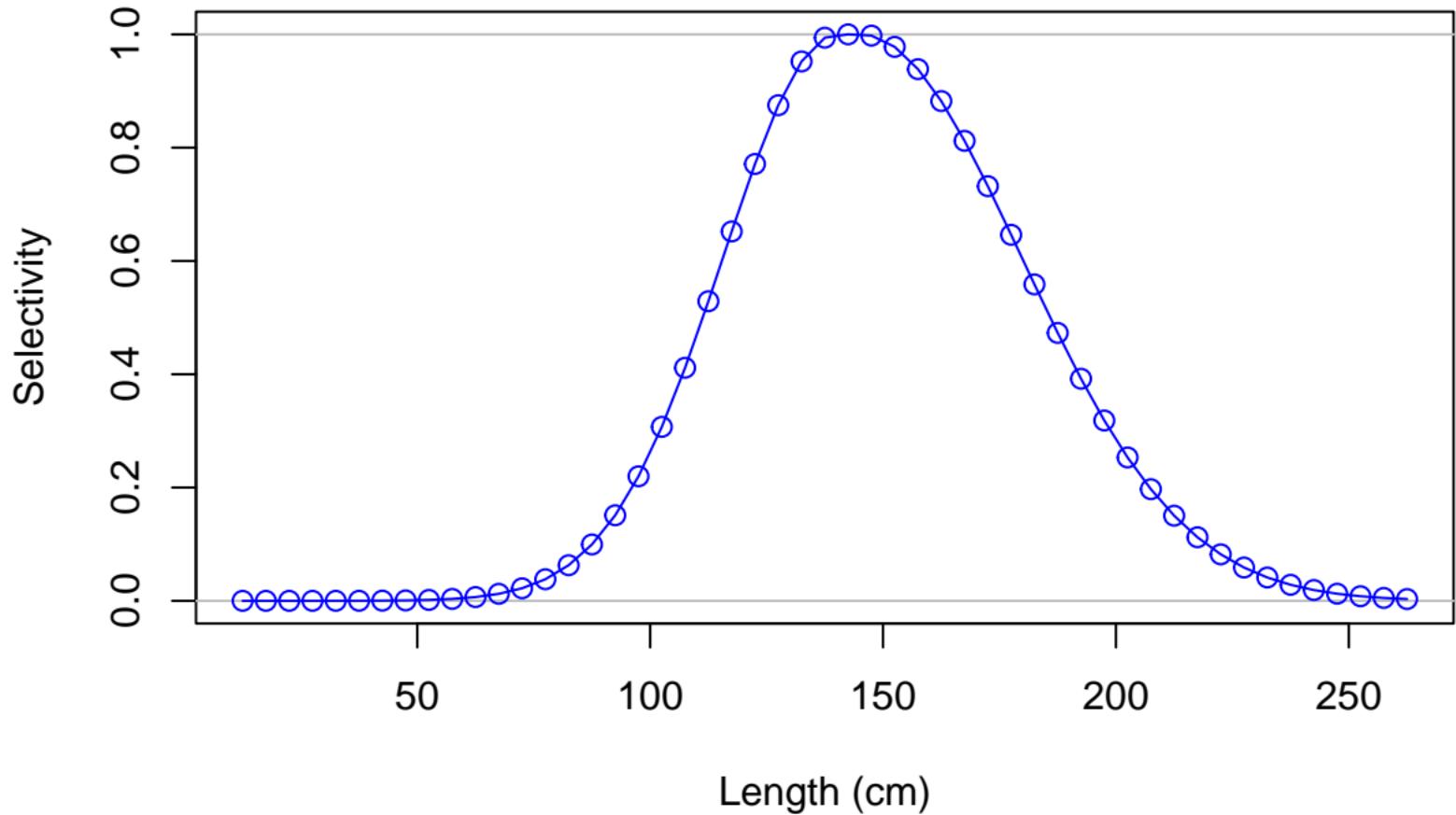


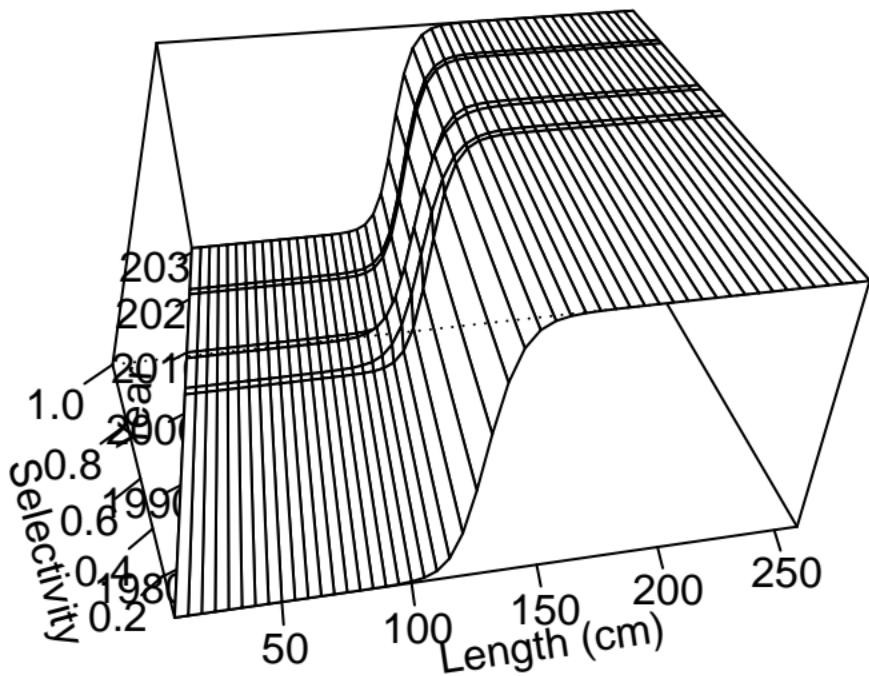












Year

1980 2000 2020

0

50

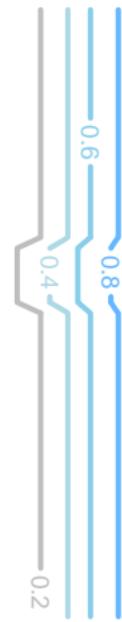
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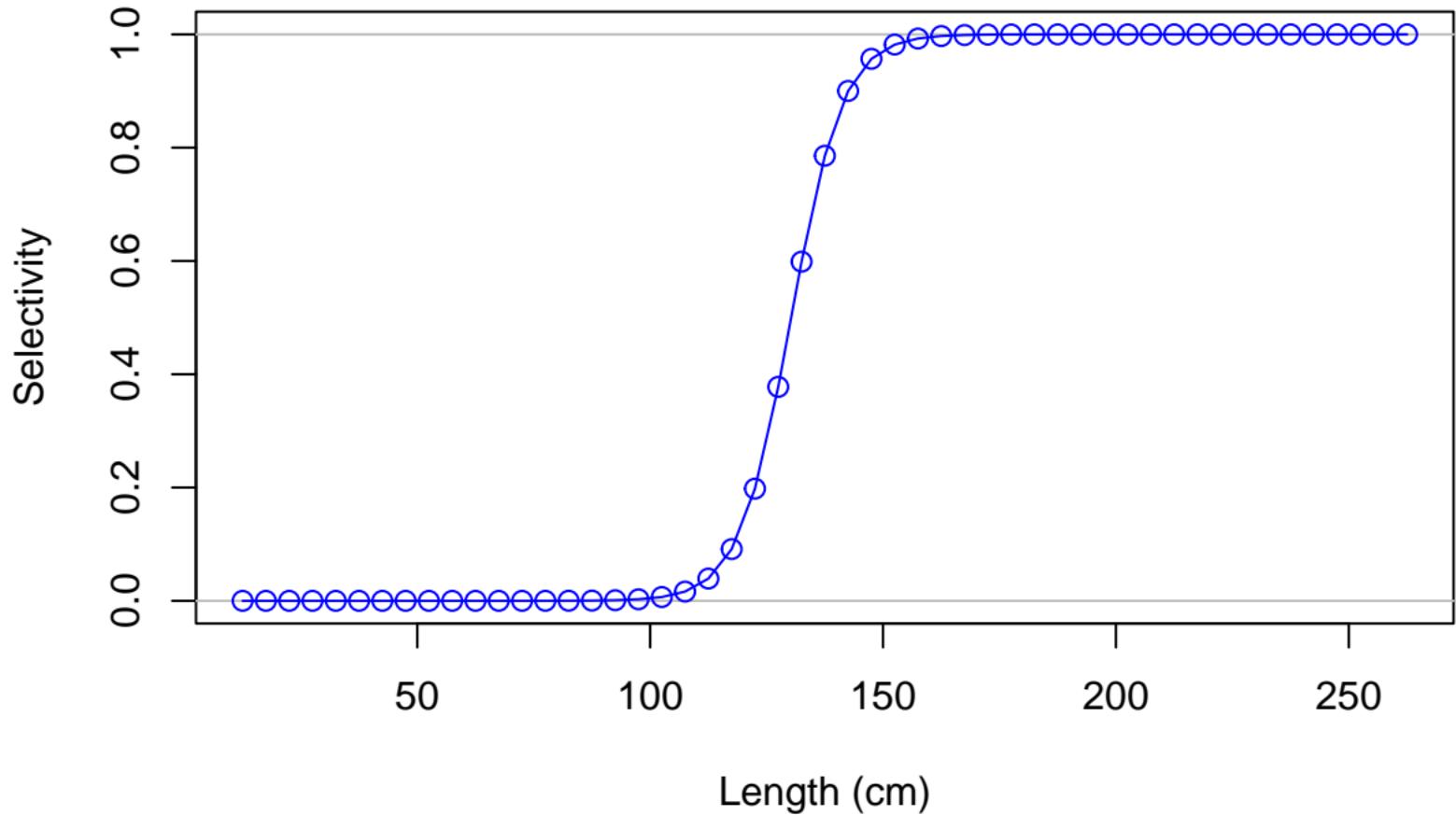
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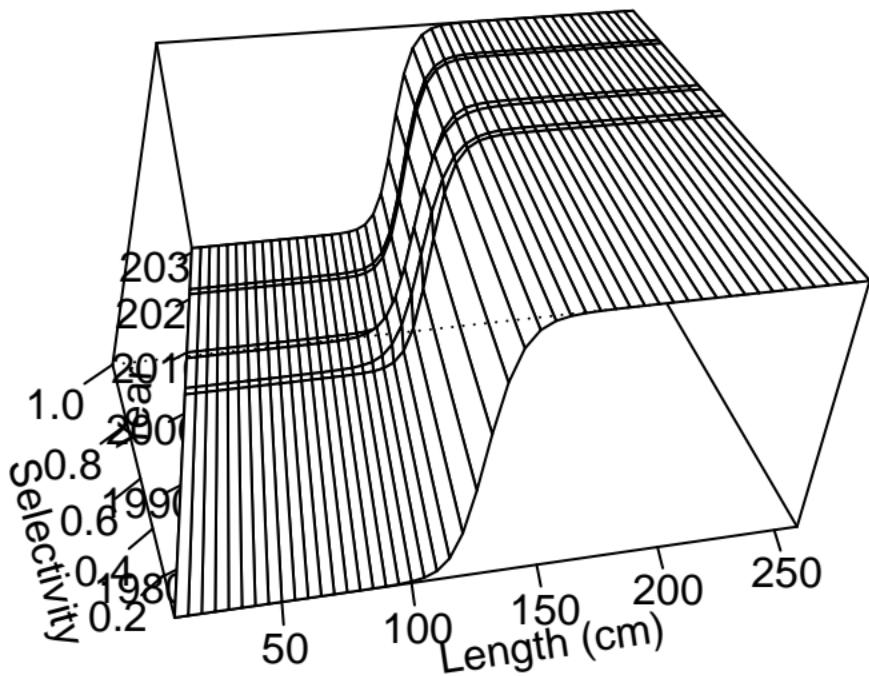
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Length (cm)







Year

1980 2000 2020

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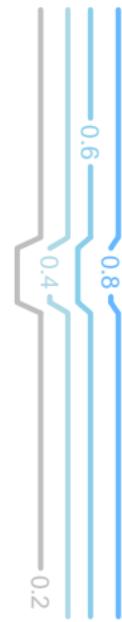
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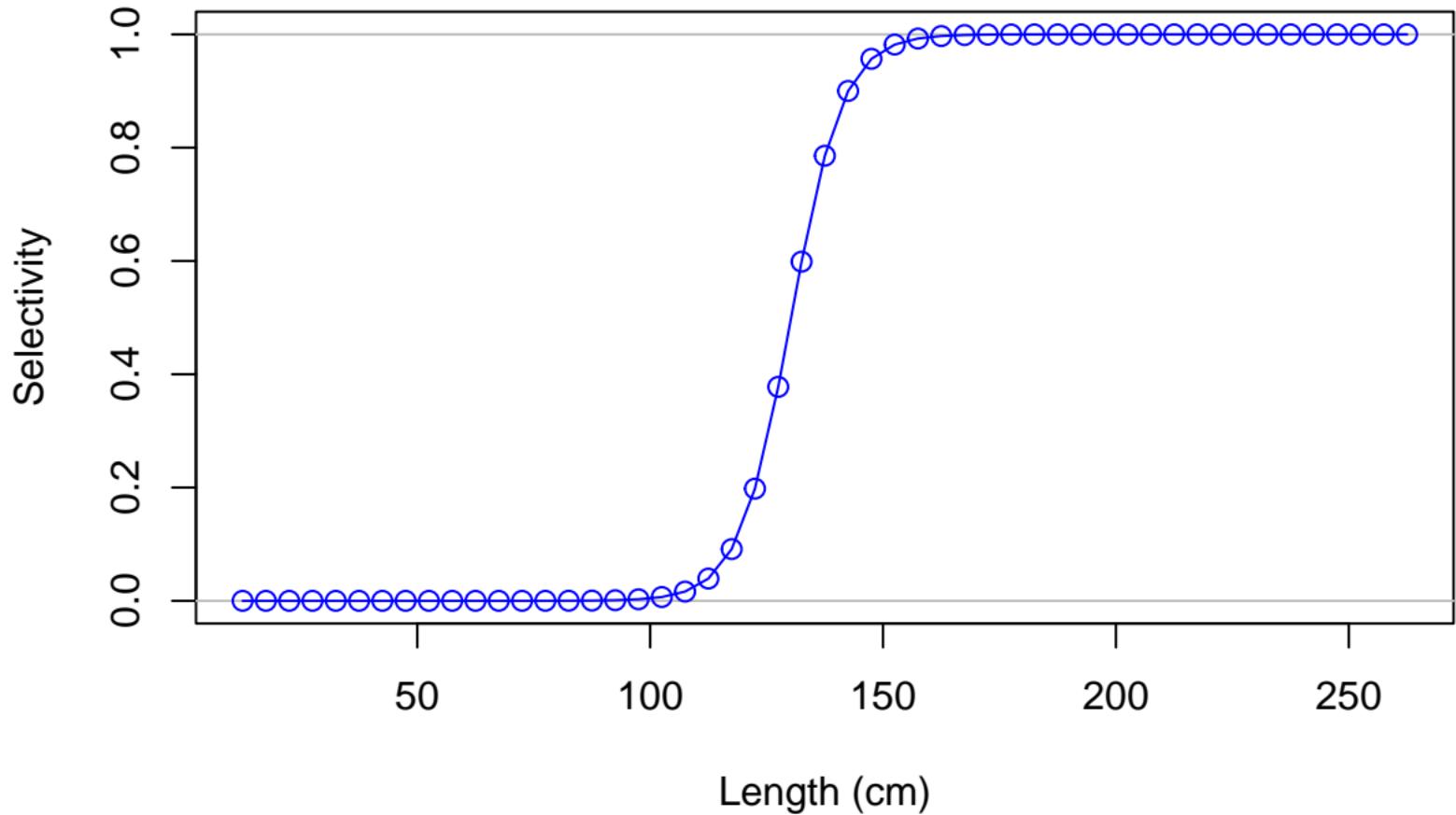
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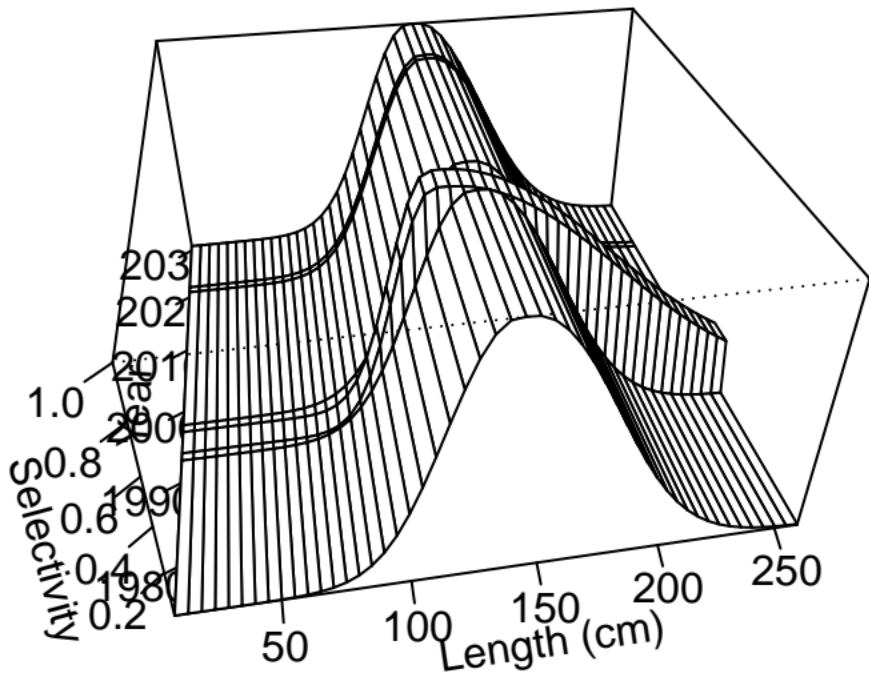
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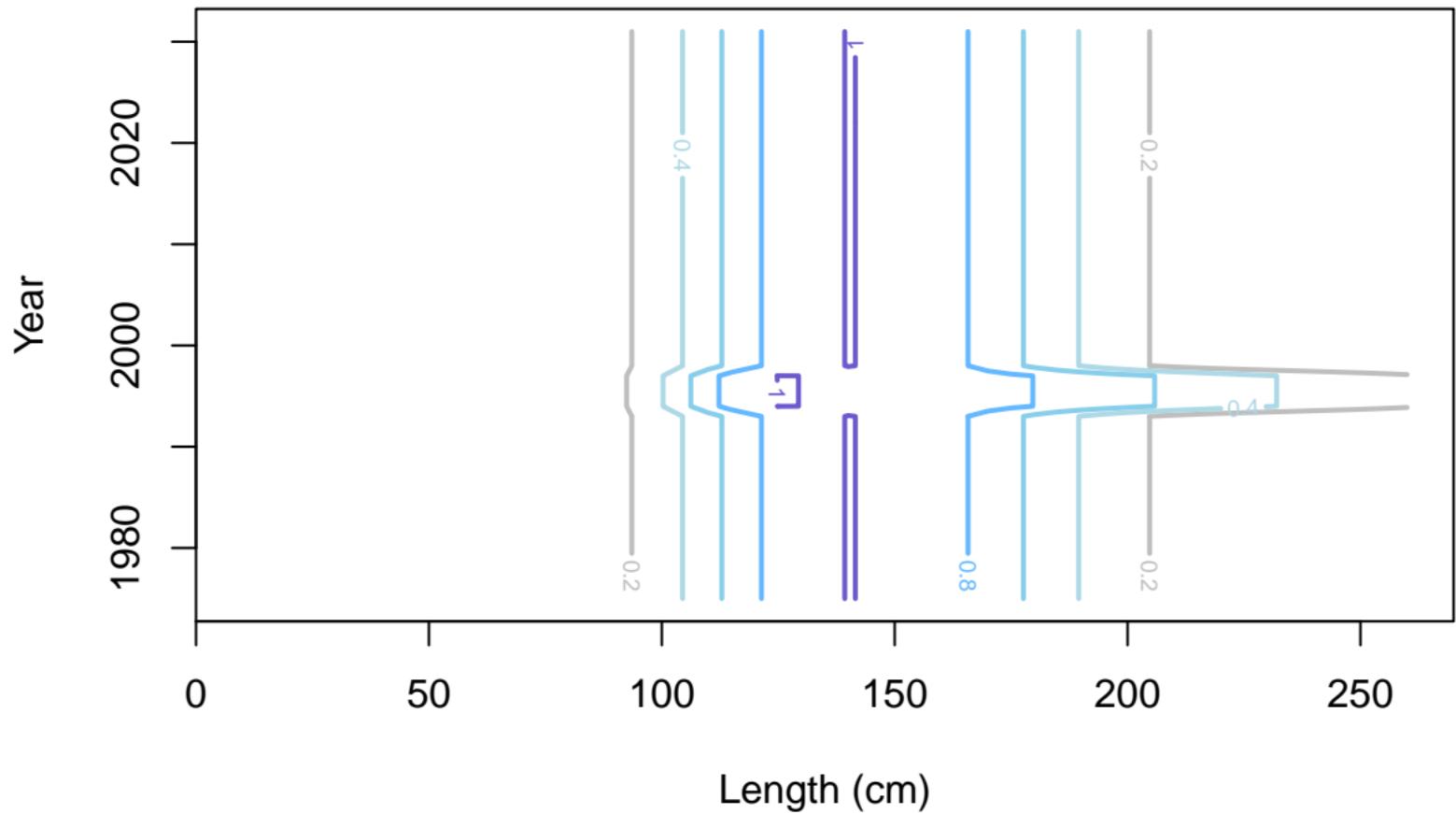
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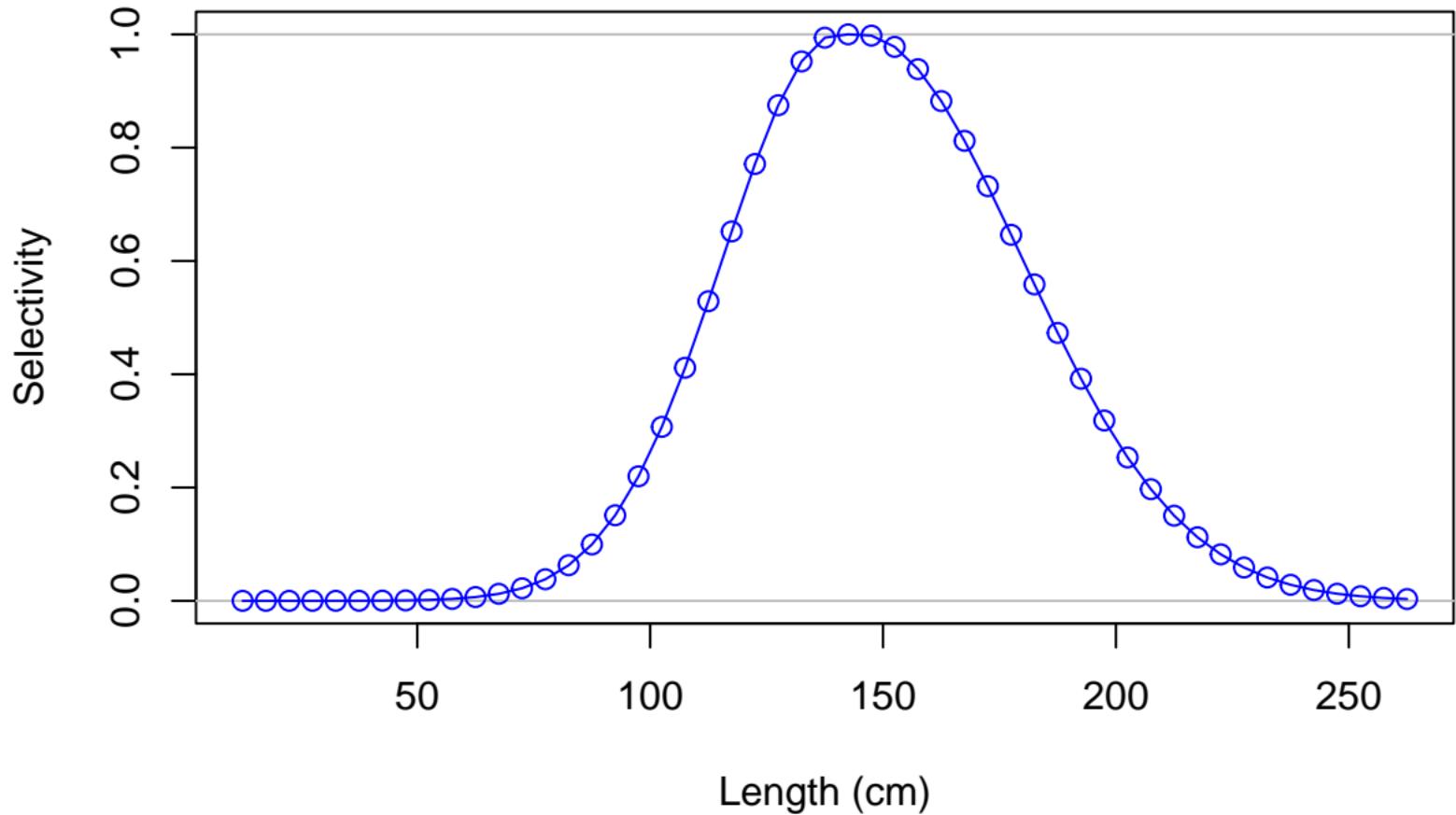
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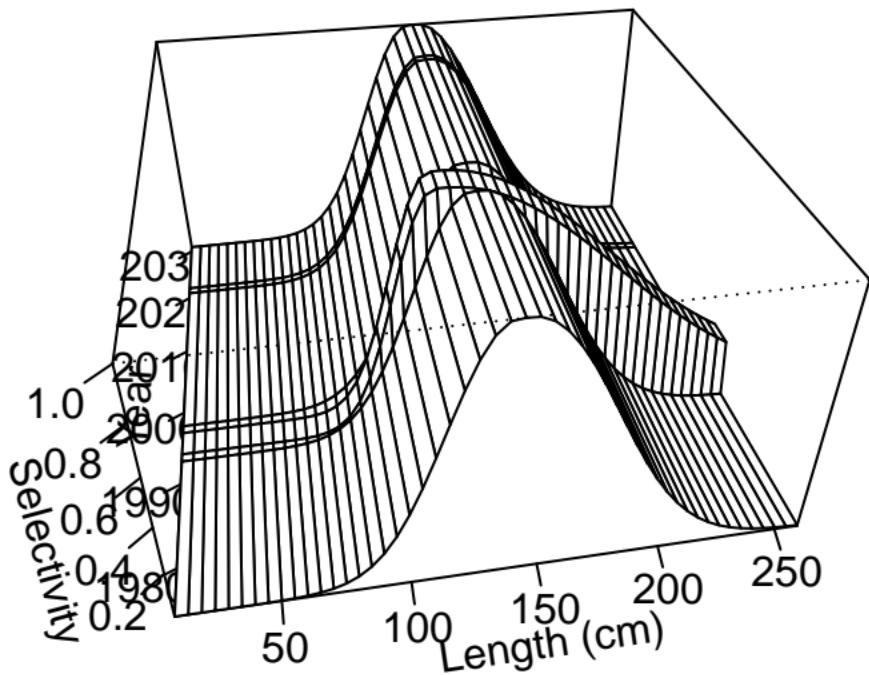


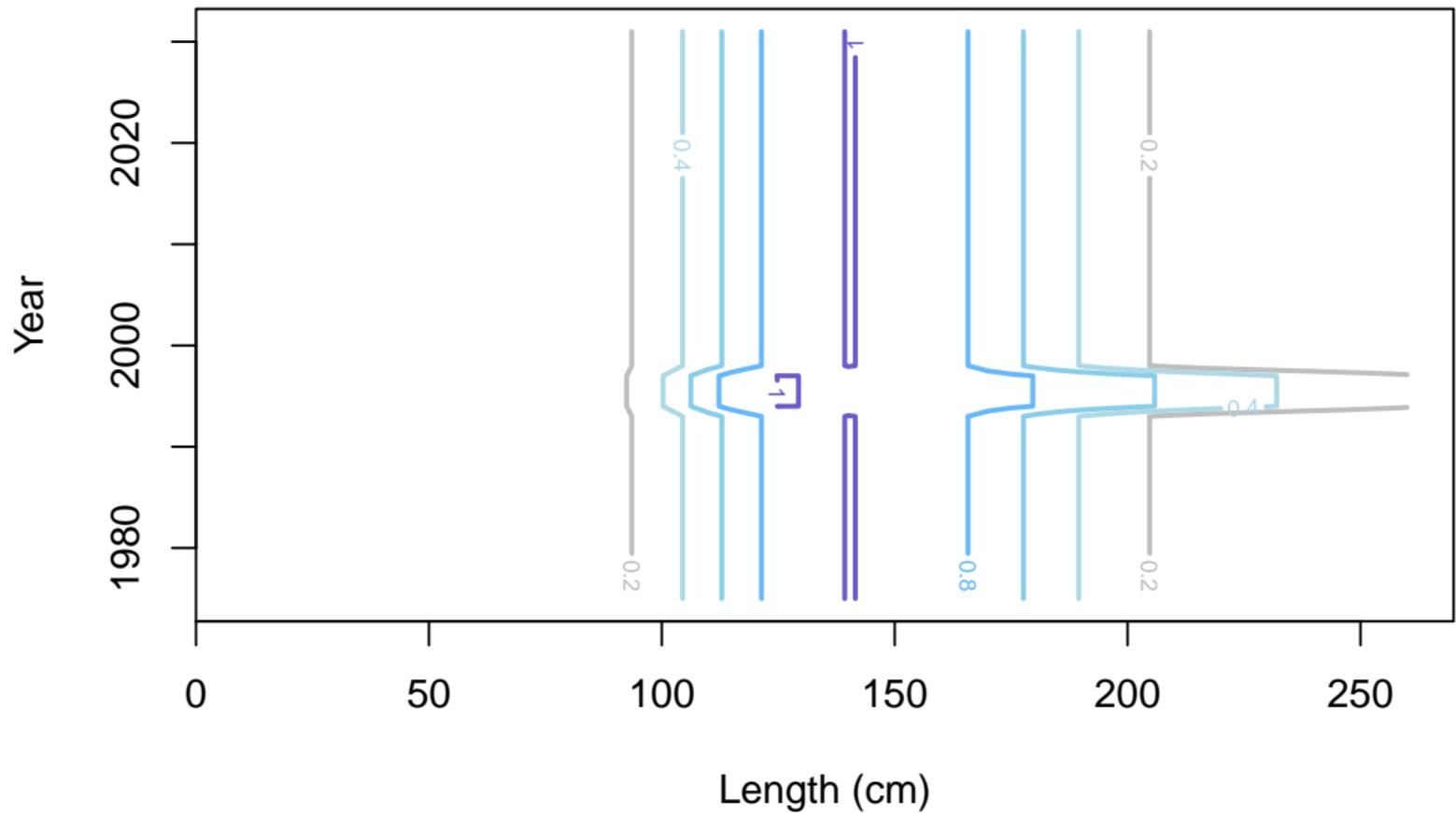


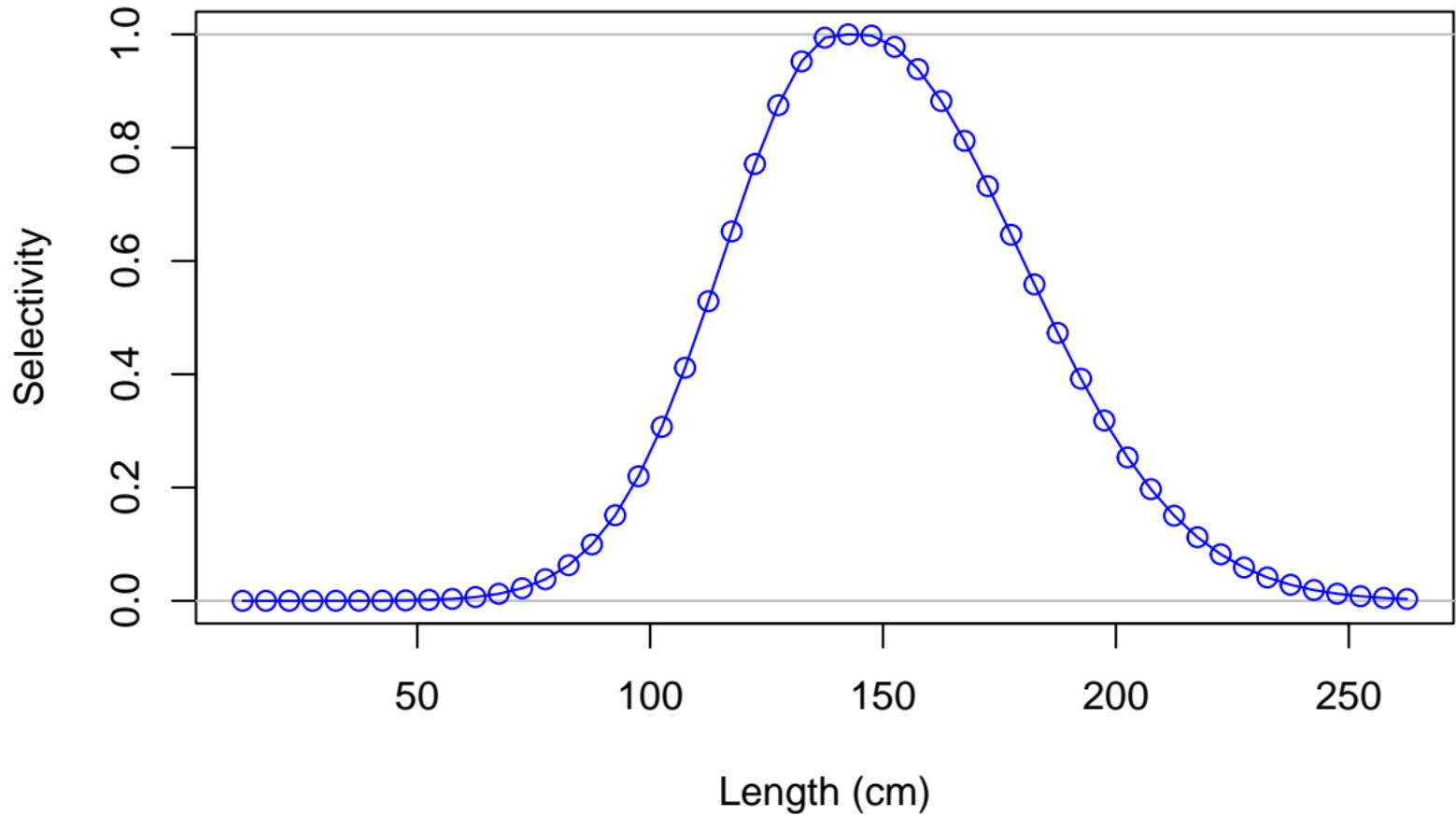


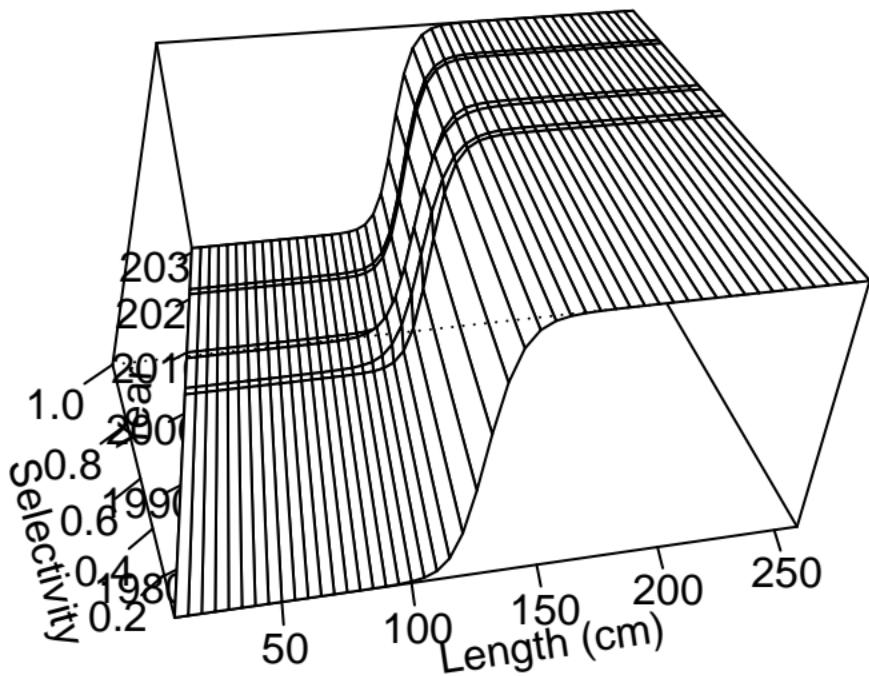












Year

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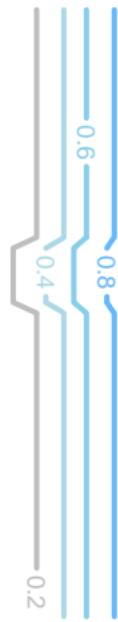
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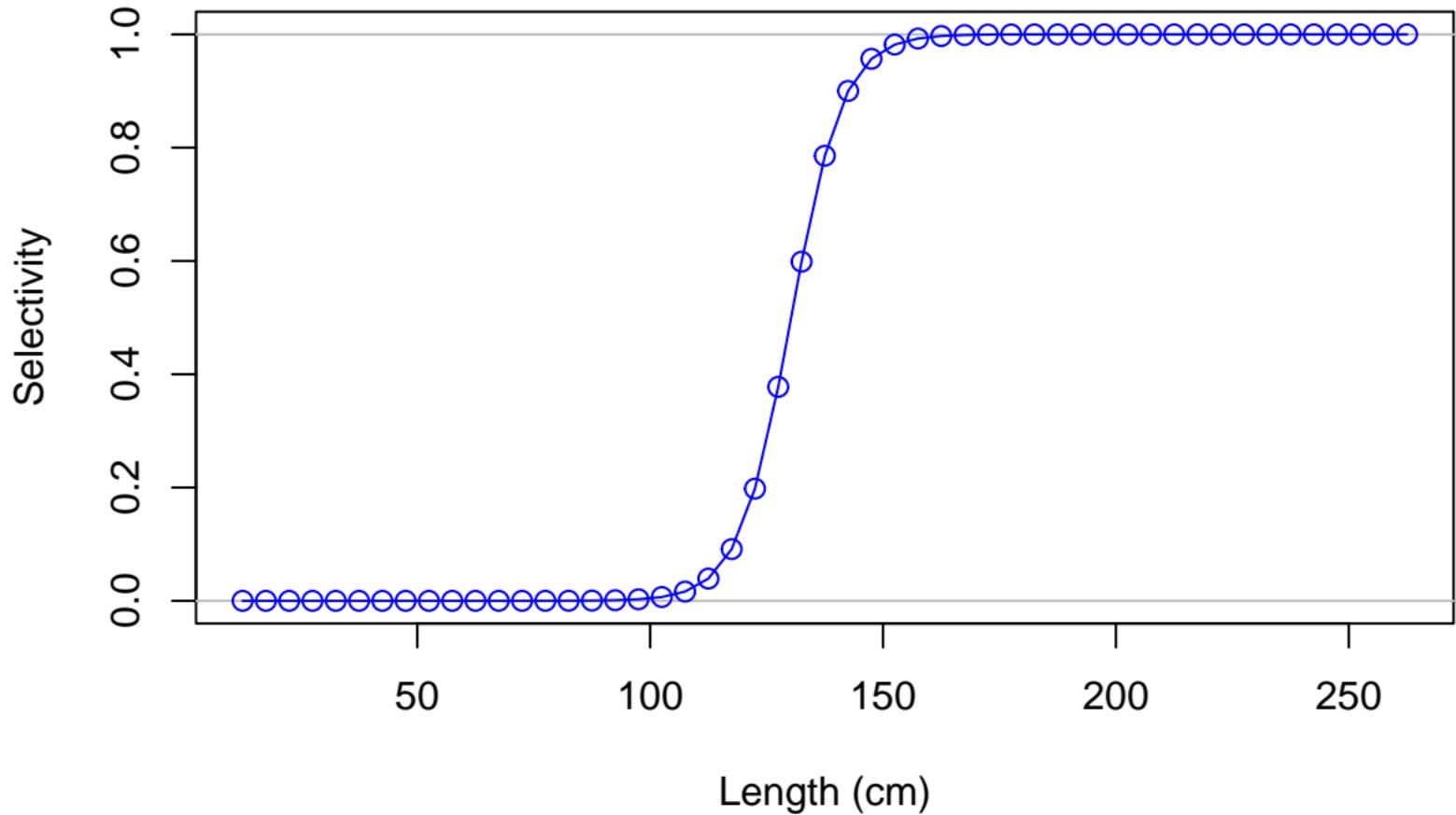
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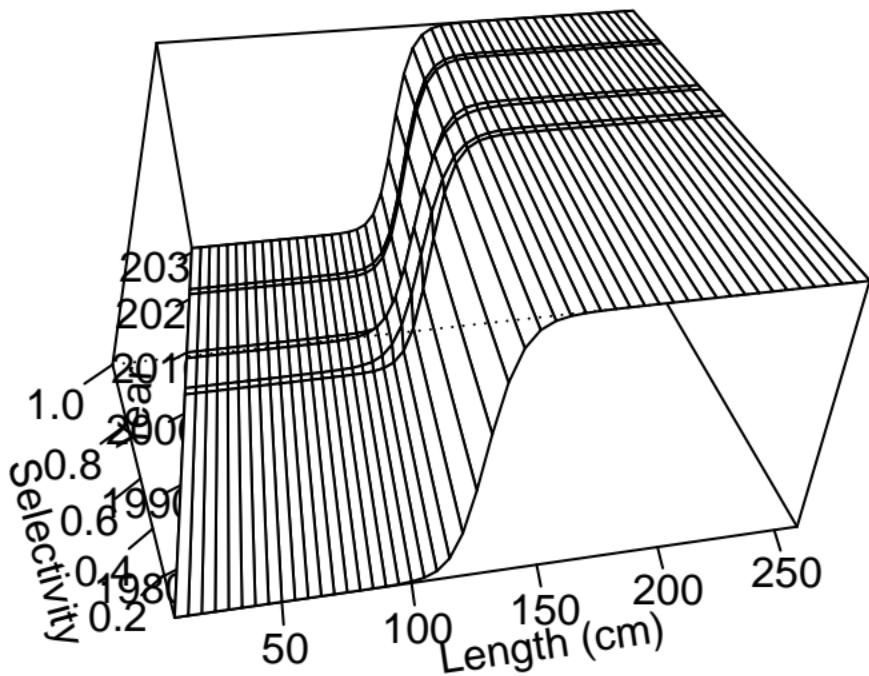
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Length (cm)



1





Year

1980 2000 2020

0

50

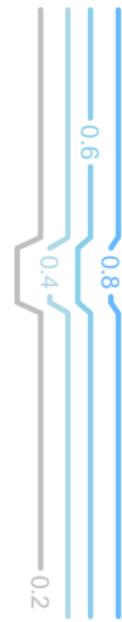
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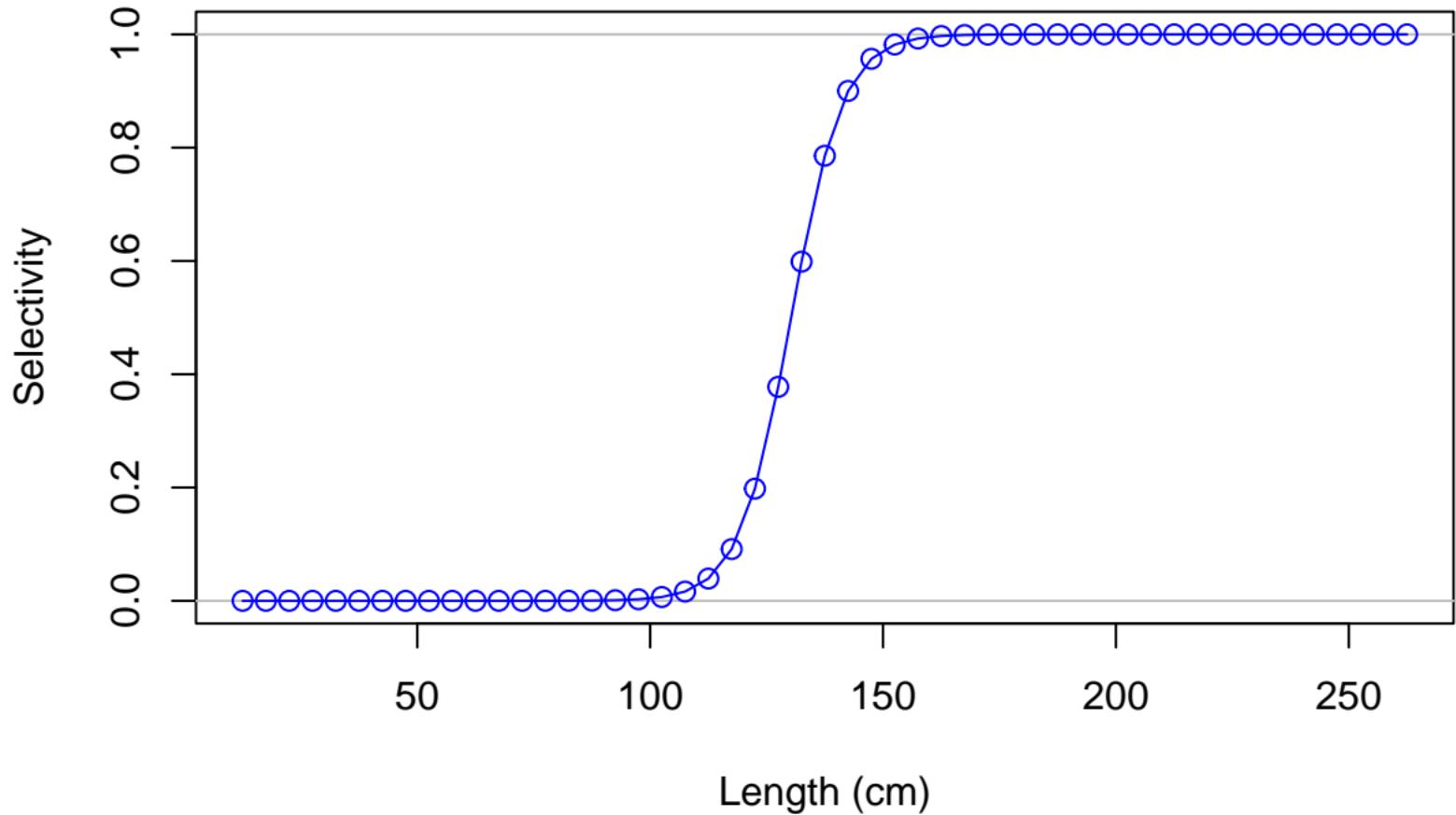
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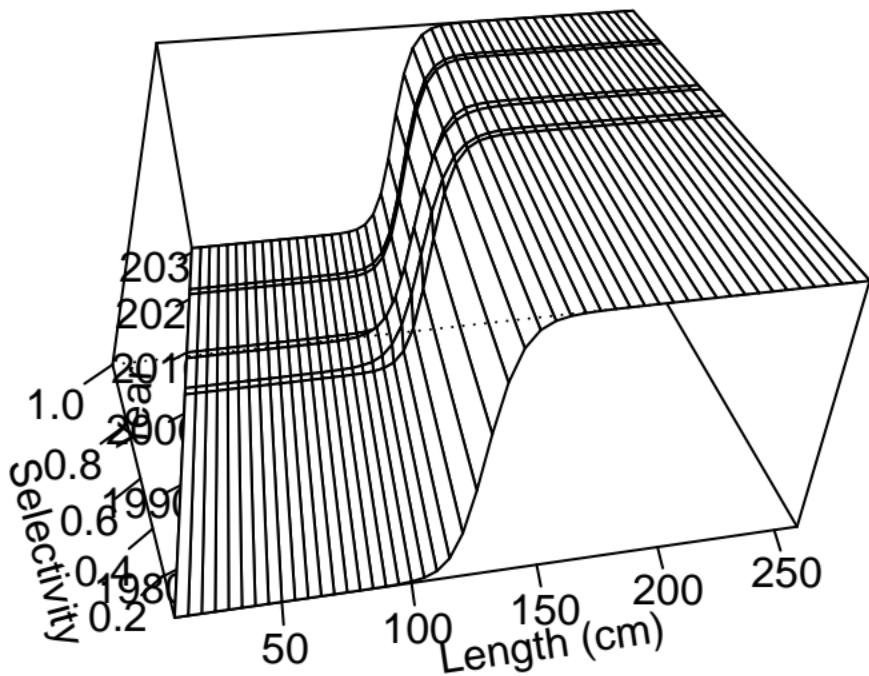
250

Length (cm)



1





Year

1980 2000 2020

0

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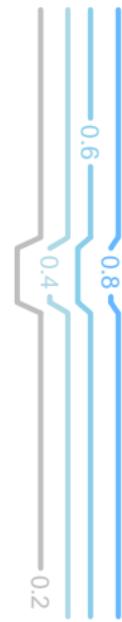
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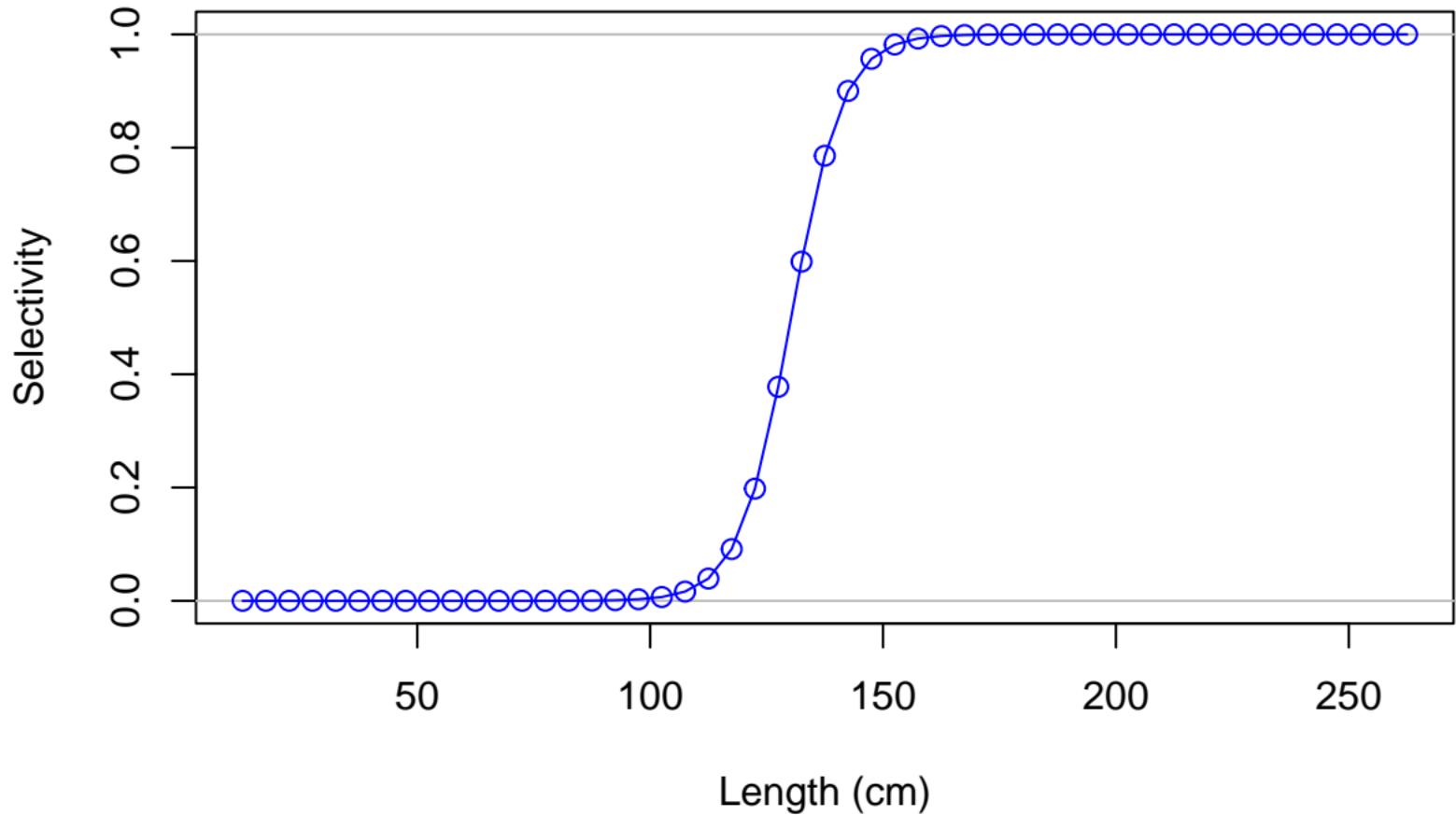
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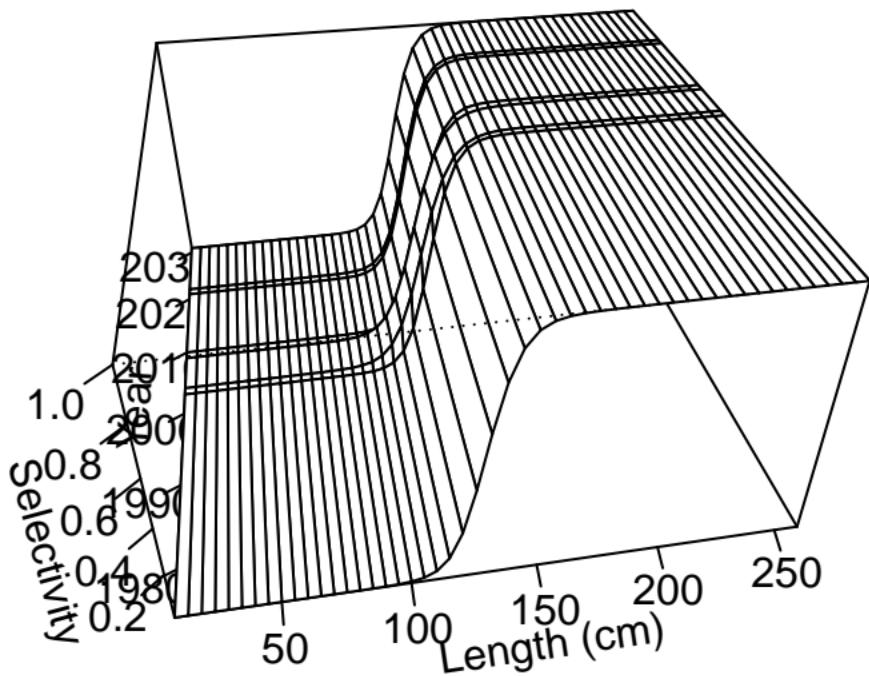
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Length (cm)







Year

1980 2000 2020

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100

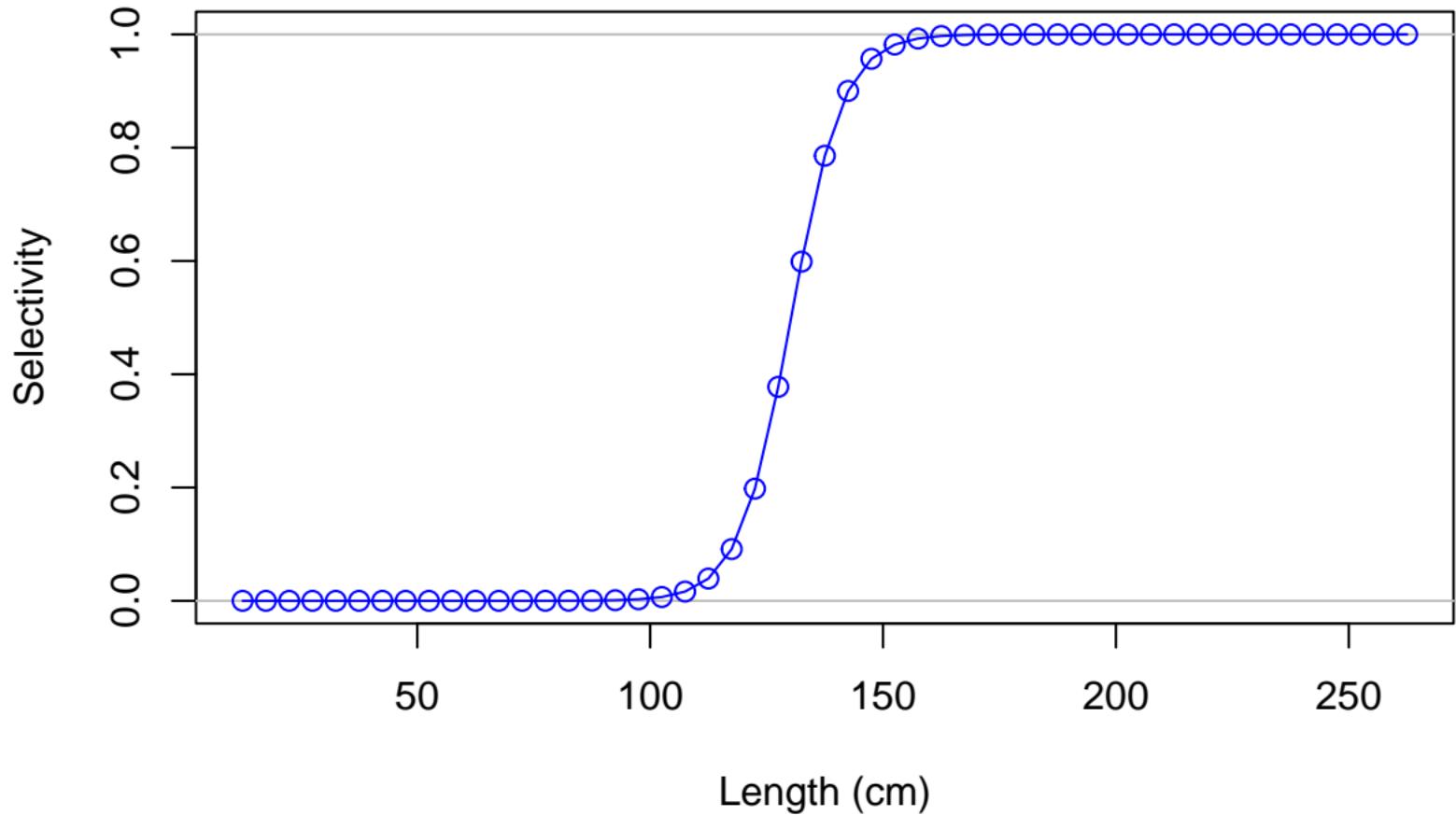
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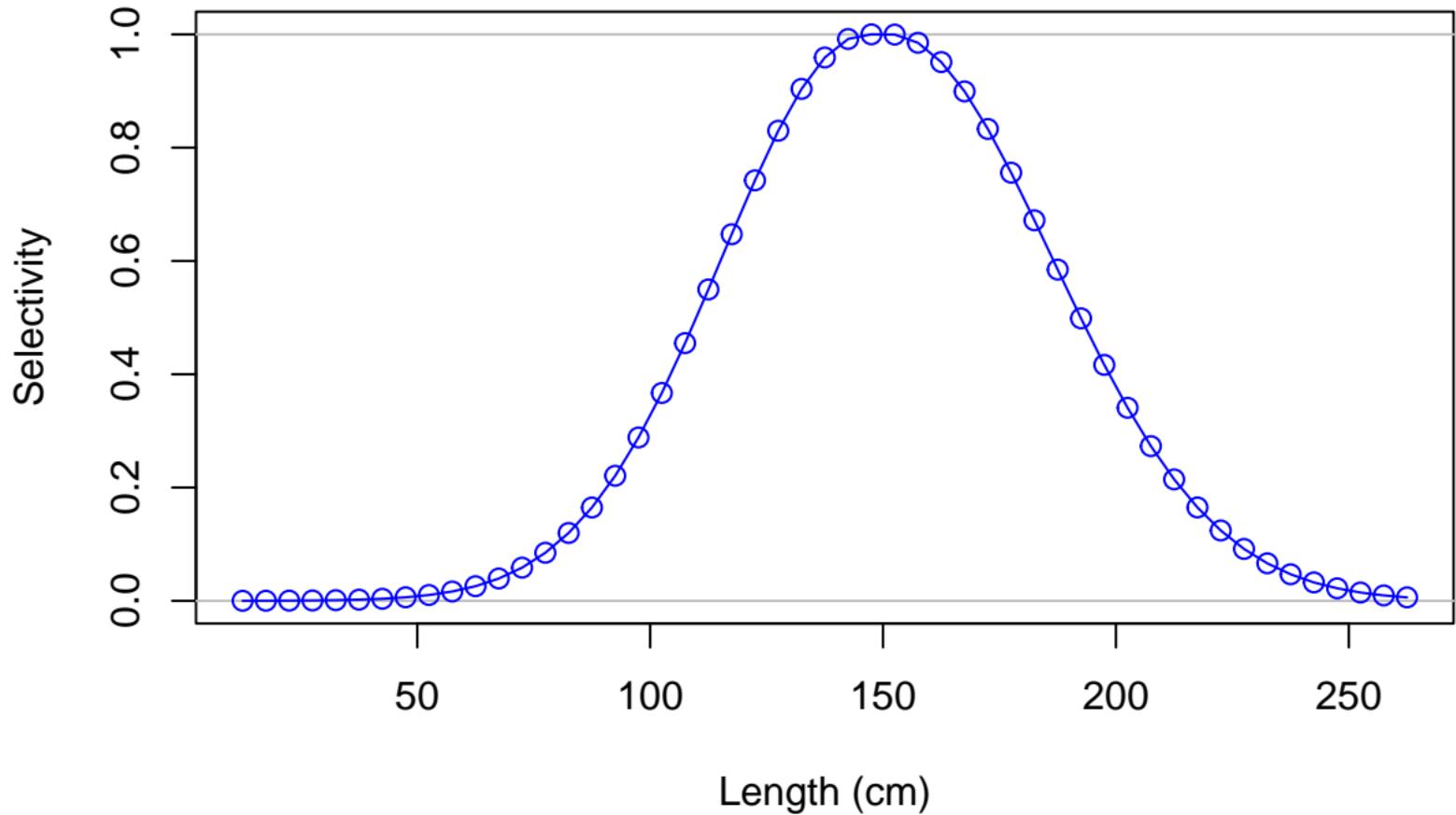
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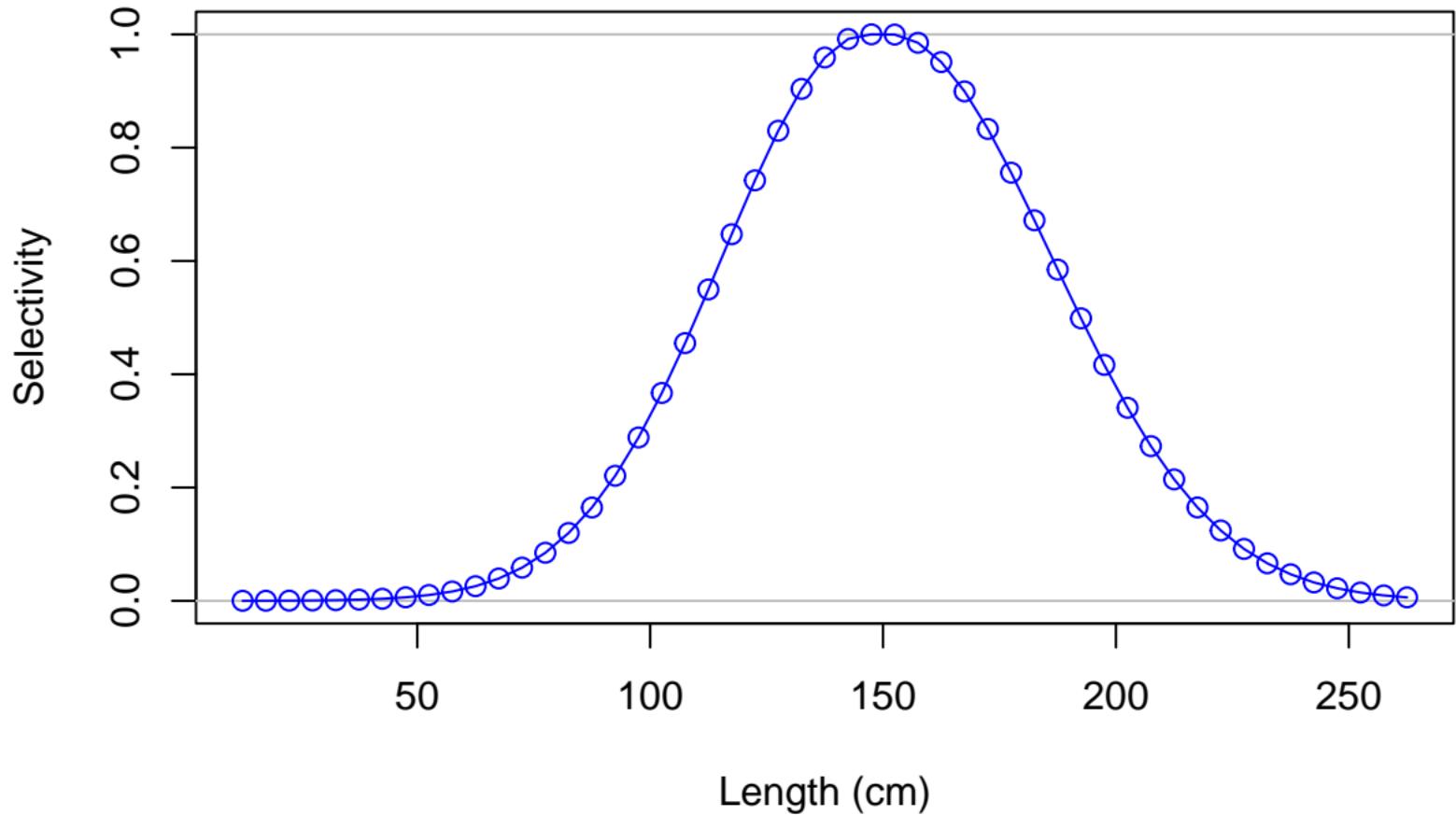
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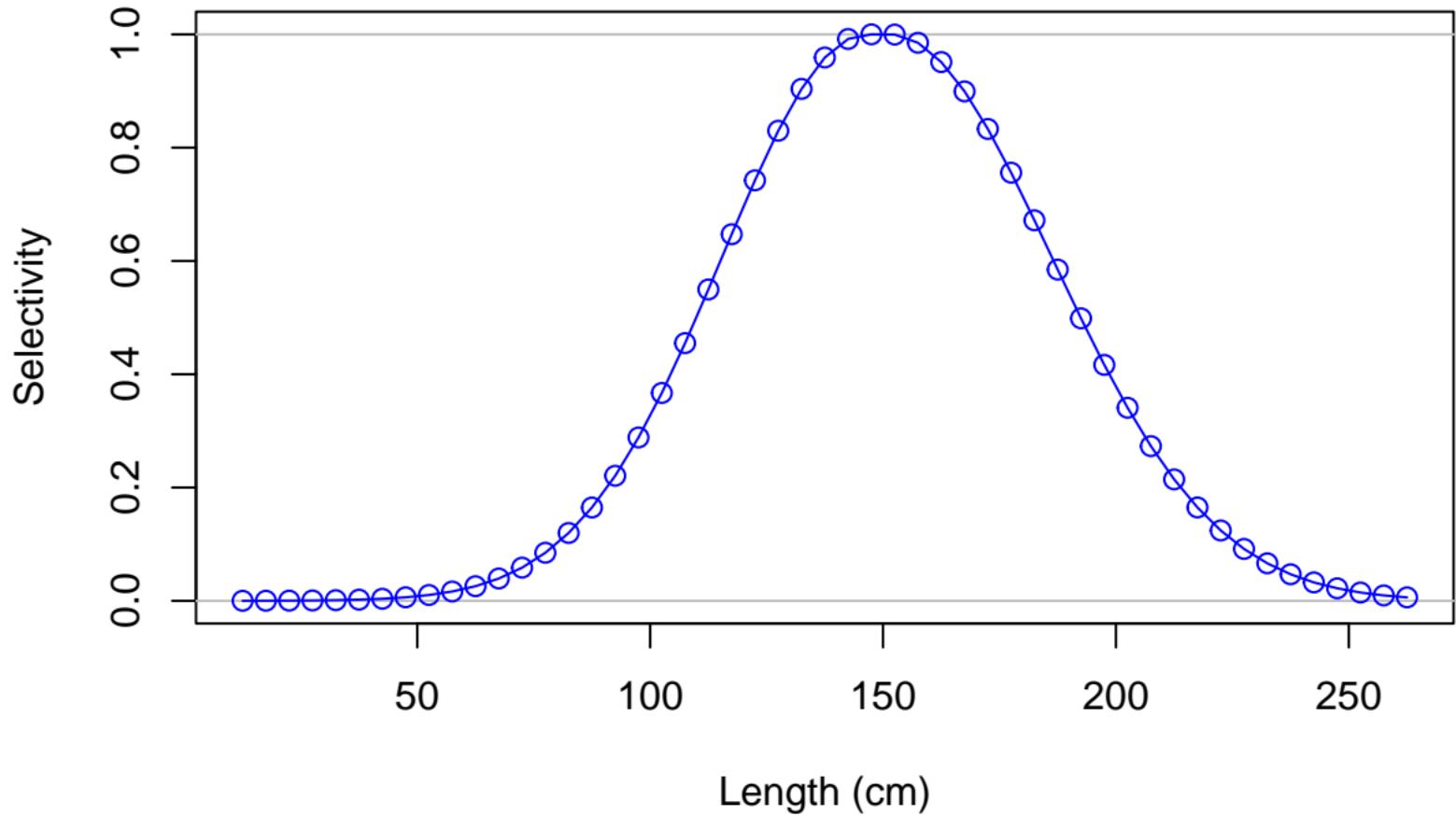
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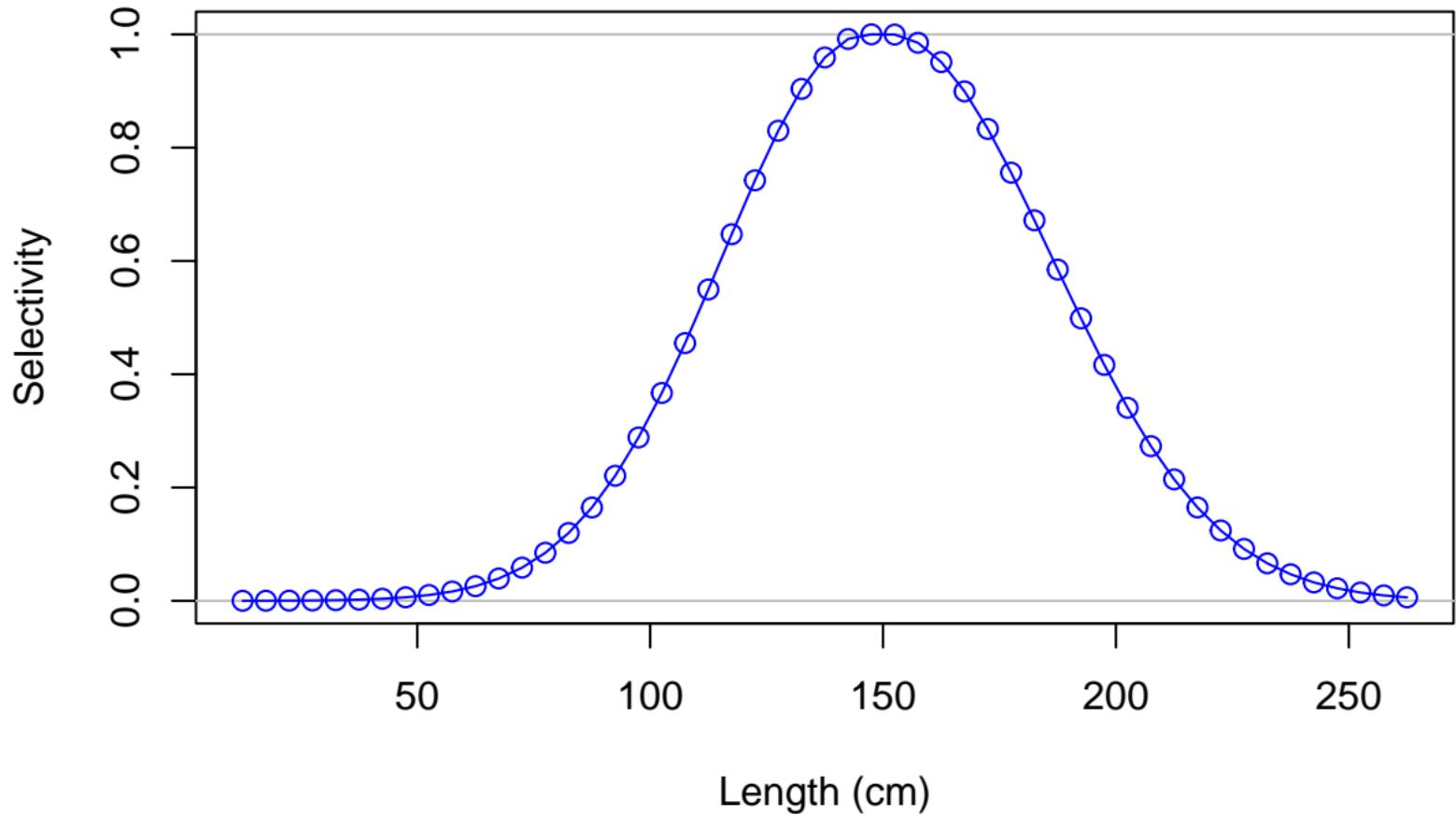


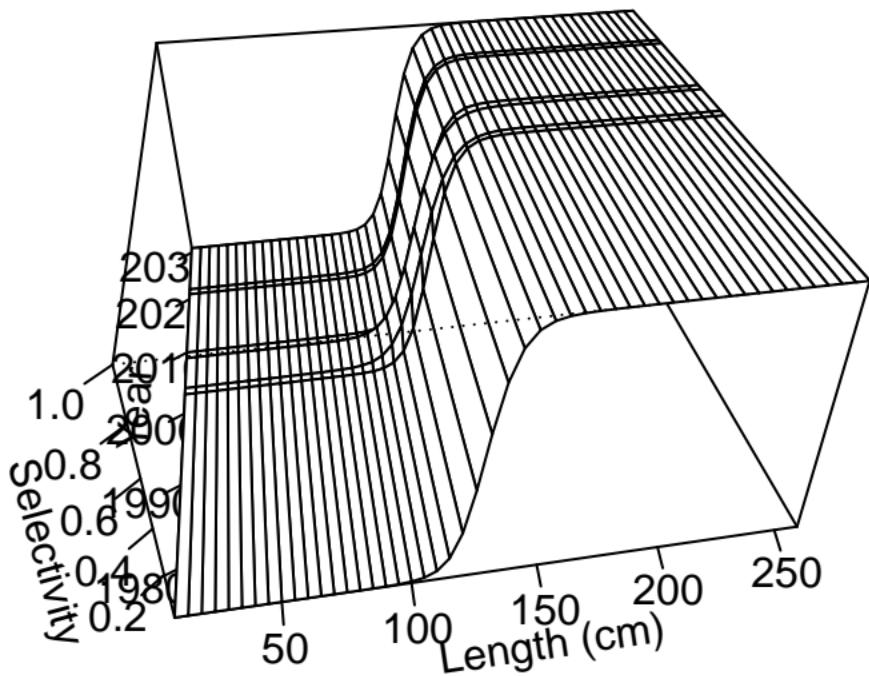












Year

1980 2000 2020

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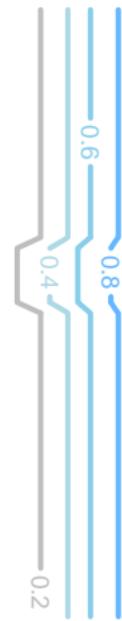
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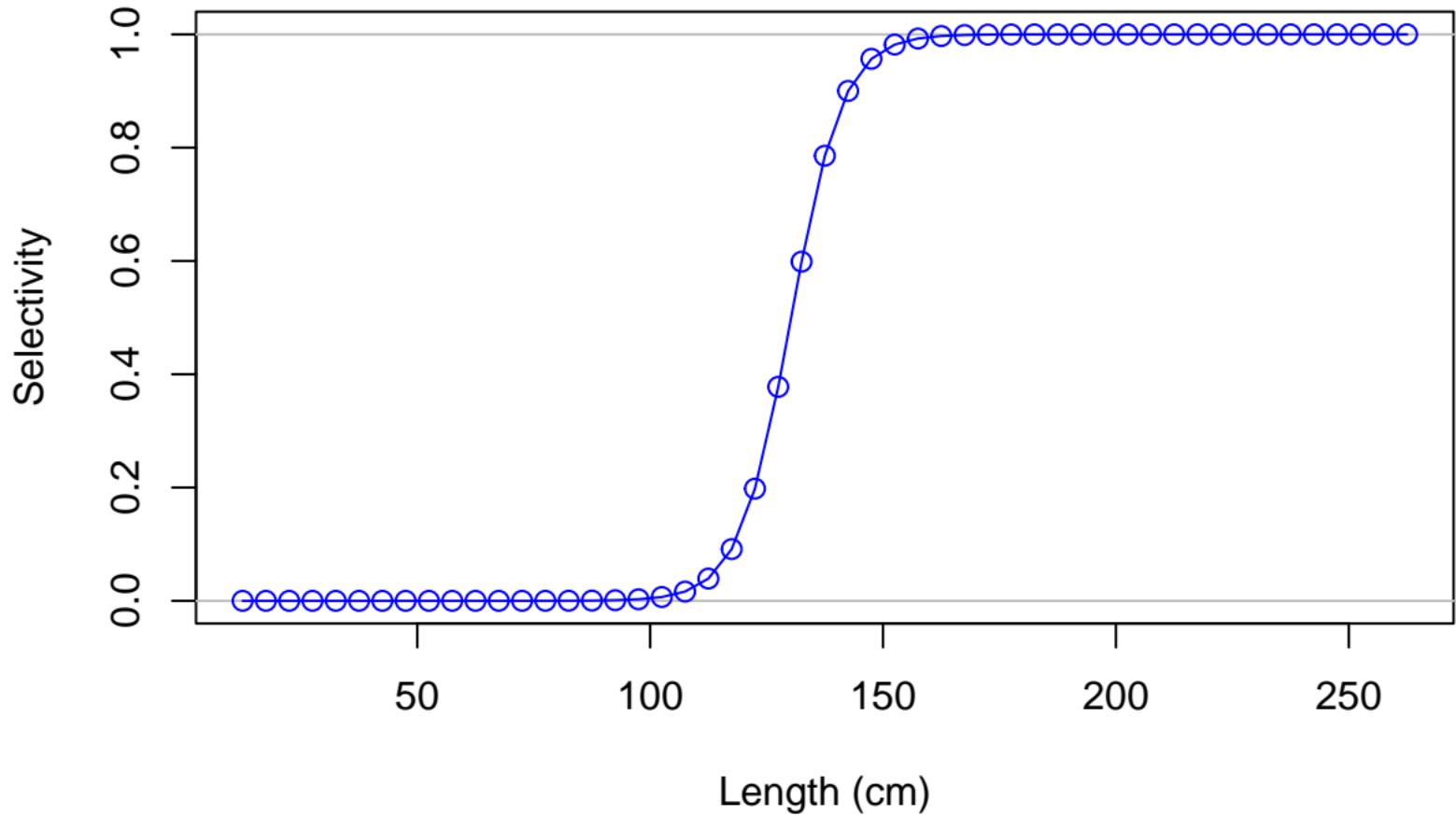
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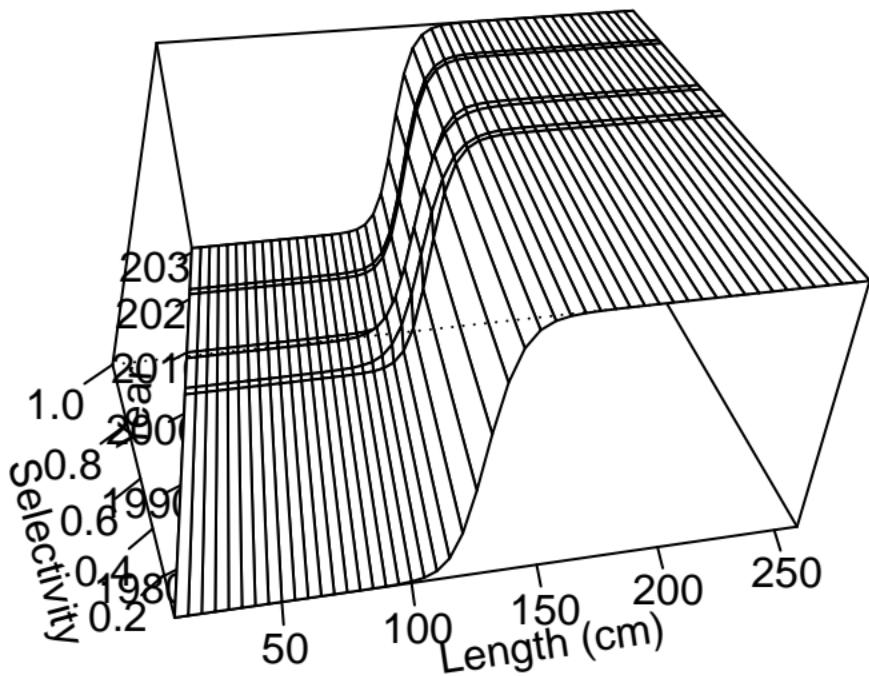
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Length (cm)







Year

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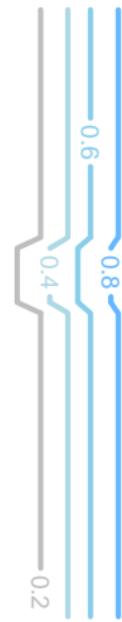
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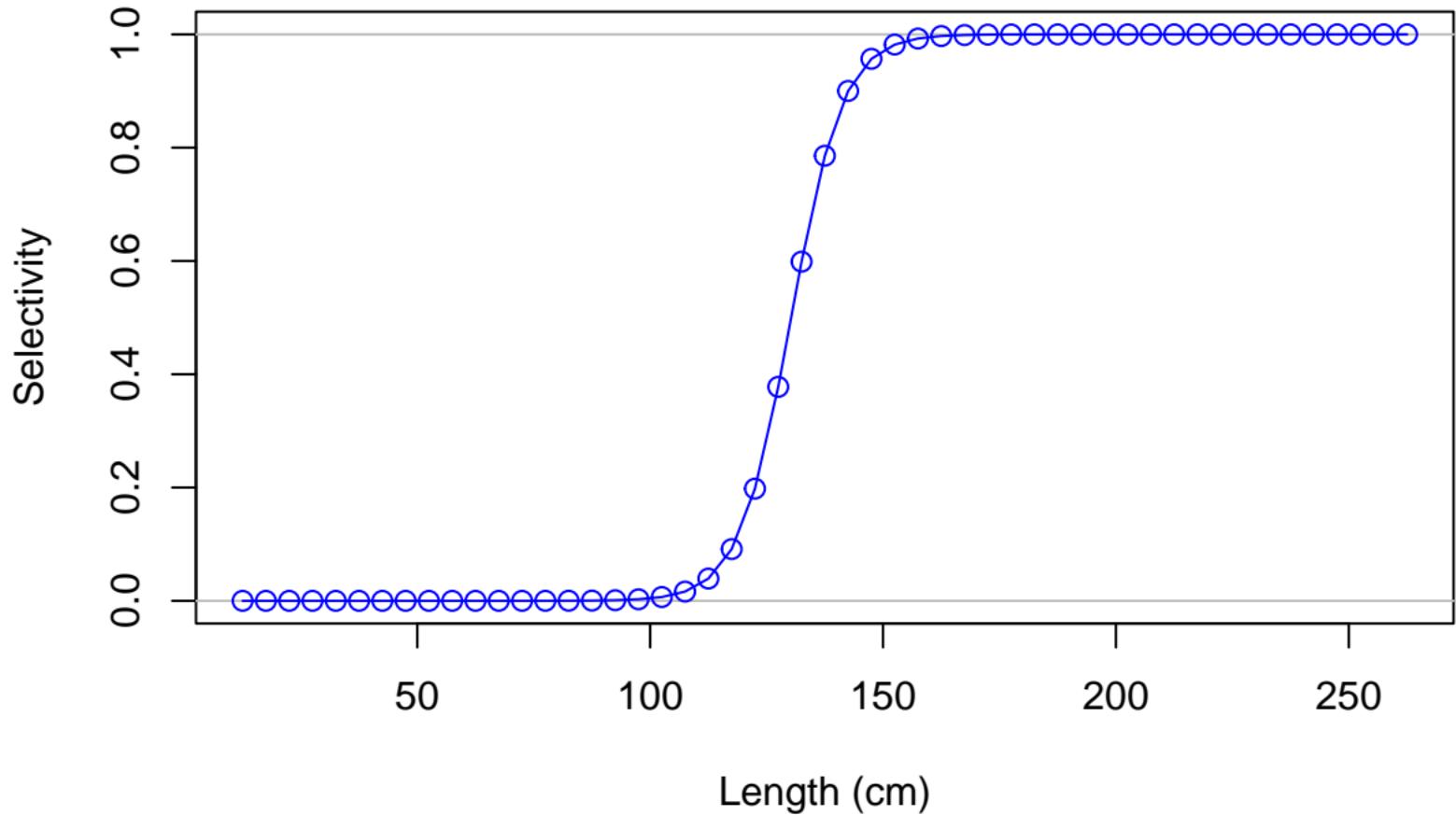
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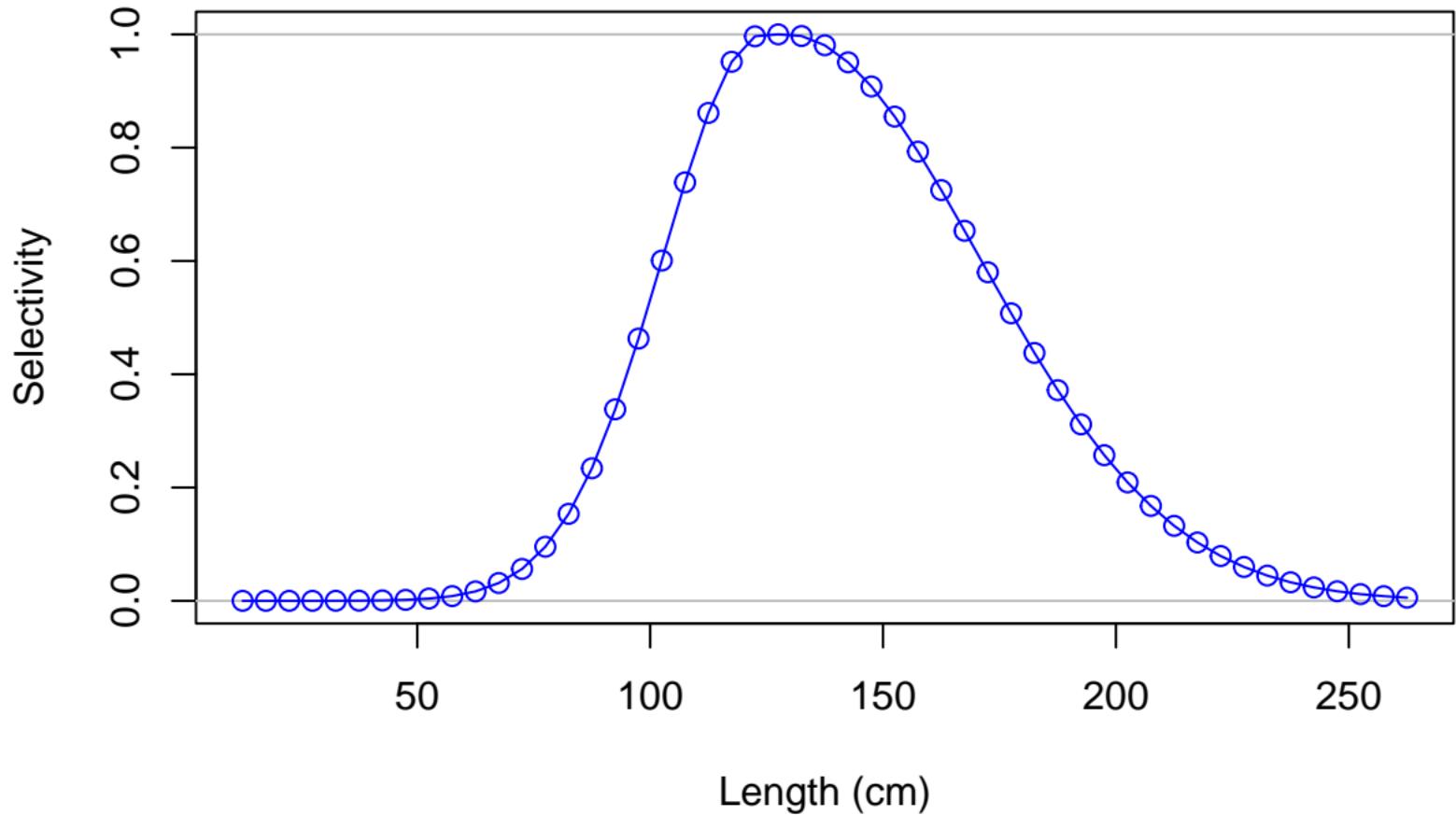
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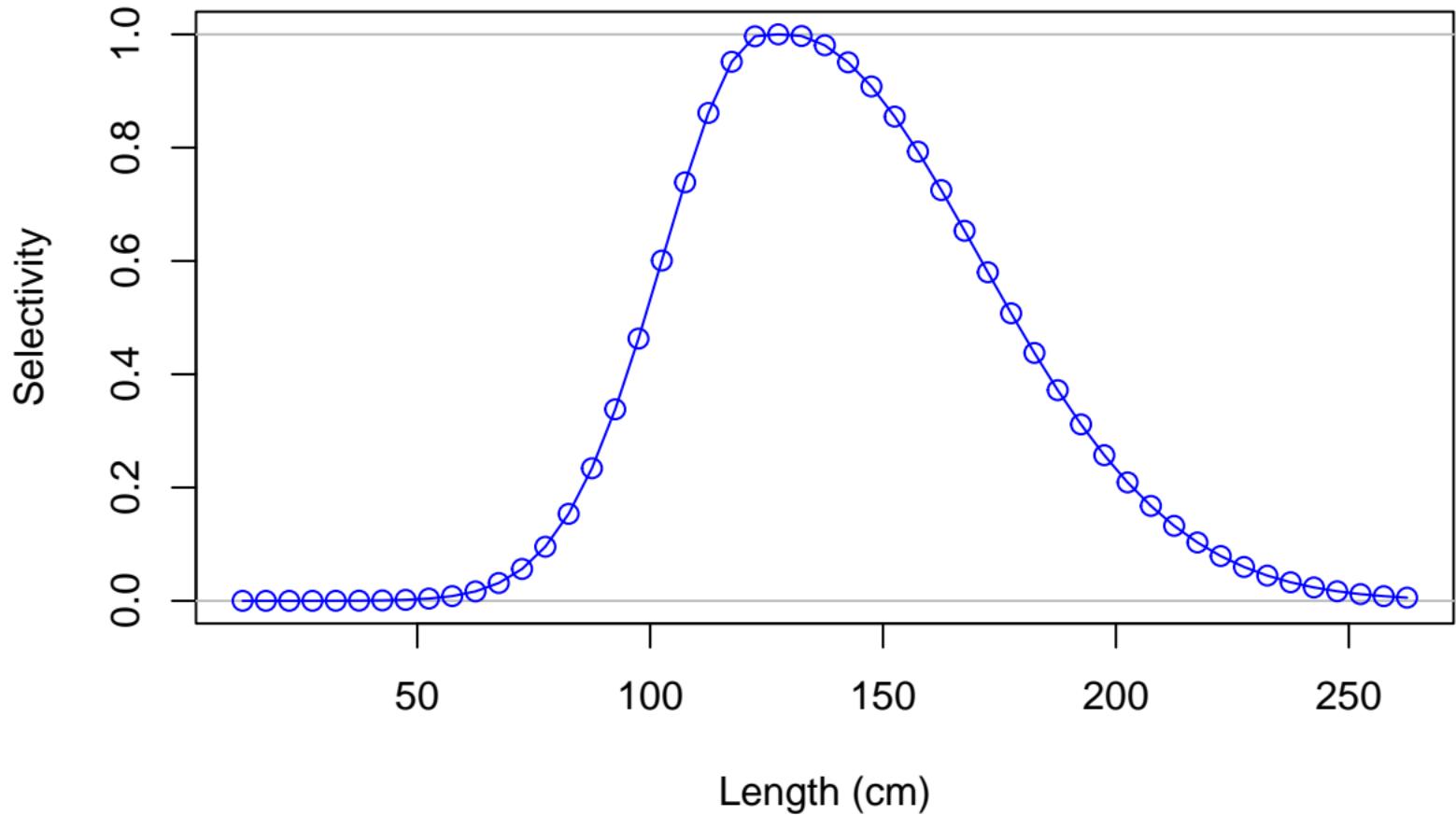
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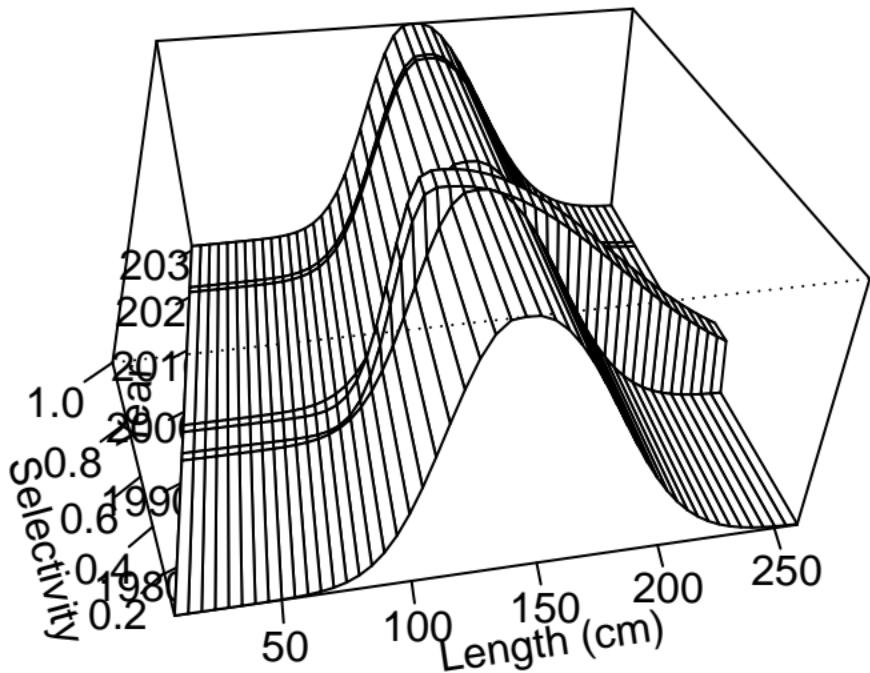
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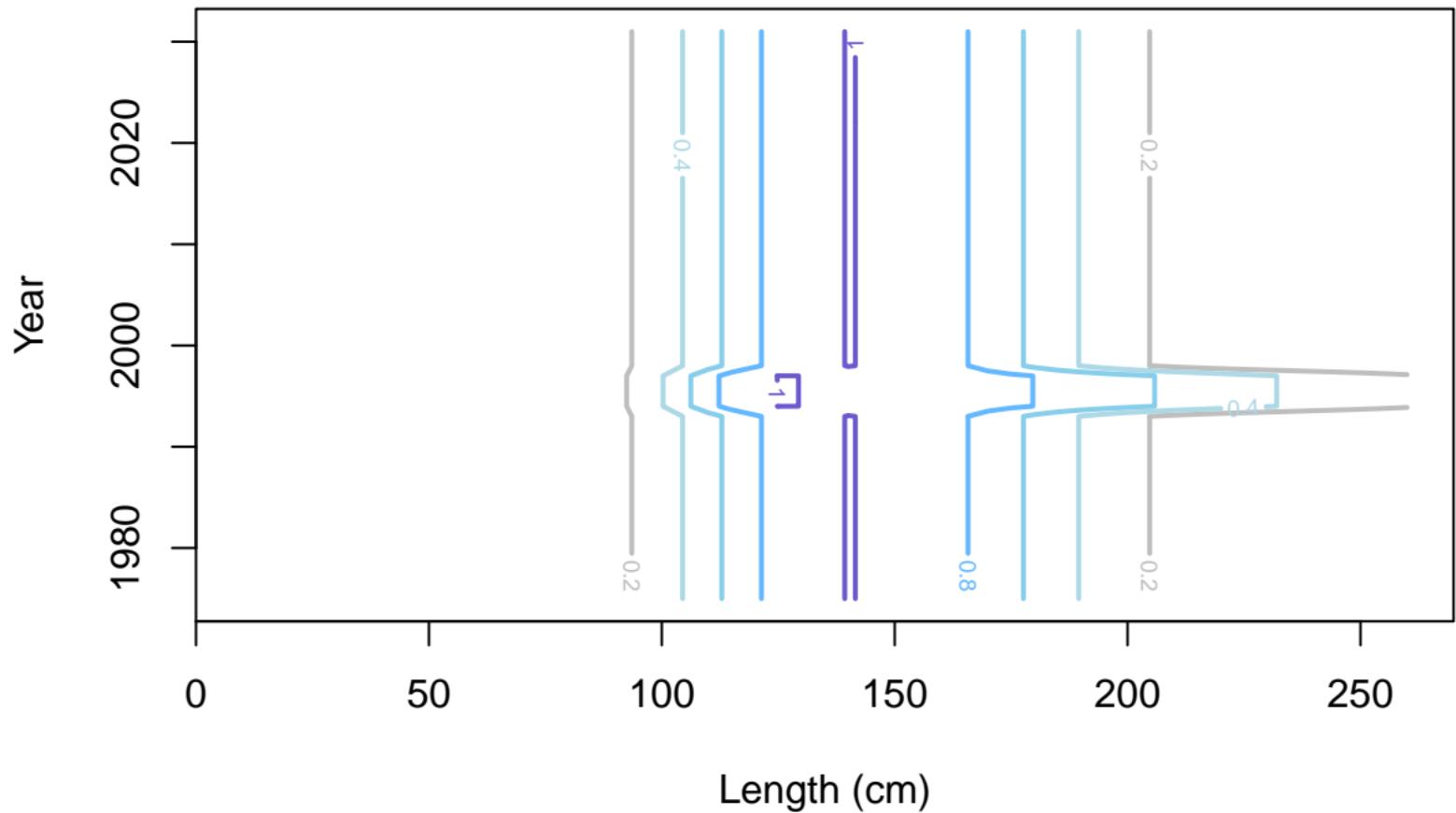


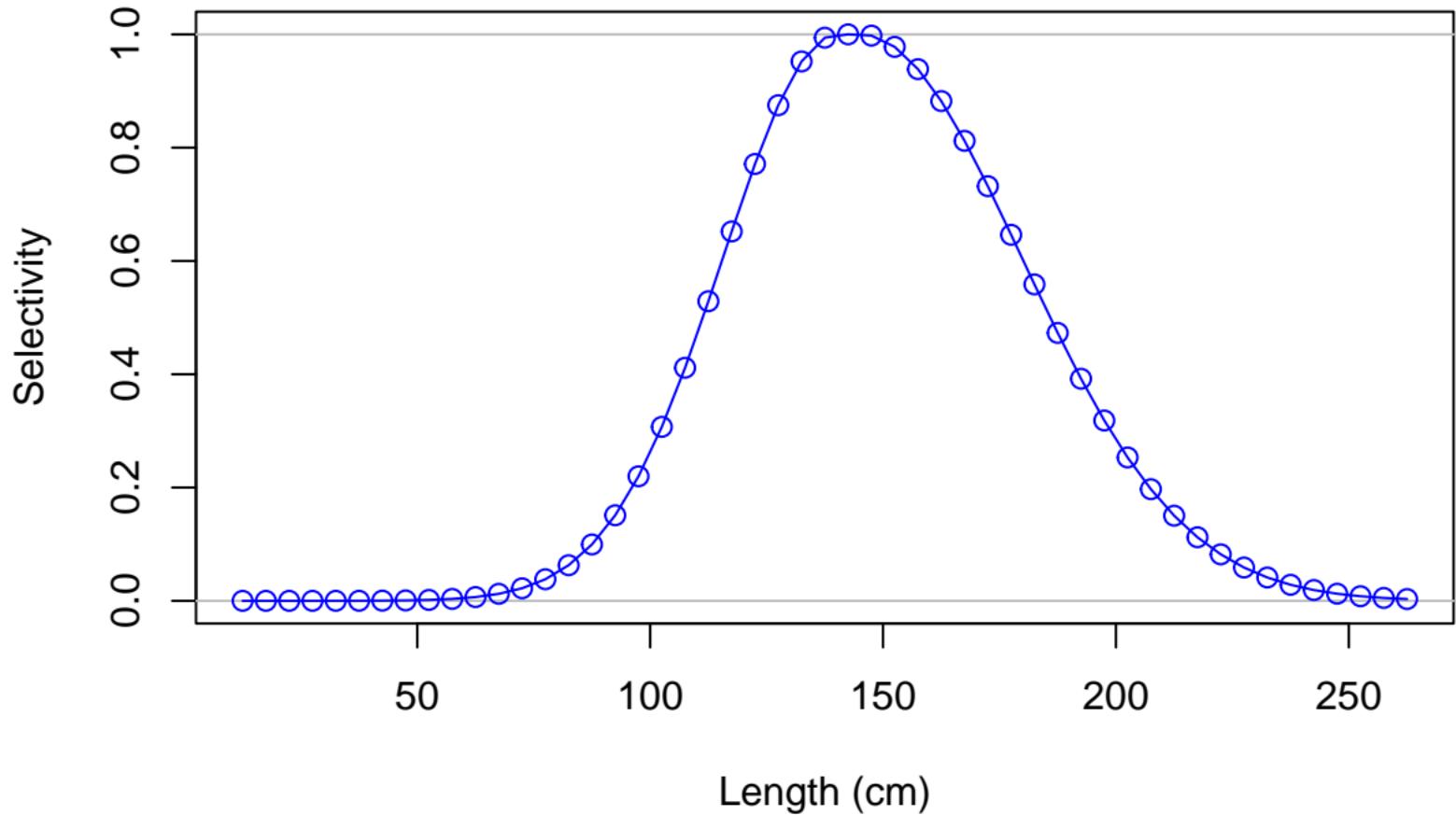


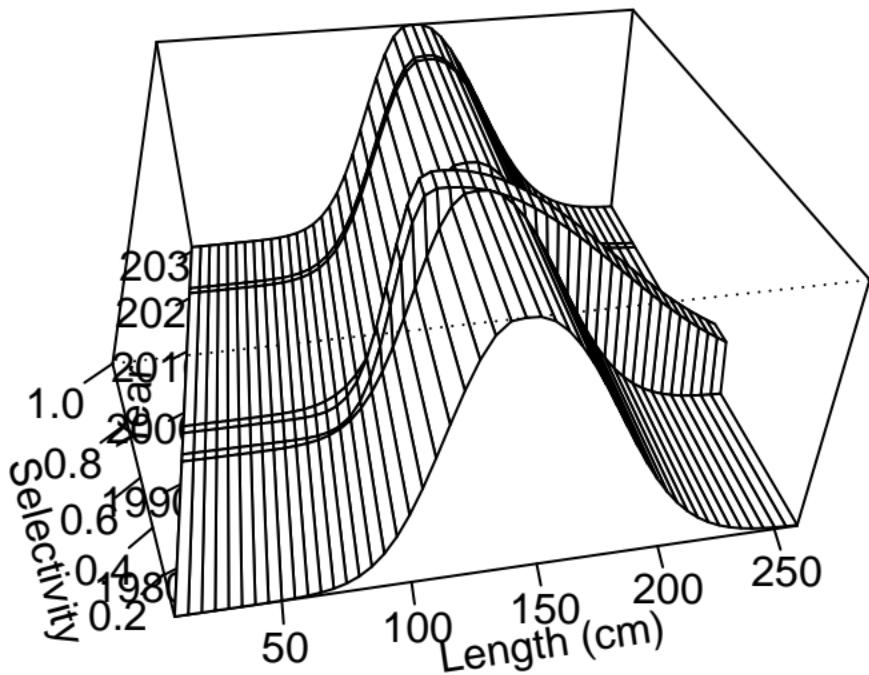


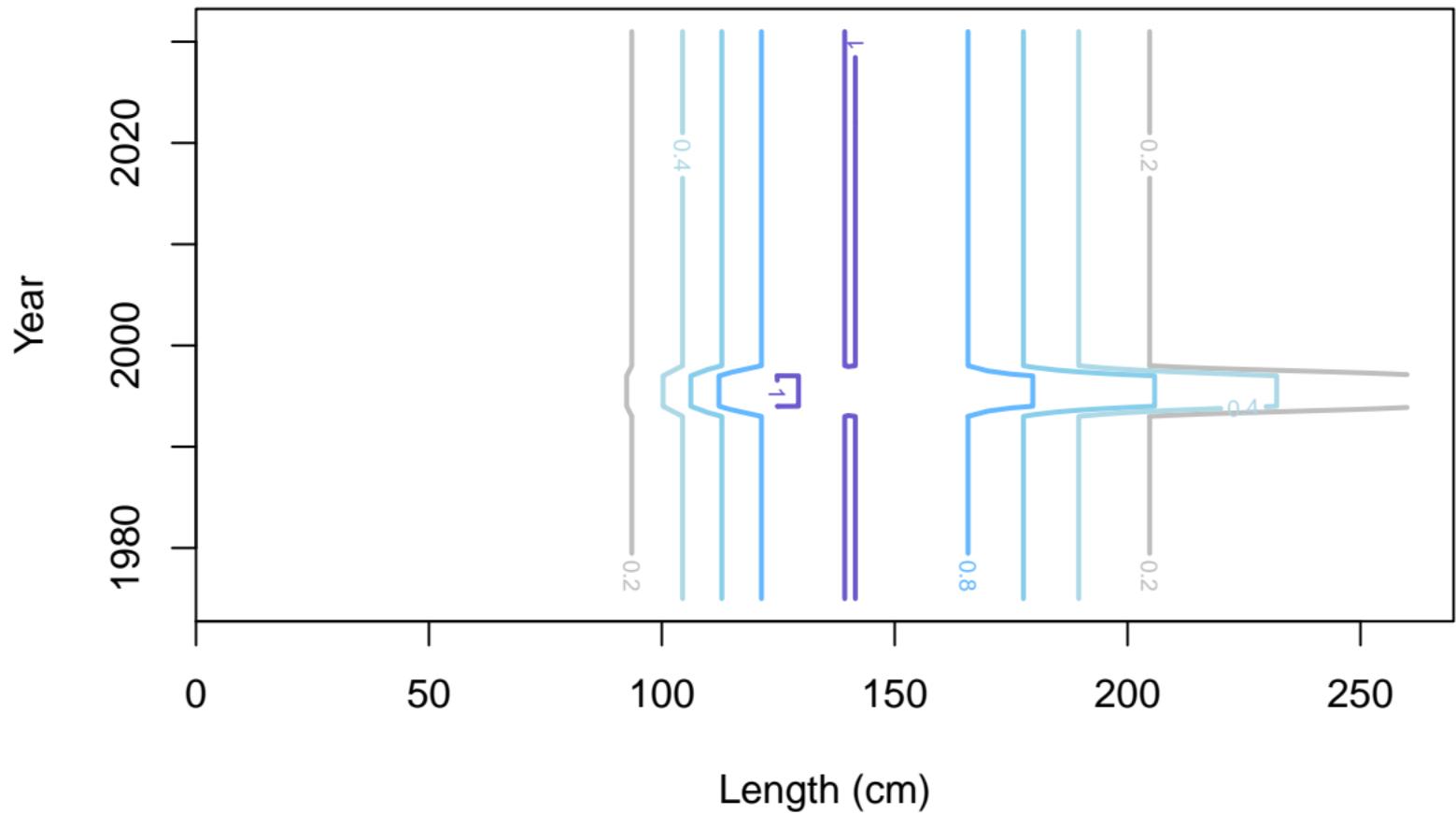


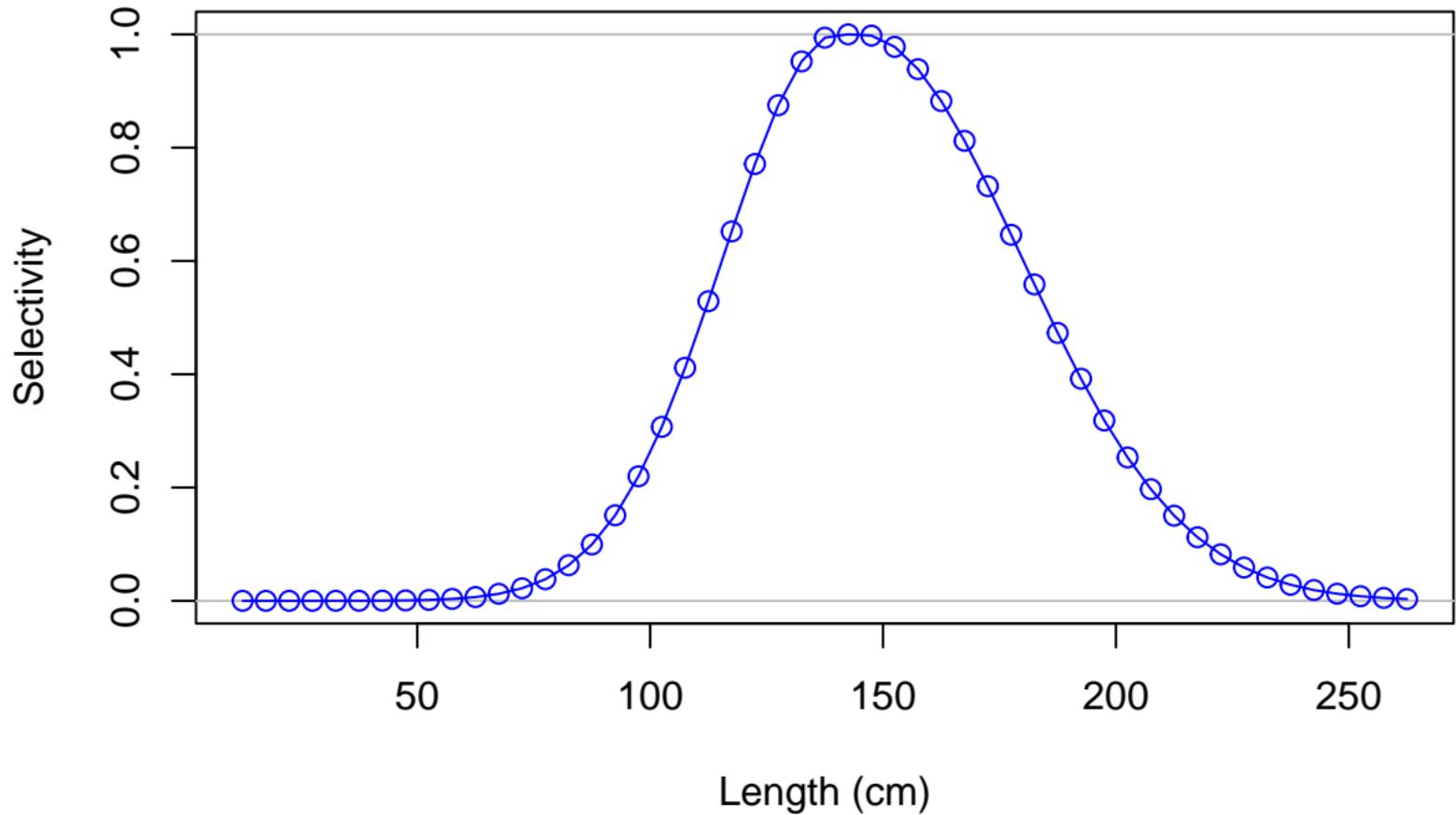


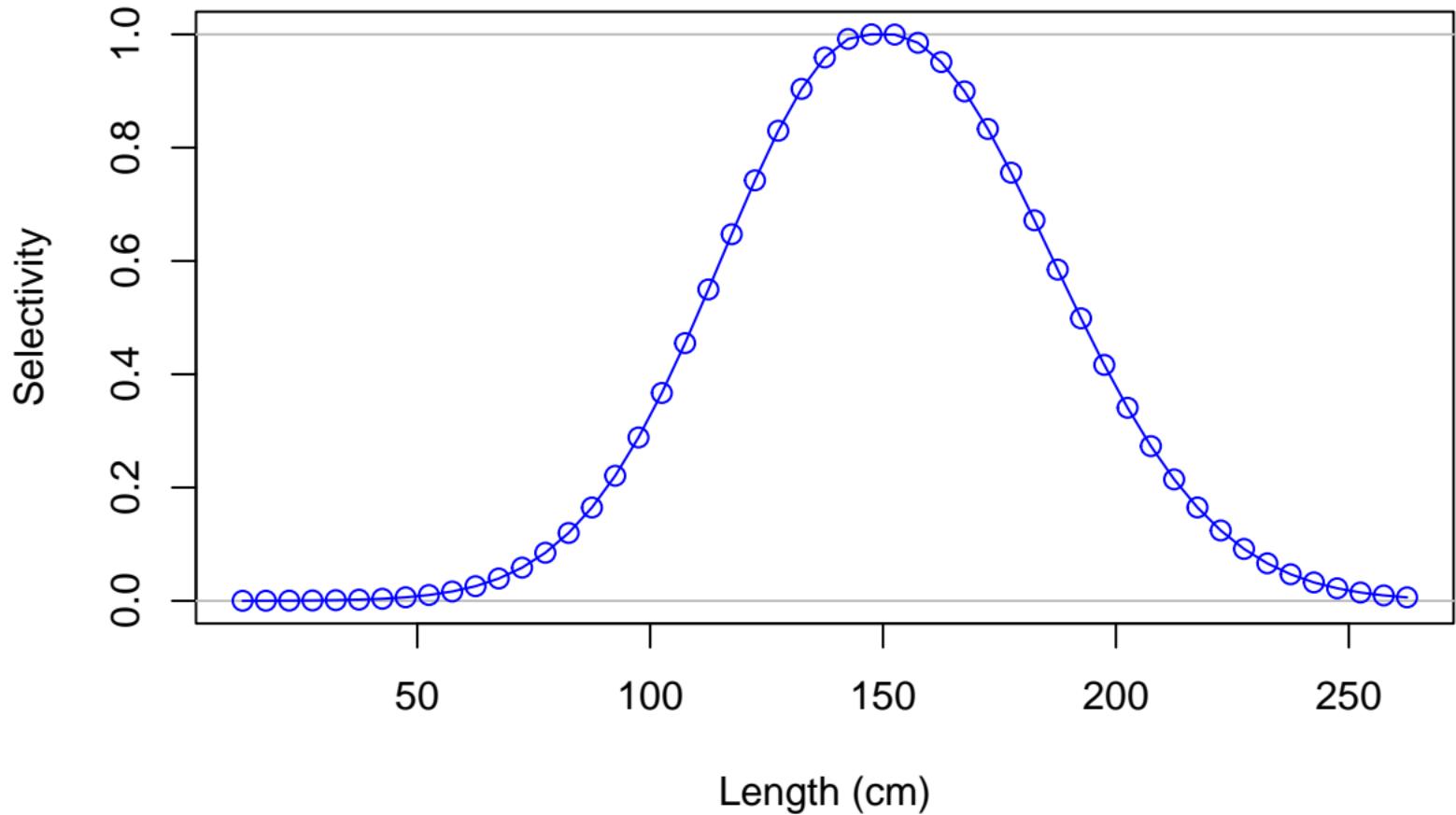


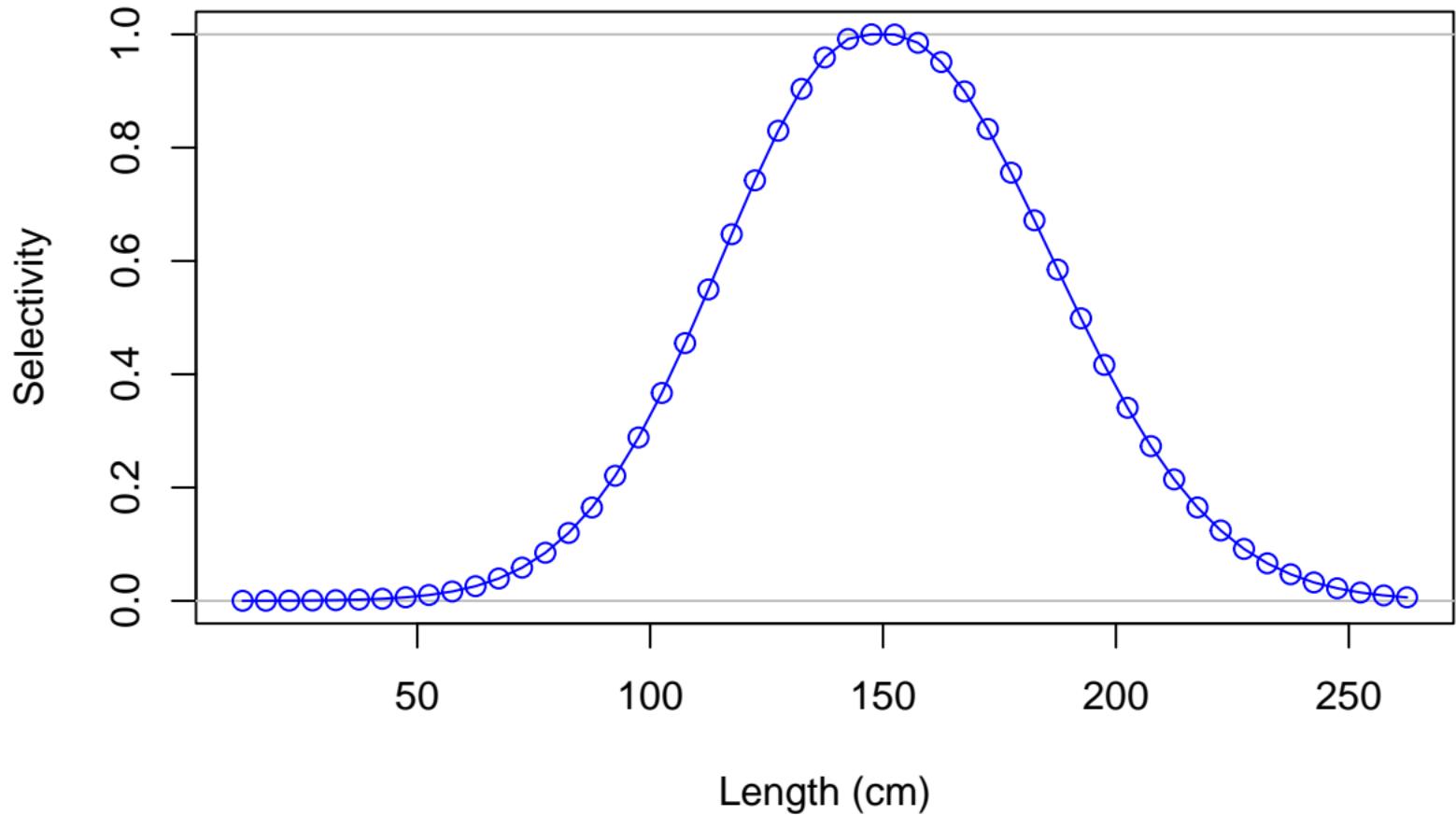


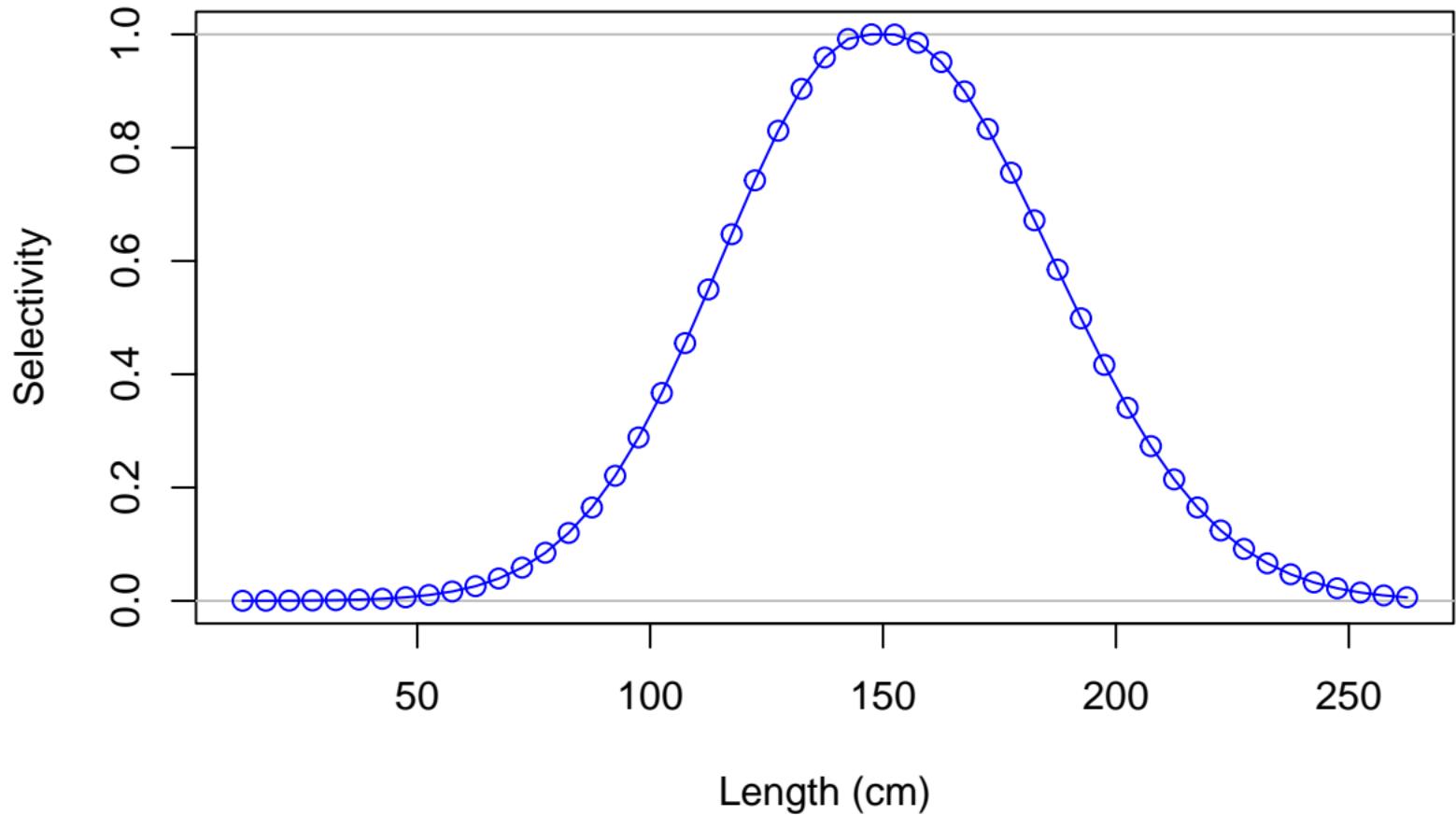


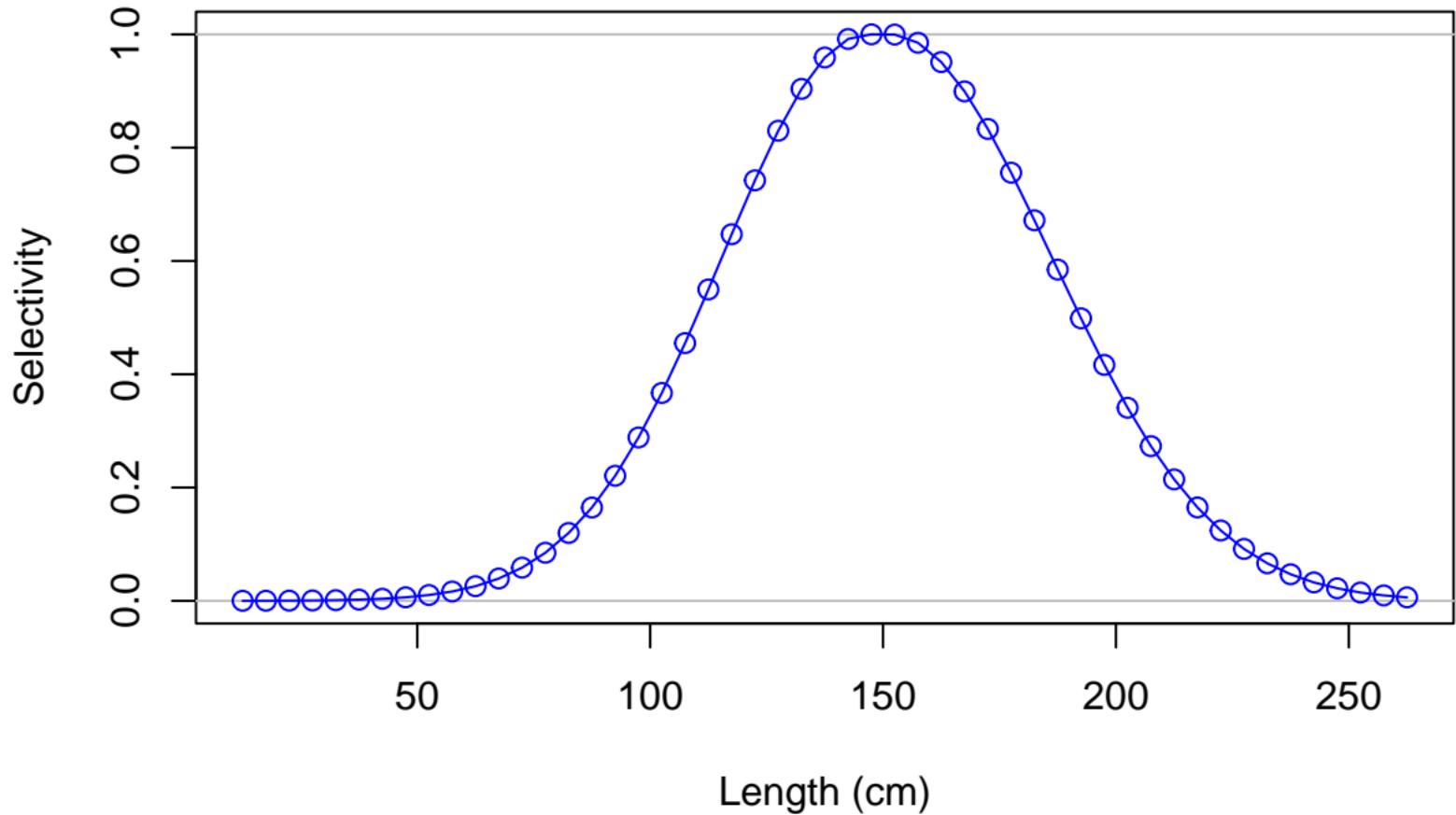


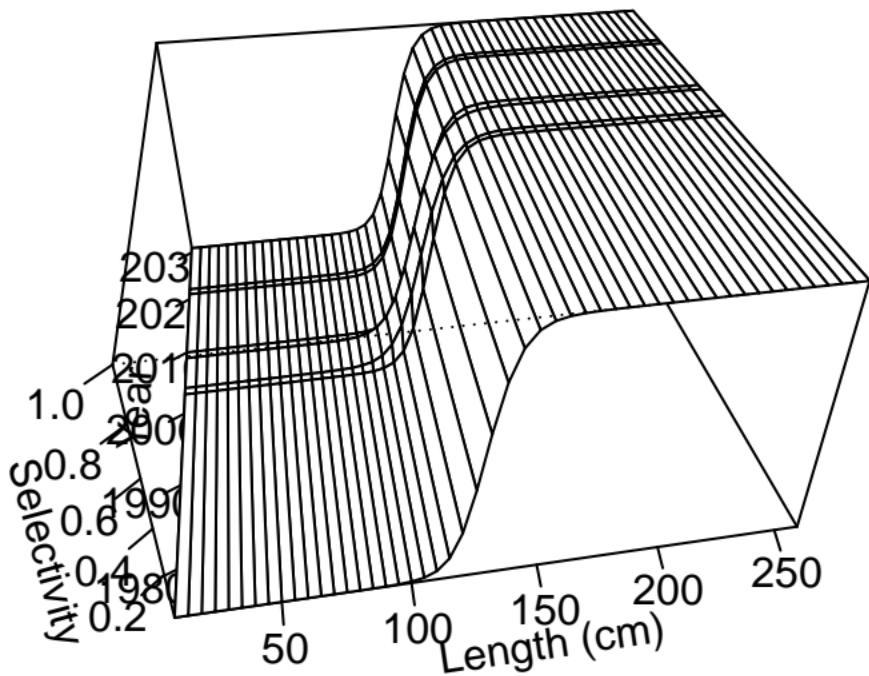












Year

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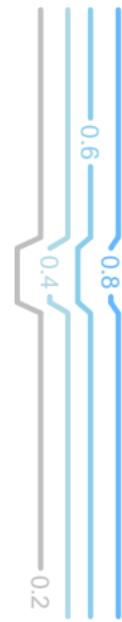
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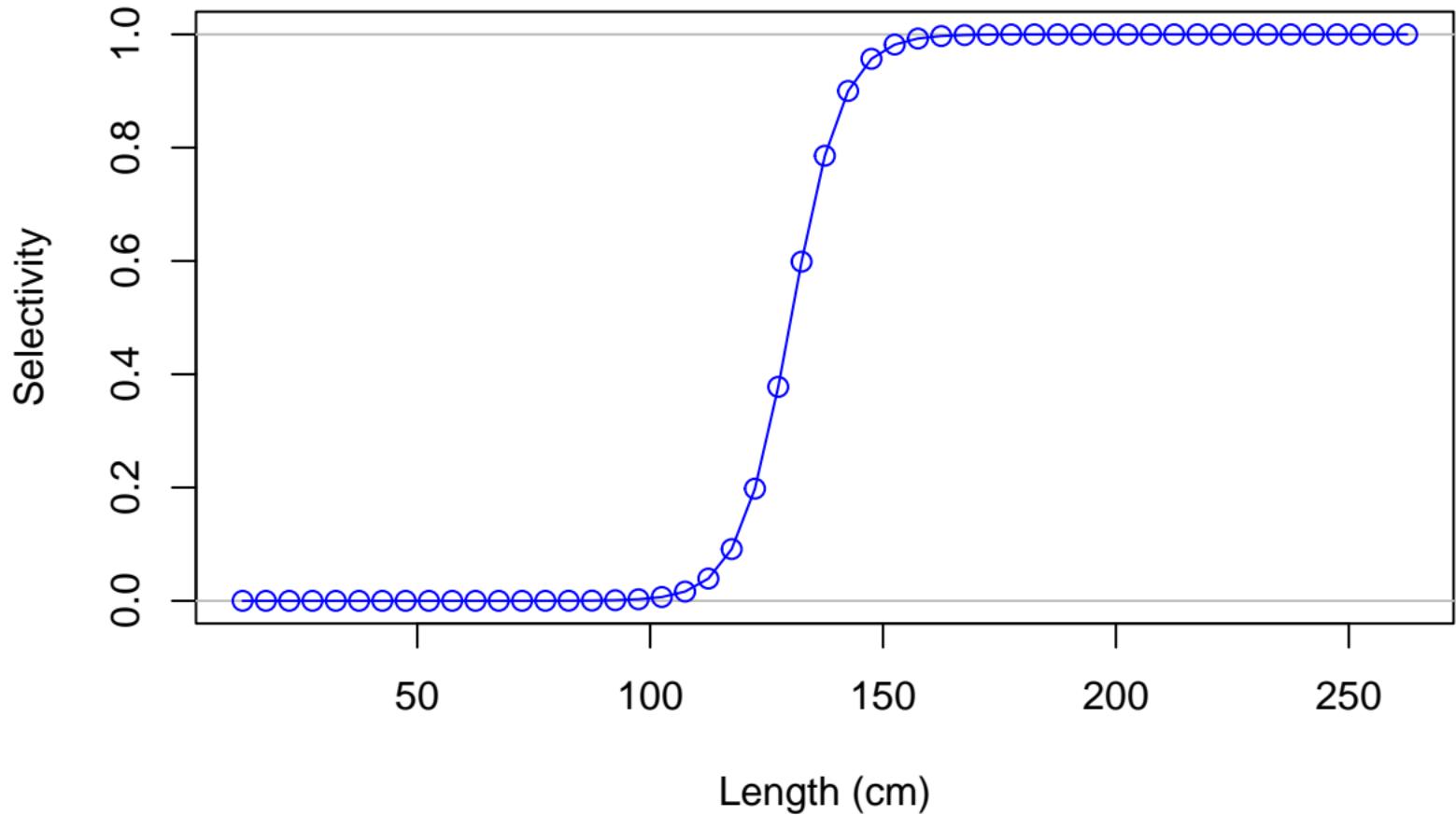
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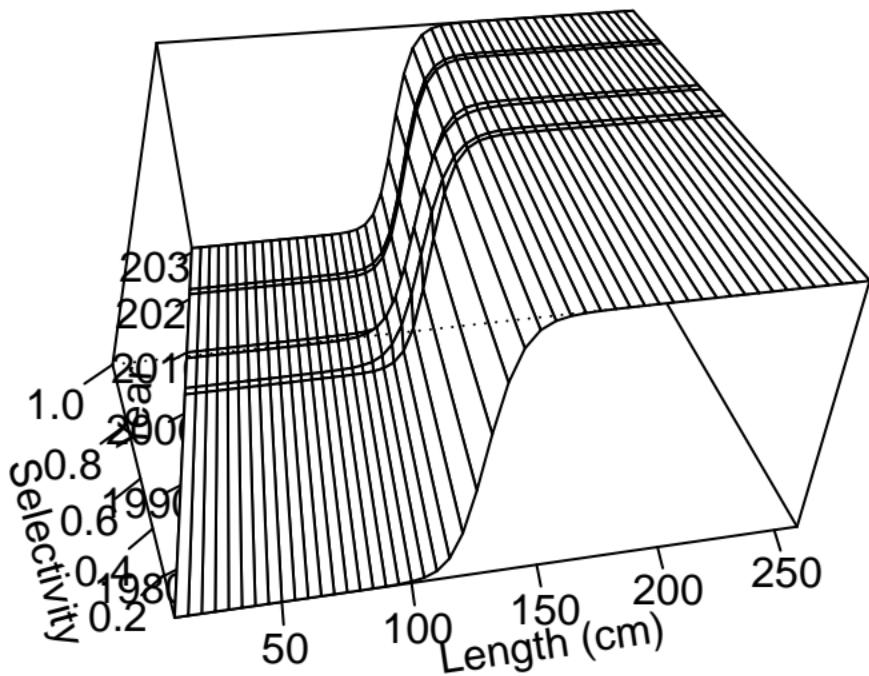
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Length (cm)



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Year

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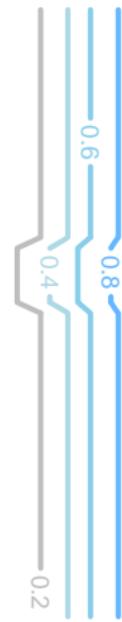
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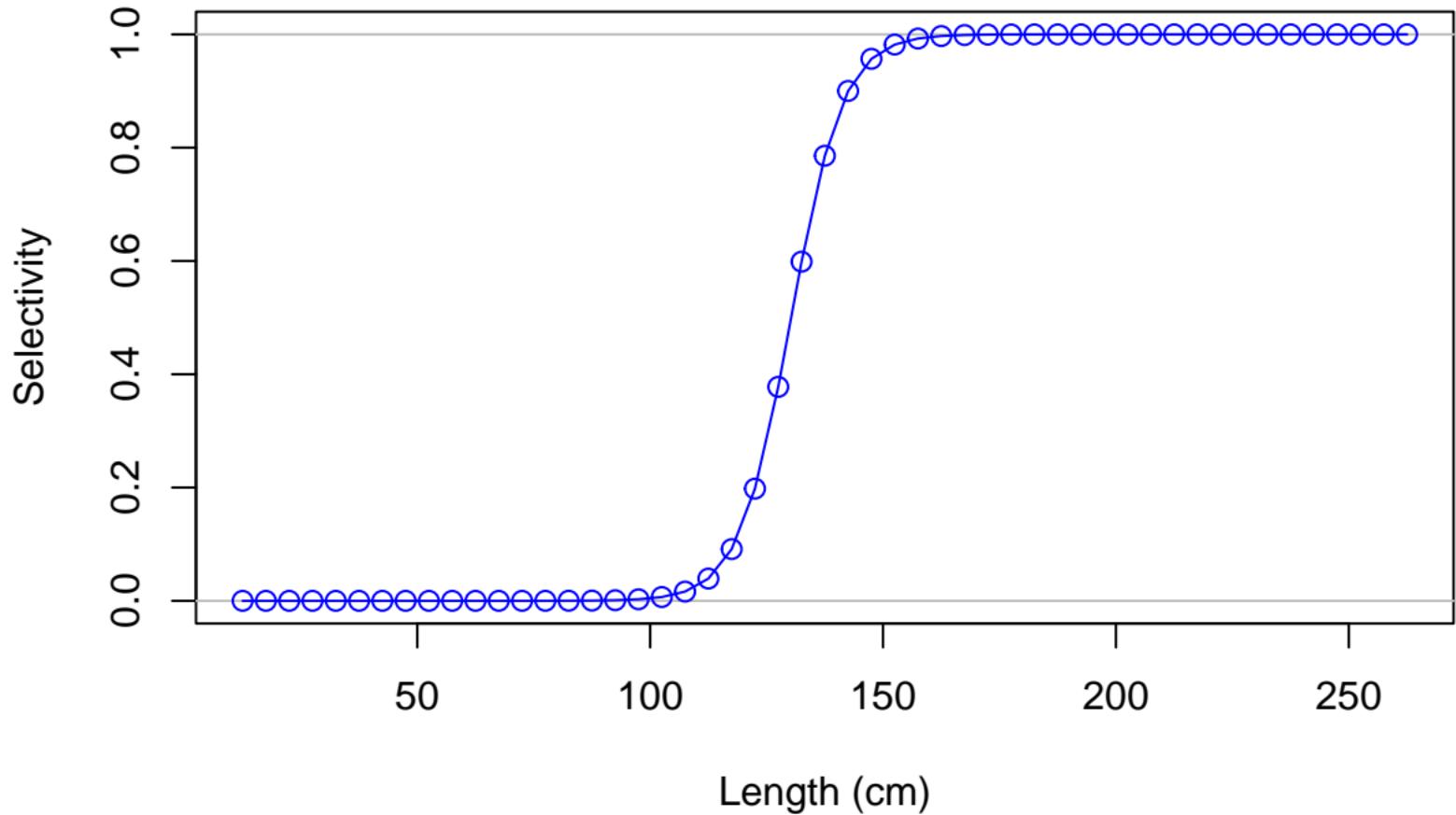
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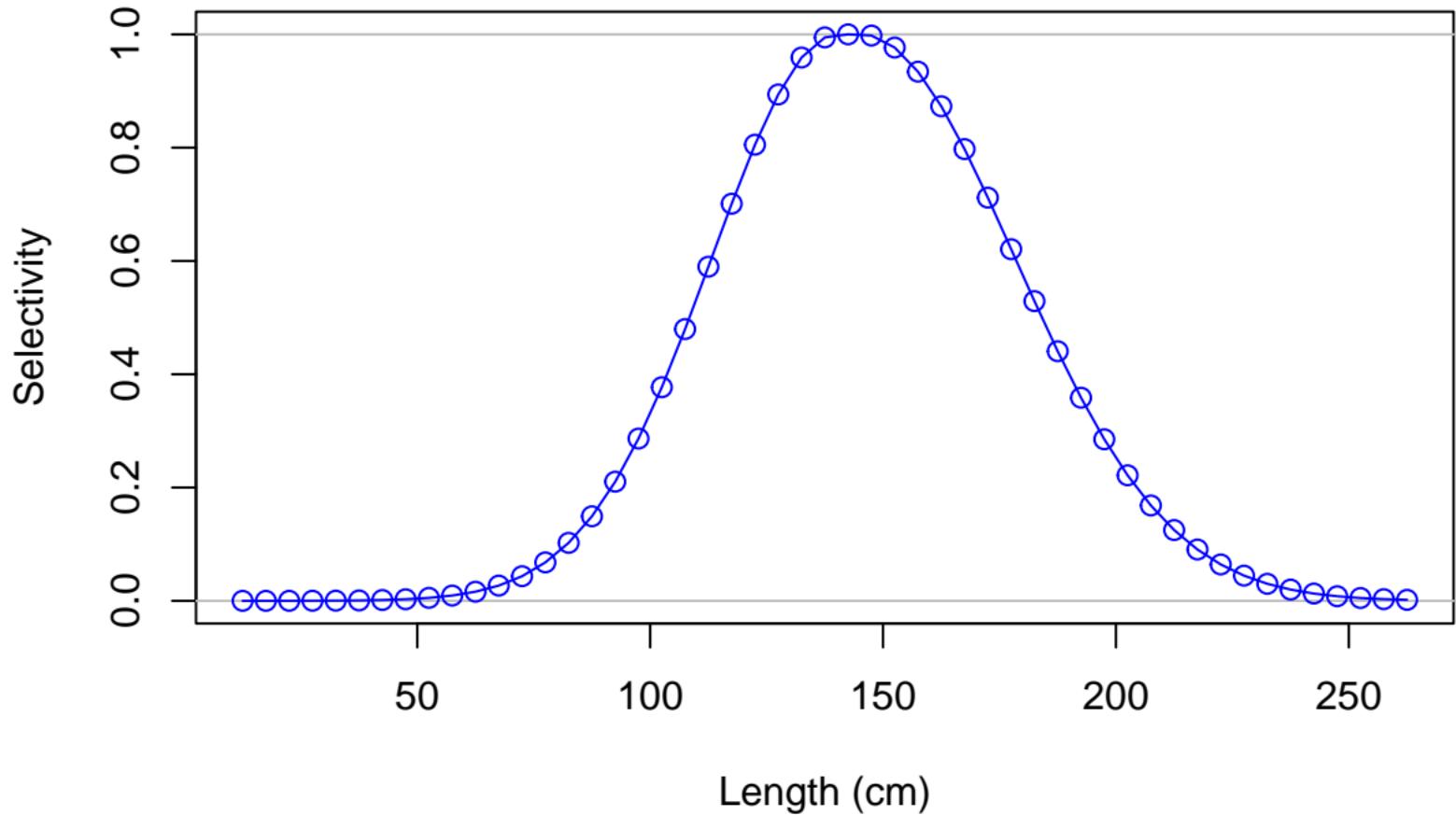
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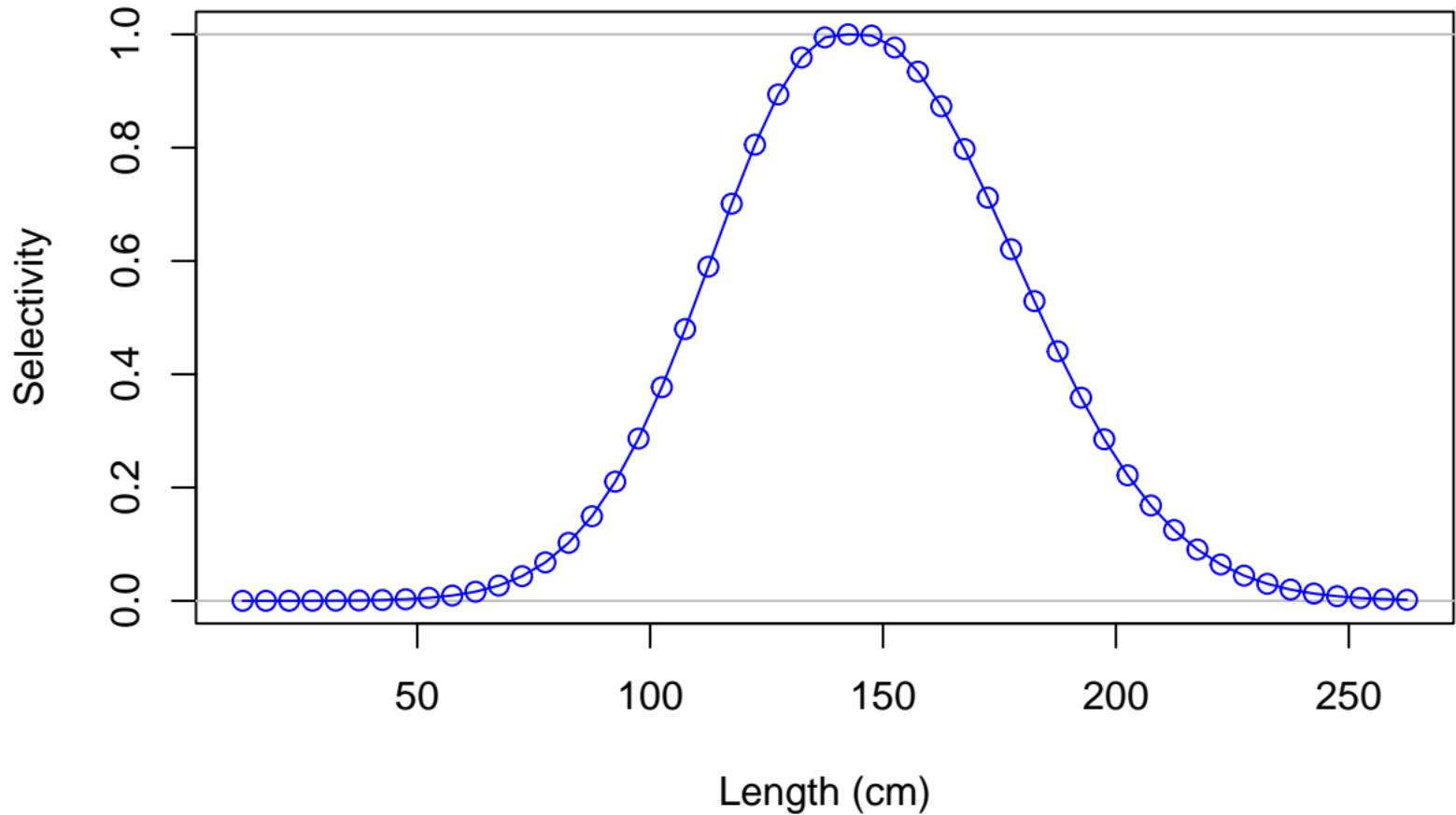
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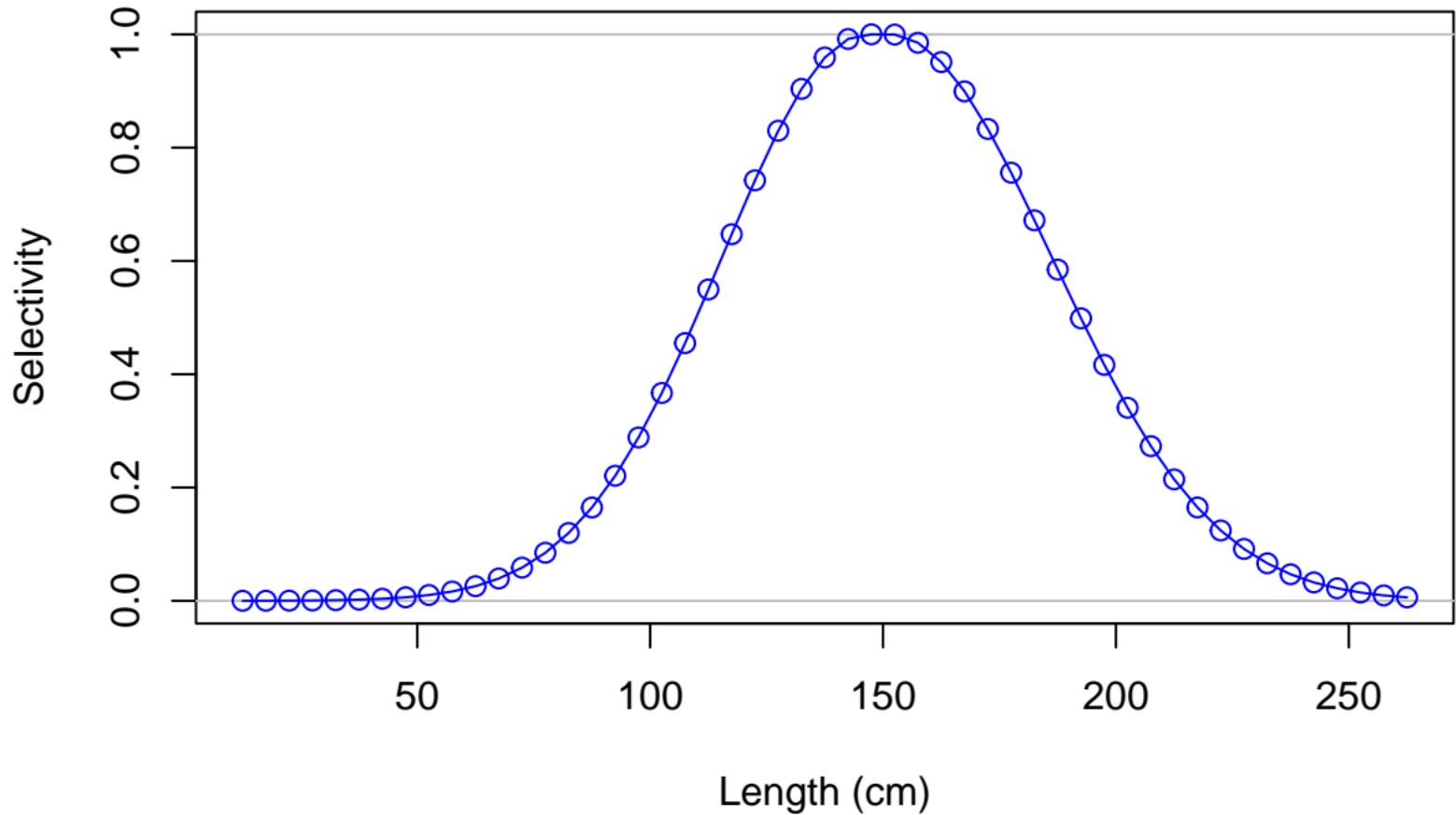
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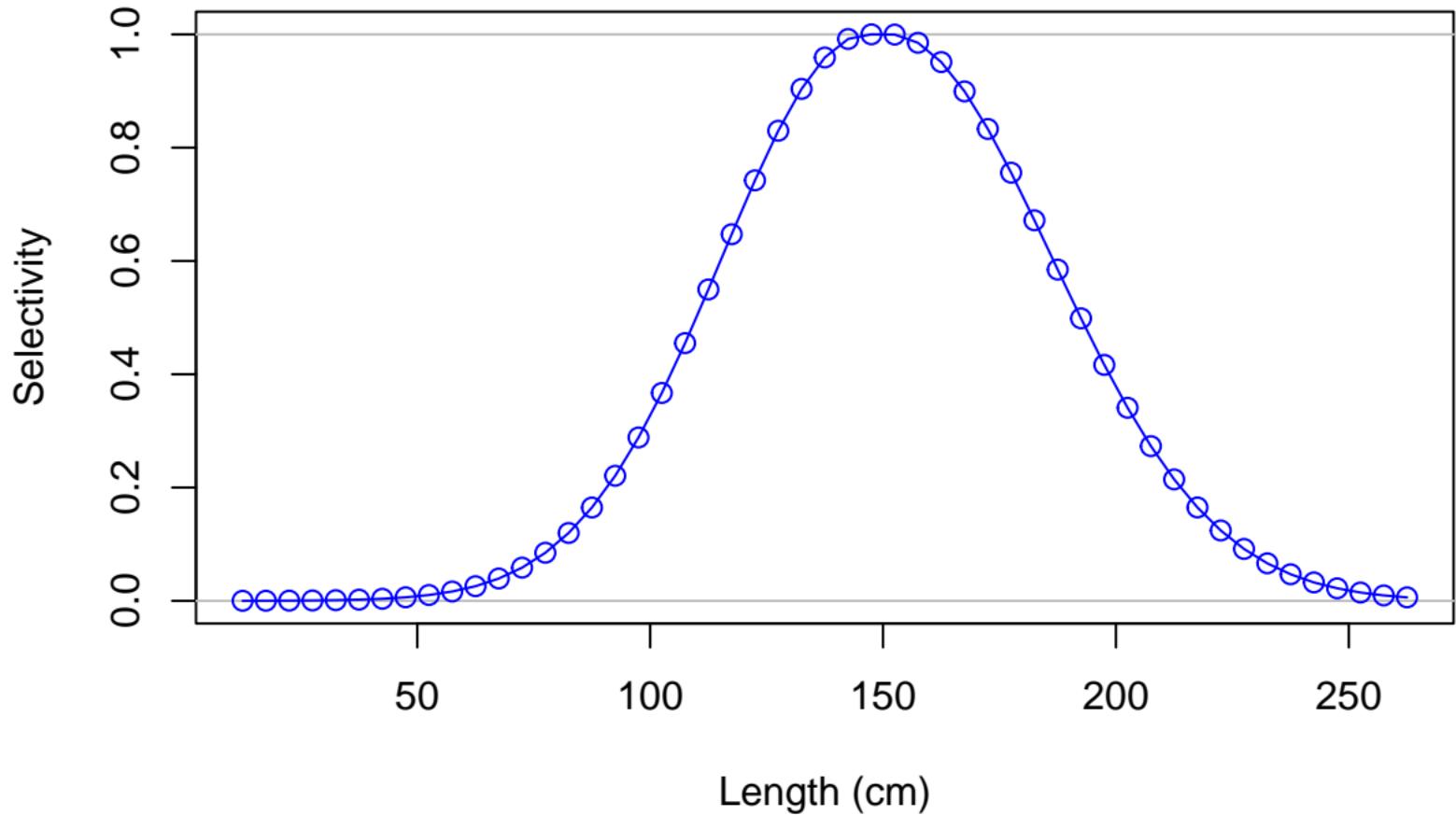


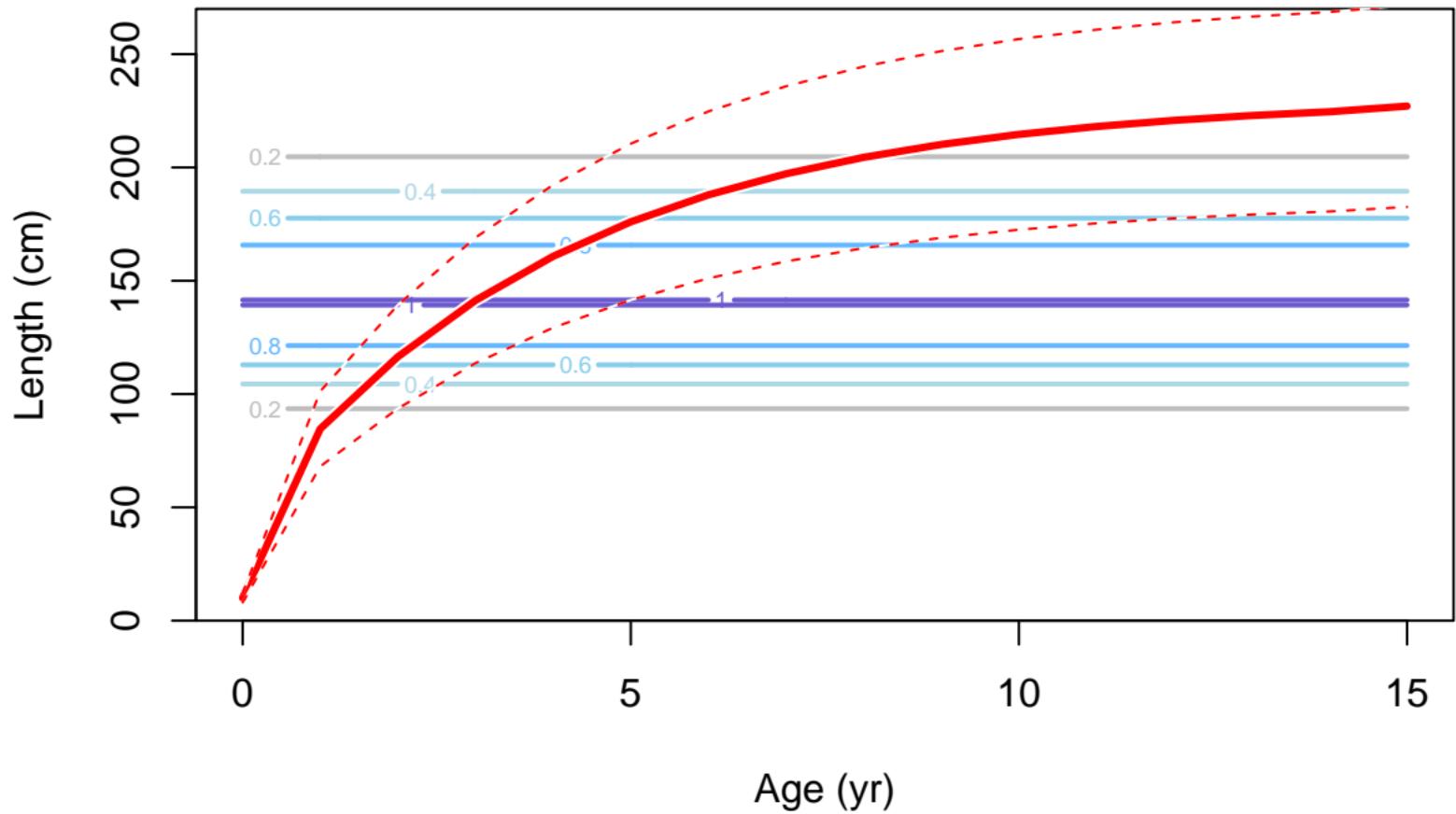


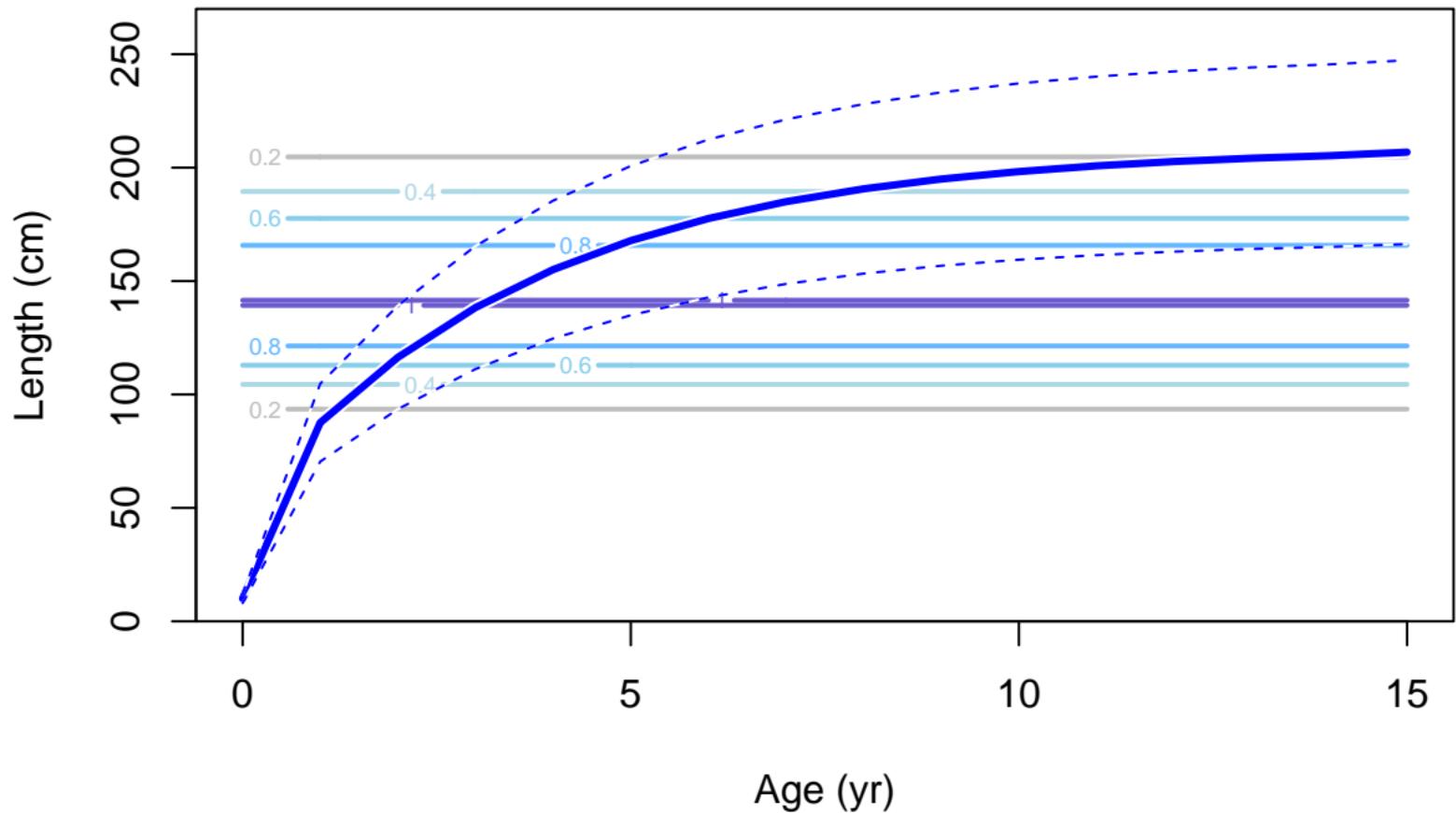


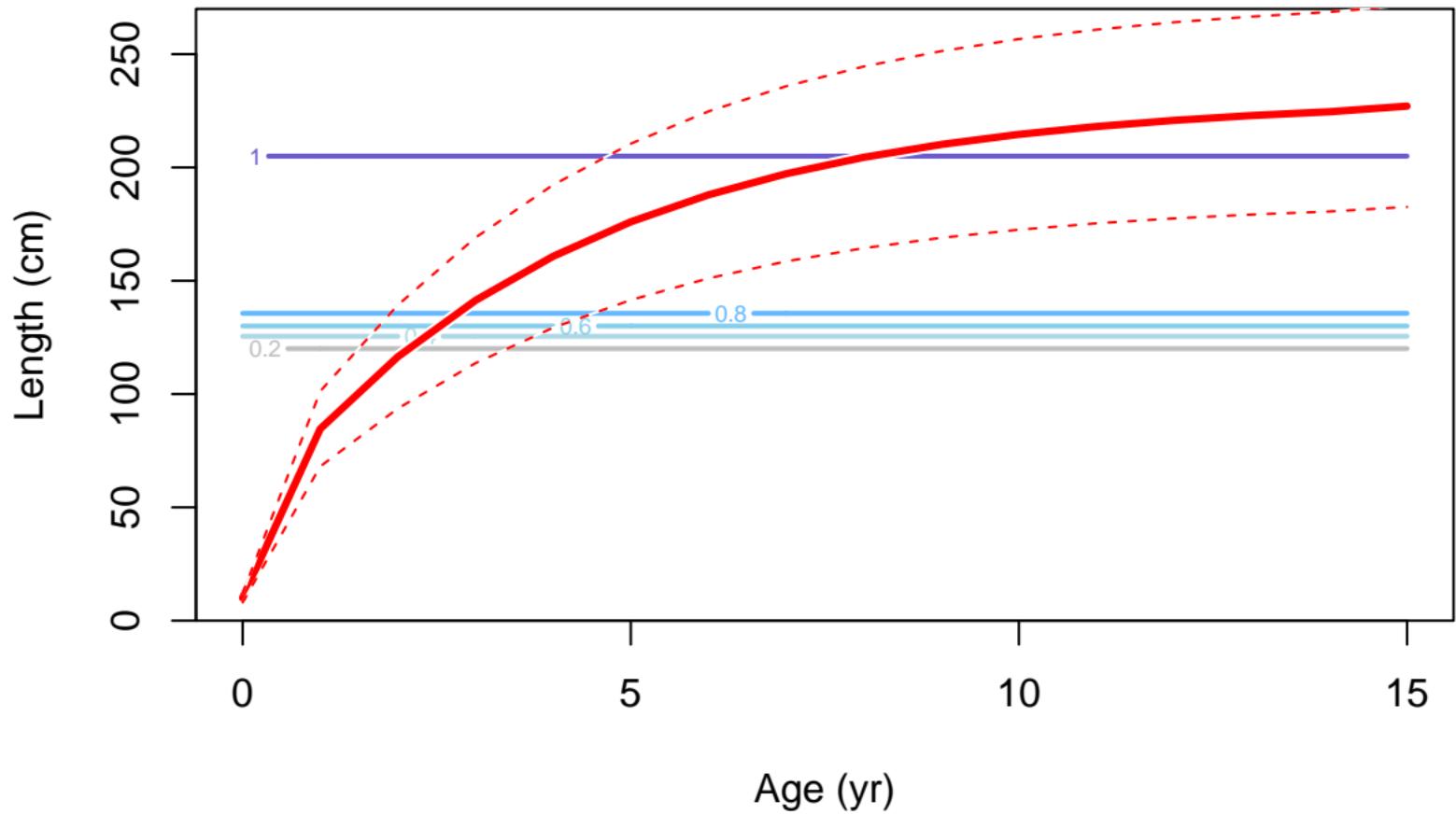


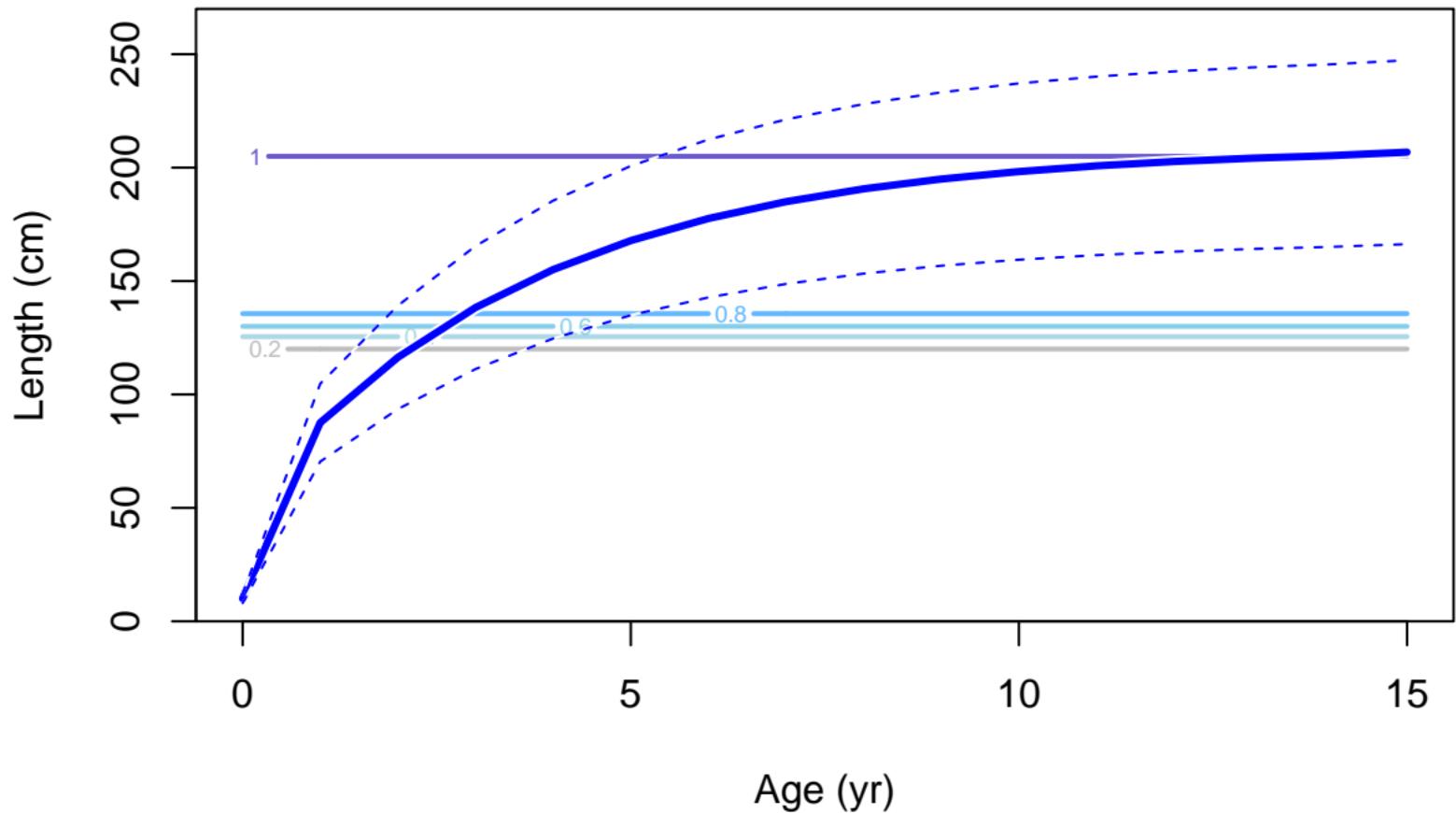


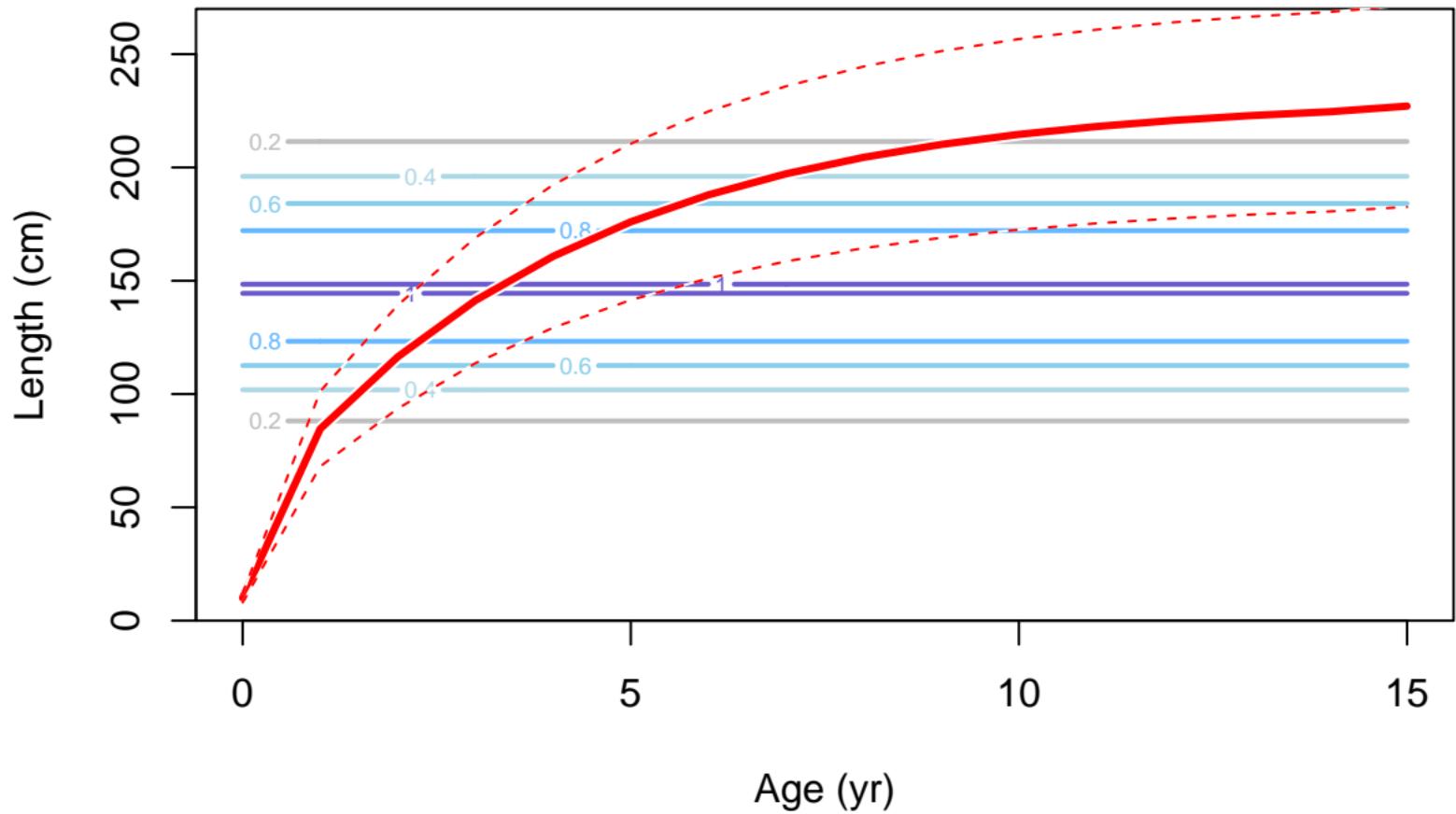


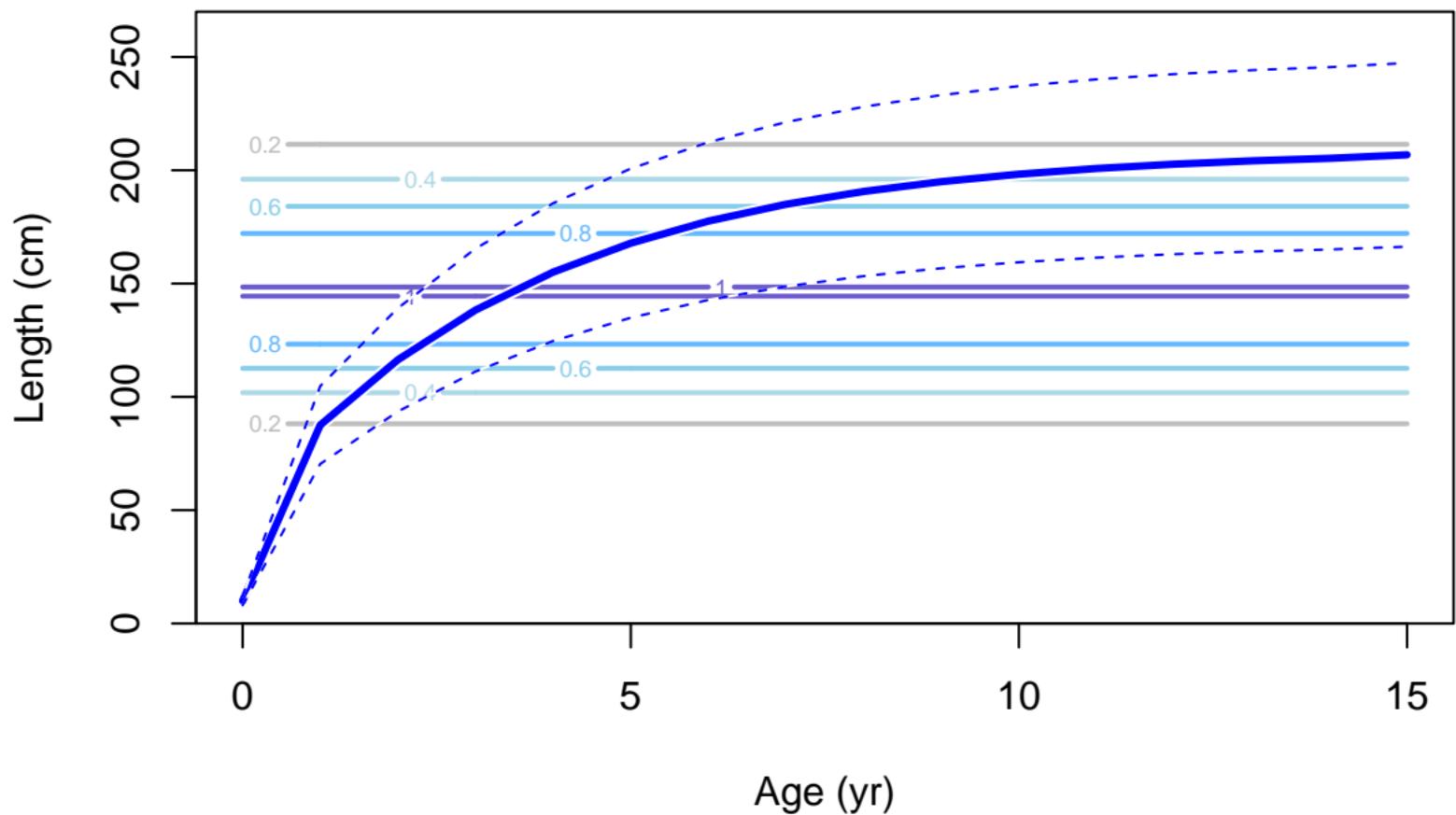


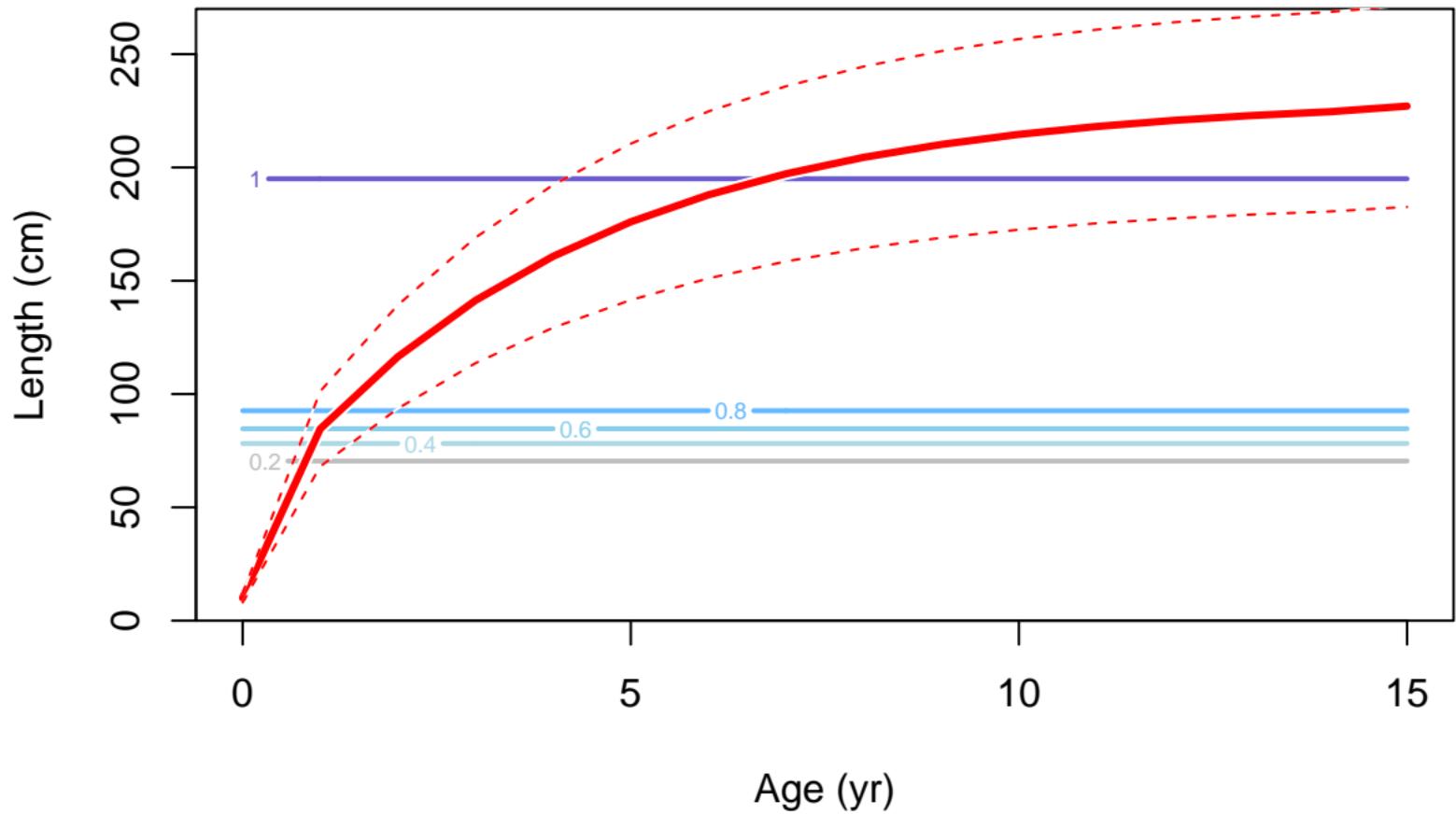


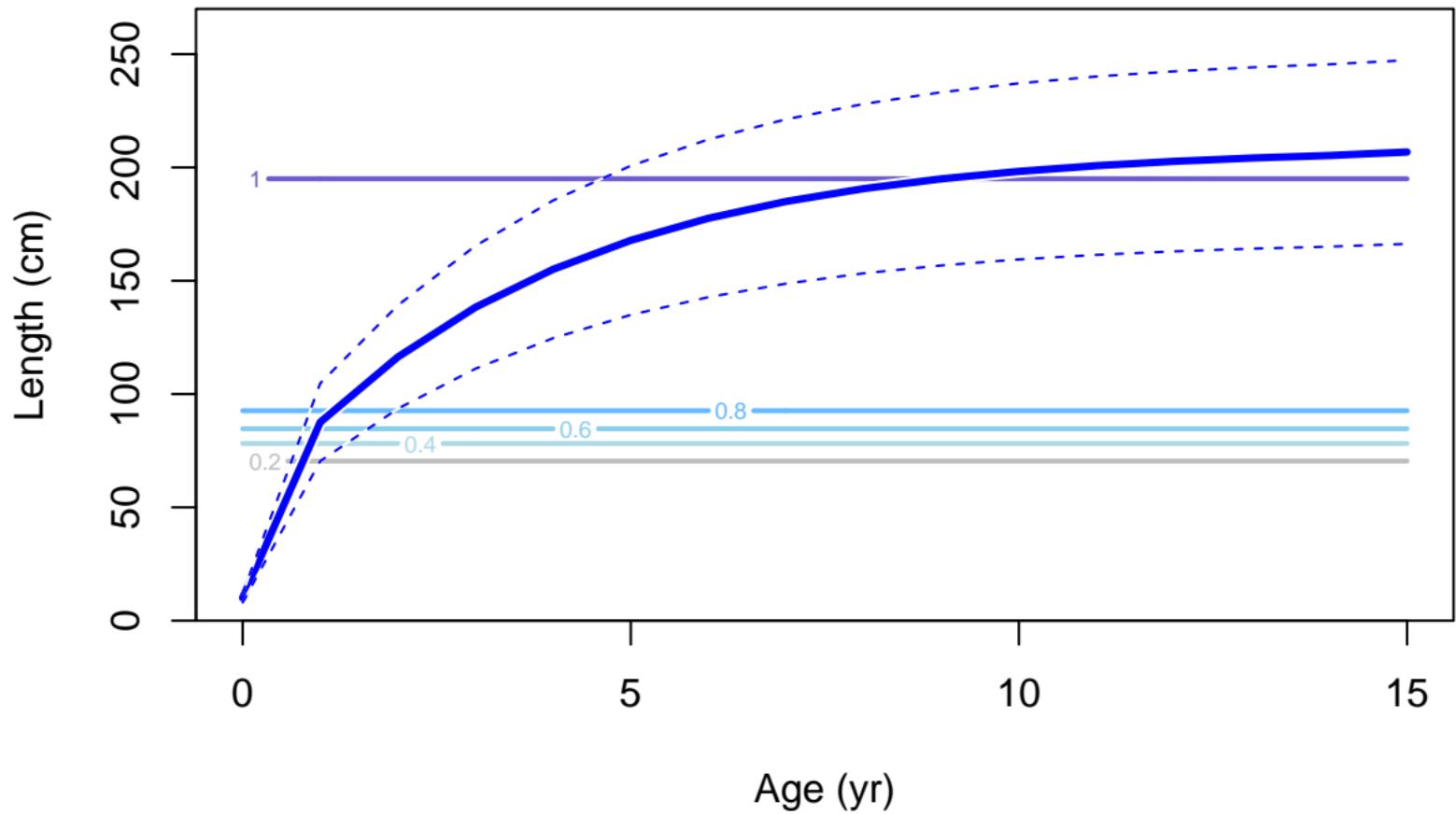


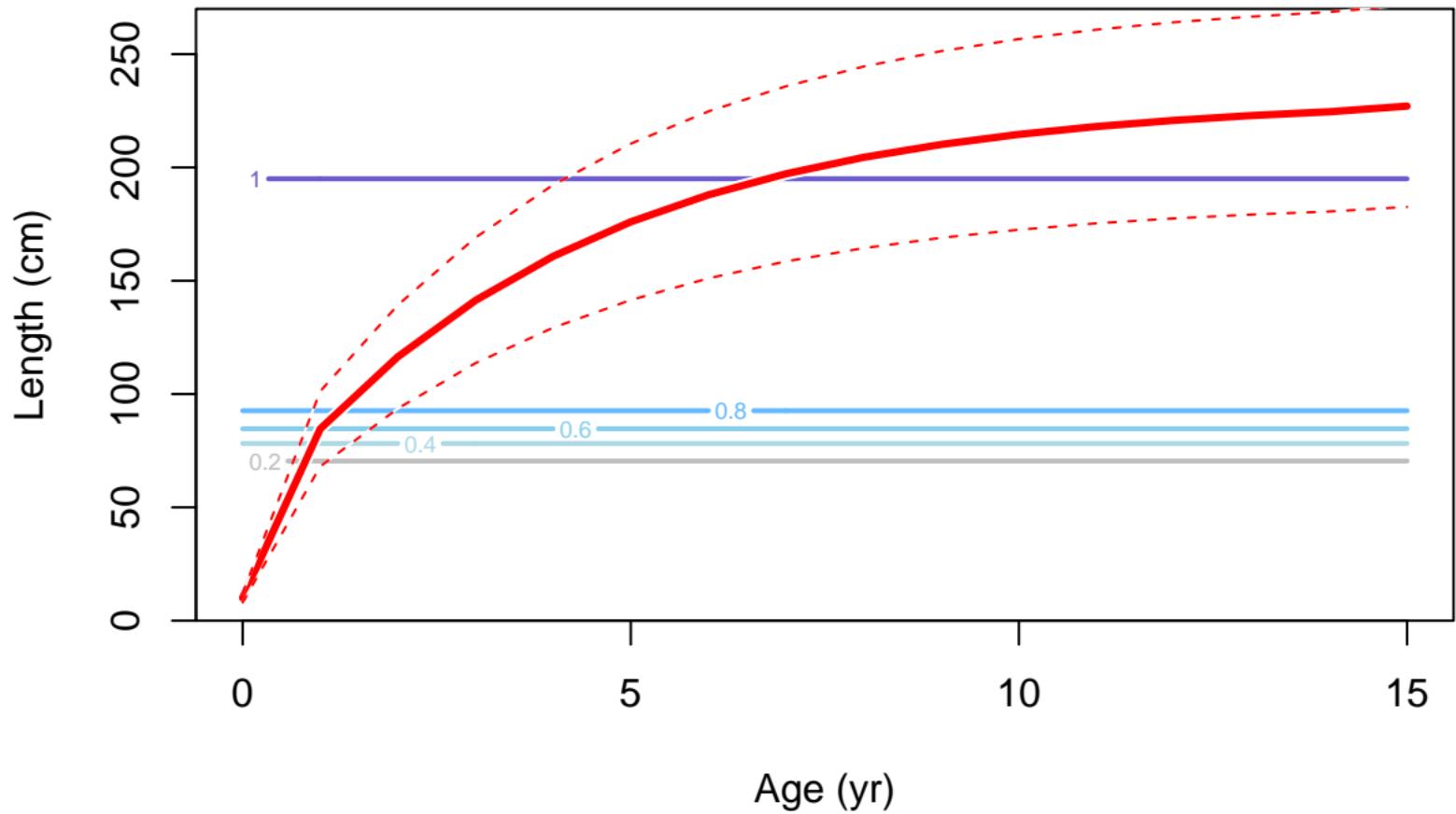


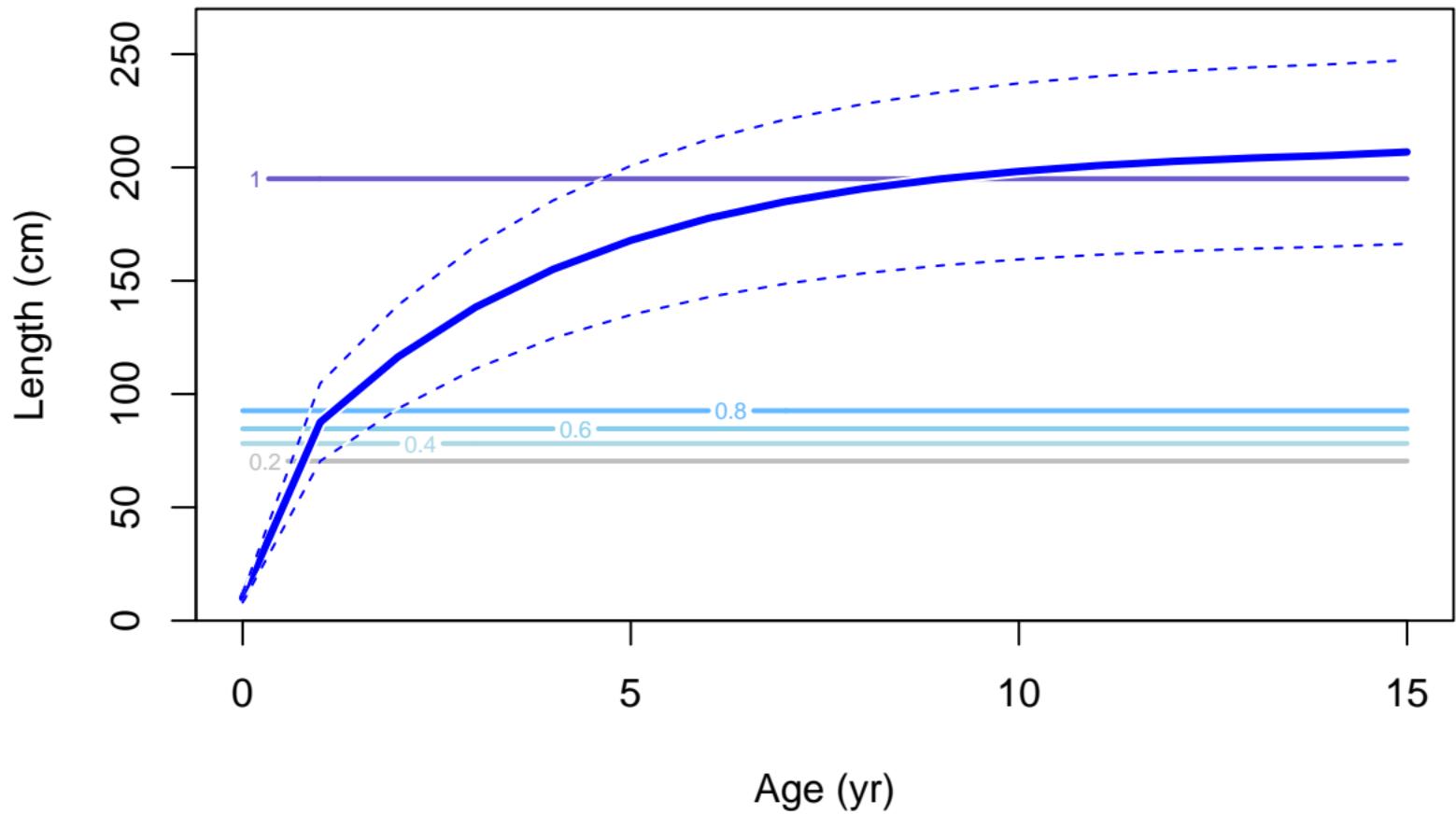


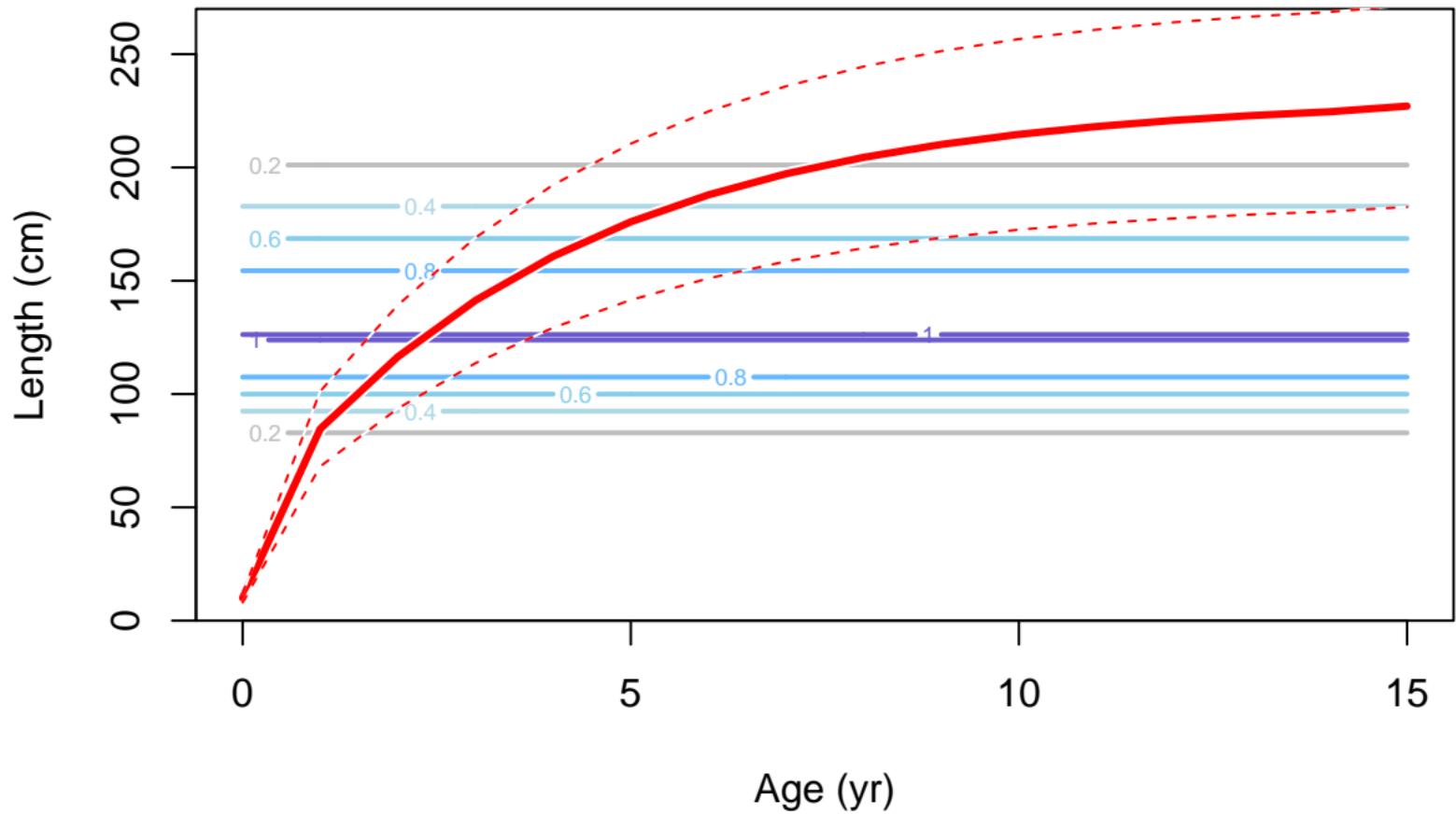


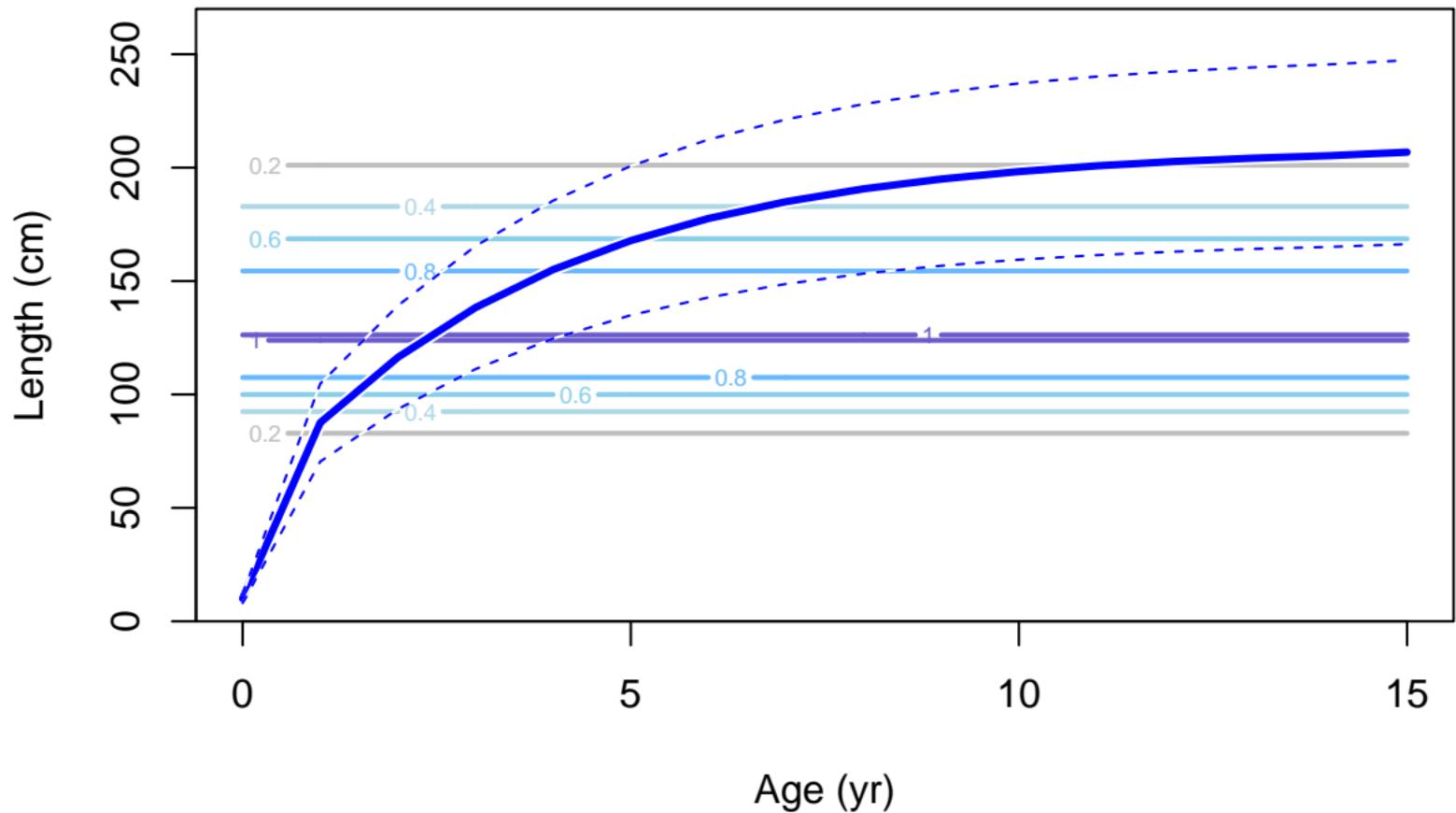


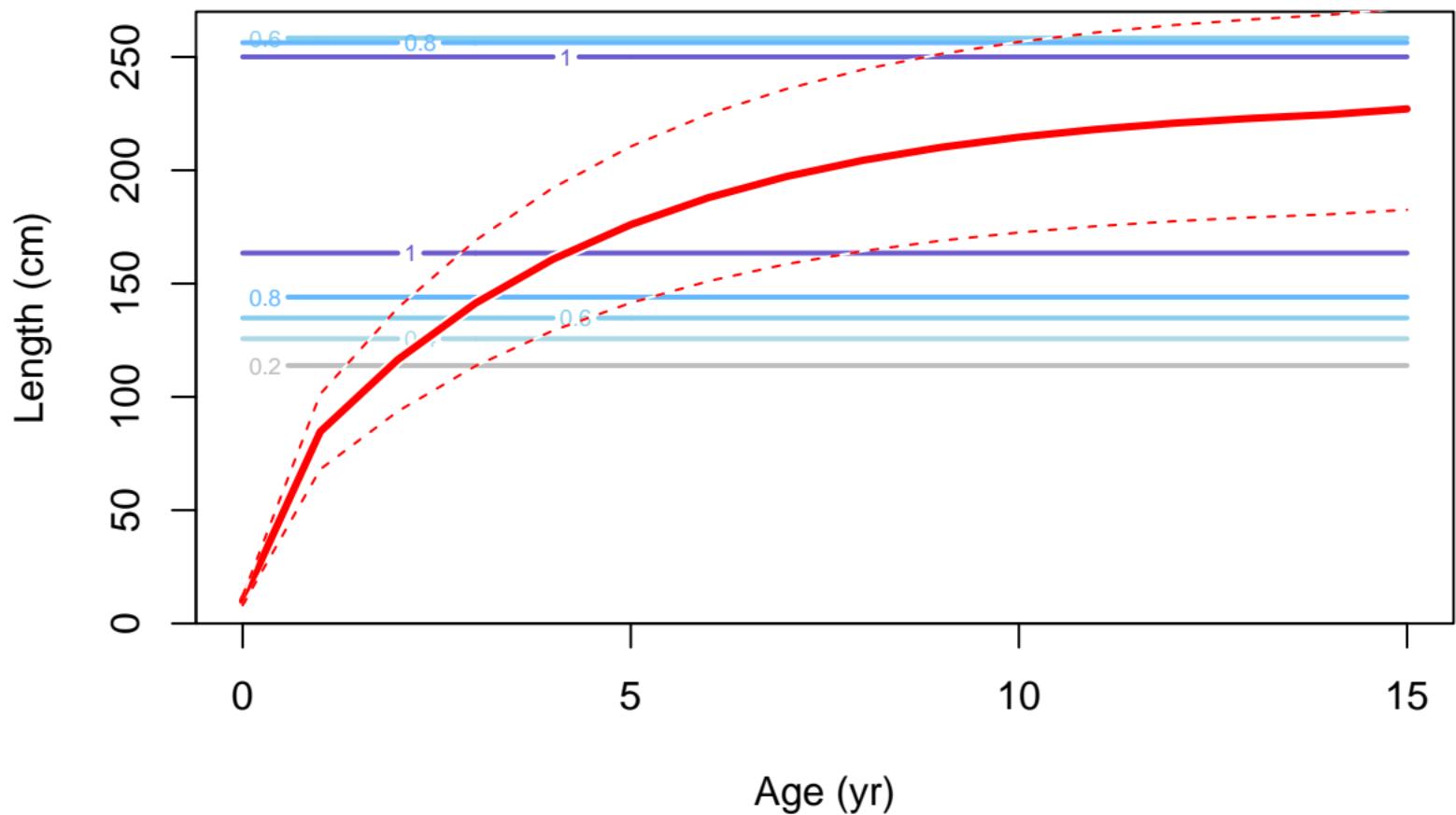


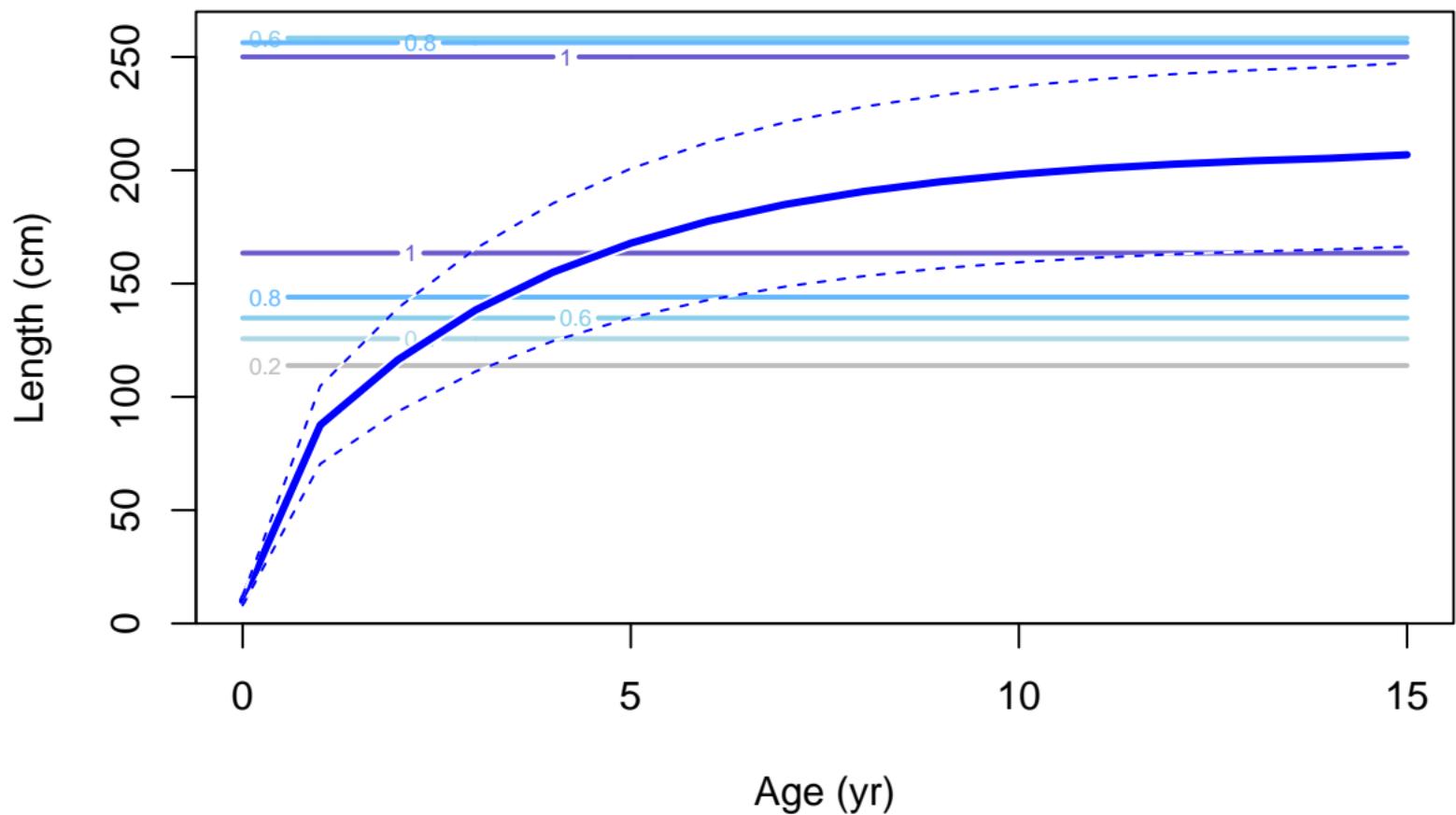


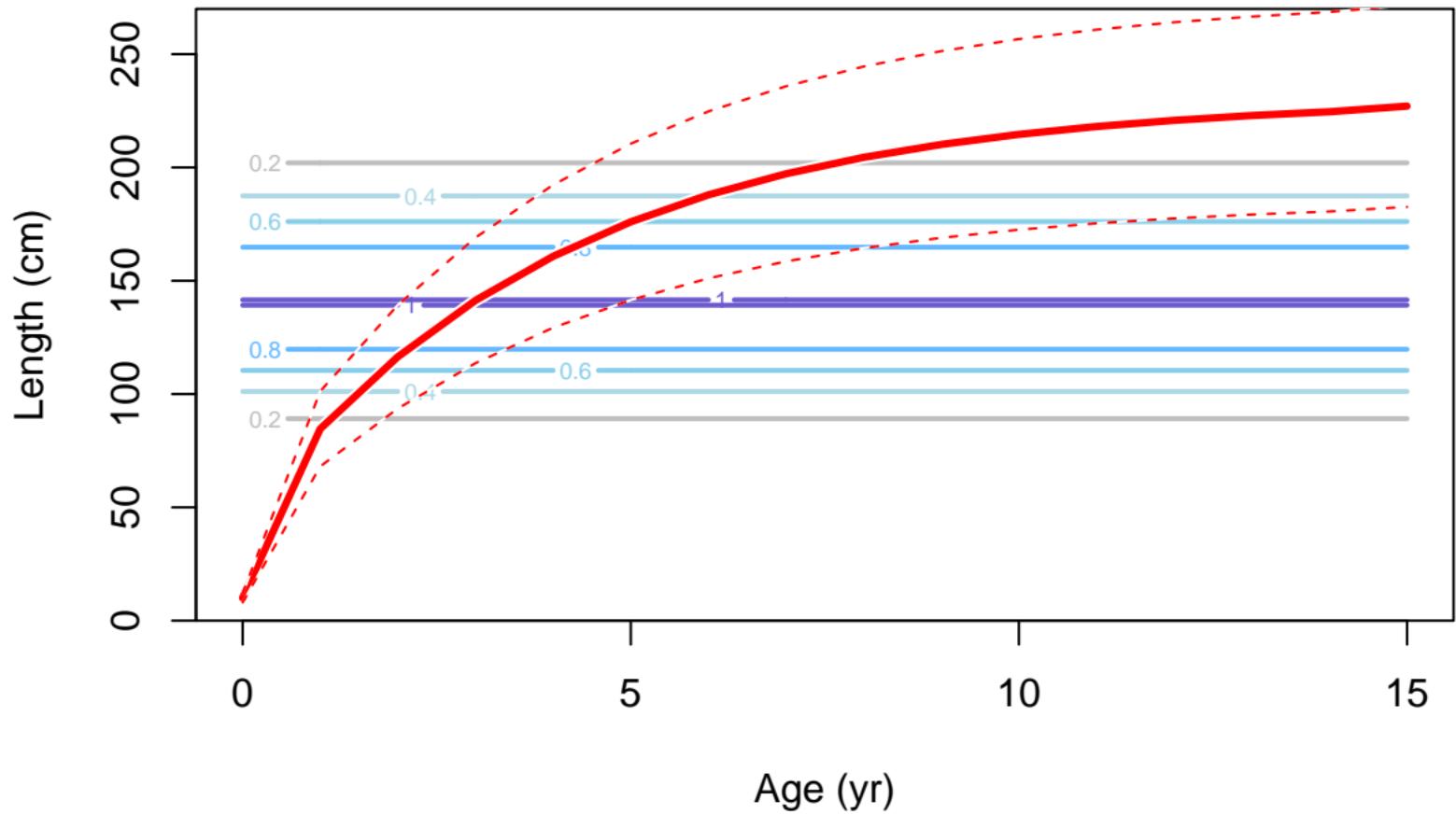


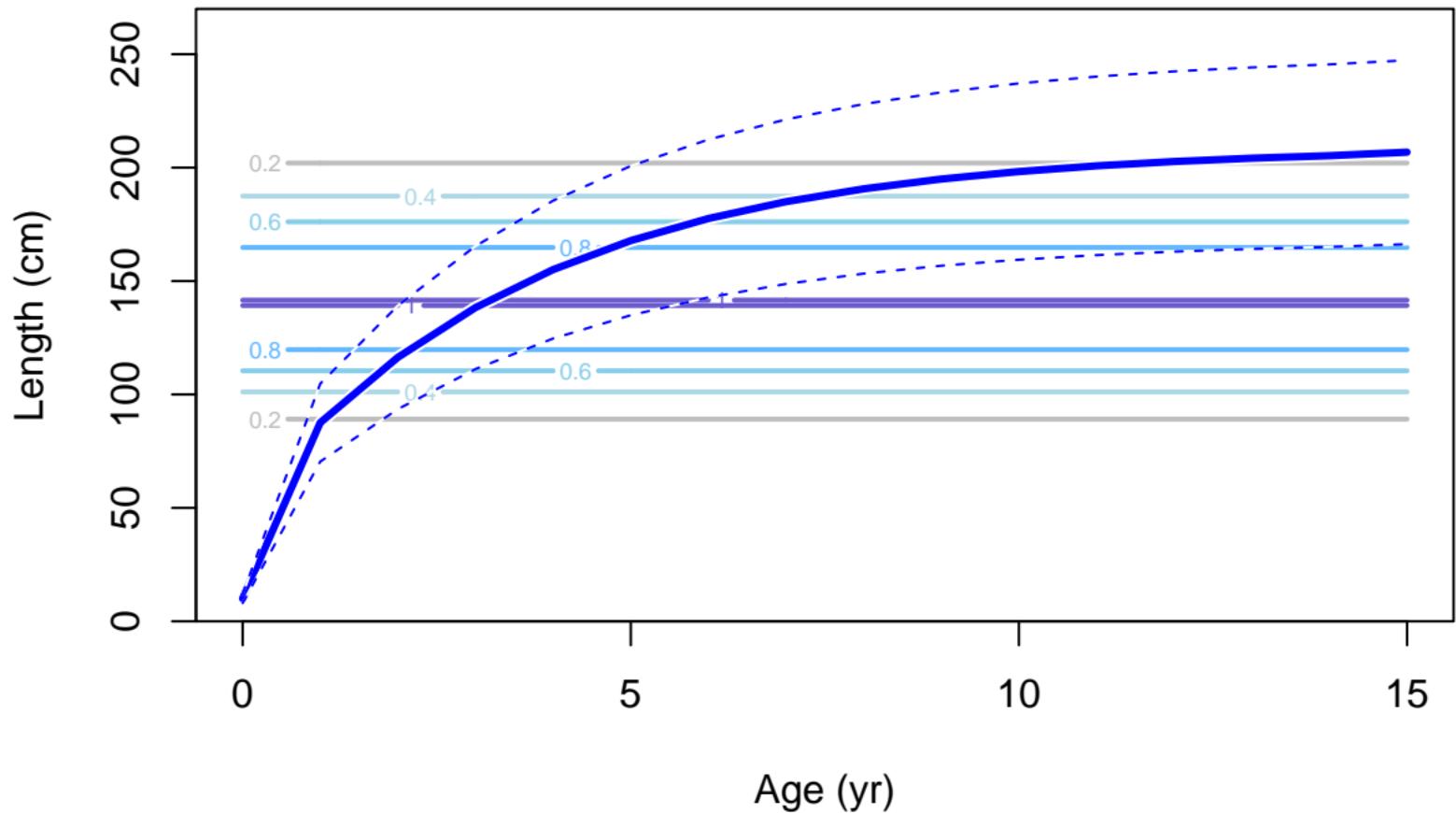


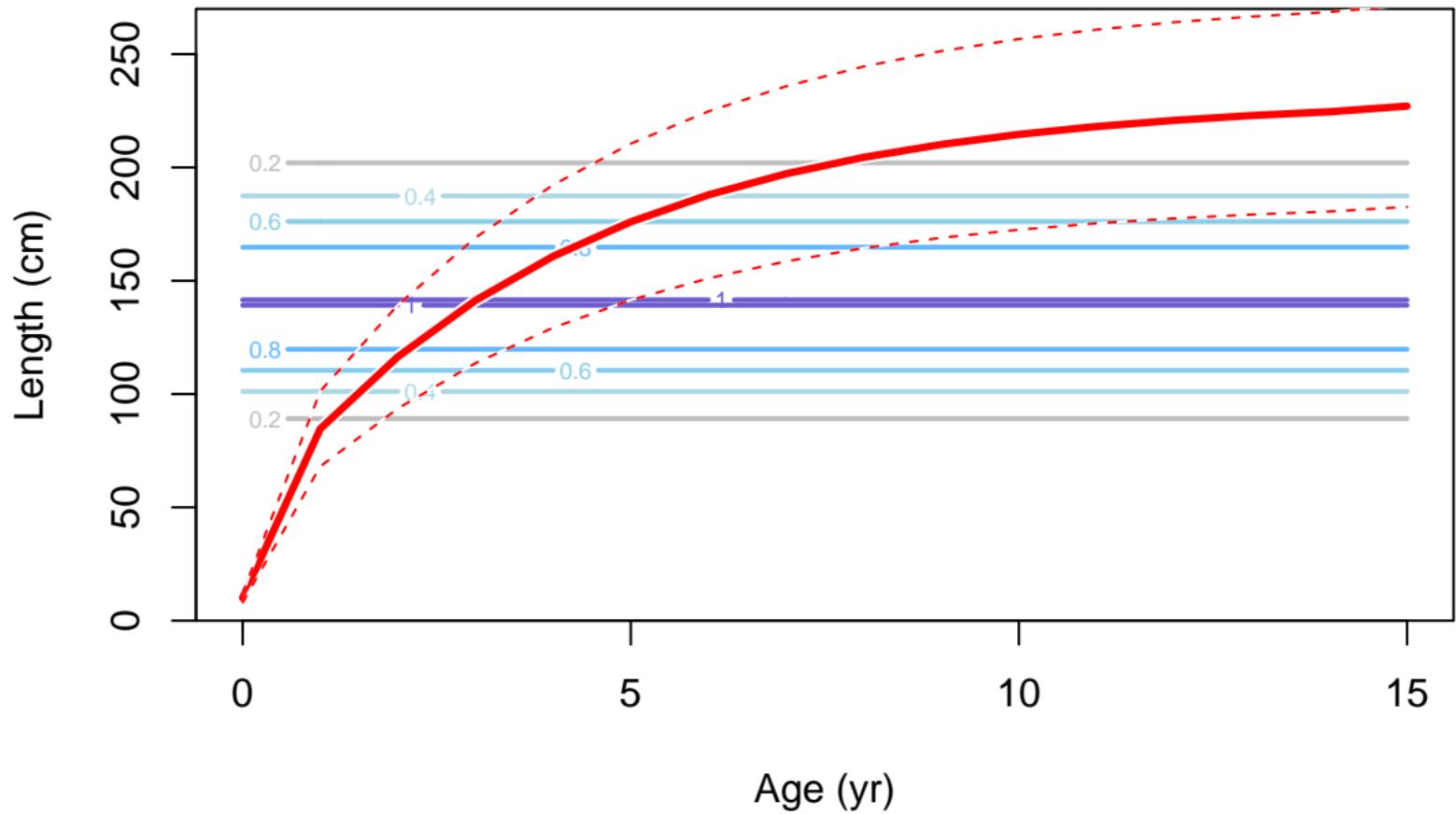


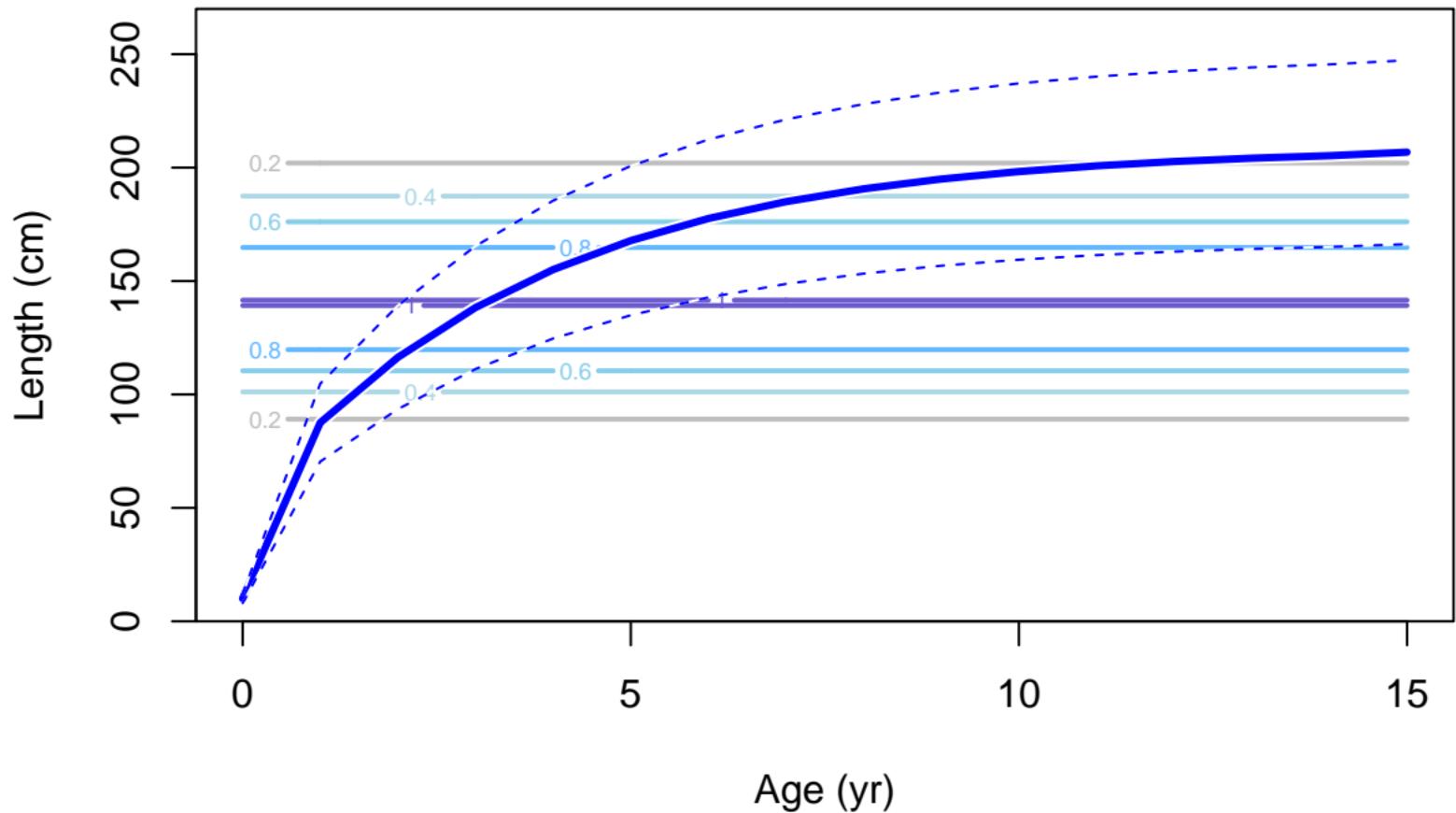


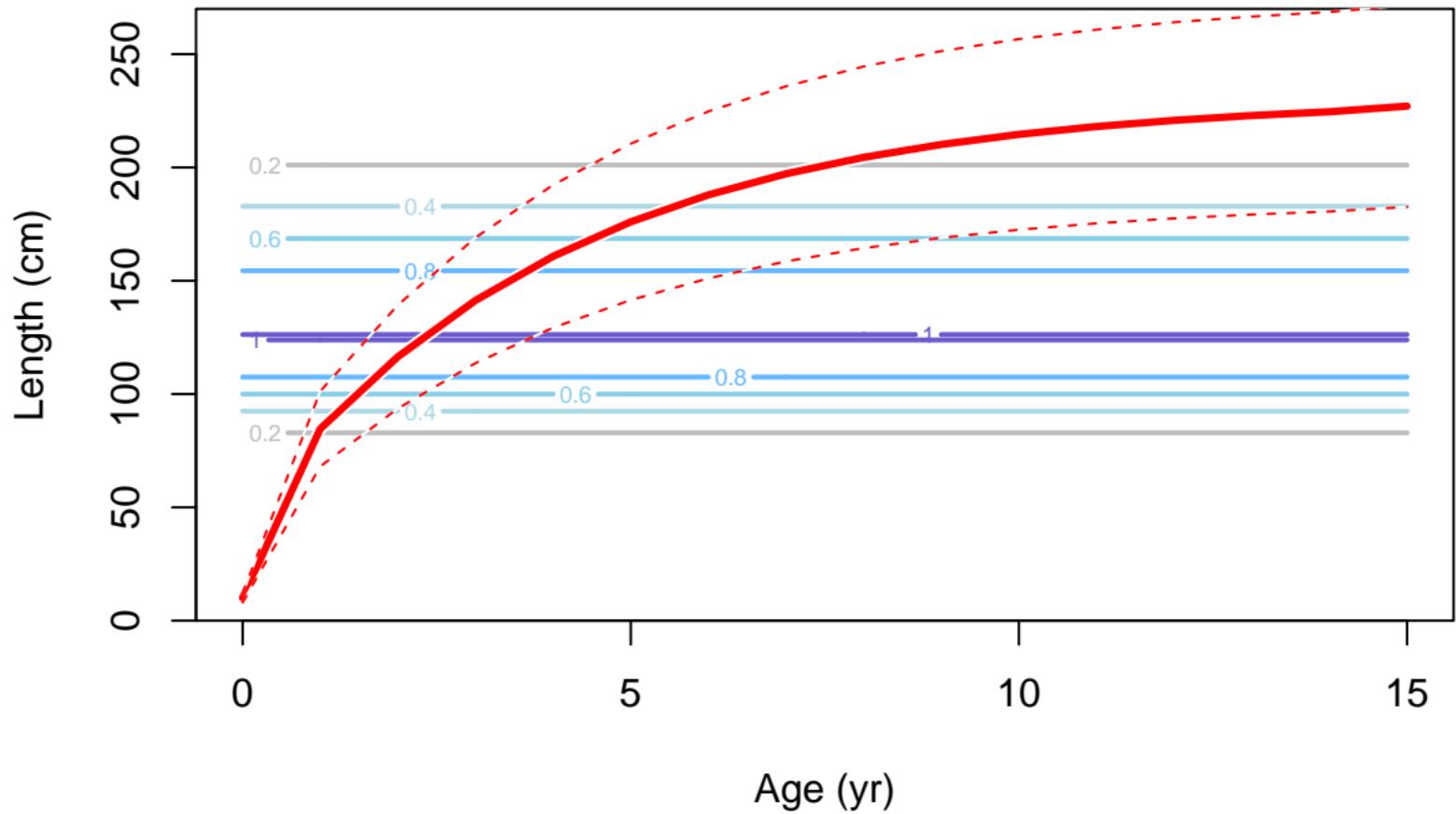


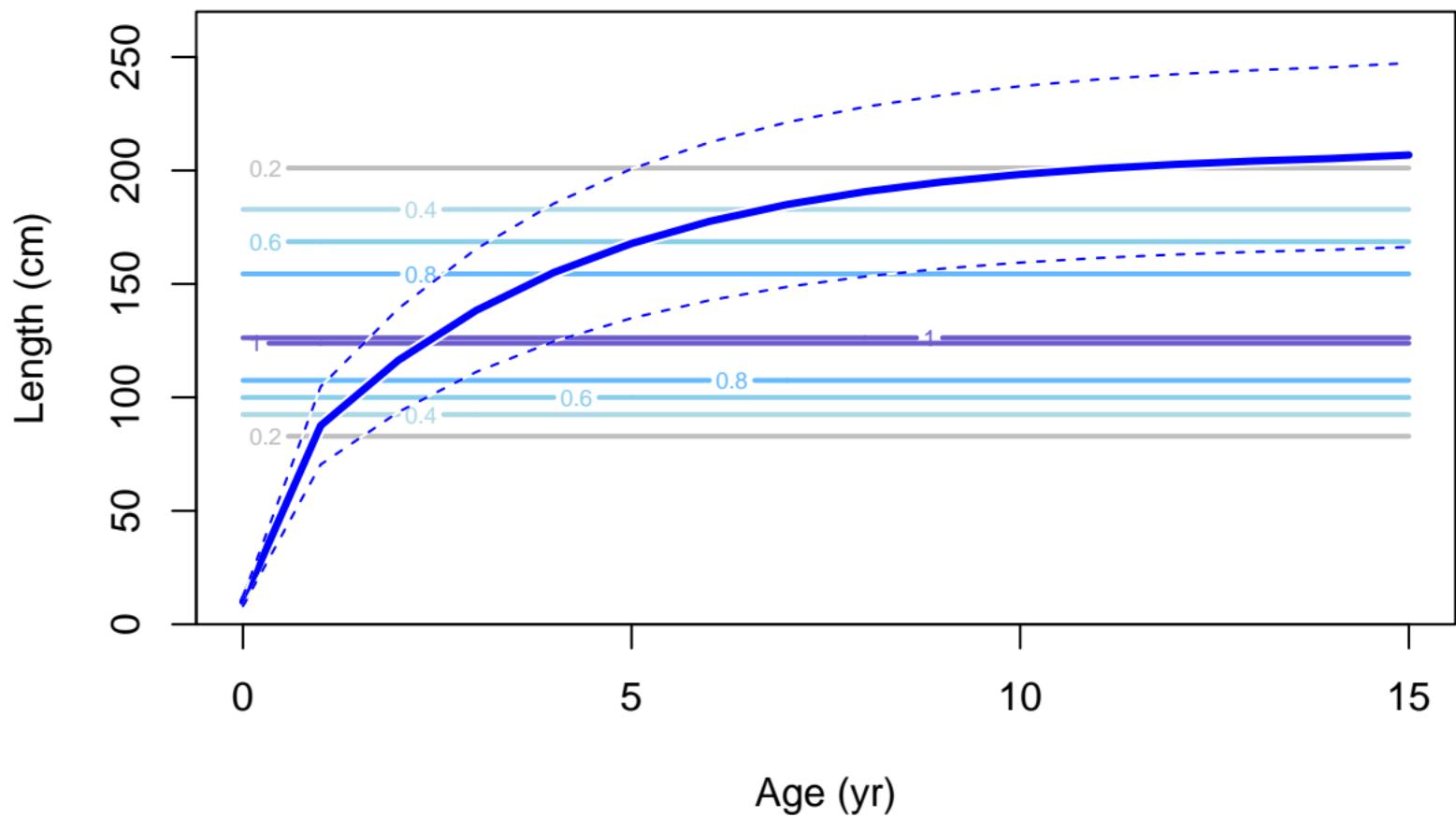


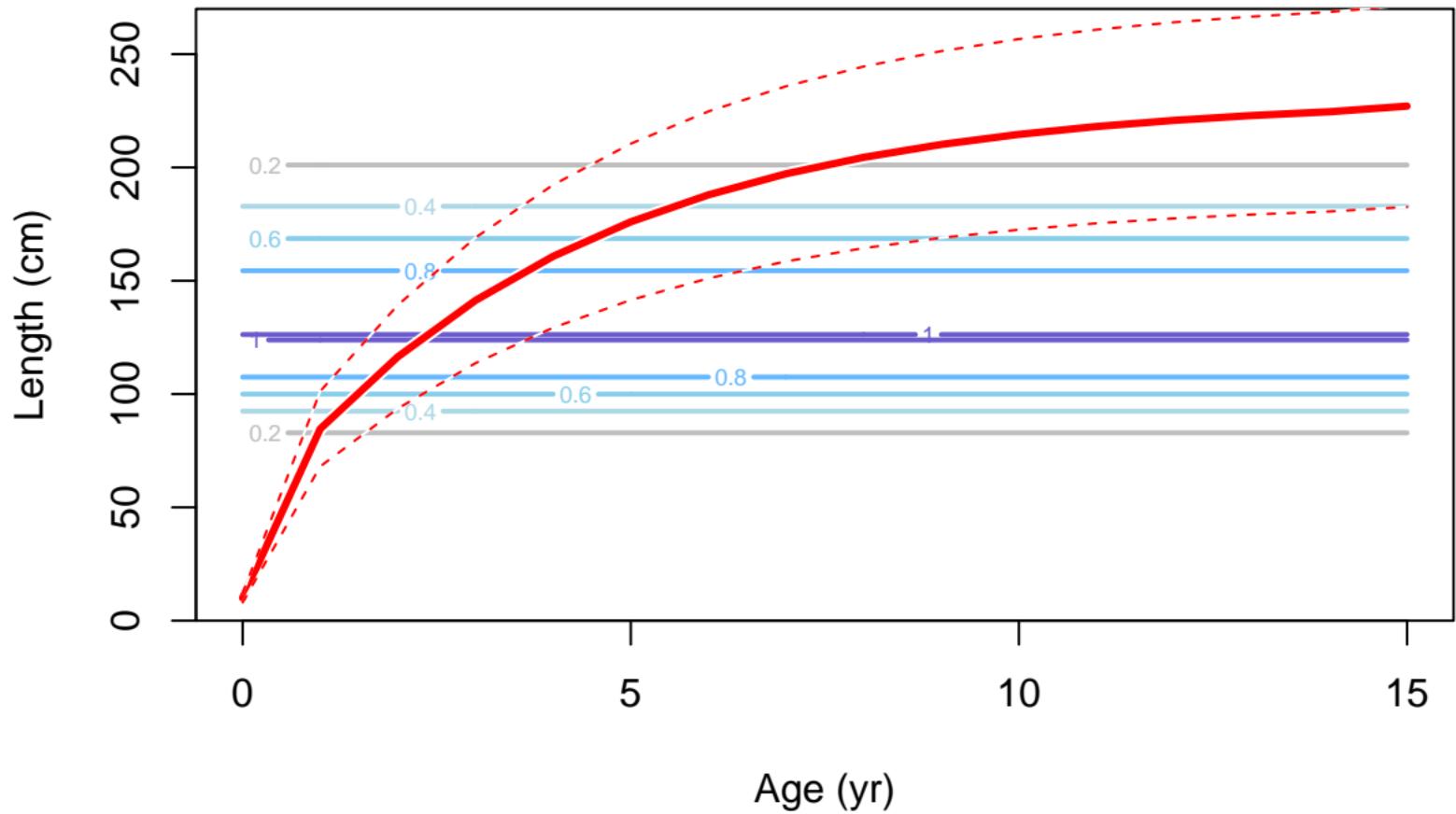


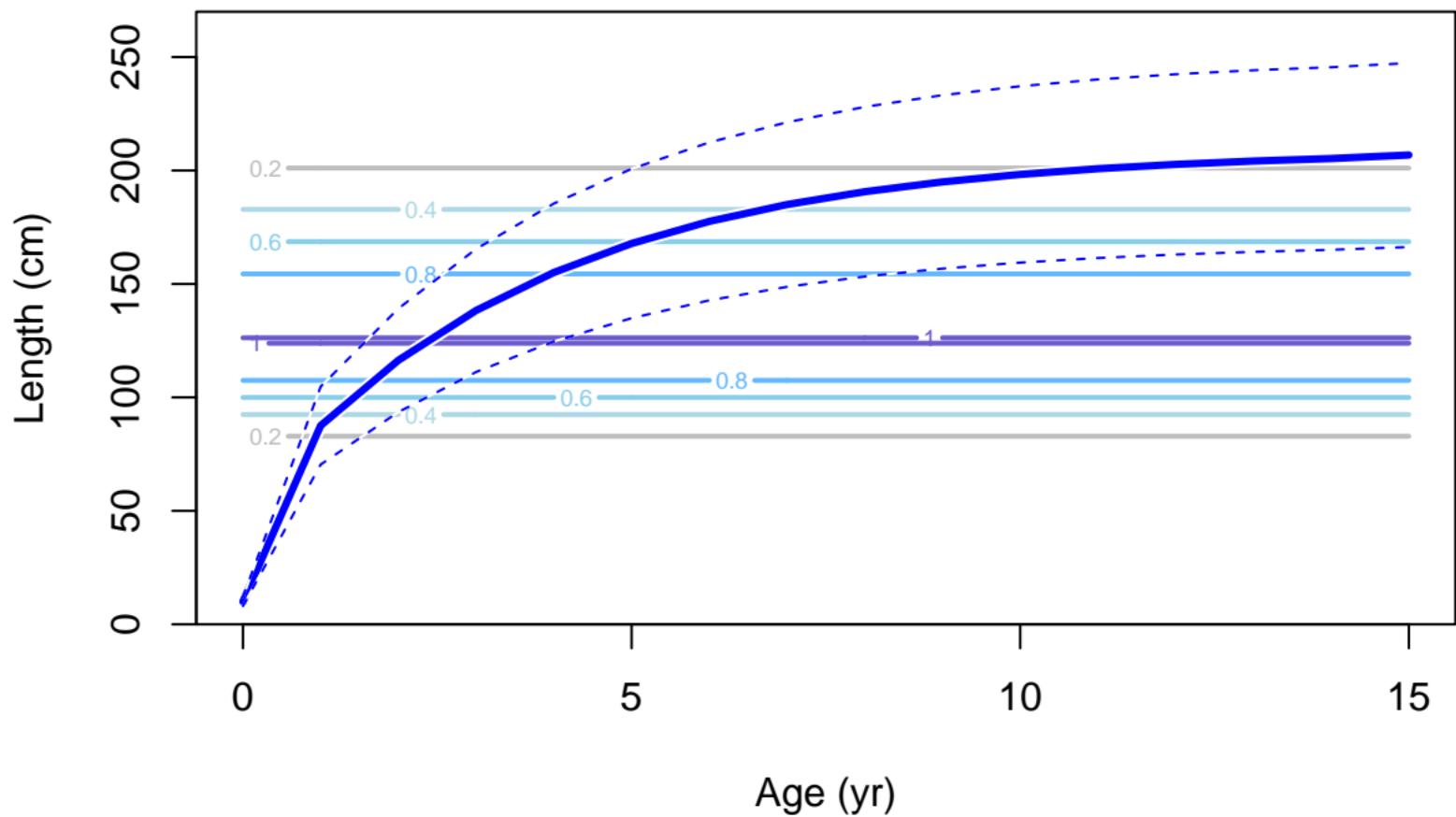


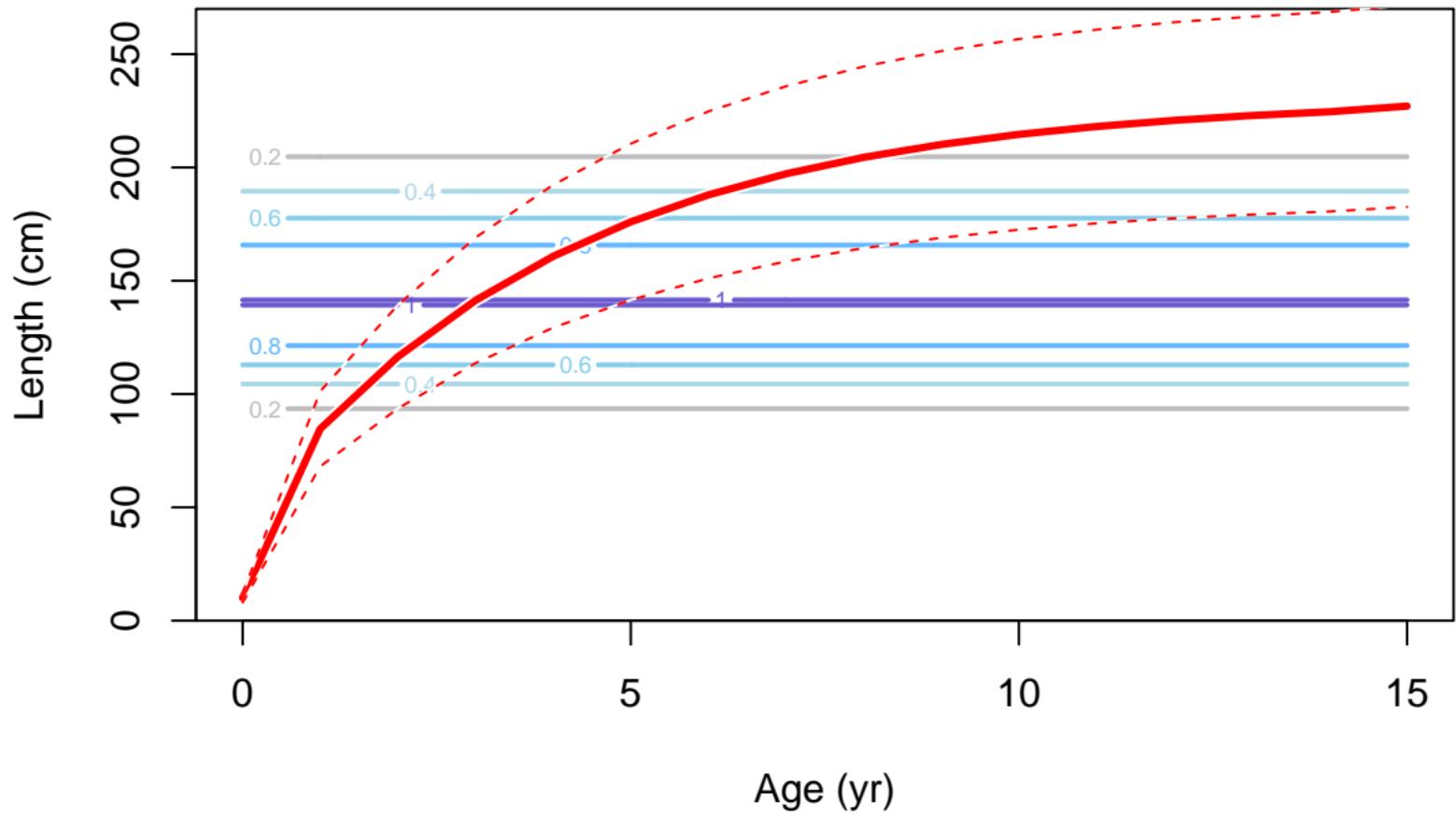


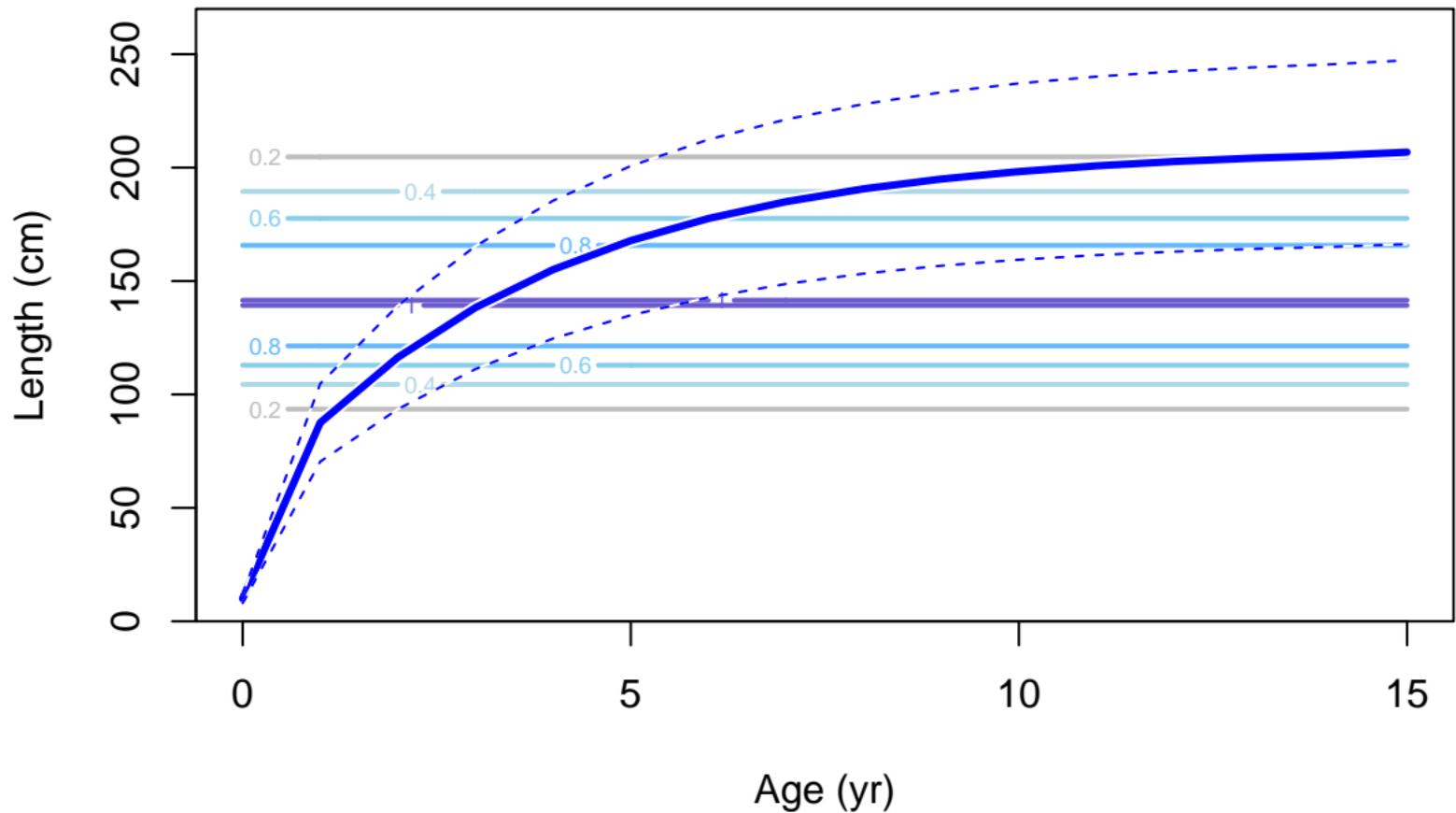


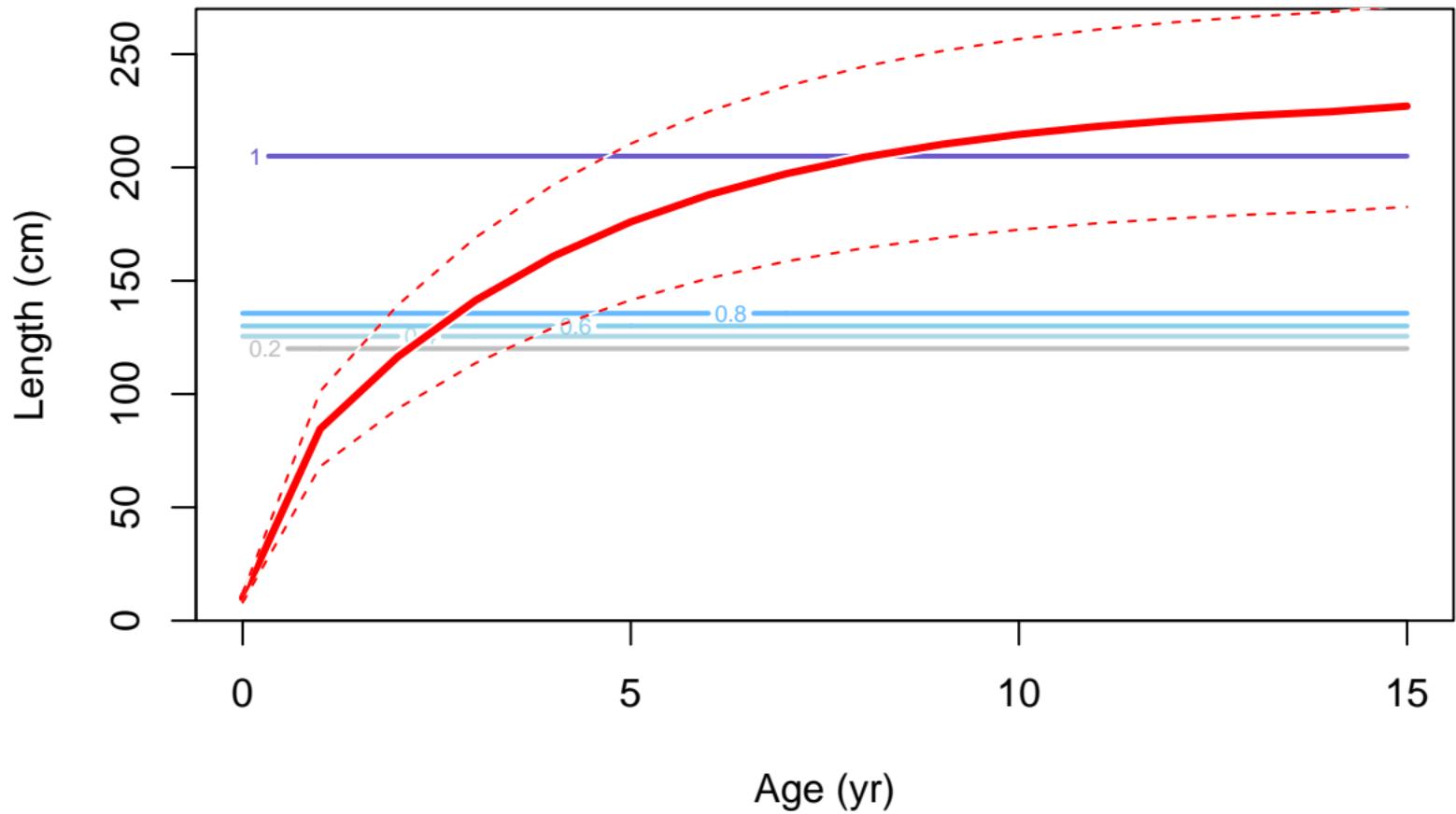


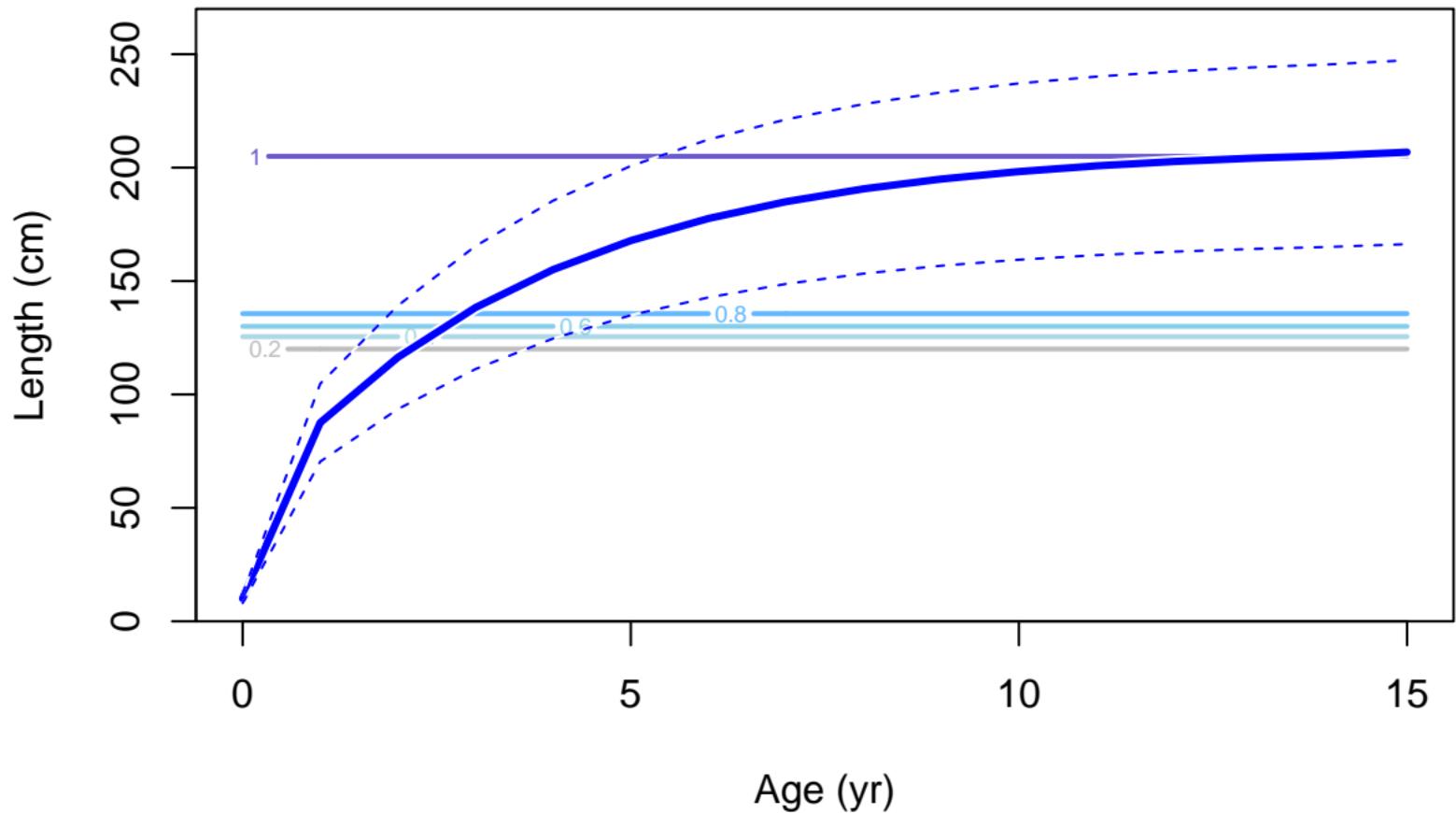


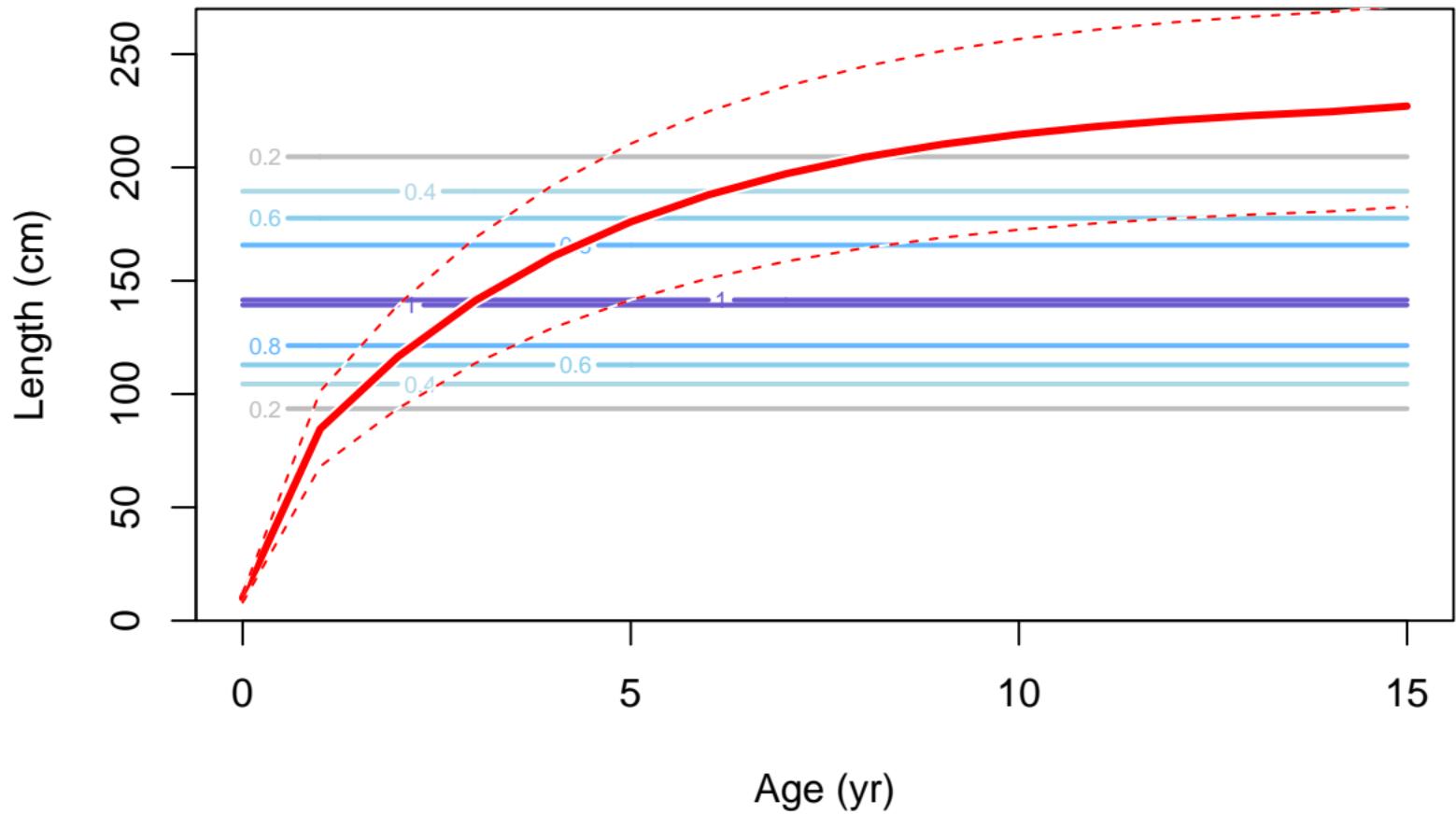


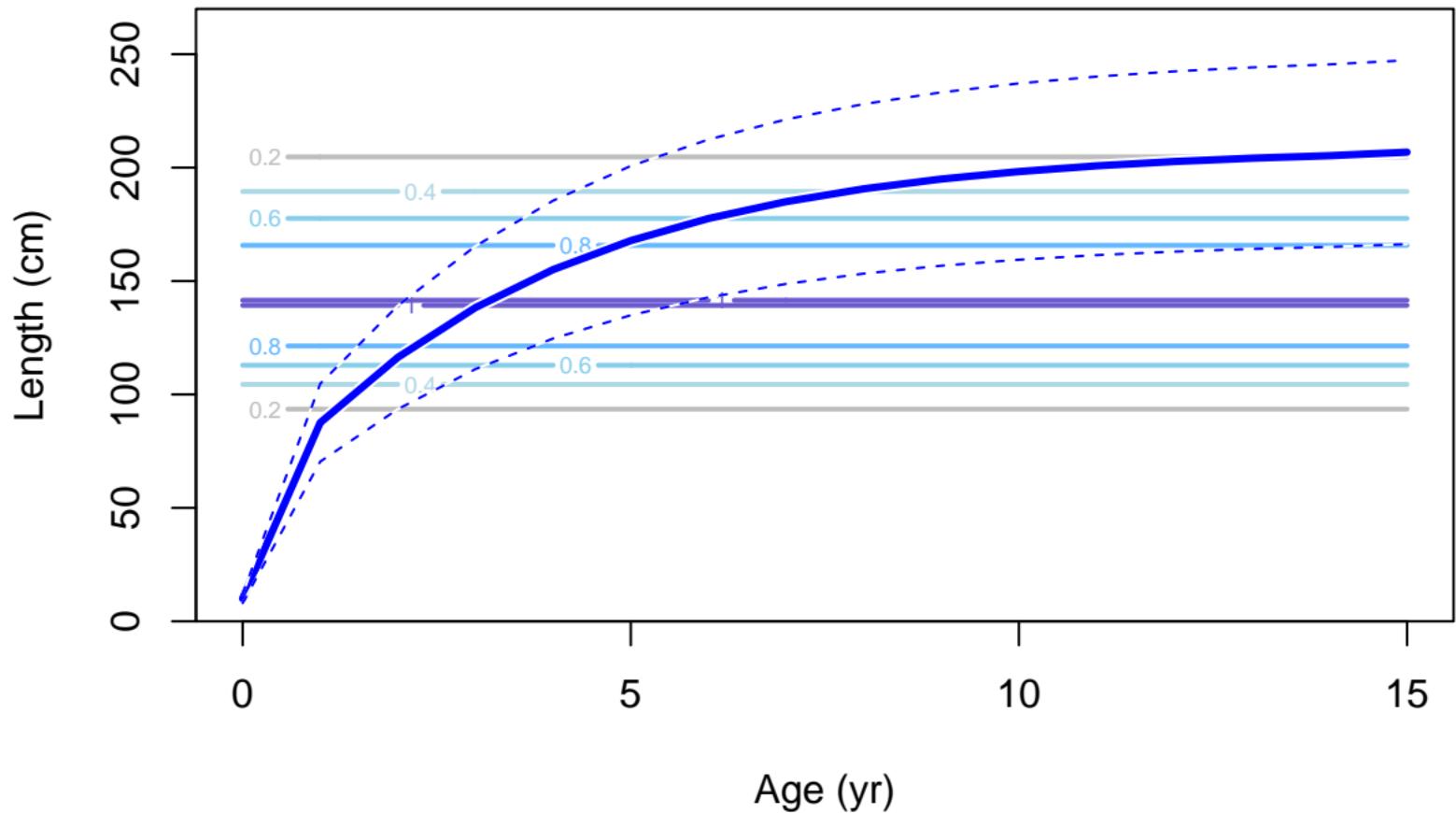


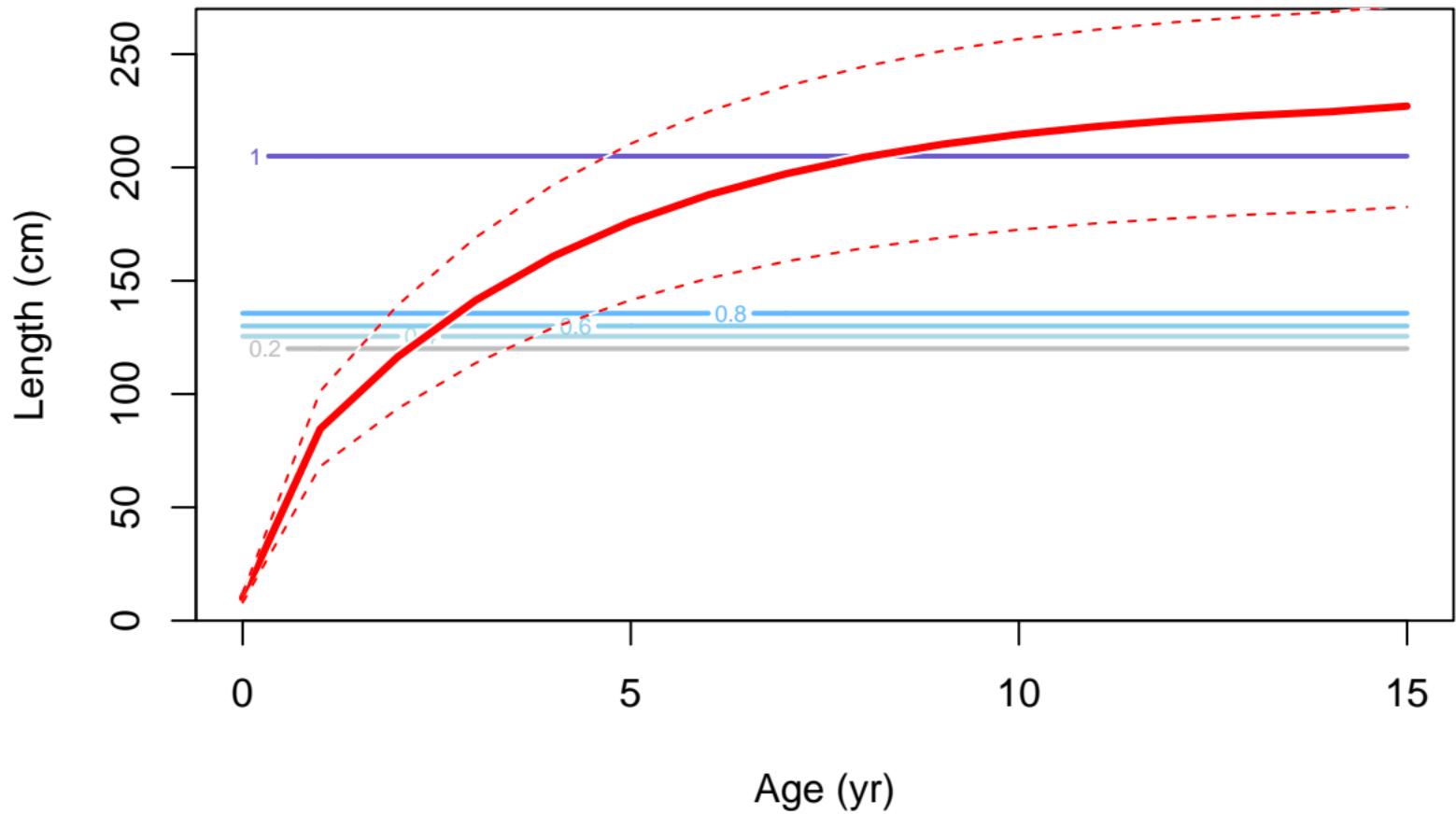


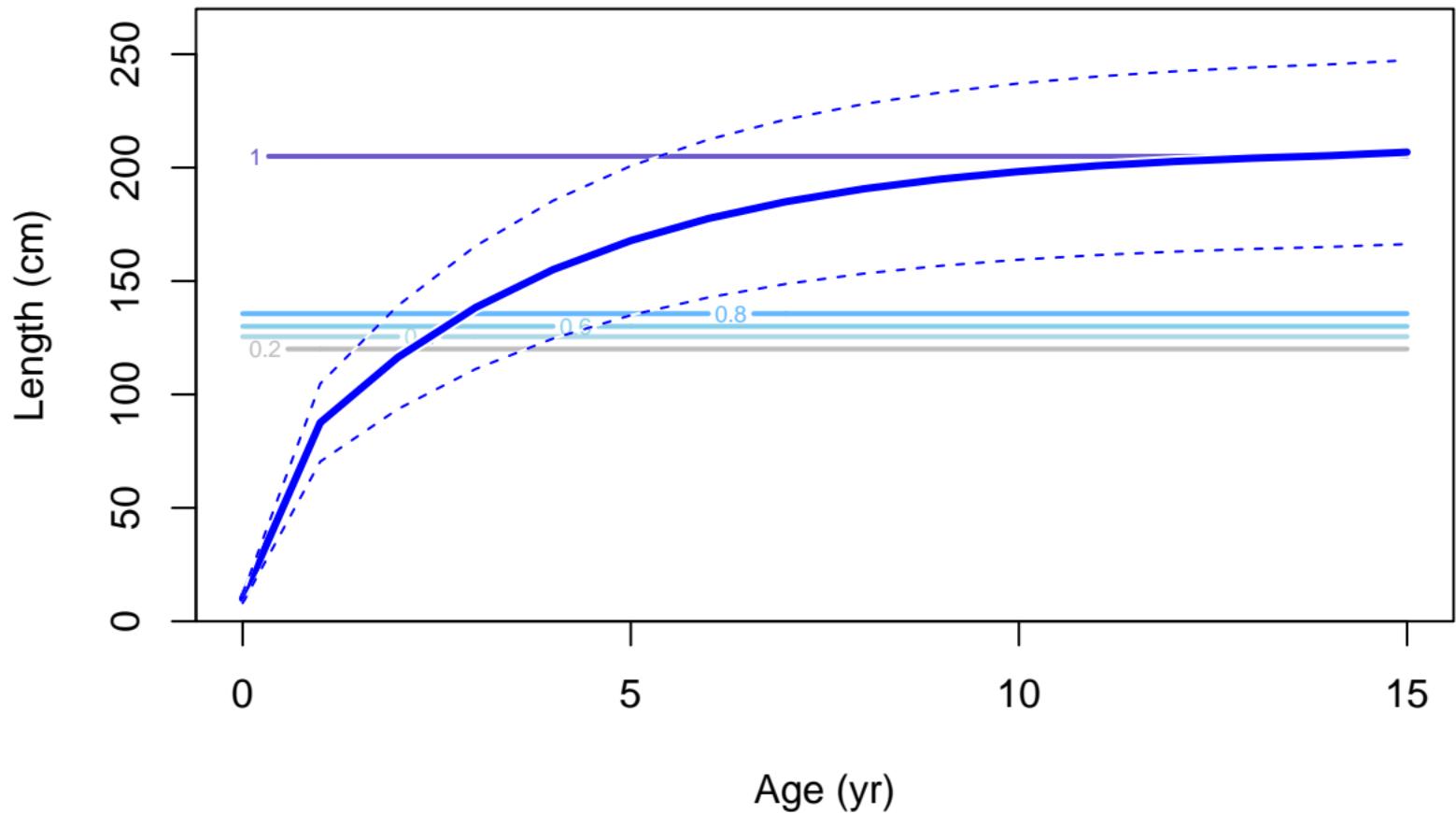


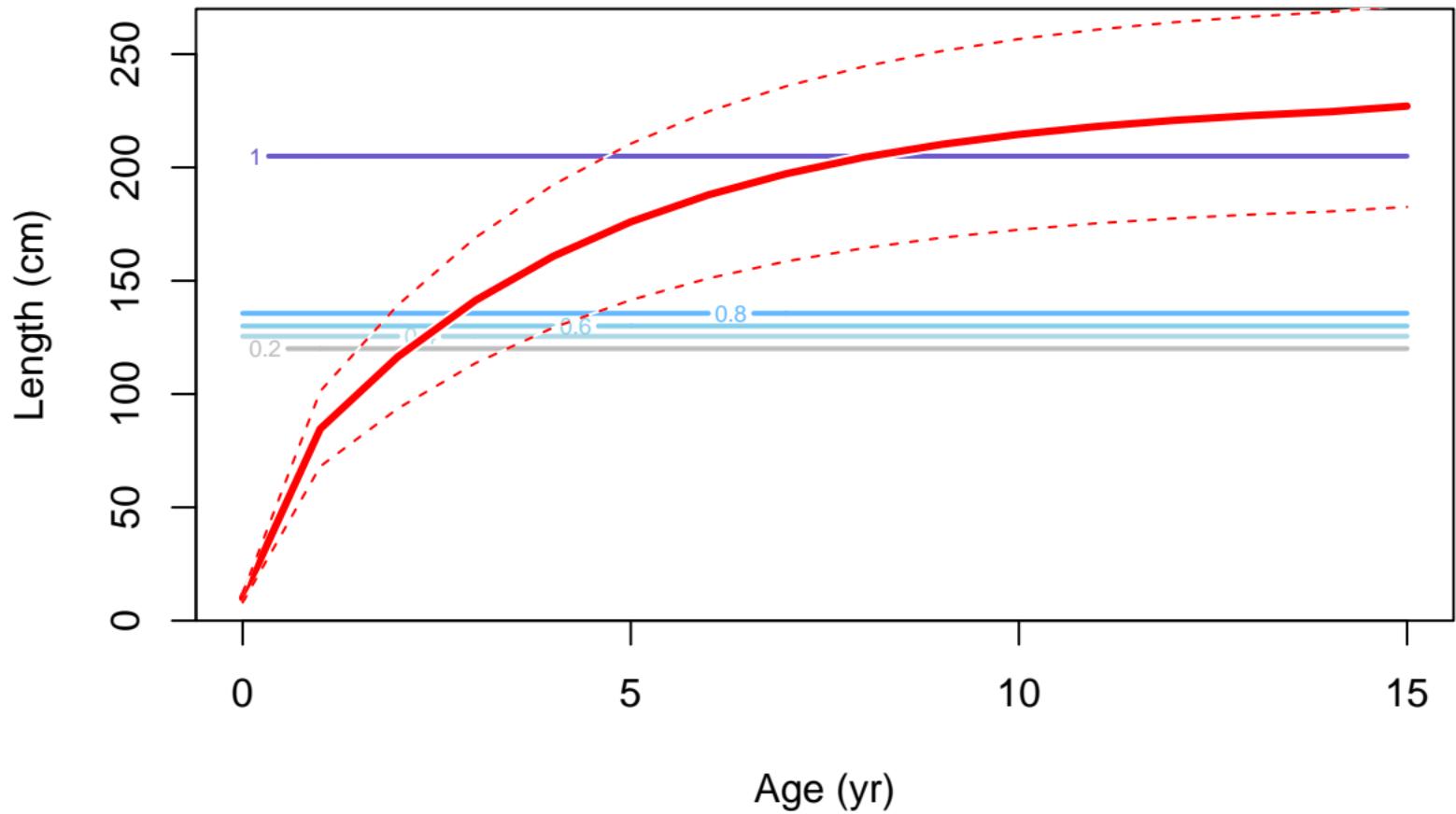


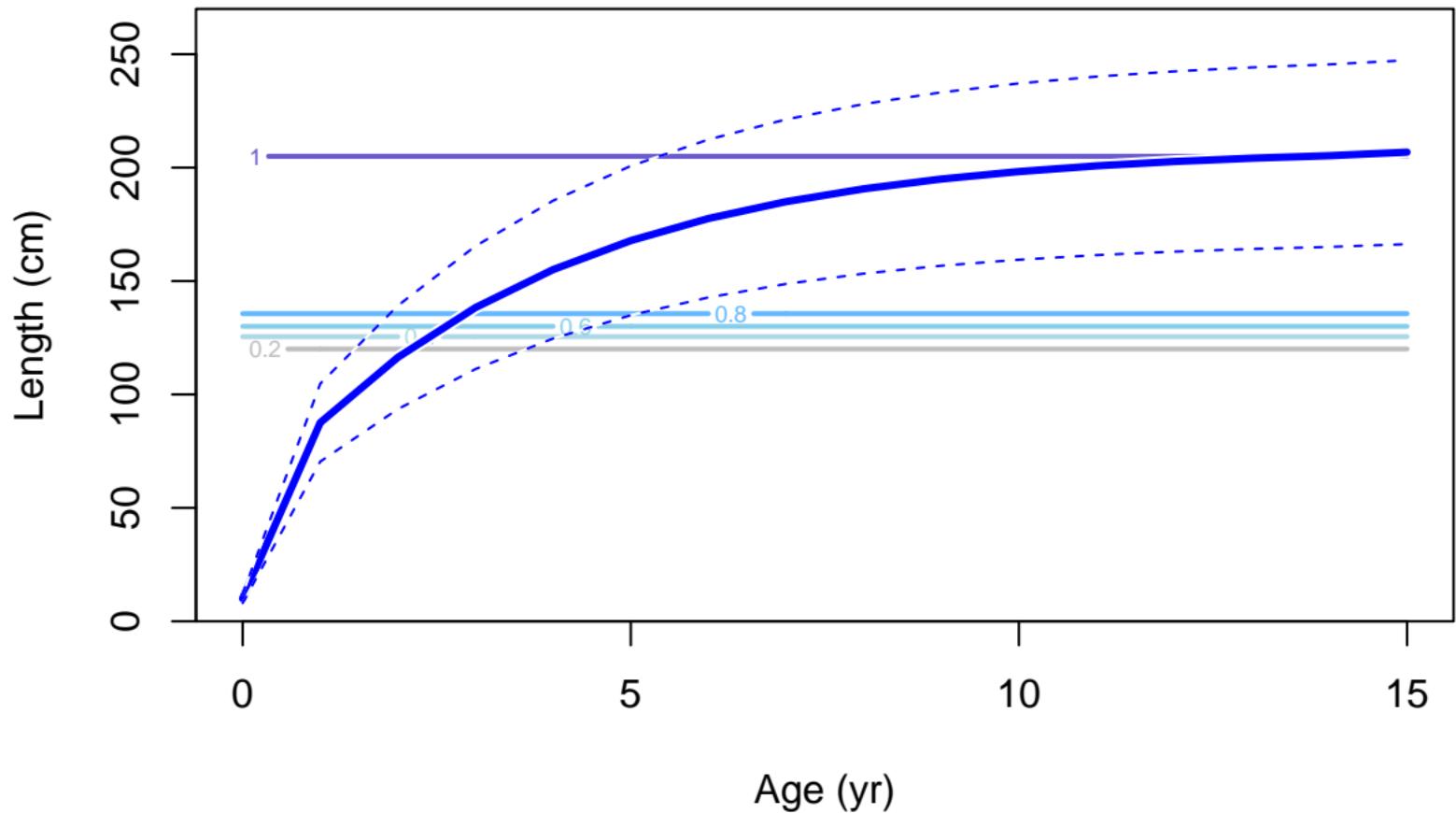


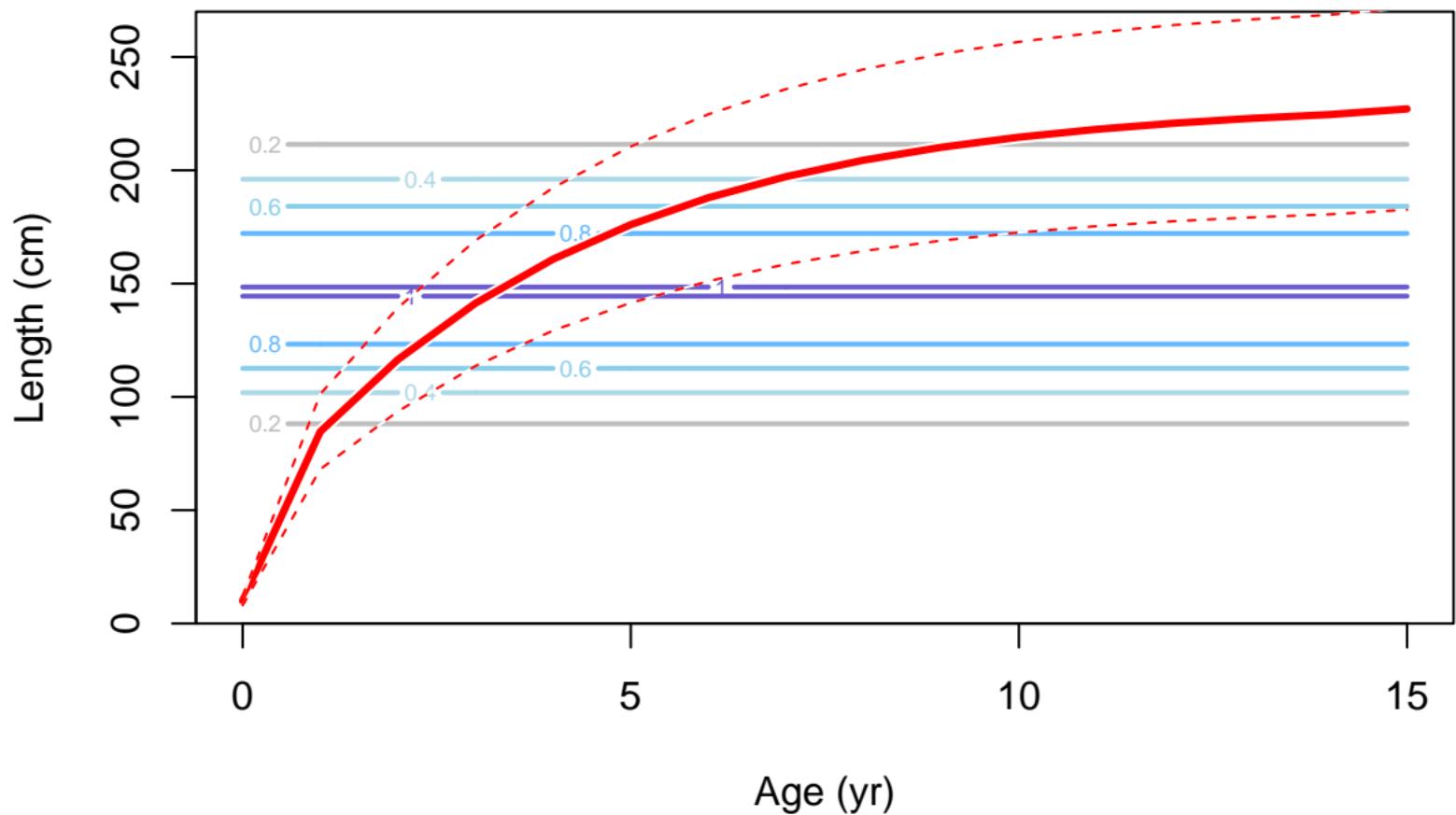


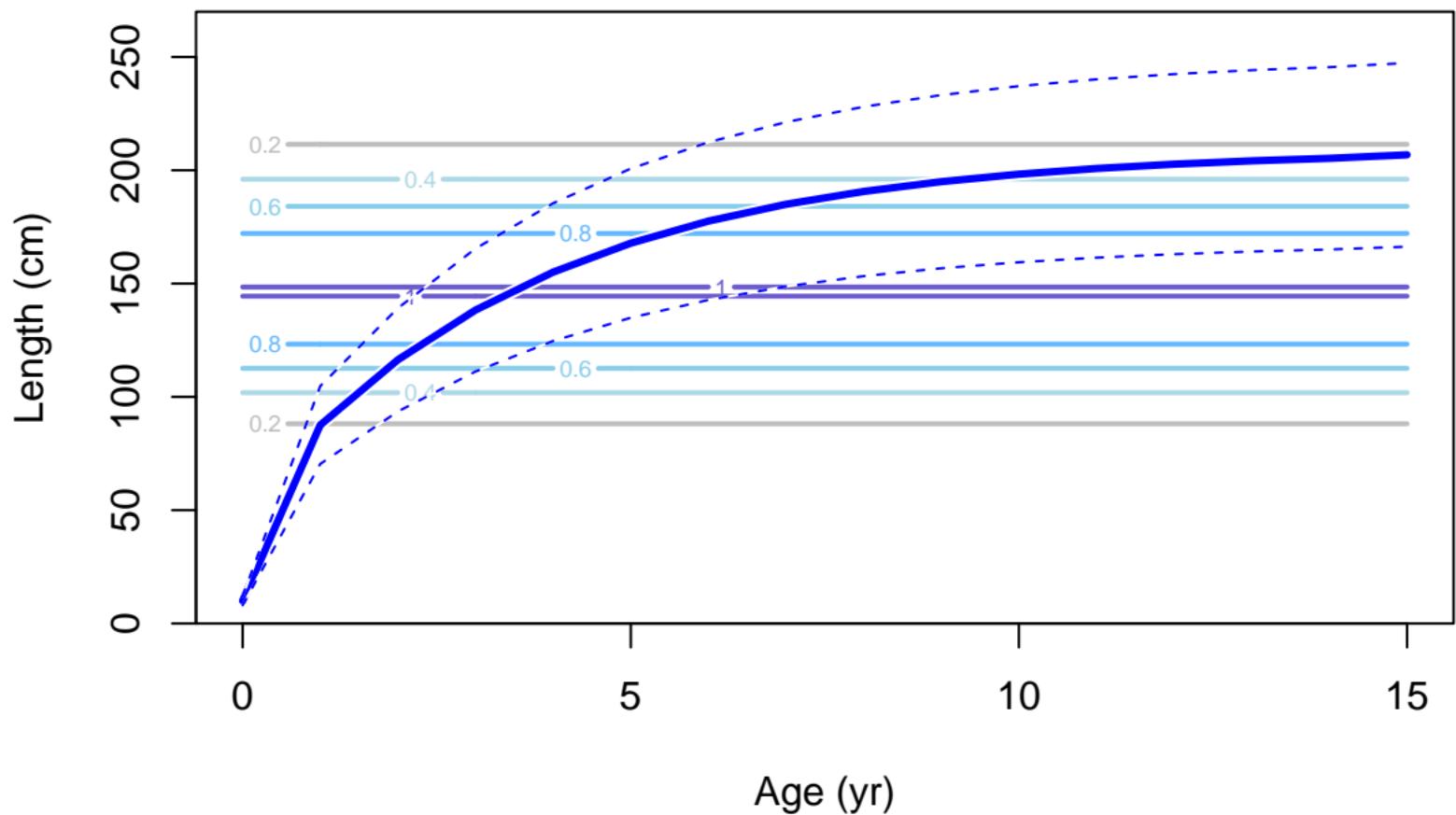


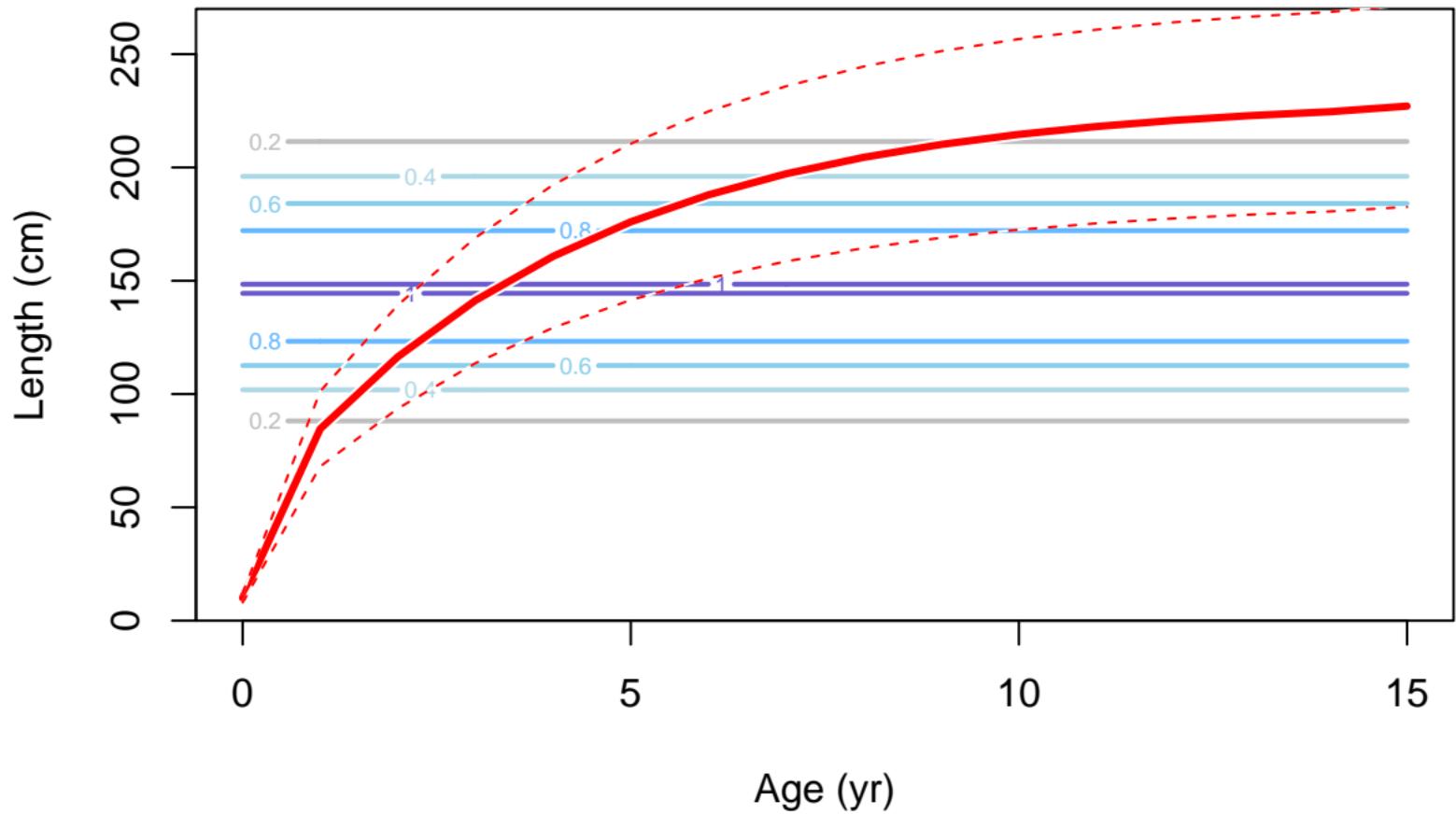


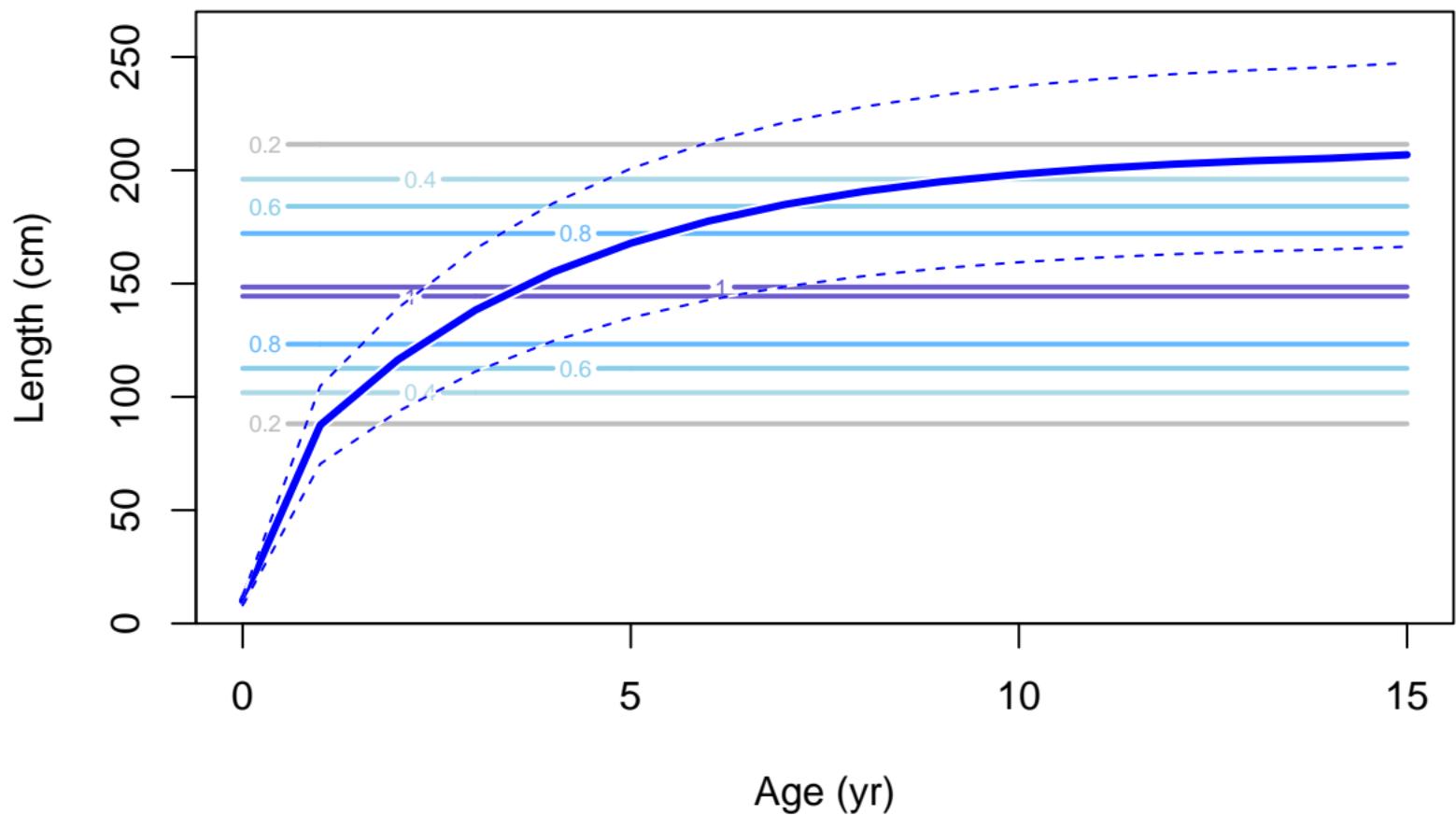


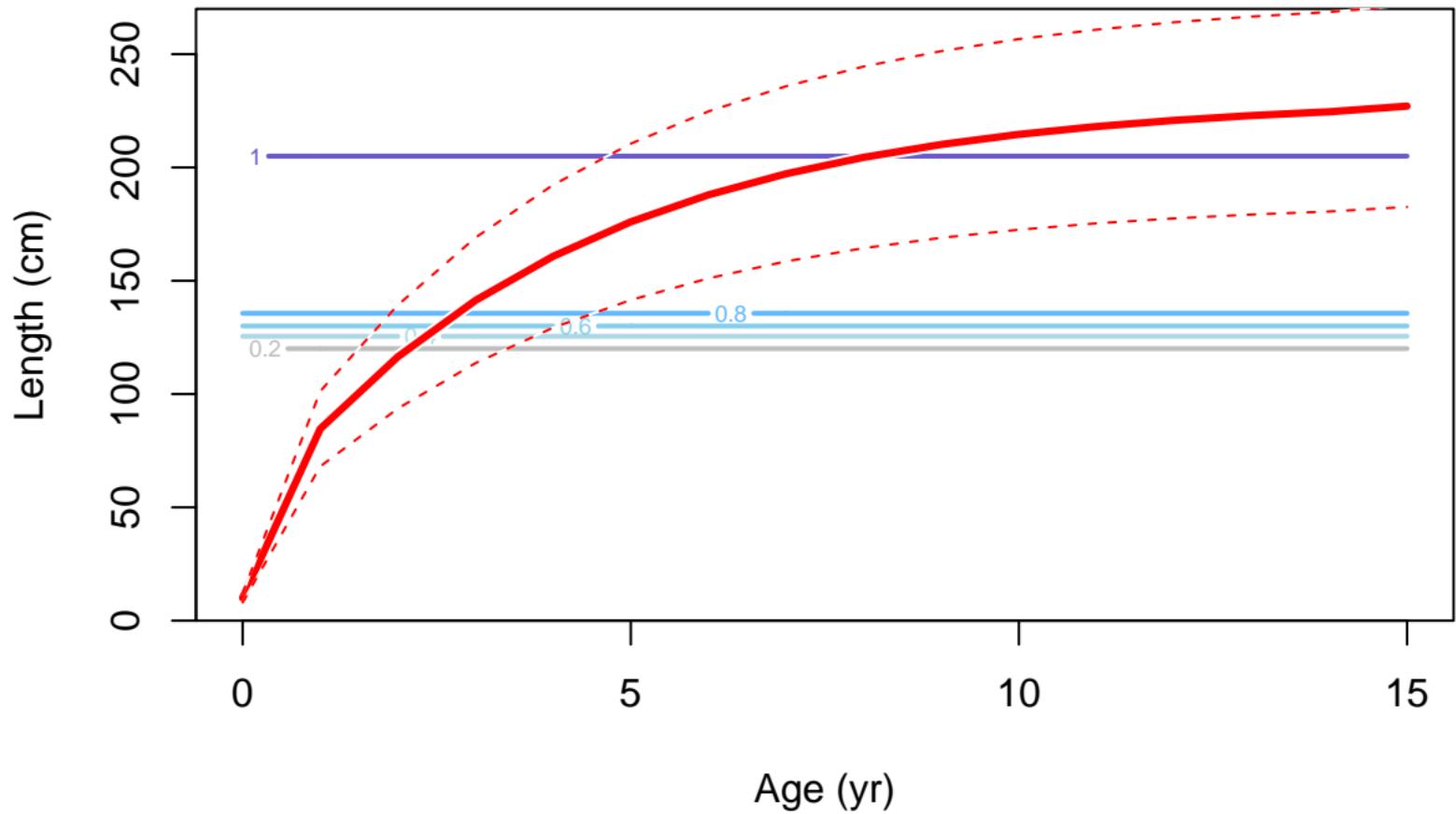


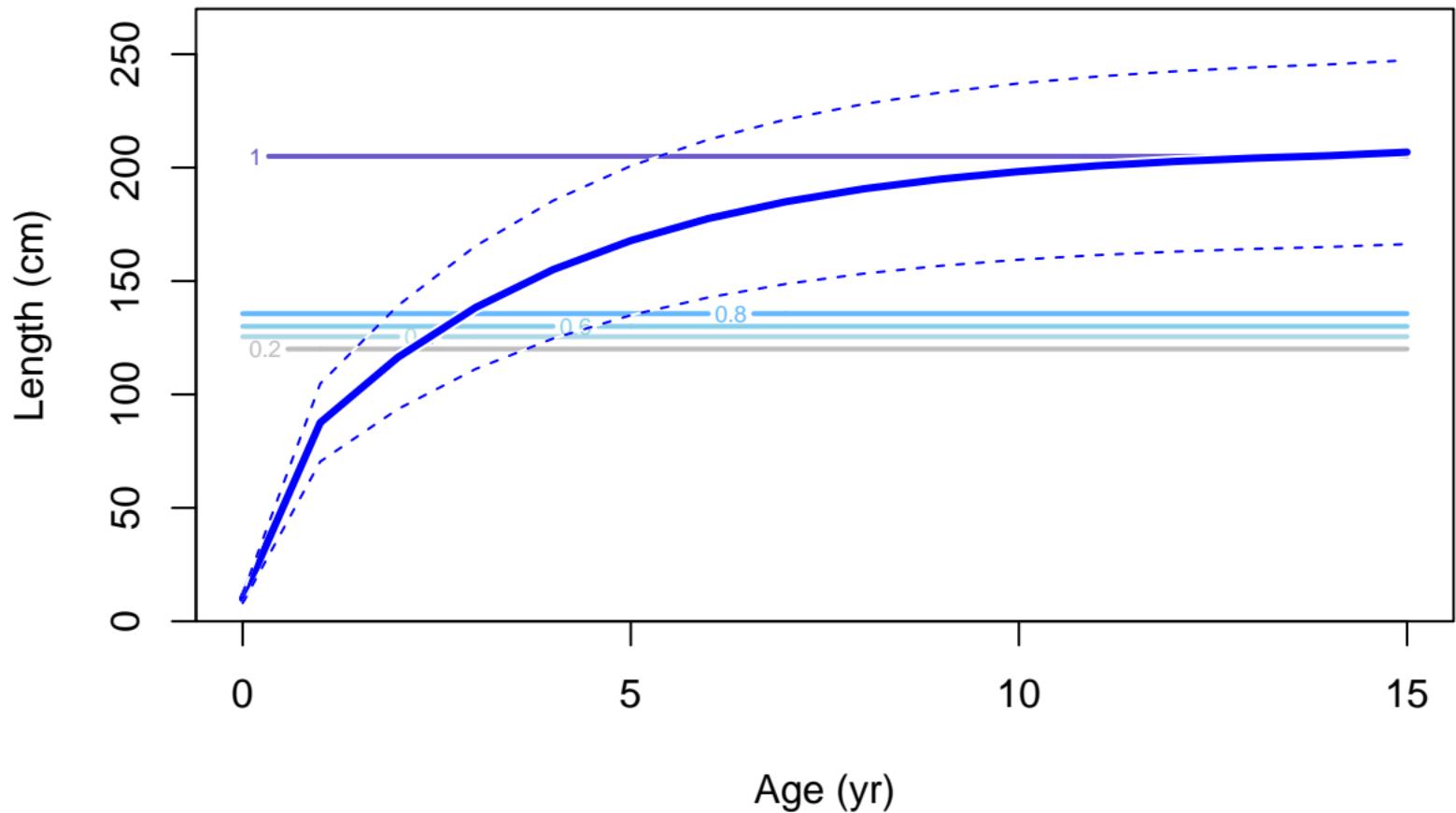


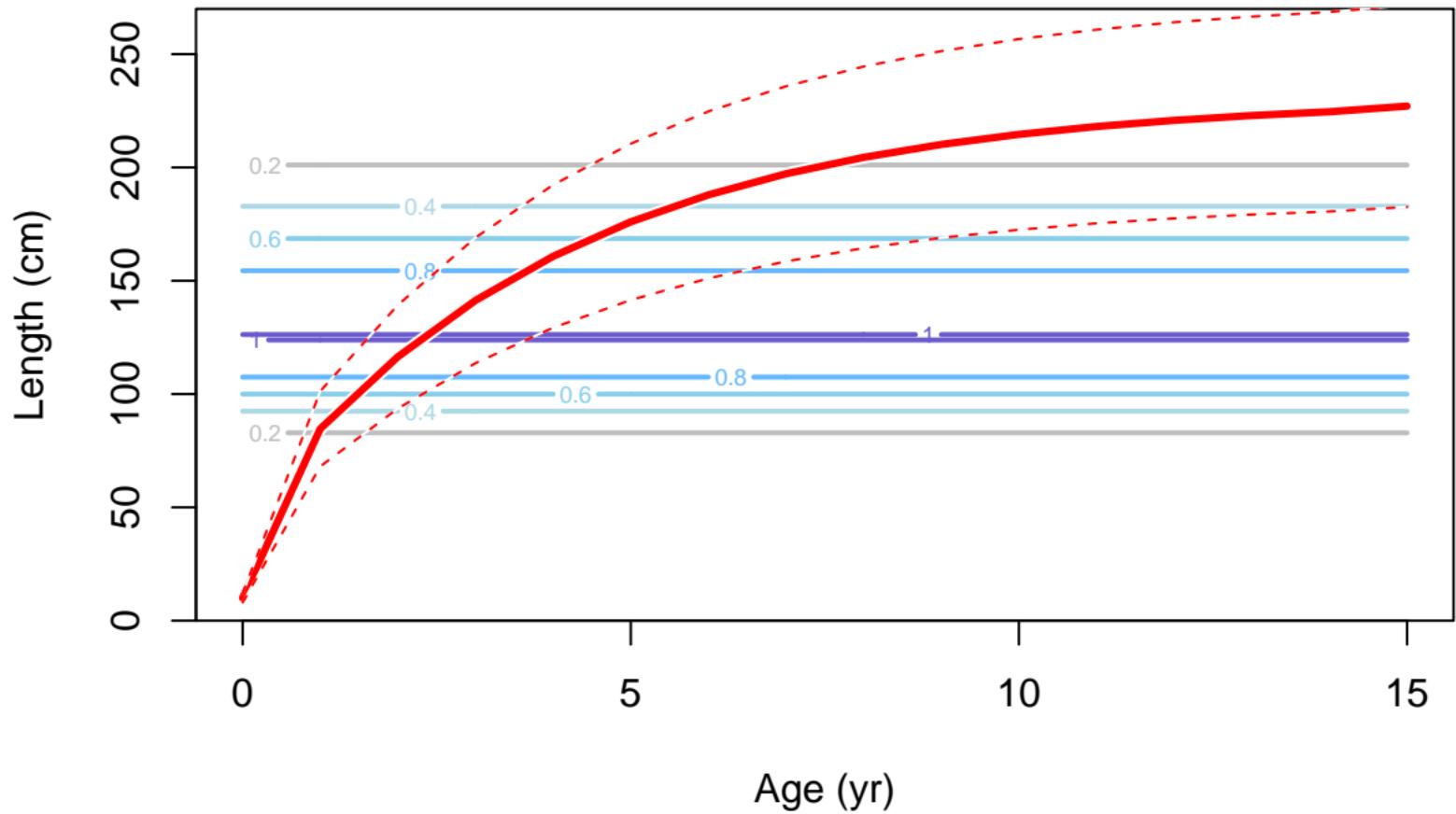


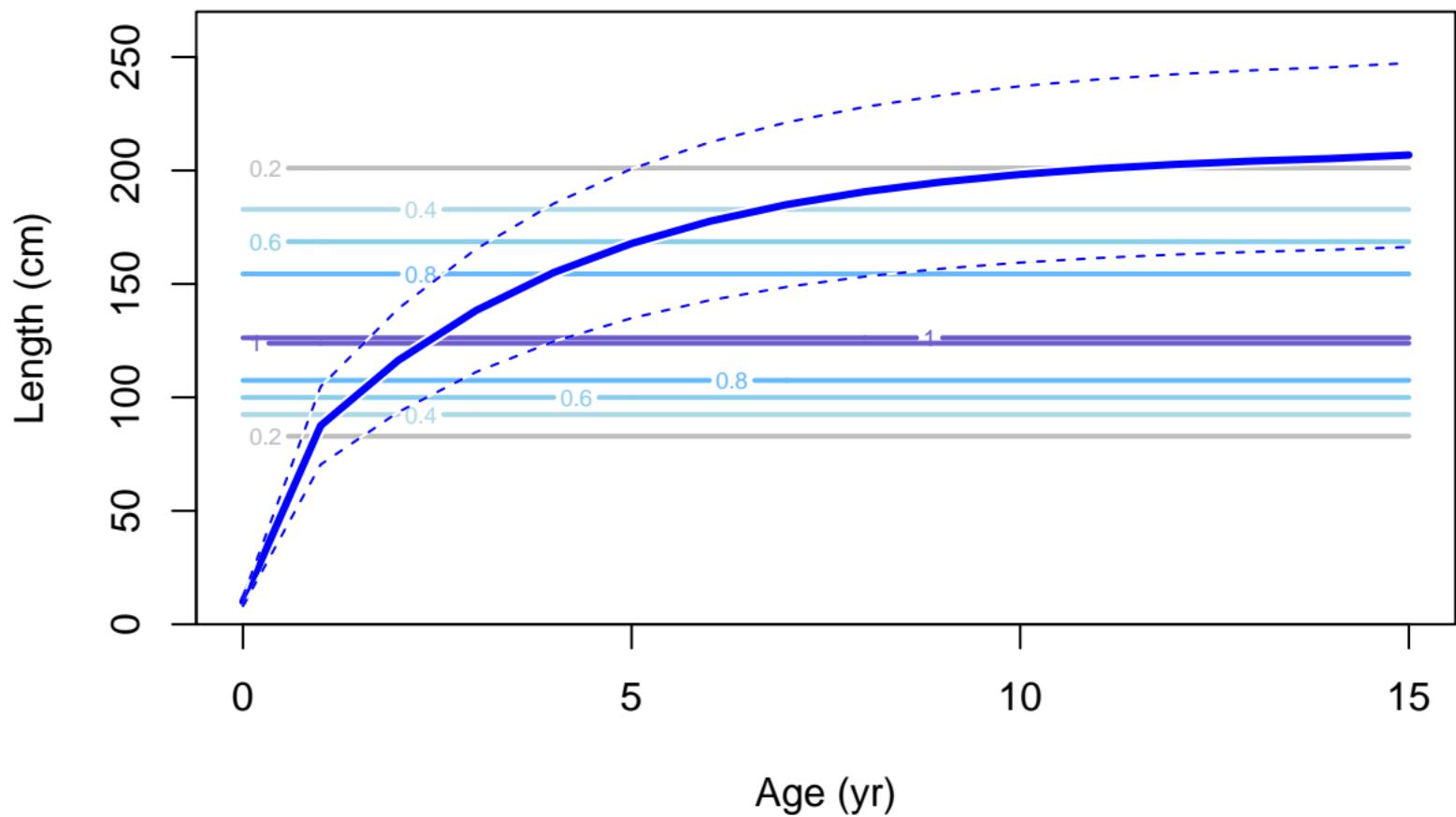


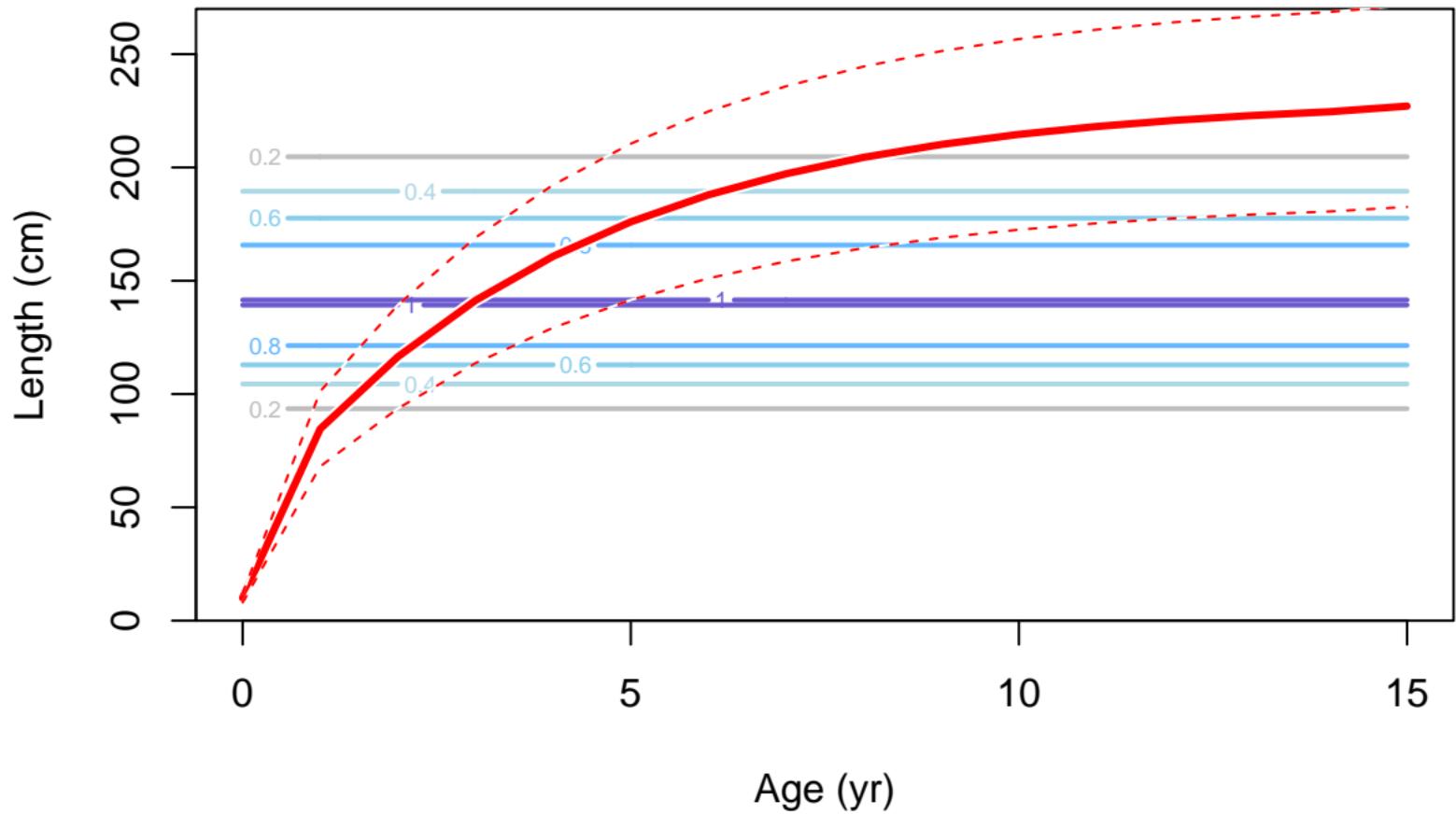


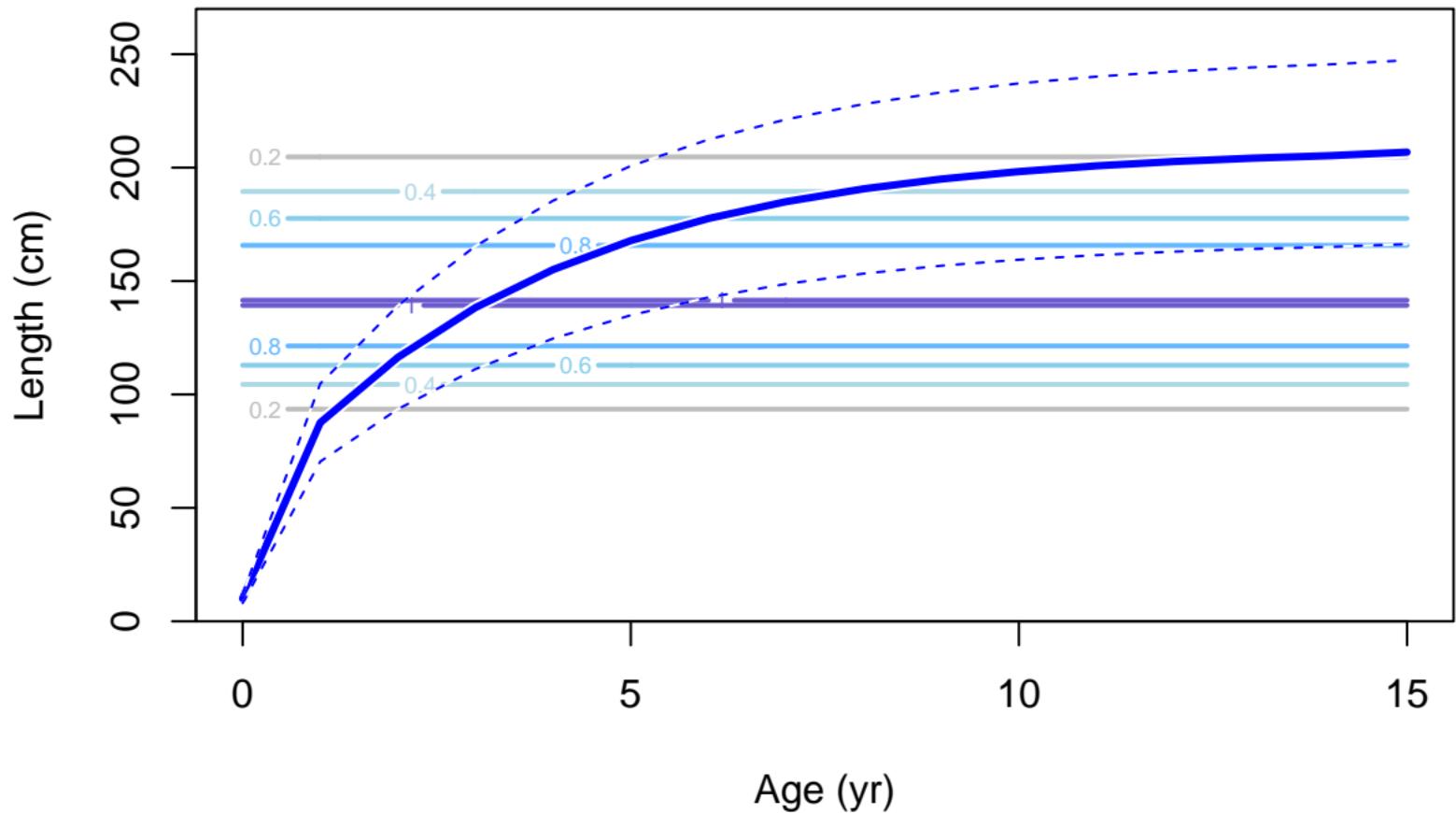


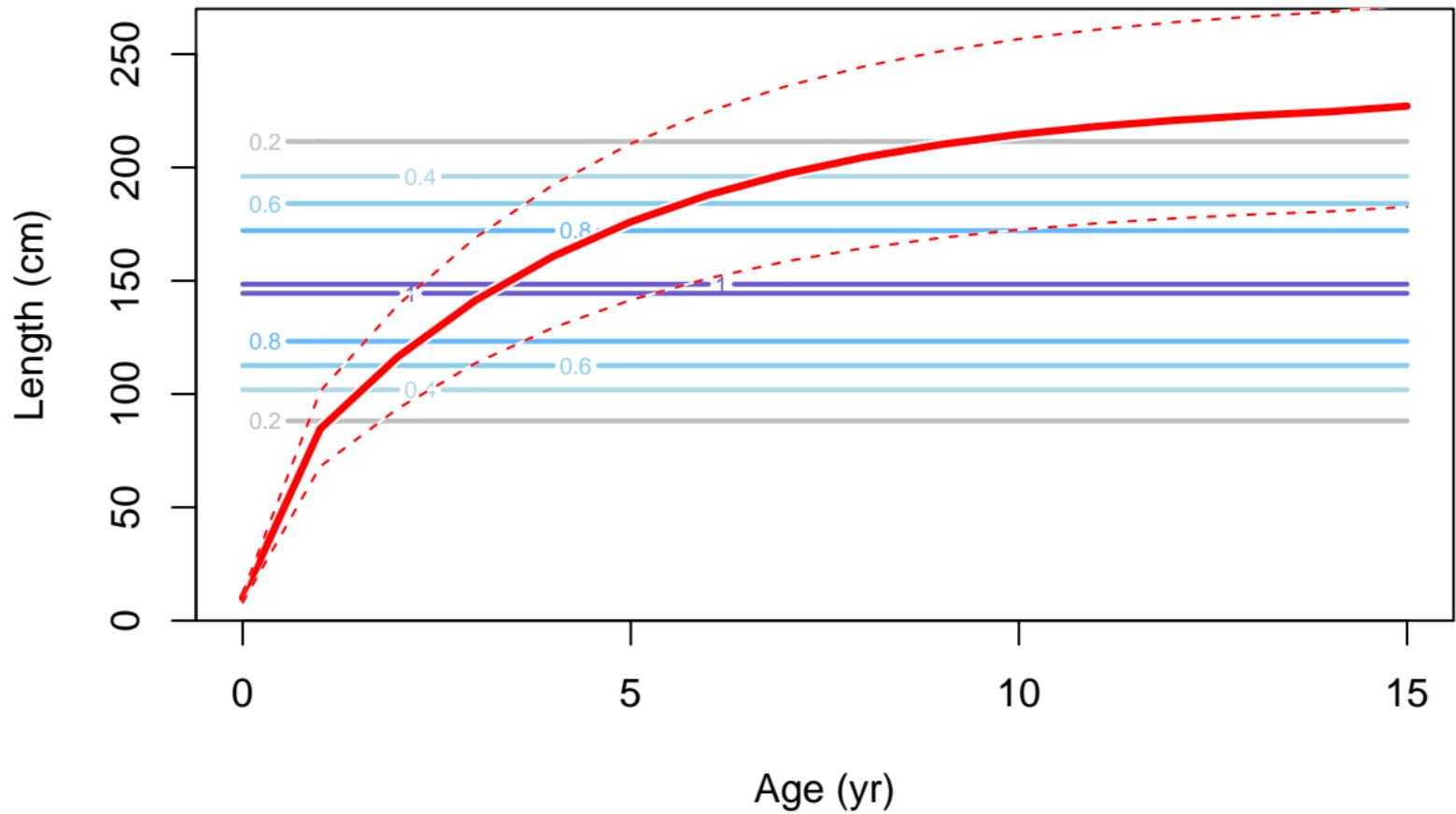


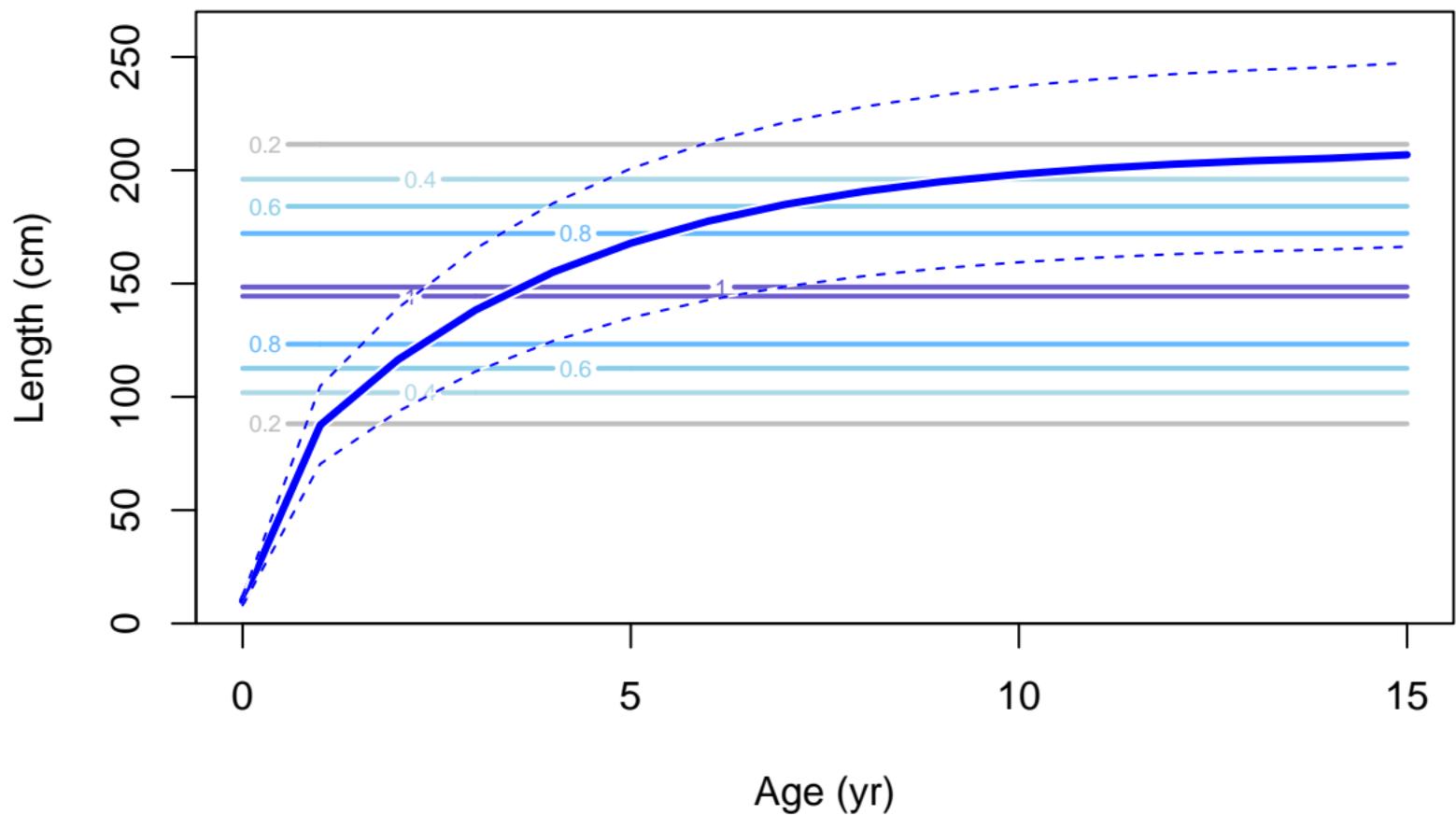


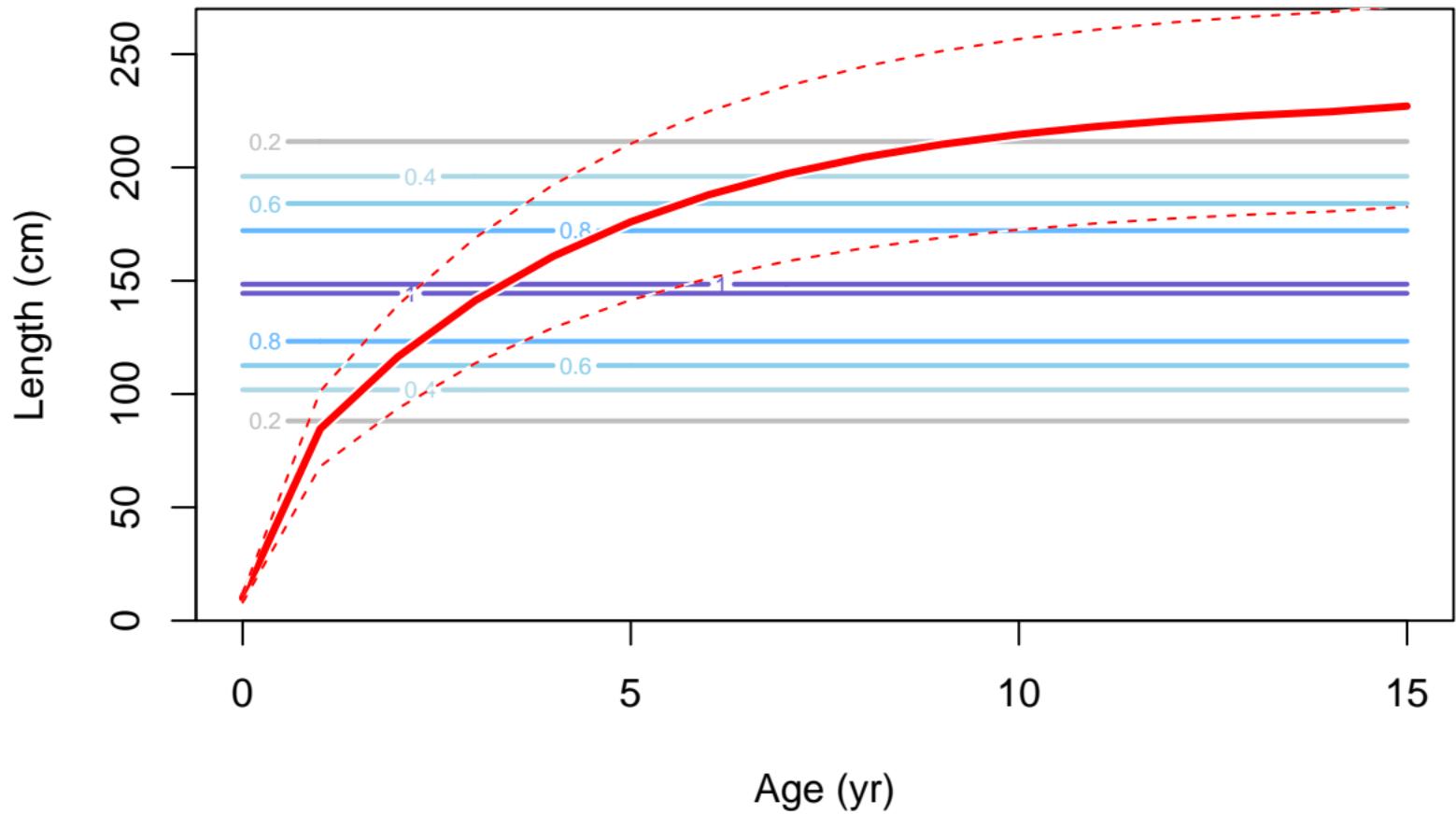


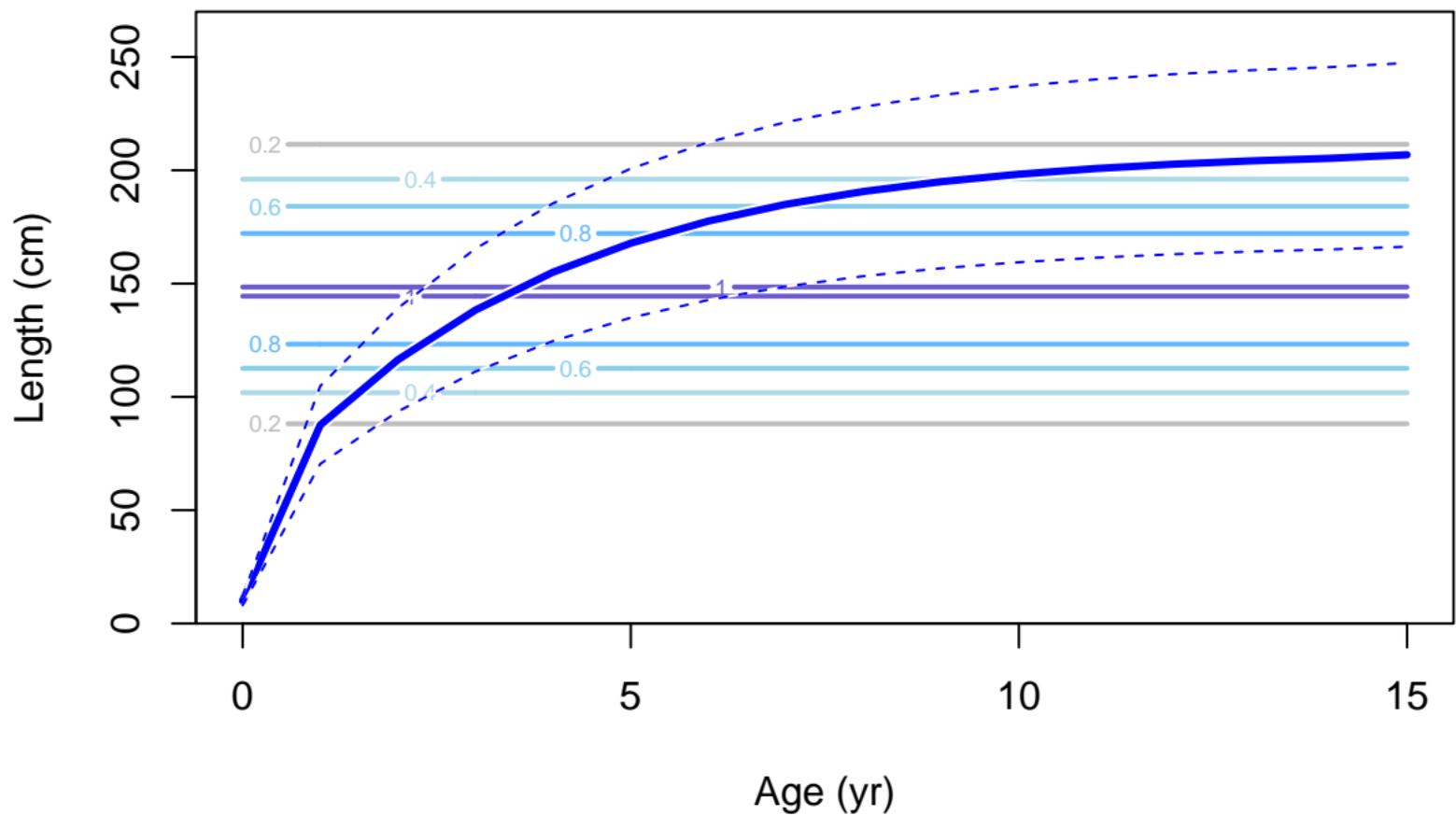


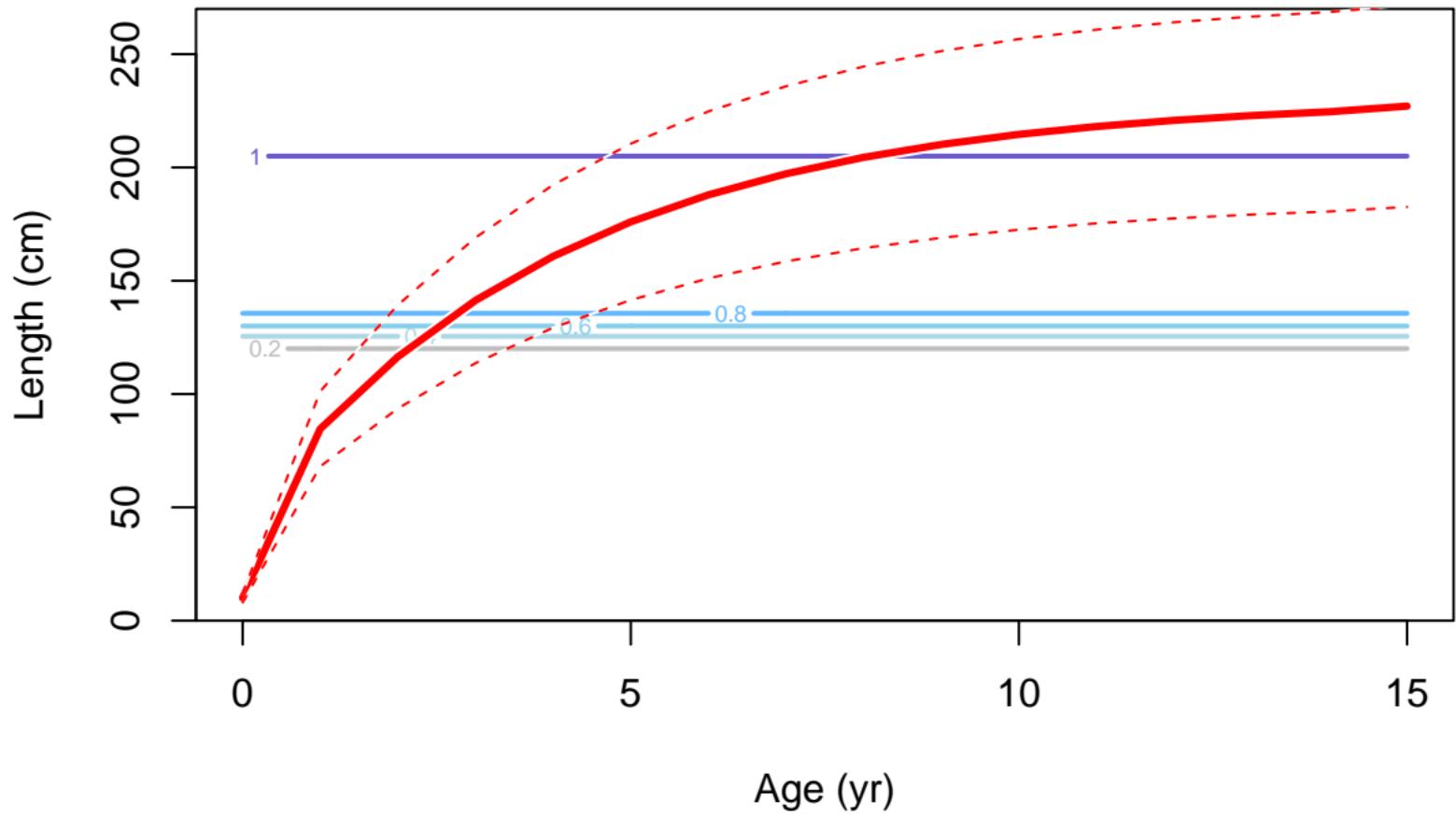


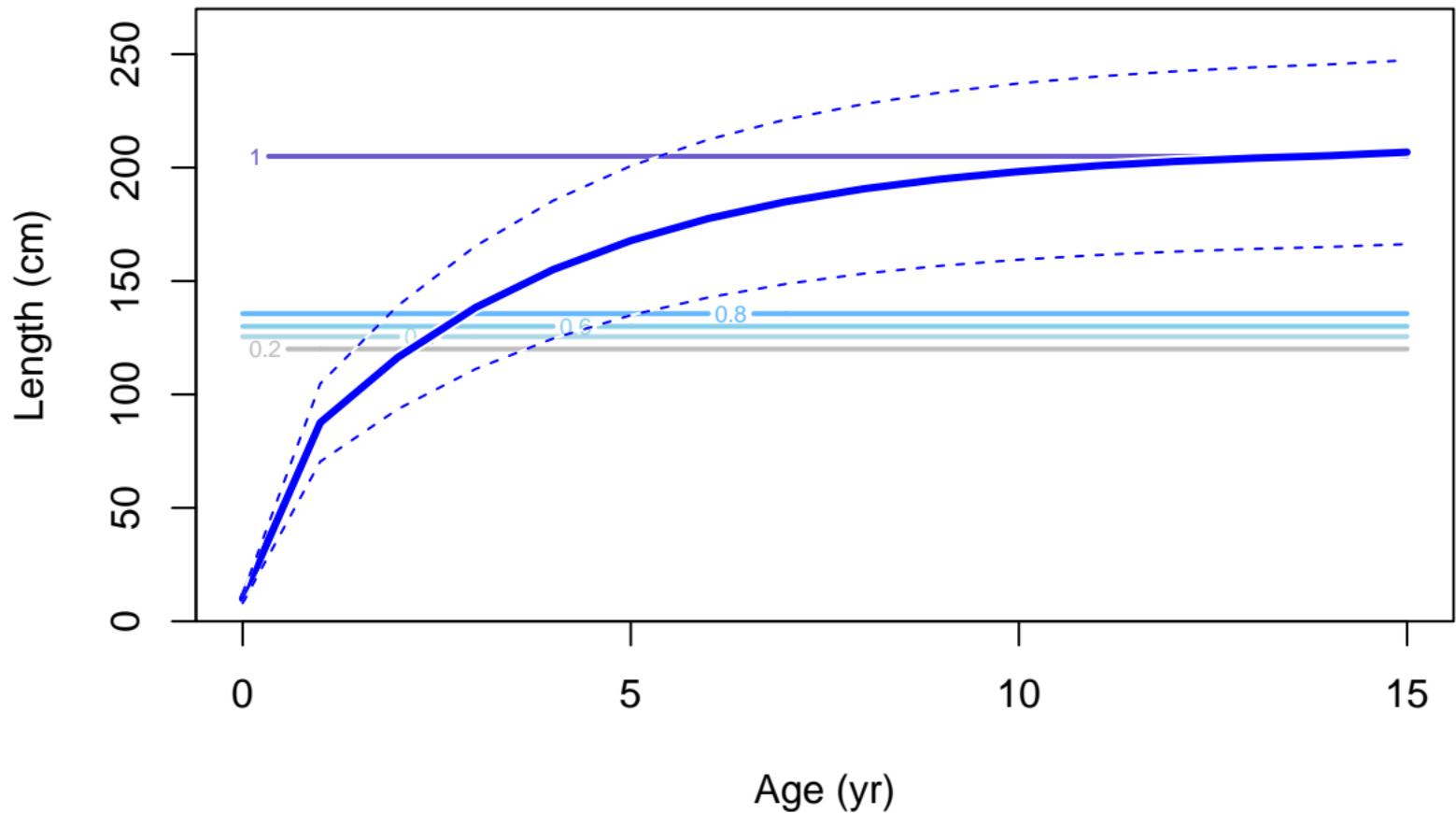


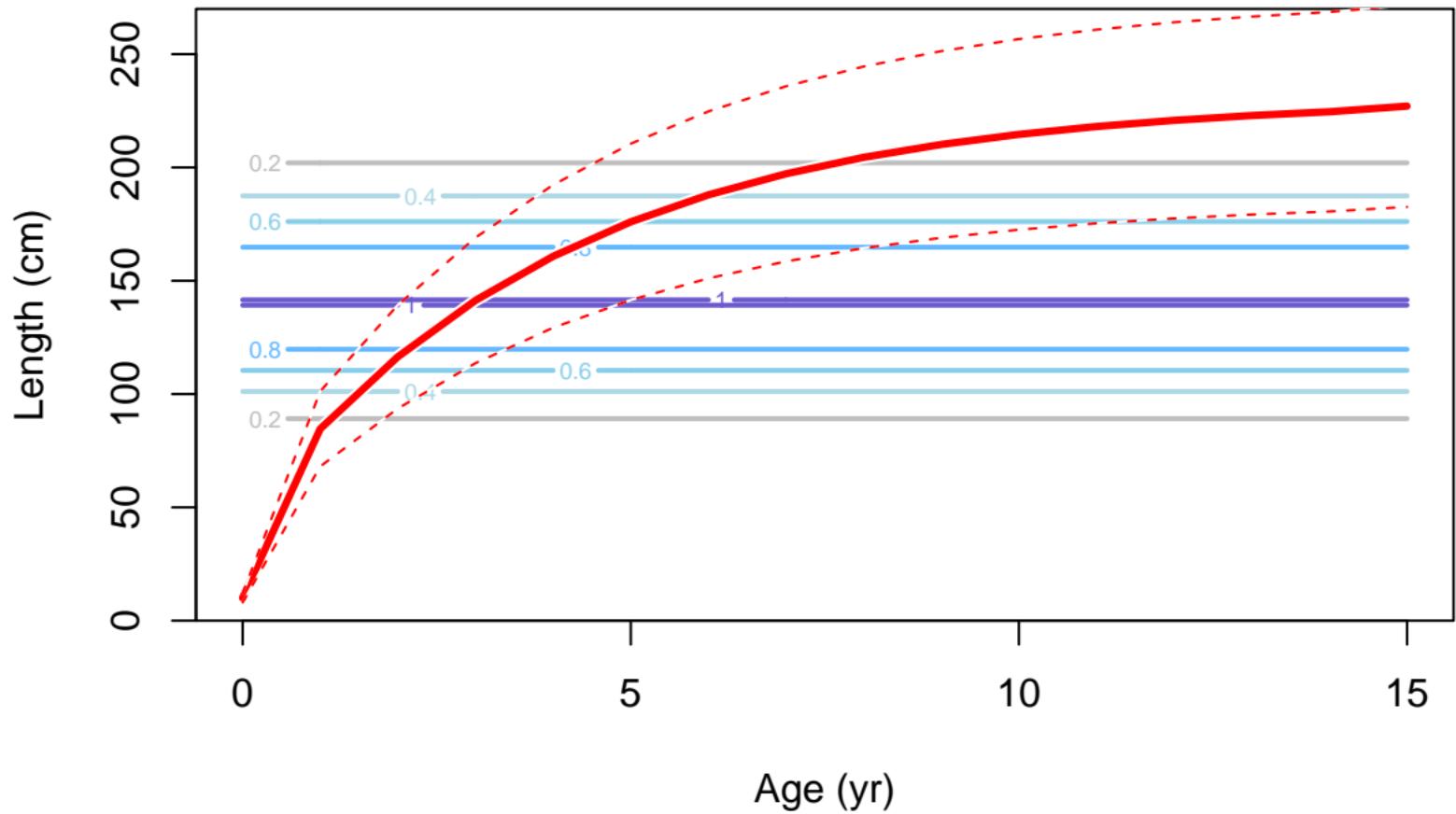


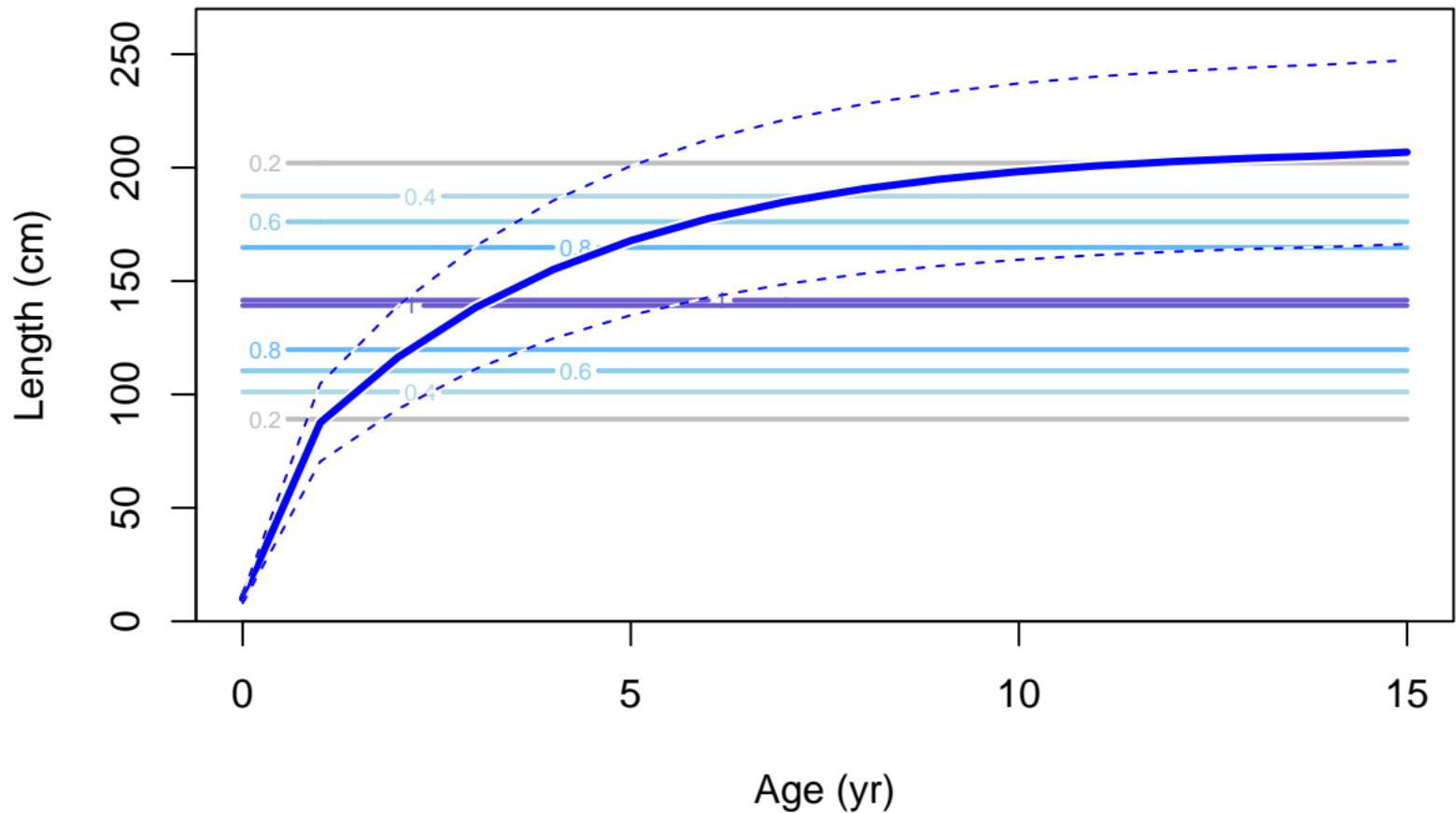


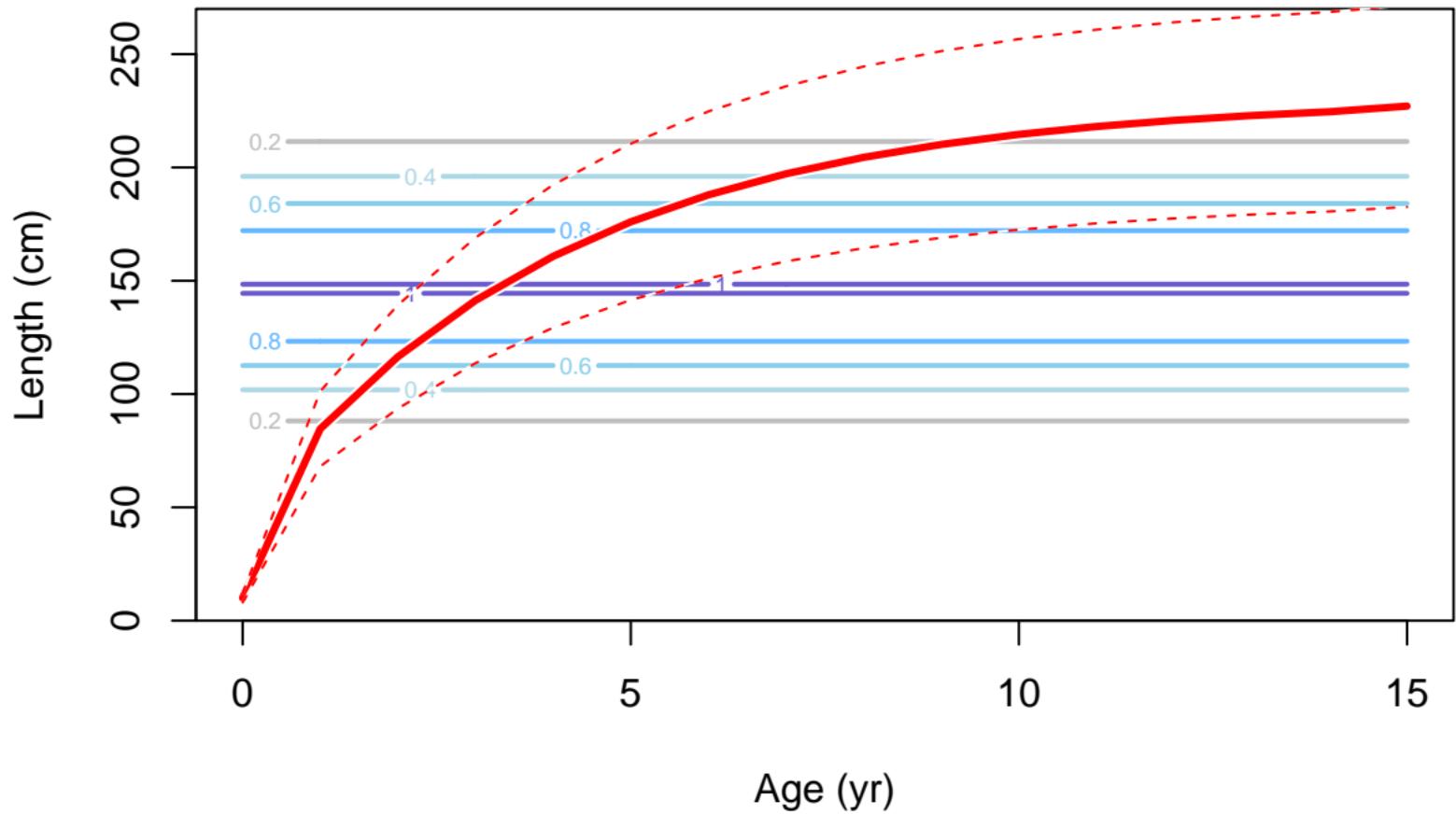


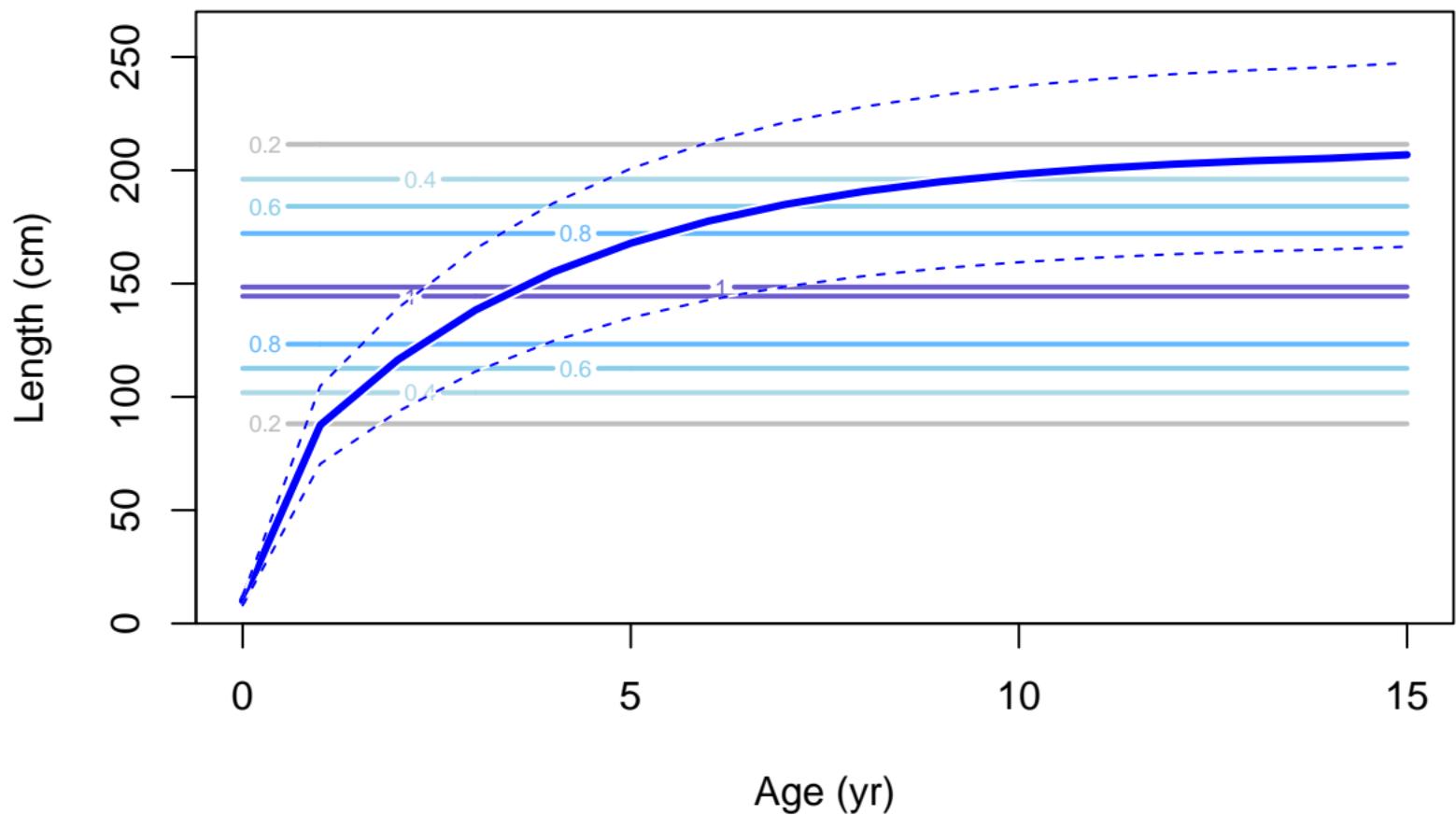


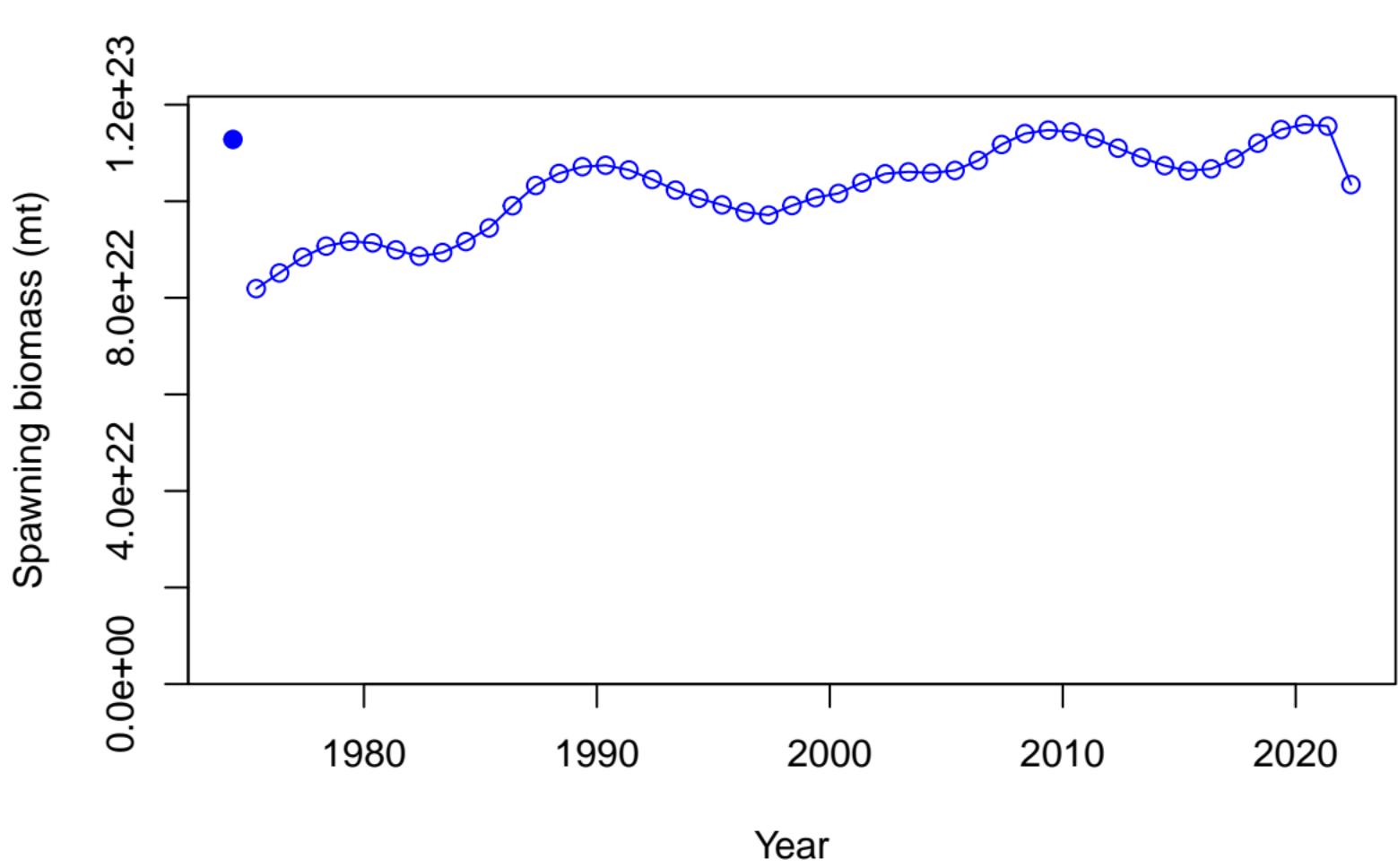




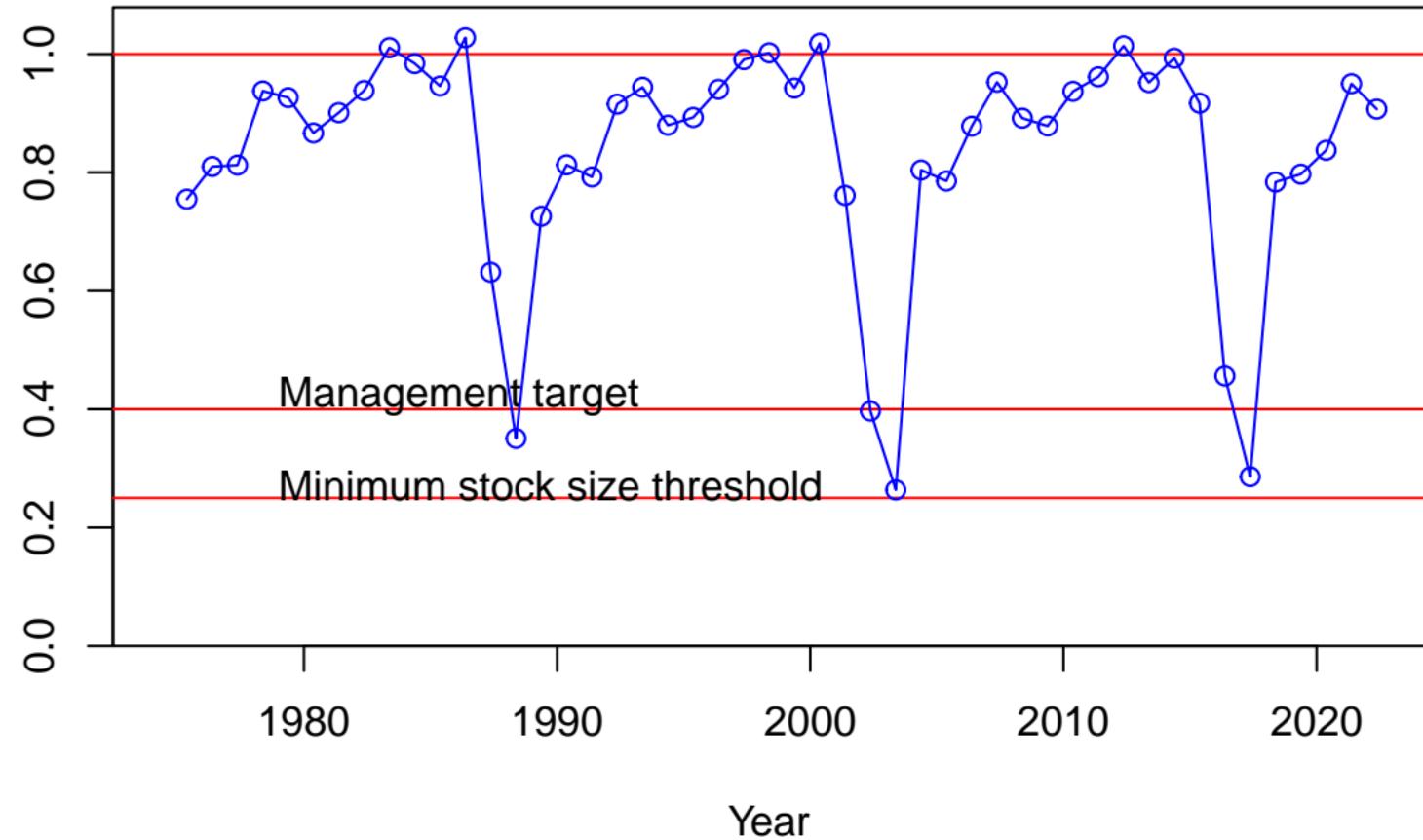


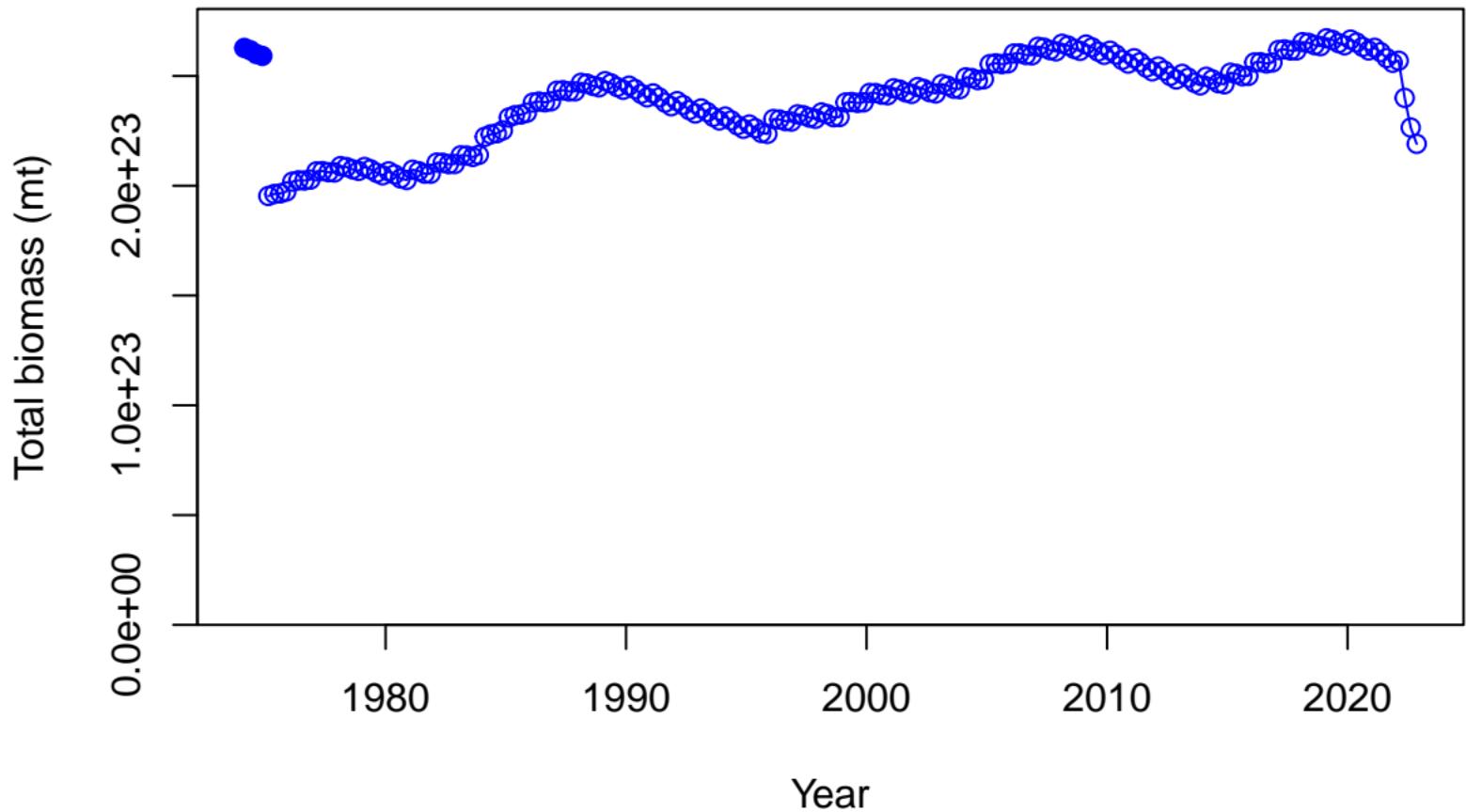


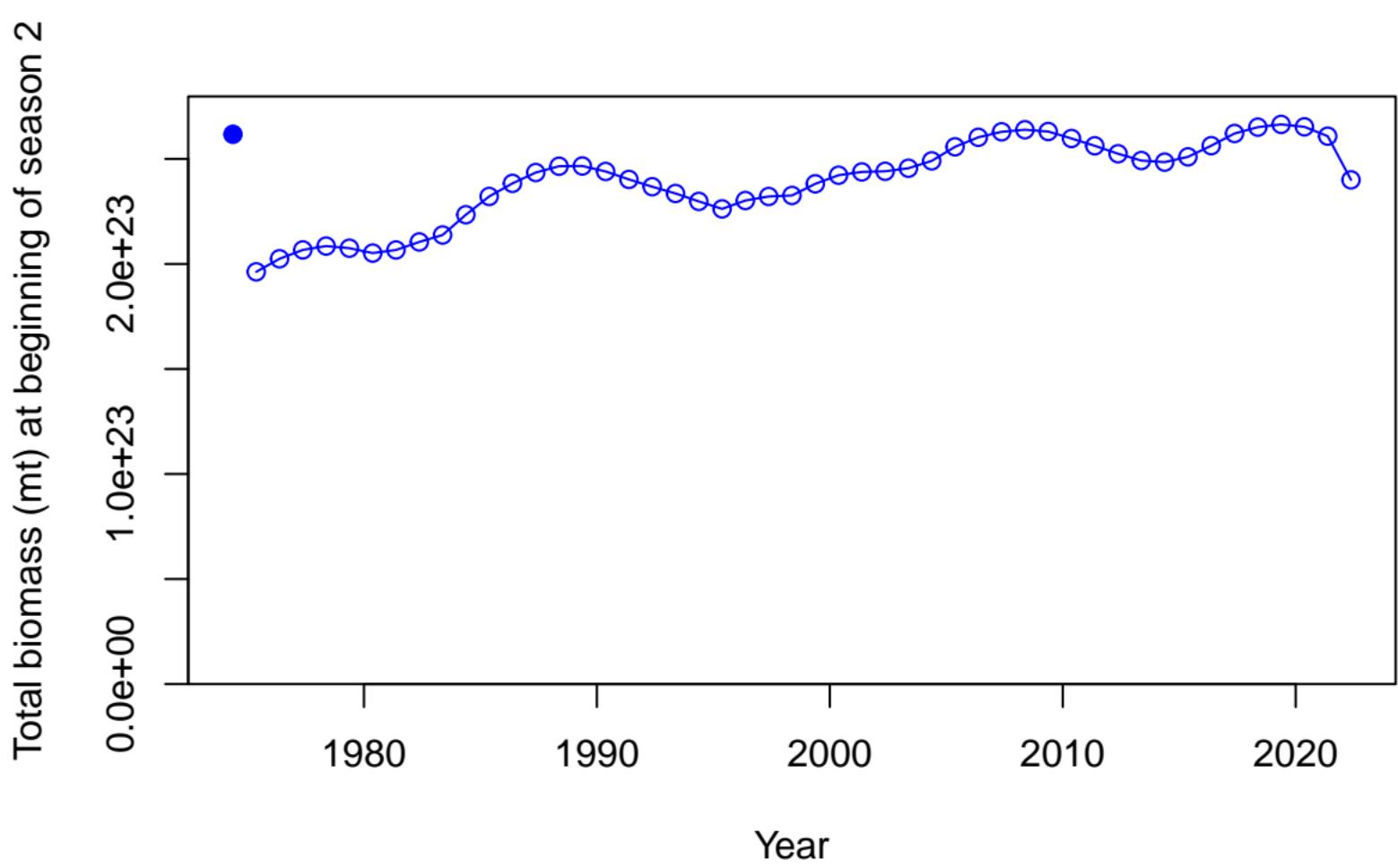




Relative spawning biomass:  $B/B_0$

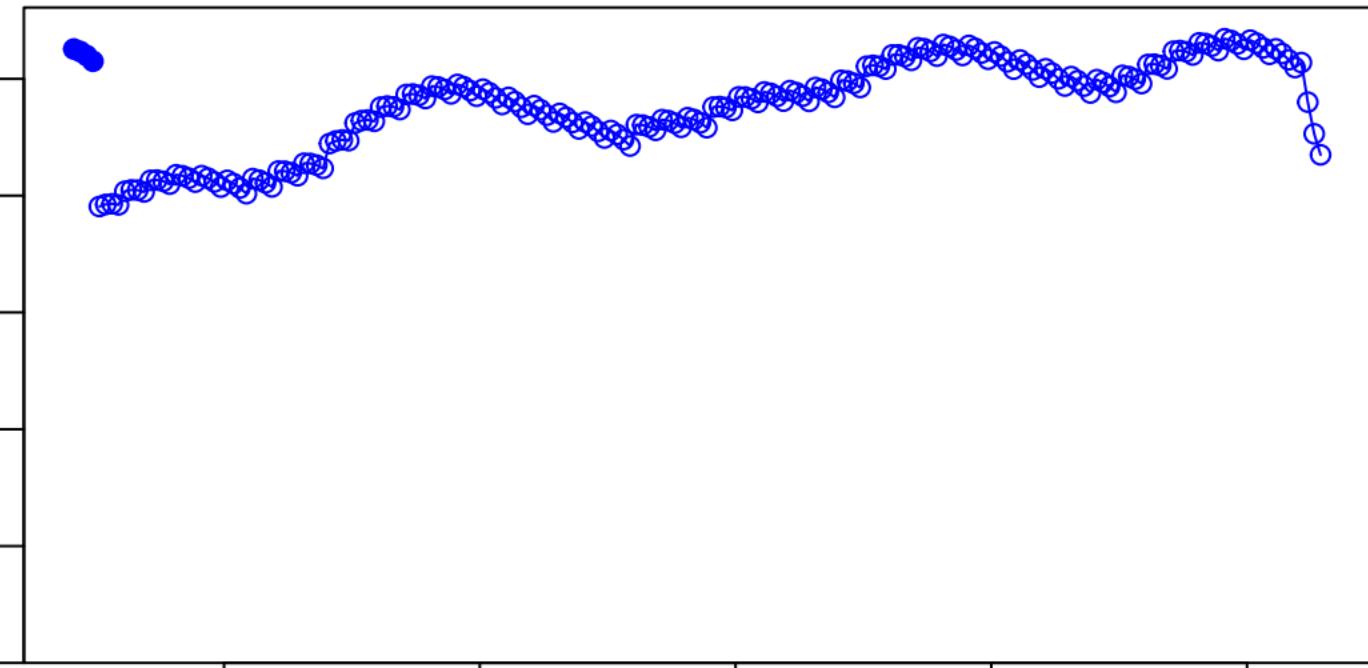






Summary biomass (mt)

0.0e+00 1.0e+23 2.0e+23



1980

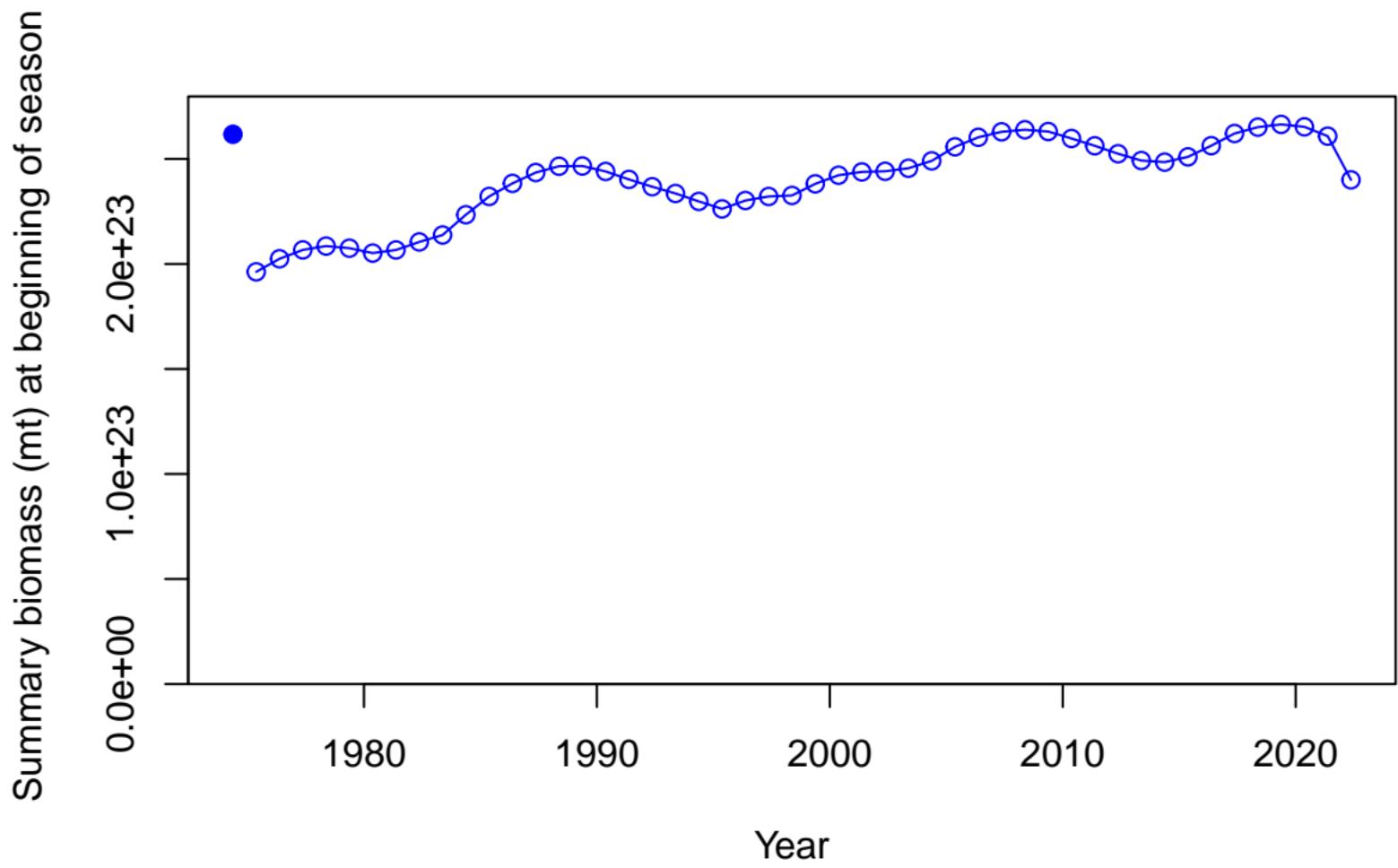
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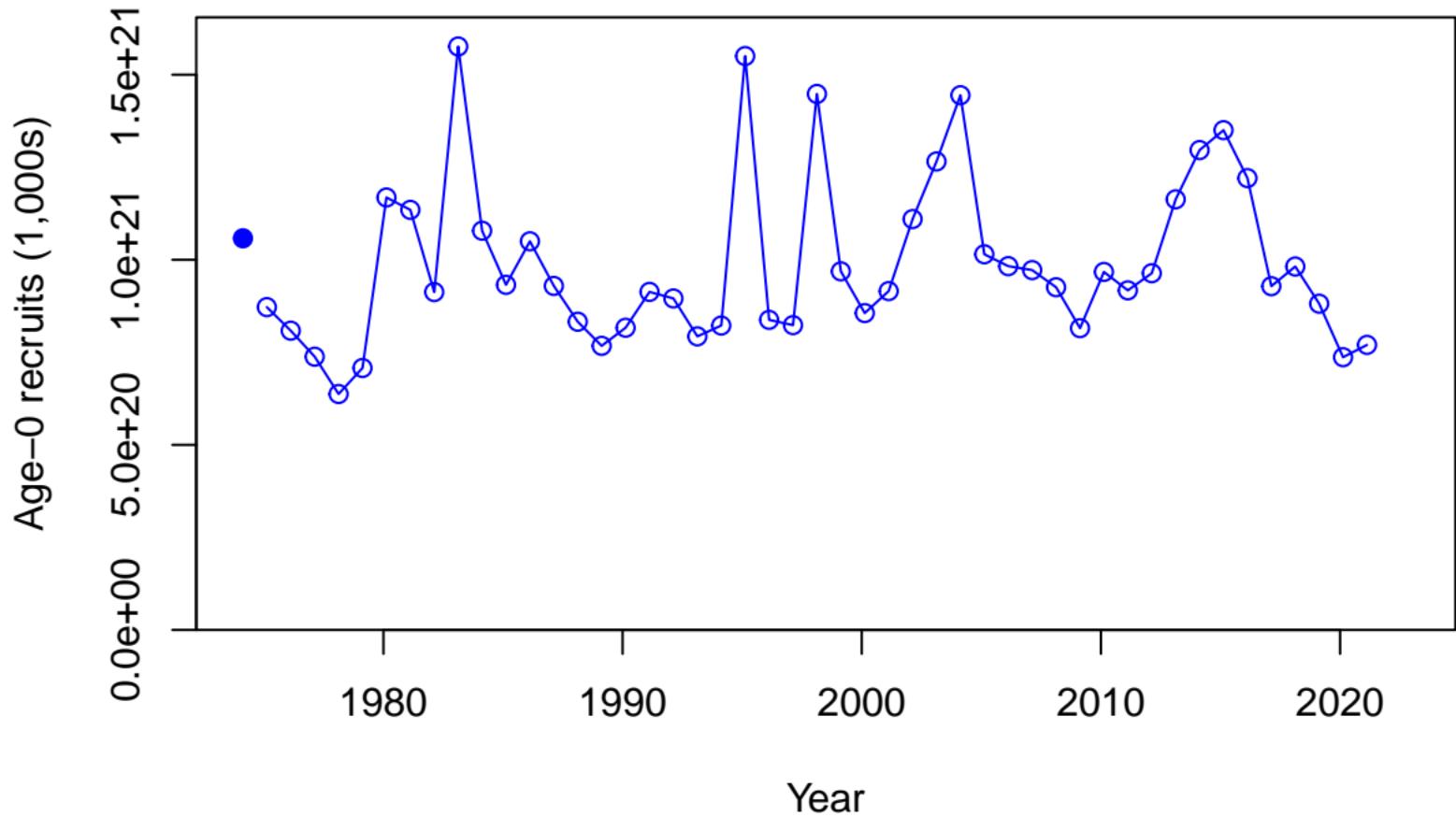
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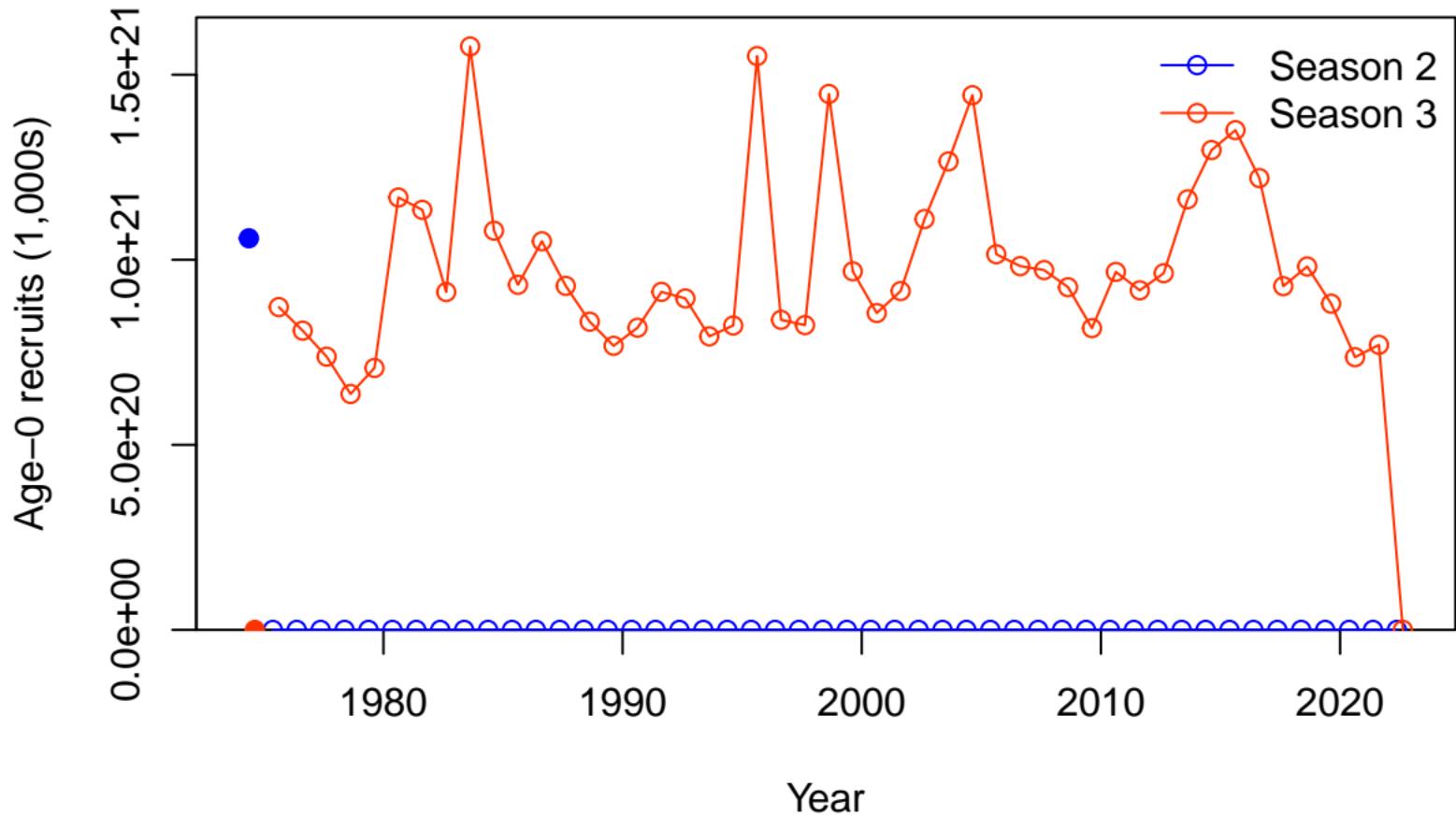
2010

2020

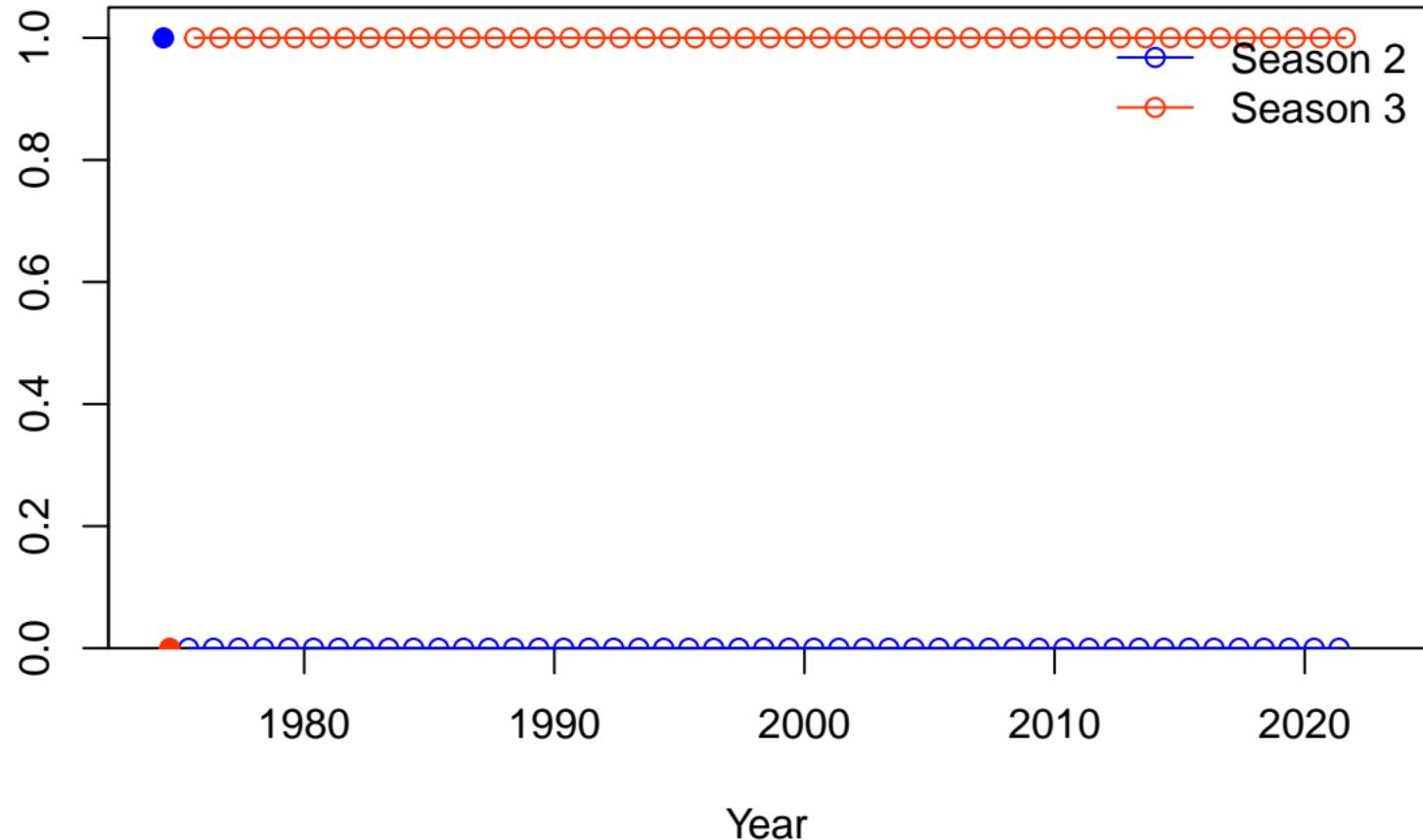
Year



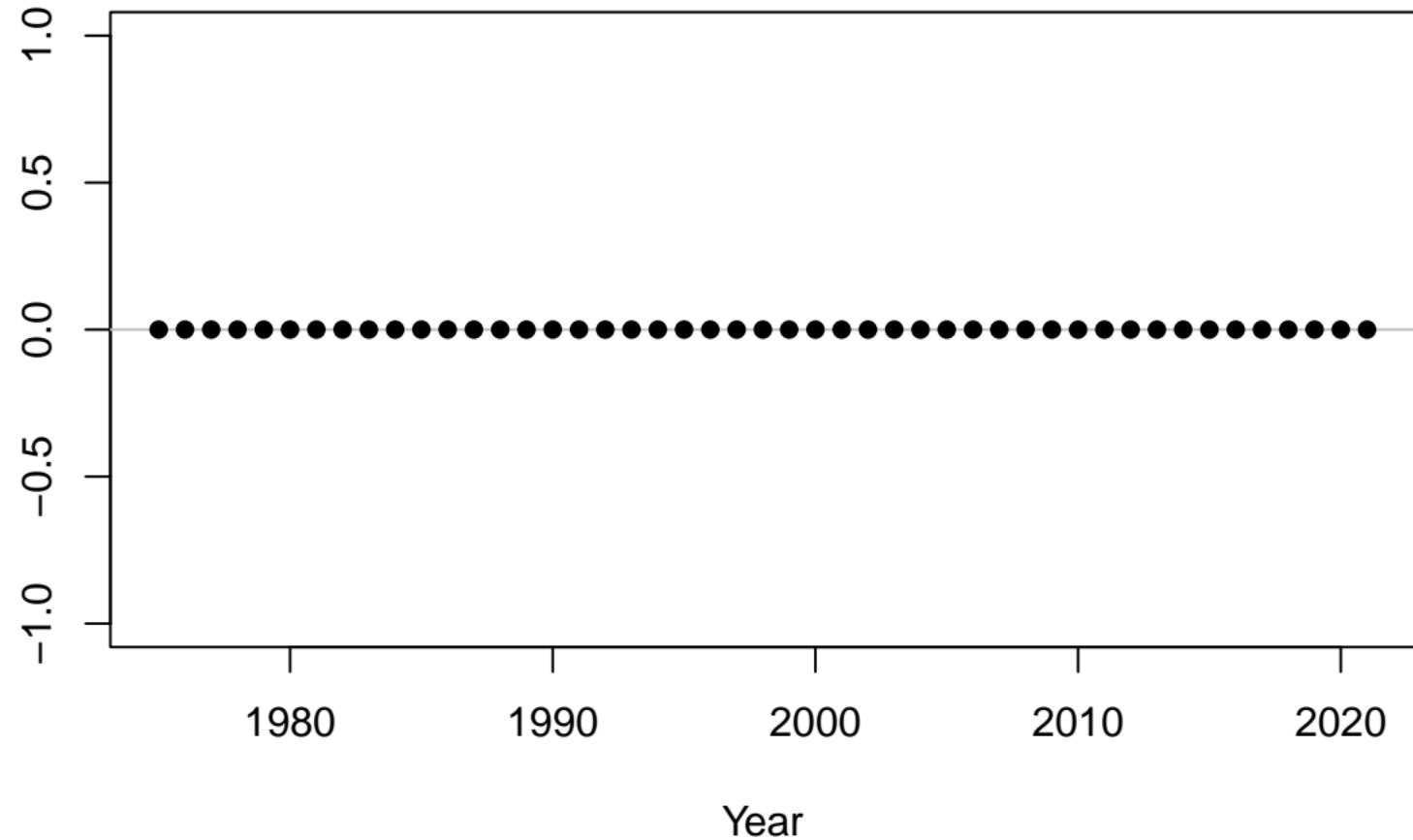


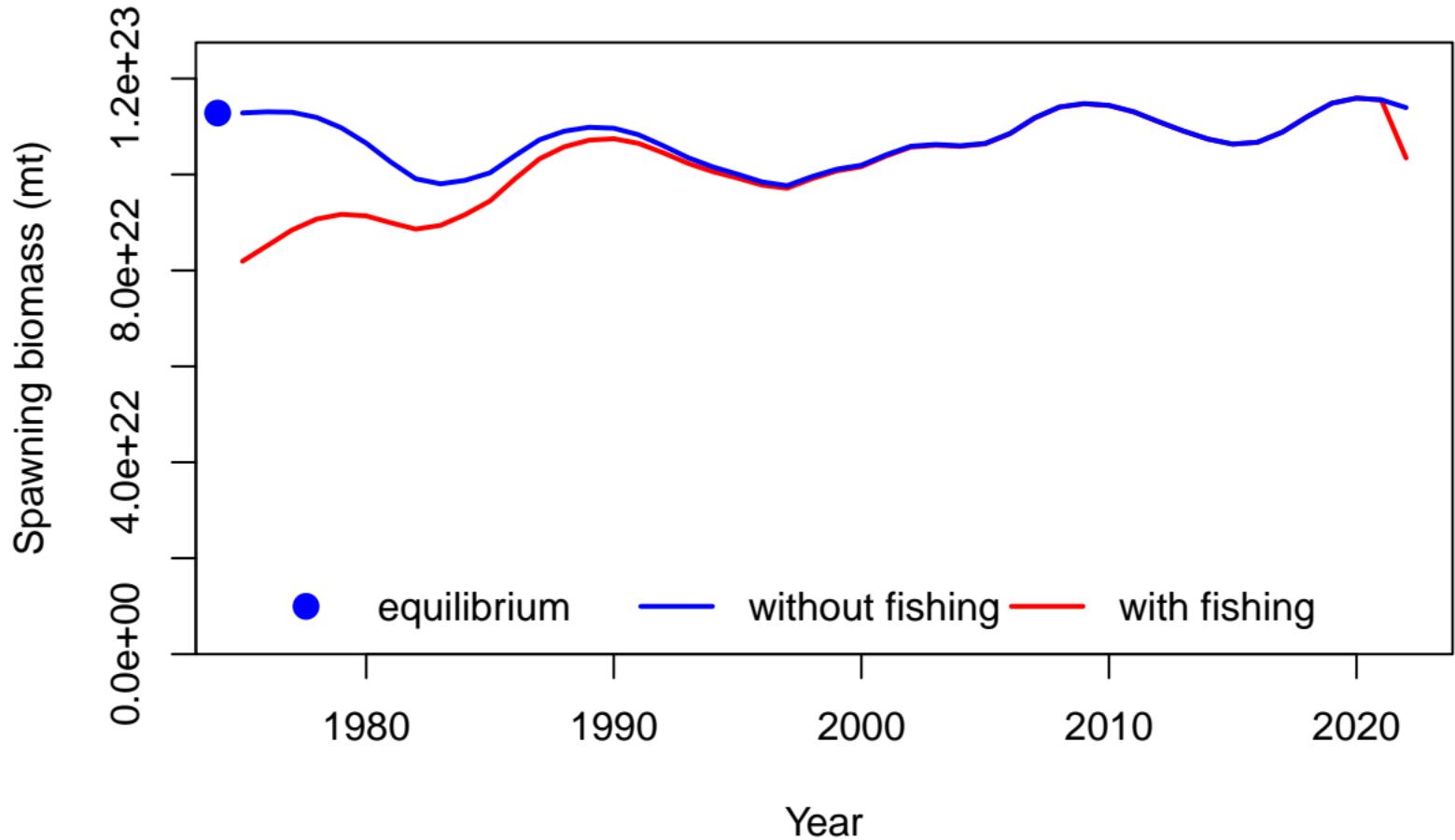


Fraction of total Age-0 recruits

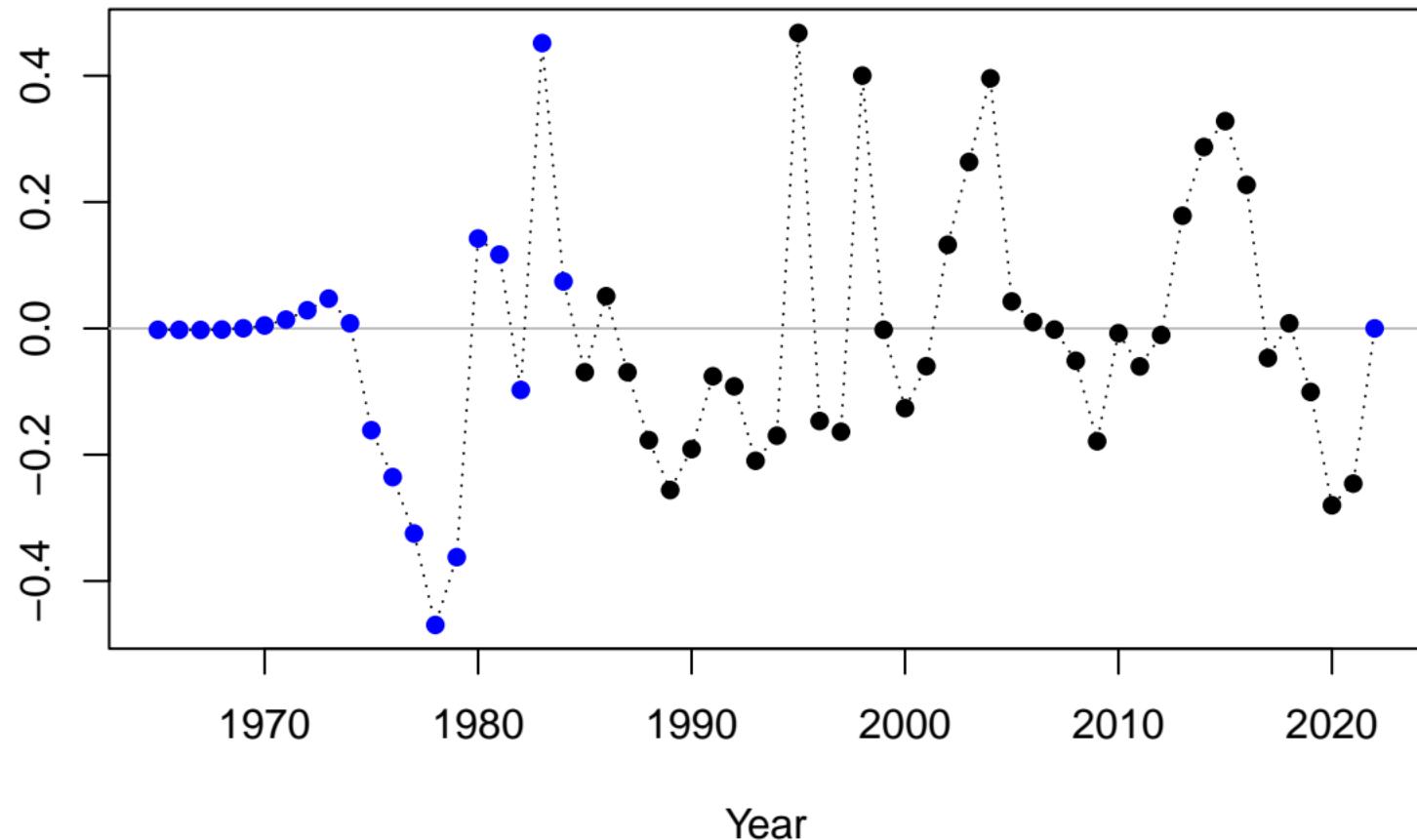


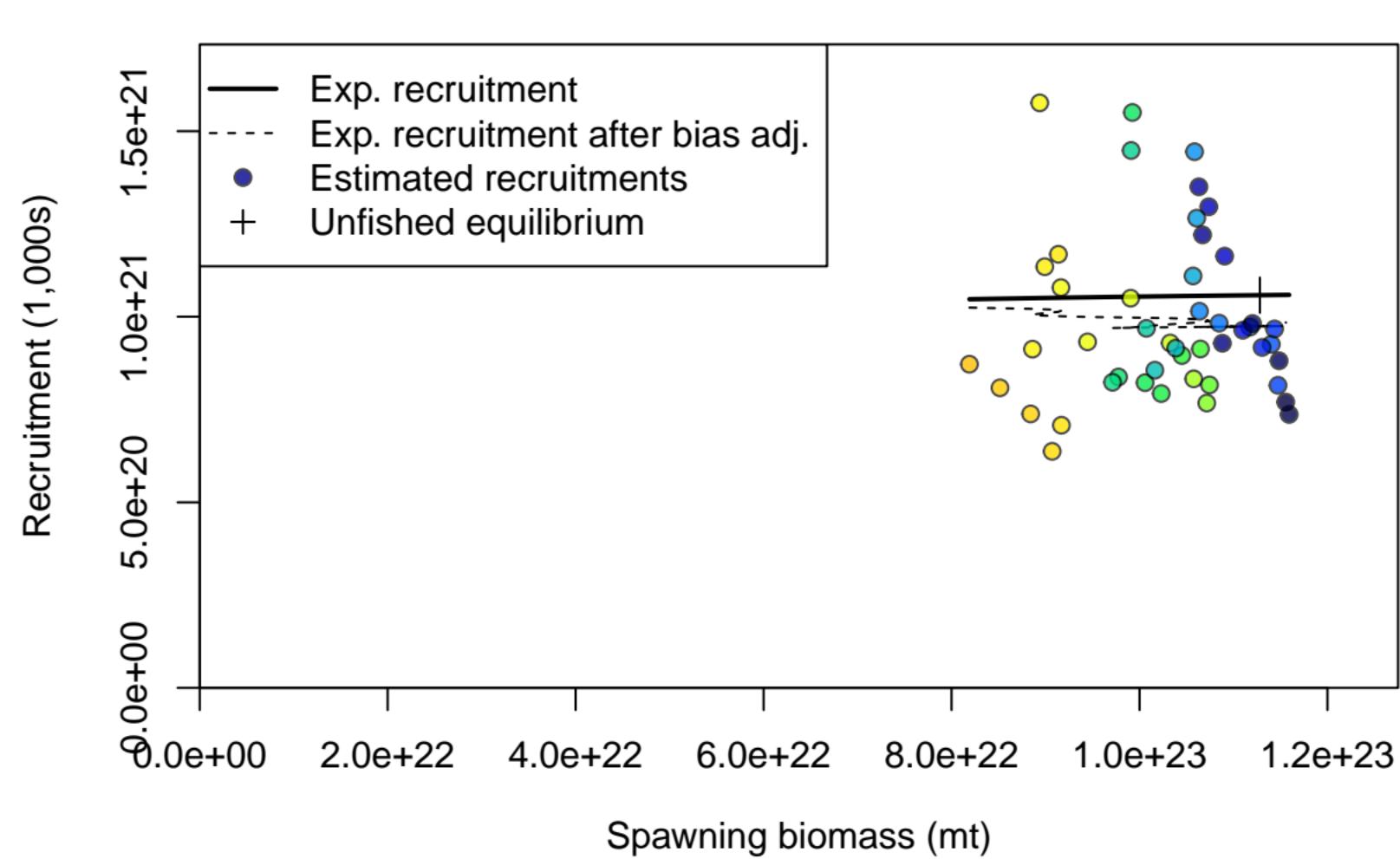
# Summary Fishing Mortality

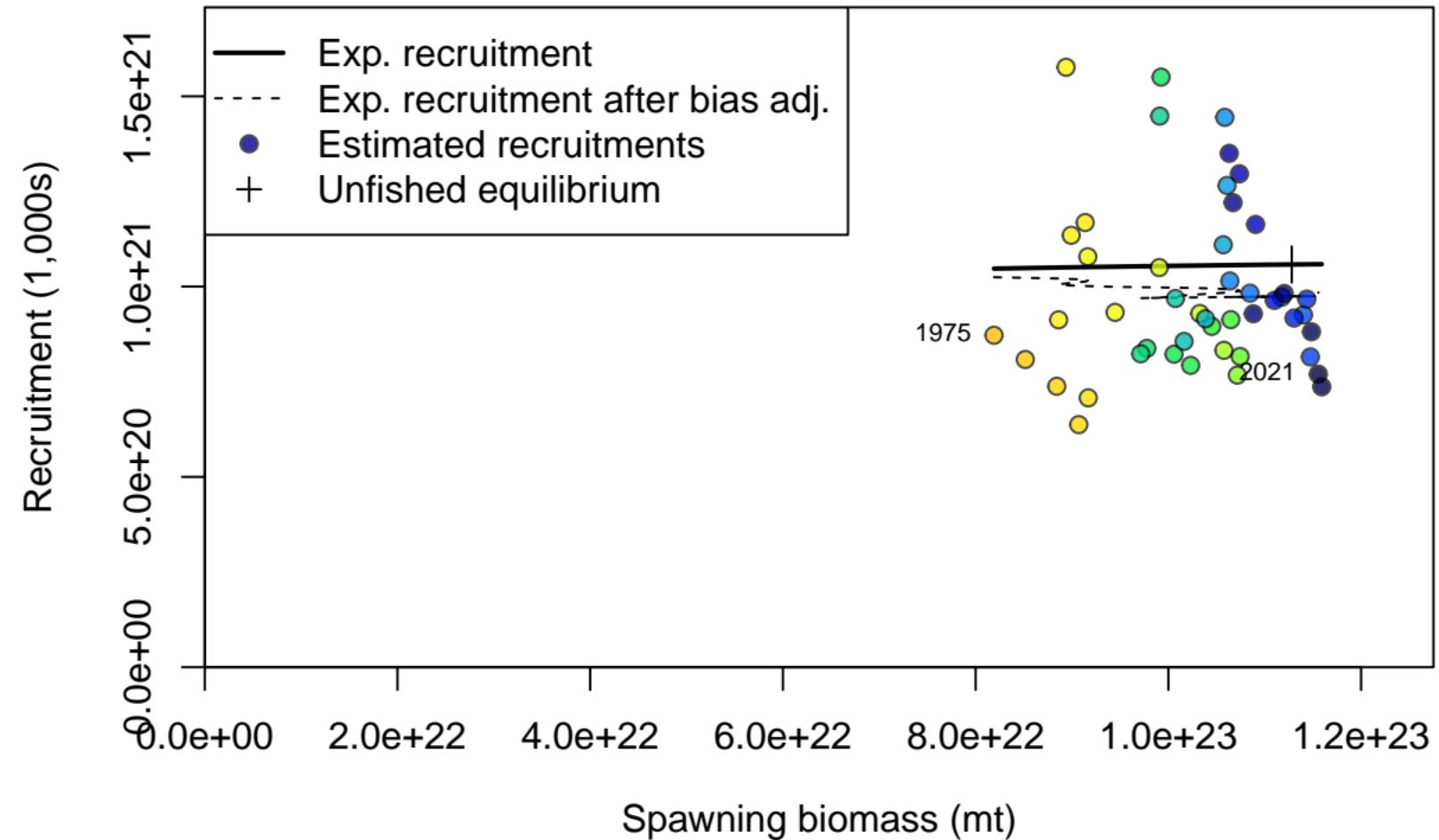


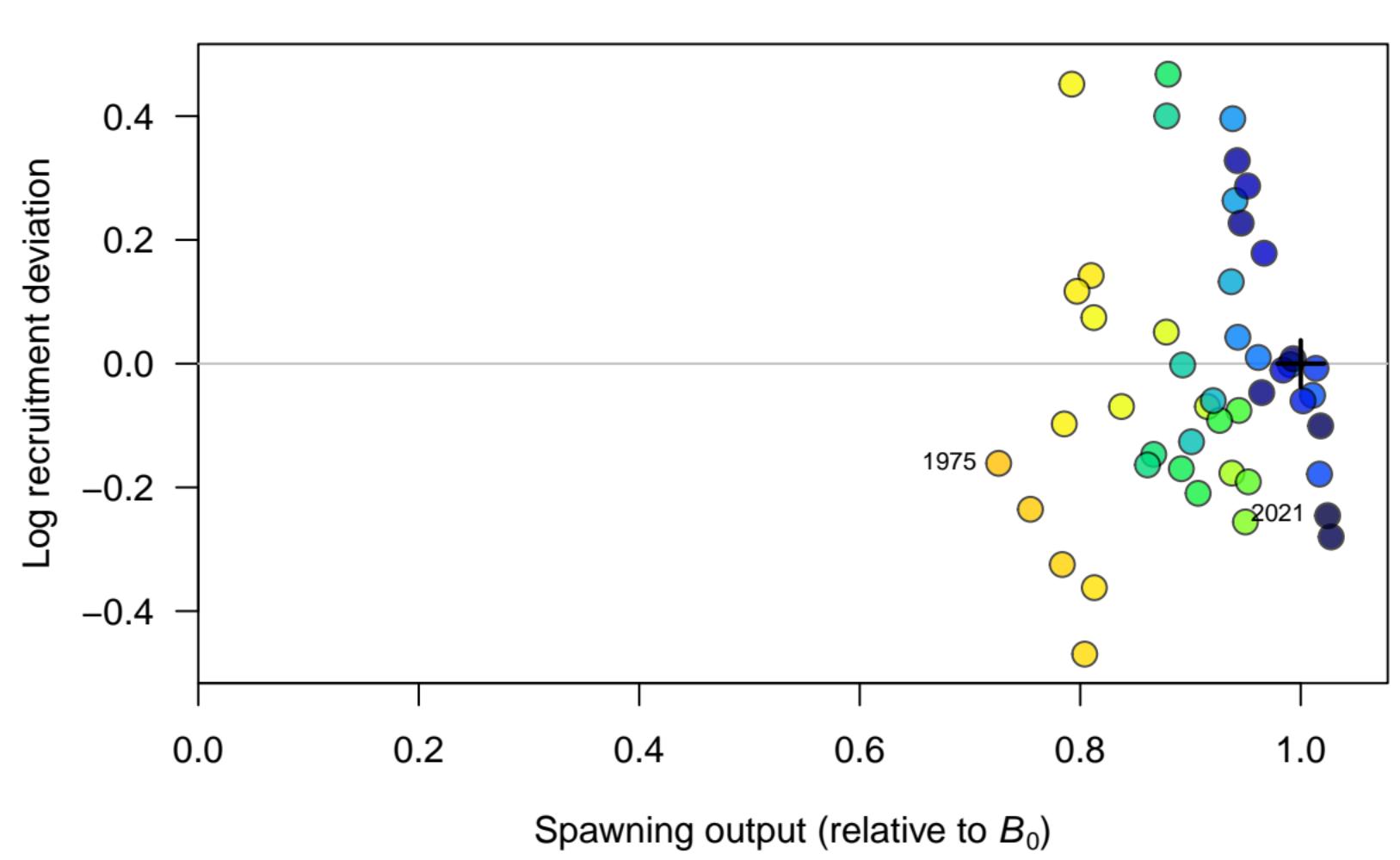


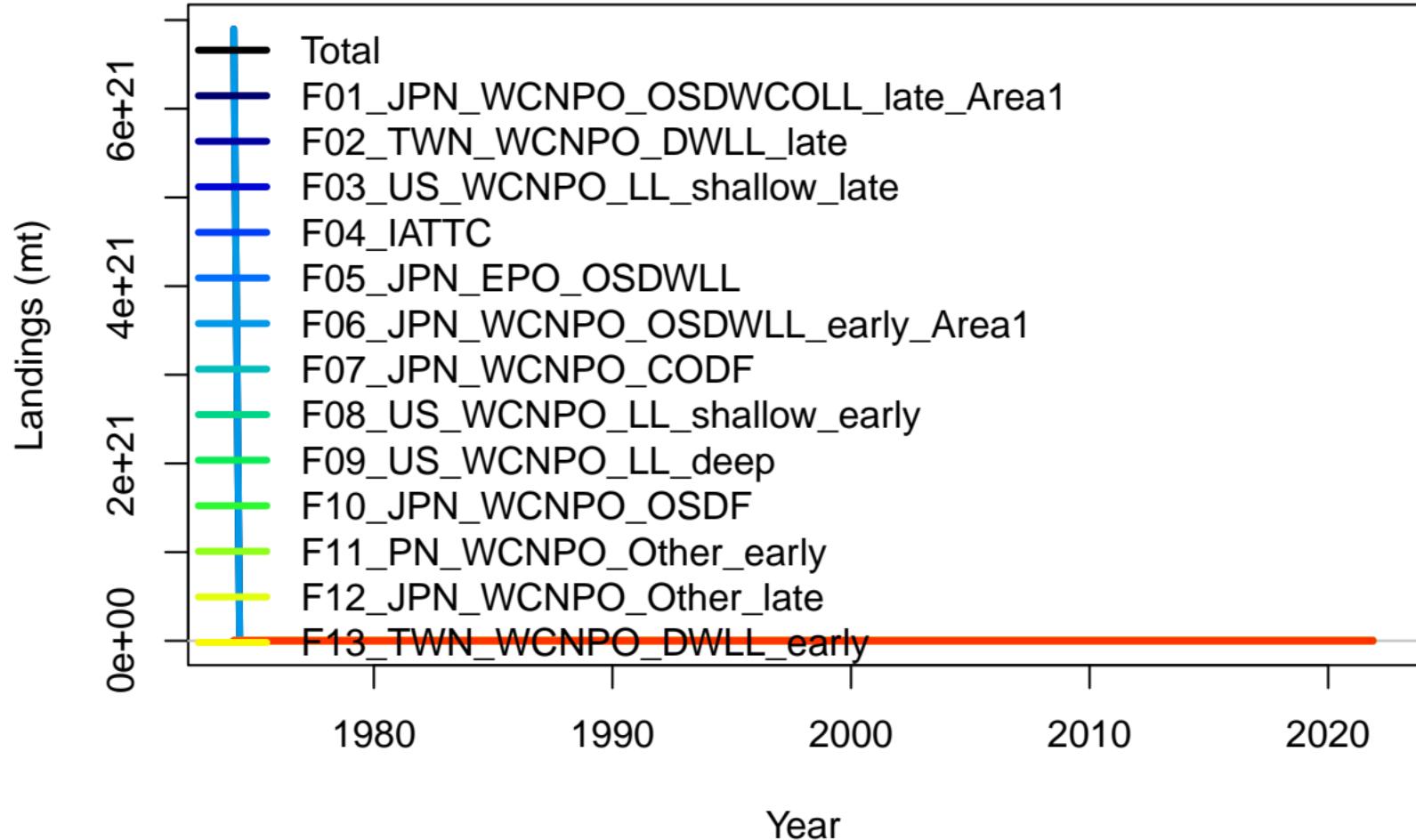
Log recruitment deviation

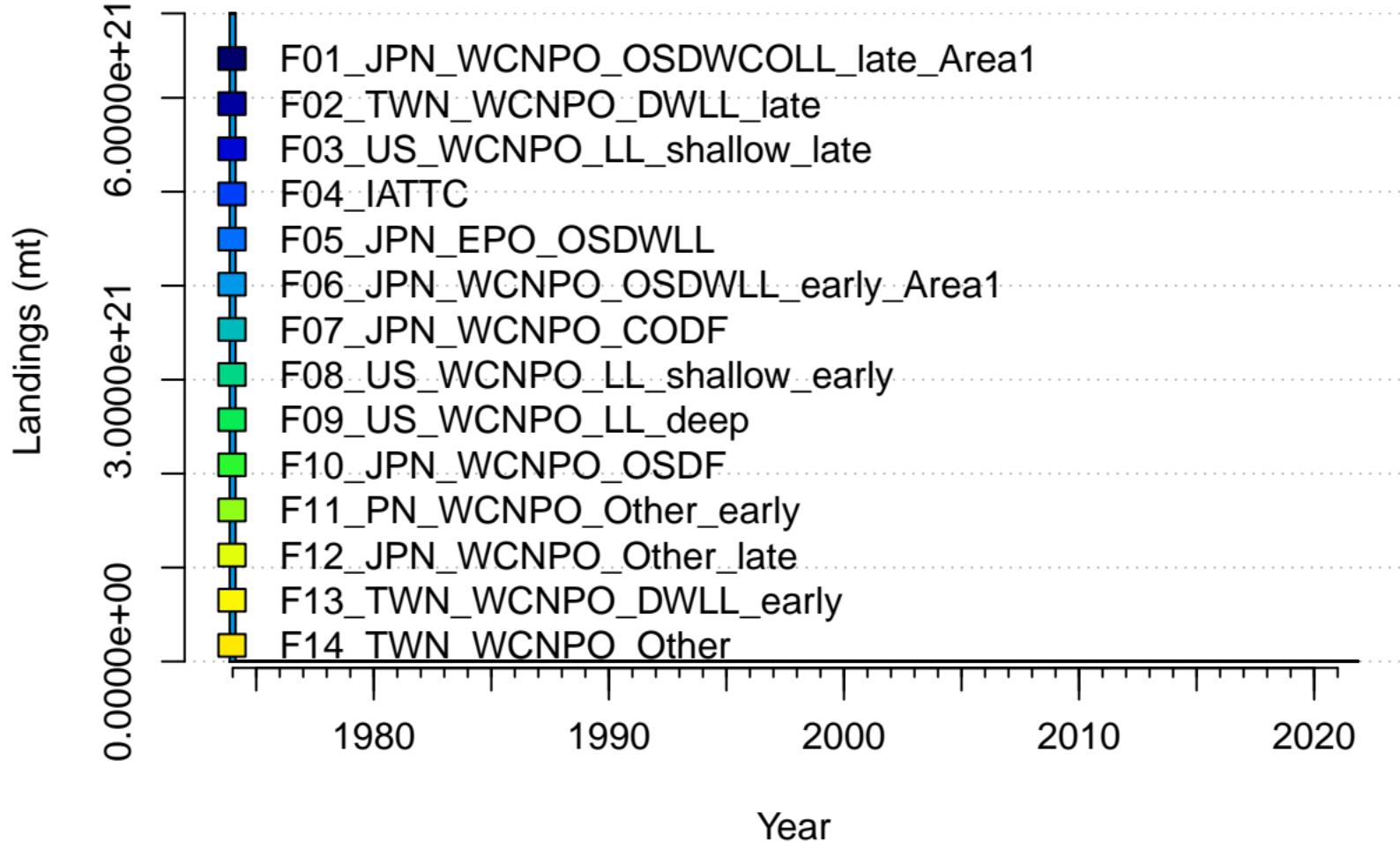




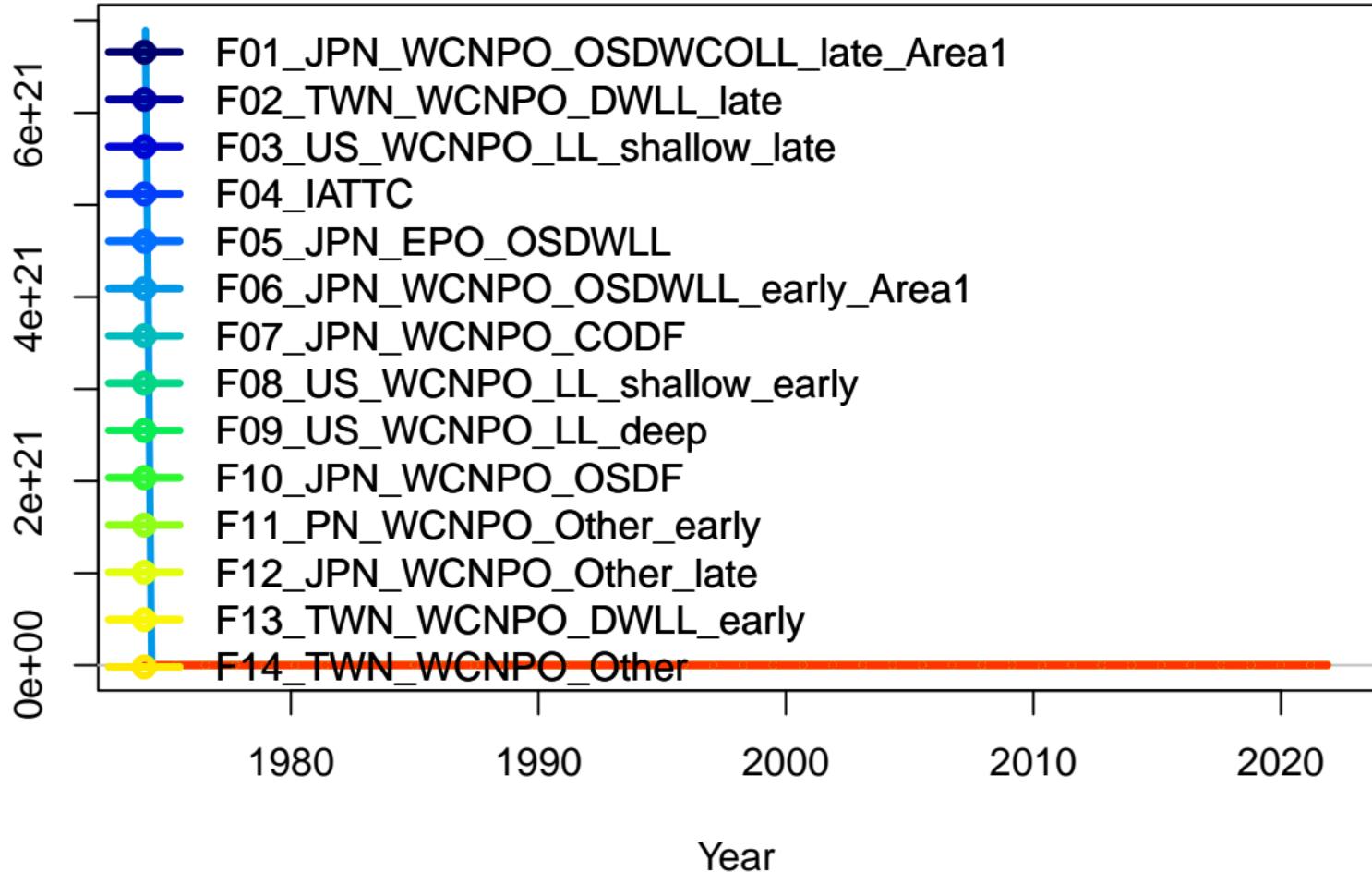






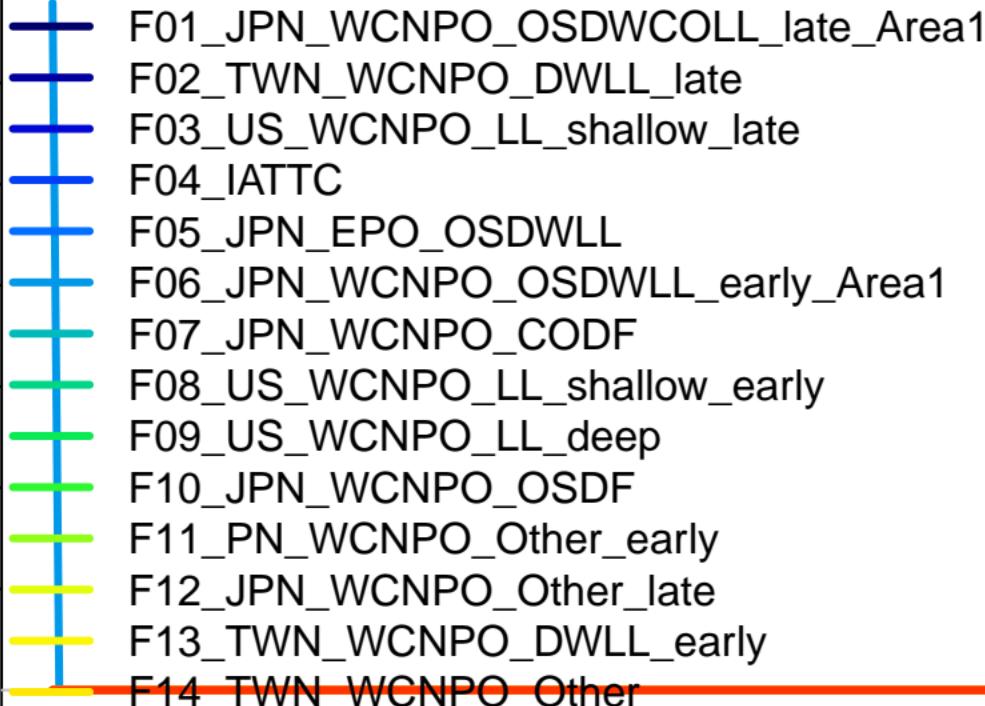


Observed and expected Landings (mt)



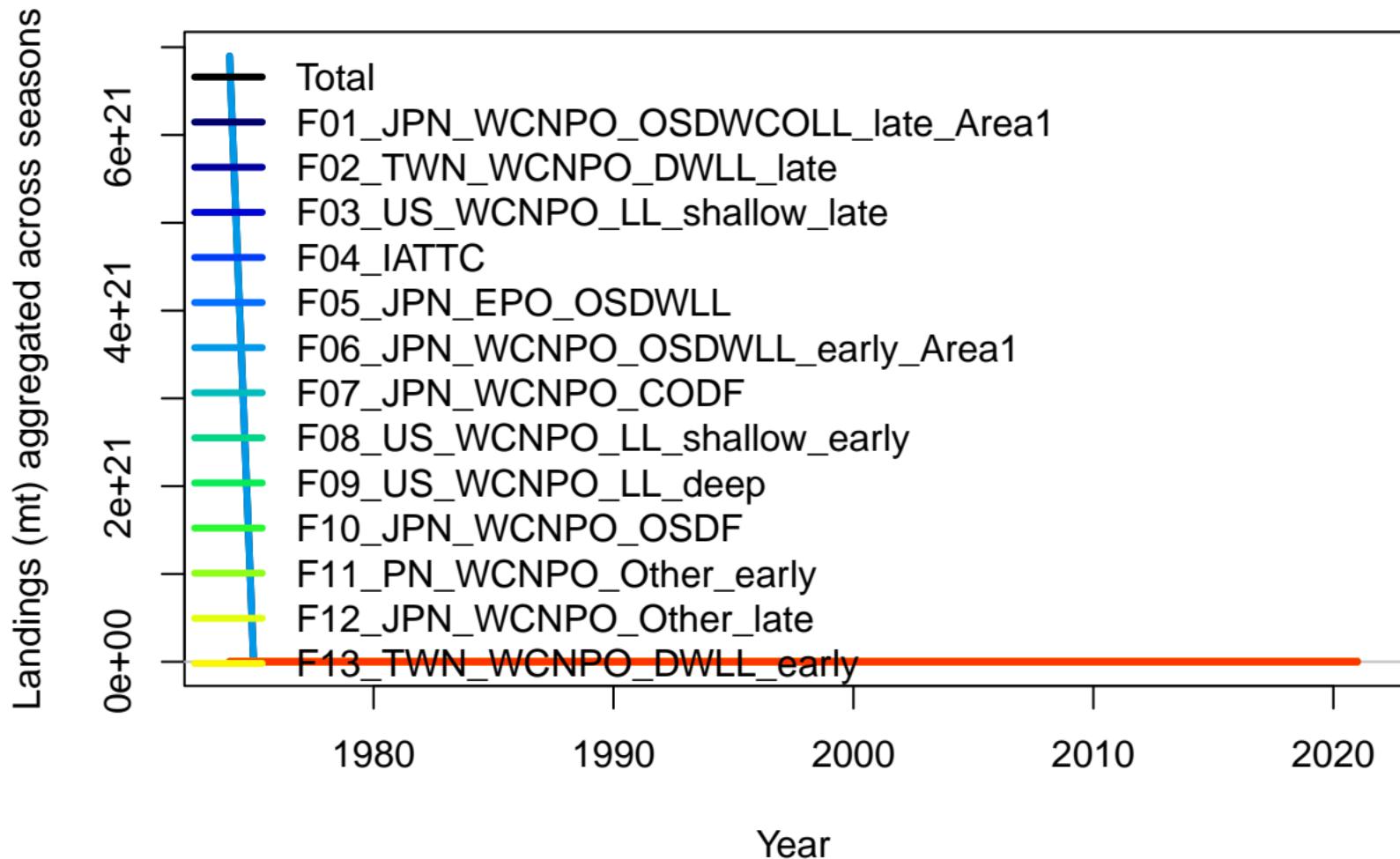
Continuous F

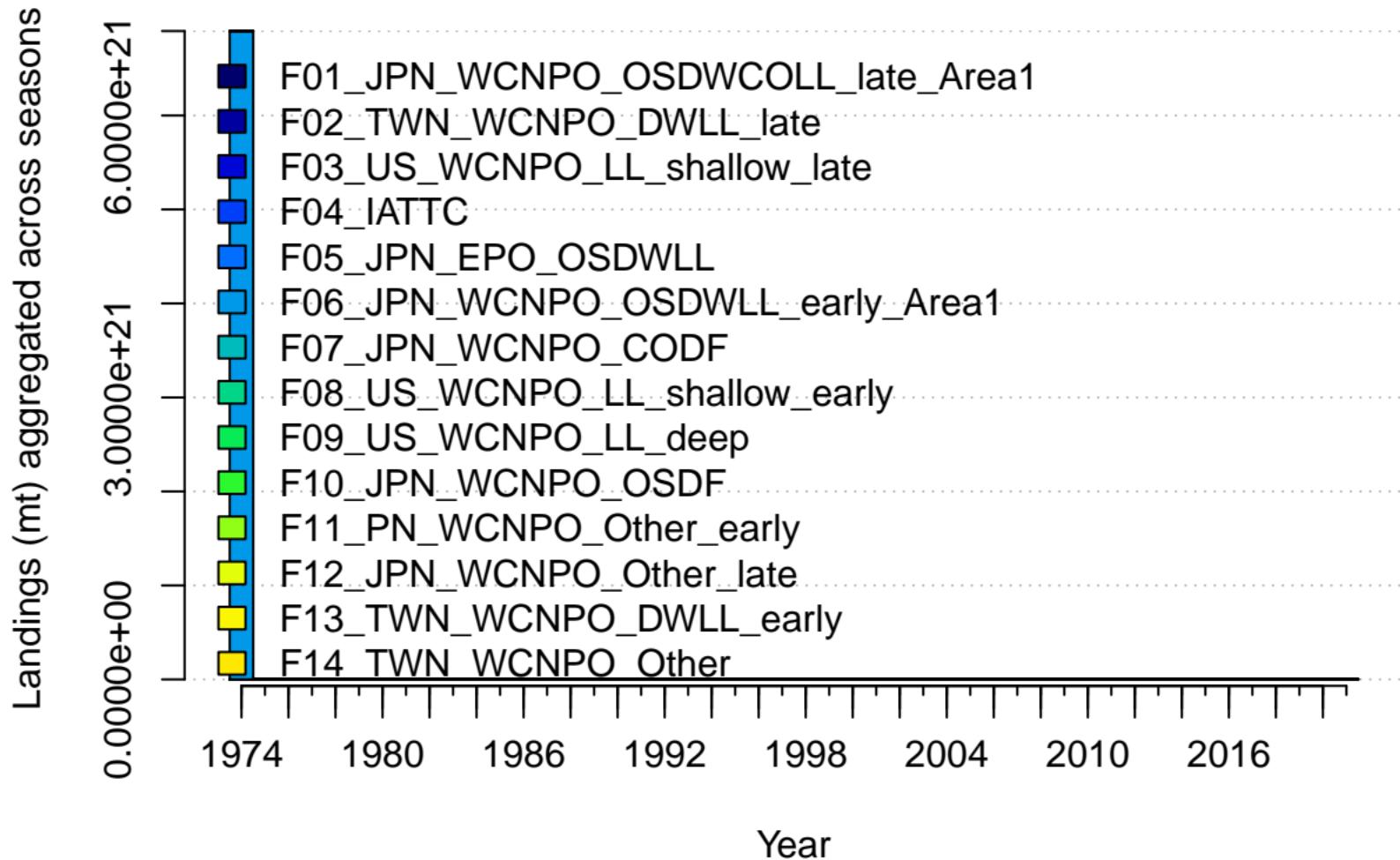
0.30  
0.20  
0.10  
0.00

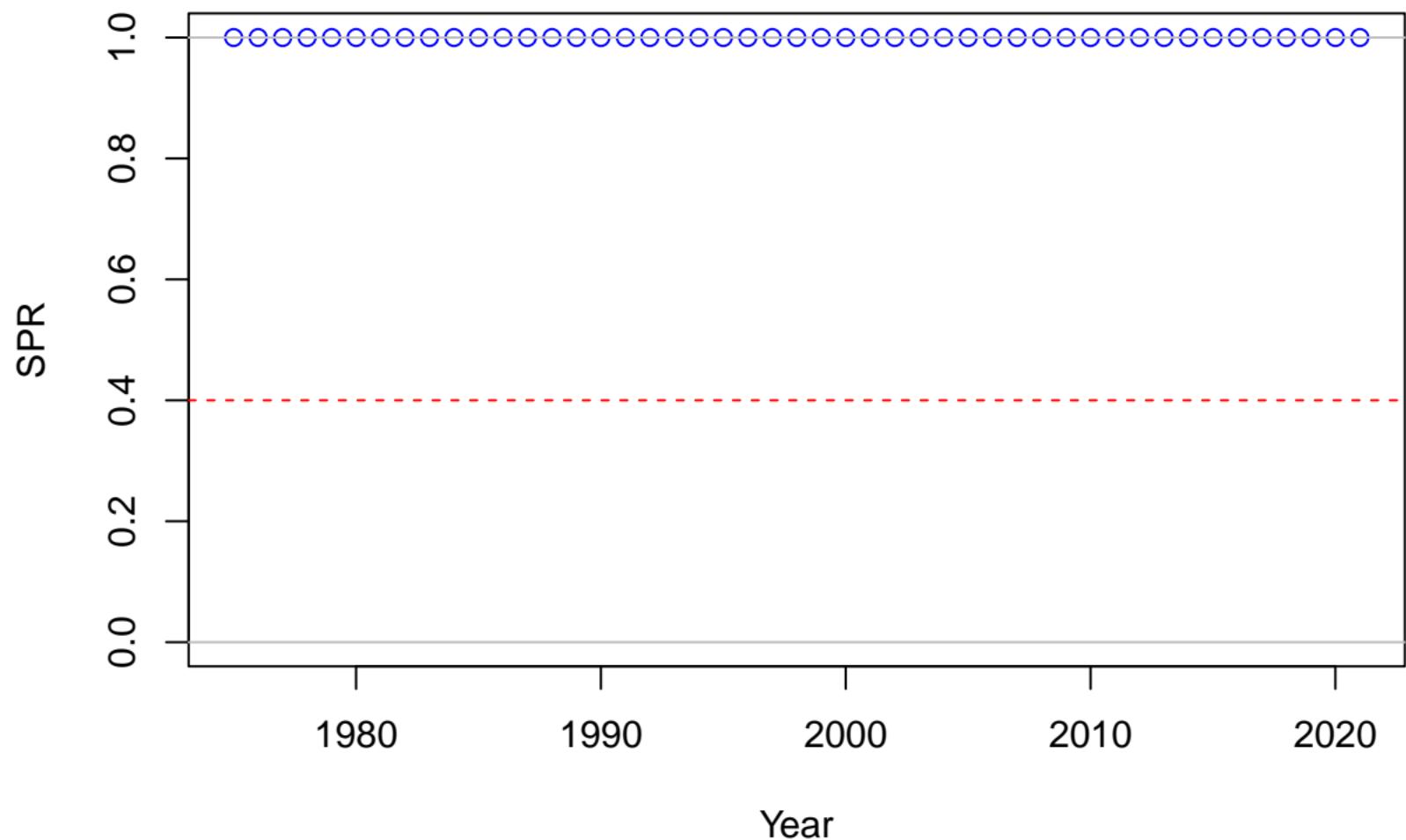


1980 1990 2000 2010 2020

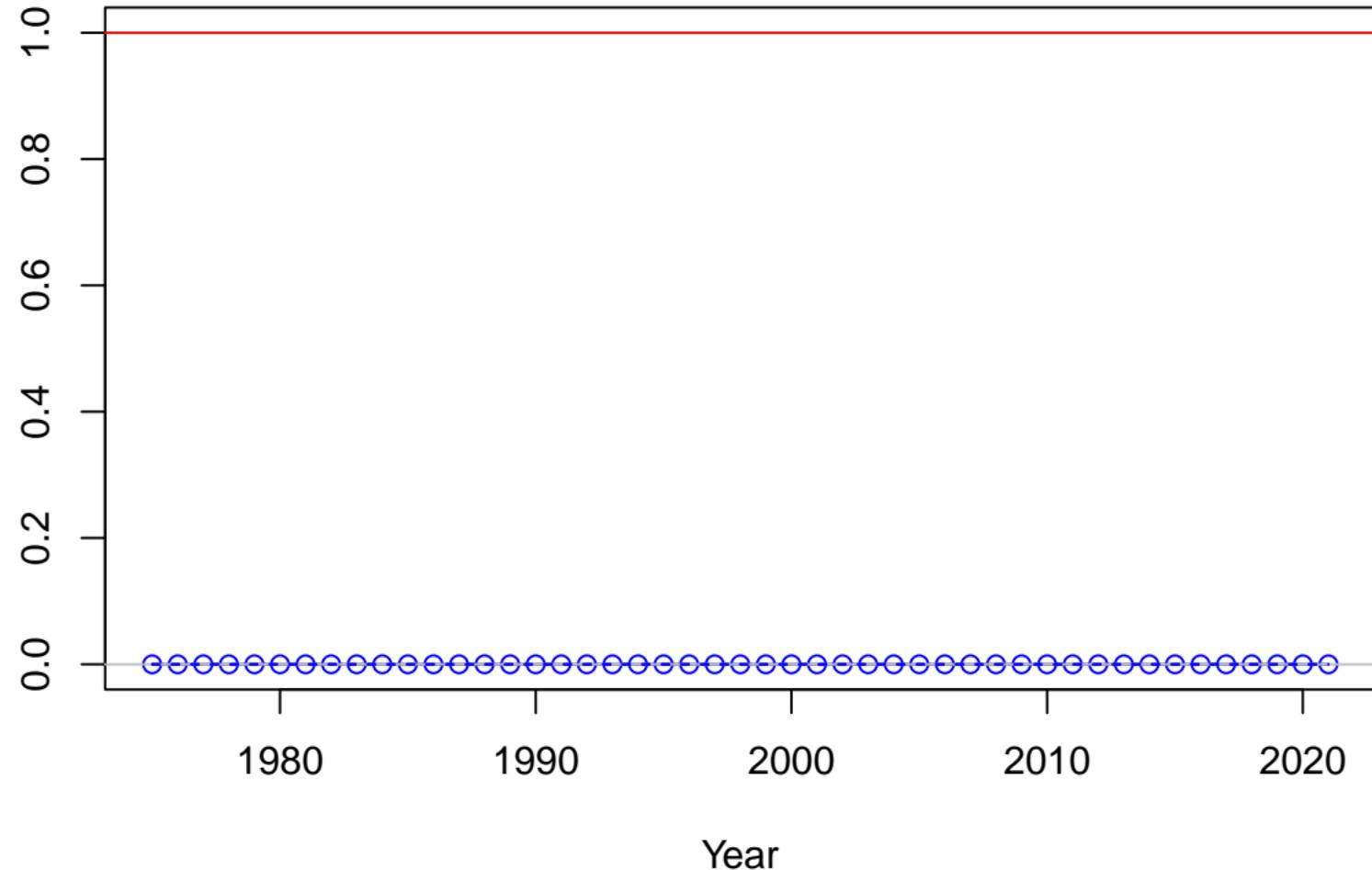
Year



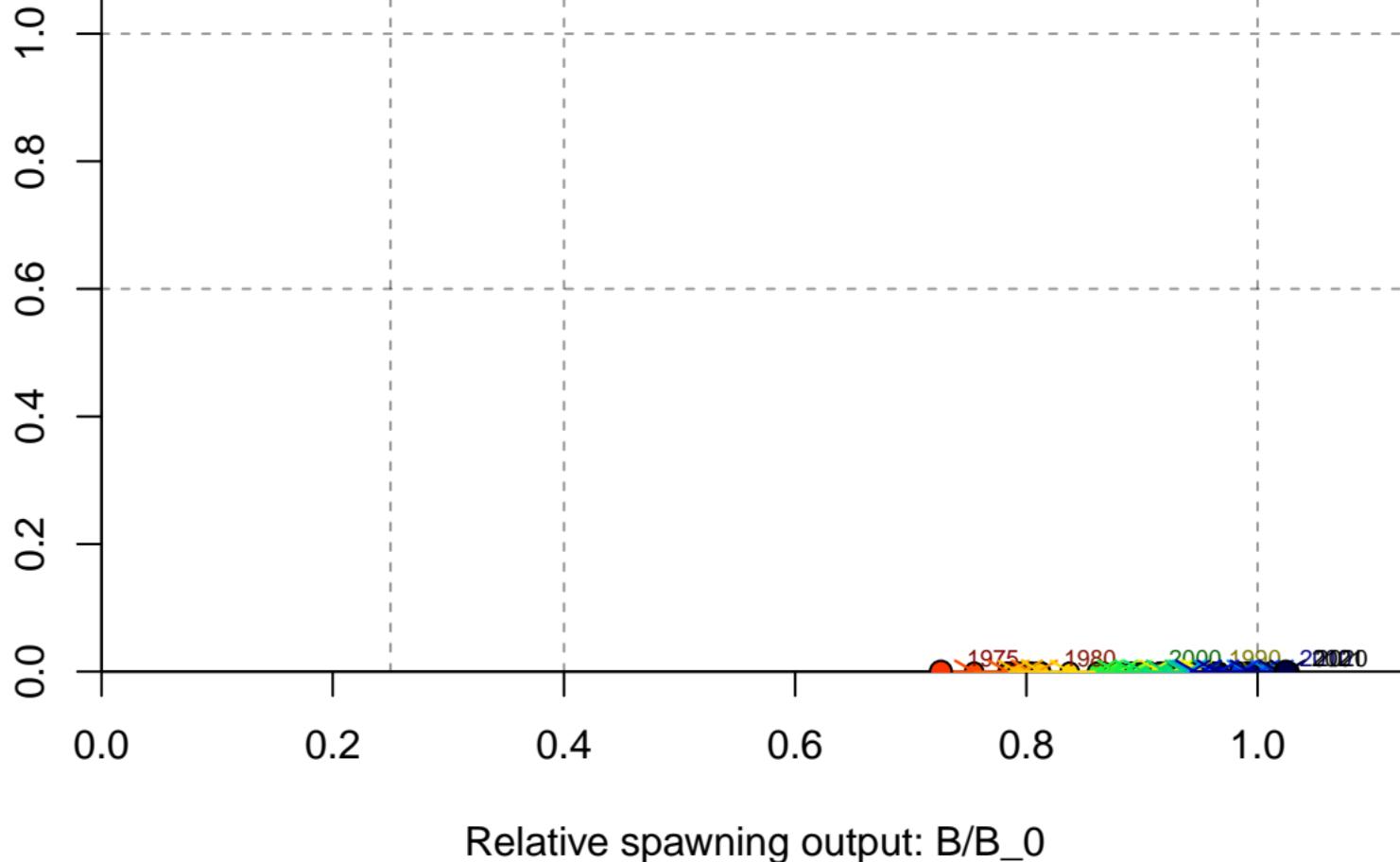


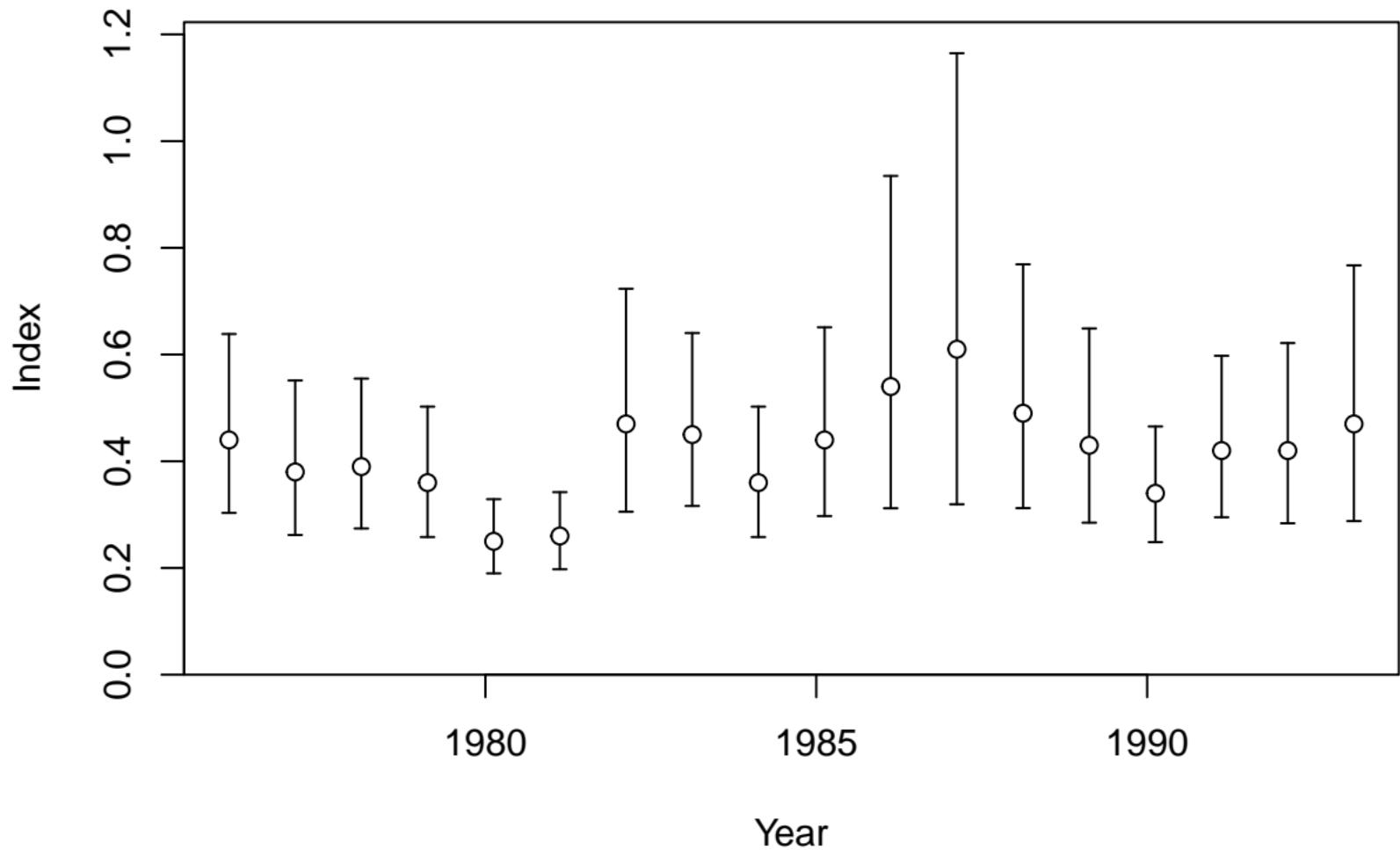


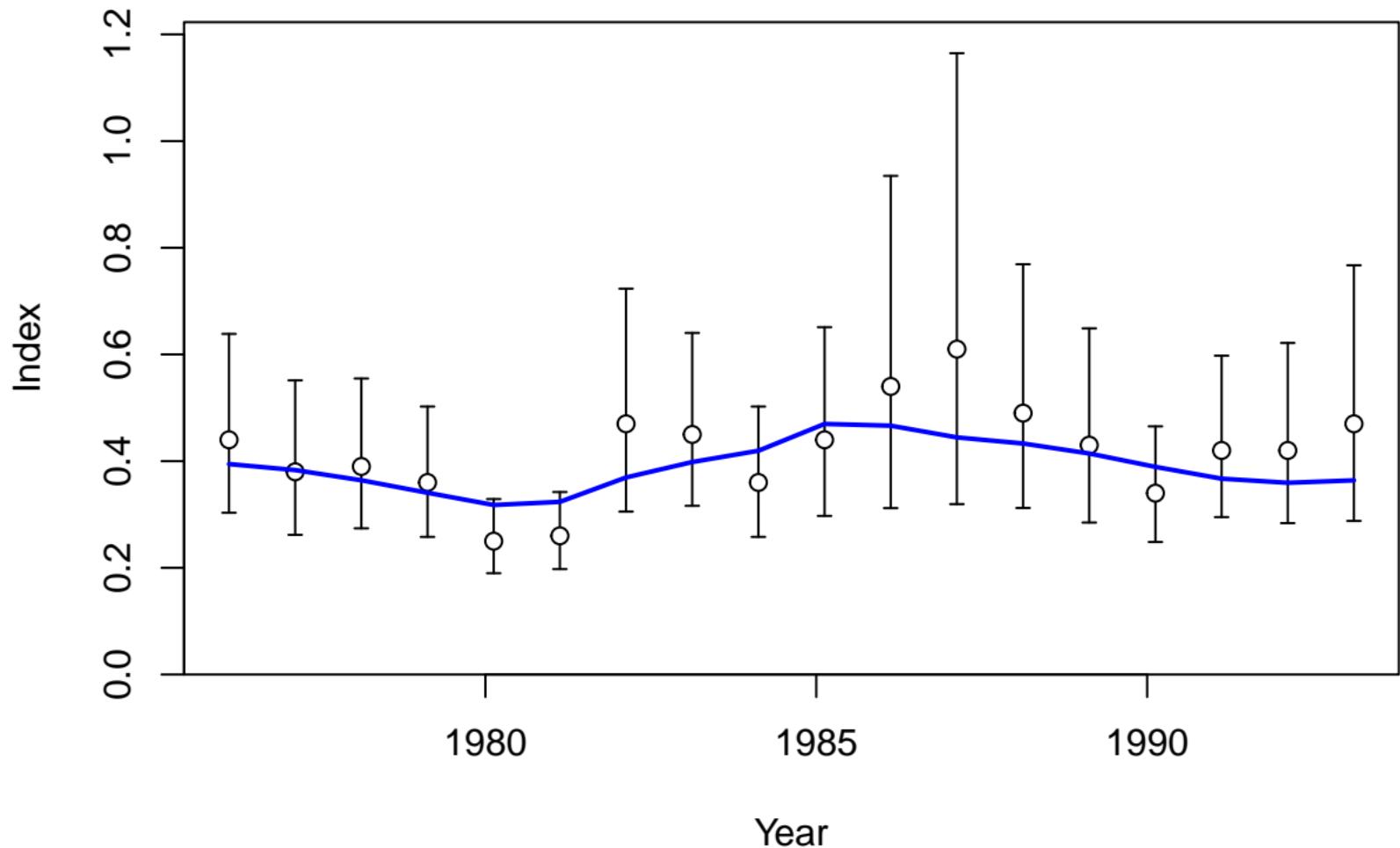
Fishing intensity: 1-SPR



Fishing intensity: 1-SPR





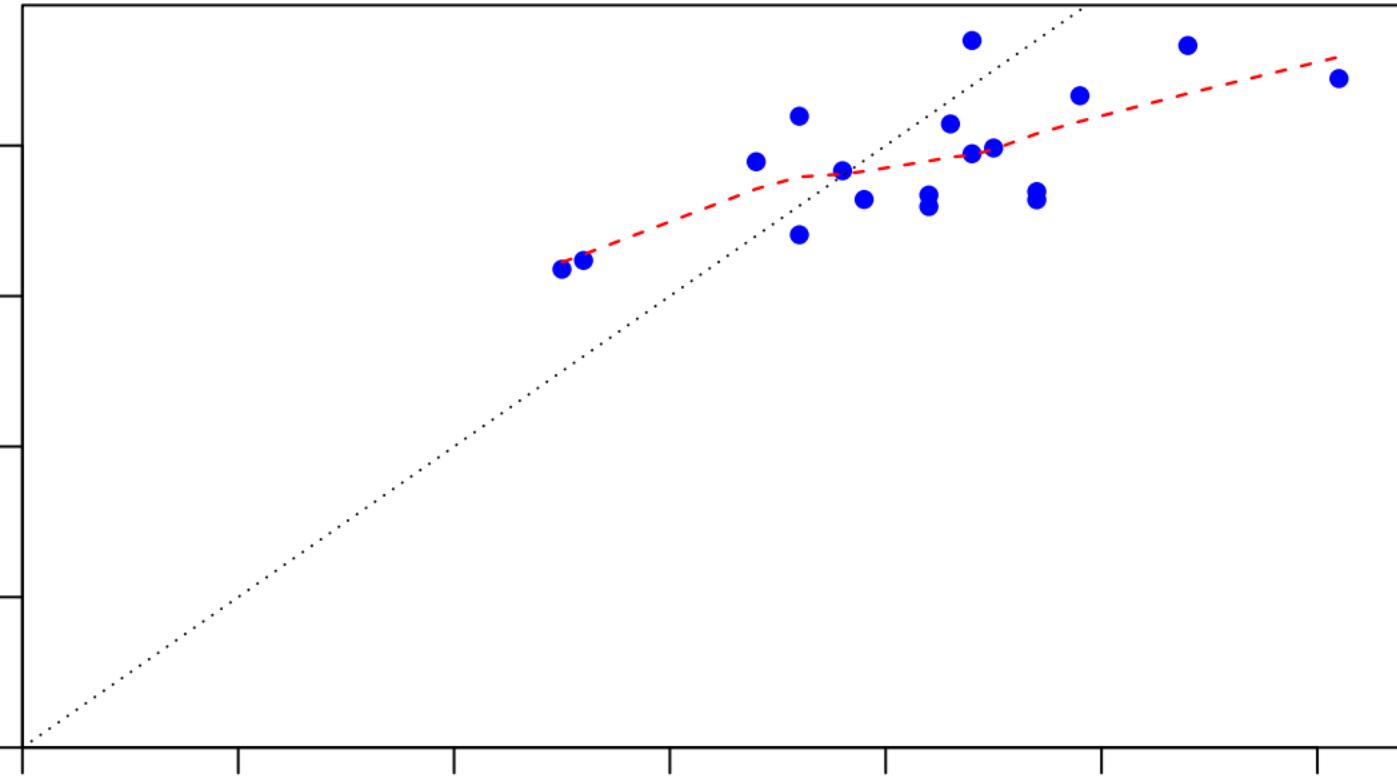


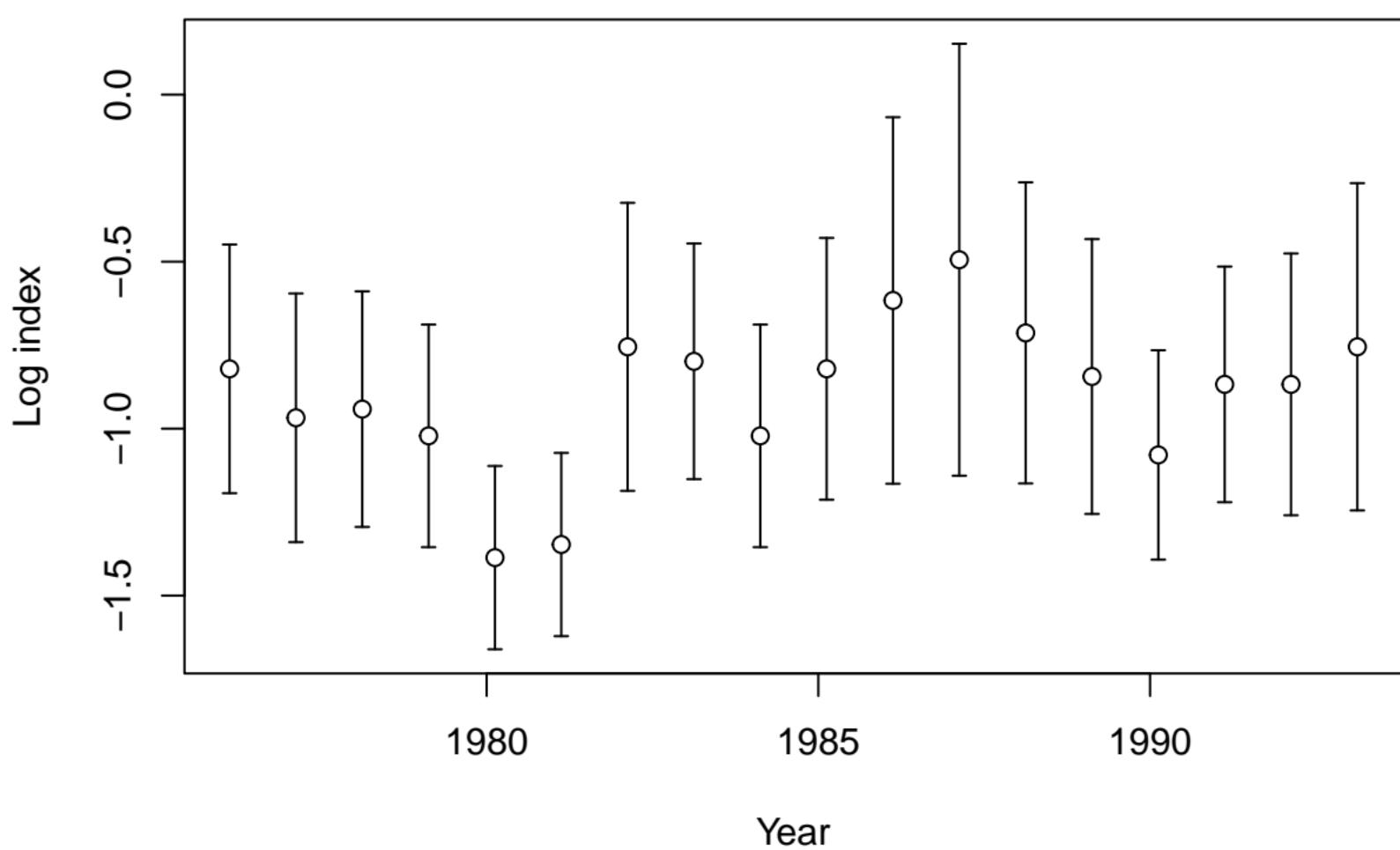
Expected index

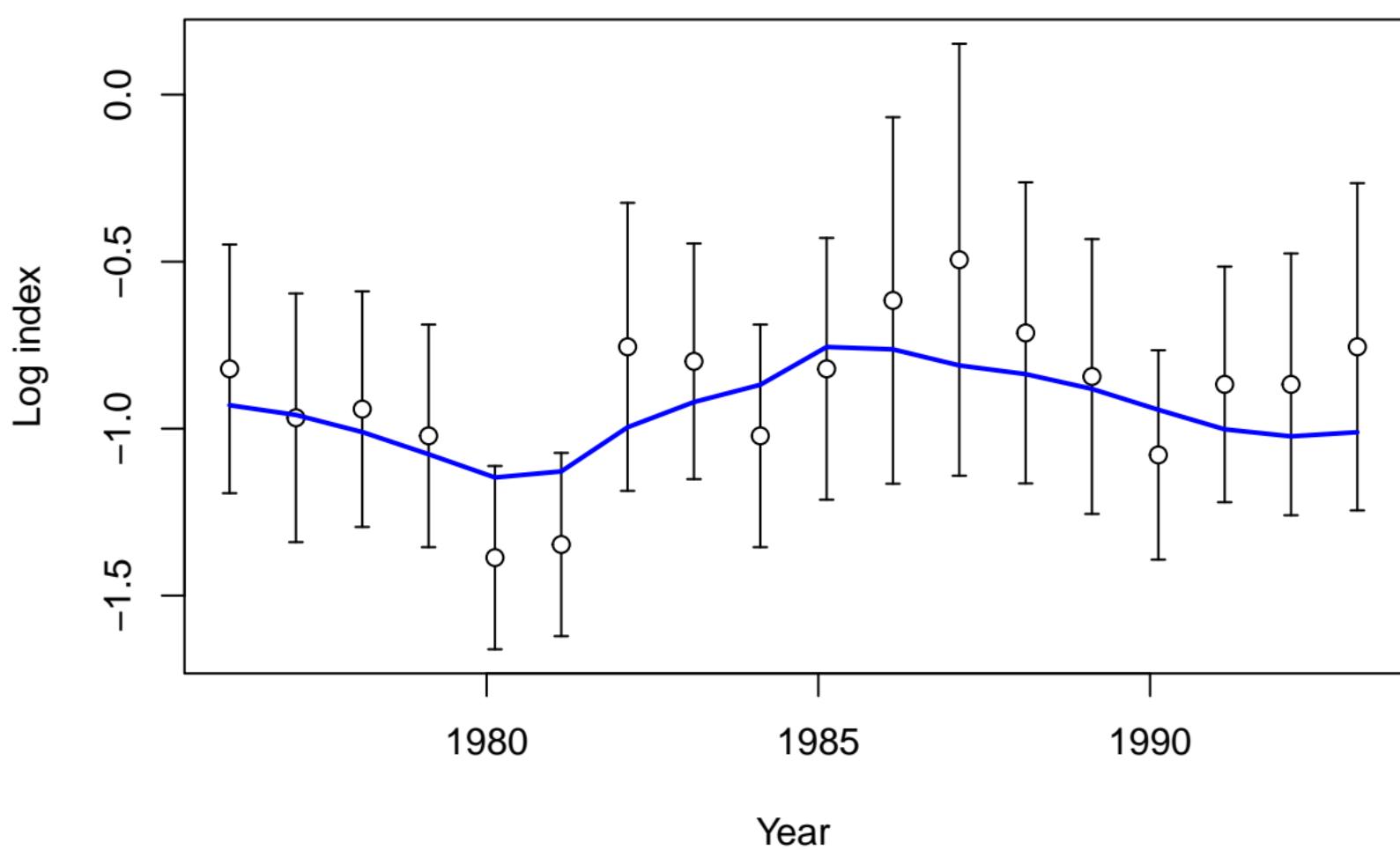
0.0 0.1 0.2 0.3 0.4

0.0 0.1 0.2 0.3 0.4 0.5 0.6

Observed index







Log expected index

-1.1  
-1.0  
-0.9  
-0.8

-1.4

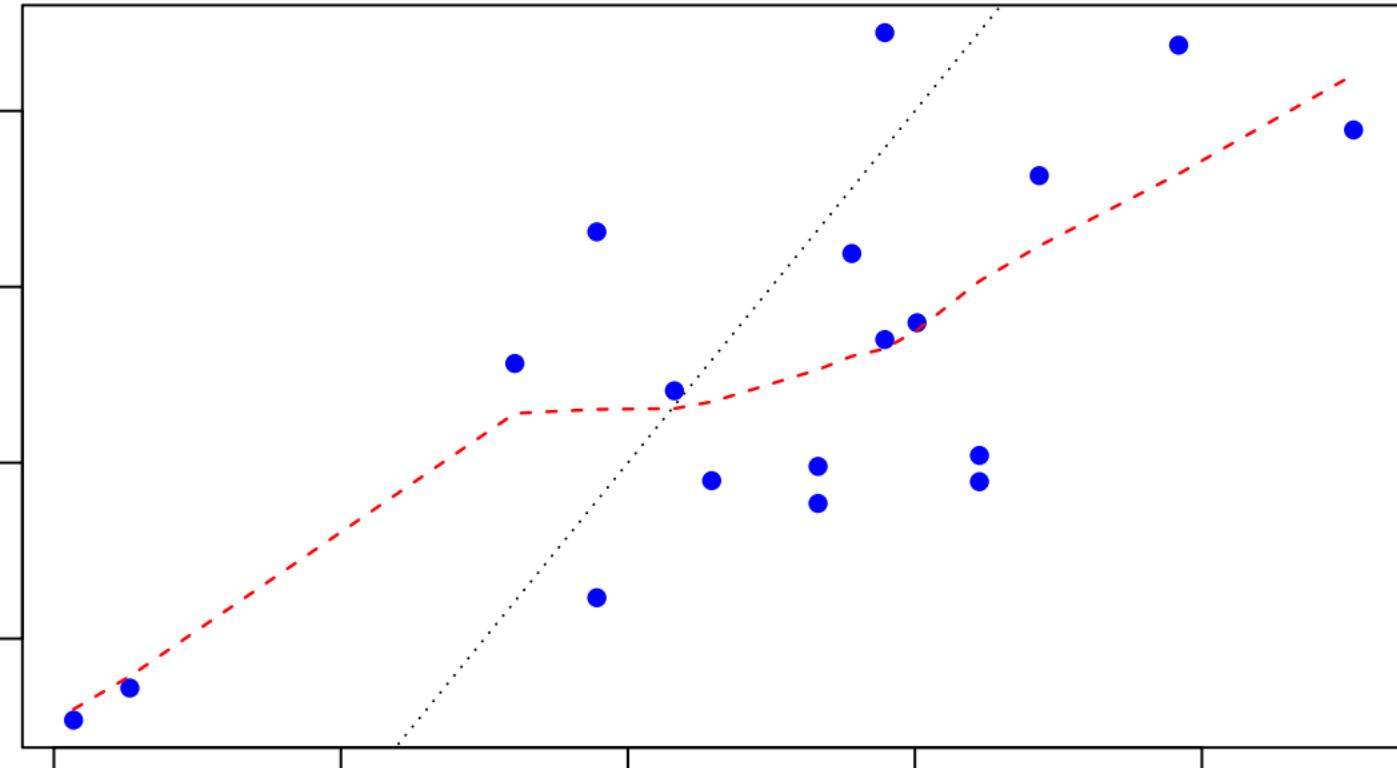
-1.2

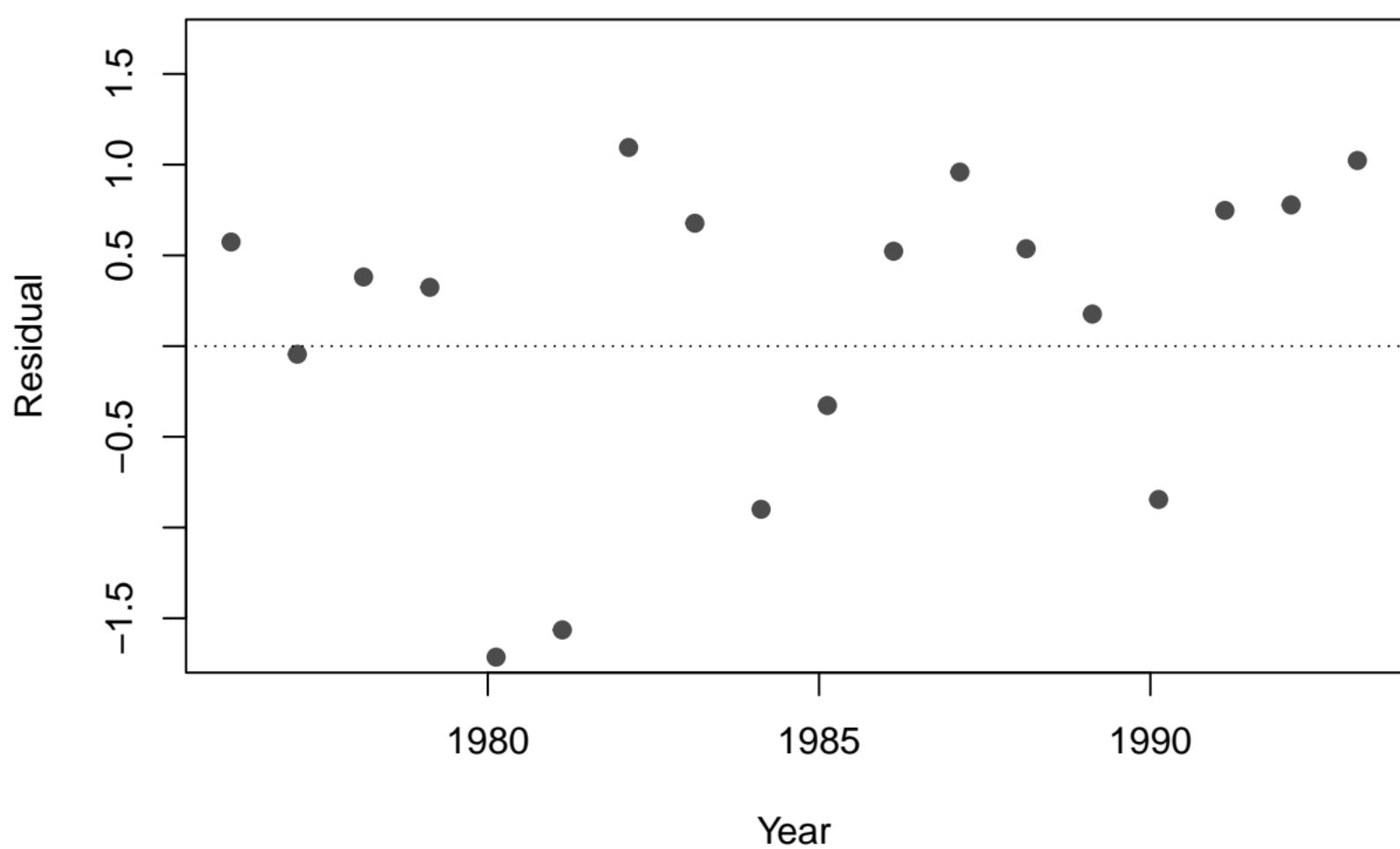
Log observed index

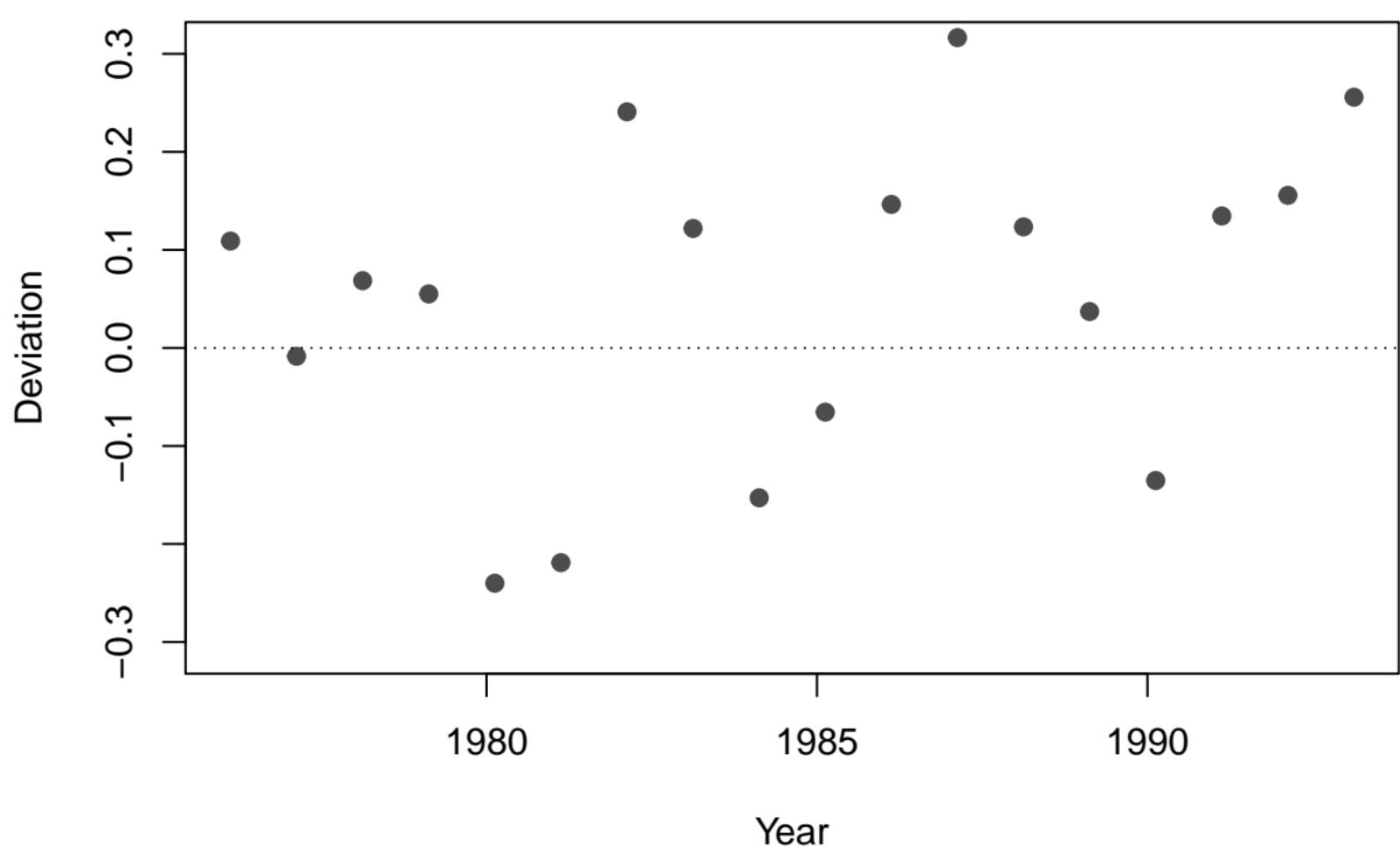
-1.0

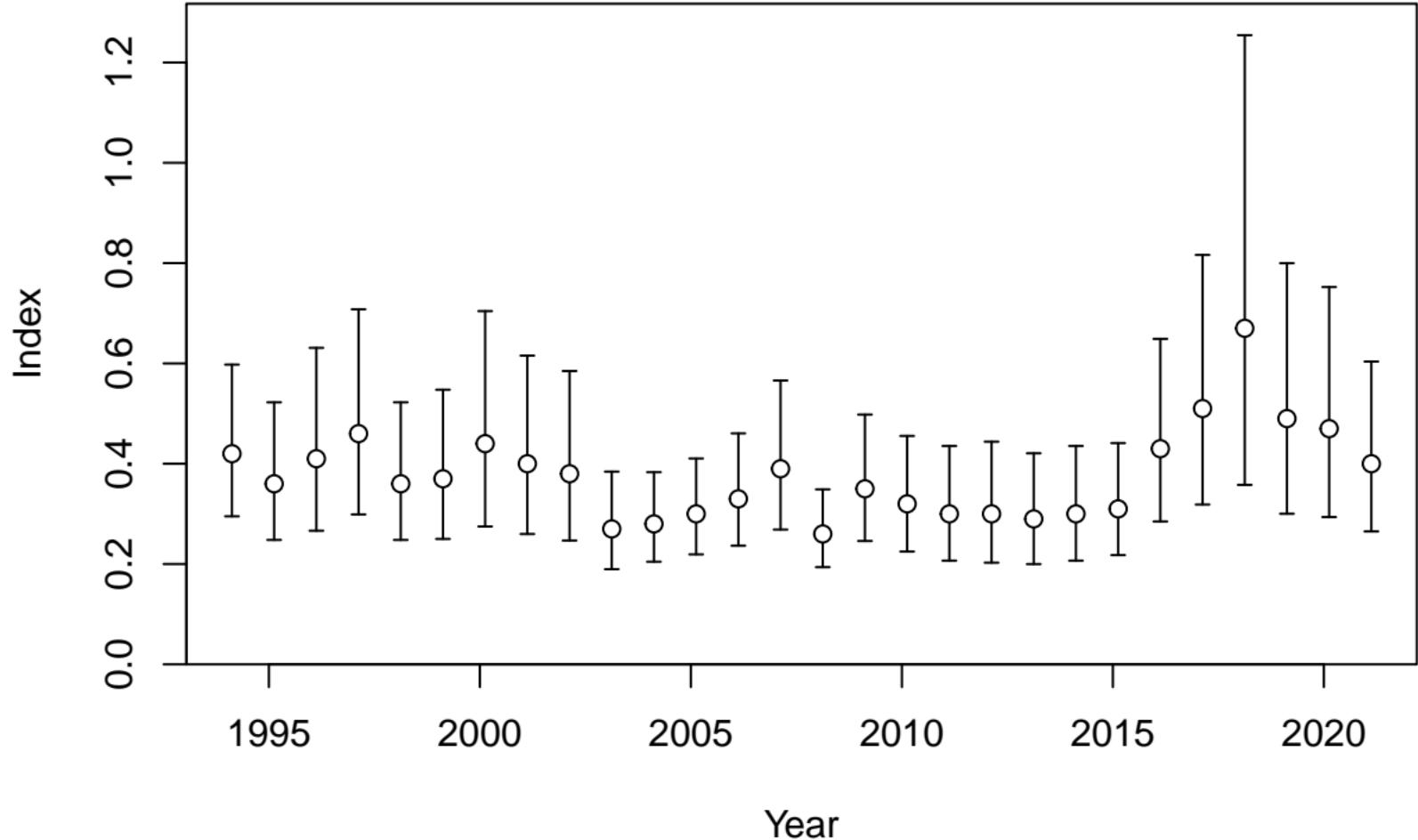
-0.8

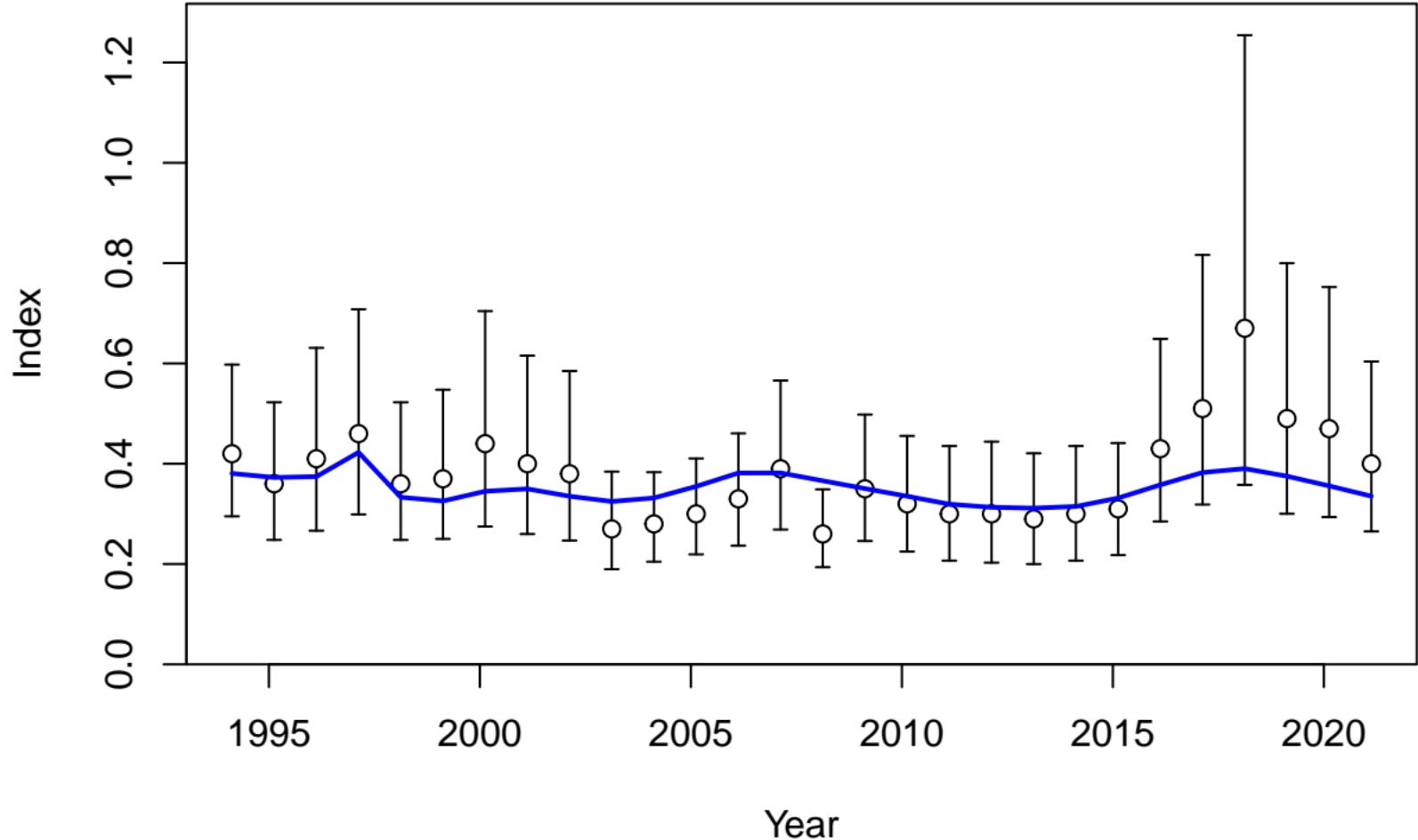
-0.6









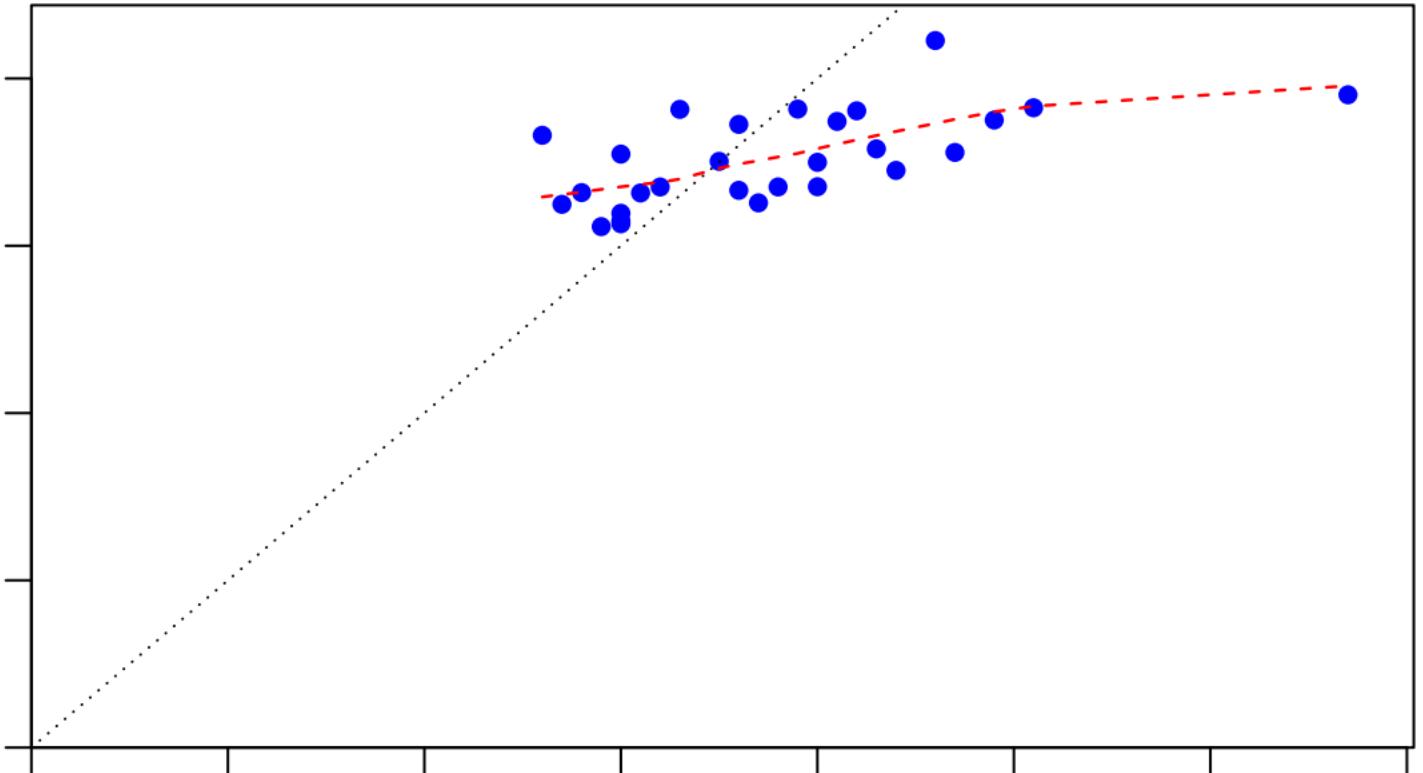


Expected index

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

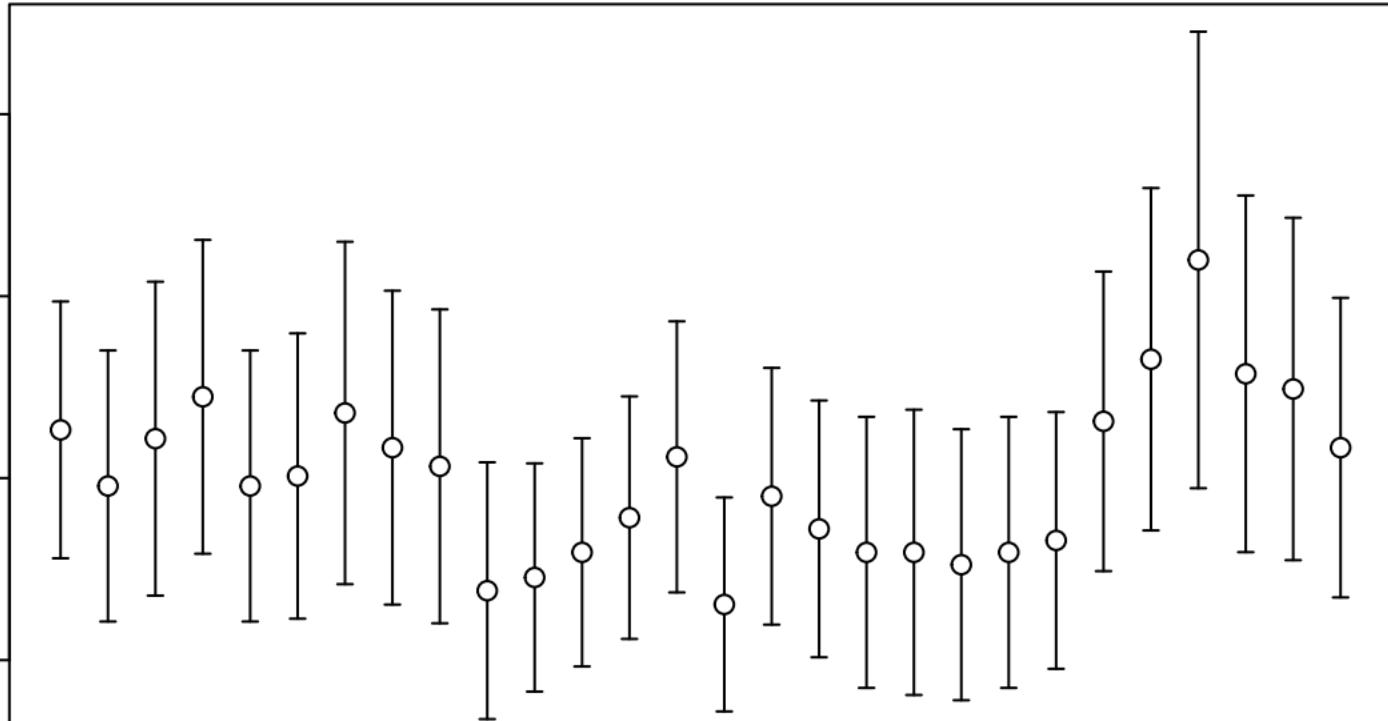


Log index

-1.5 -1.0 -0.5 0.0

1995 2000 2005 2010 2015 2020

Year

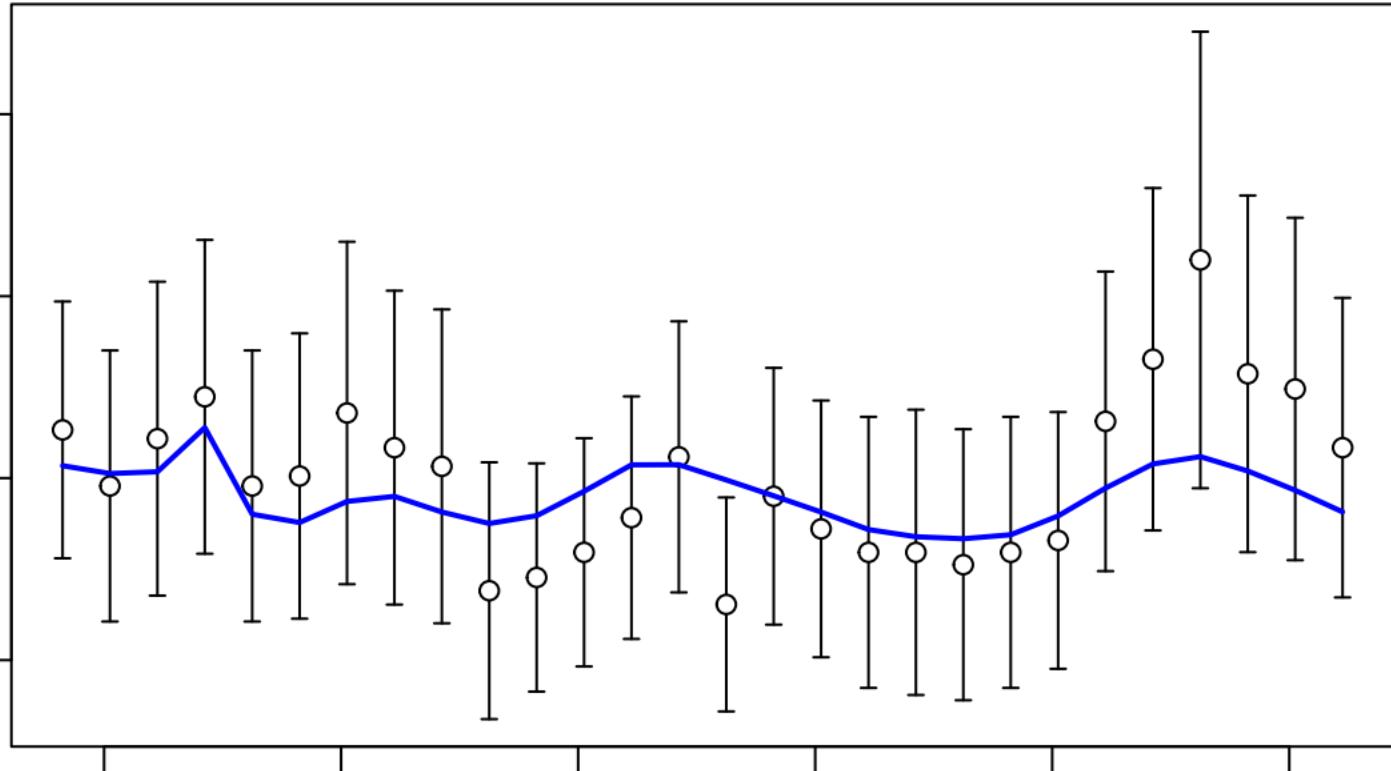


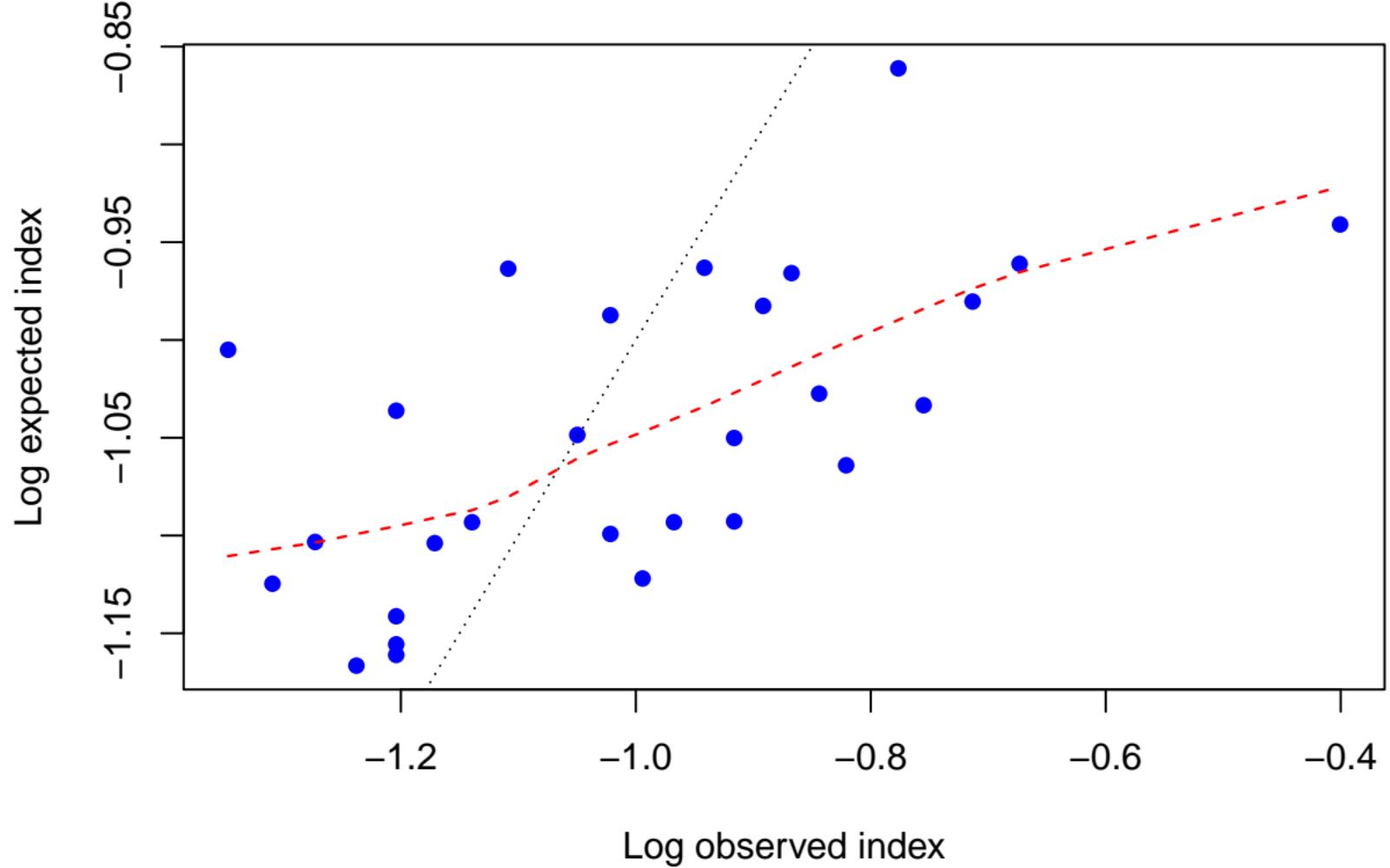
Log index

-1.5 -1.0 -0.5 0.0

1995 2000 2005 2010 2015 2020

Year





Residual

2

1

0

-1

-2

1995

2000

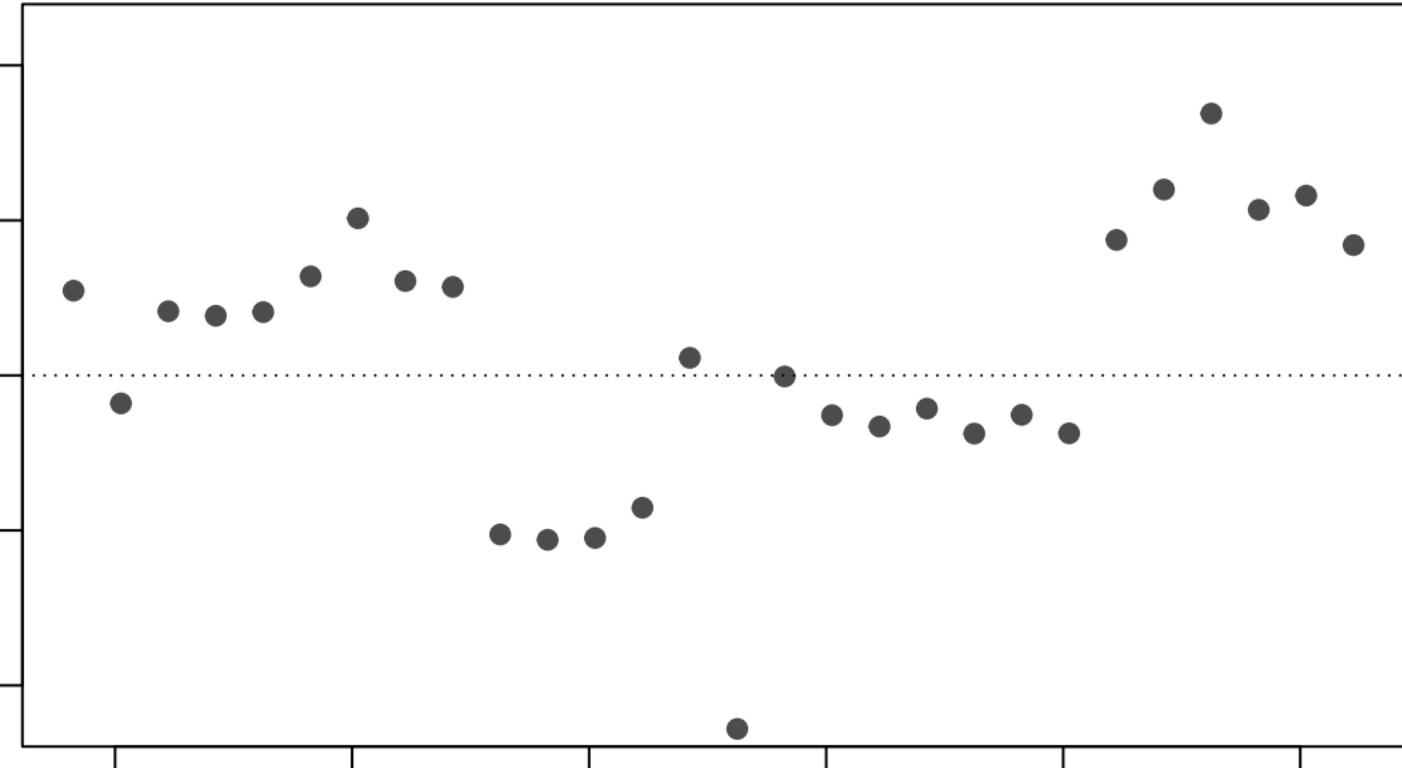
2005

2010

2015

2020

Year

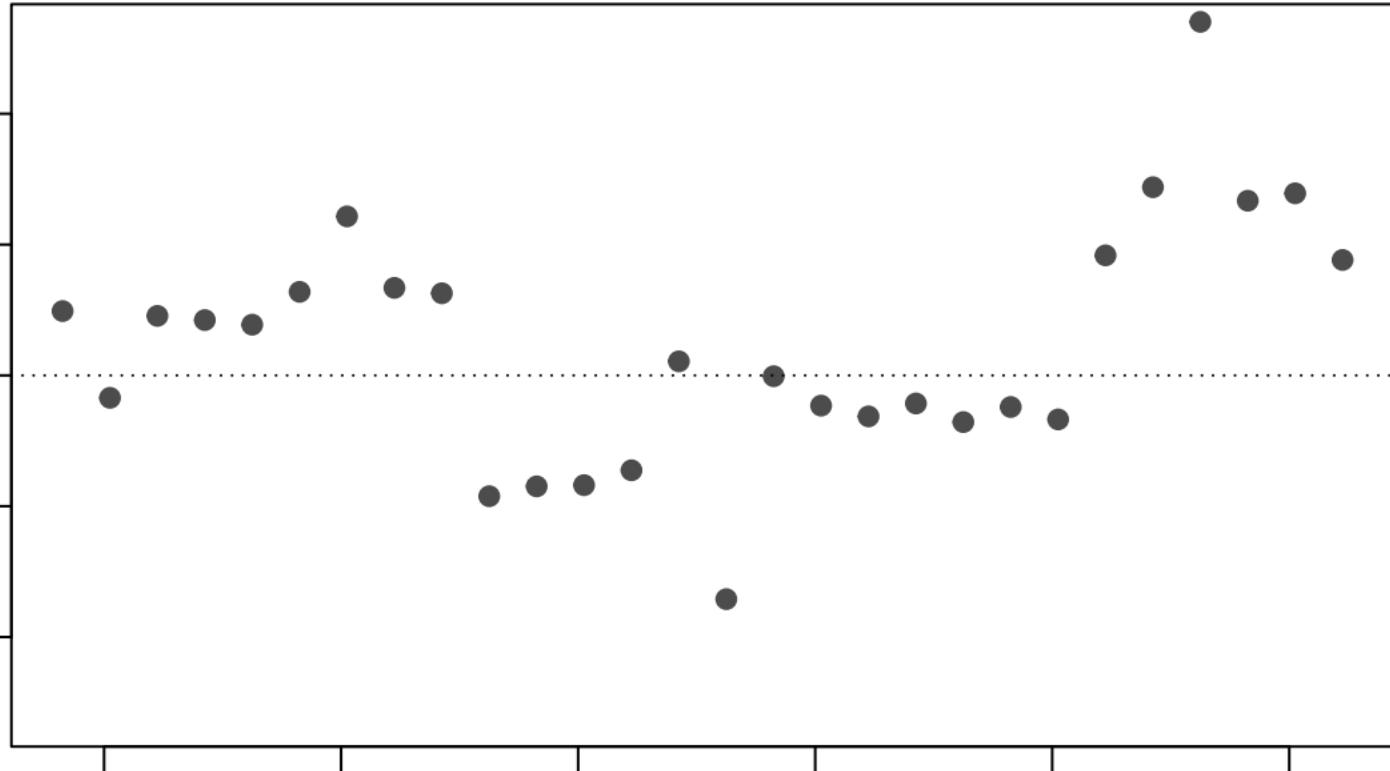


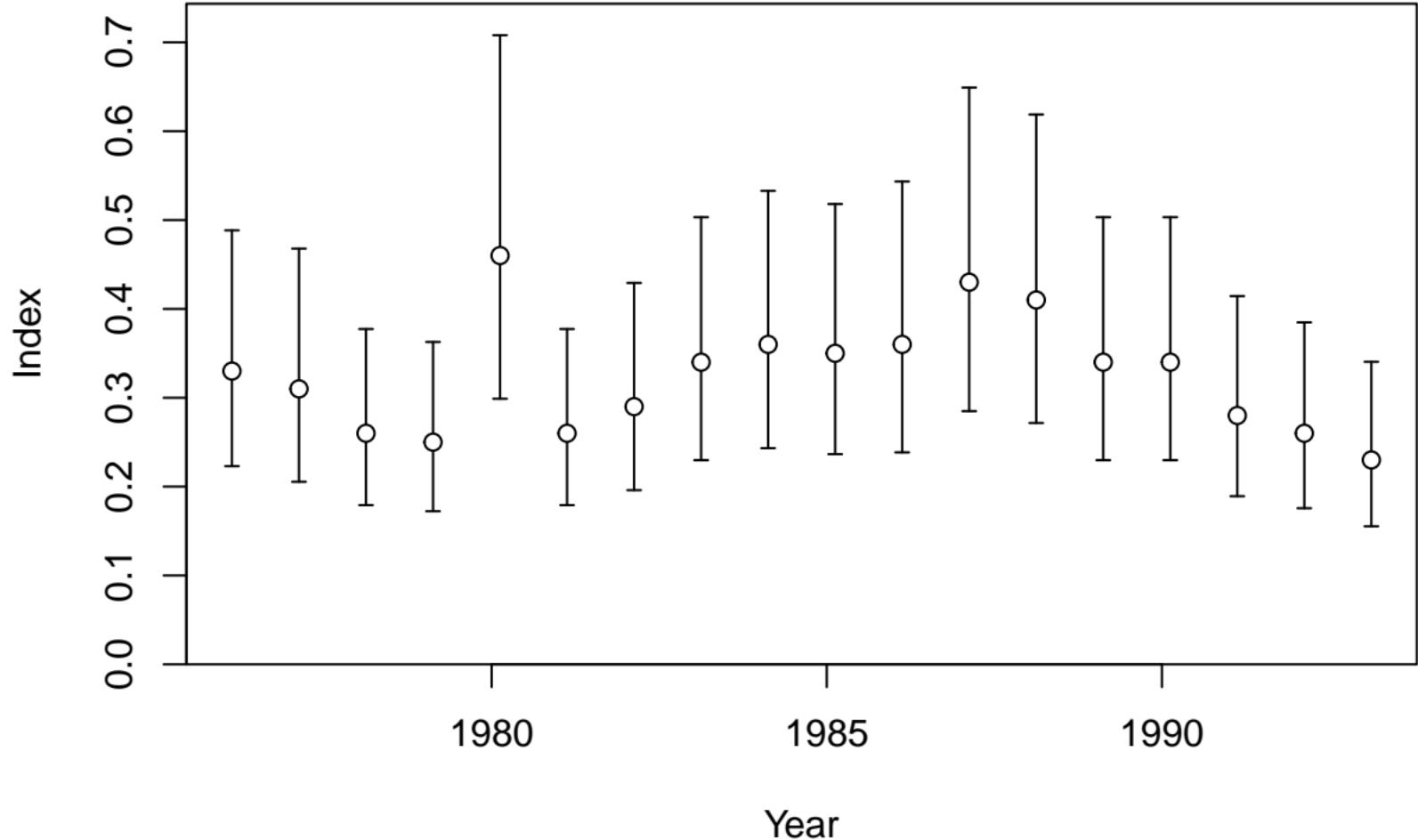
Deviation

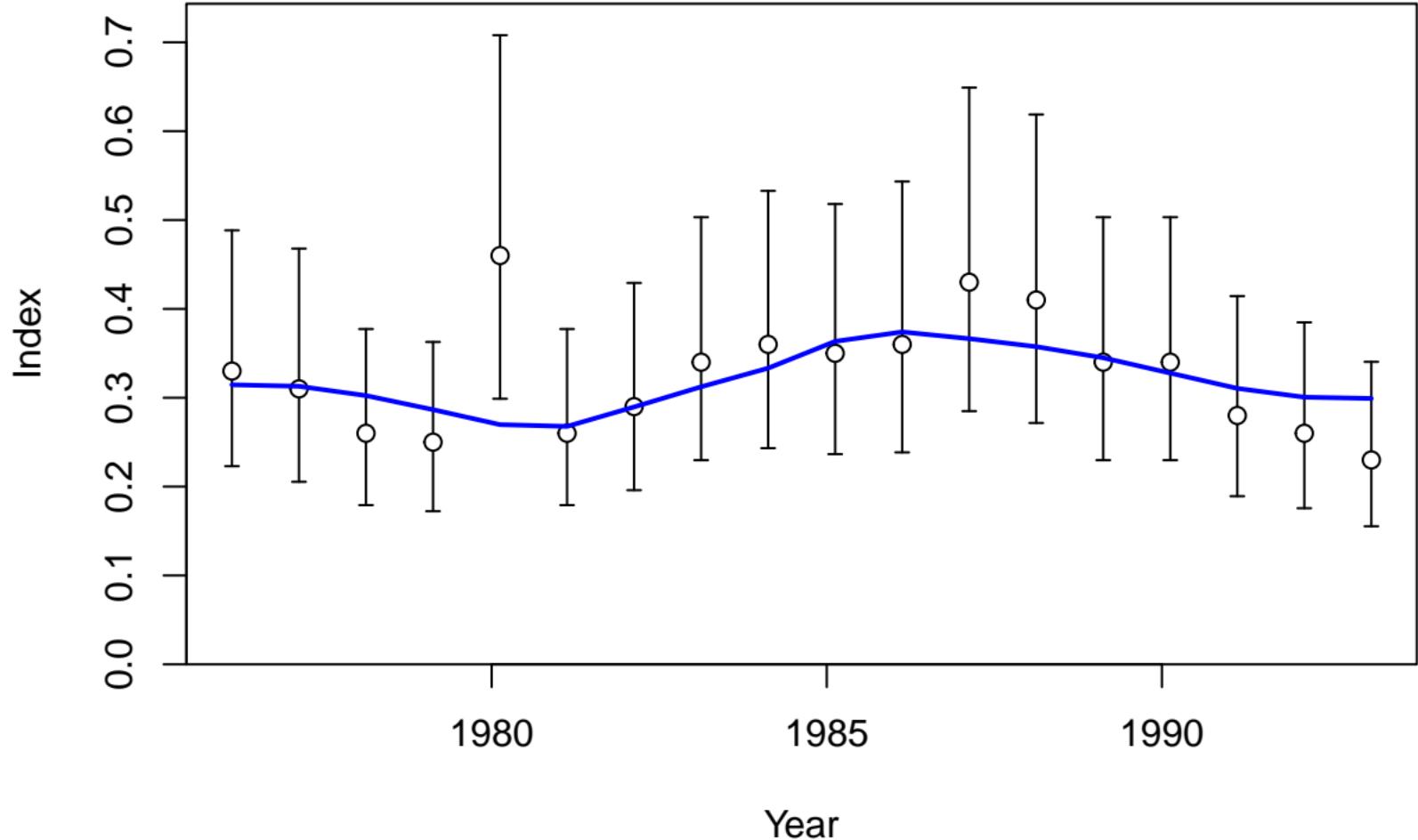
-0.4 -0.2 0.0 0.2 0.4

1995 2000 2005 2010 2015 2020

Year





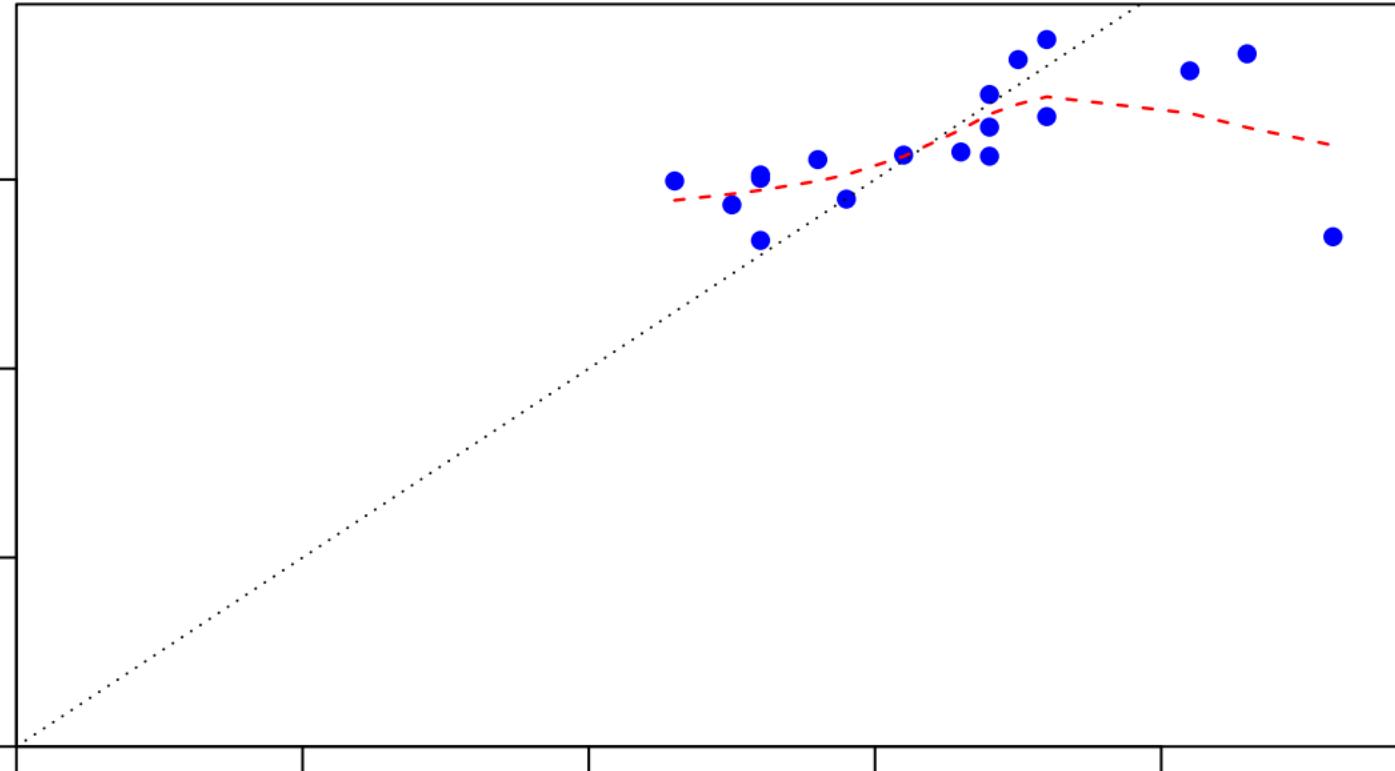


Expected index

0.0  
0.1  
0.2  
0.3

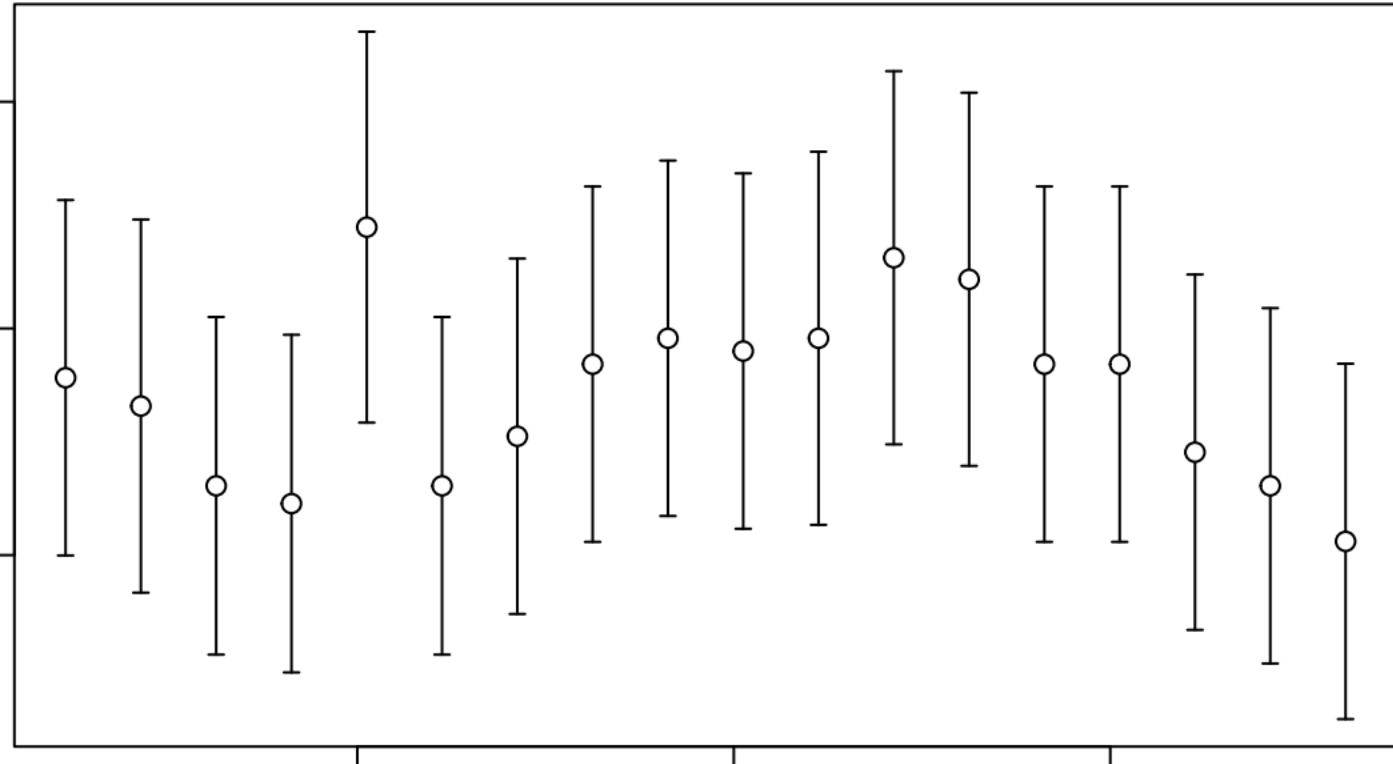
0.0 0.1 0.2 0.3 0.4

Observed index



Log index

-0.5  
-1.0  
-1.5



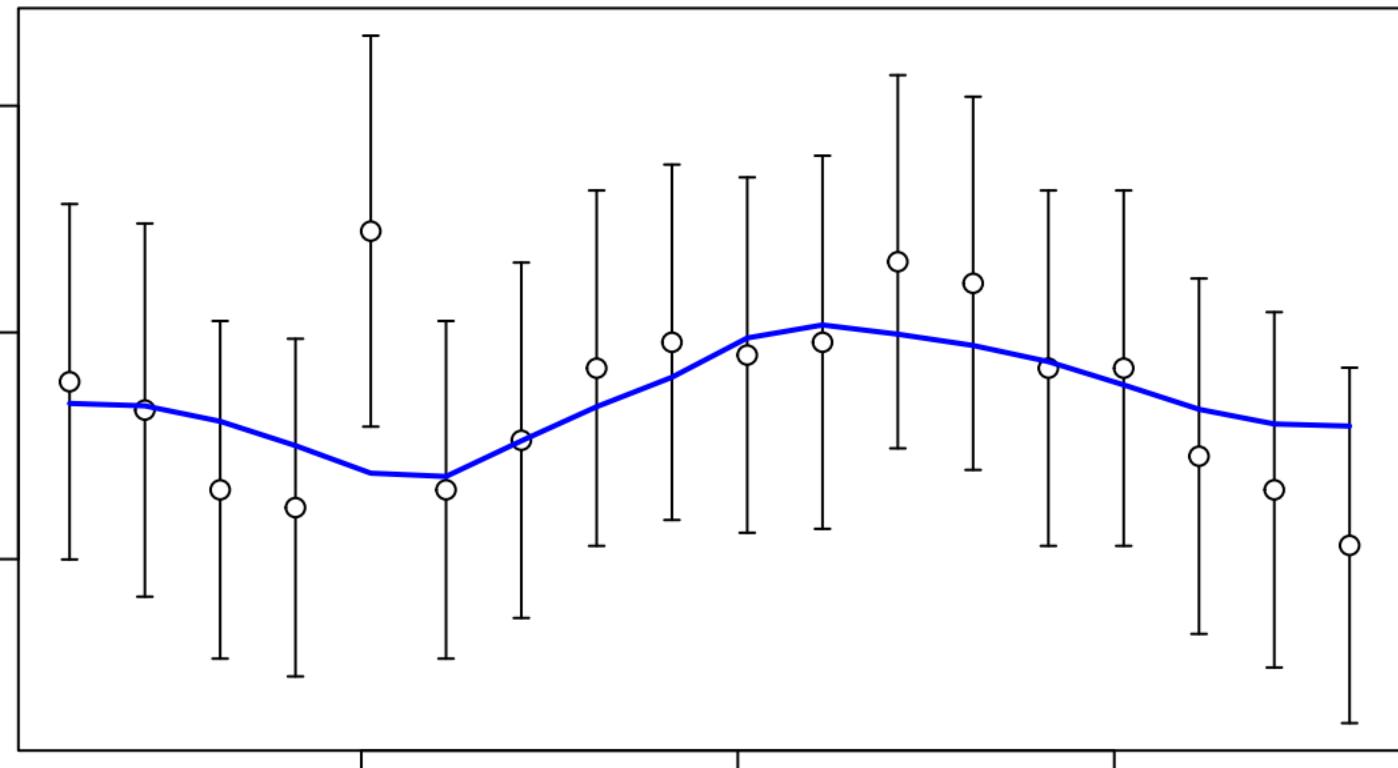
Year

Log index

-0.5  
-1.0  
-1.5

1980 1985 1990

Year

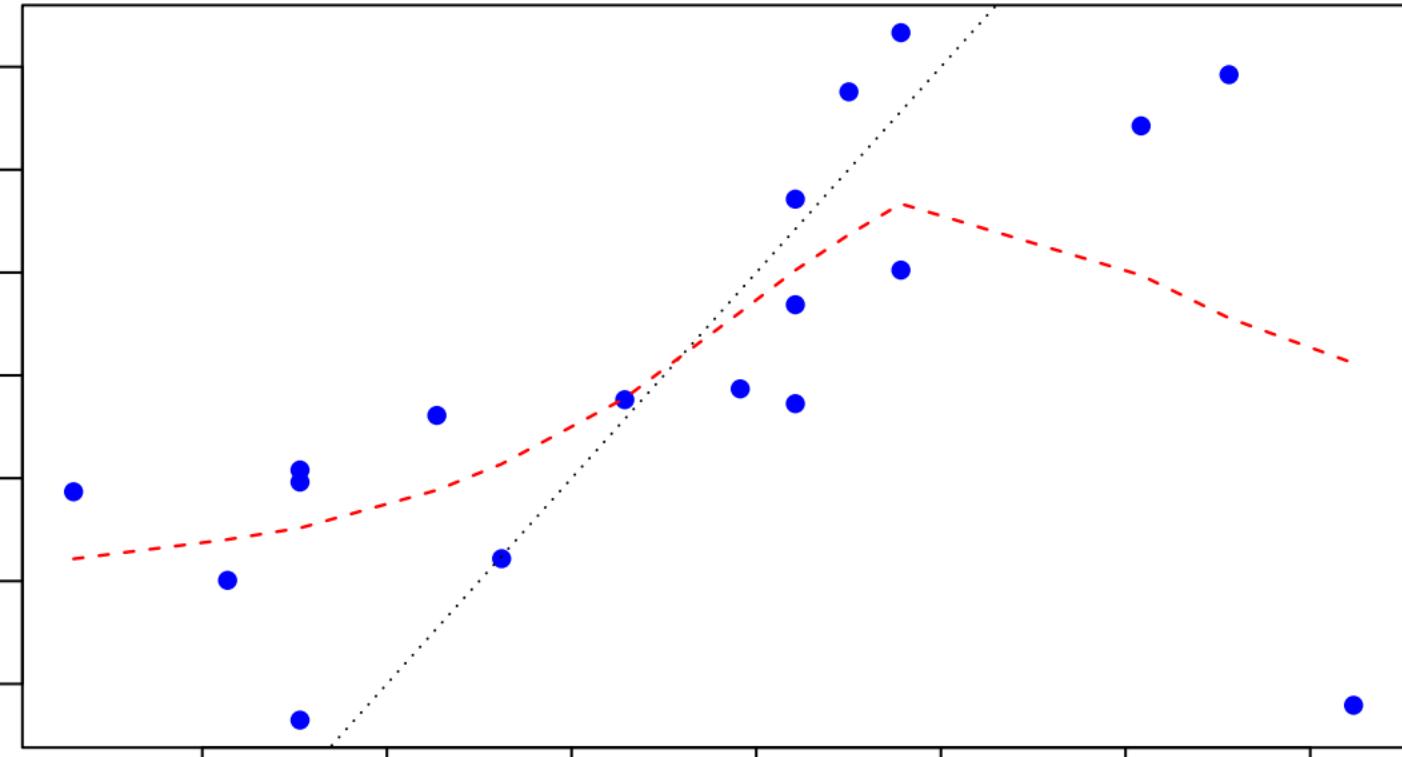


Log expected index

-1.30 -1.20 -1.10 -1.00

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

Log observed index



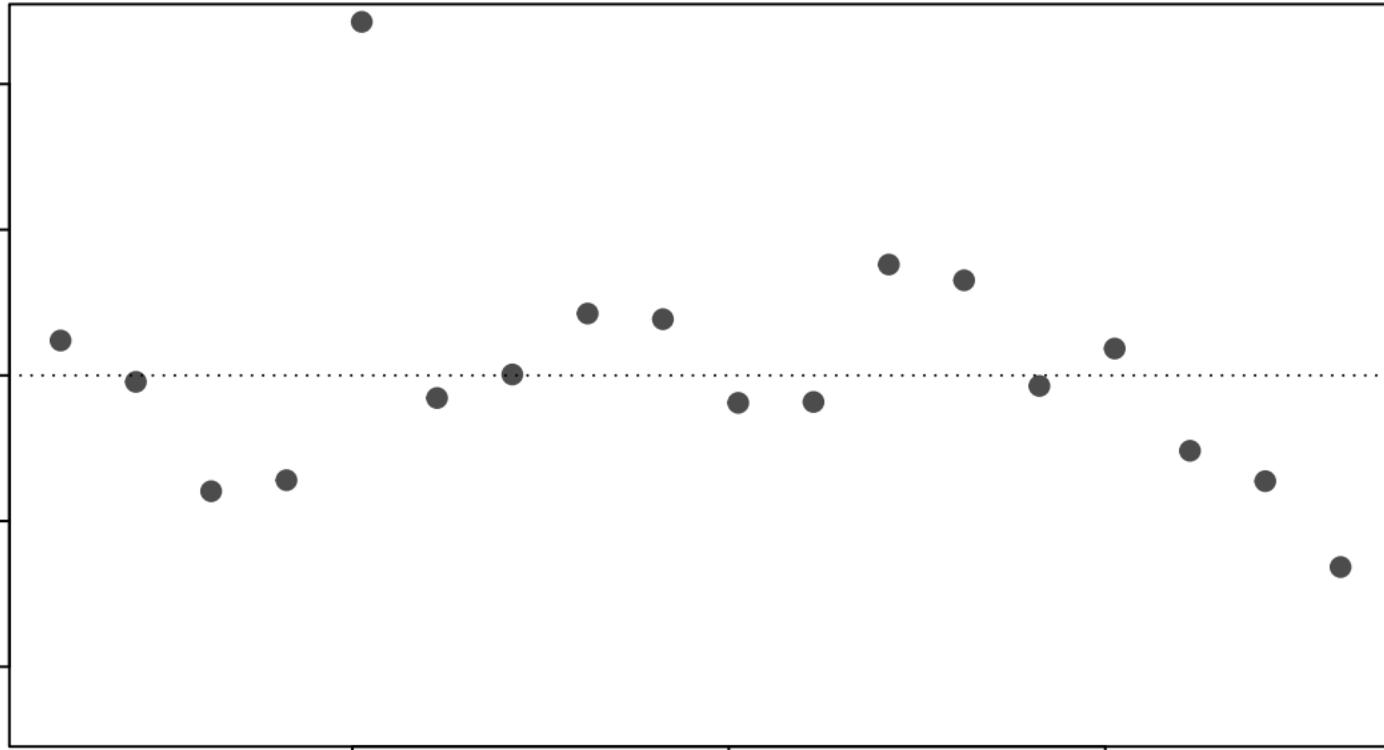
Residual

2  
1  
0  
-1  
-2

1980

Year

1985 1990



Deviation

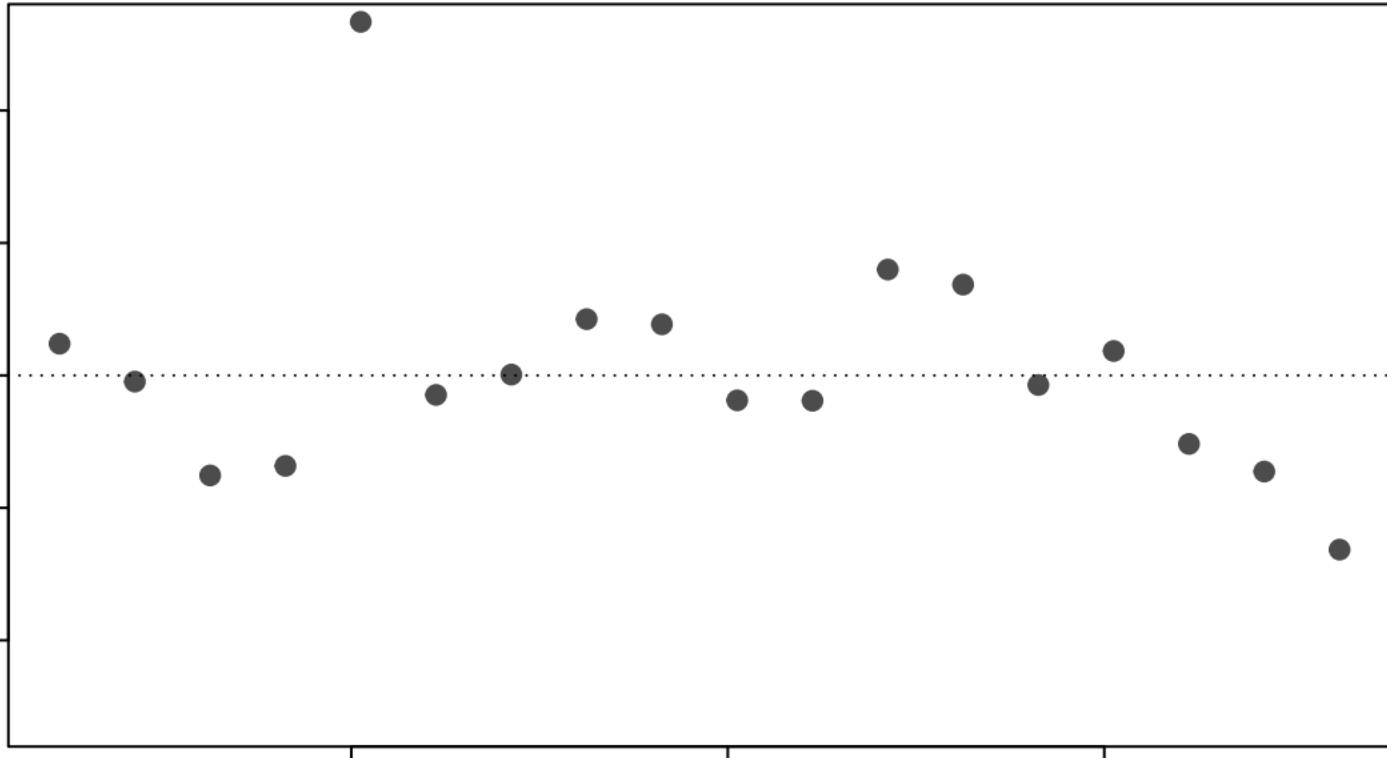
-0.4  
-0.2  
0.0  
0.2  
0.4

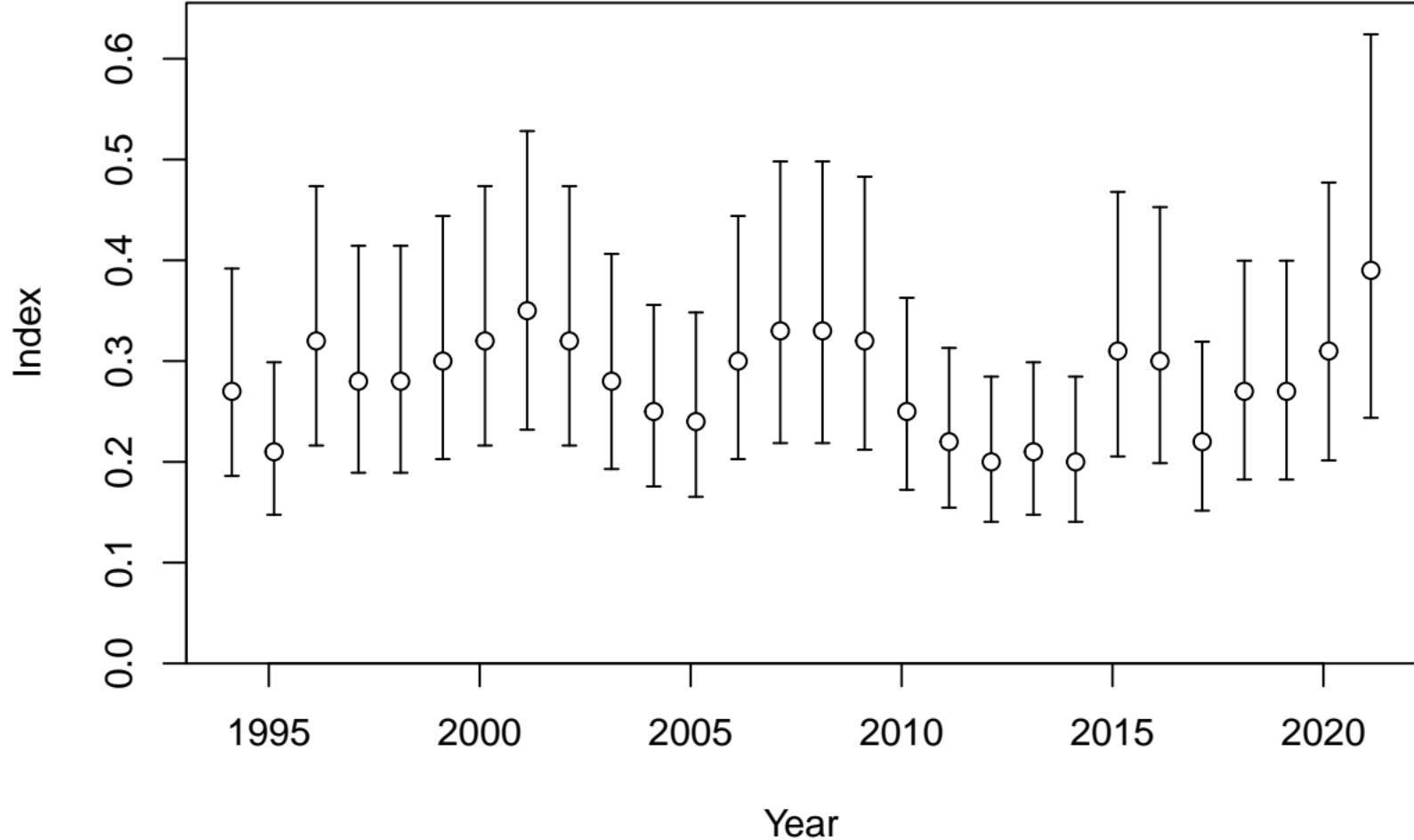
1980

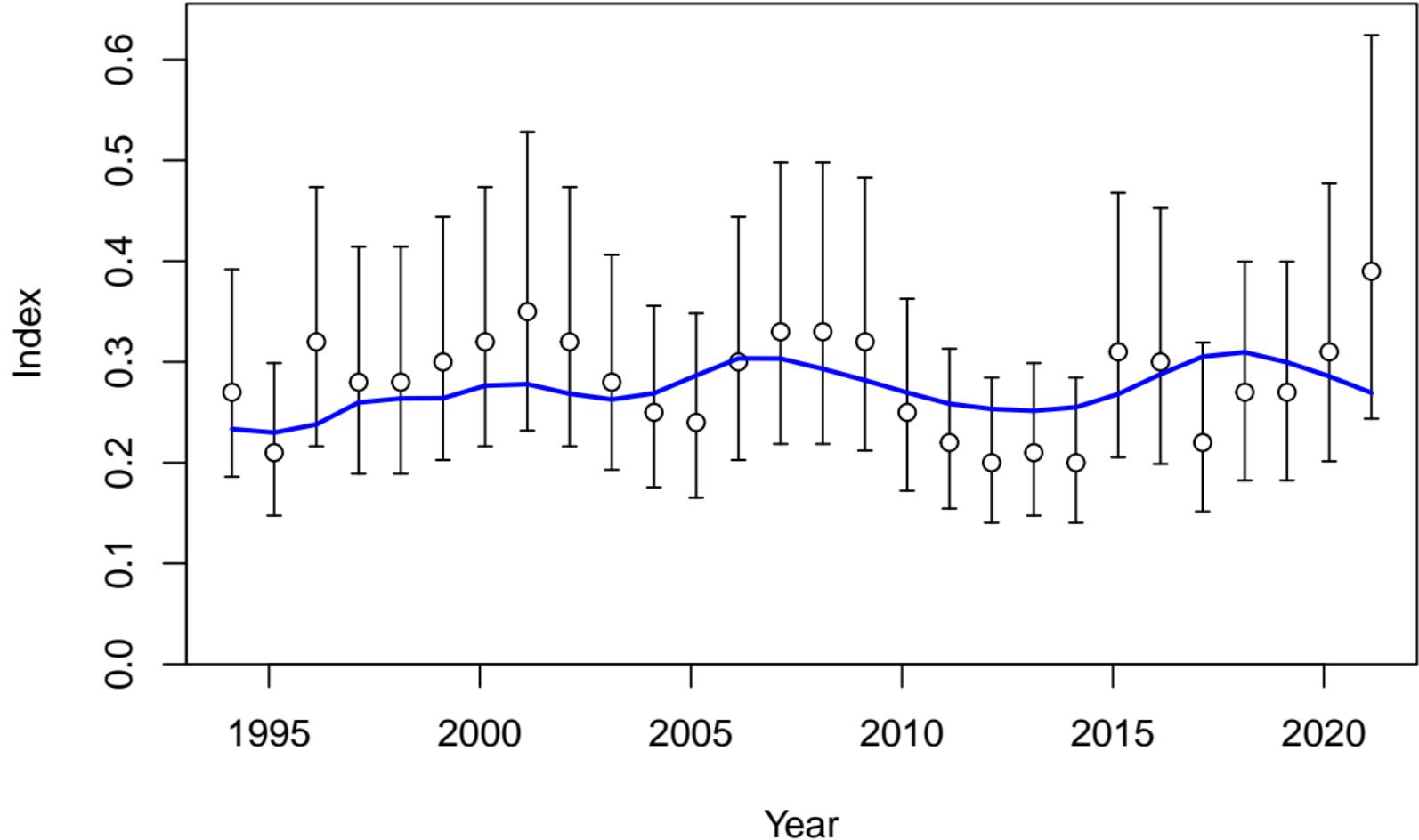
Year

1985

1990







Expected index

0.30

0.20

0.10

0.00

0.0

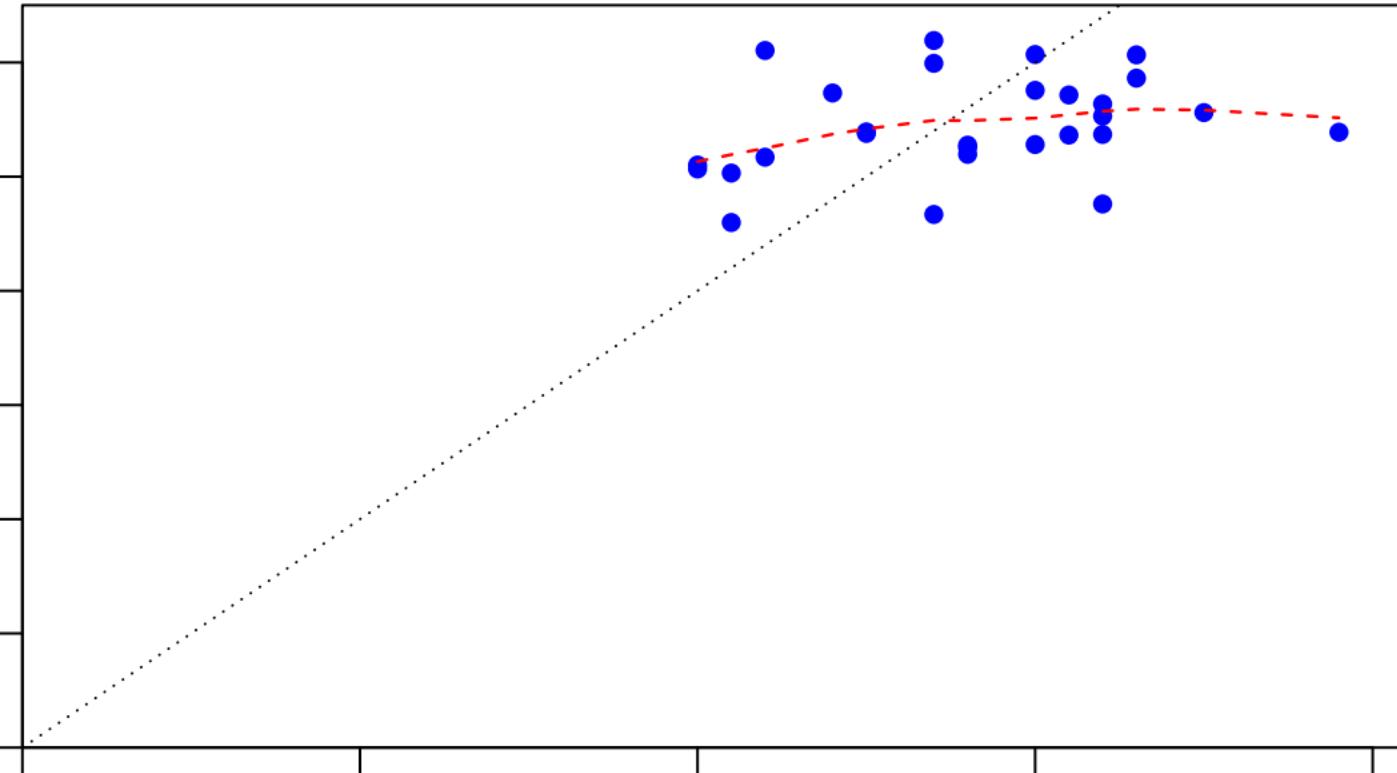
0.1

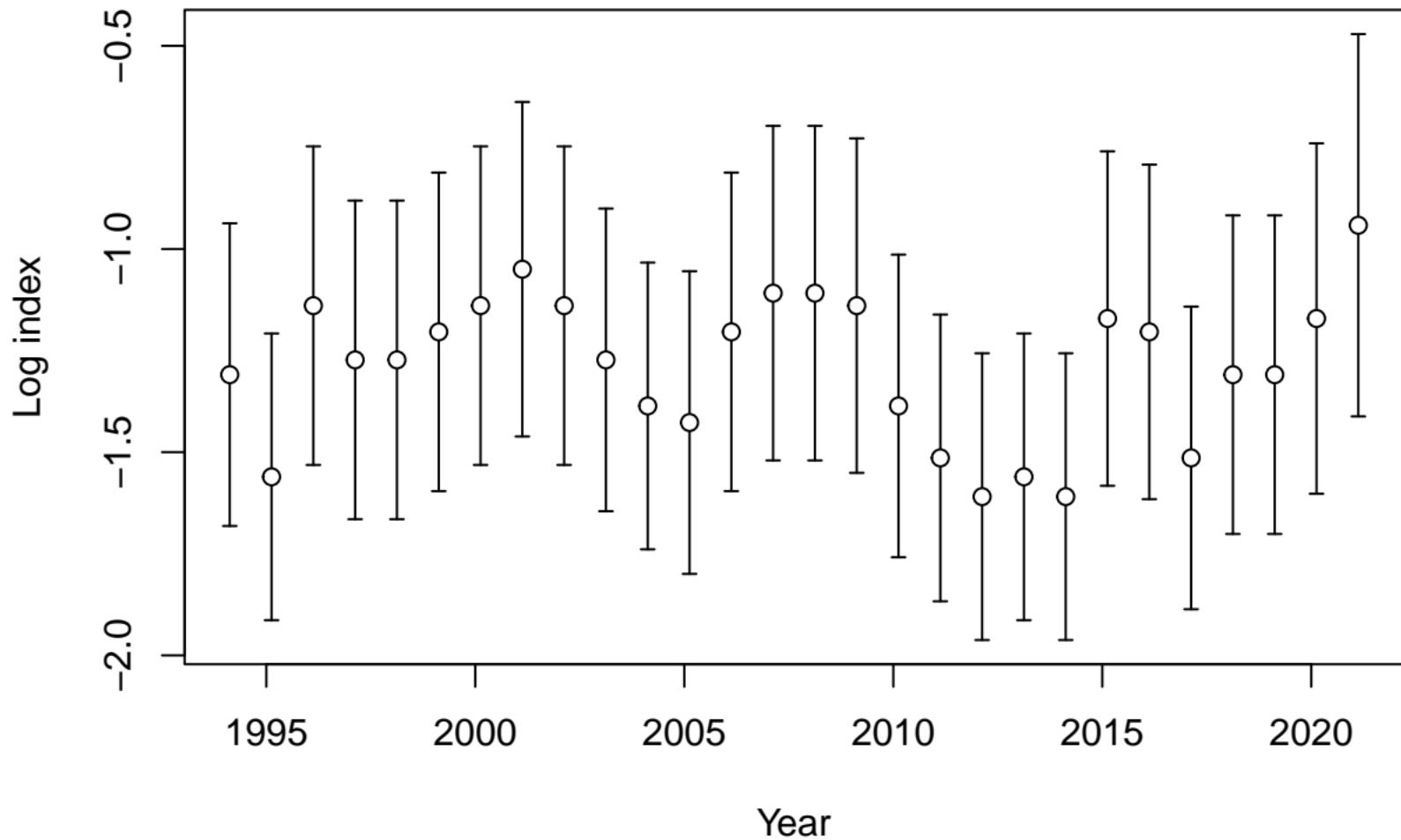
0.2

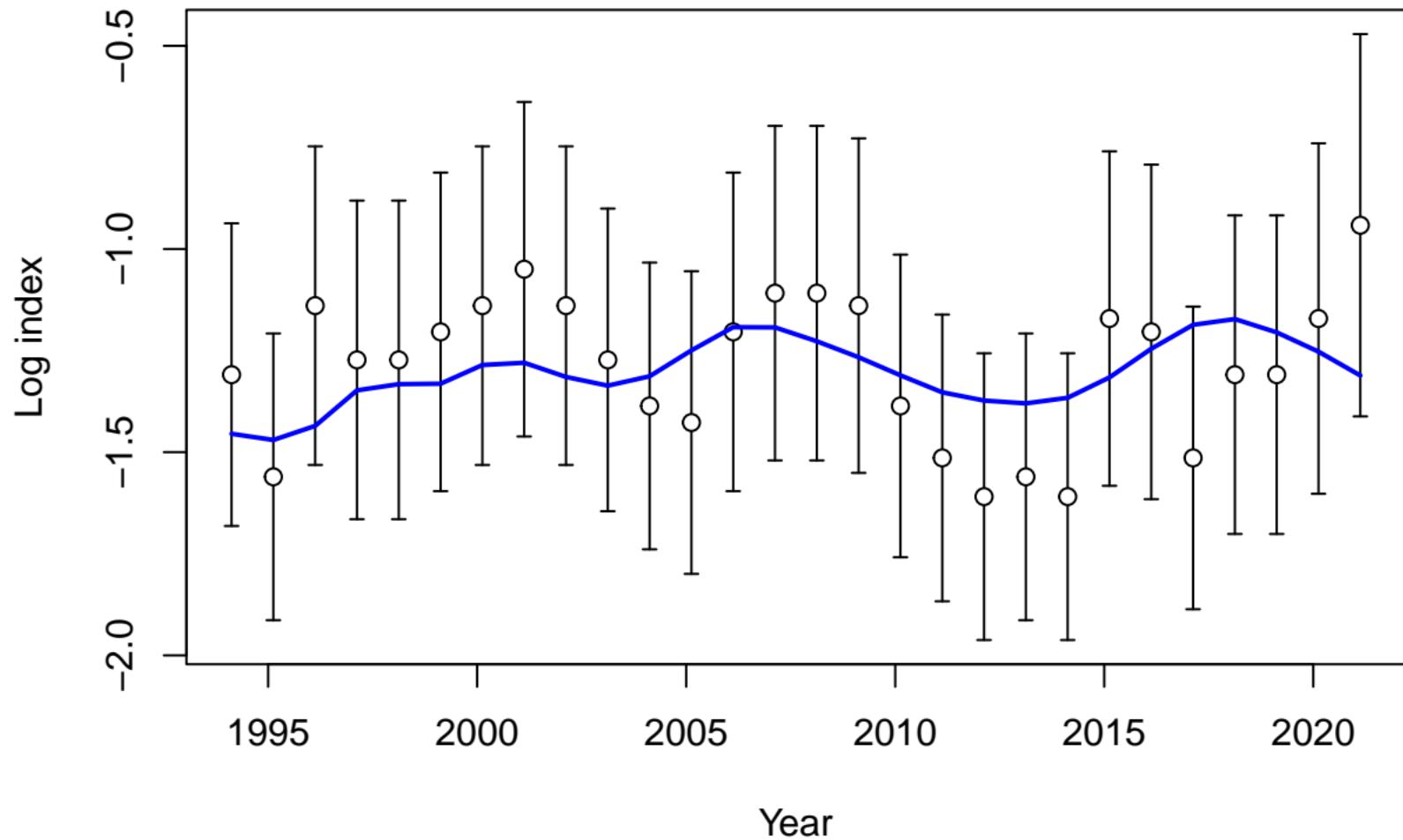
0.3

0.4

Observed index





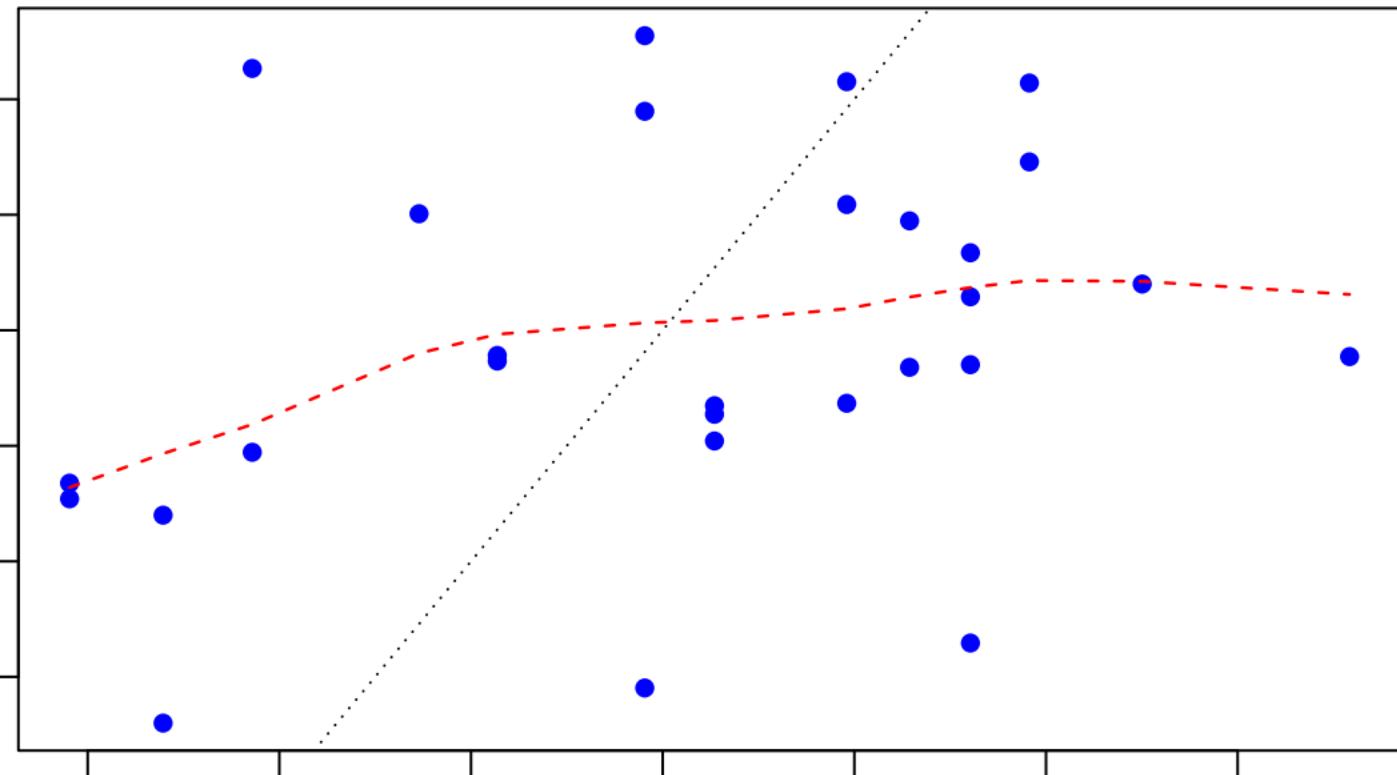


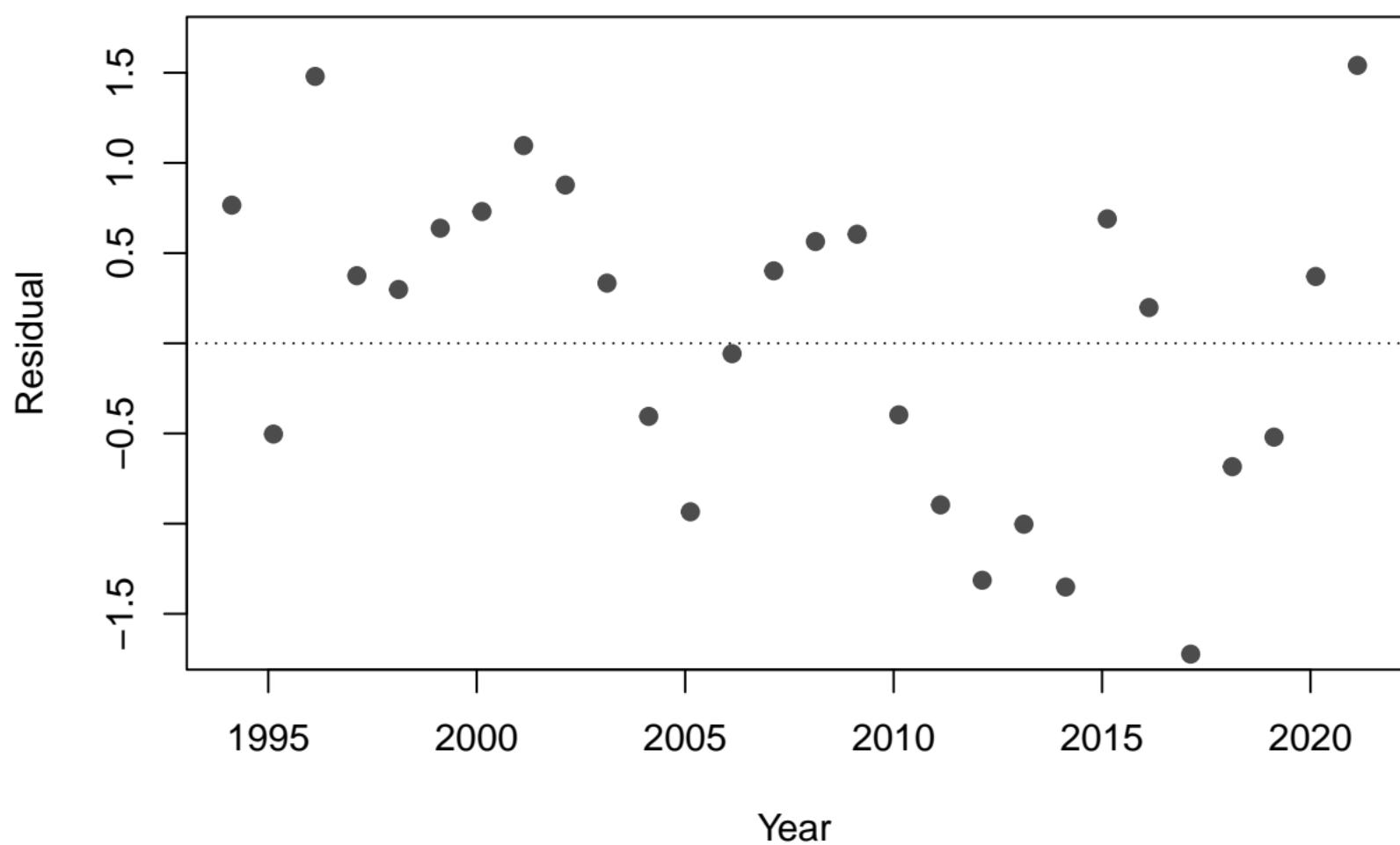
Log expected index

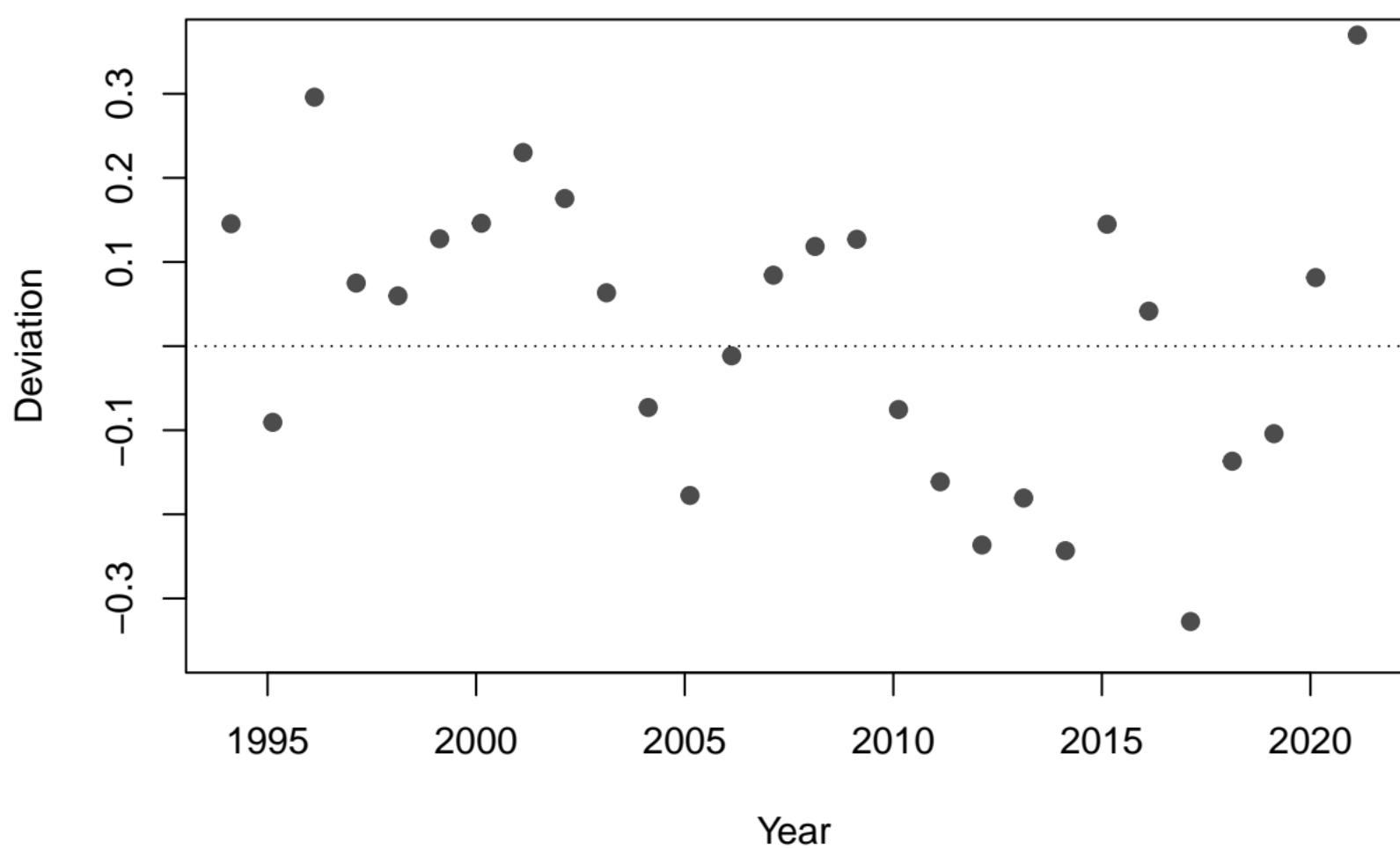
-1.25  
-1.35  
-1.45

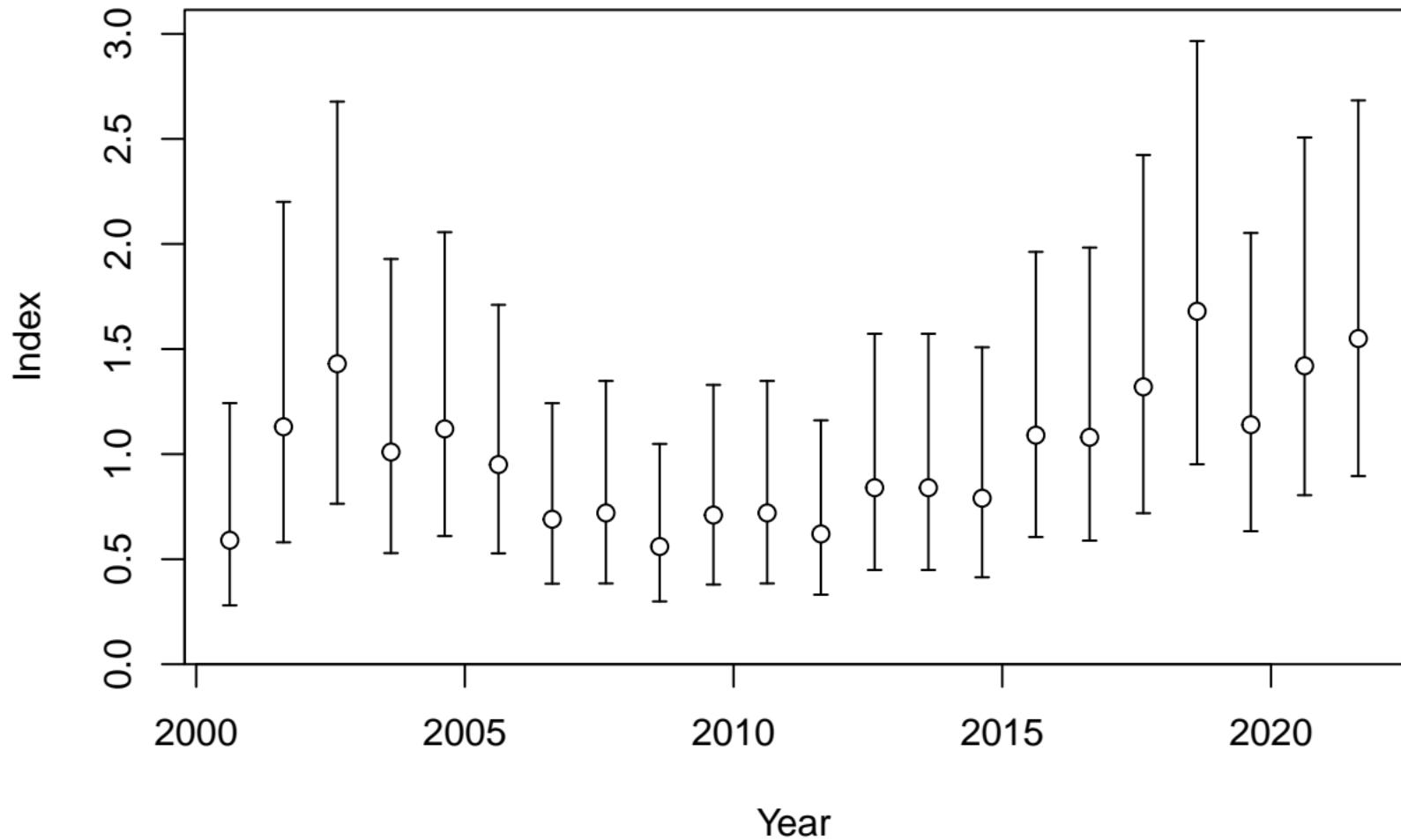
-1.6 -1.5 -1.4 -1.3 -1.2 -1.1 -1.0

Log observed index

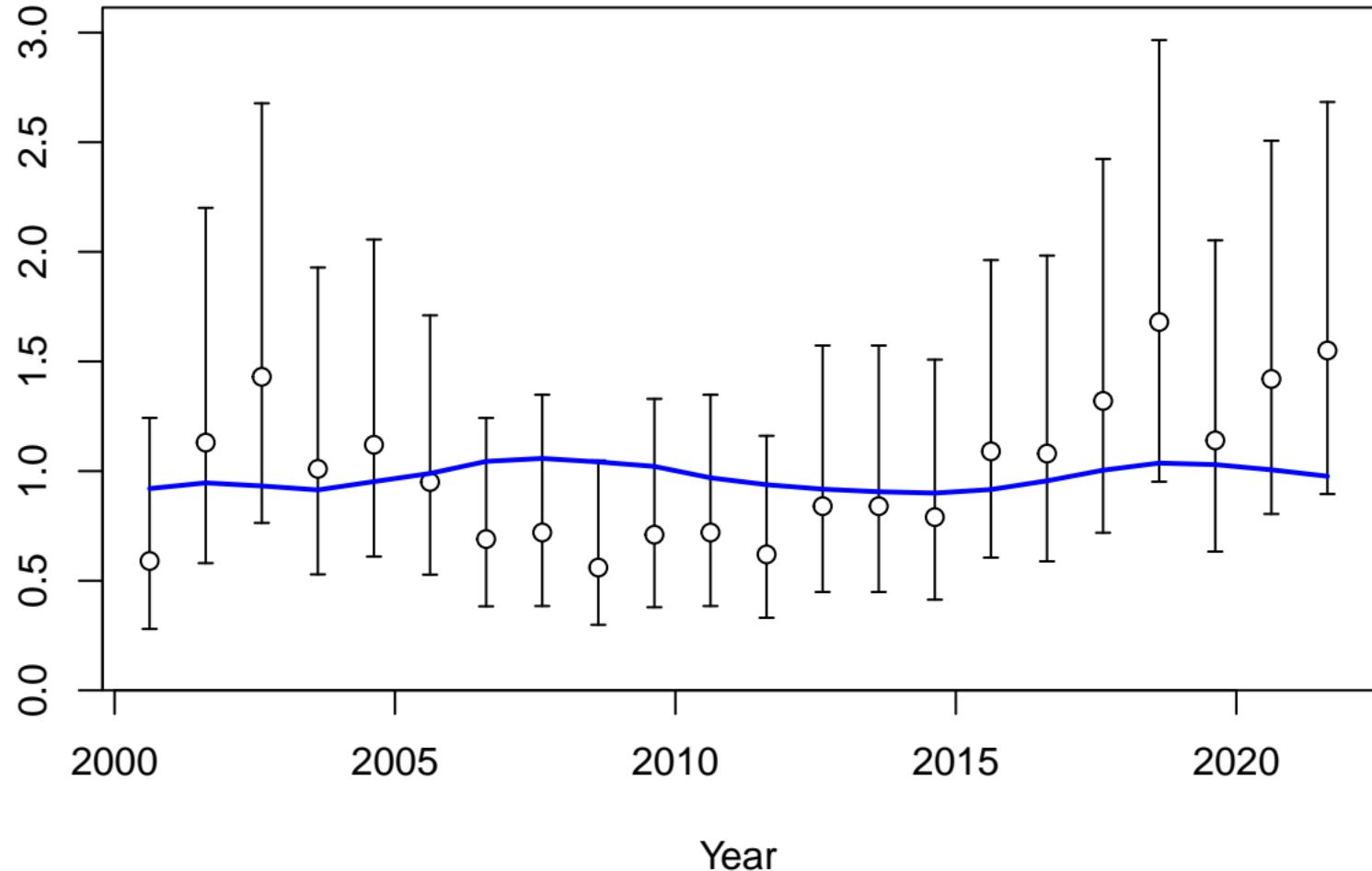








Index



Expected index

1.0  
0.8  
0.6  
0.4  
0.2  
0.0

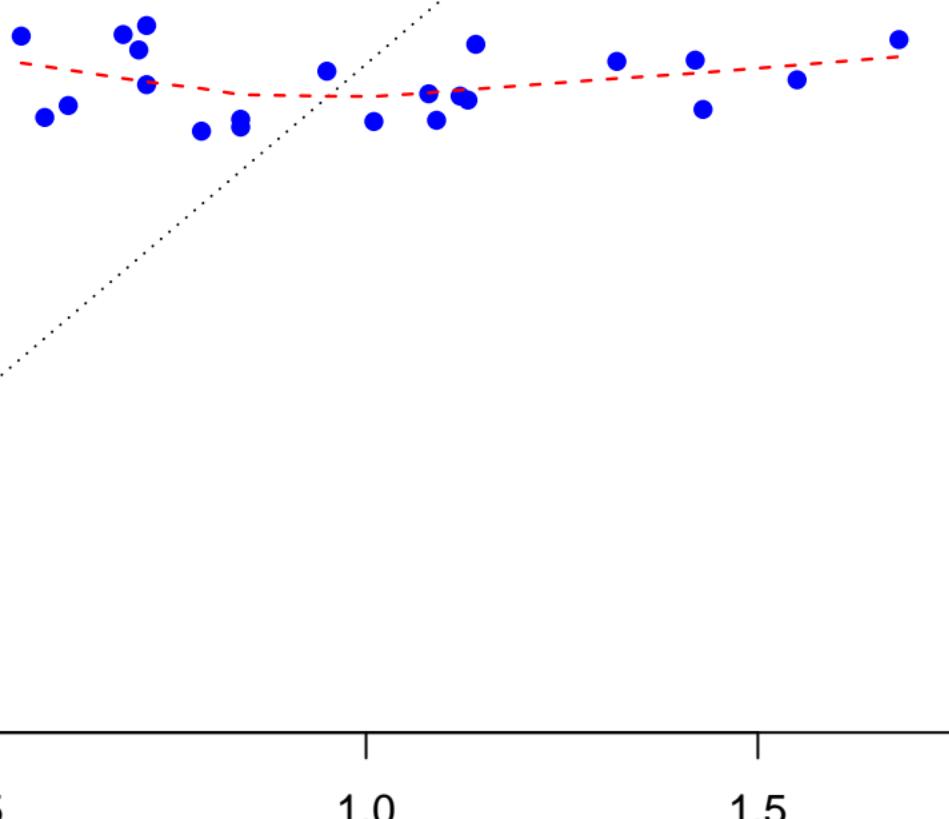
0.0

0.5

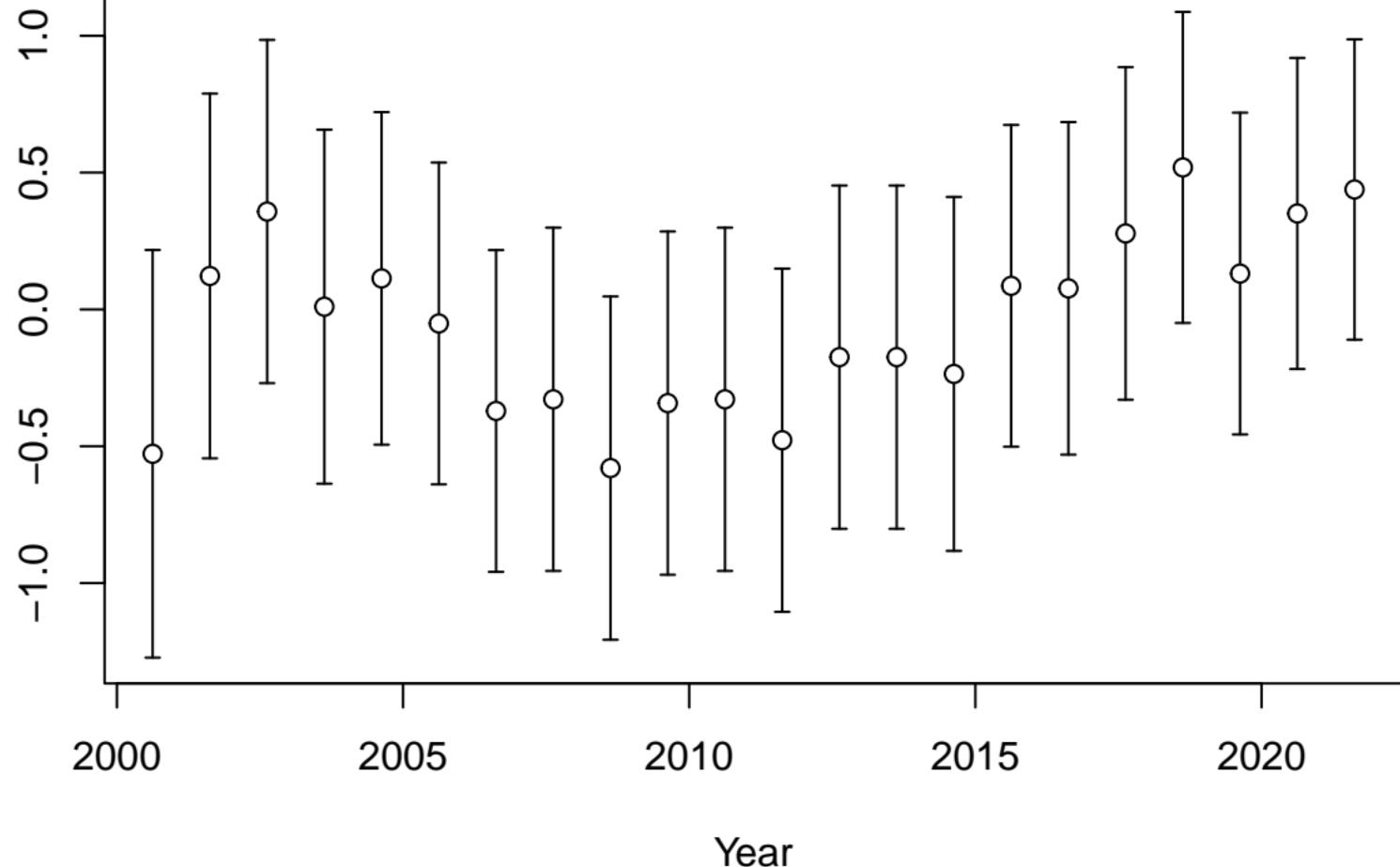
1.0

1.5

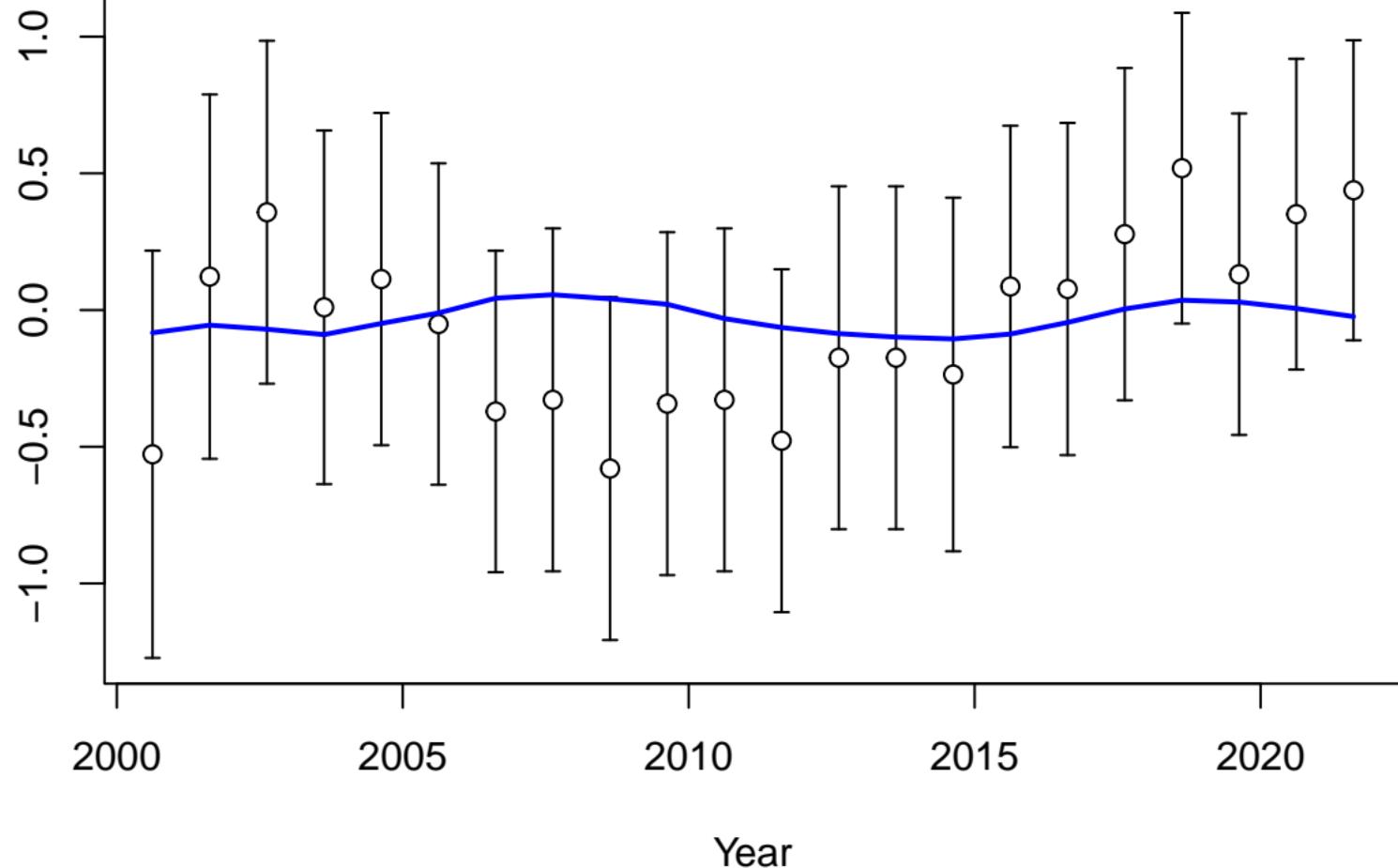
Observed index

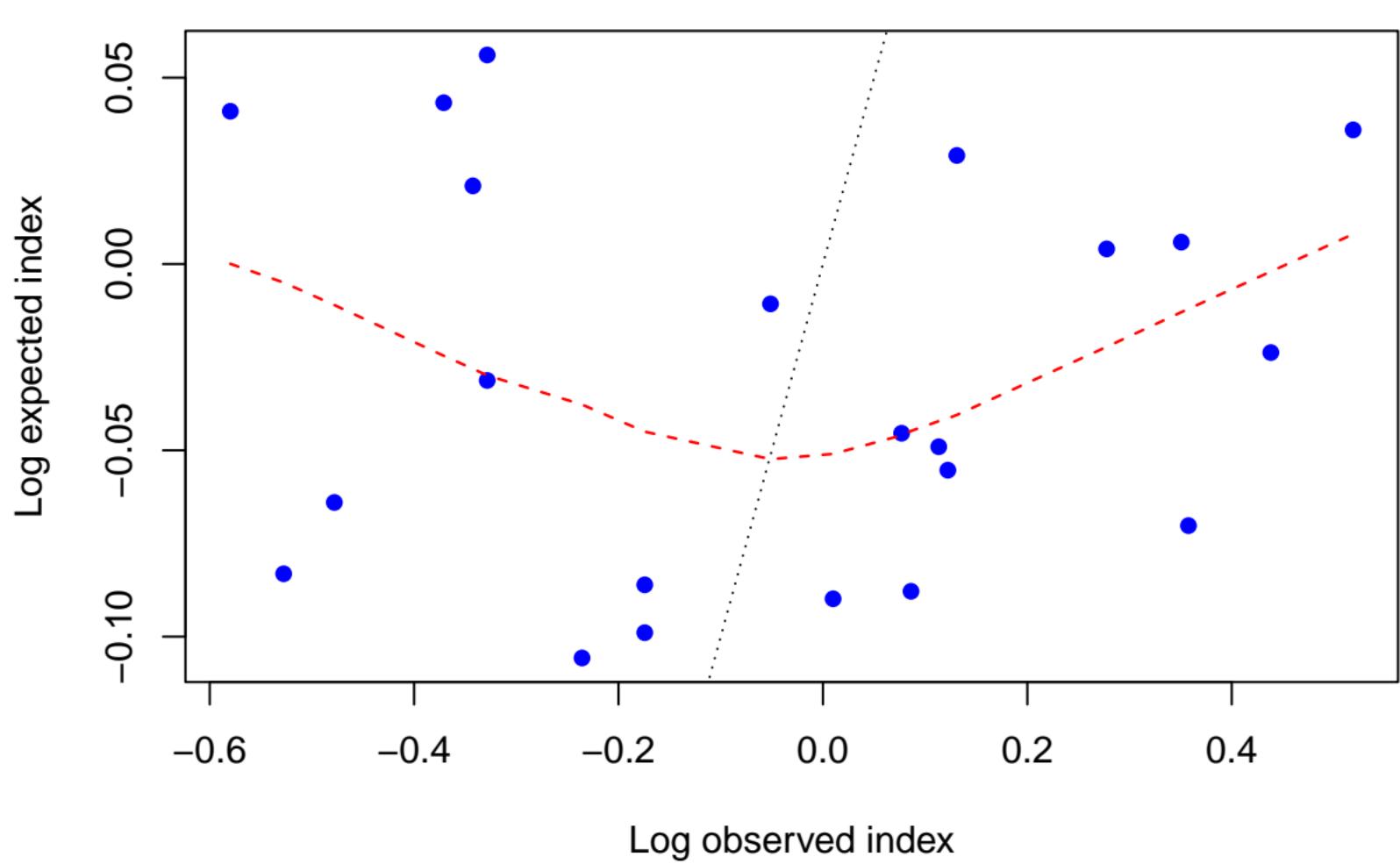


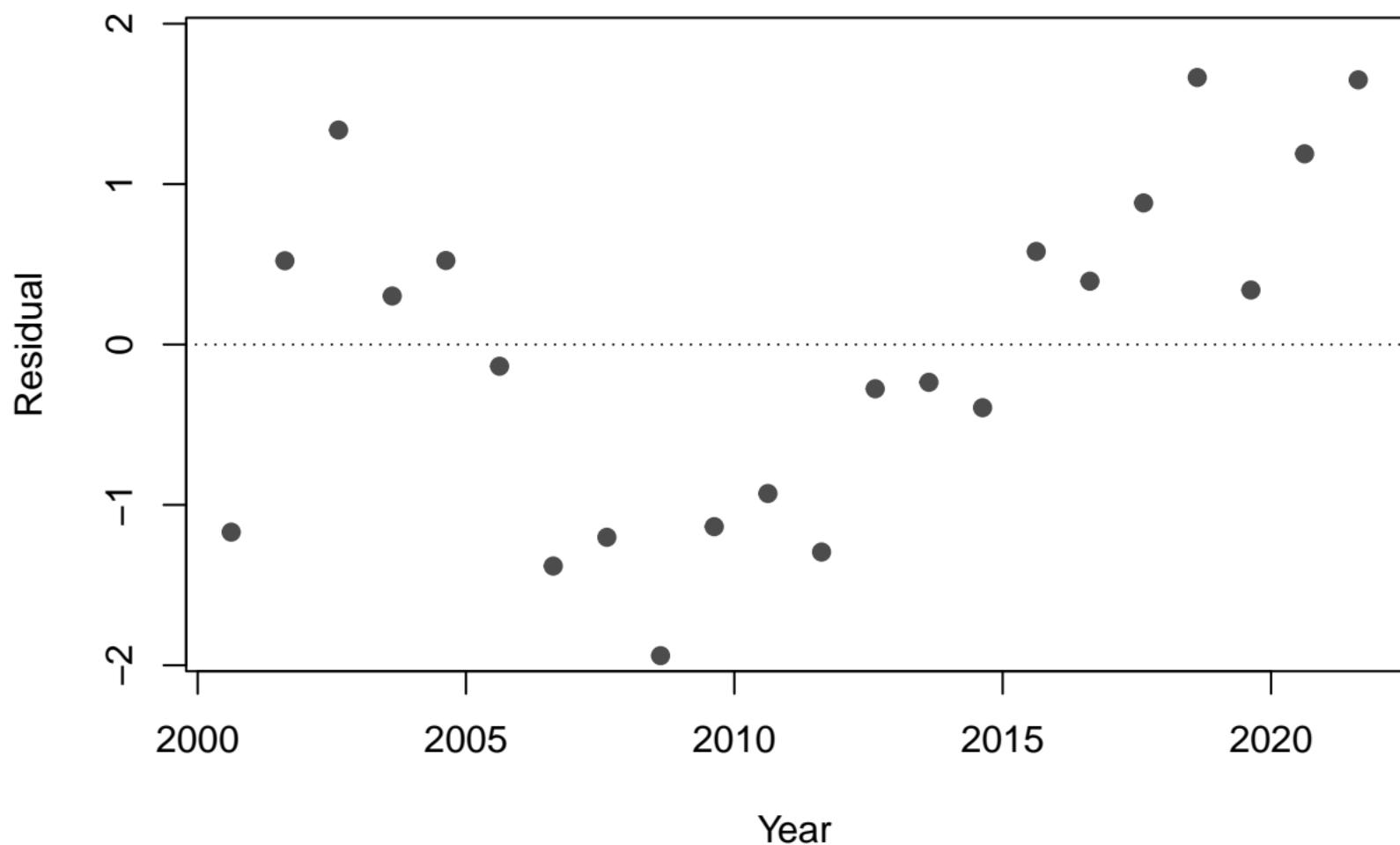
Log index

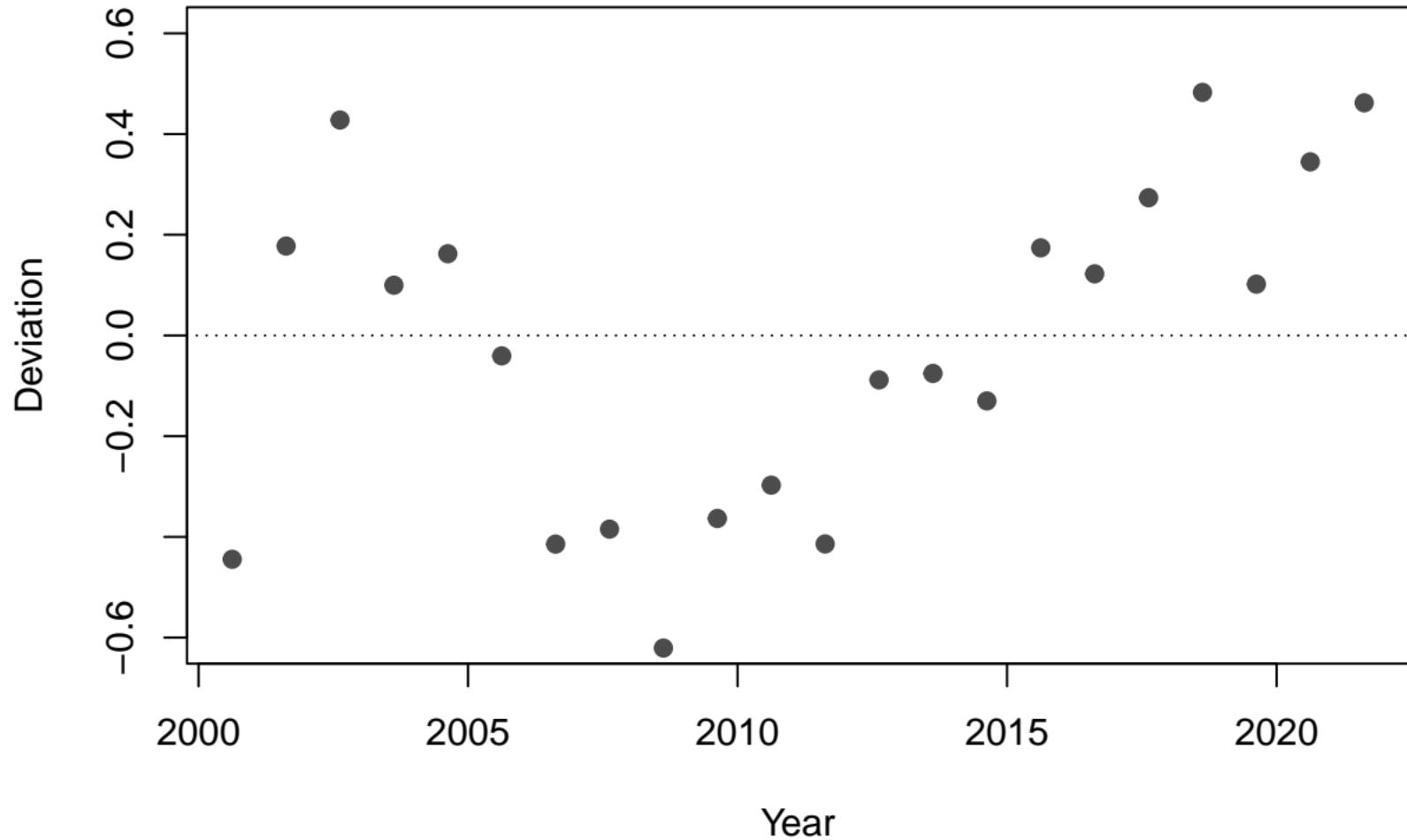


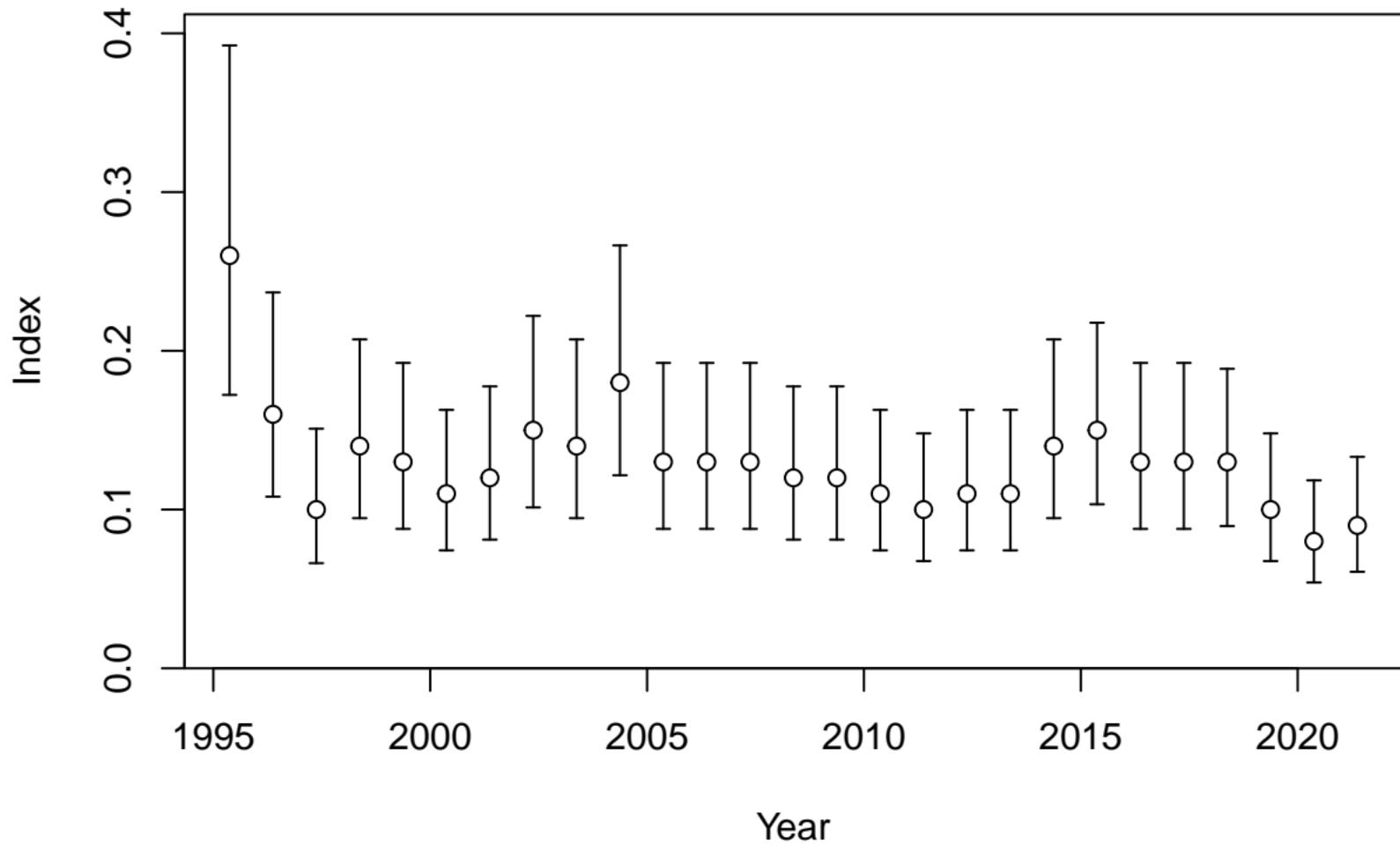
Log index

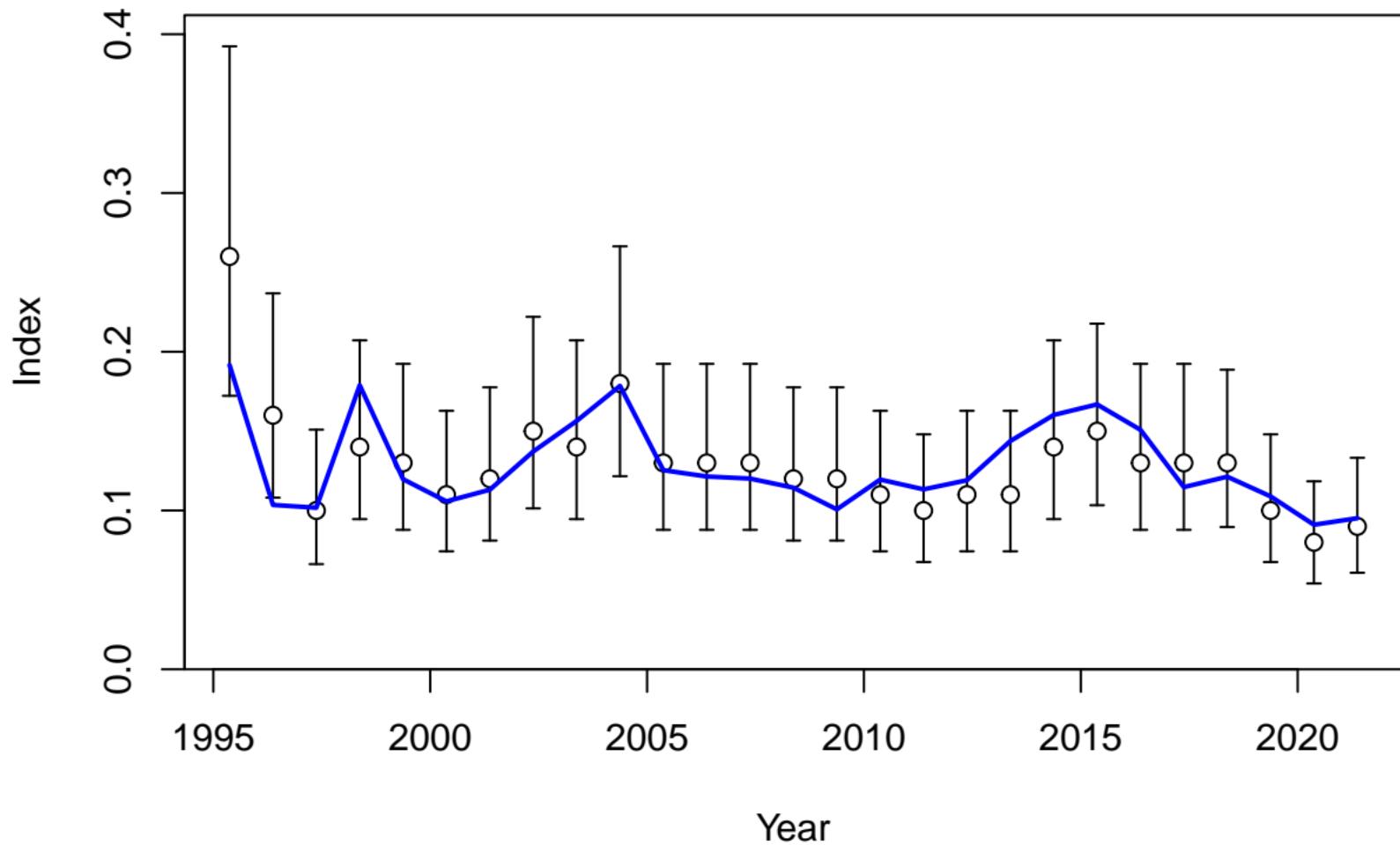




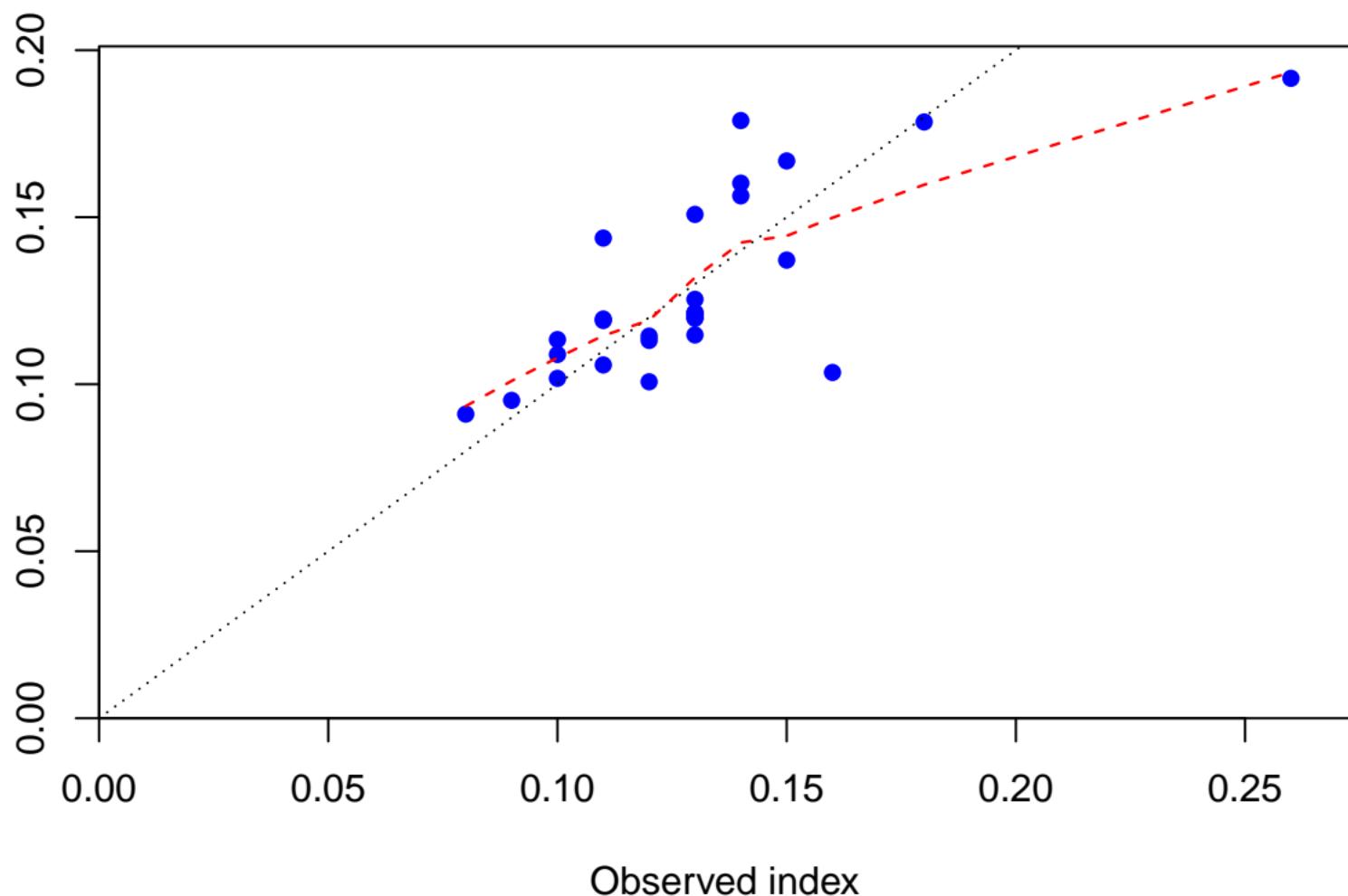




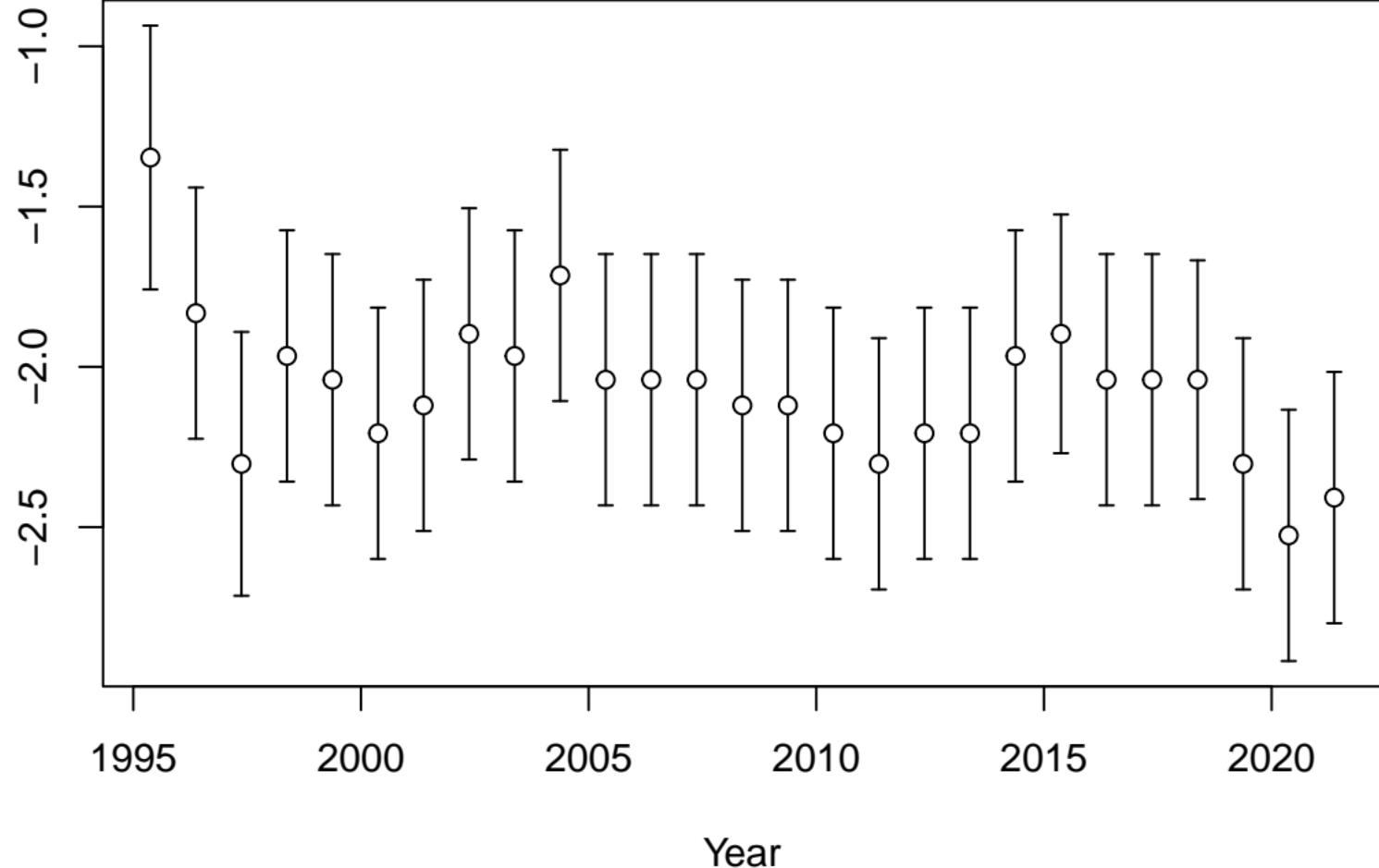


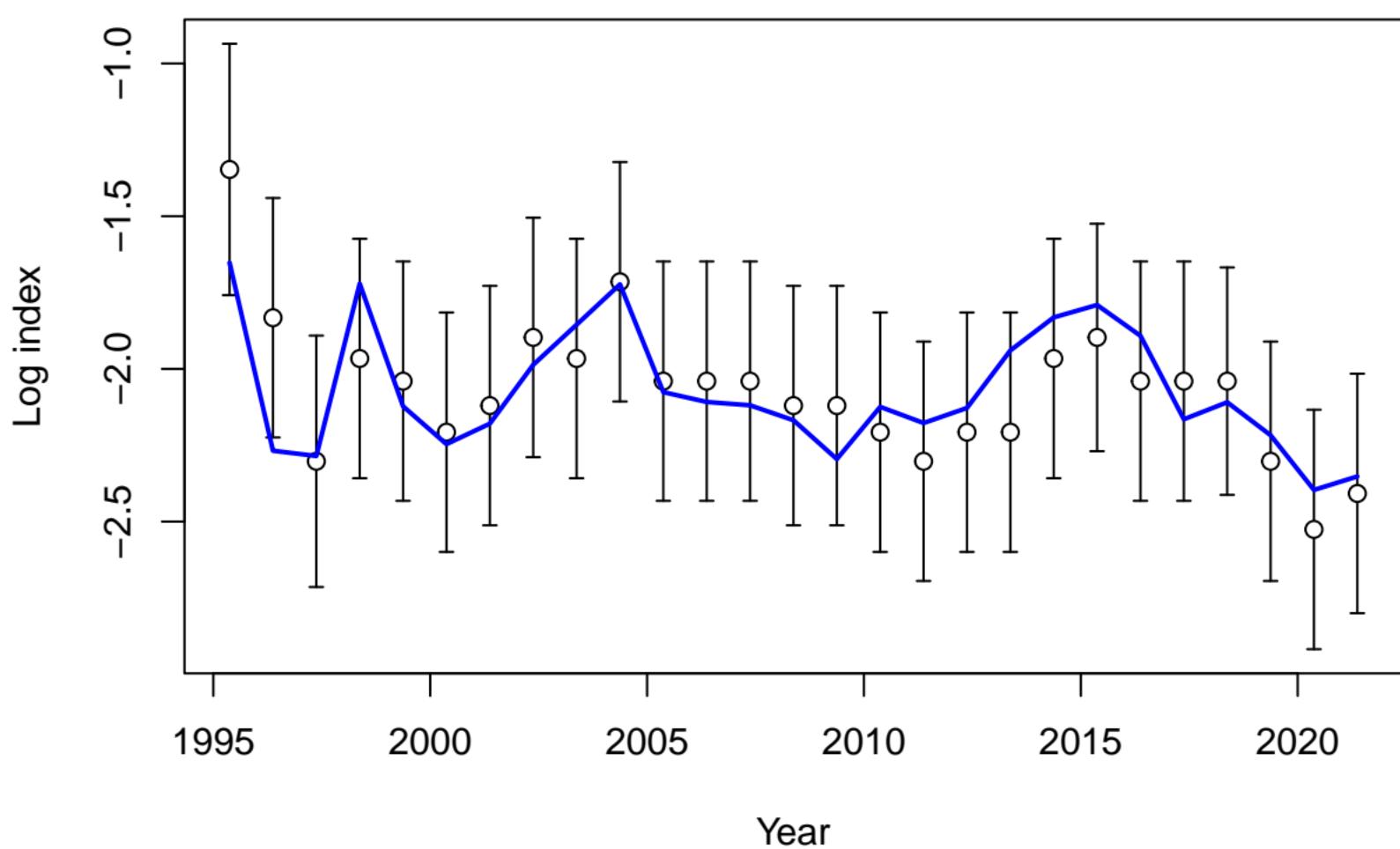


Expected index



Log index





Log expected index

-2.4 -2.0 -1.8

-2.4 -2.2 -2.0 -1.8 -1.6 -1.4

-2.4

-2.2

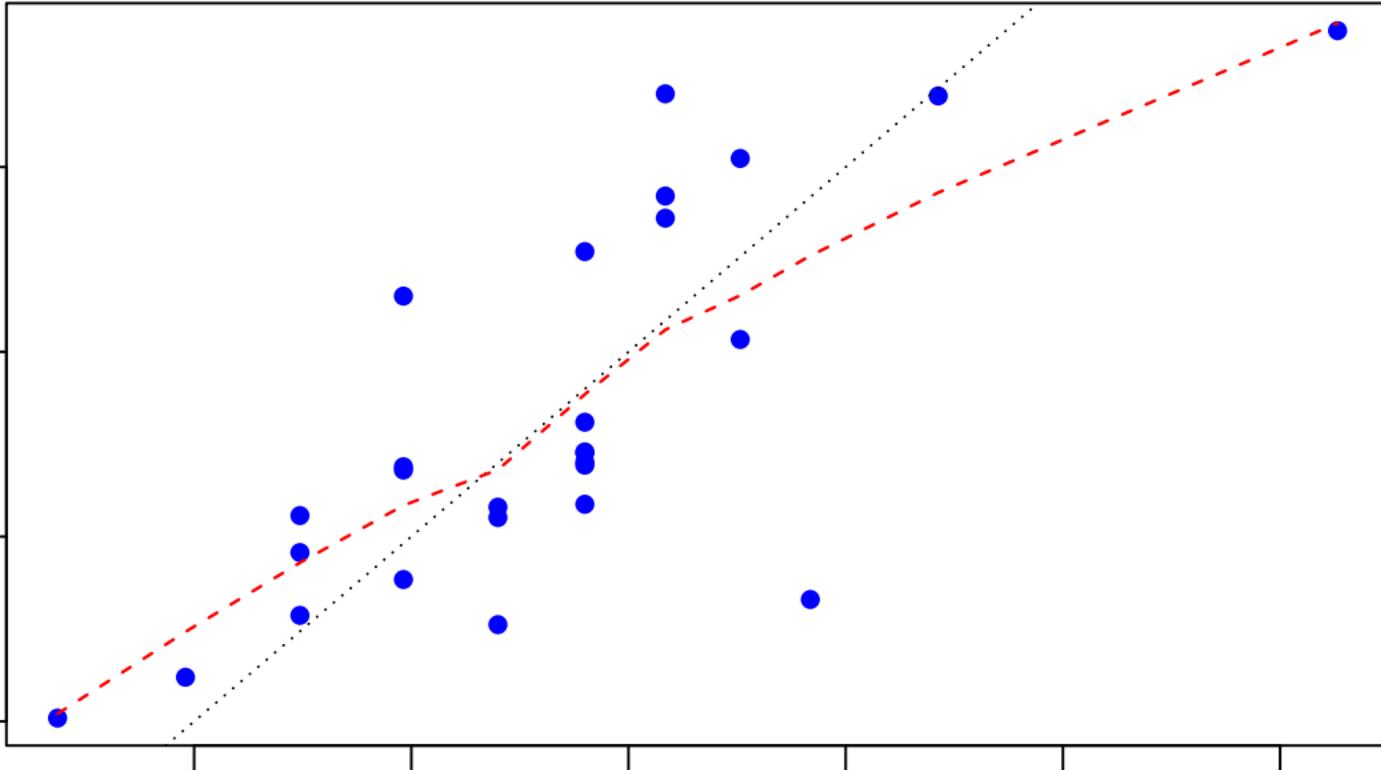
Log observed index

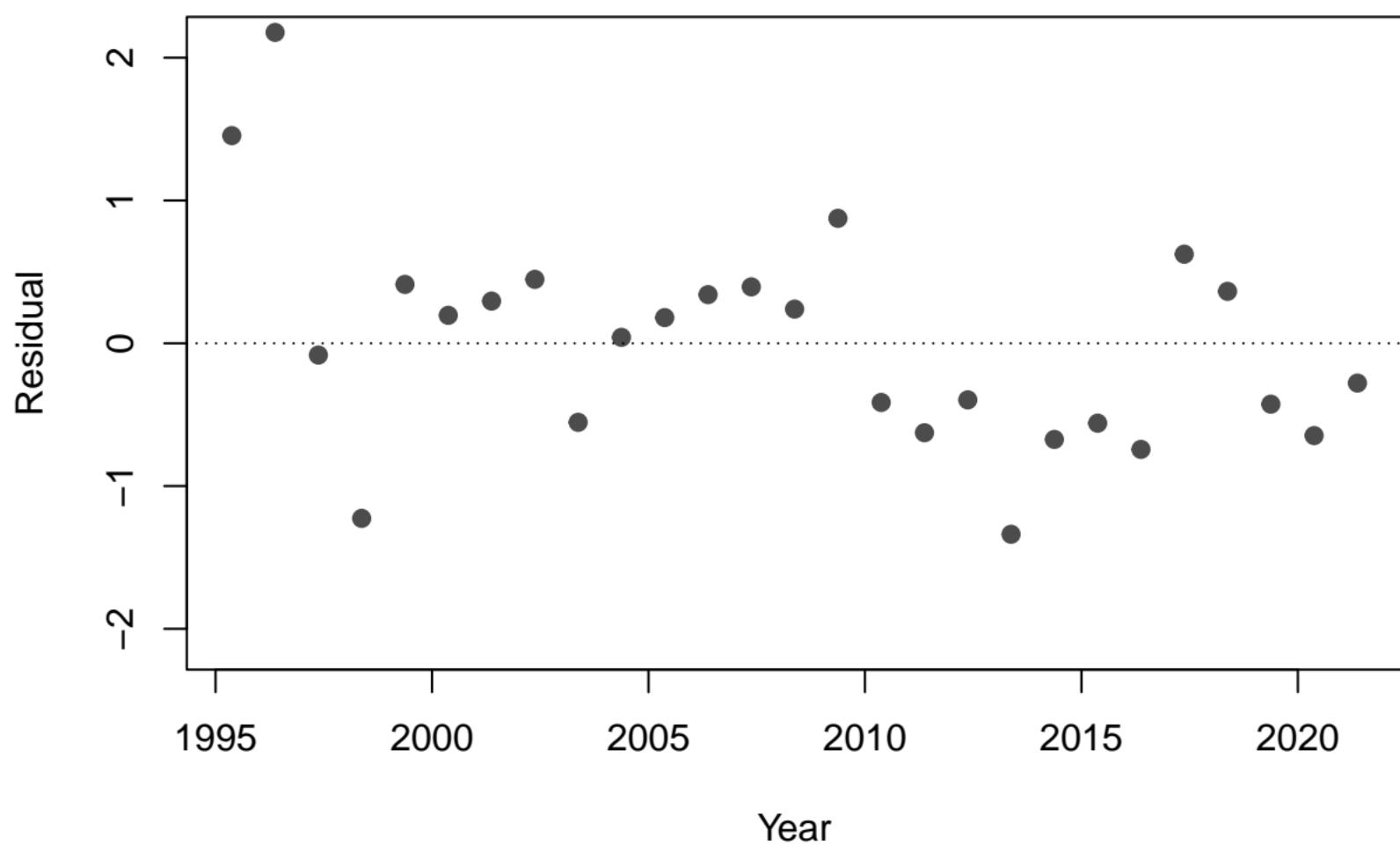
-2.0

-1.8

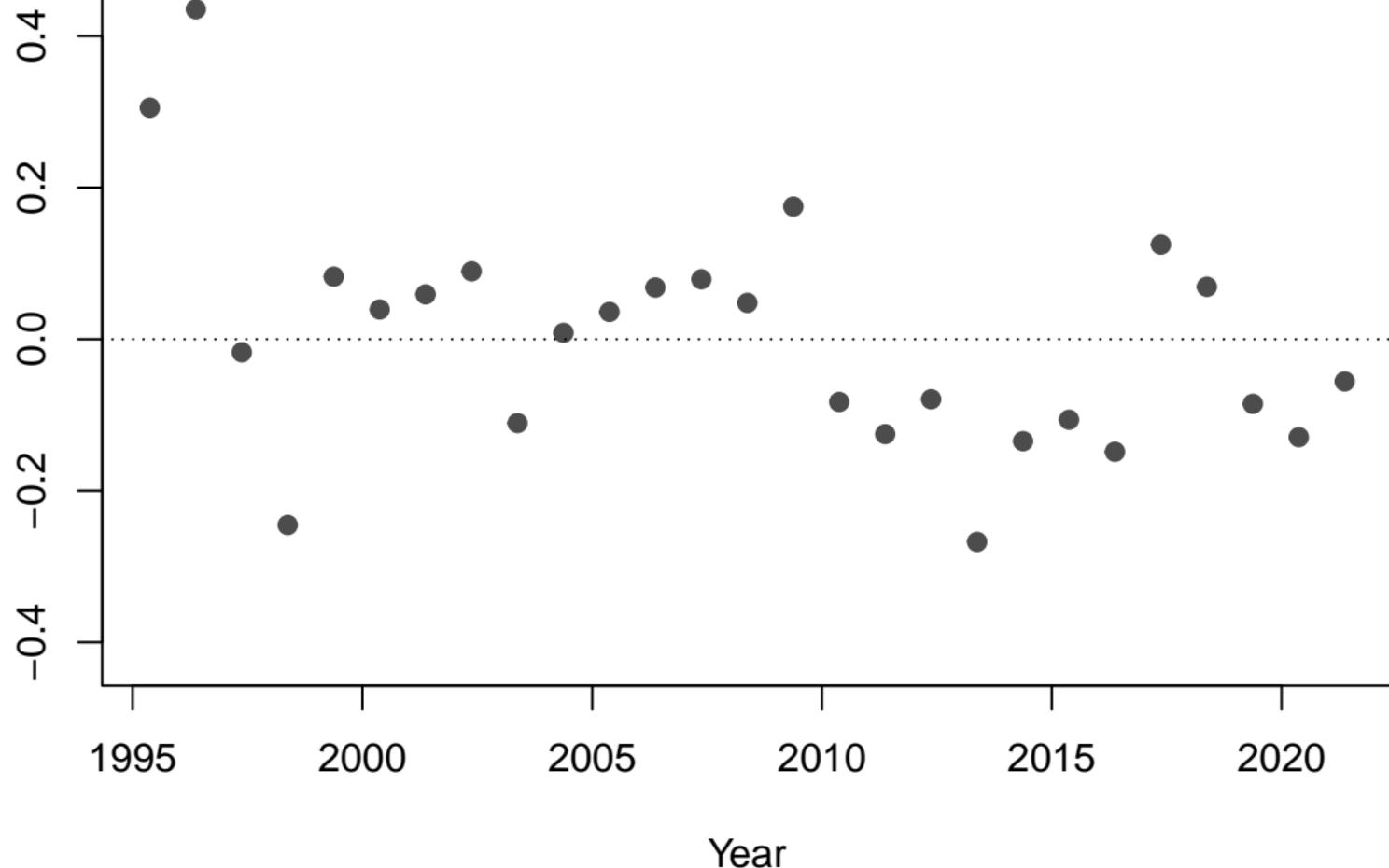
-1.6

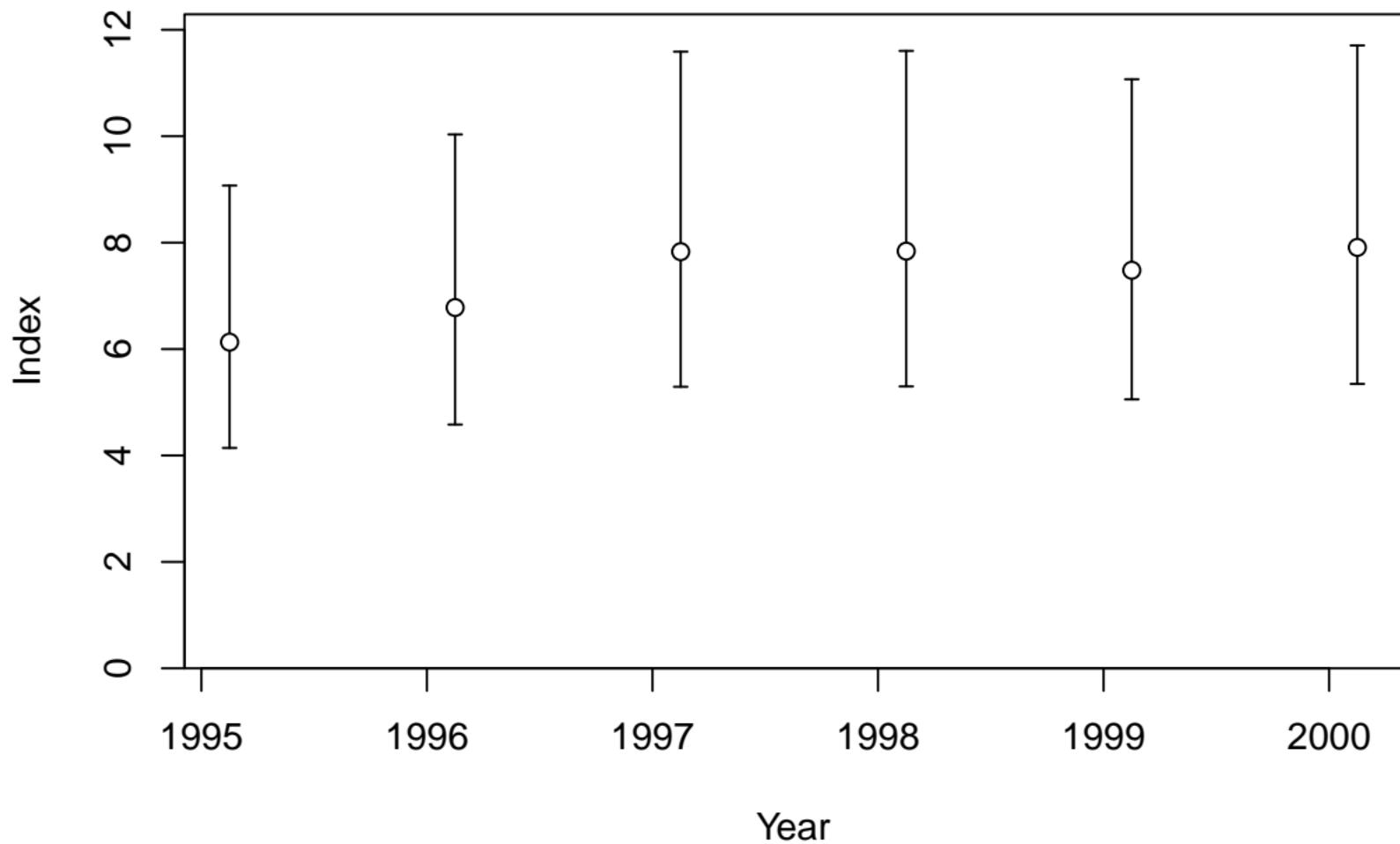
-1.4

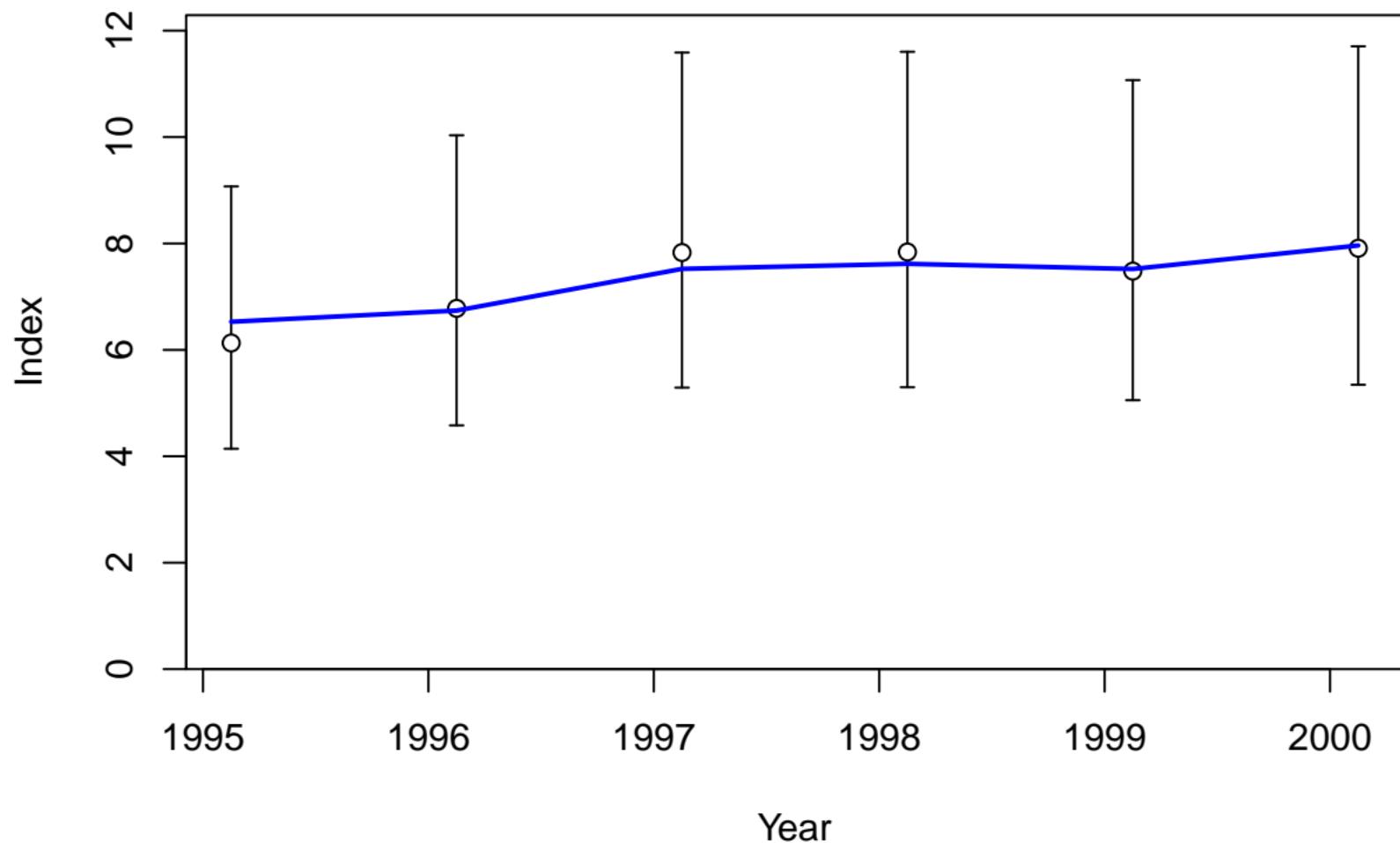




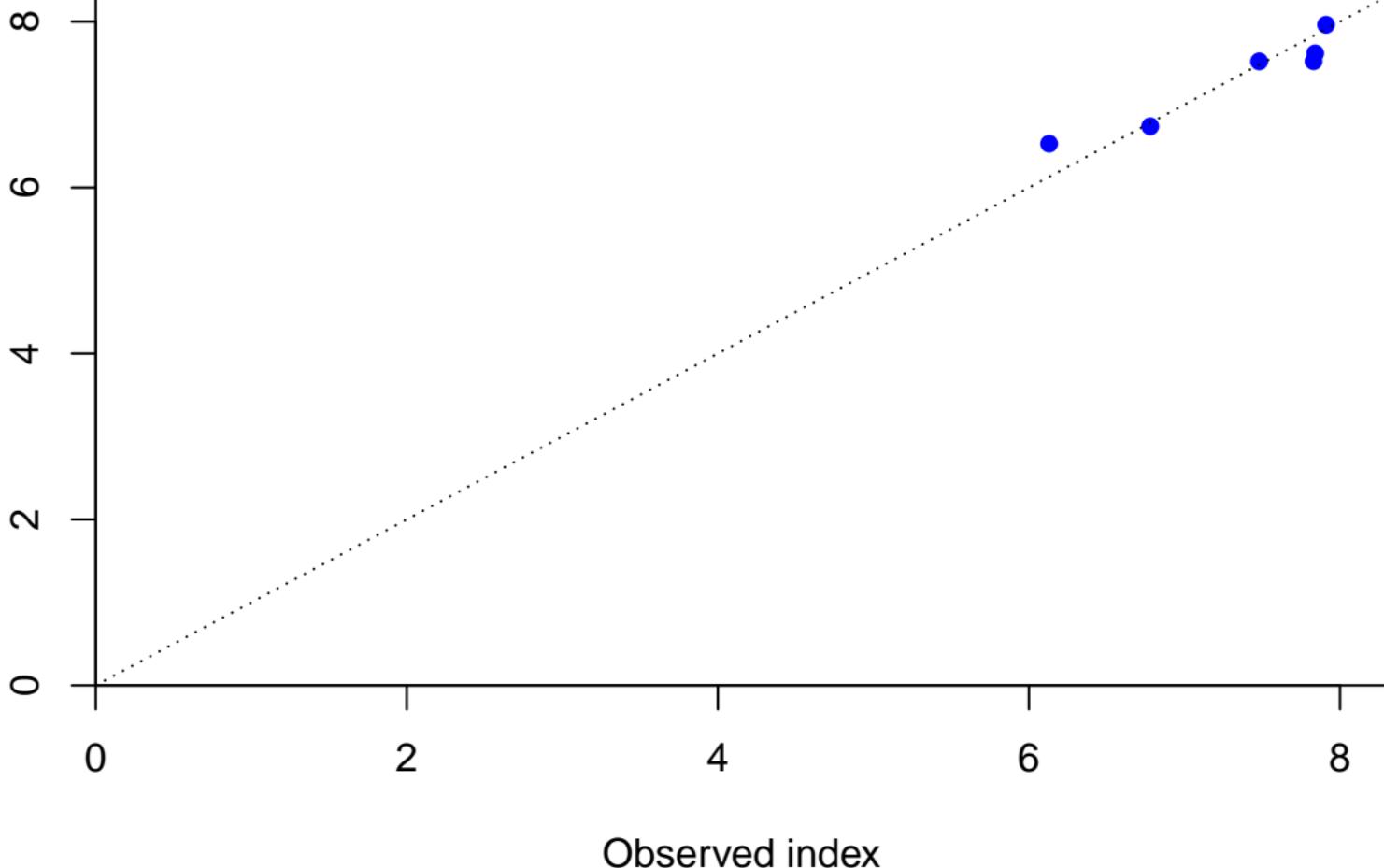
Deviation

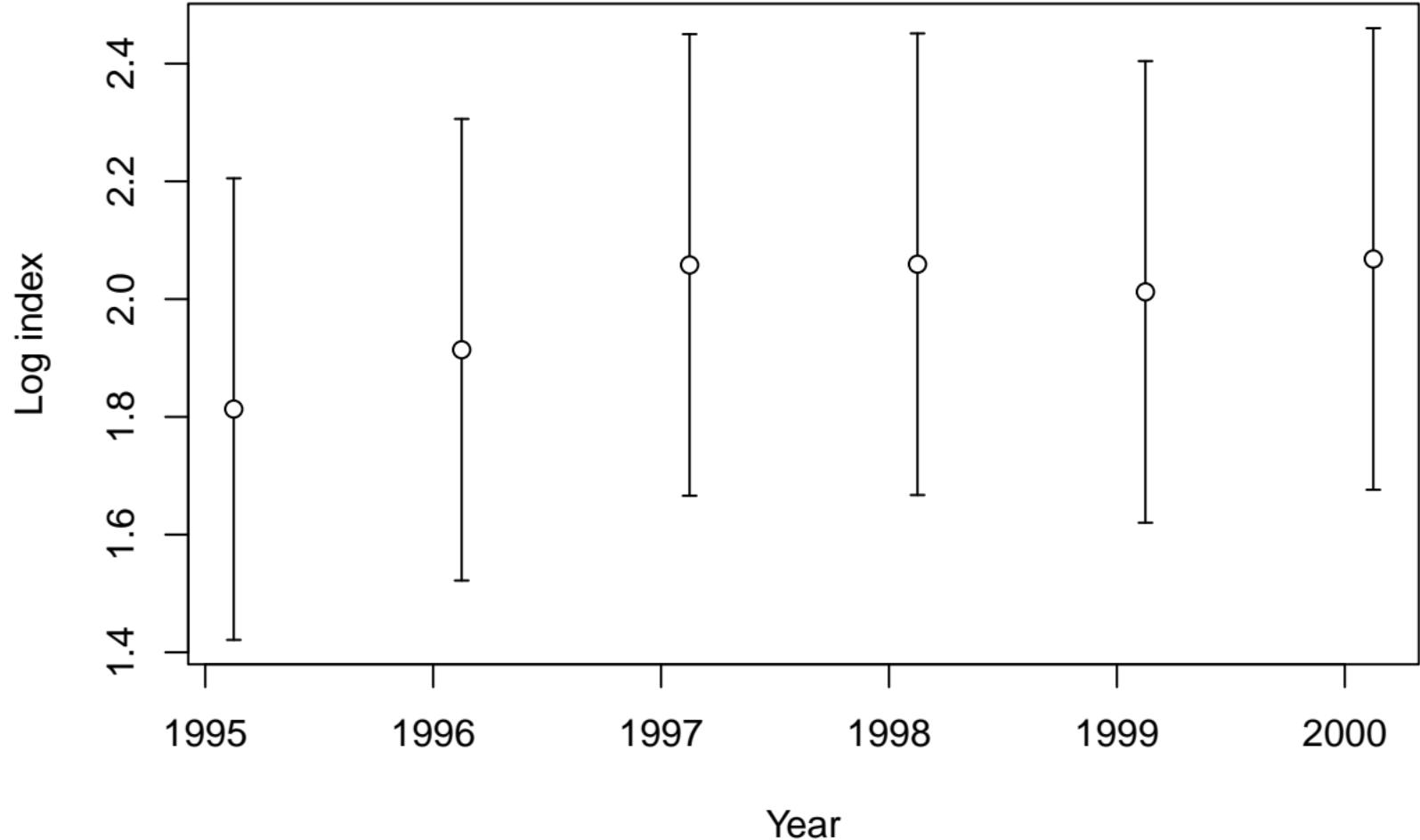






Expected index



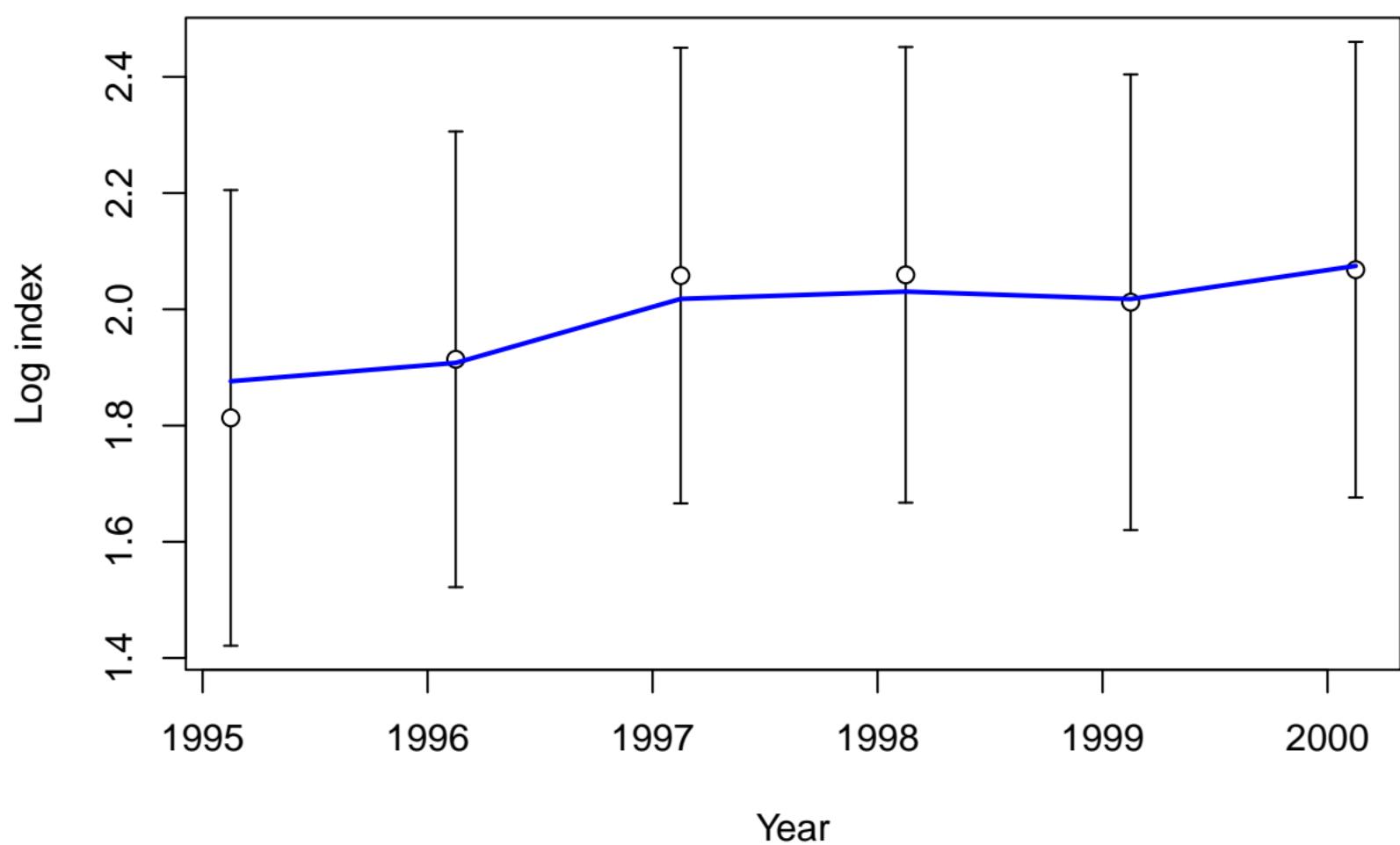


Log index

2.4  
2.2  
2.0  
1.8  
1.6  
1.4

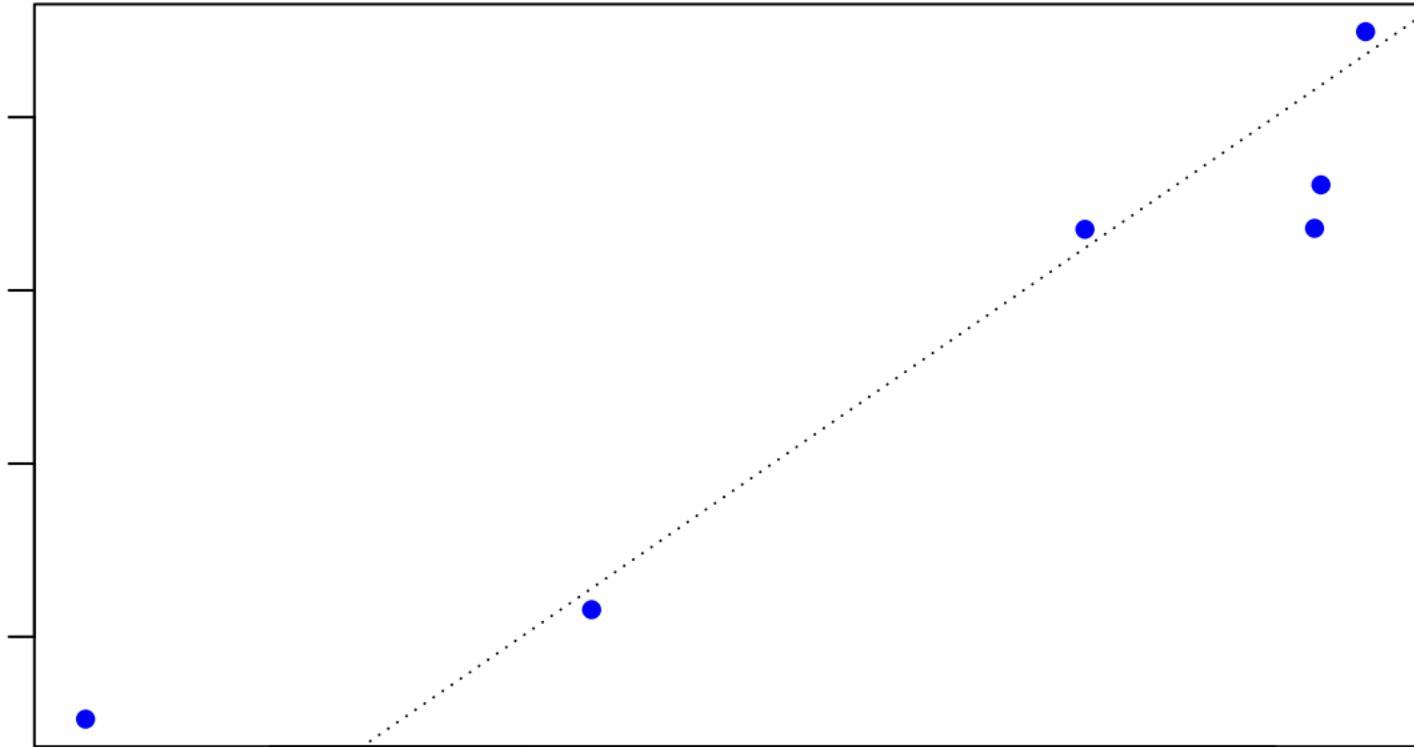
1995 1996 1997 1998 1999 2000

Year



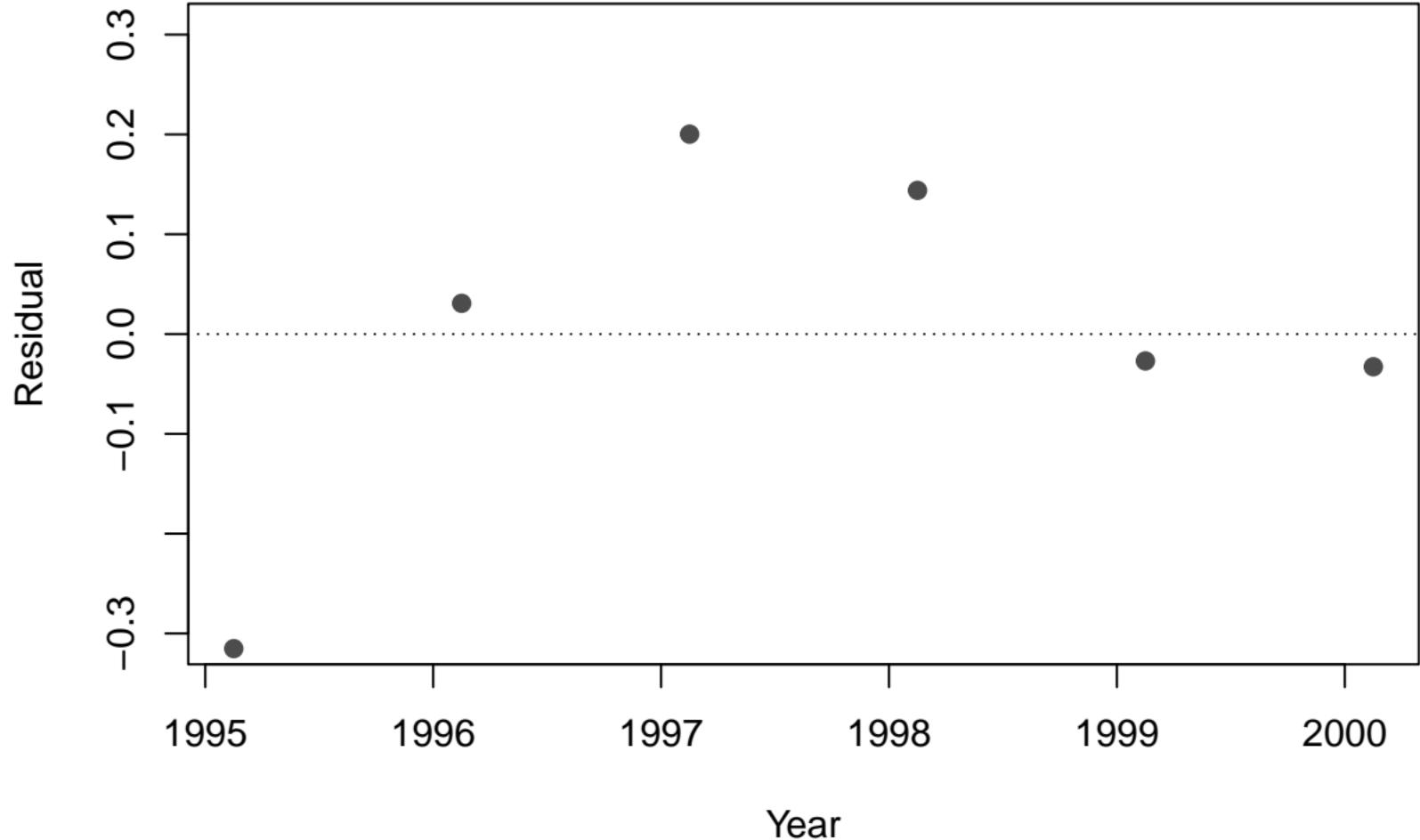
Log expected index

2.05  
2.00  
1.95  
1.90



Log observed index

2.05



Deviation

0.06

0.02

-0.02

-0.06

1995

1996

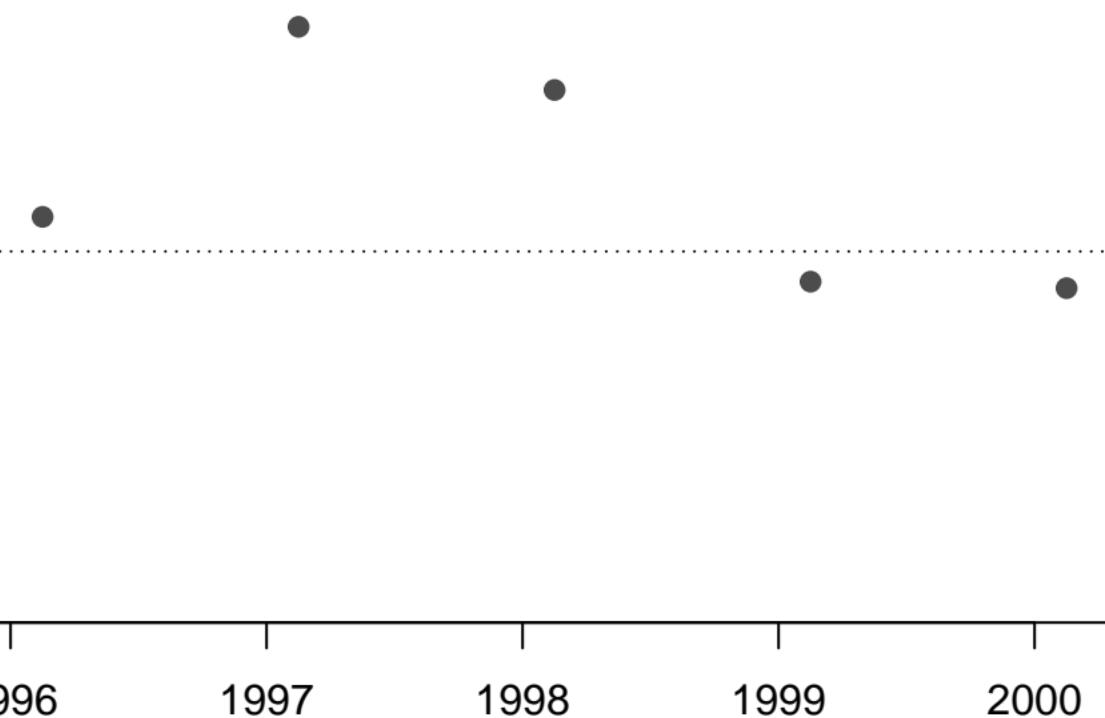
1997

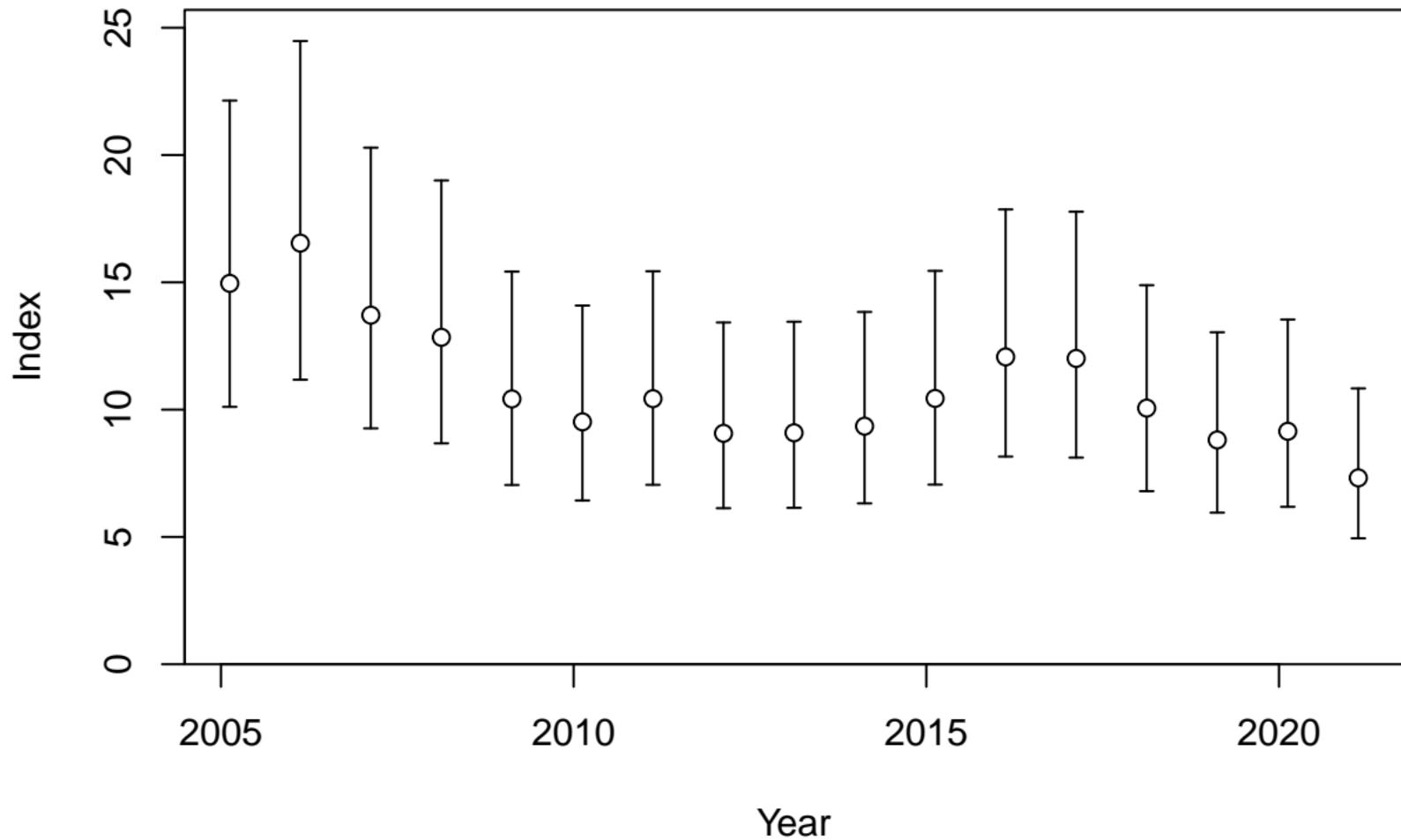
1998

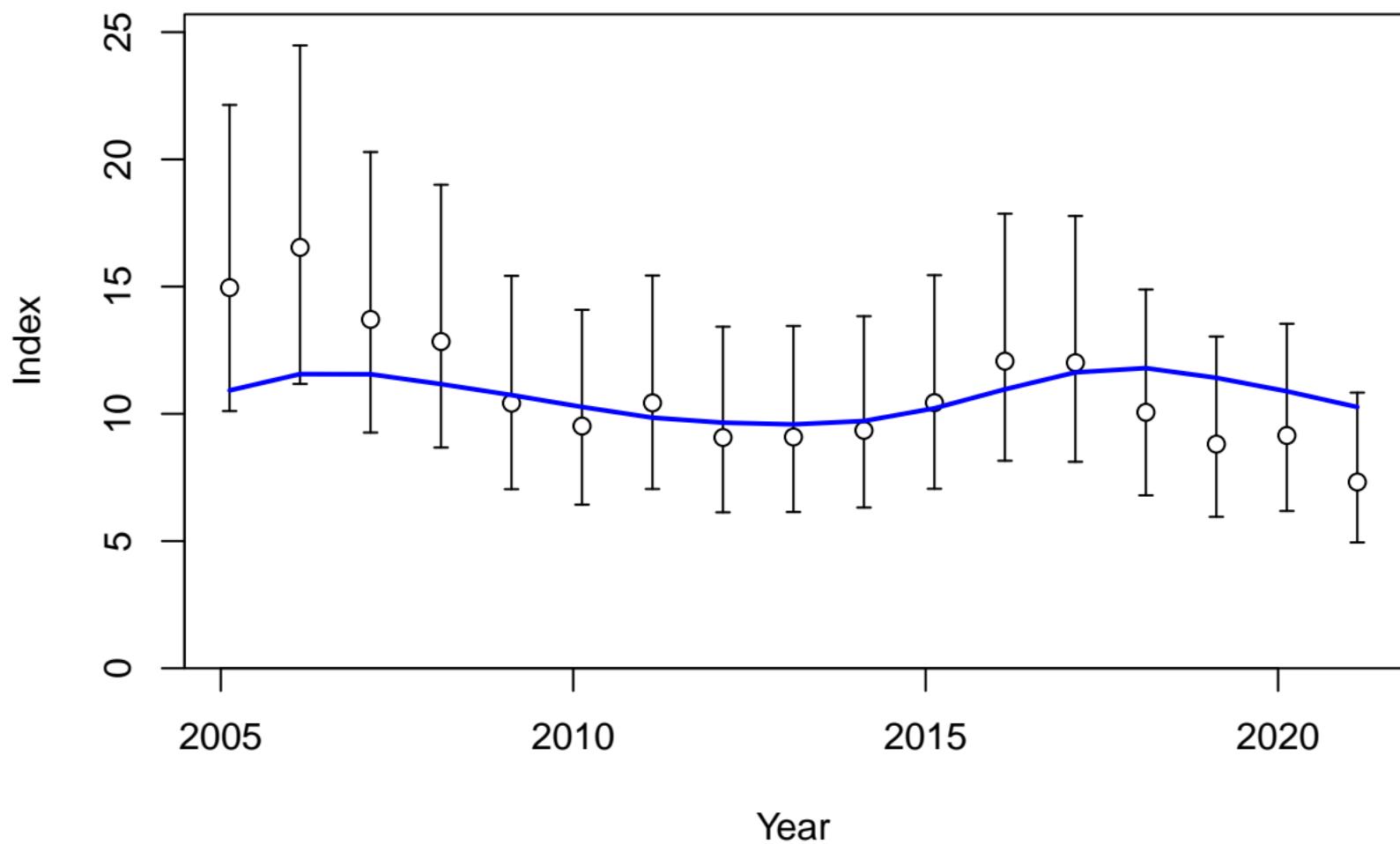
1999

2000

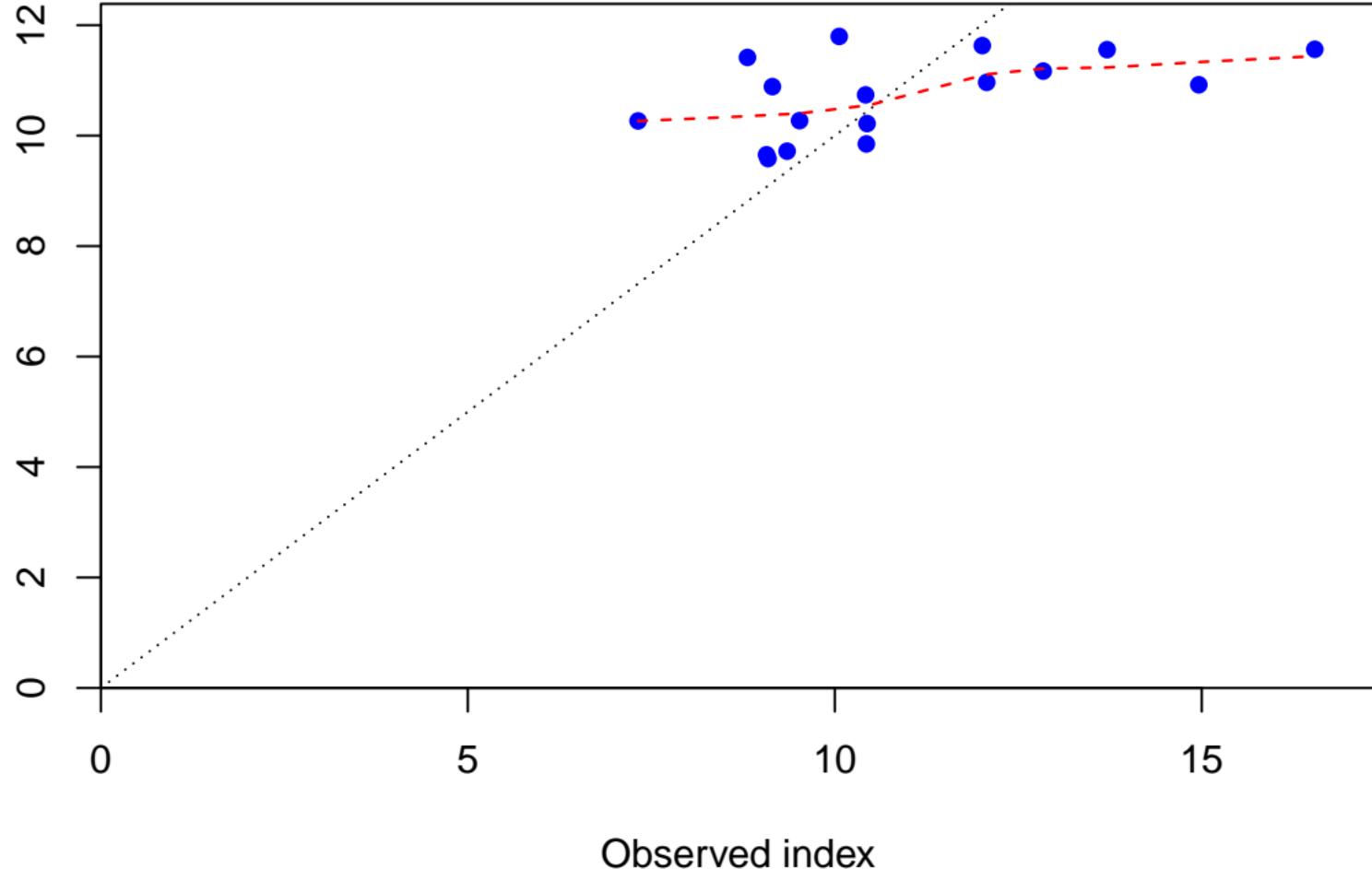
Year







Expected index



Log index

3.0  
2.5  
2.0

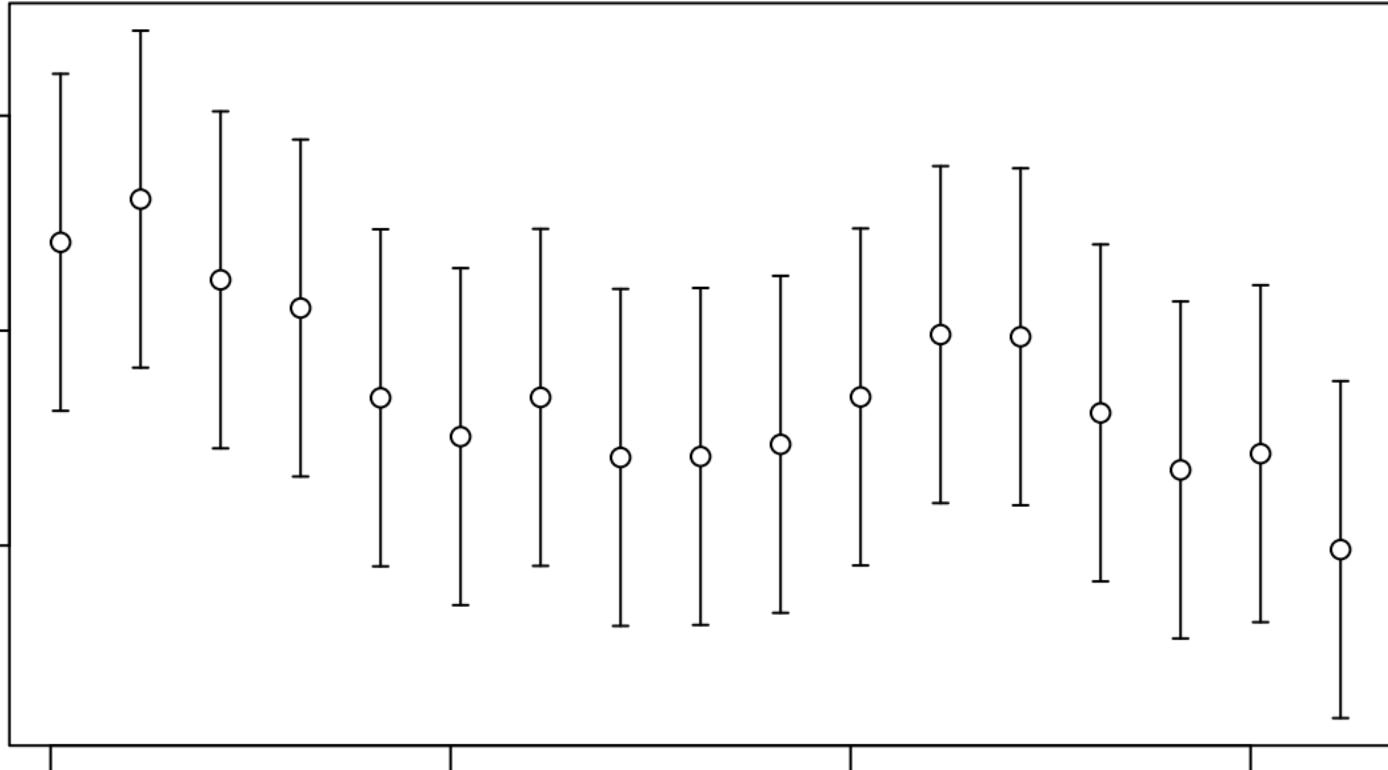
2005

2010

2015

2020

Year

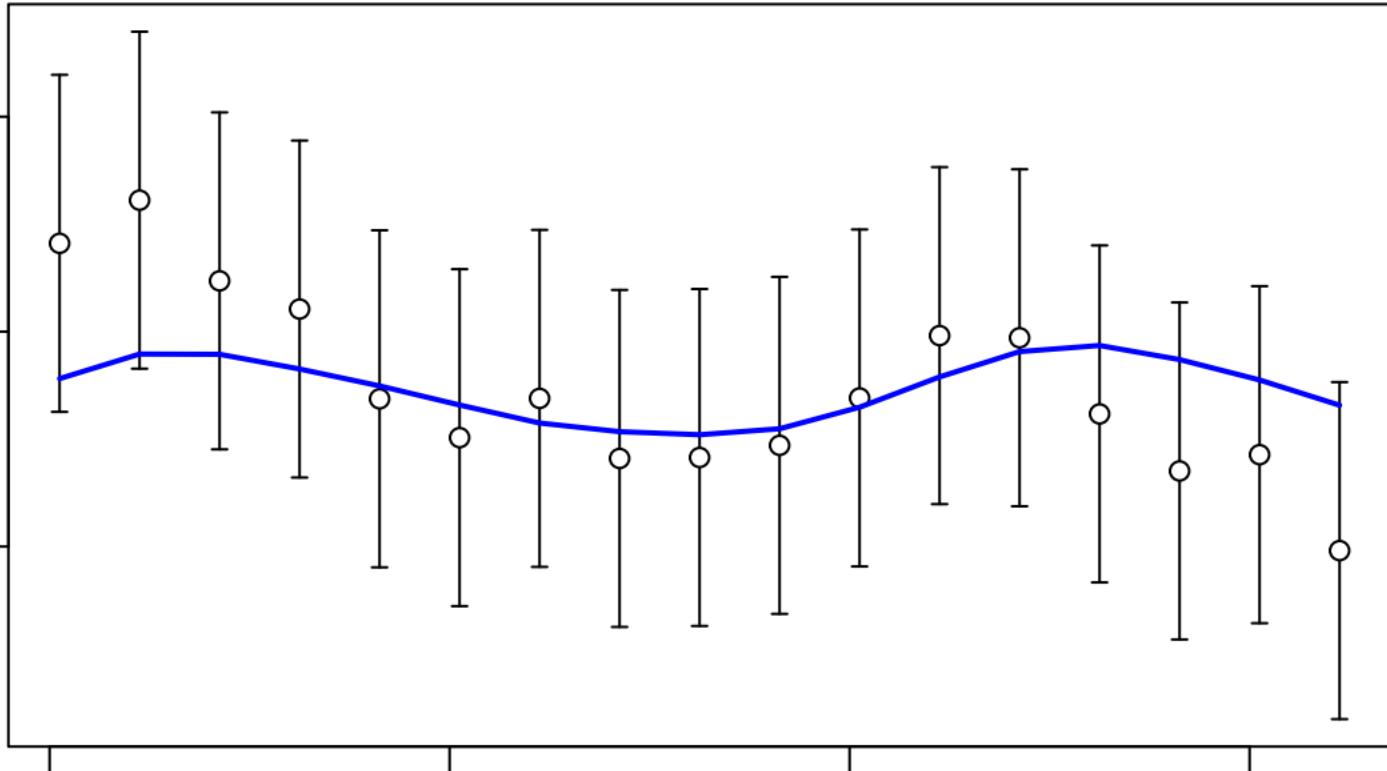


Log index

3.0  
2.5  
2.0

2005 2010 2015 2020

Year



Log expected index

2.30 2.35 2.40 2.45

2.0

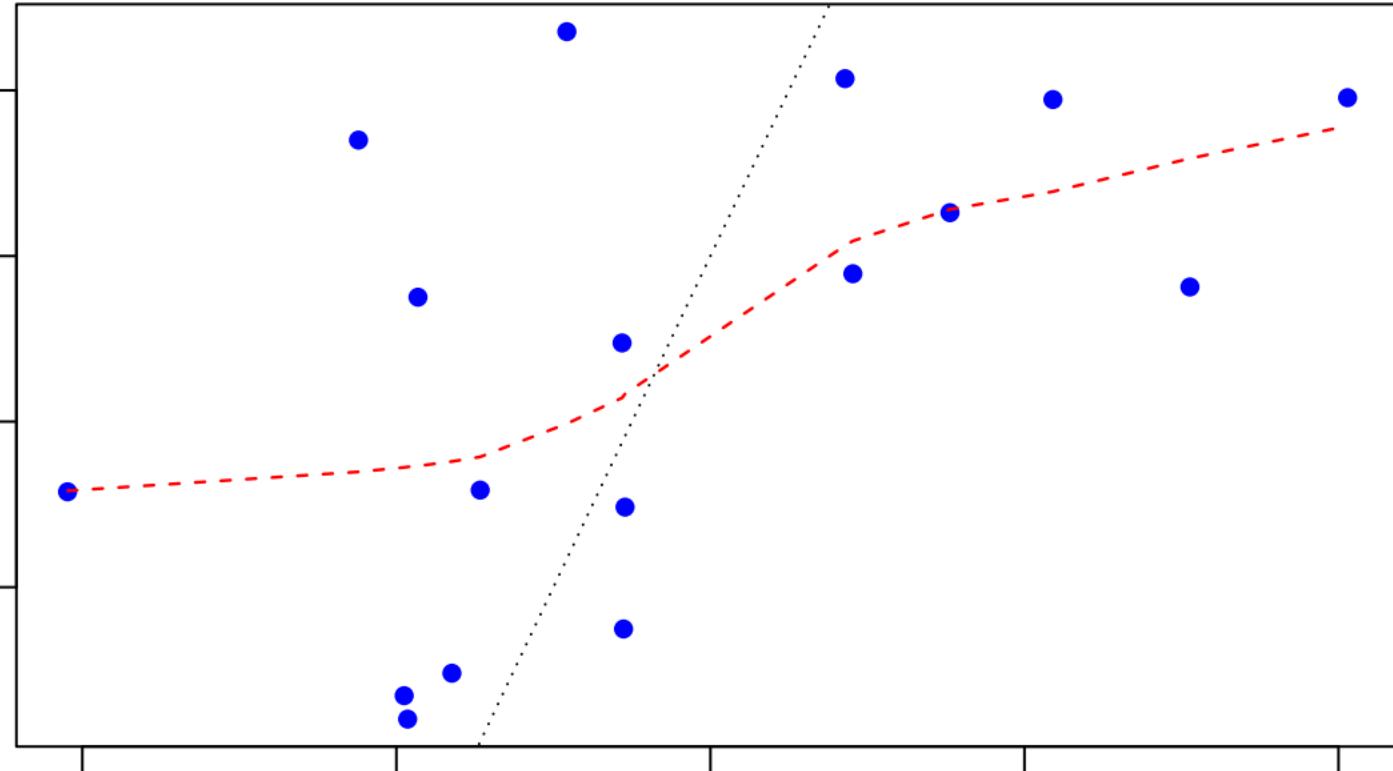
2.2

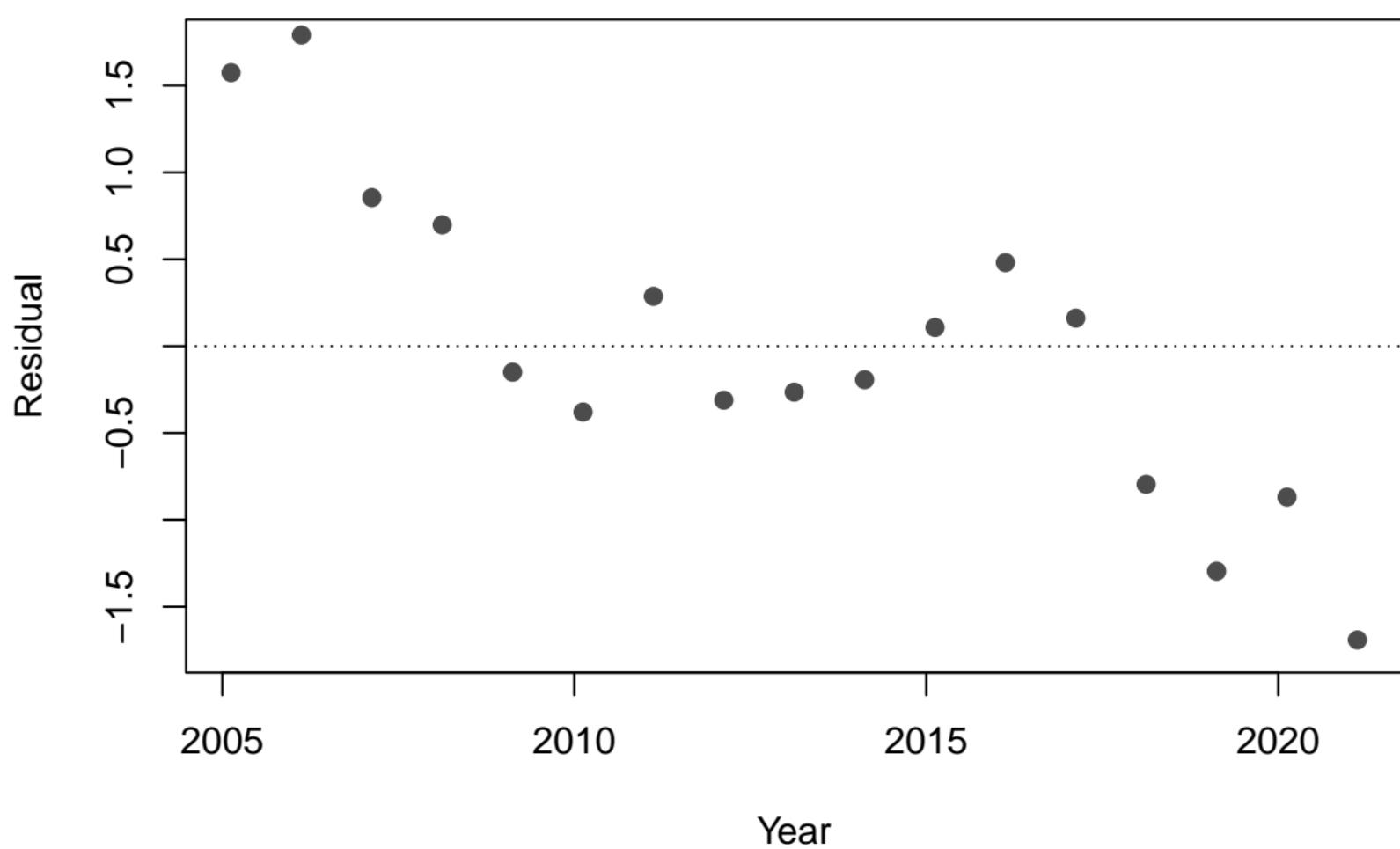
2.4

2.6

2.8

Log observed index



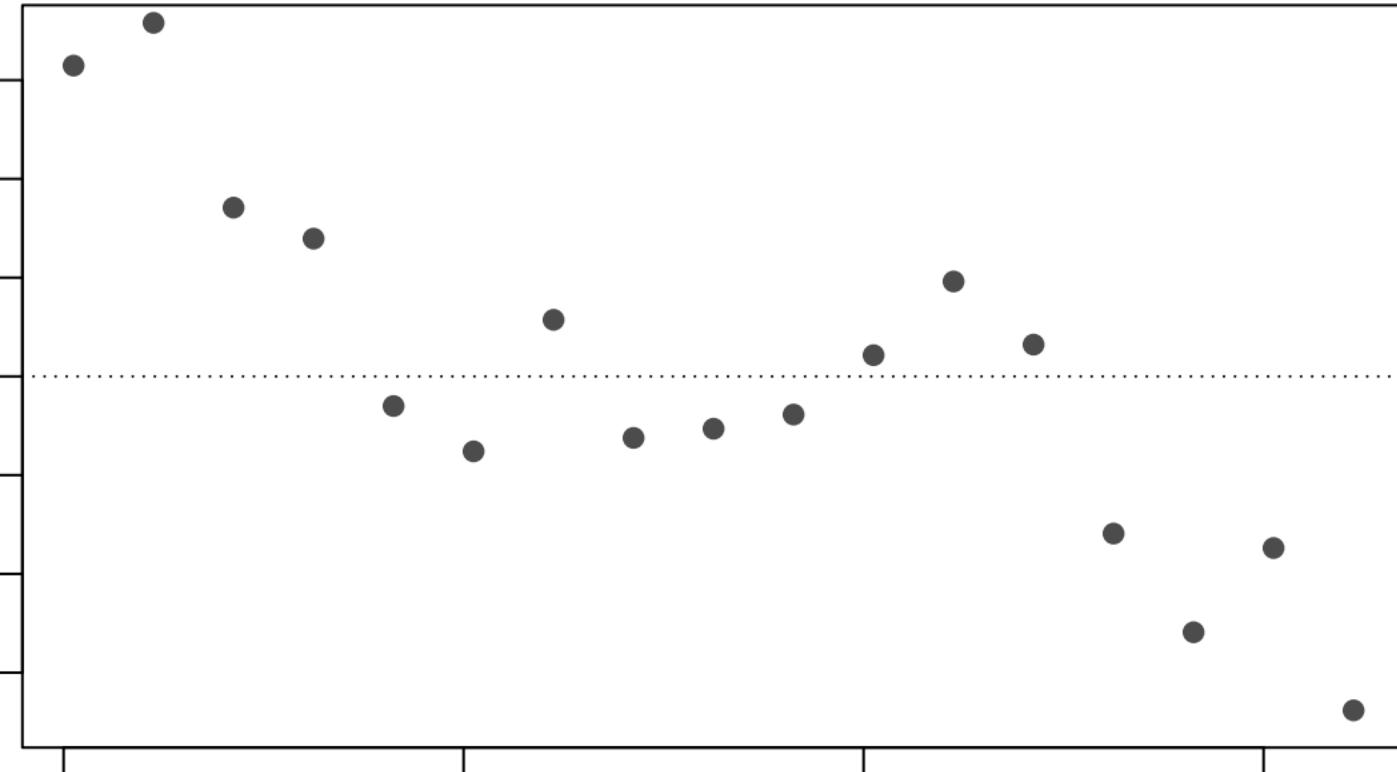


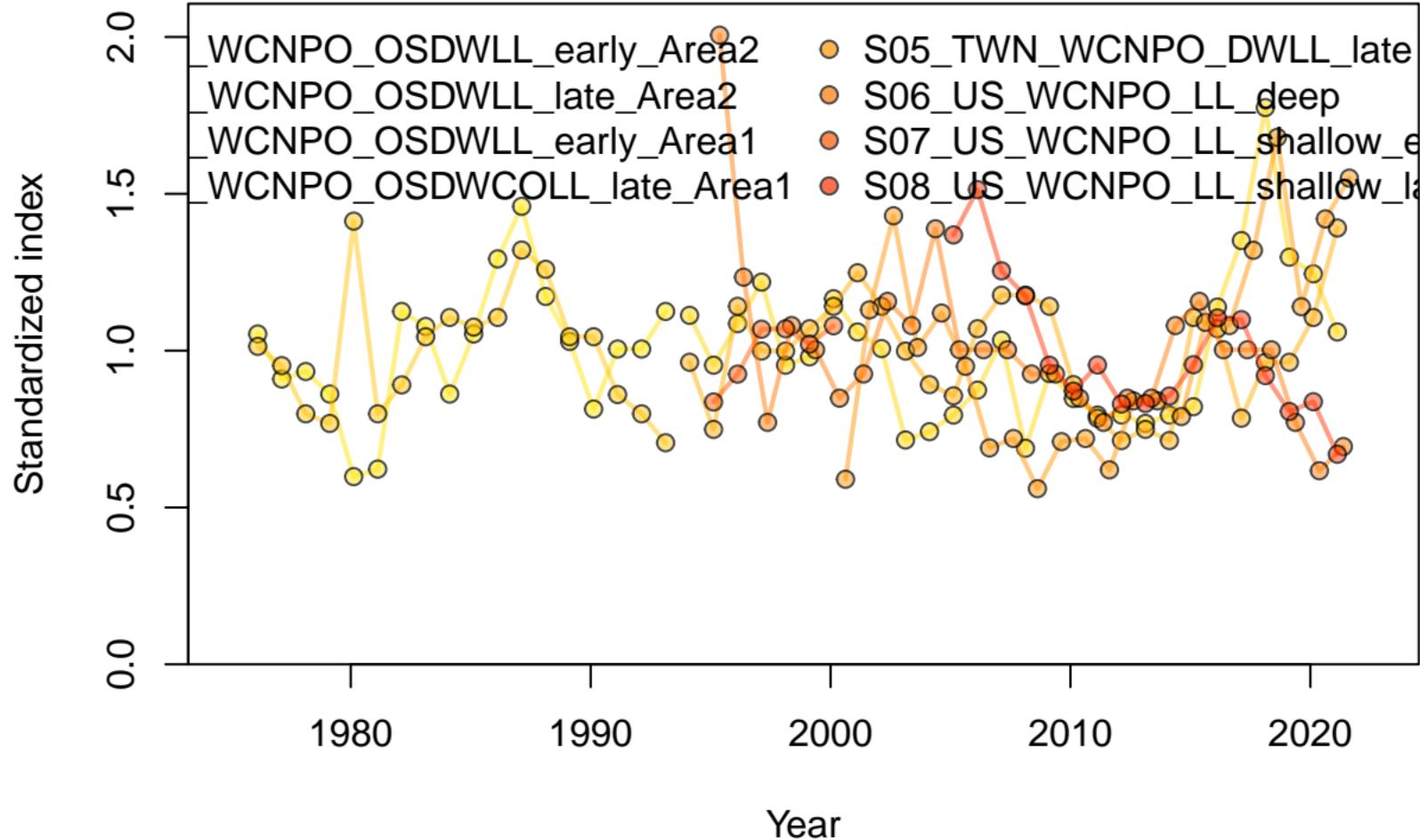
Deviation

0.3  
0.2  
0.1  
0  
-0.1  
-0.2  
-0.3

2005 2010 2015 2020

Year



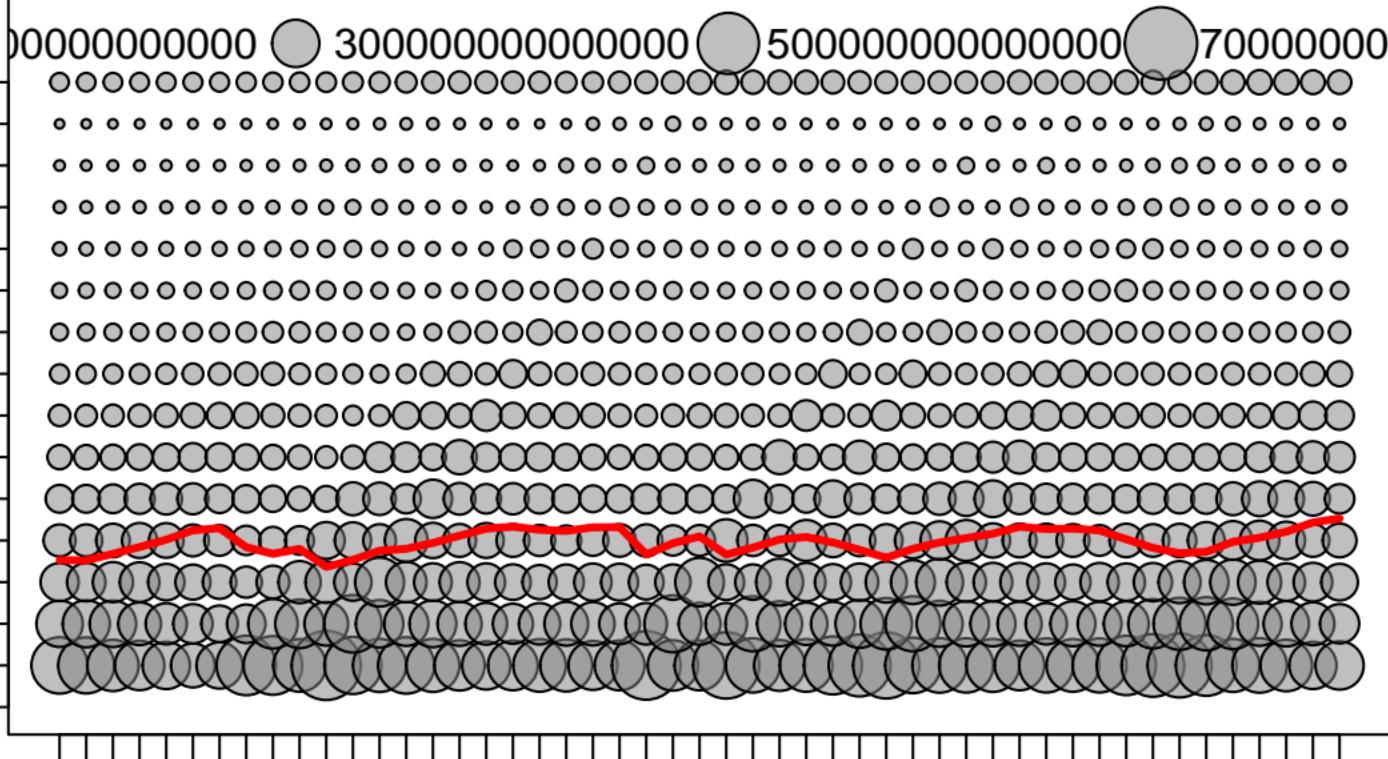


Age

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

1974 1979 1984 1989 1994 1999 2004 2009 2014 2019

Year

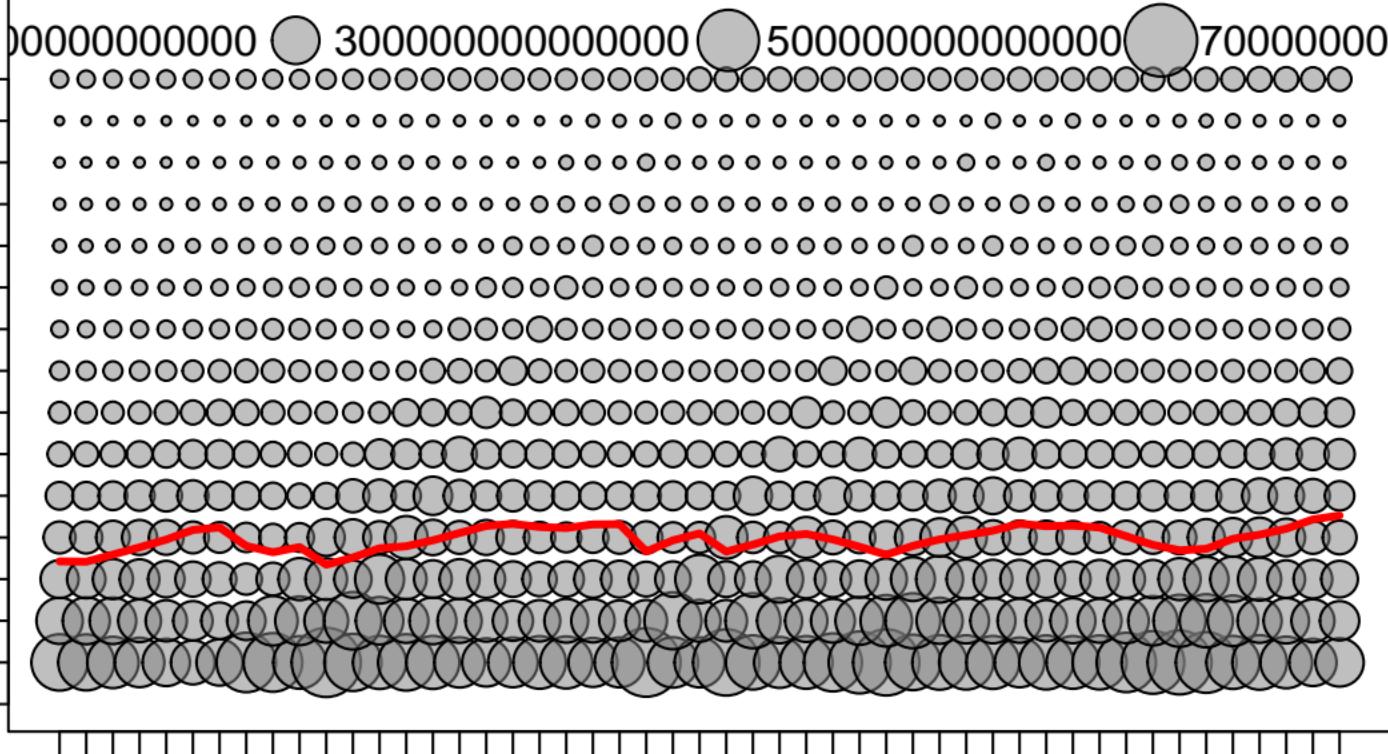


Age

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

1974 1979 1984 1989 1994 1999 2004 2009 2014 2019

Year



Mean age (yr)

4  
3  
2  
1  
0

- -○- Females  
—×— Males

1980 1990 2000 2010 2020

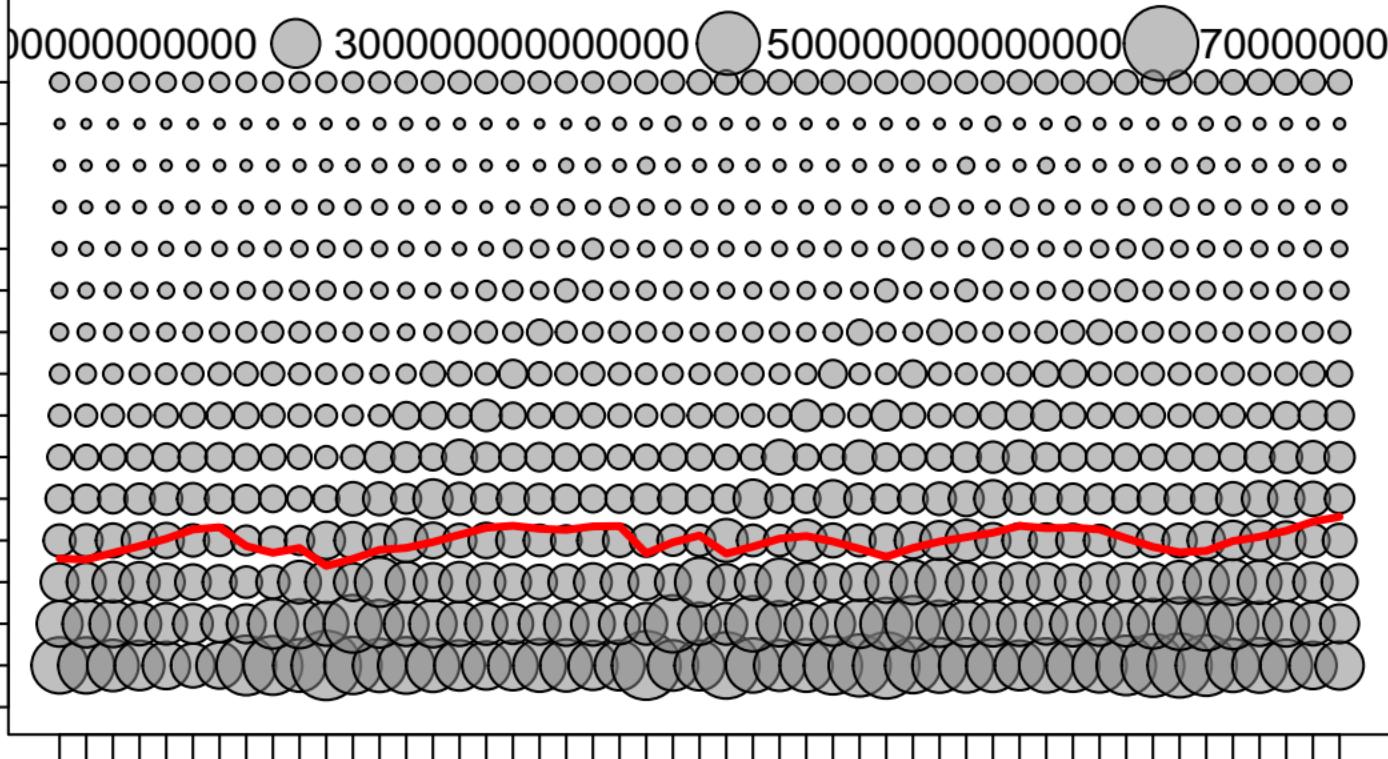
Year

Age

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

1974 1979 1984 1989 1994 1999 2004 2009 2014 2019

Year

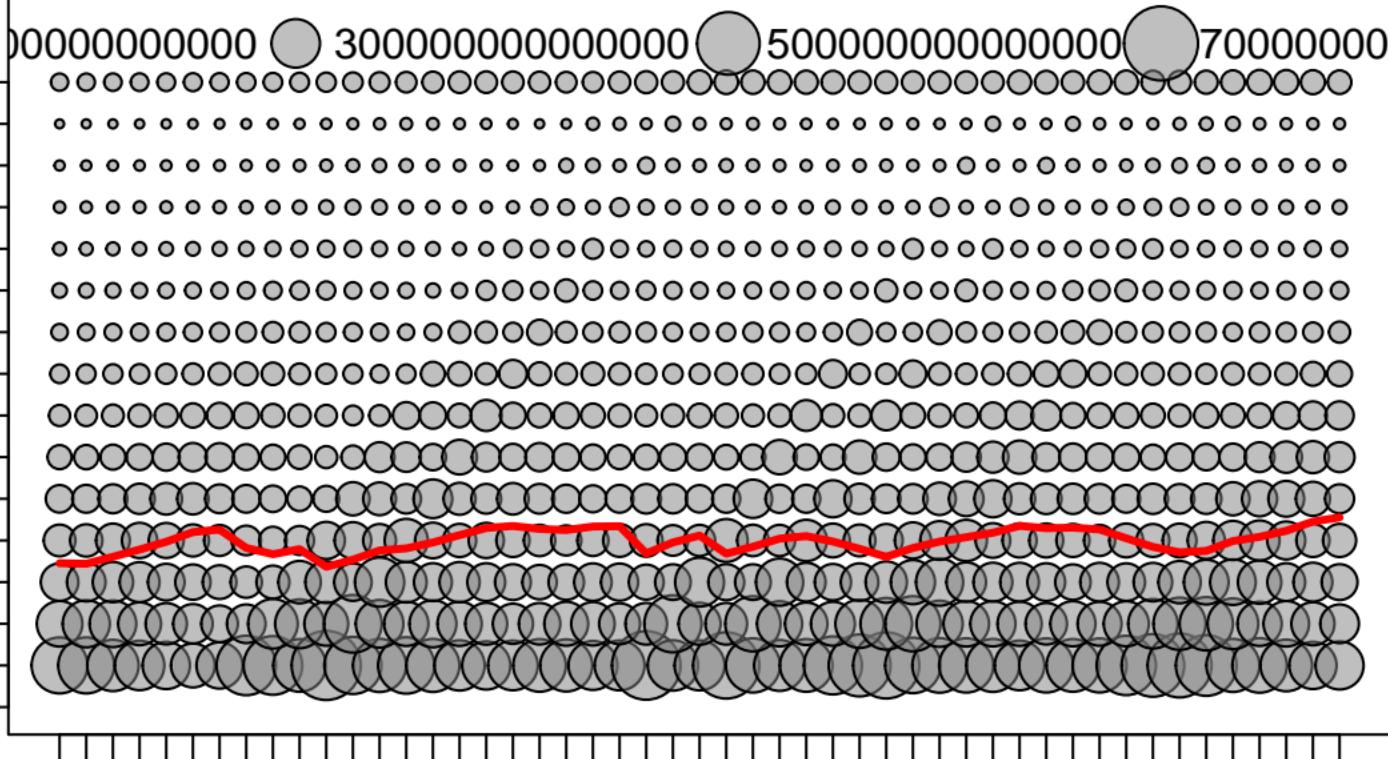


Age

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

1974 1979 1984 1989 1994 1999 2004 2009 2014 2019

Year



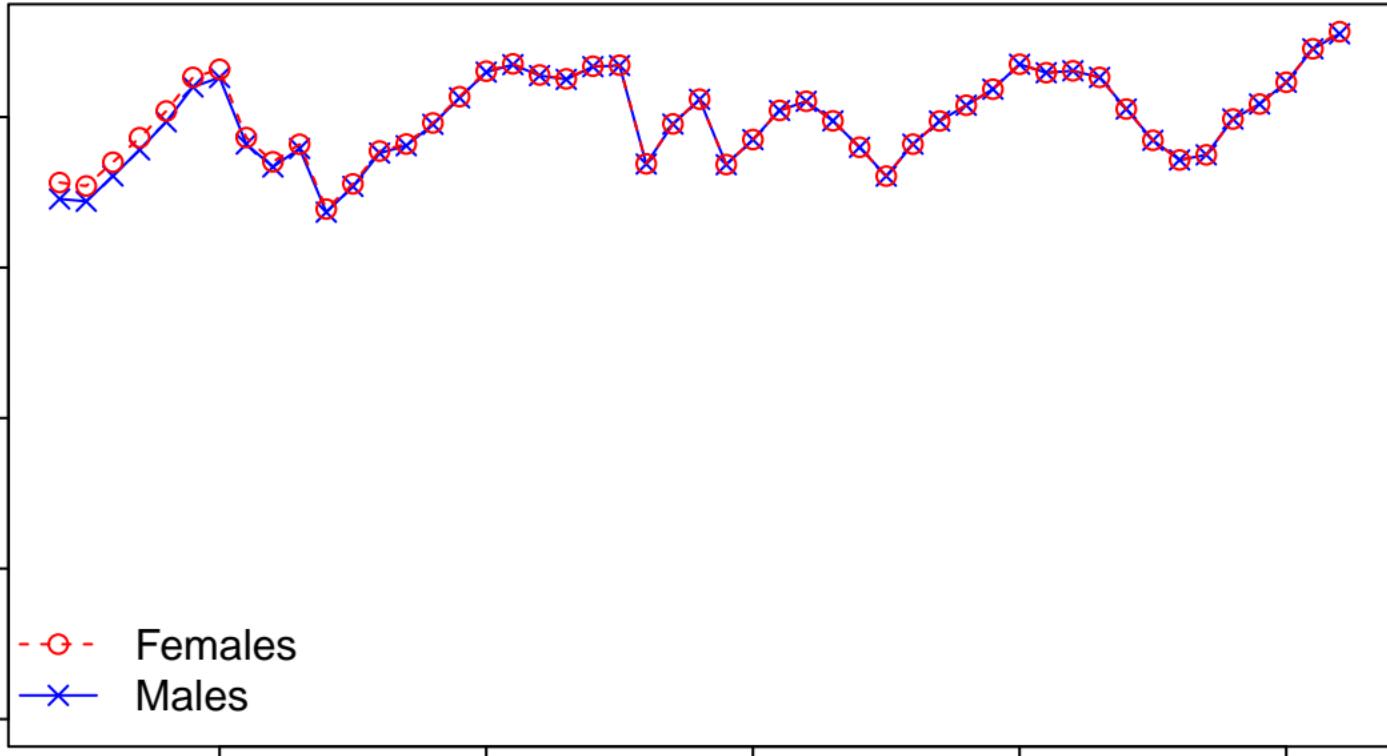
Mean age (yr)

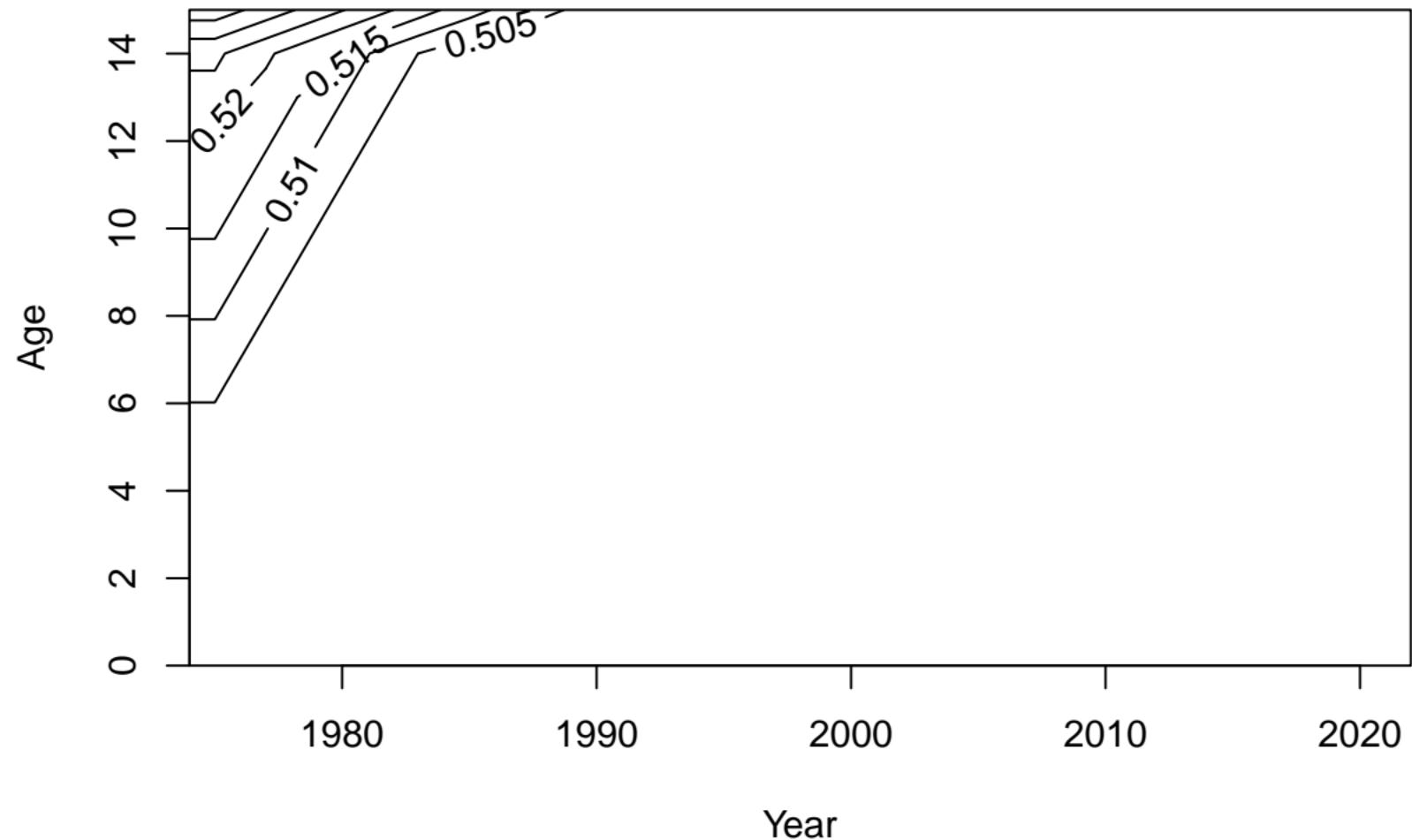
4  
3  
2  
1  
0

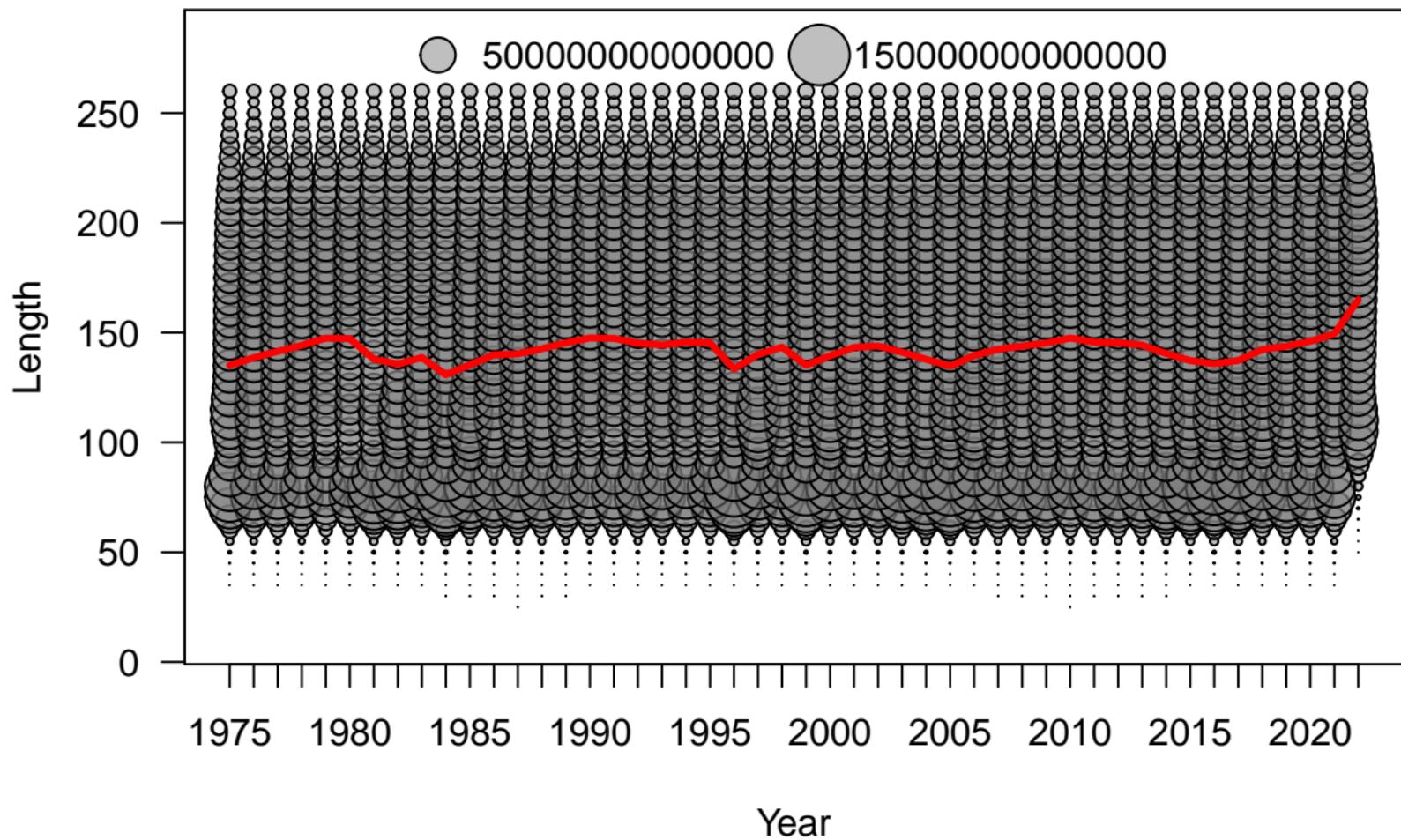
- -○- Females  
—×— Males

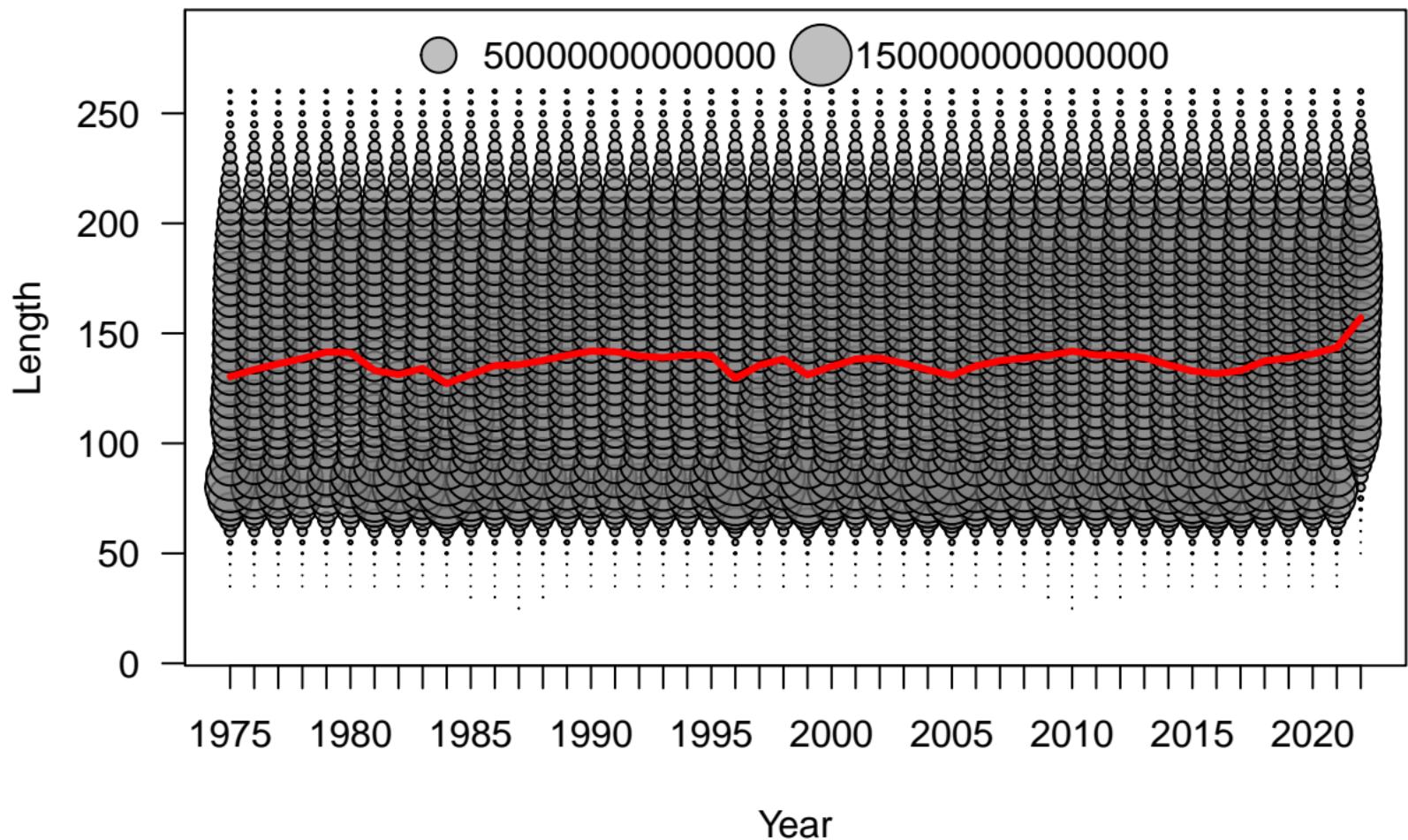
1980 1990 2000 2010 2020

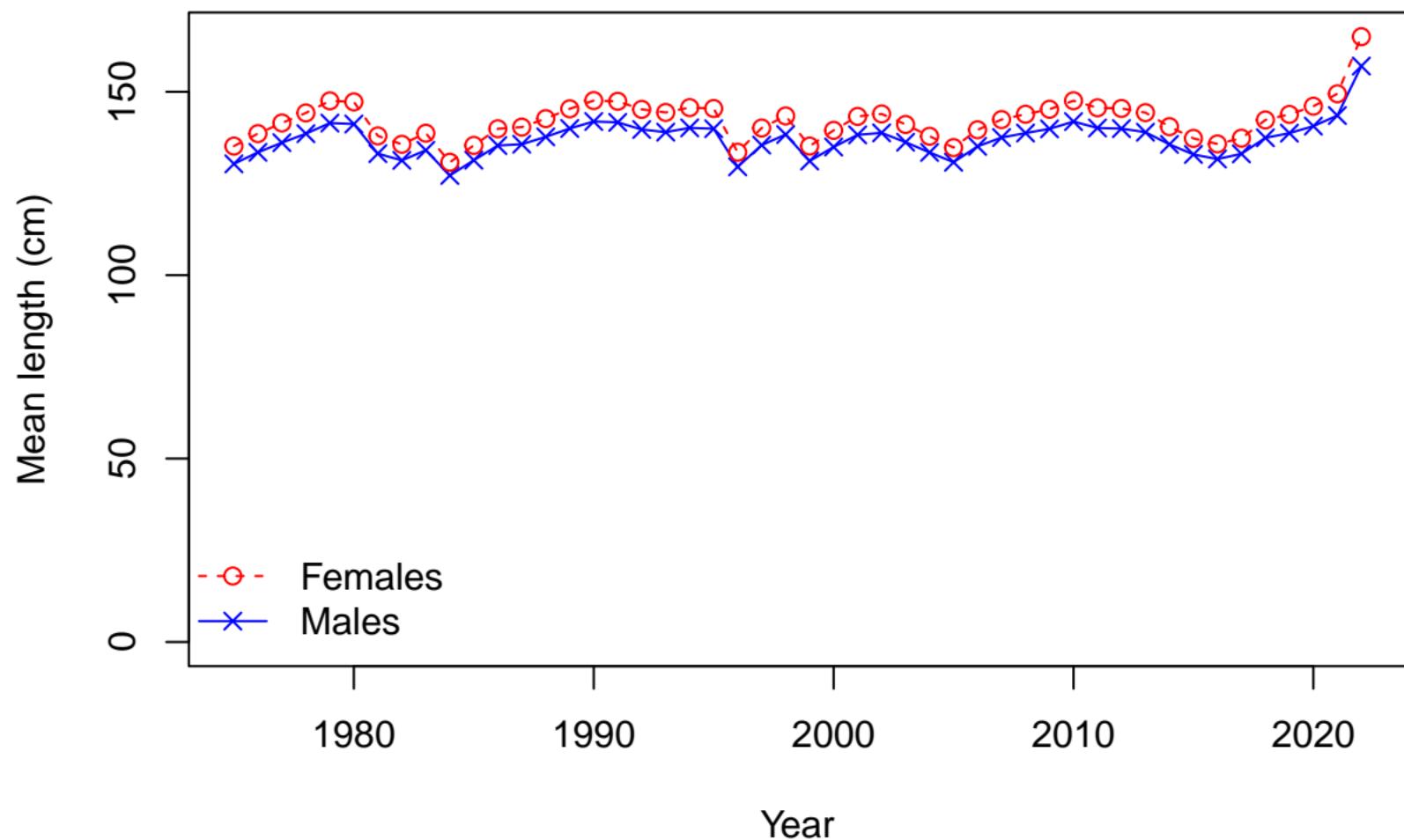
Year

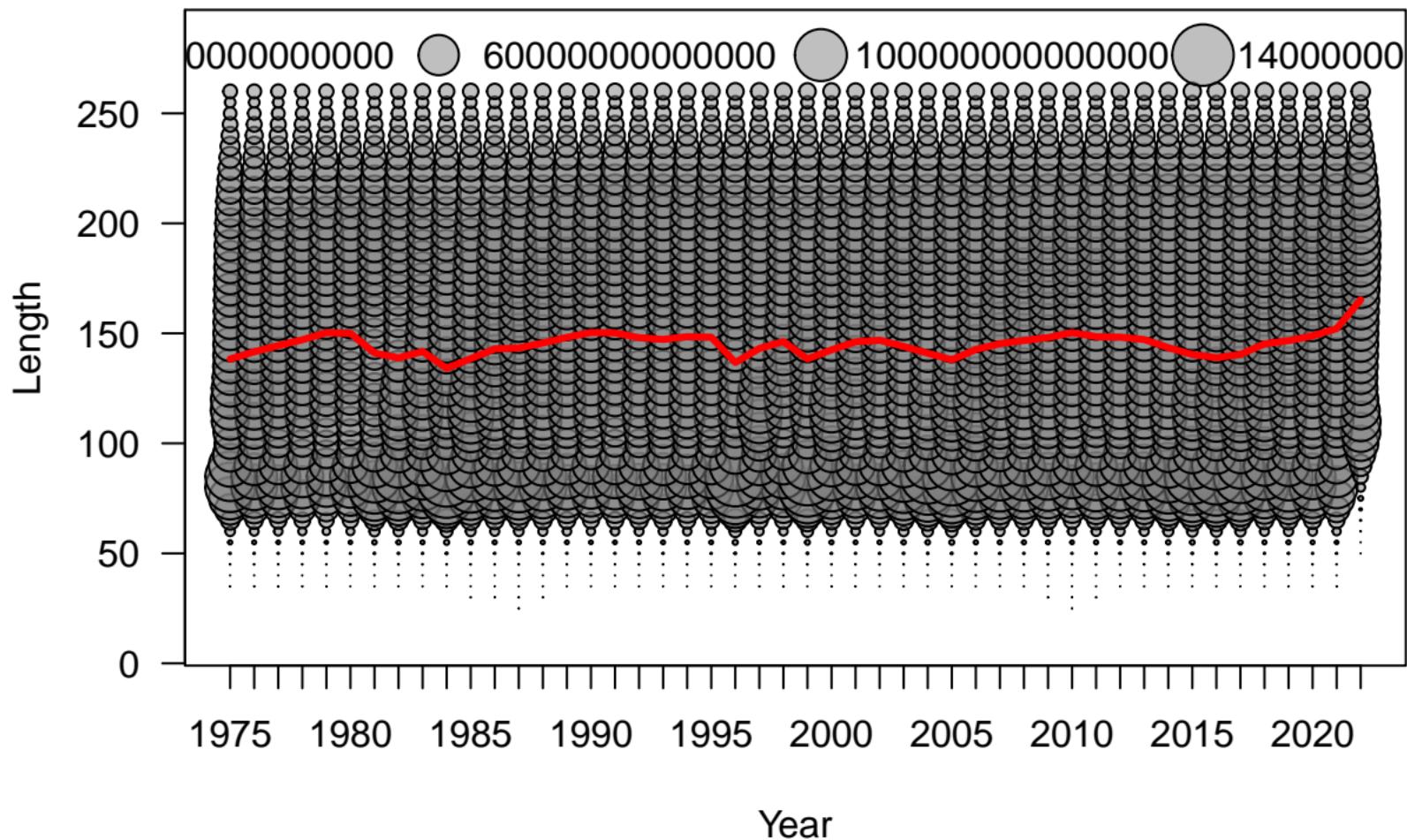


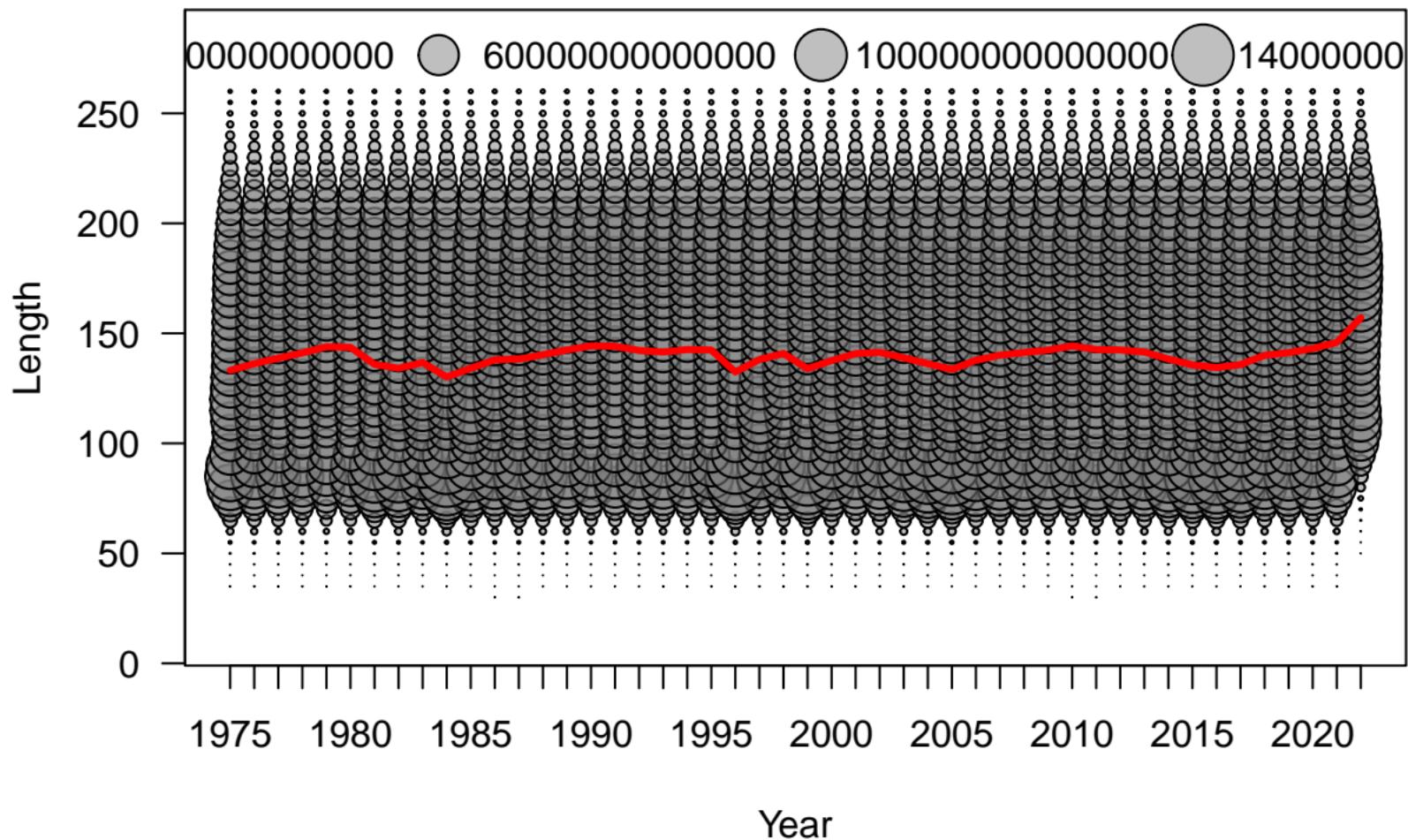


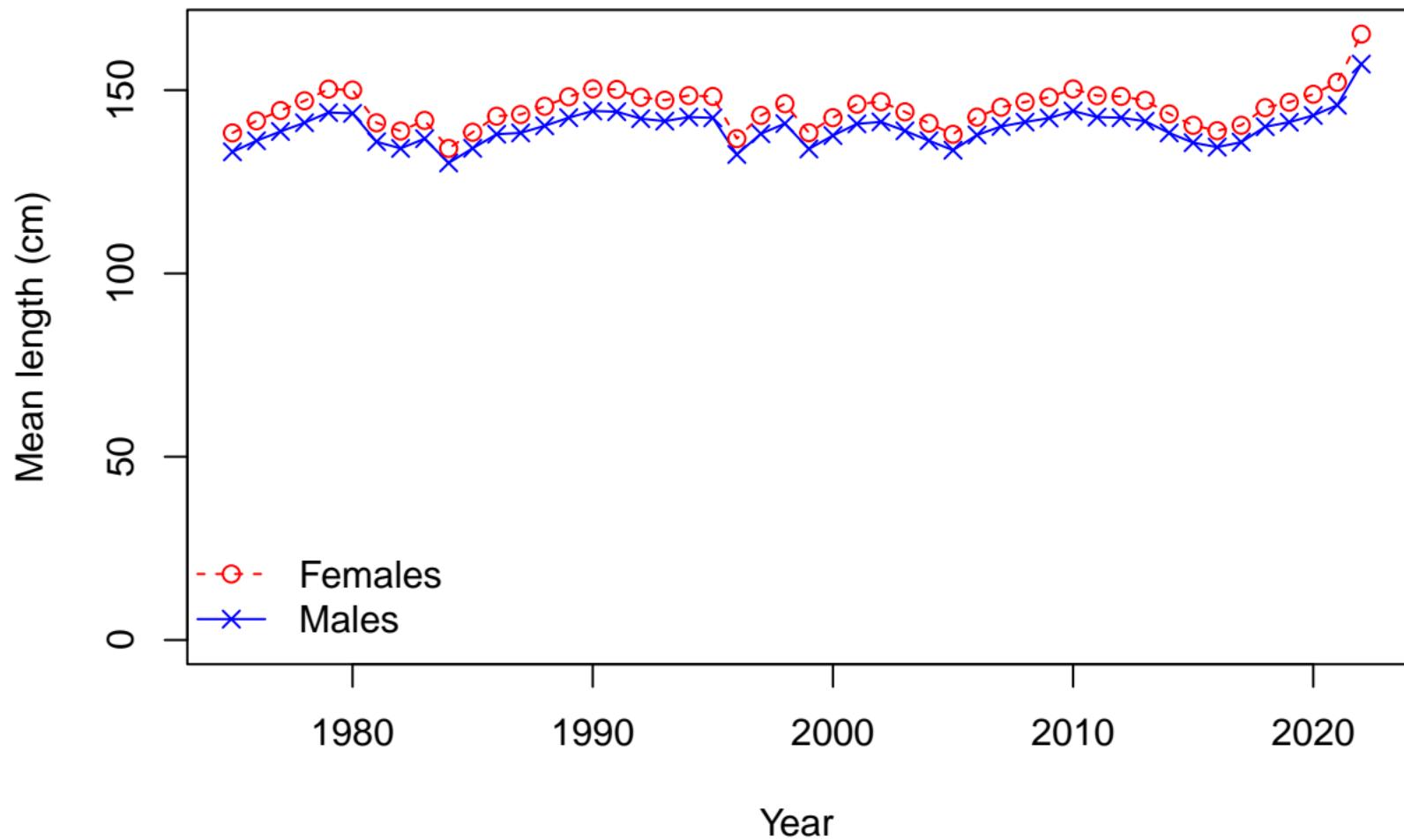


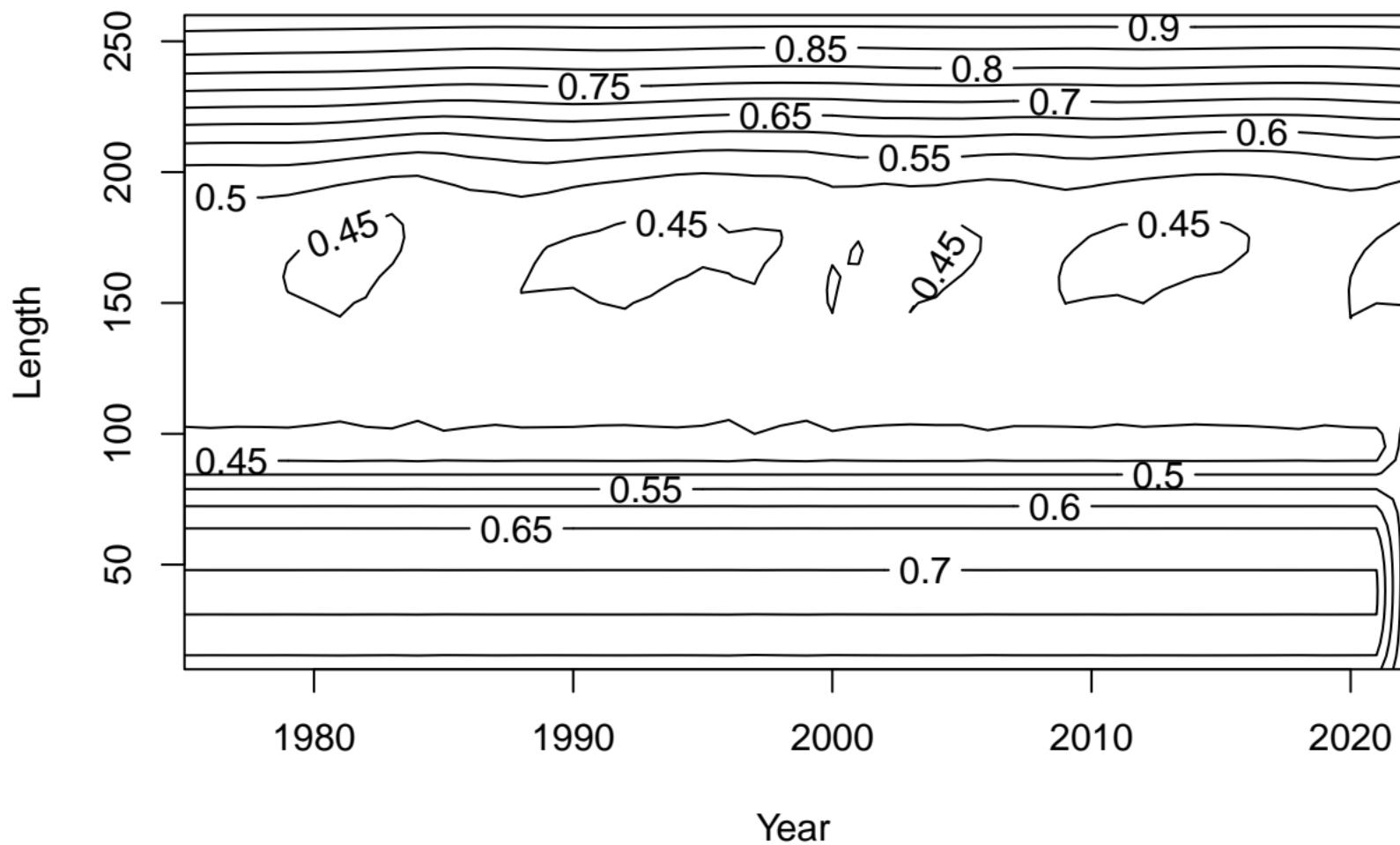




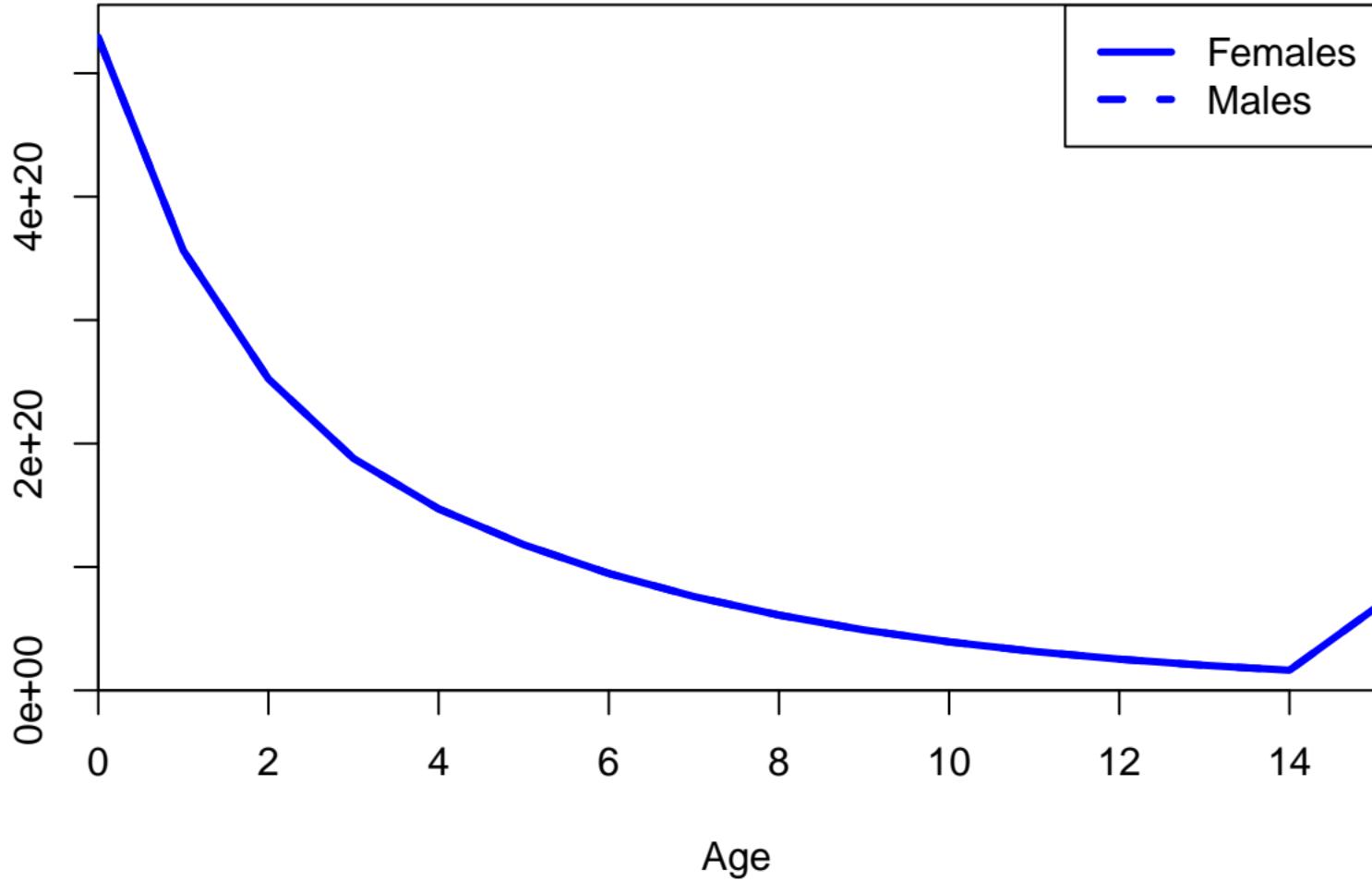




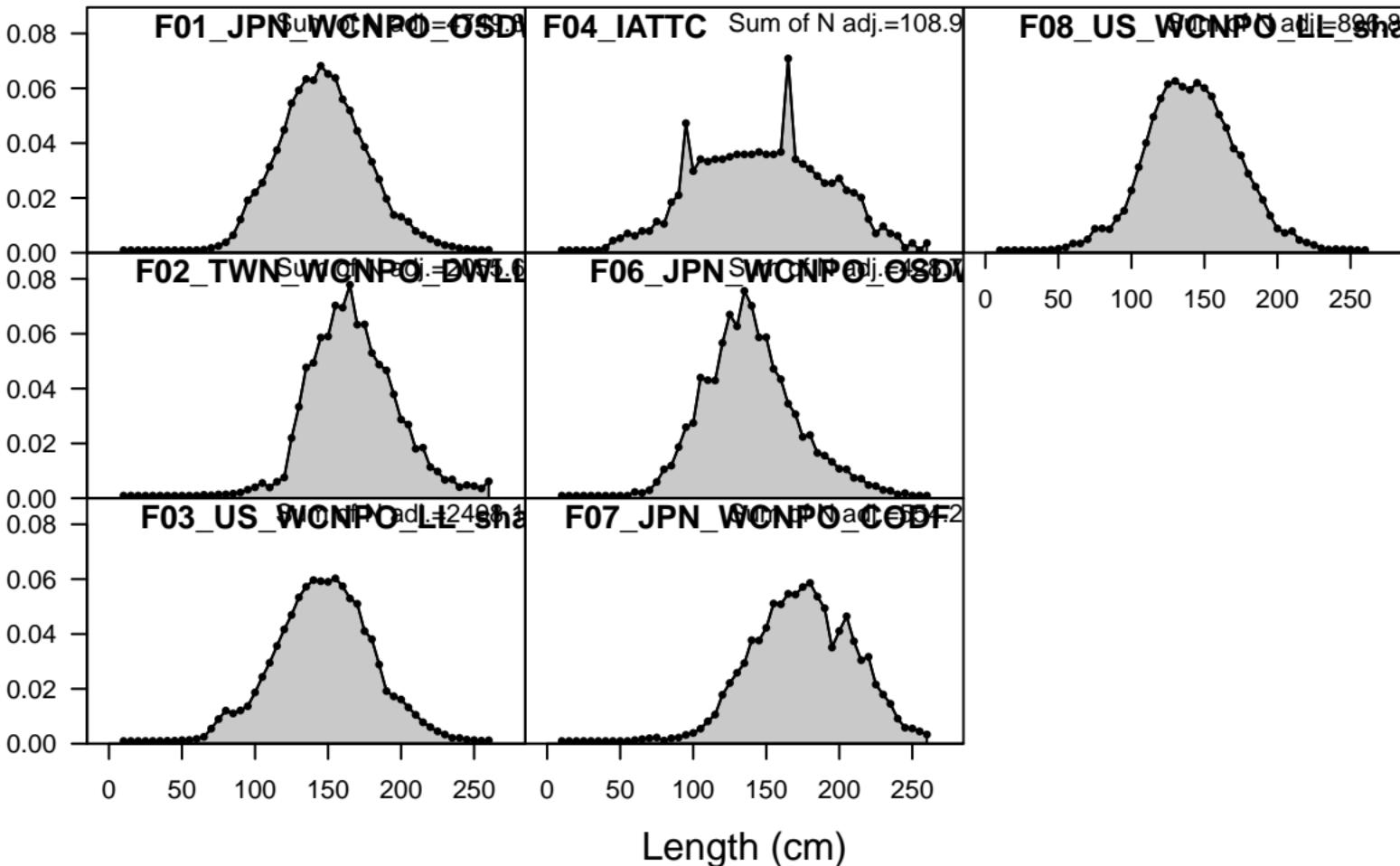


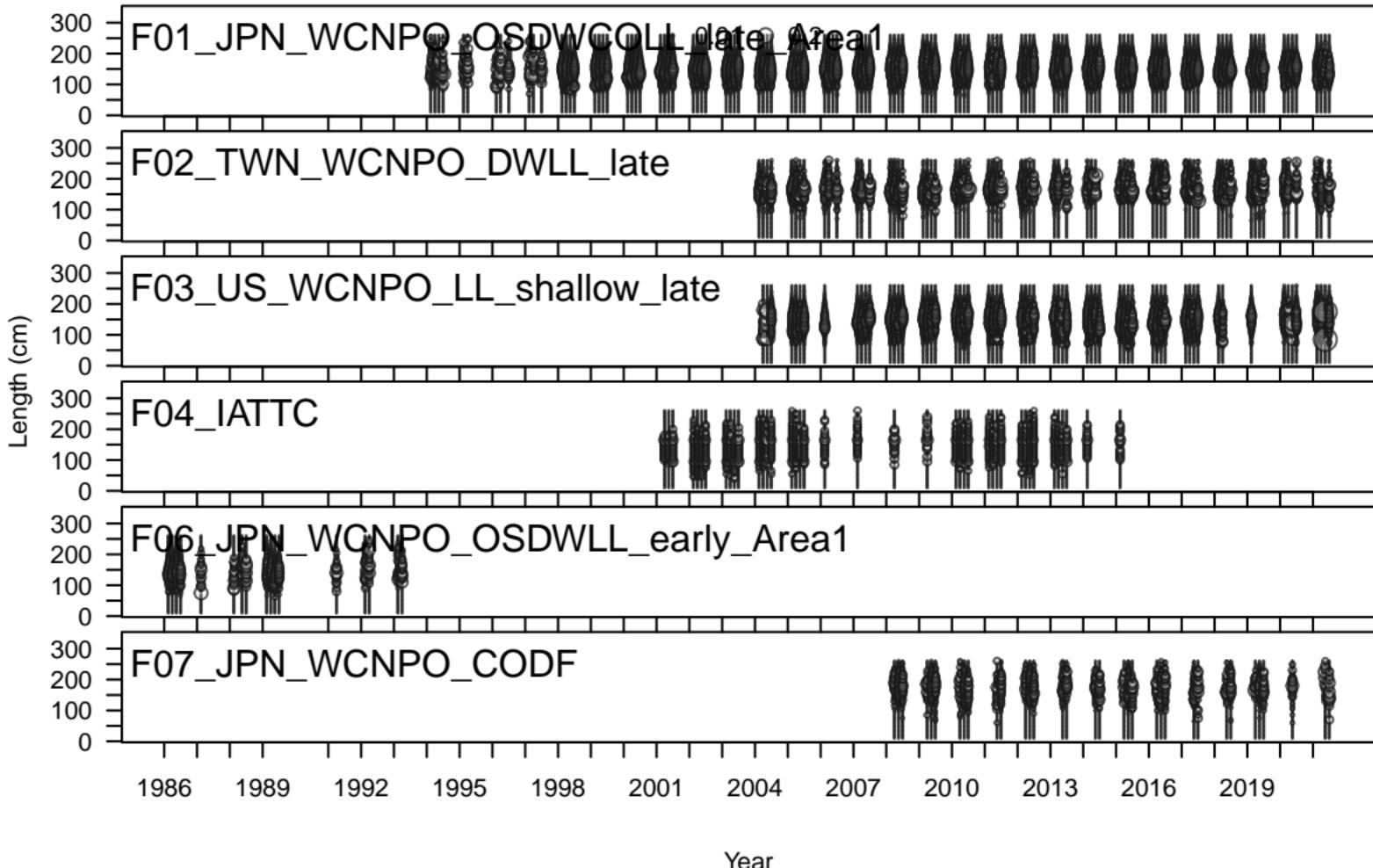


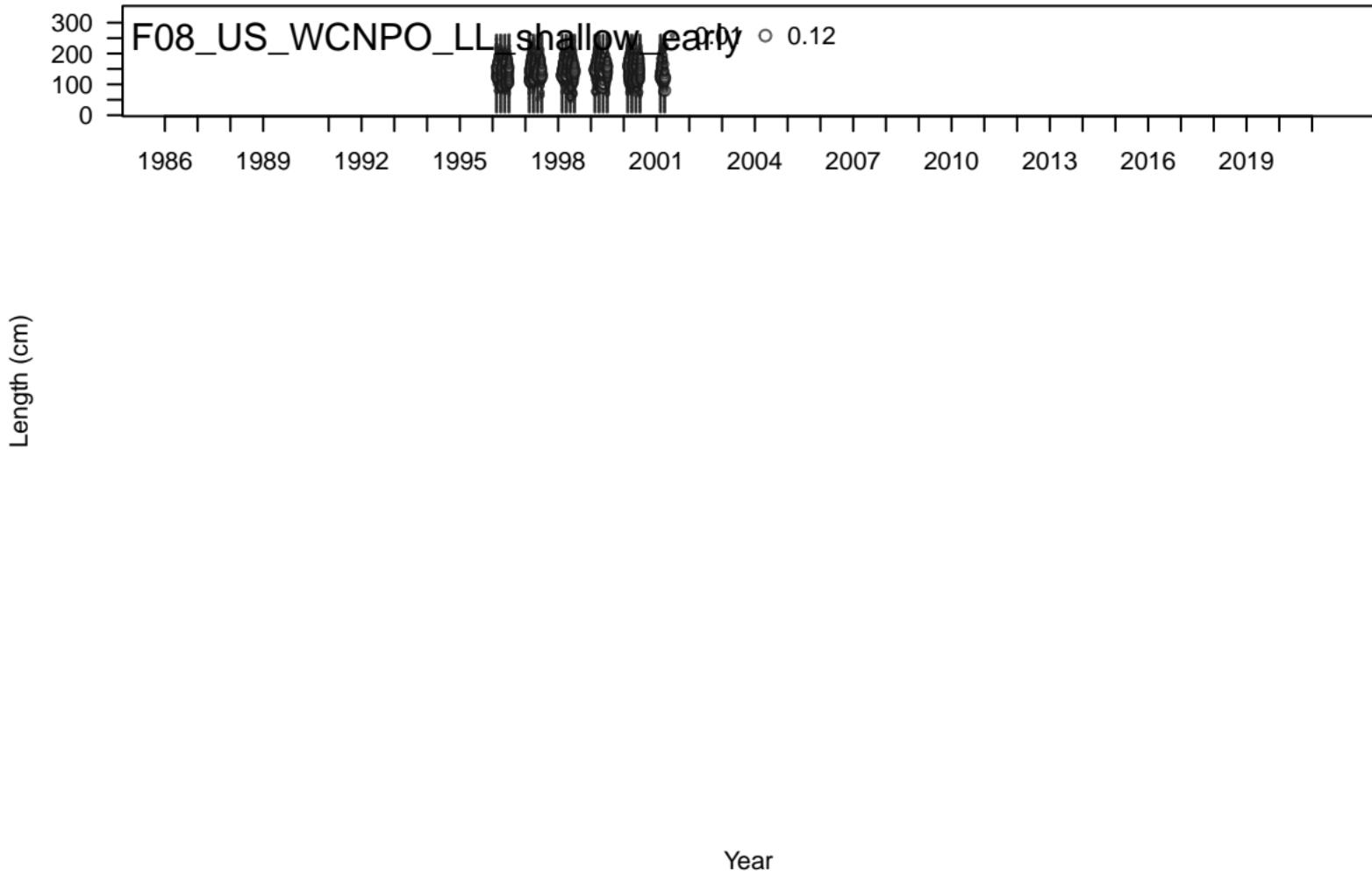
Numbers at age at equilibrium



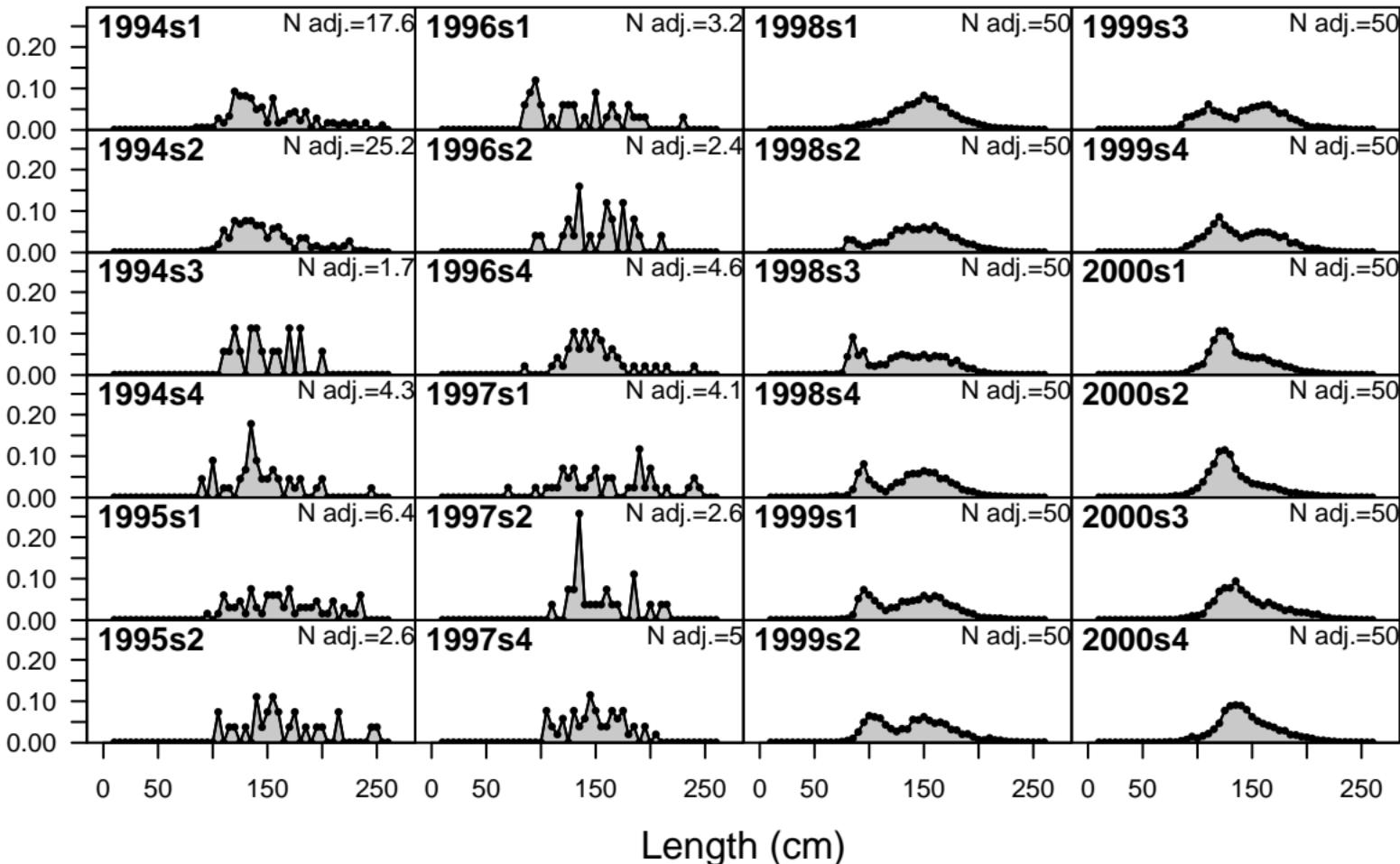
Proportion



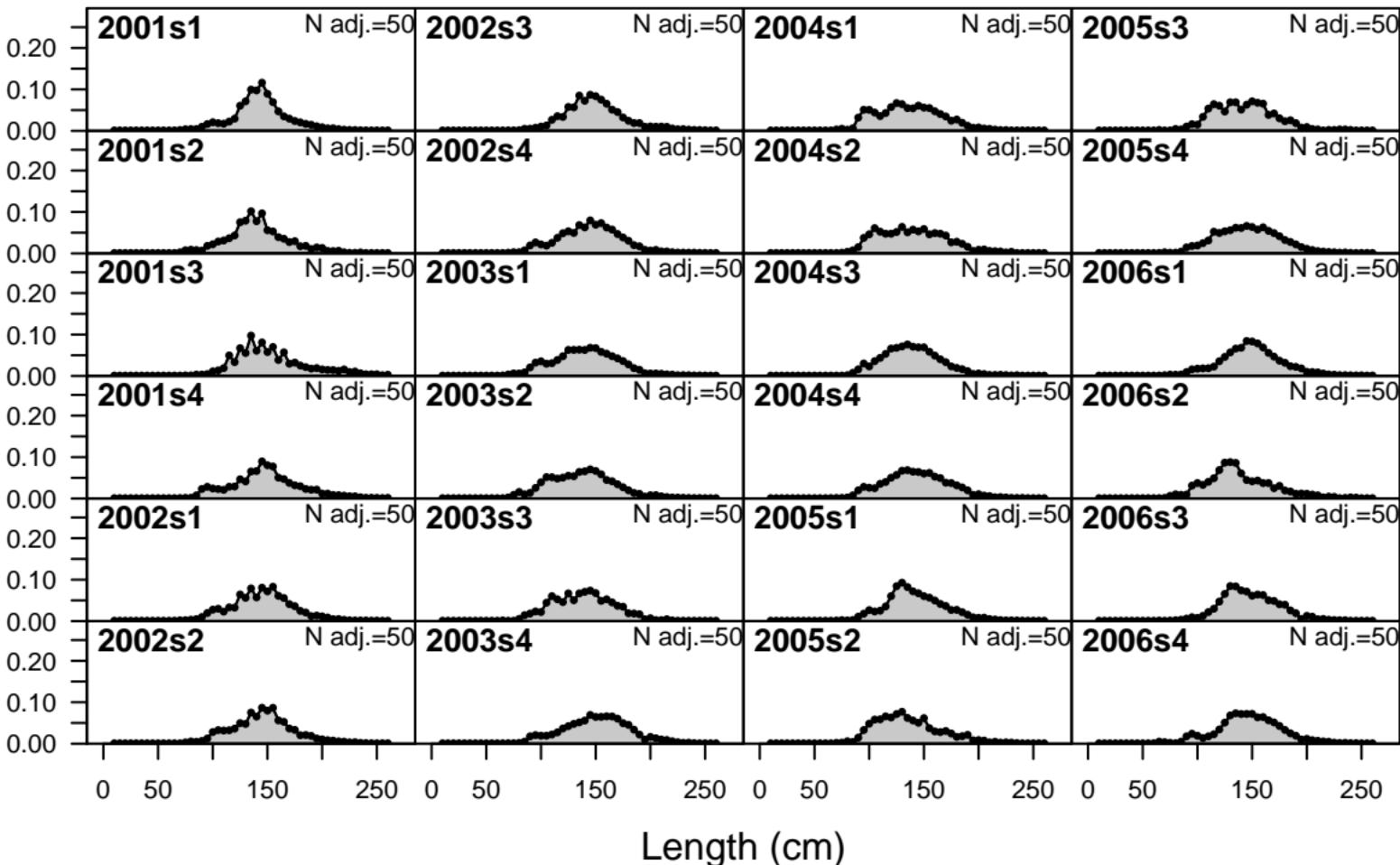




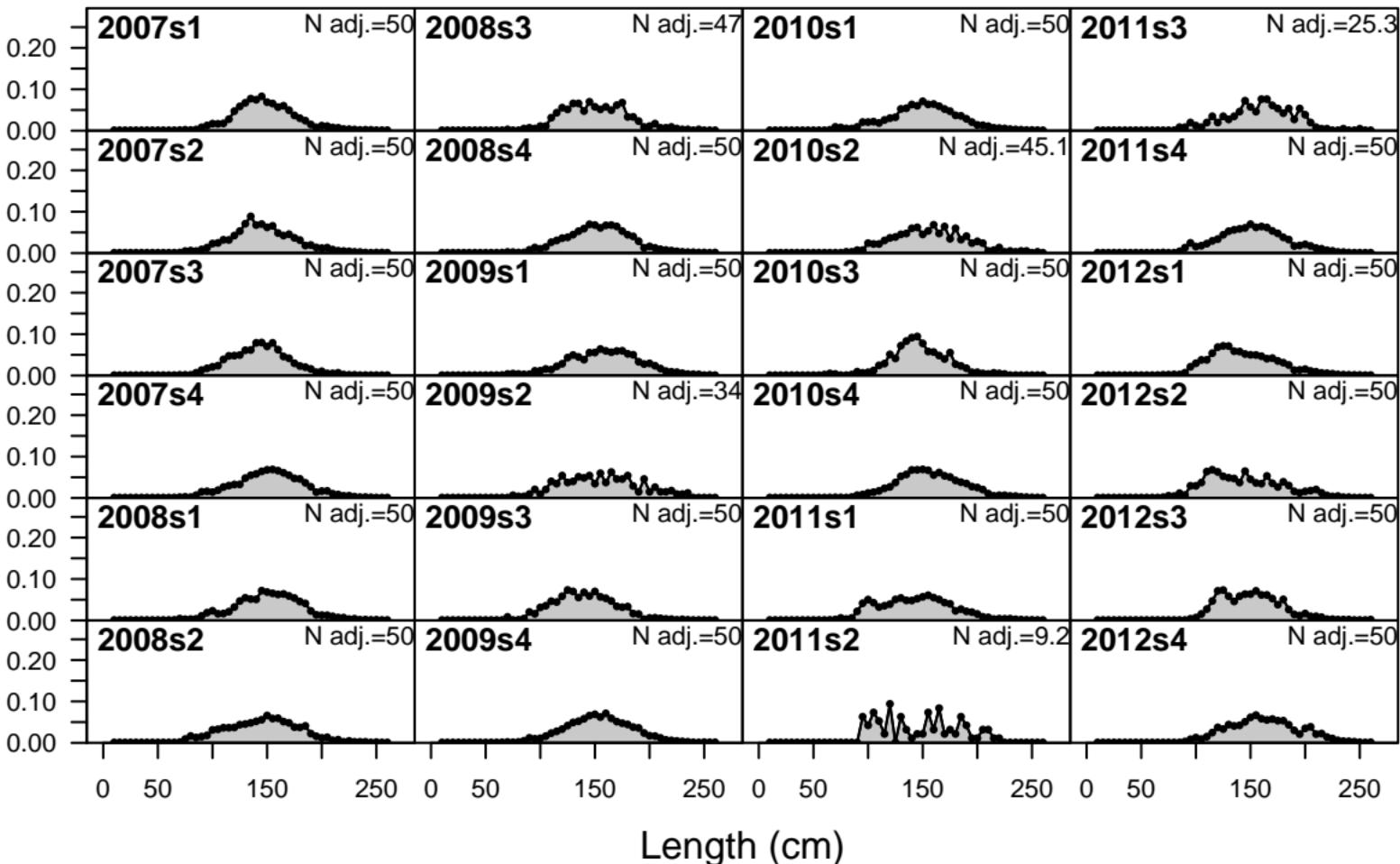
Proportion



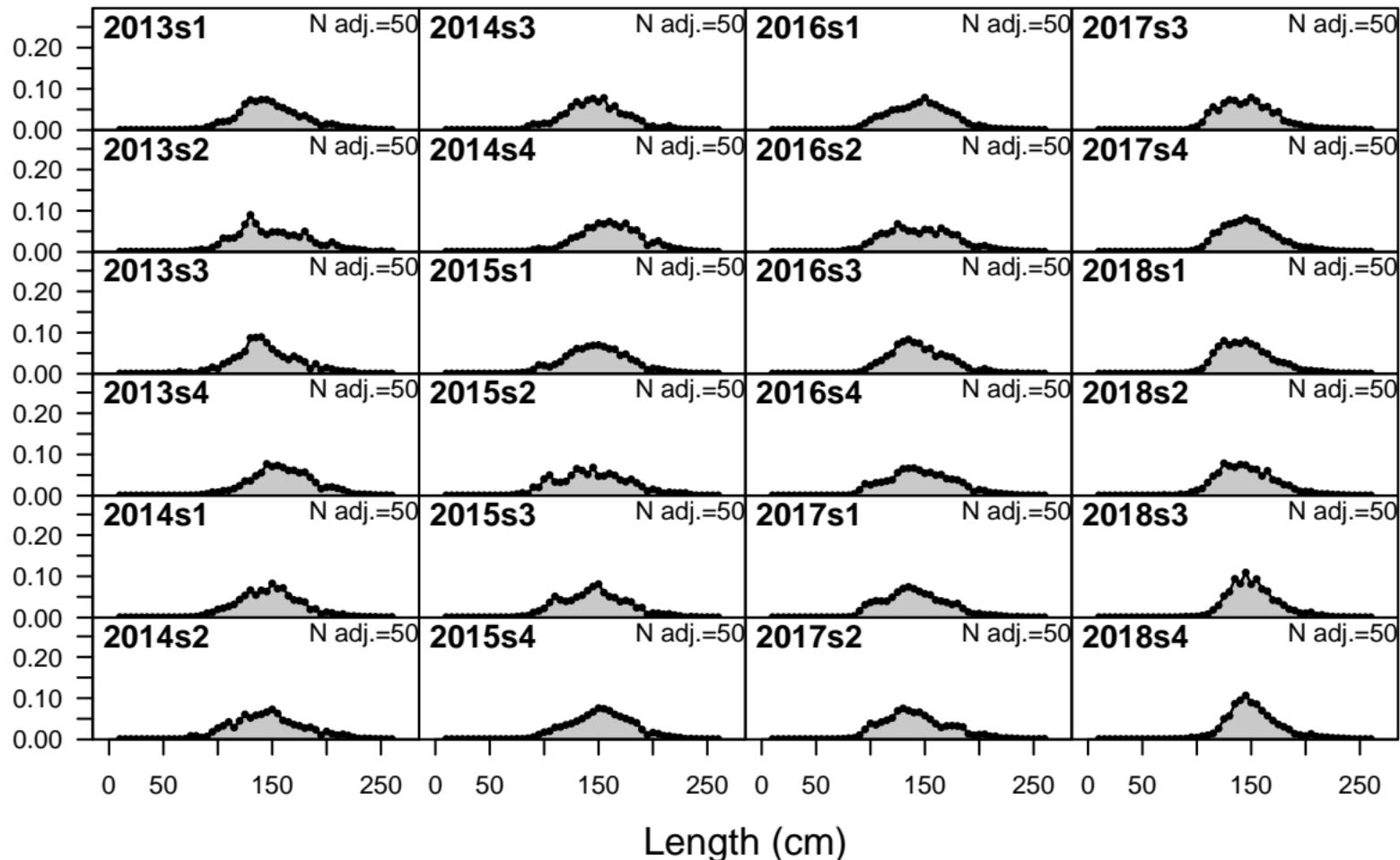
Proportion



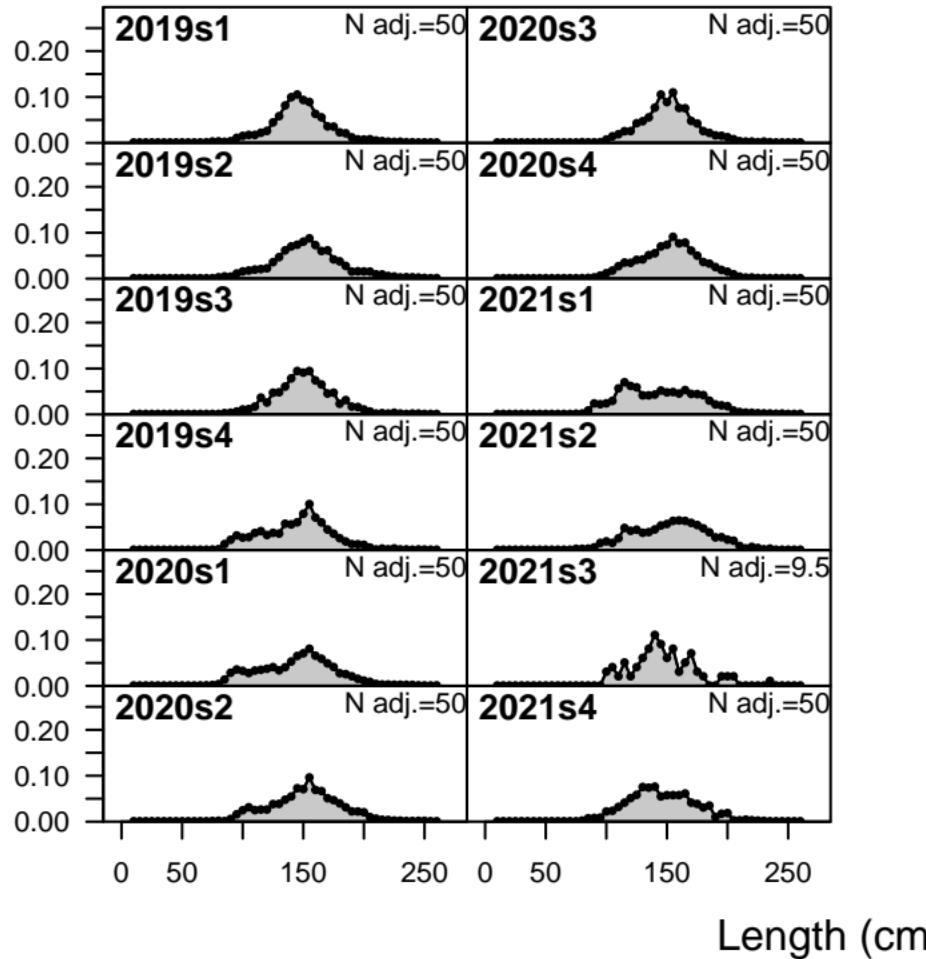
Proportion

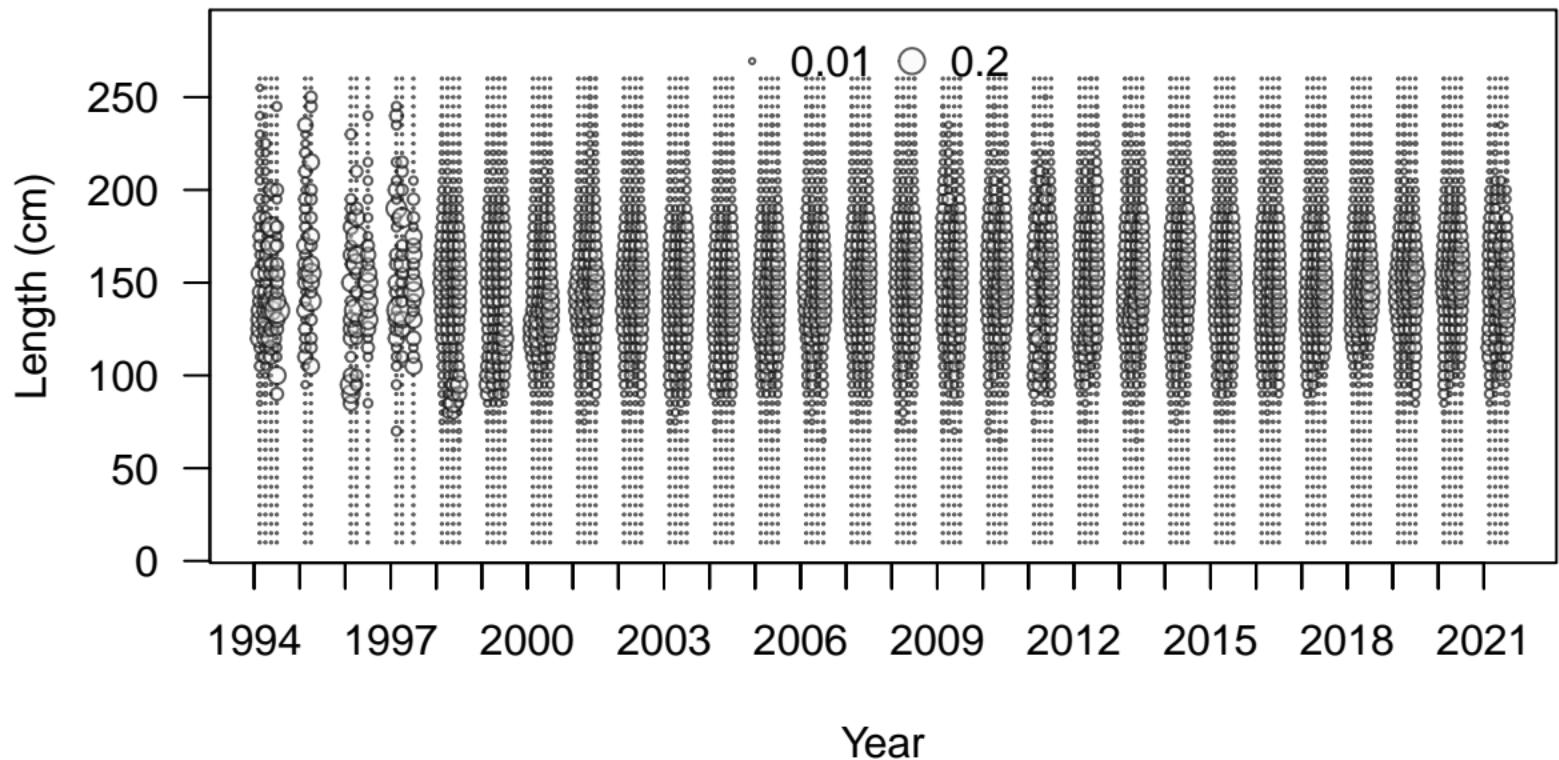


Proportion

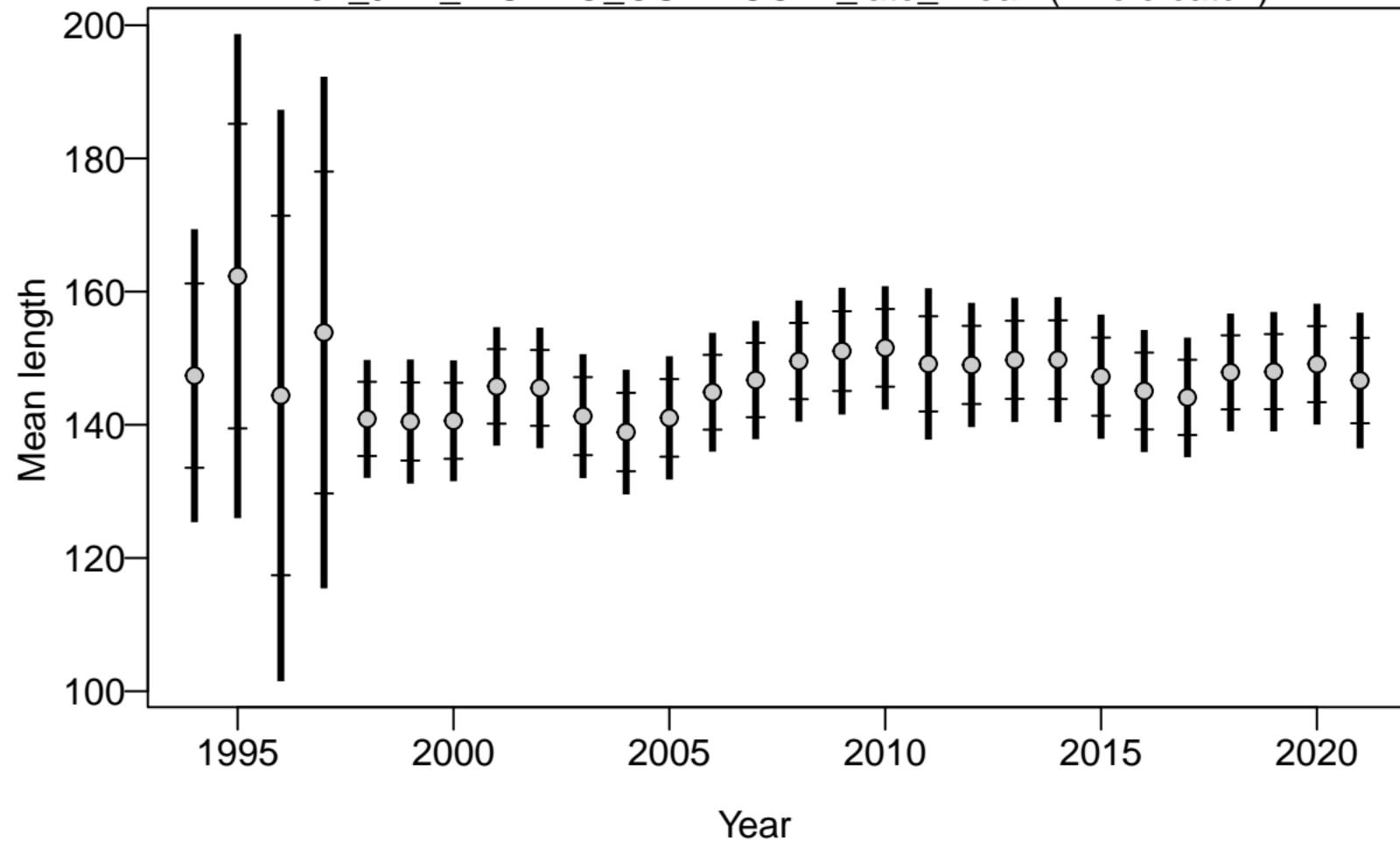


Proportion

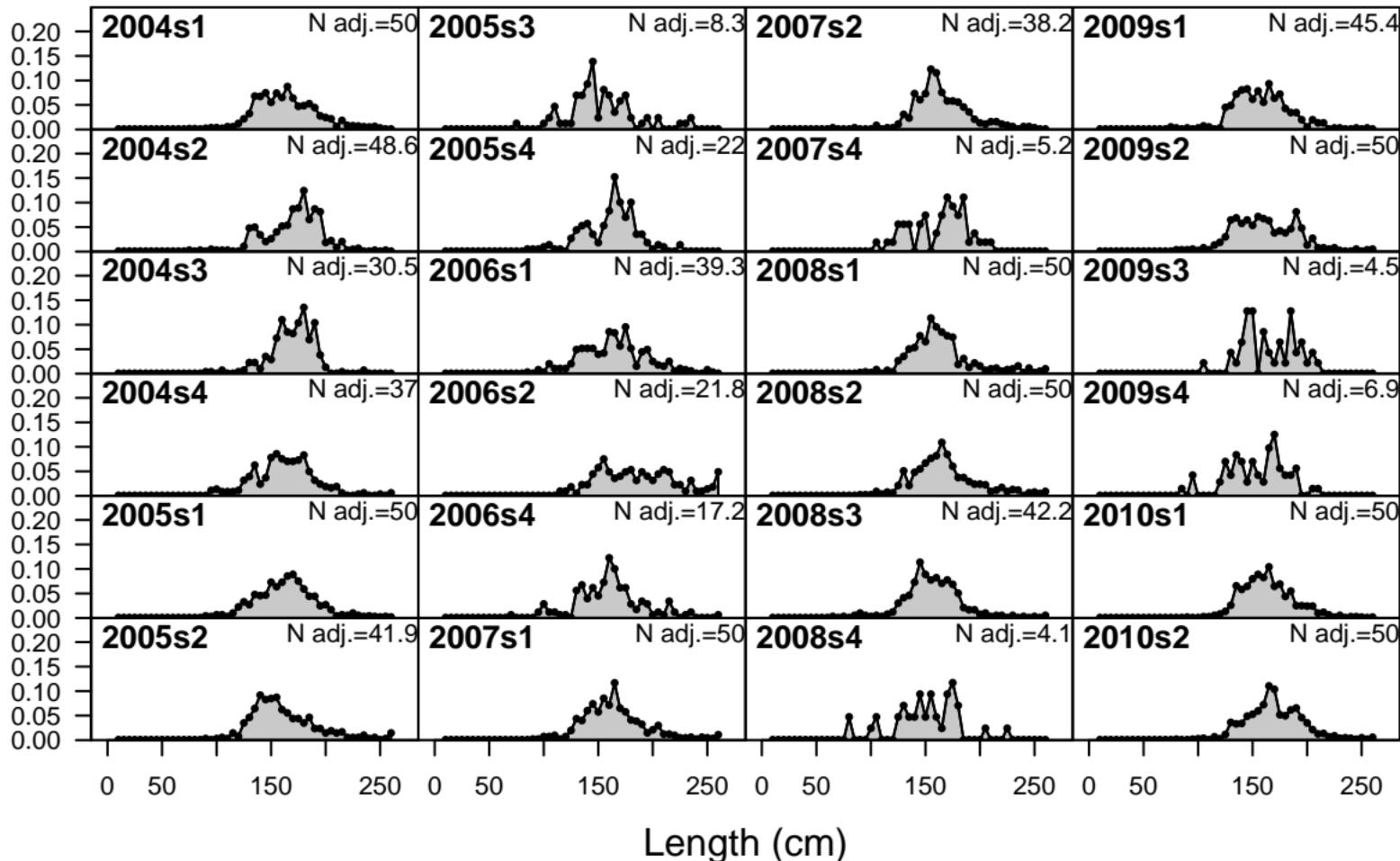




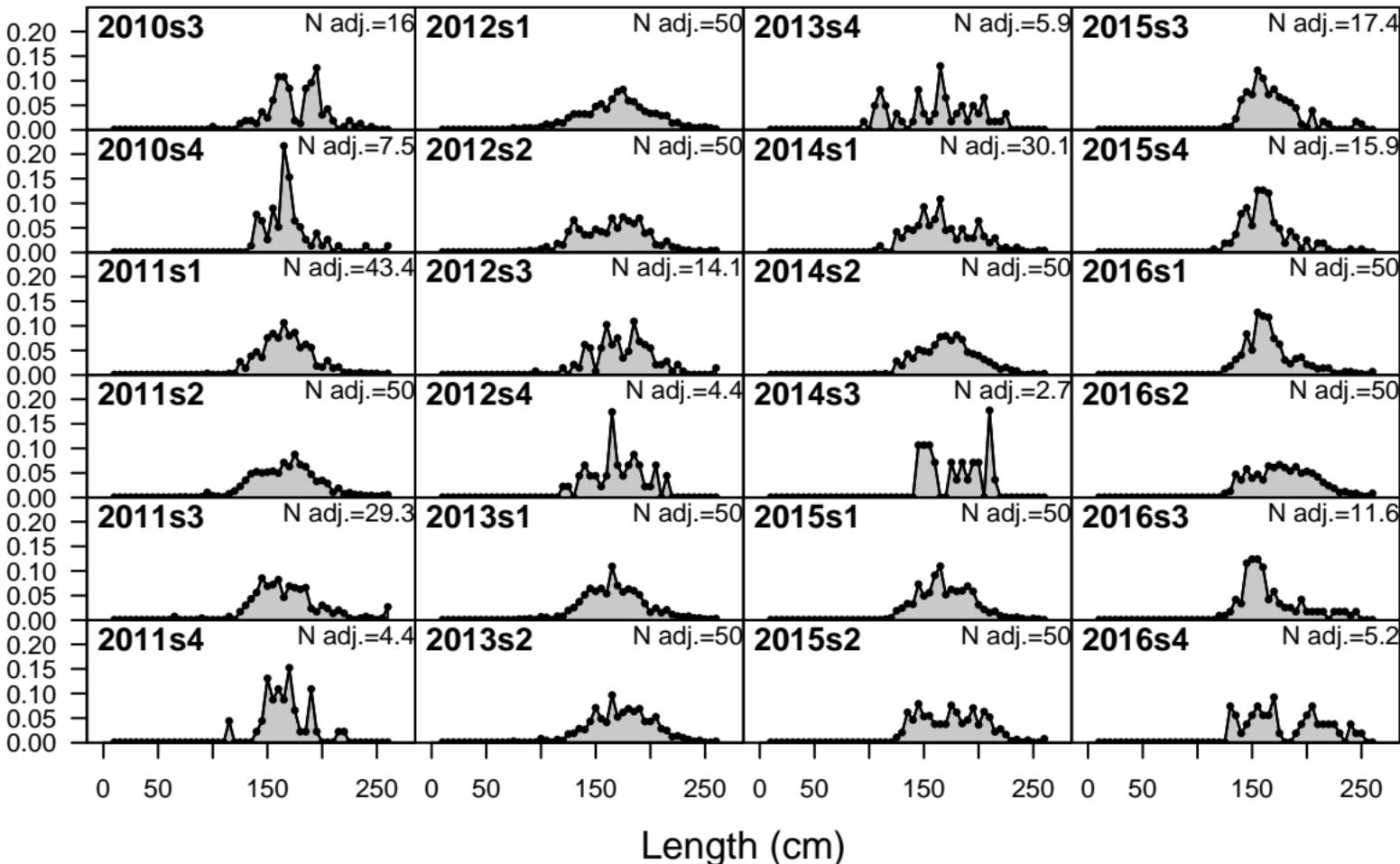
F01\_JPN\_WCNPO OSDWCOLL\_late\_Area1 (whole catch)



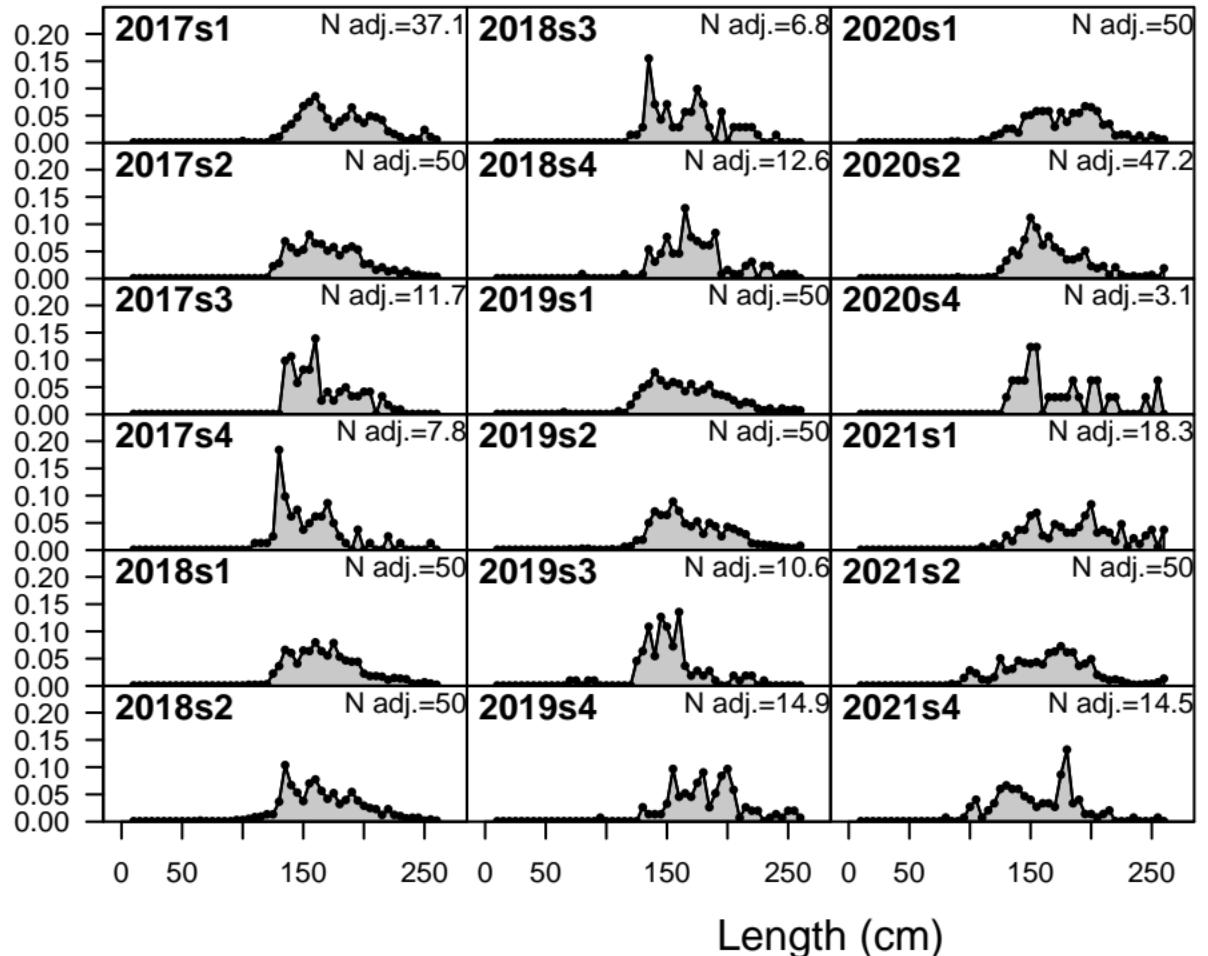
Proportion

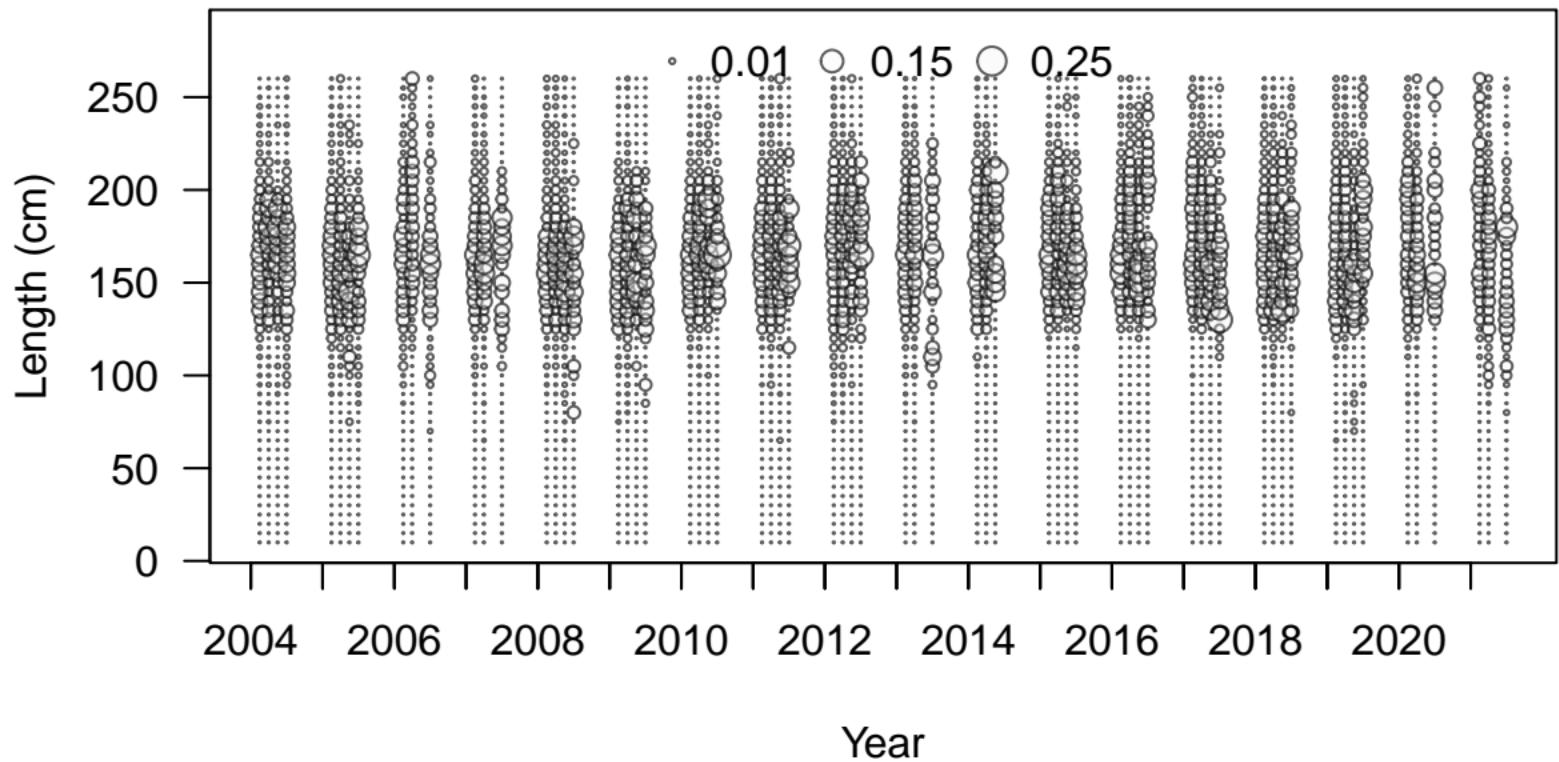


Proportion

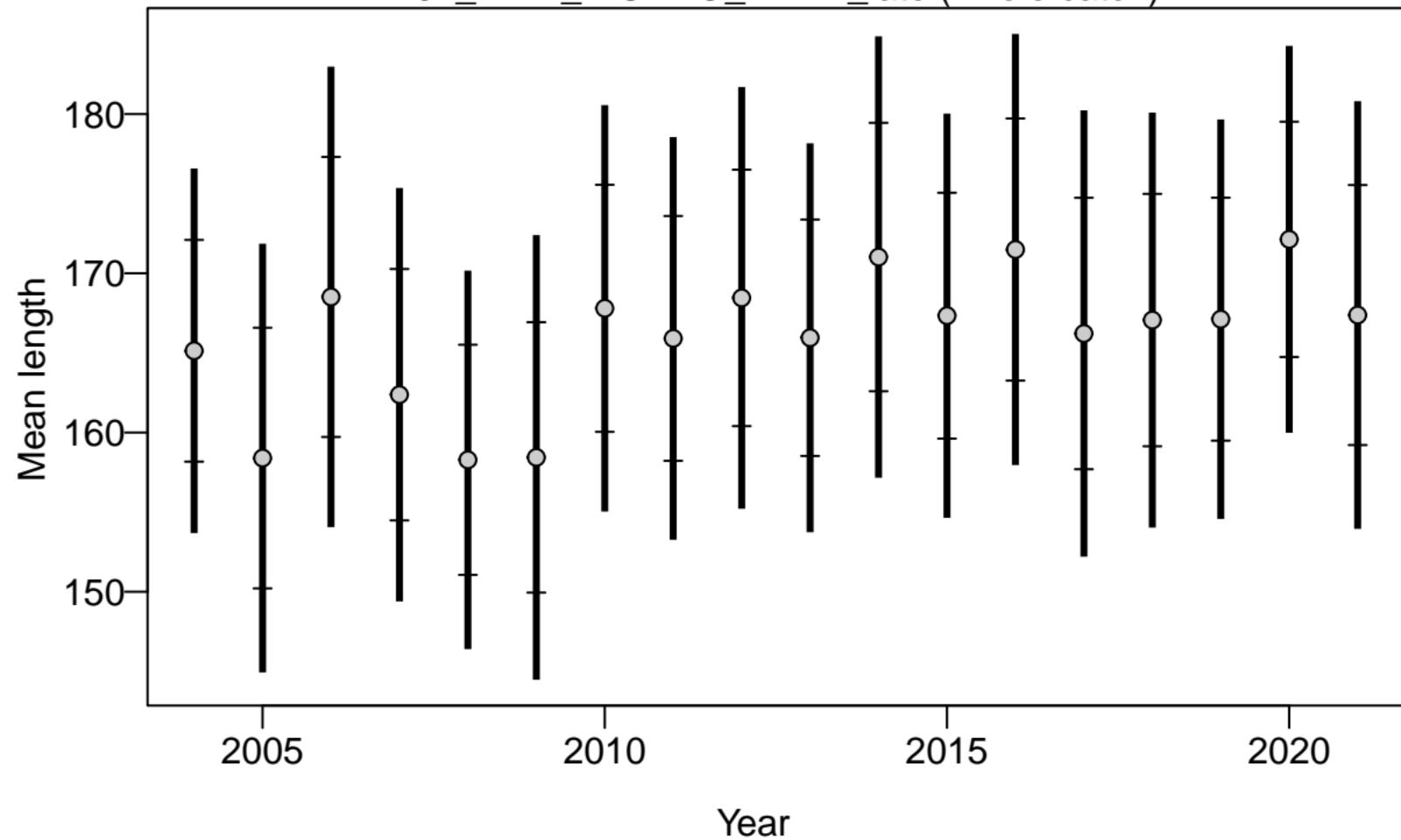


Proportion

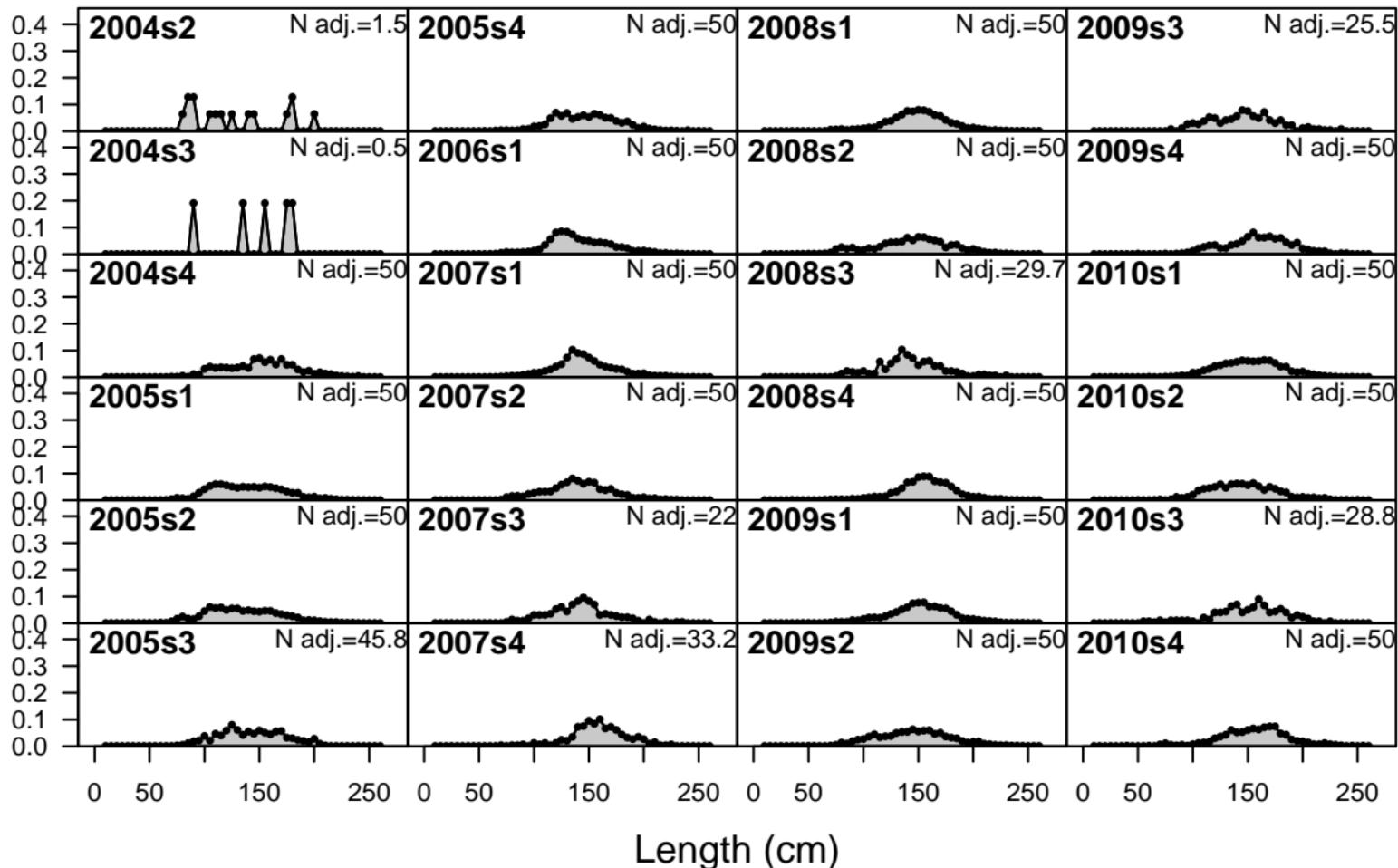




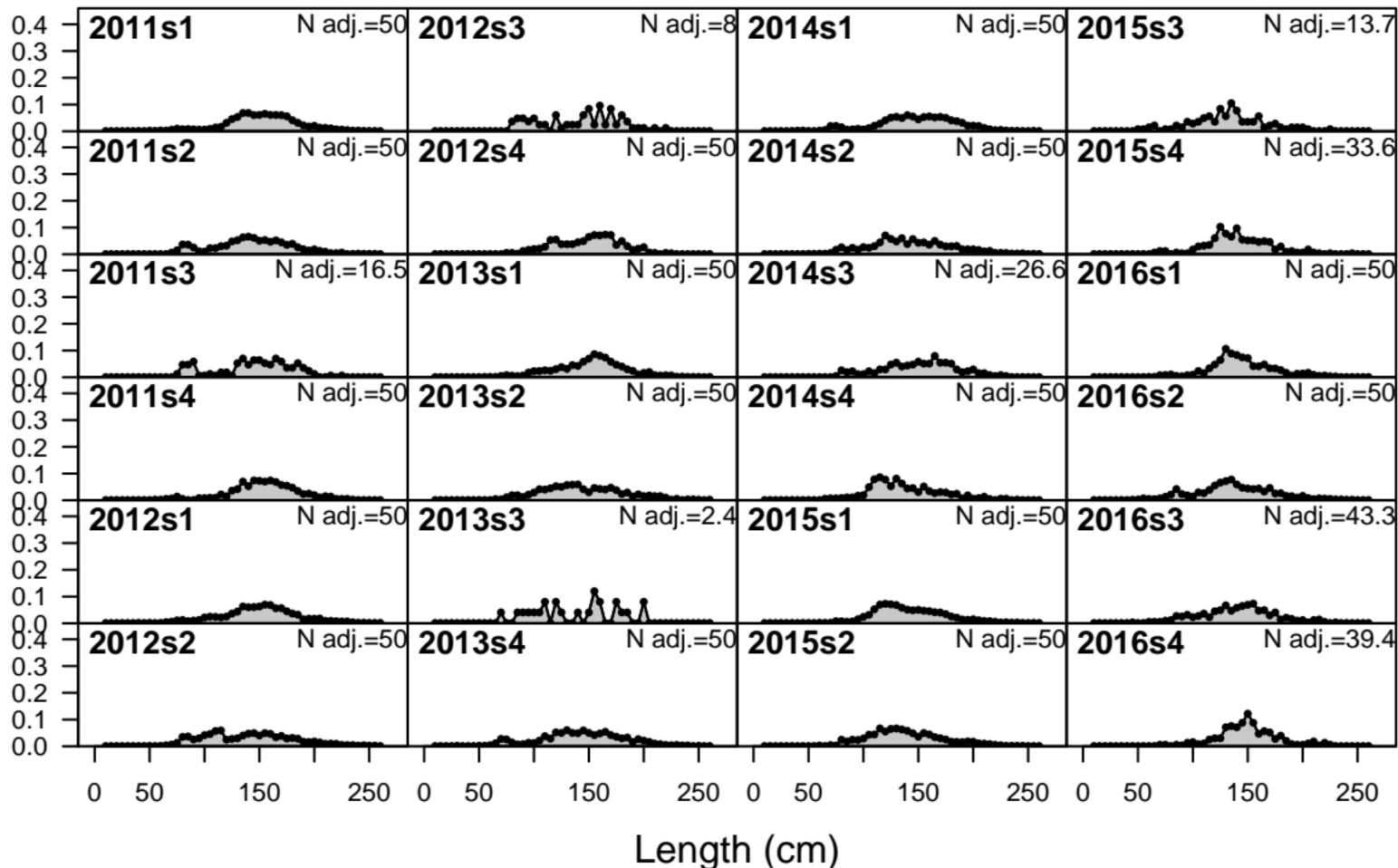
# F02\_TWN\_WCNPO\_DWLL\_late (whole catch)



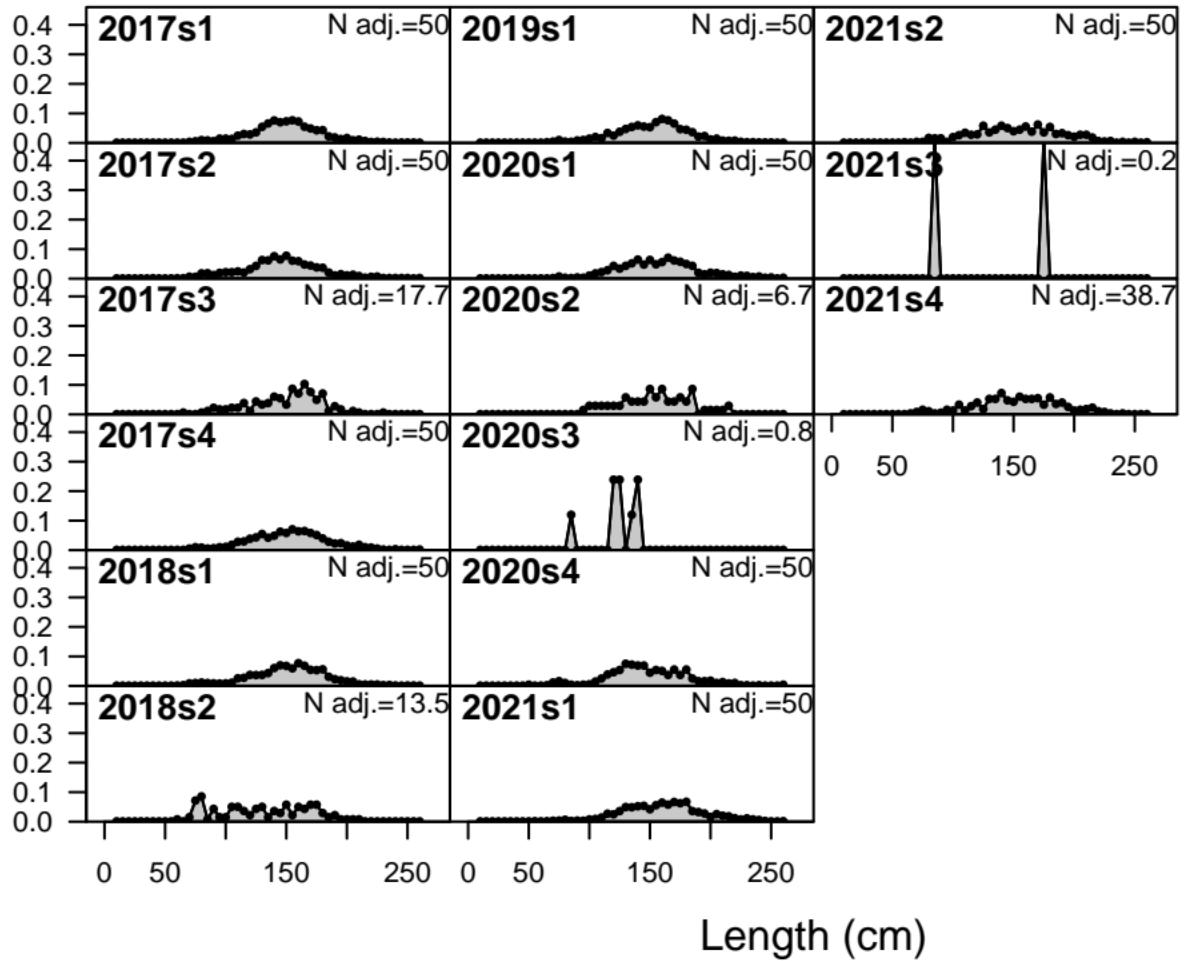
Proportion

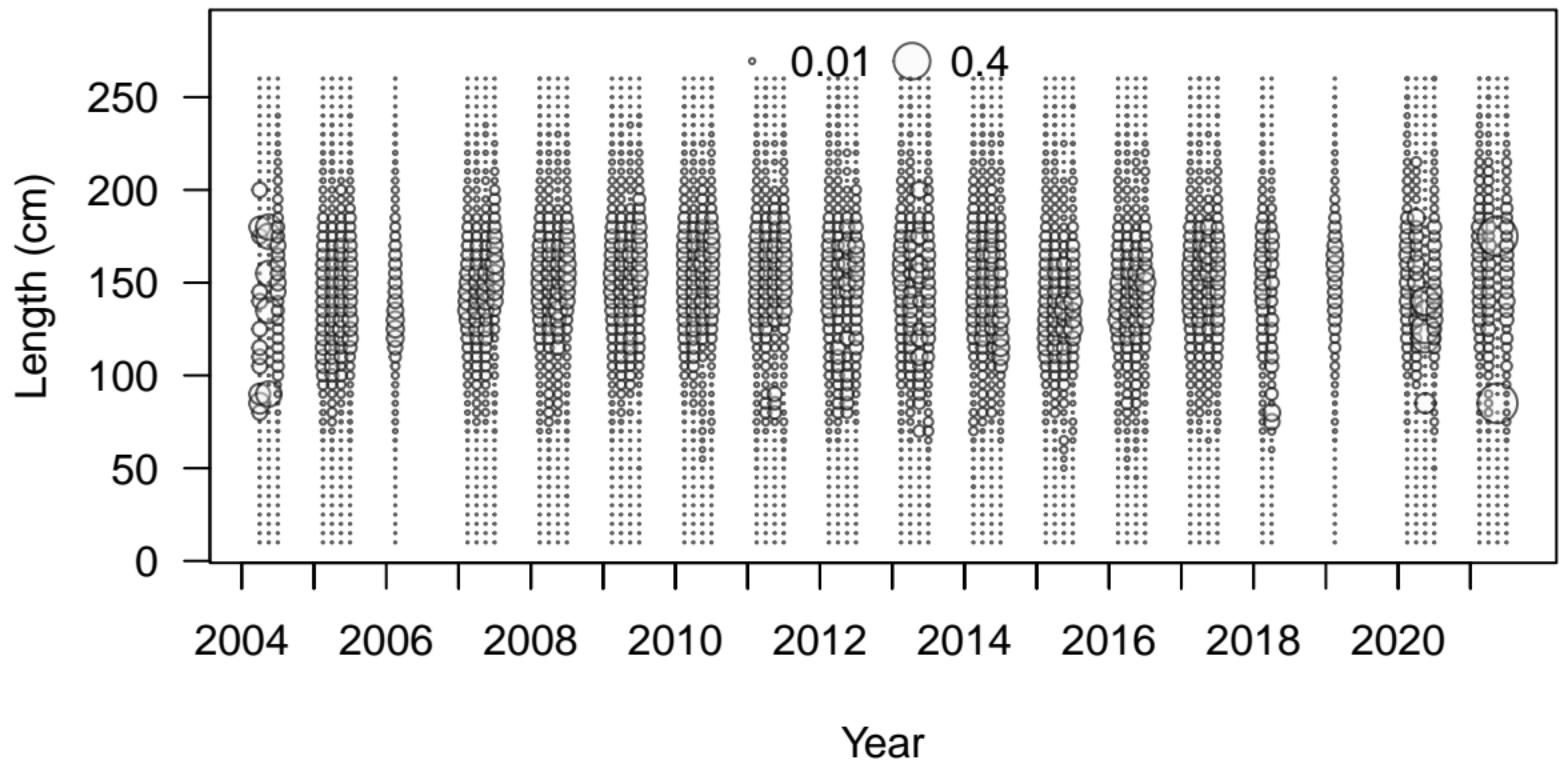


Proportion

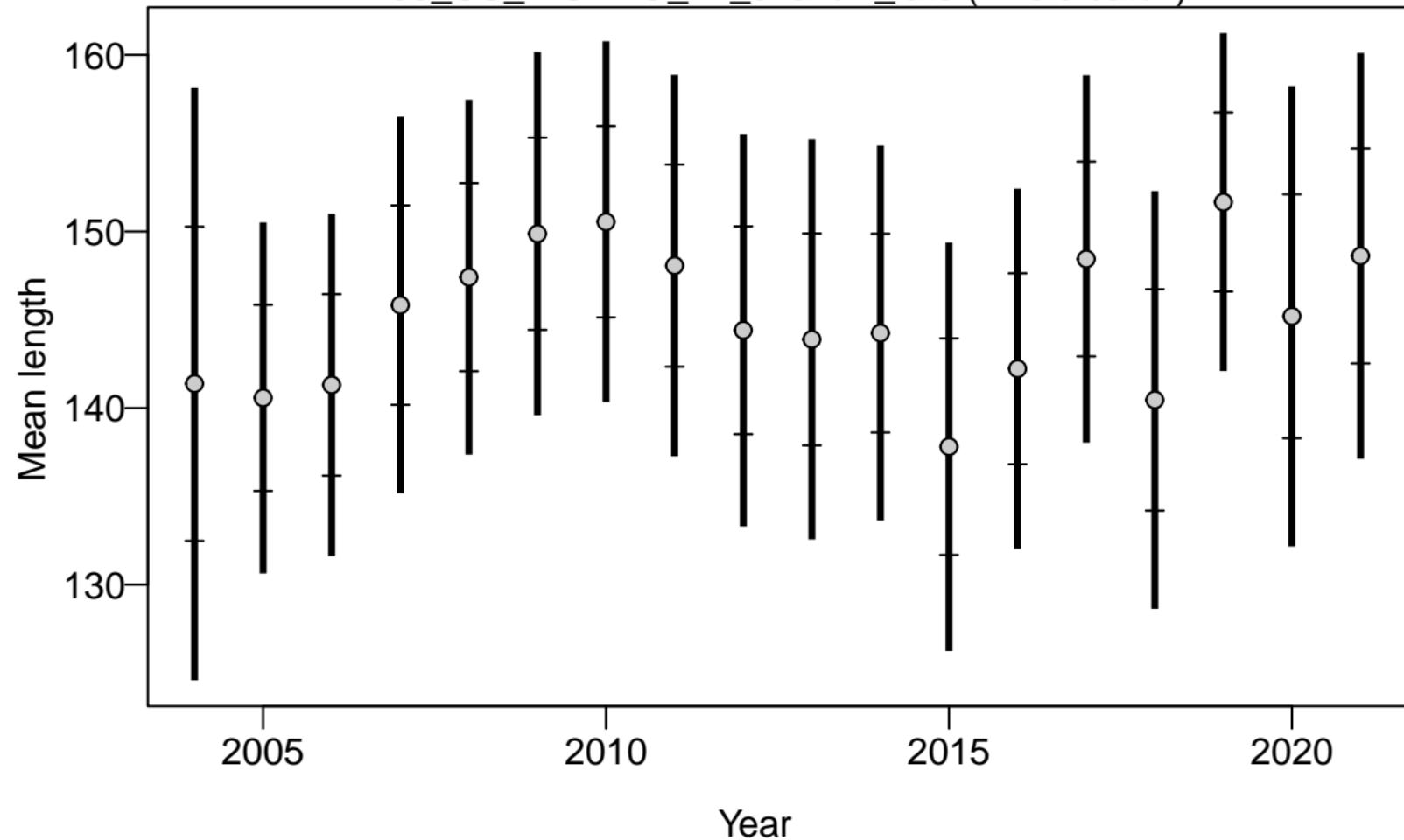


Proportion

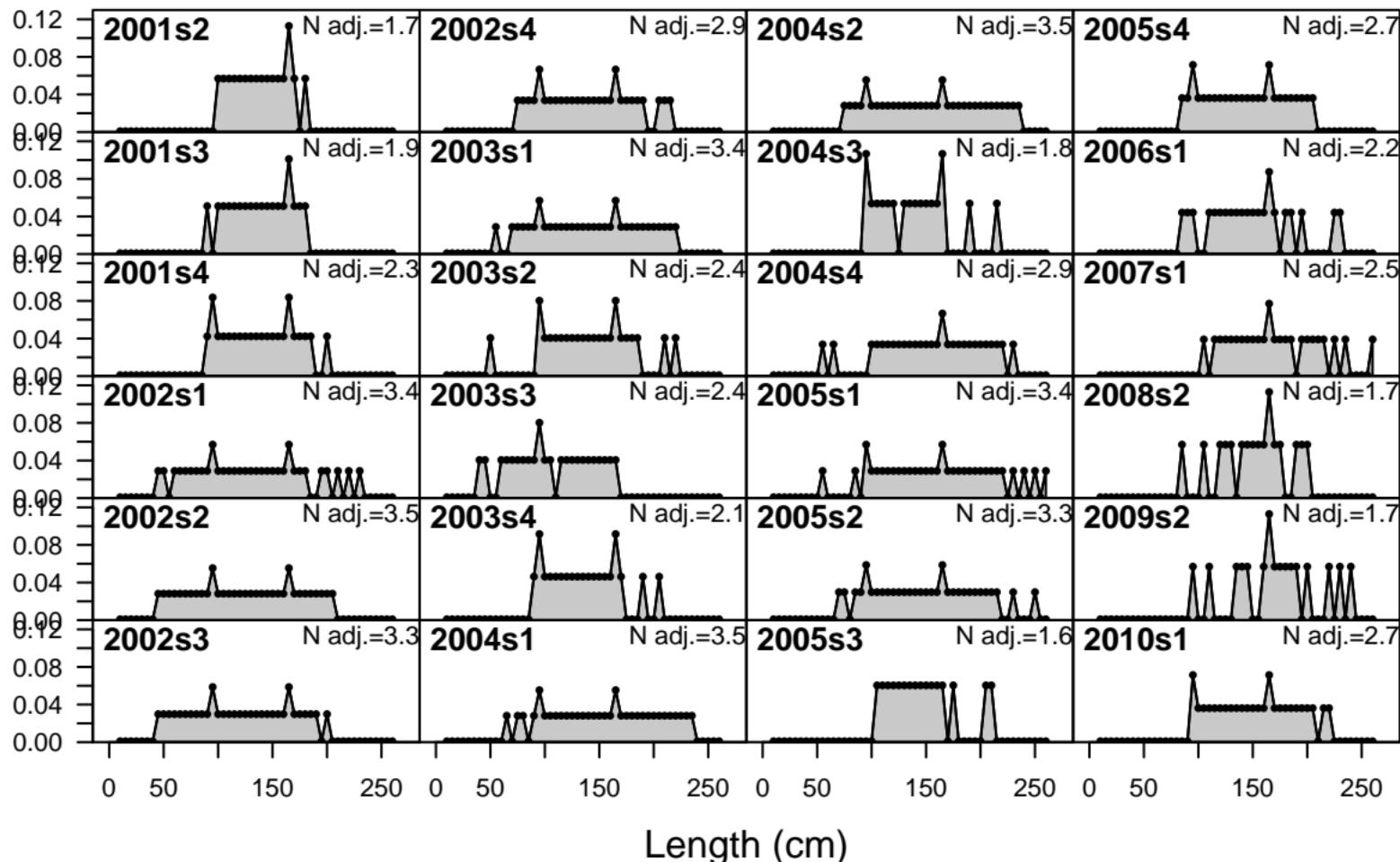




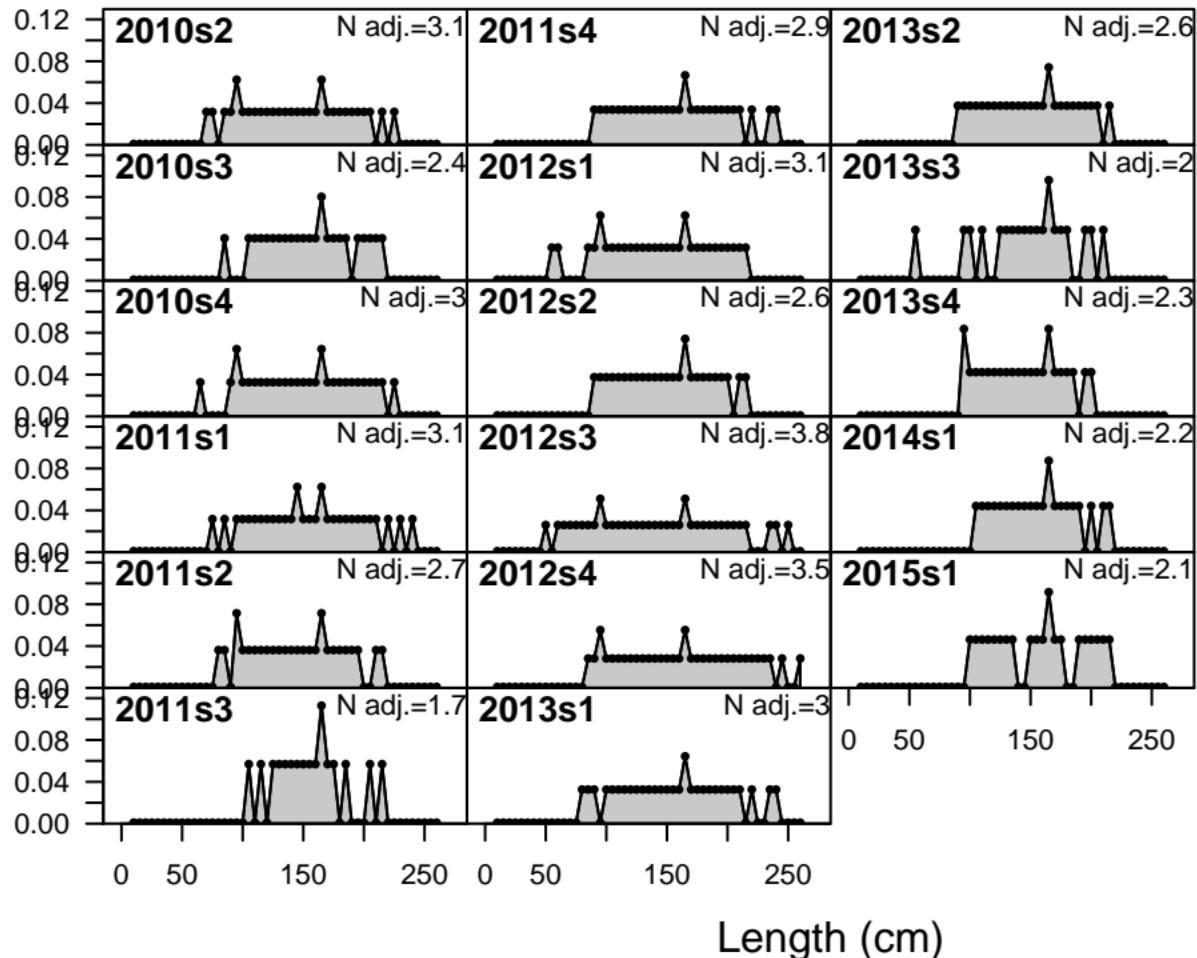
F03\_US\_WCNPO\_LL\_shallow\_late (whole catch)

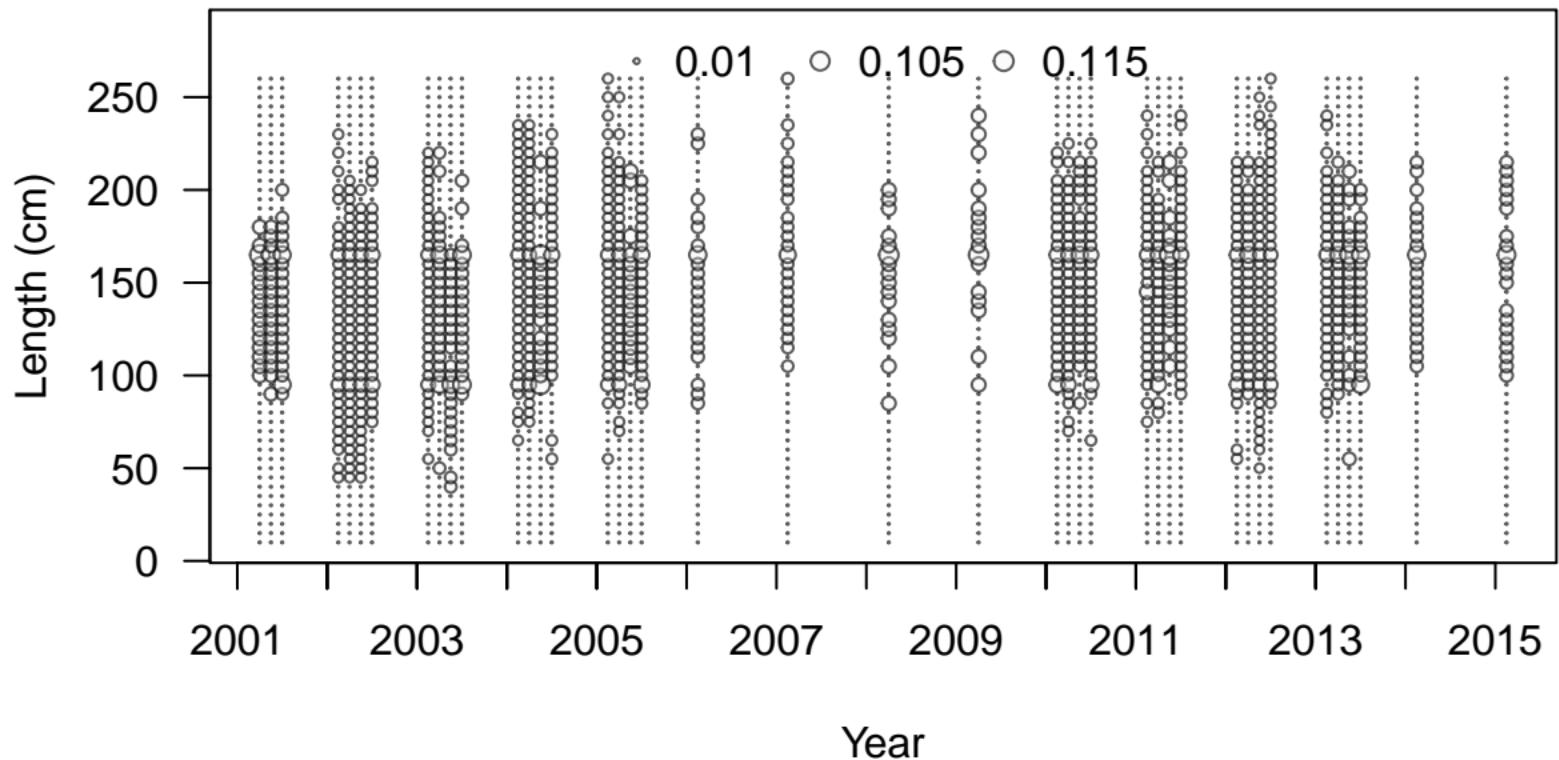


Proportion

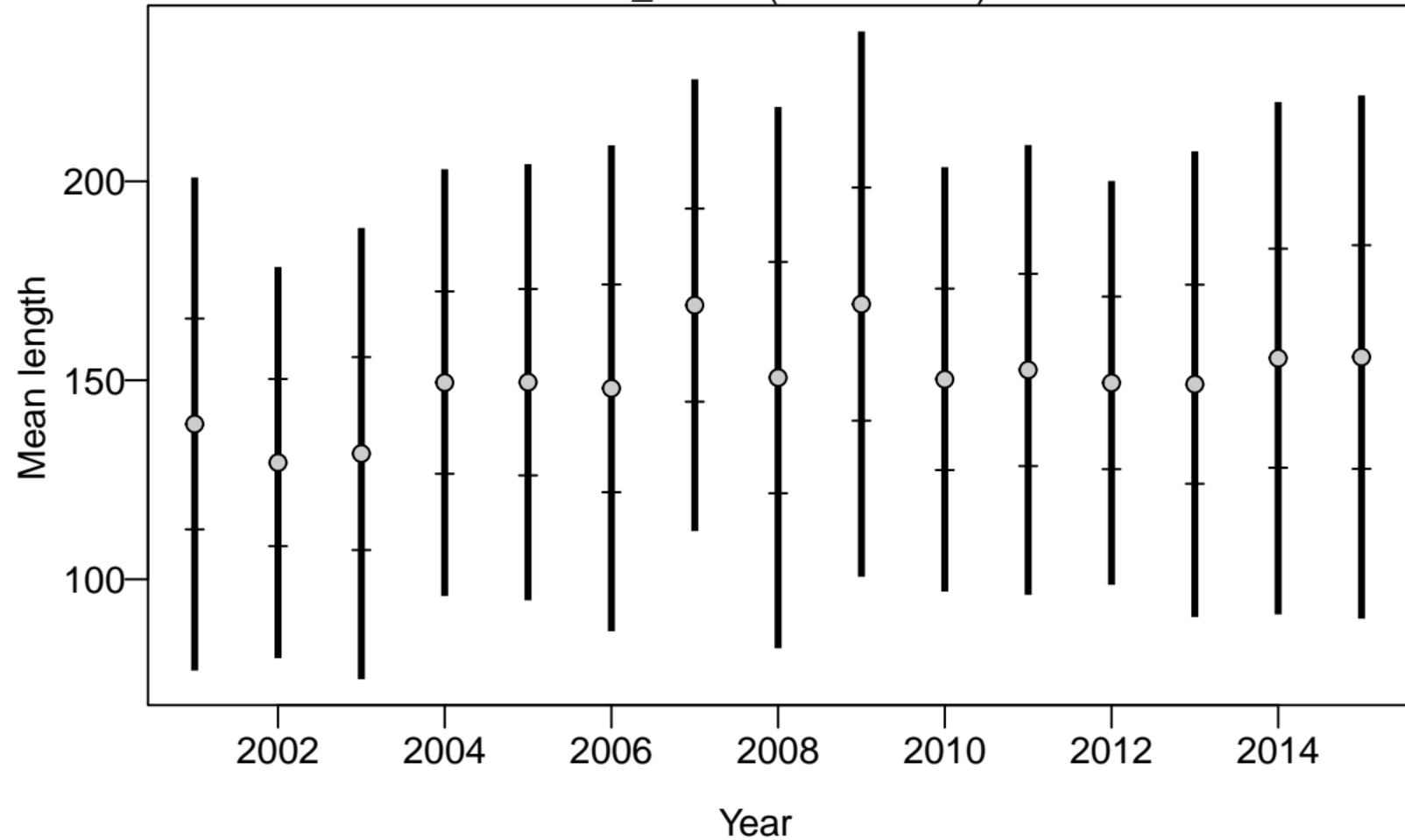


Proportion

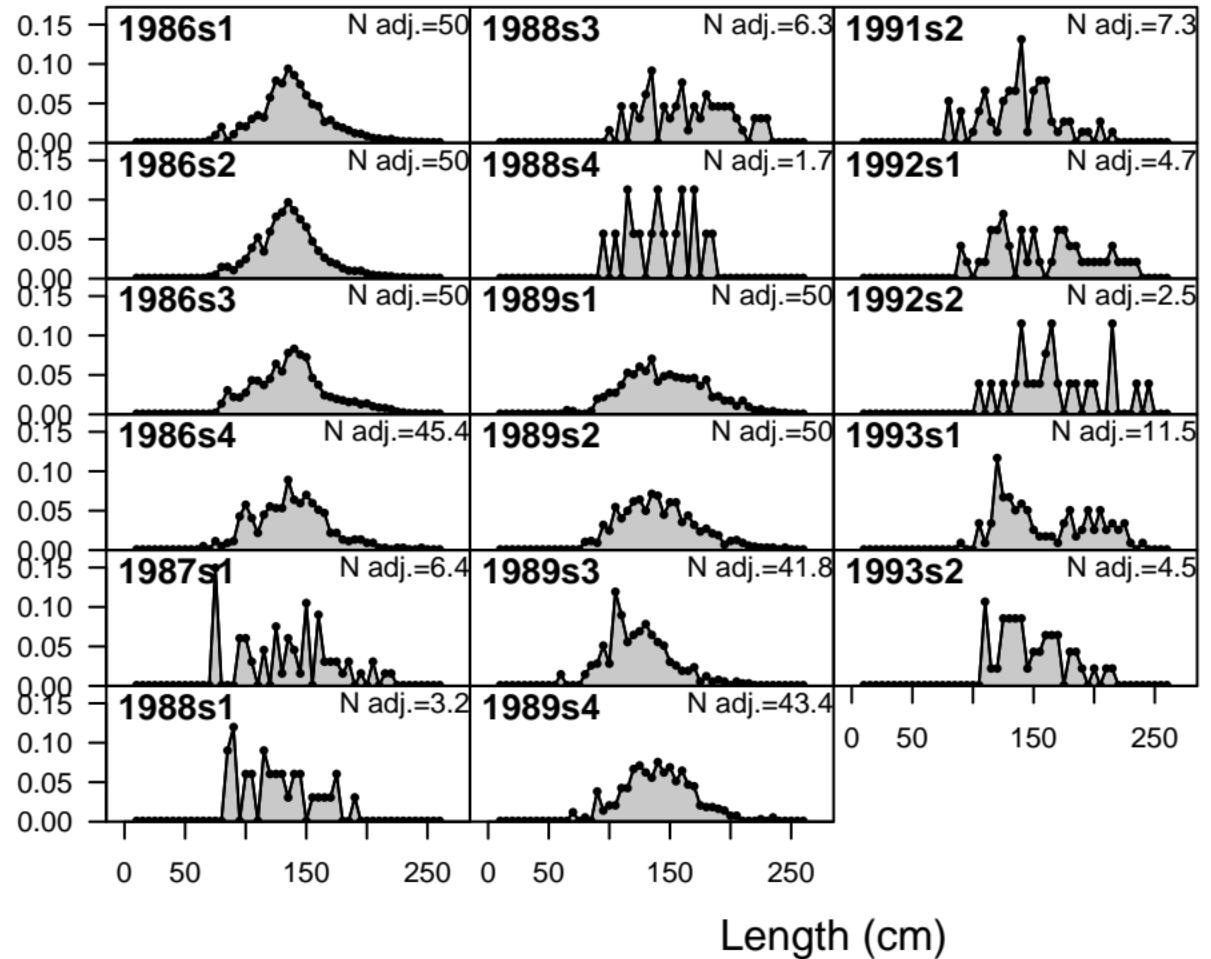


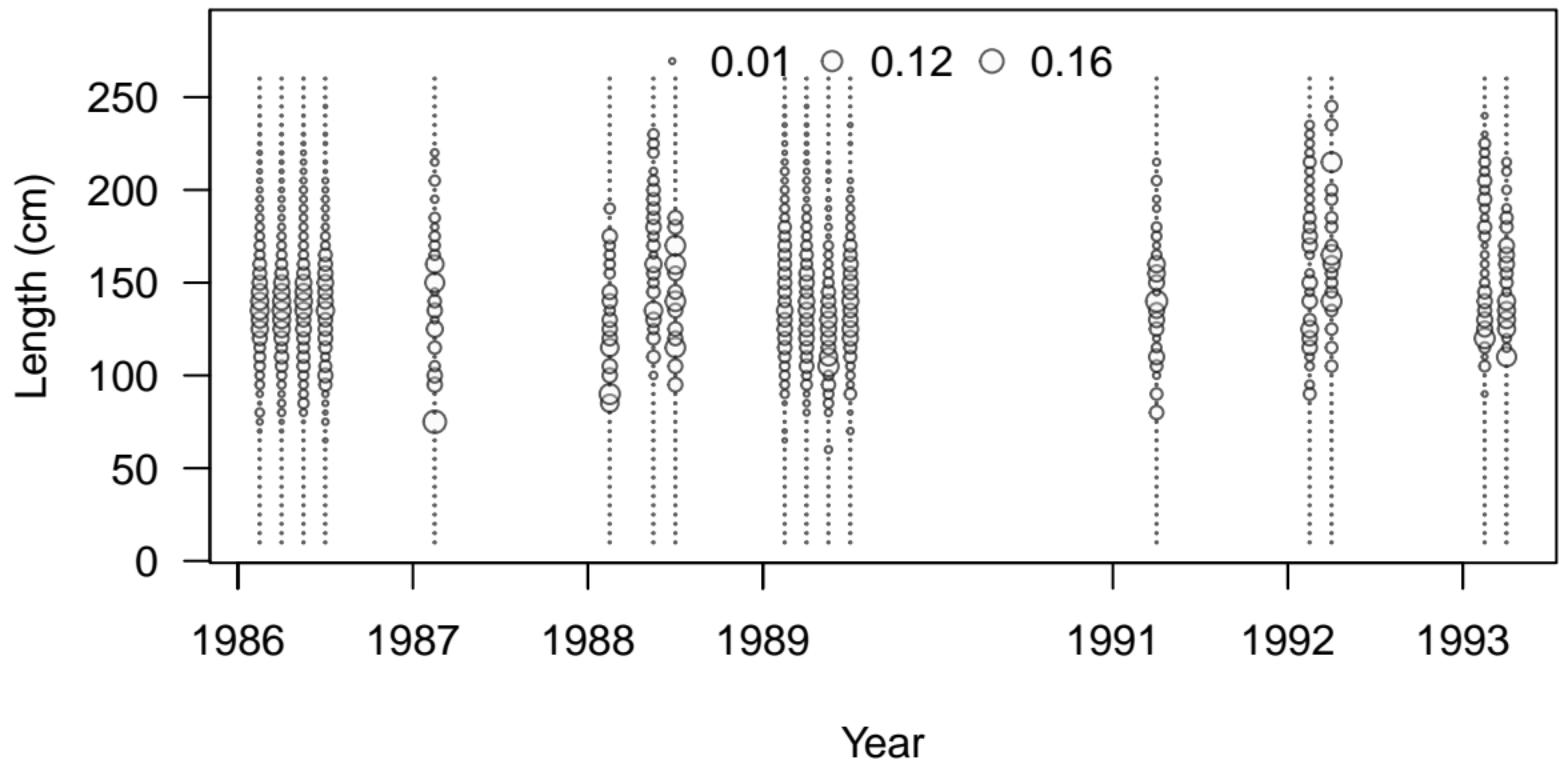


# F04\_IATTC (whole catch)

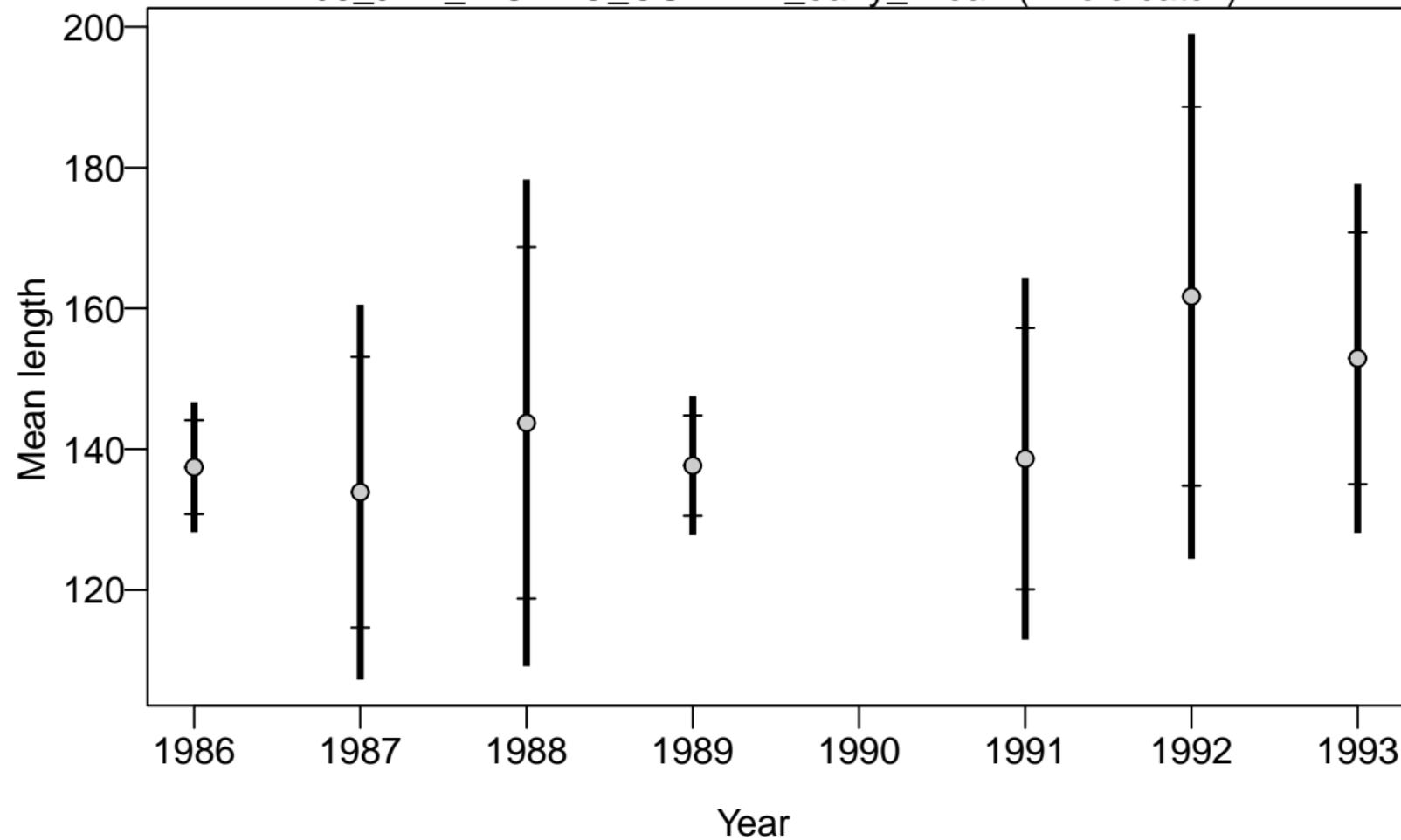


Proportion

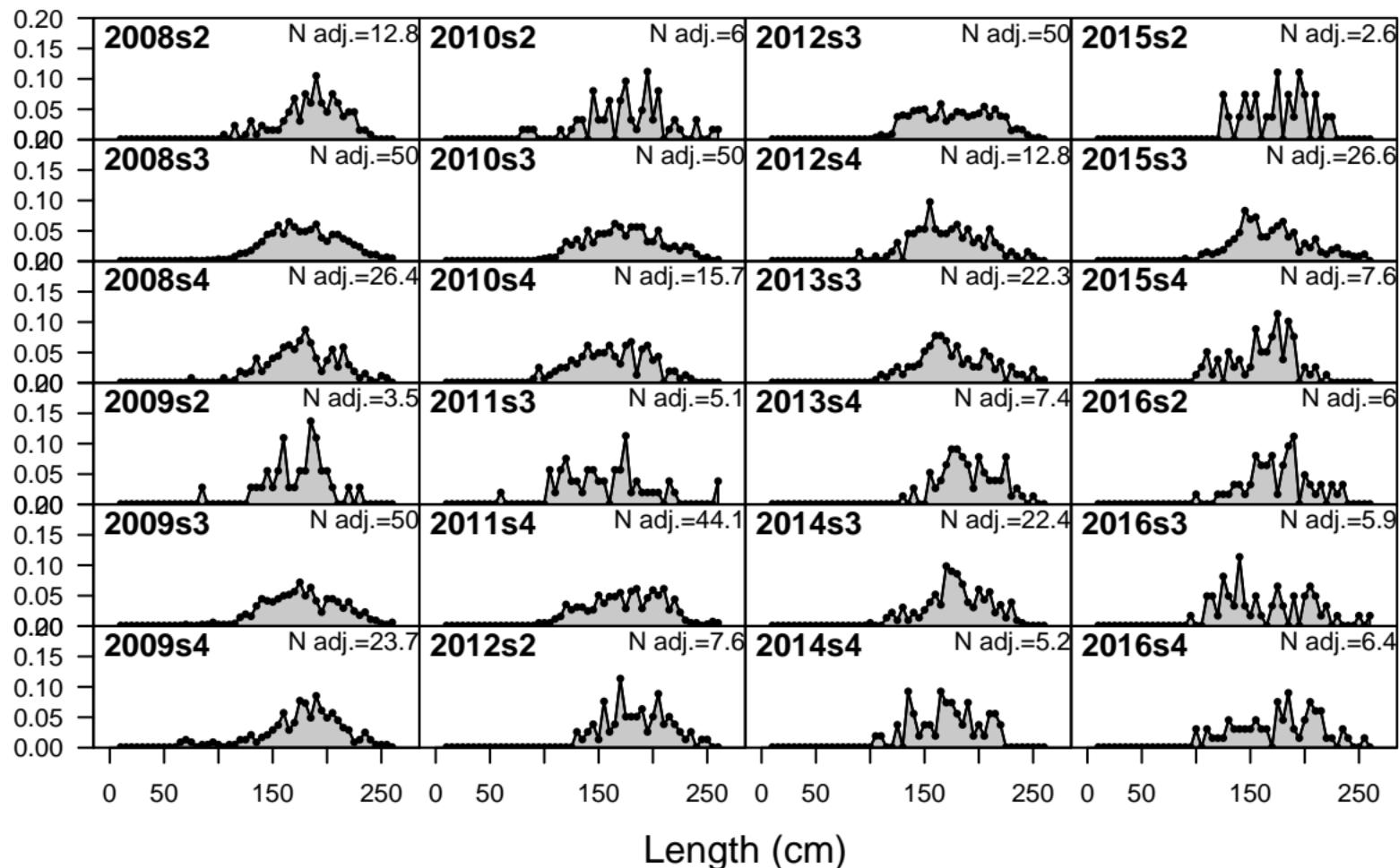




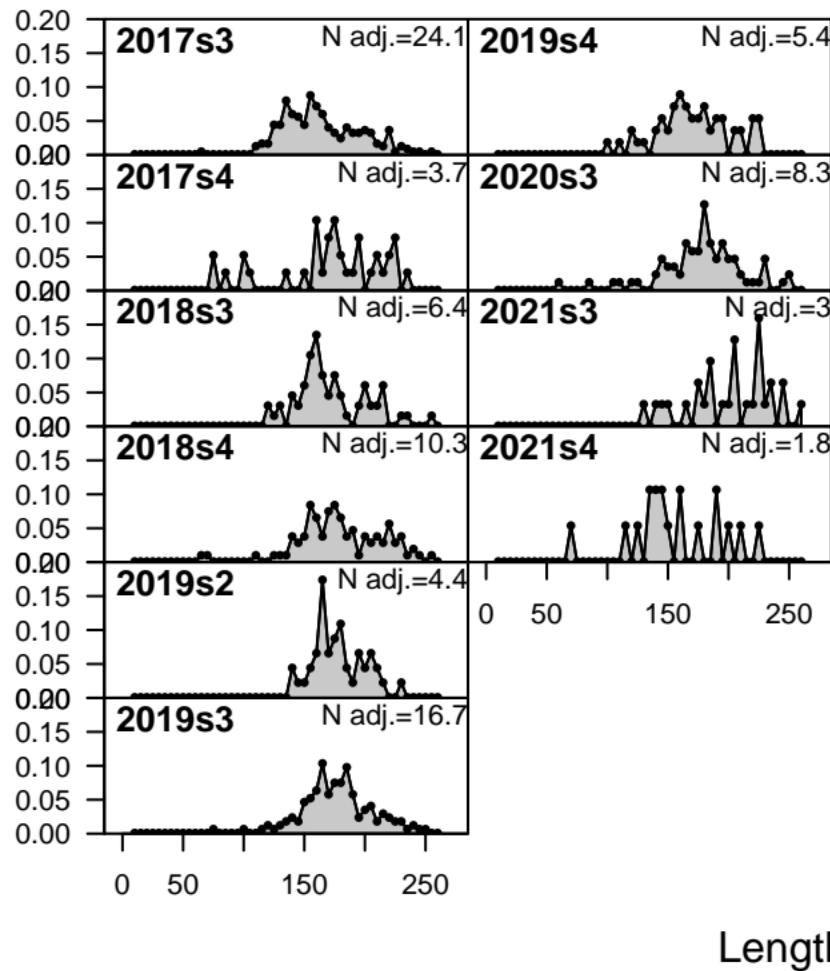
F06\_JPN\_WCNPO\_OSDWLL\_early\_Area1 (whole catch)

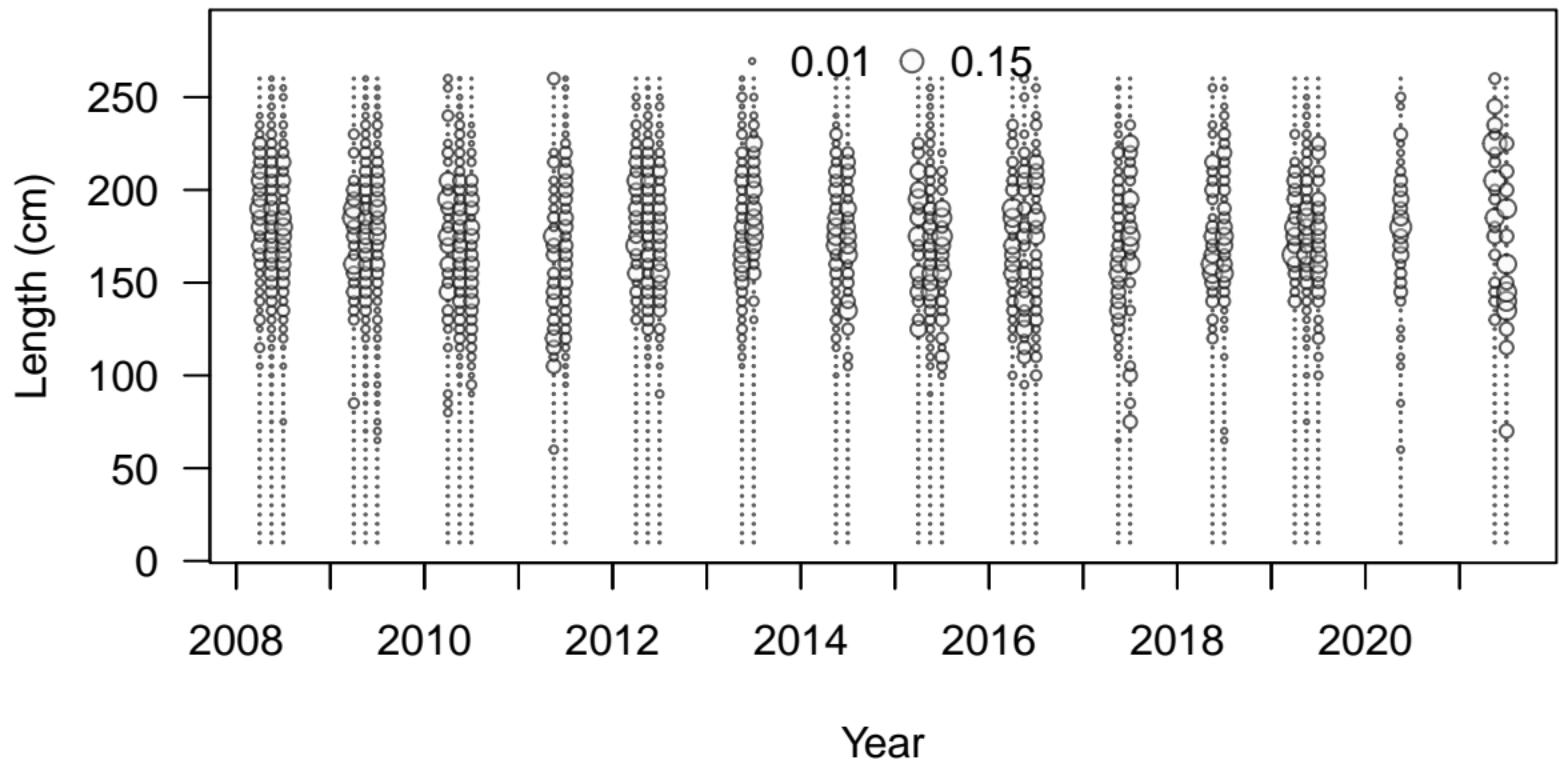


Proportion

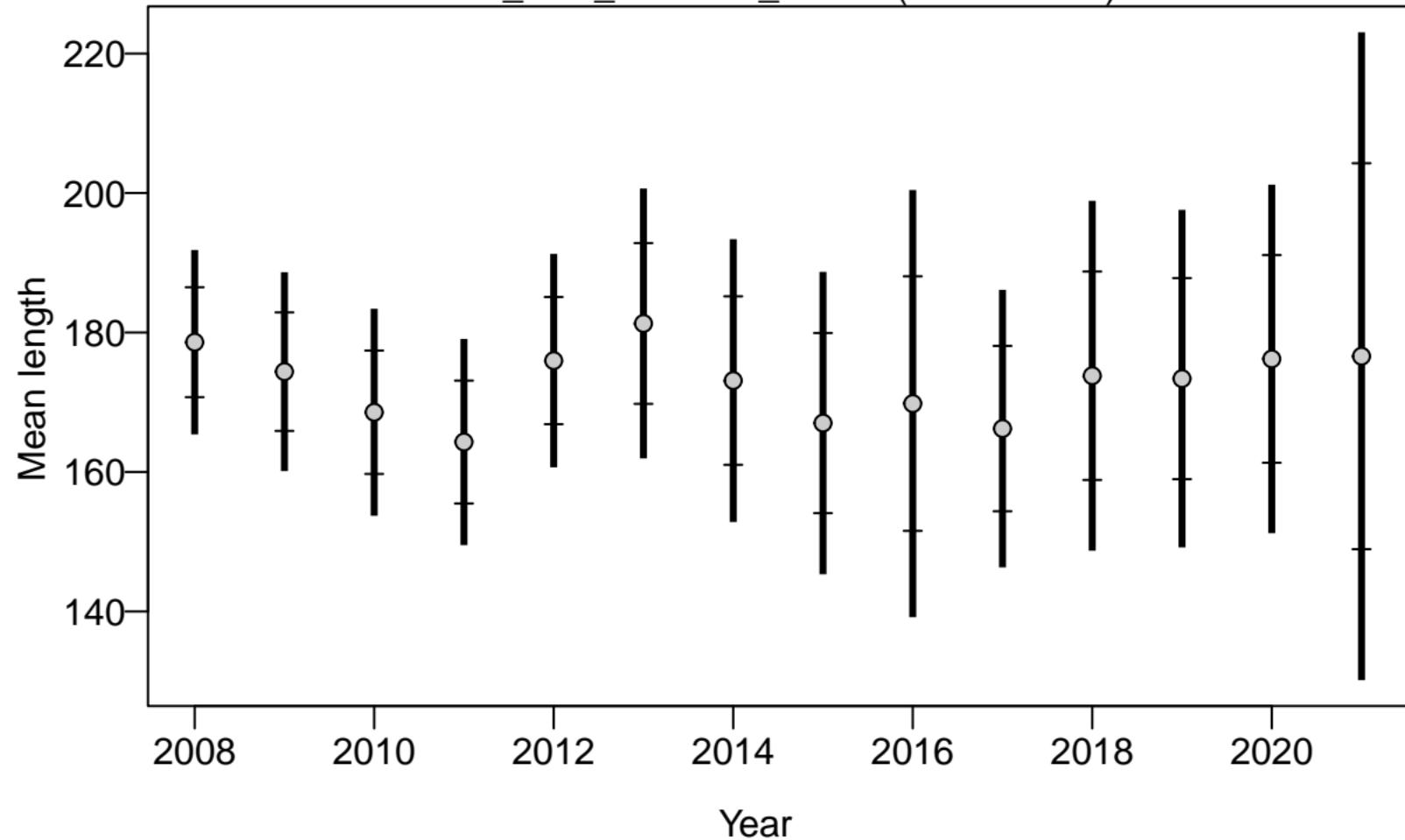


Proportion

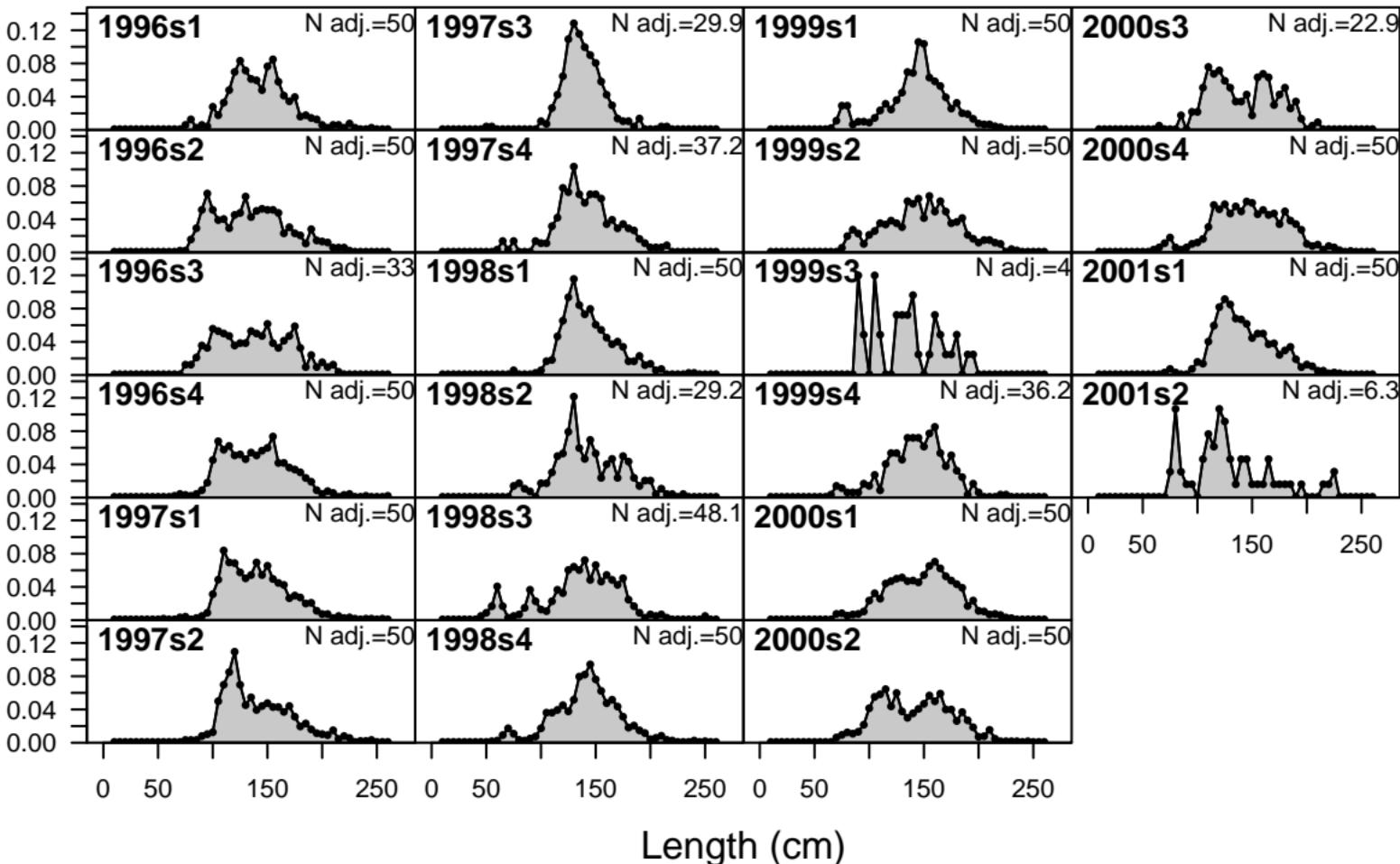


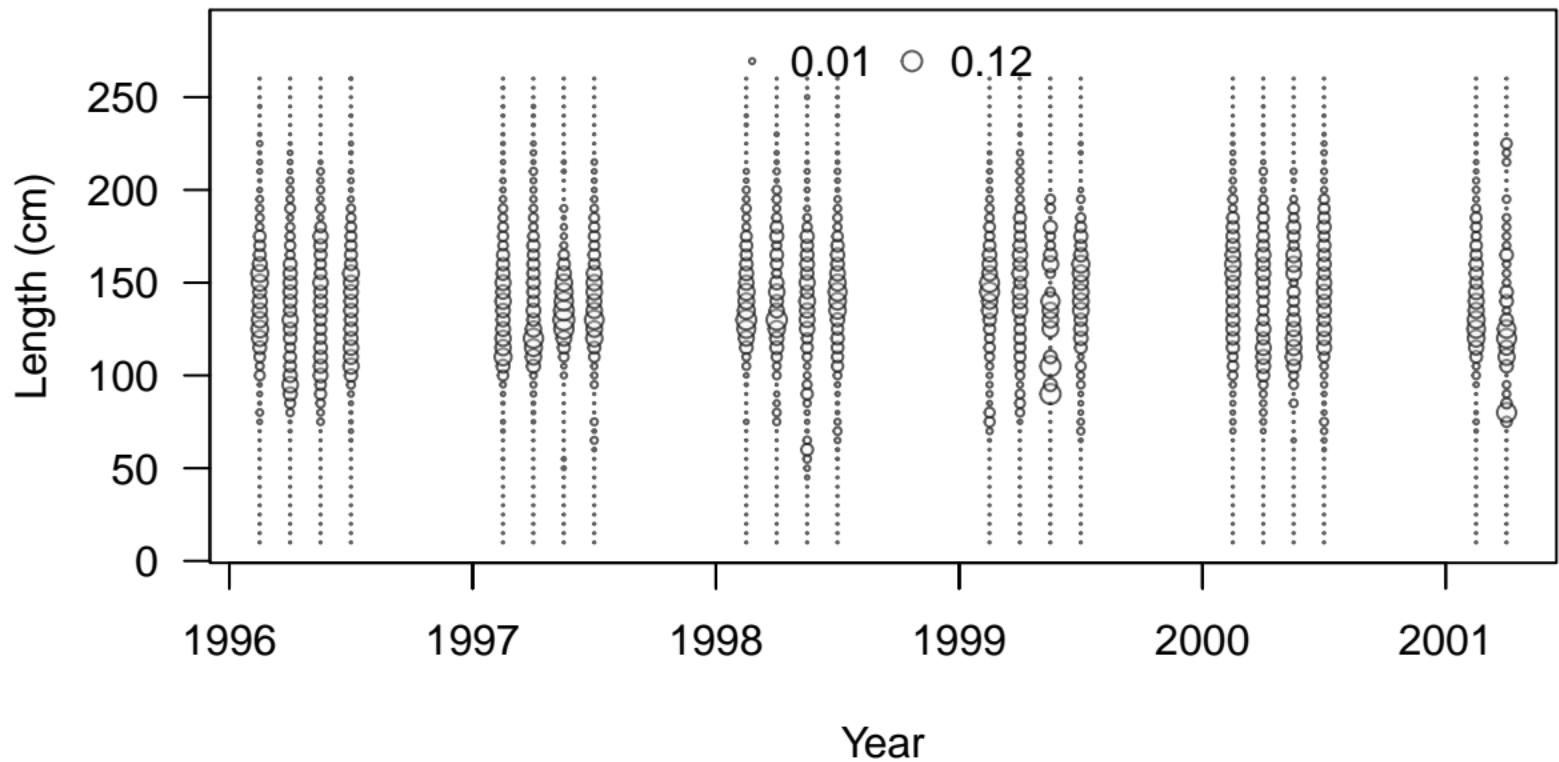


# F07\_JPN\_WCNPO\_CODF (whole catch)

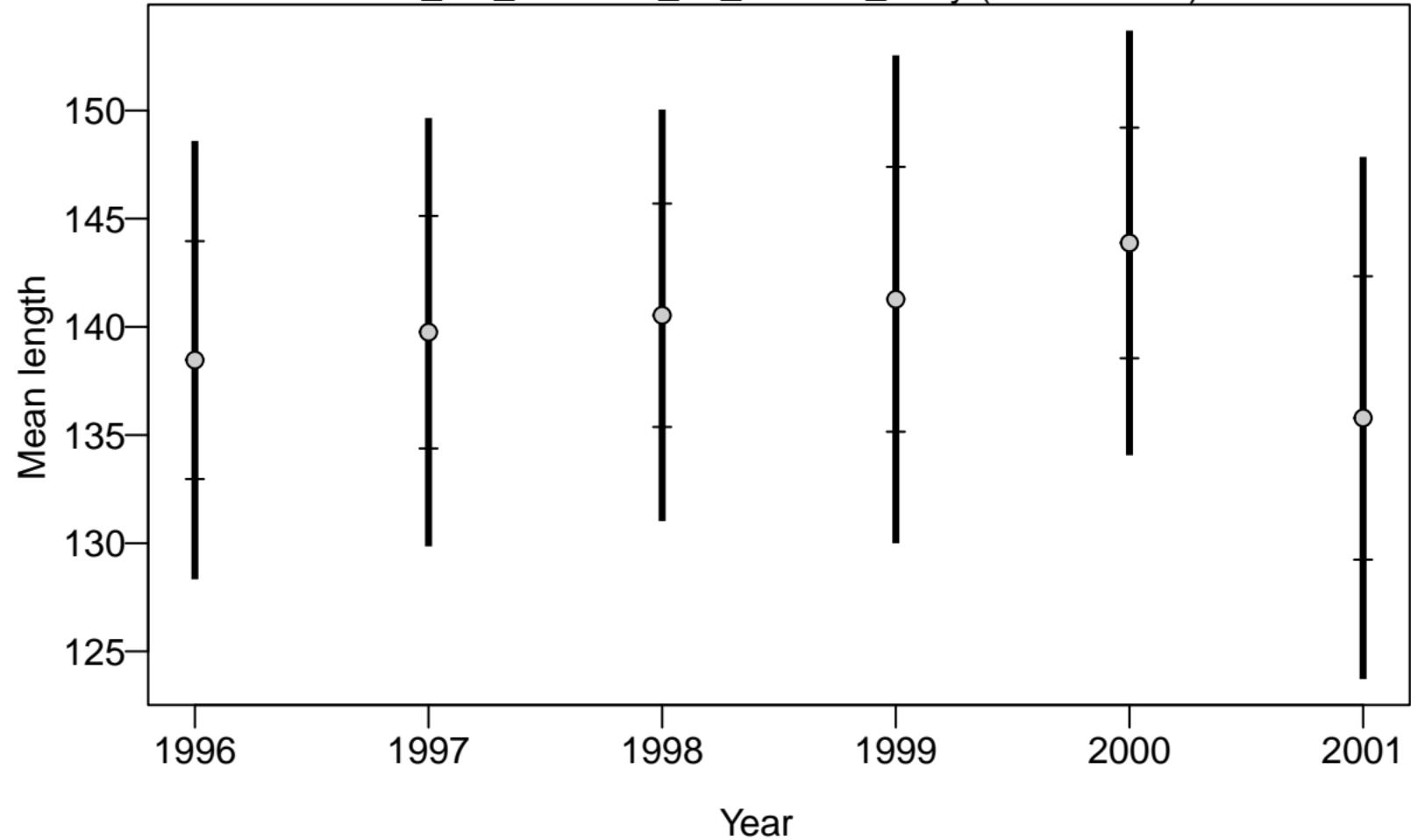


Proportion

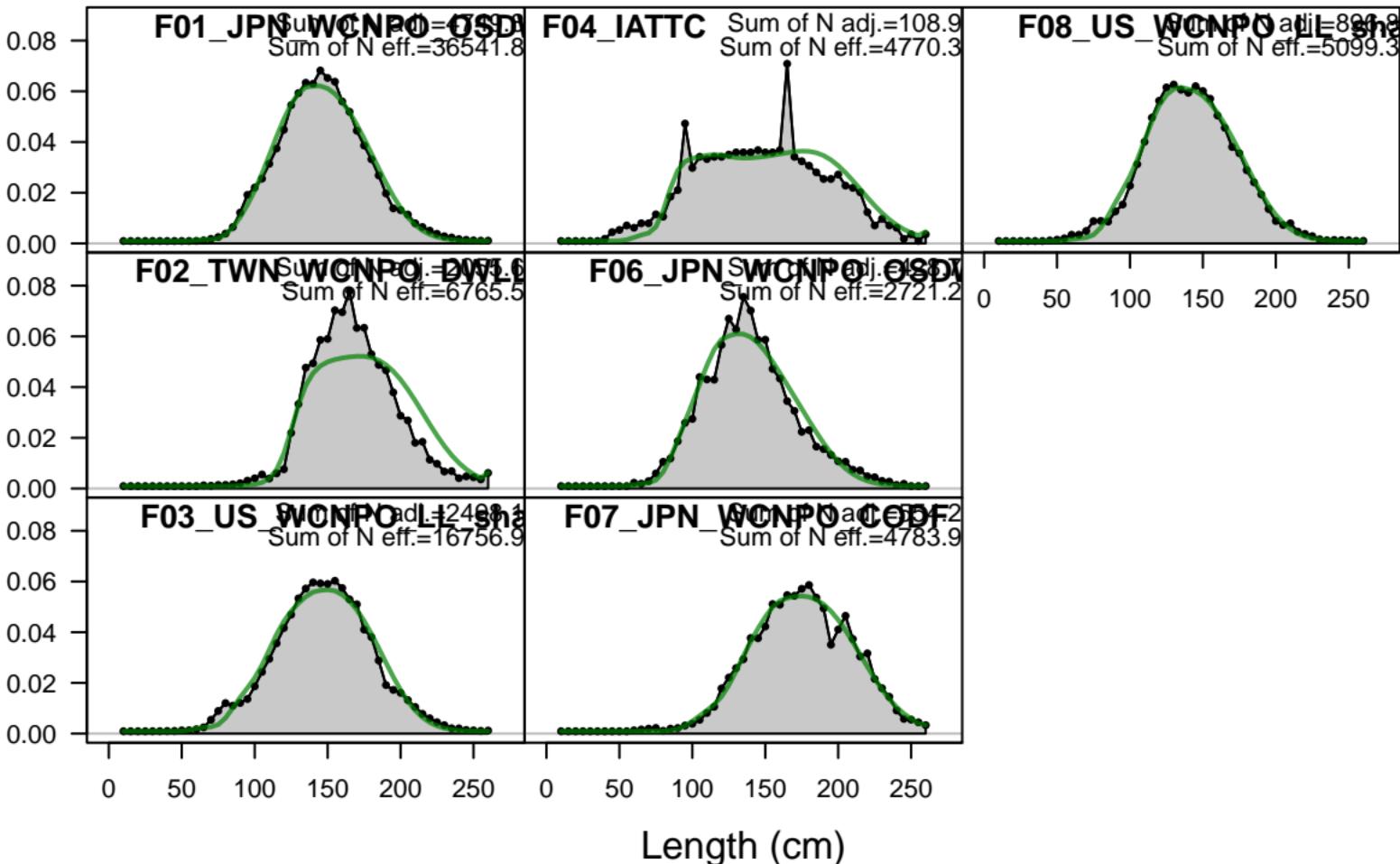


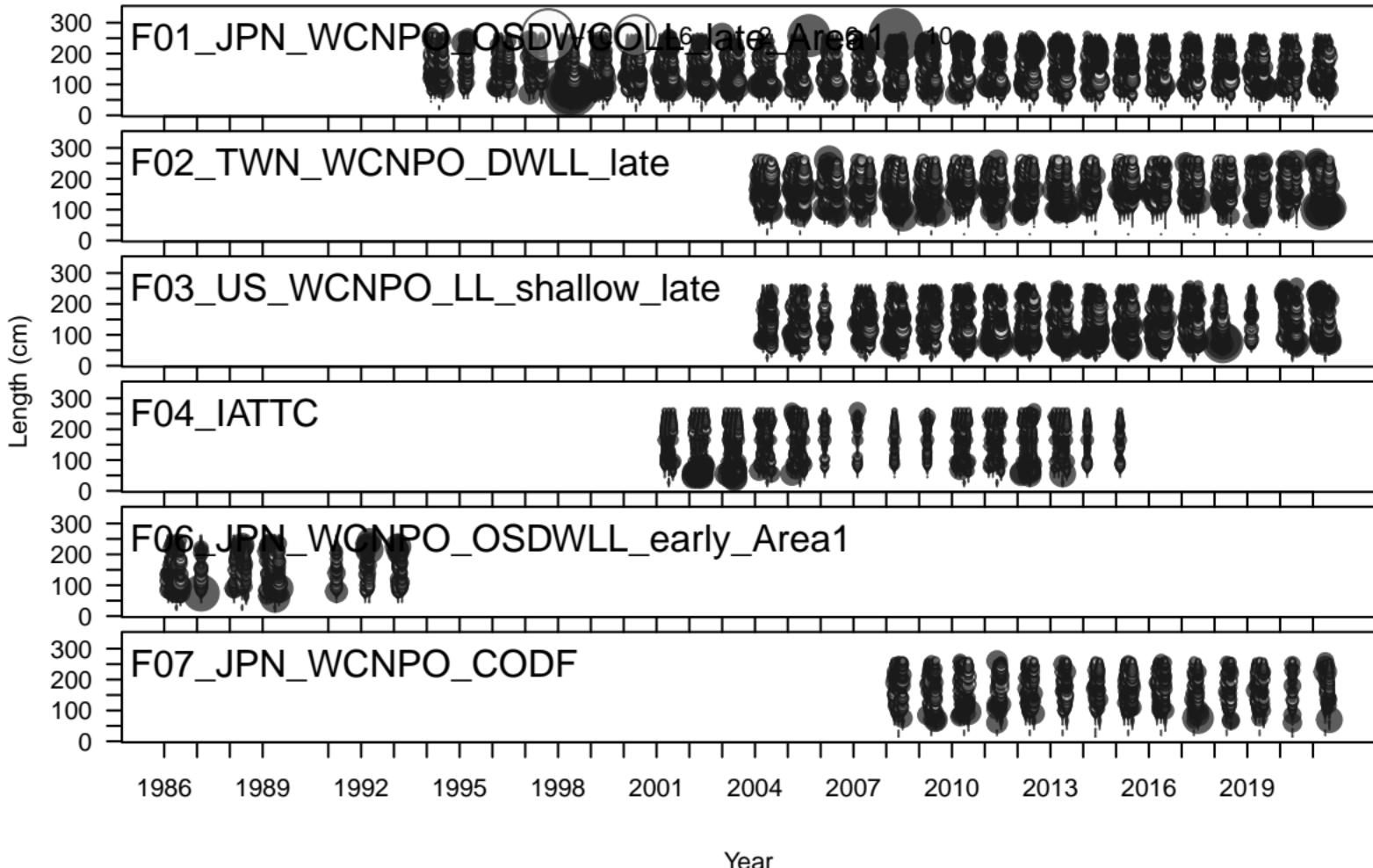


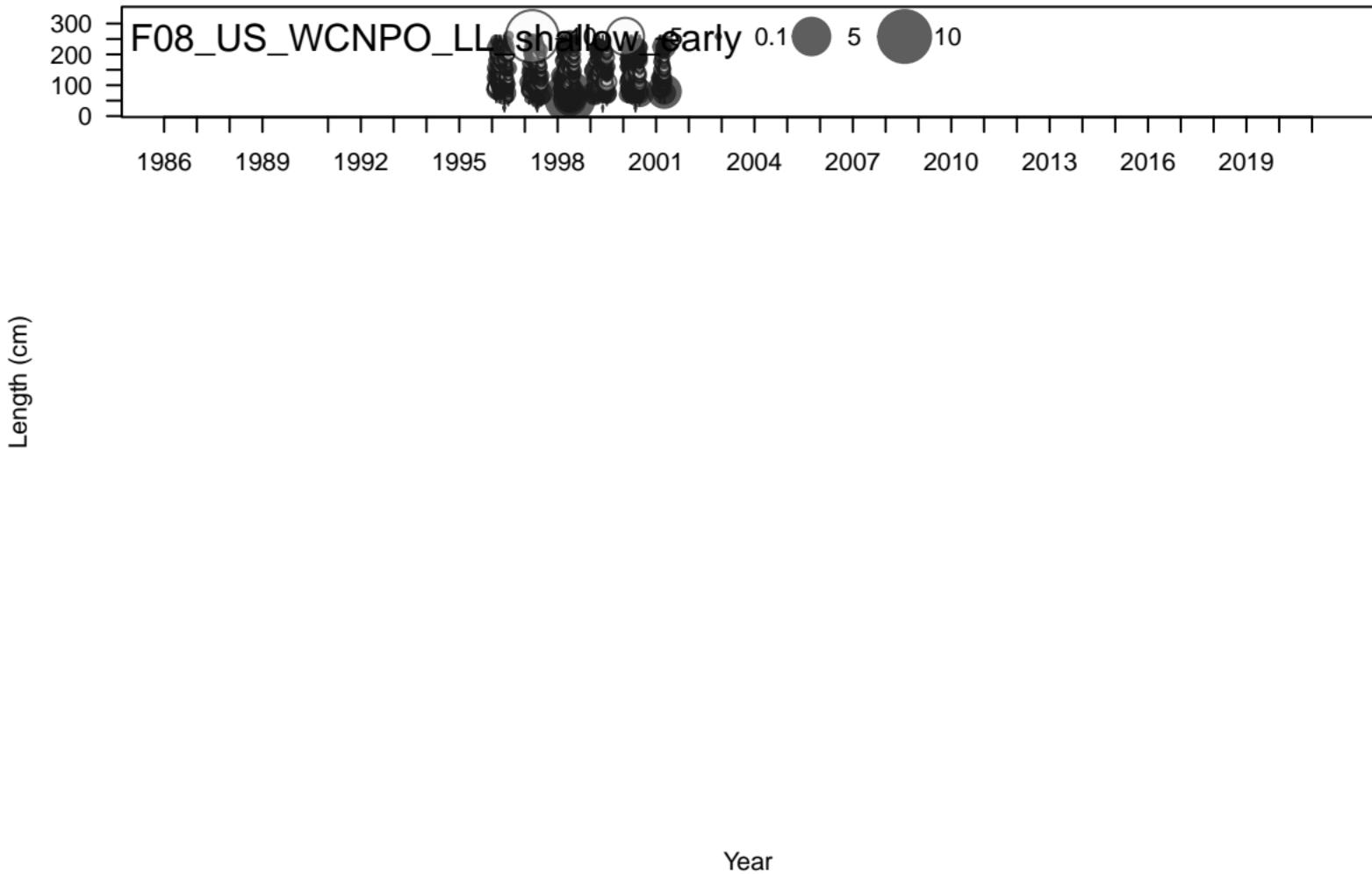
F08\_US\_WCNPO\_LL\_shallow\_early (whole catch)



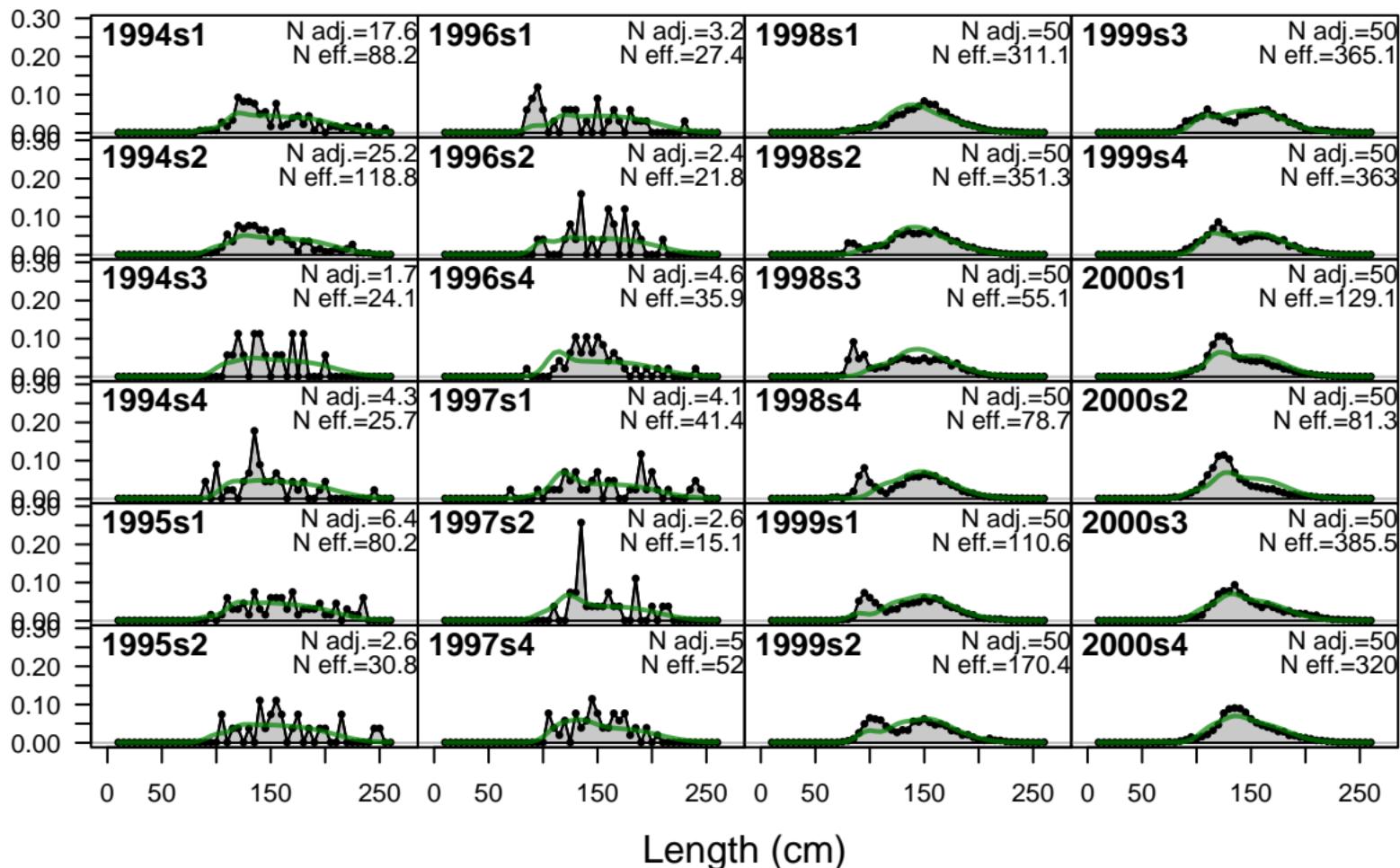
Proportion



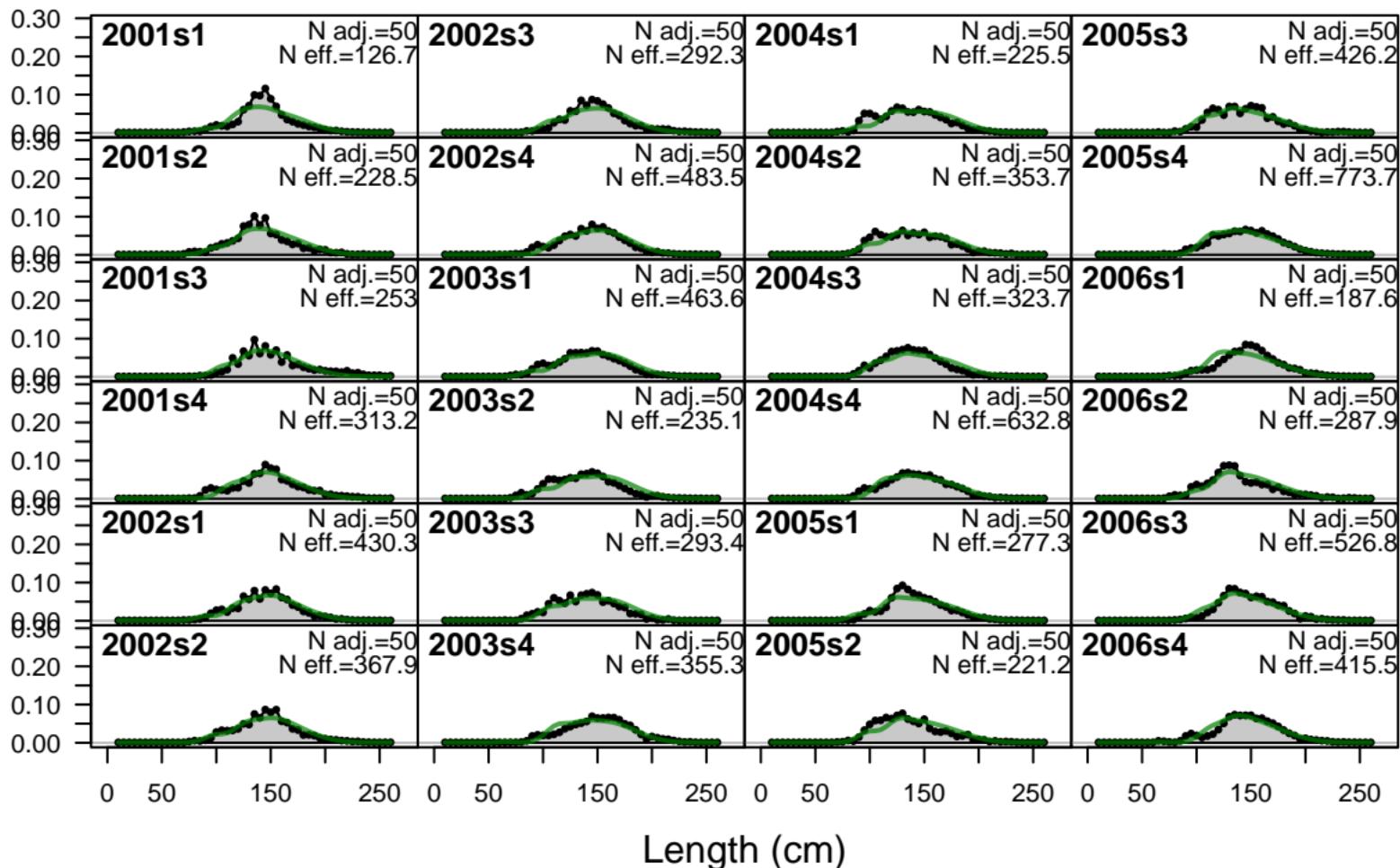




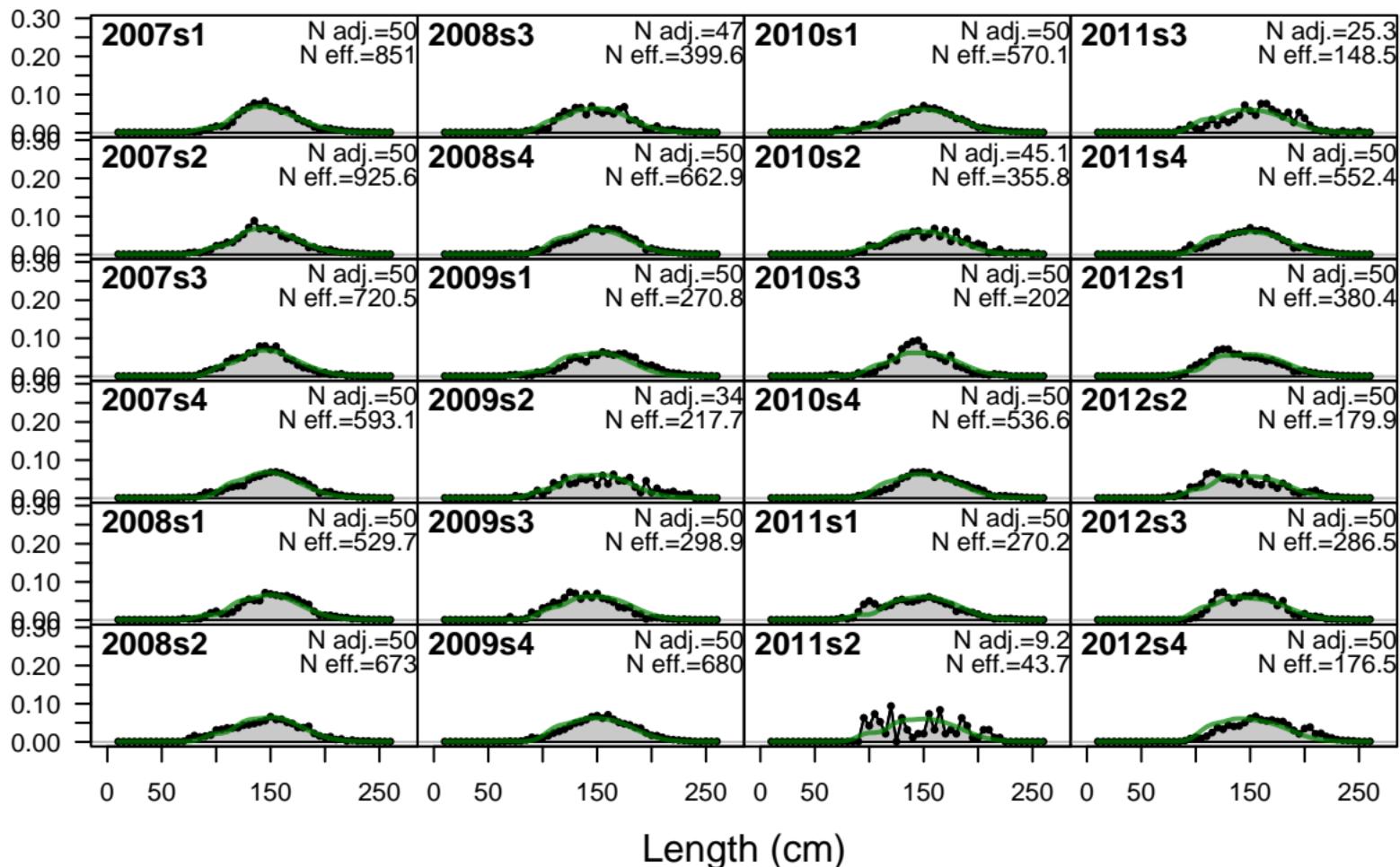
Proportion



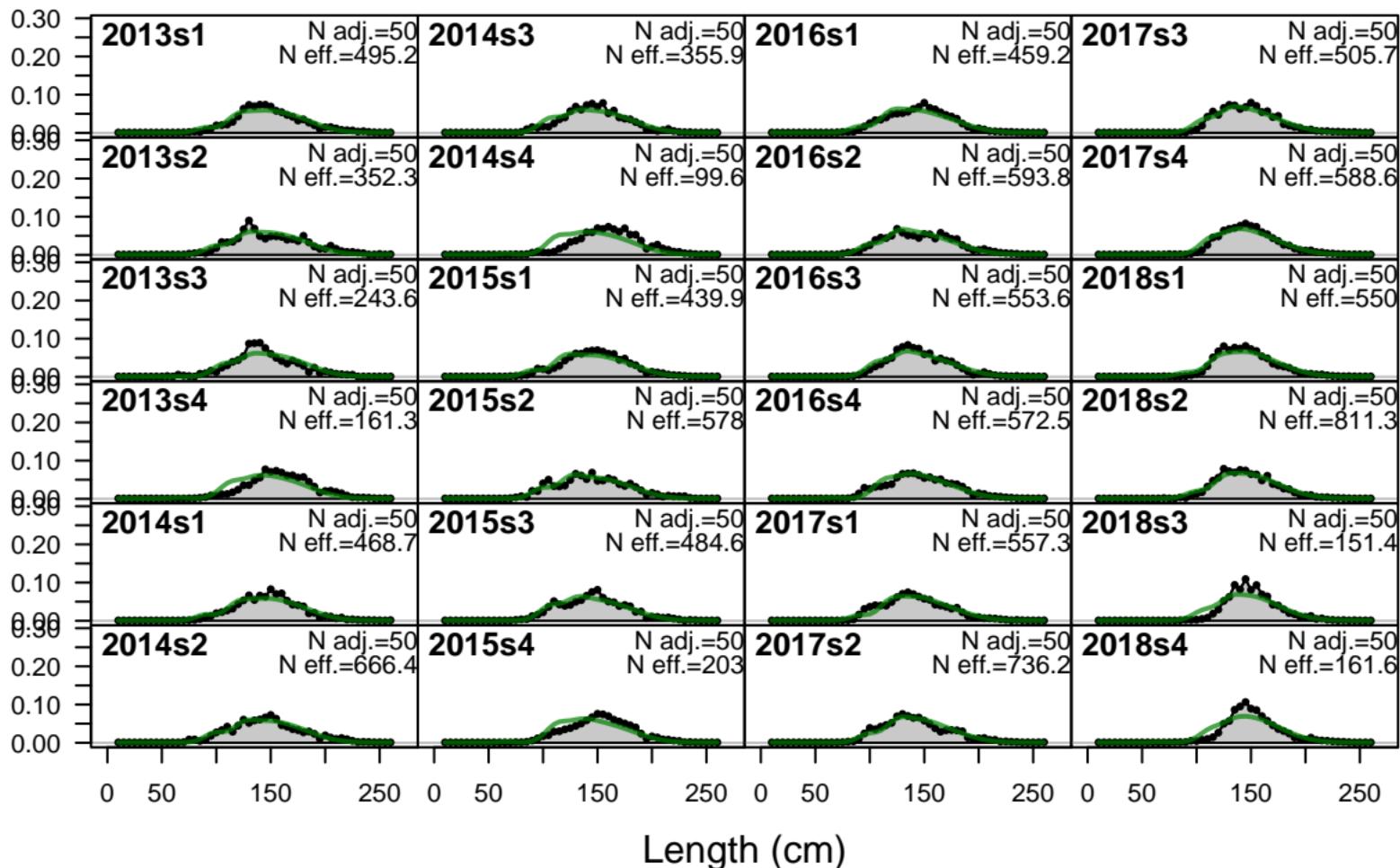
Proportion



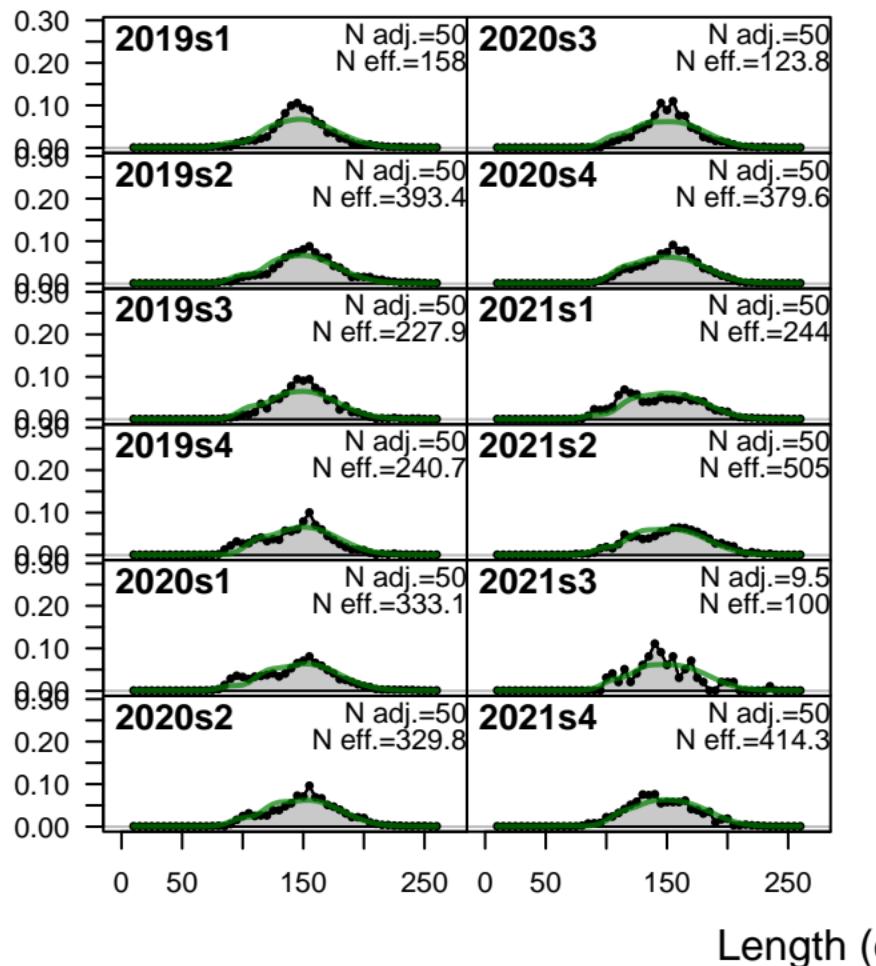
Proportion

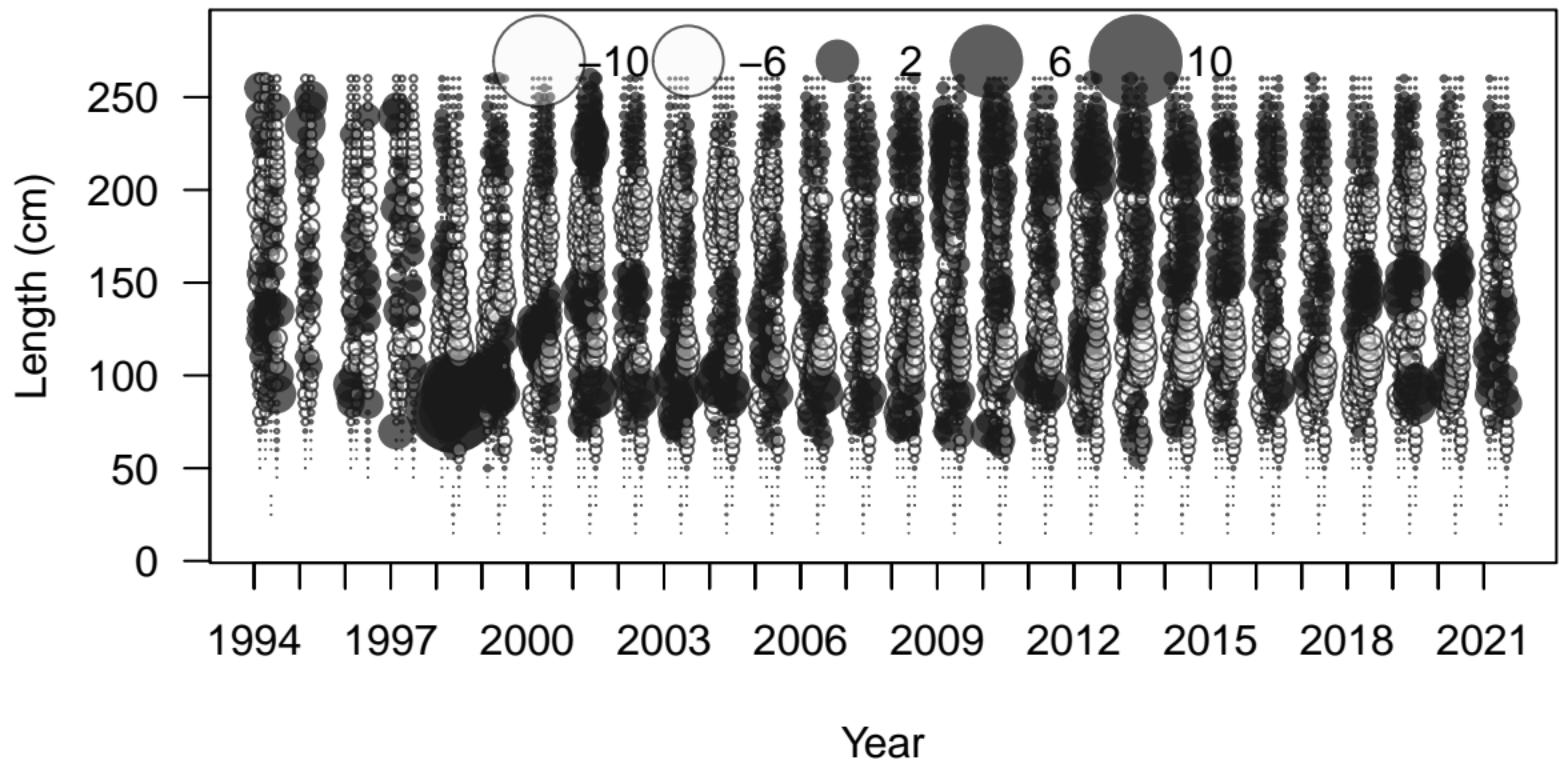


Proportion

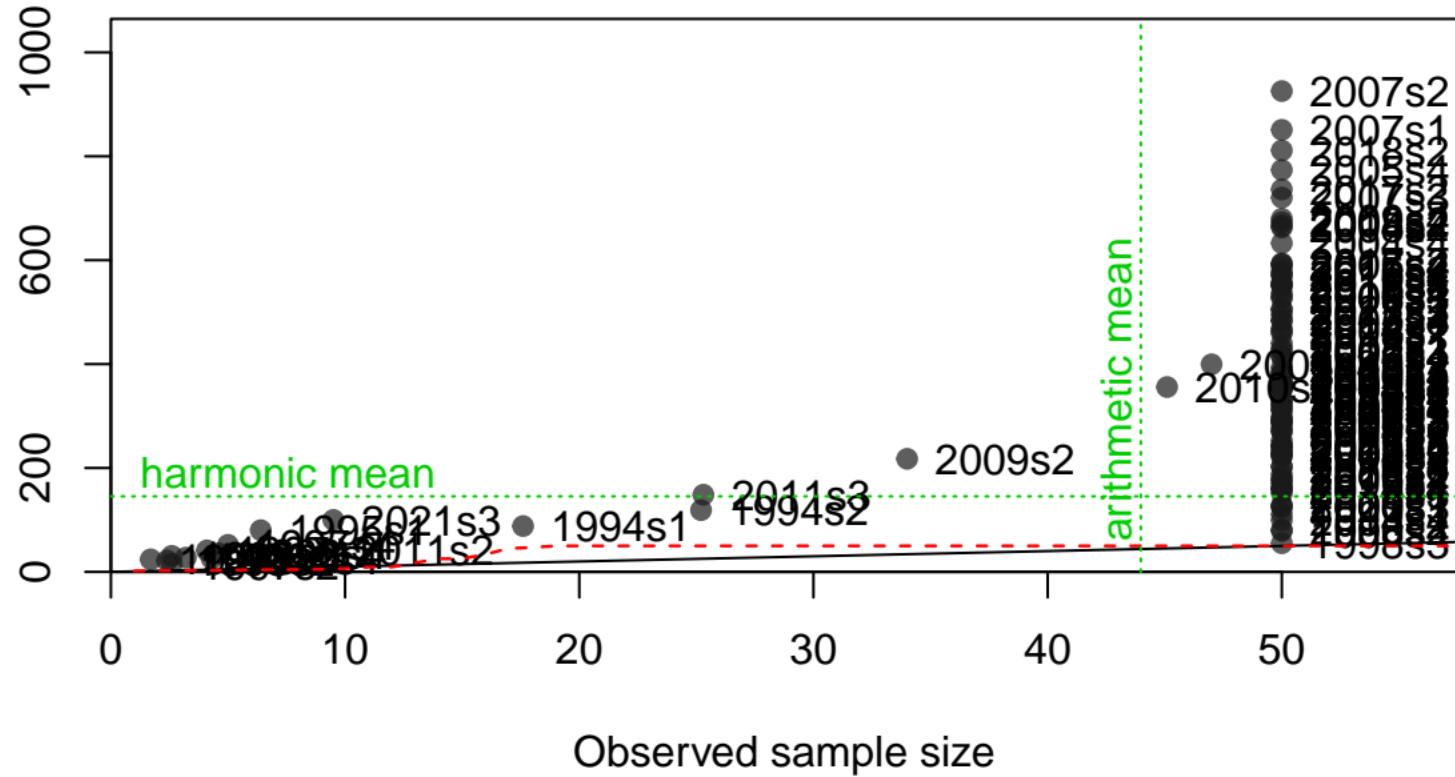


Proportion

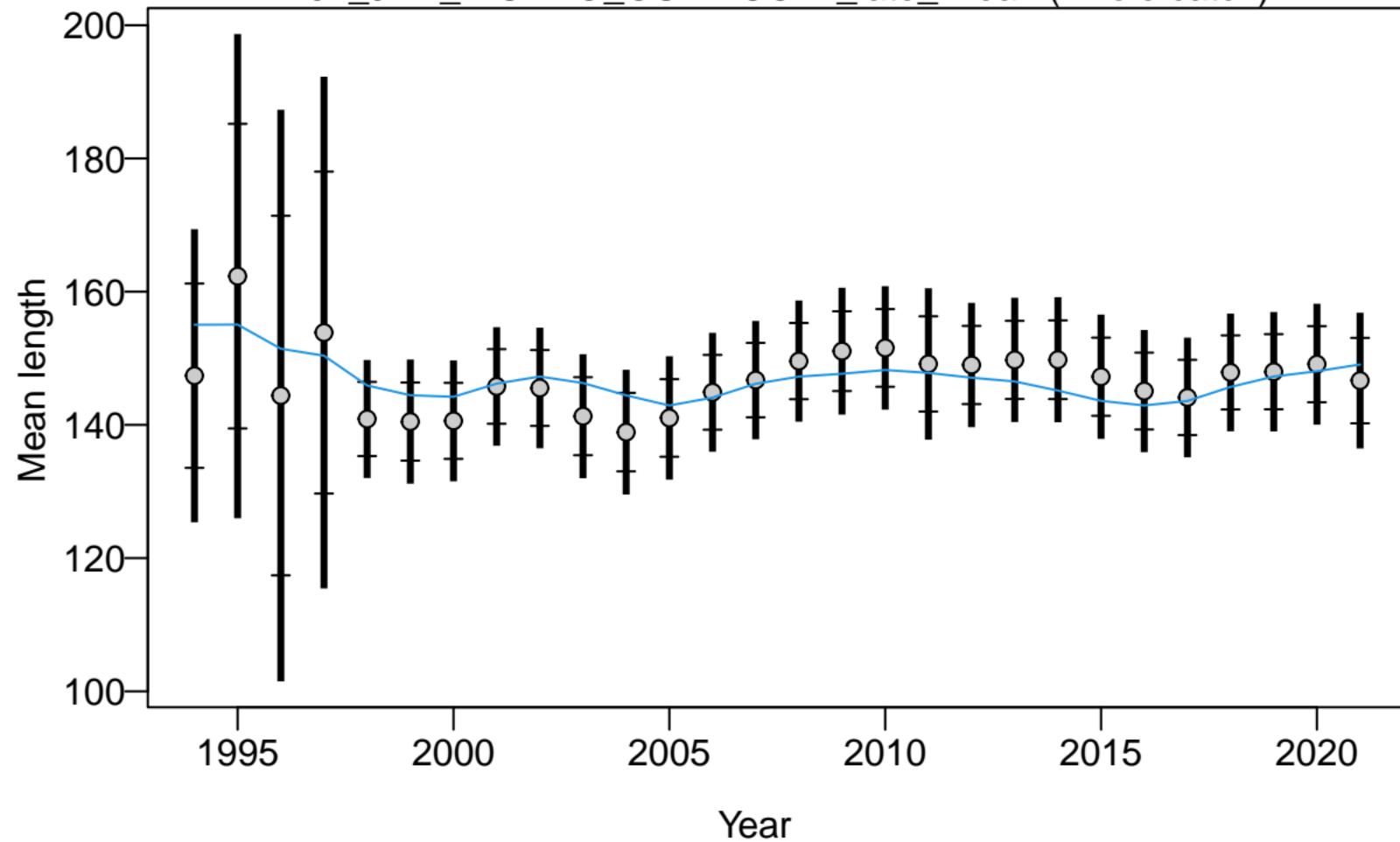




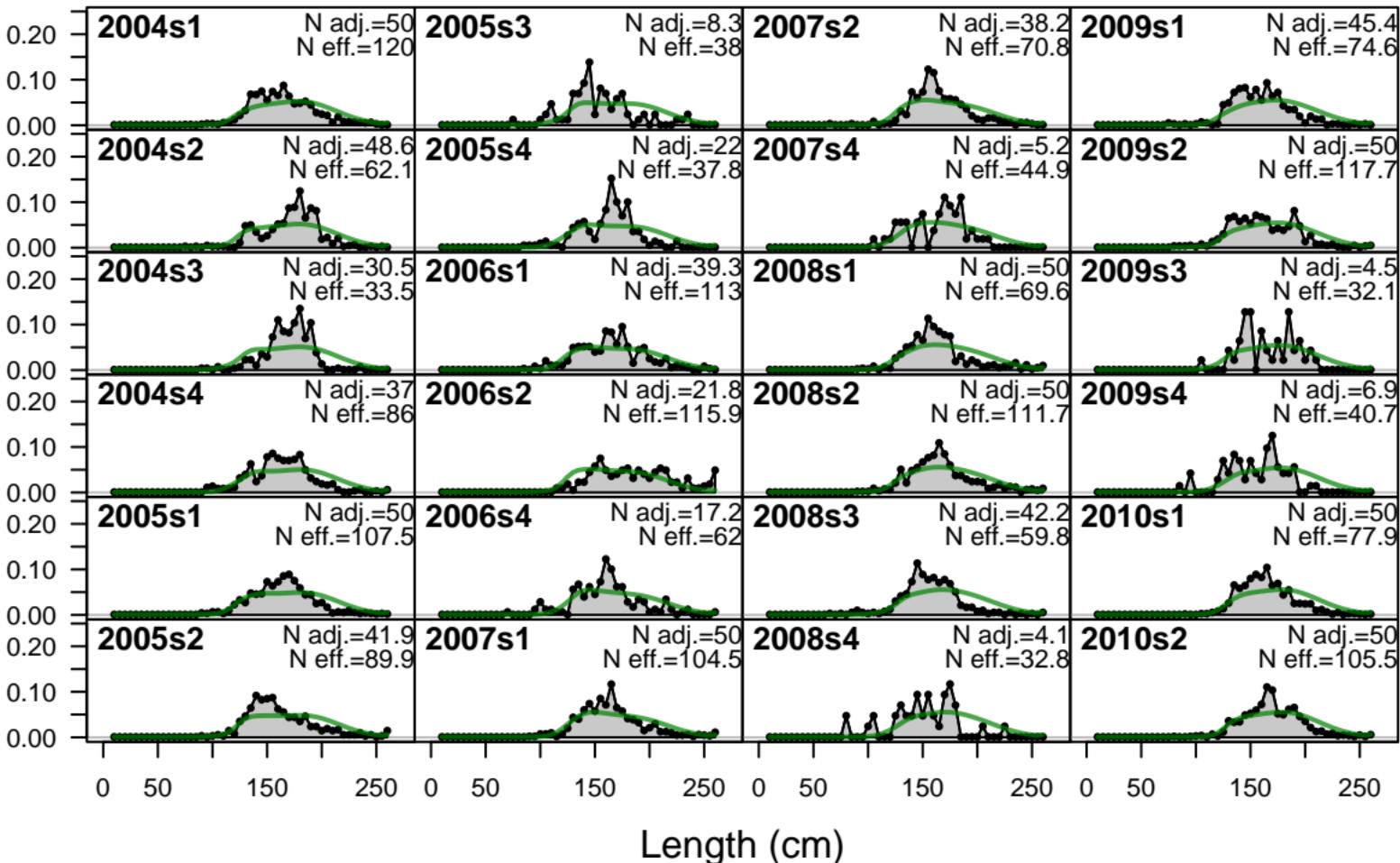
Effective sample size



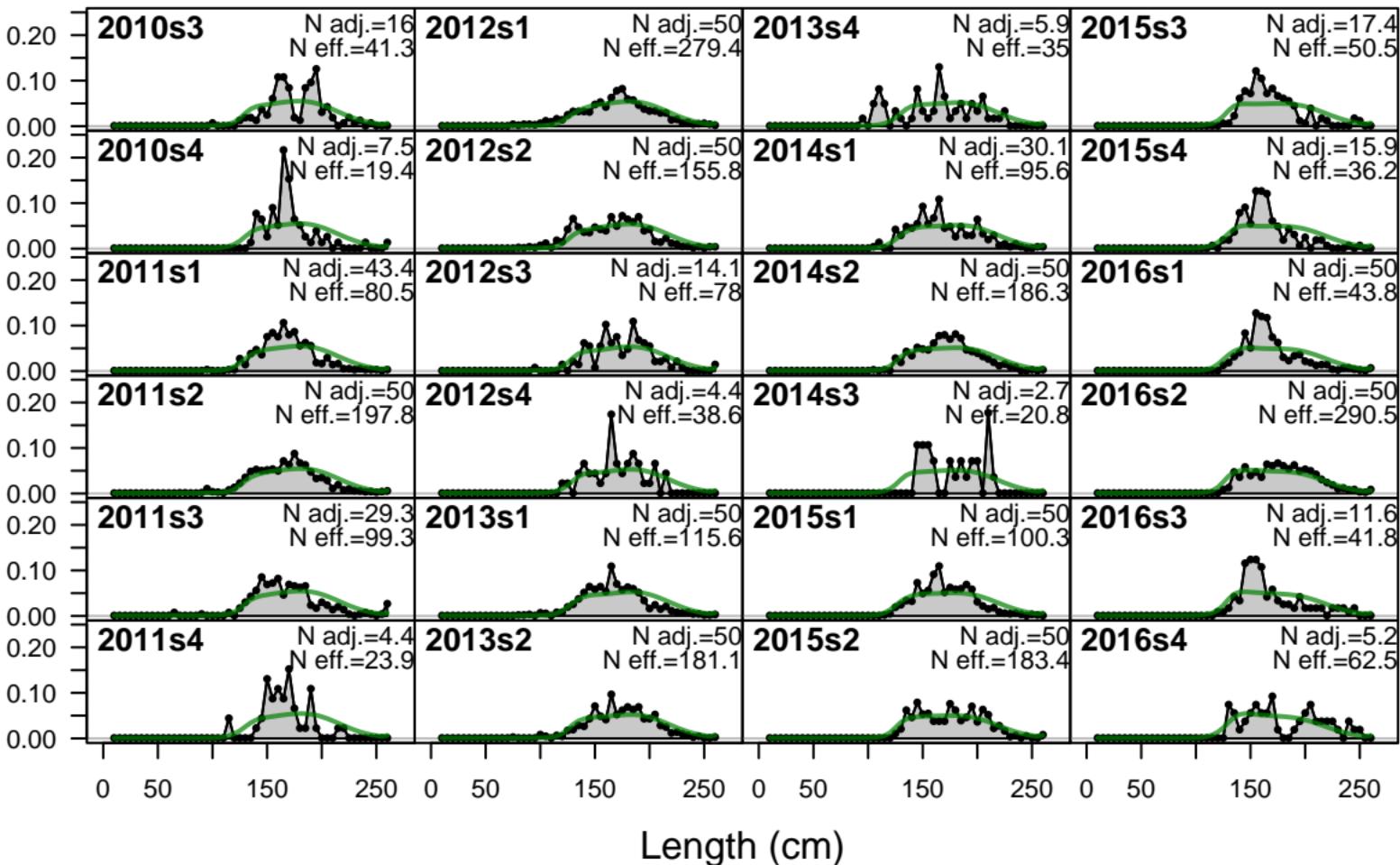
F01\_JPN\_WCNPO OSDWCOLL\_late\_Area1 (whole catch)



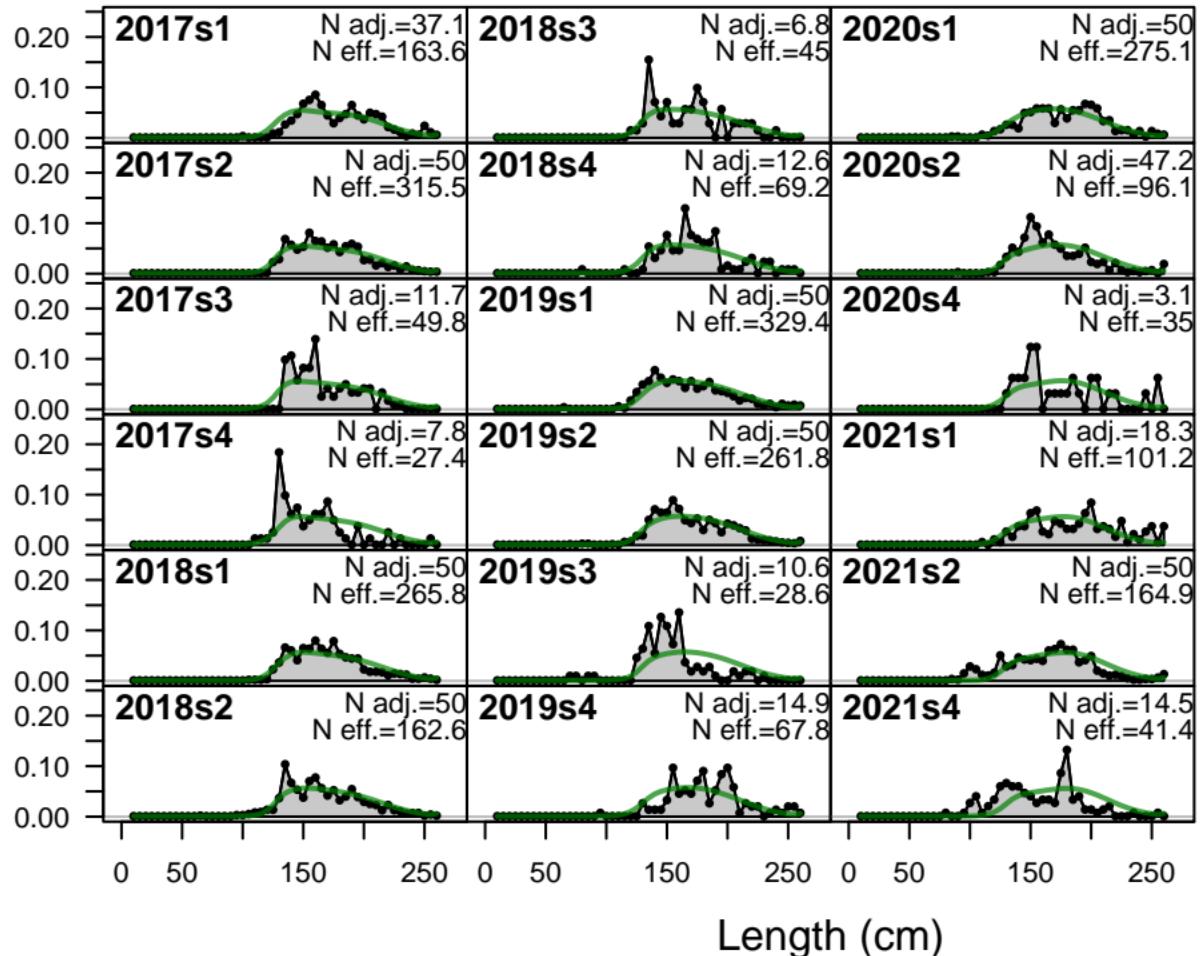
Proportion

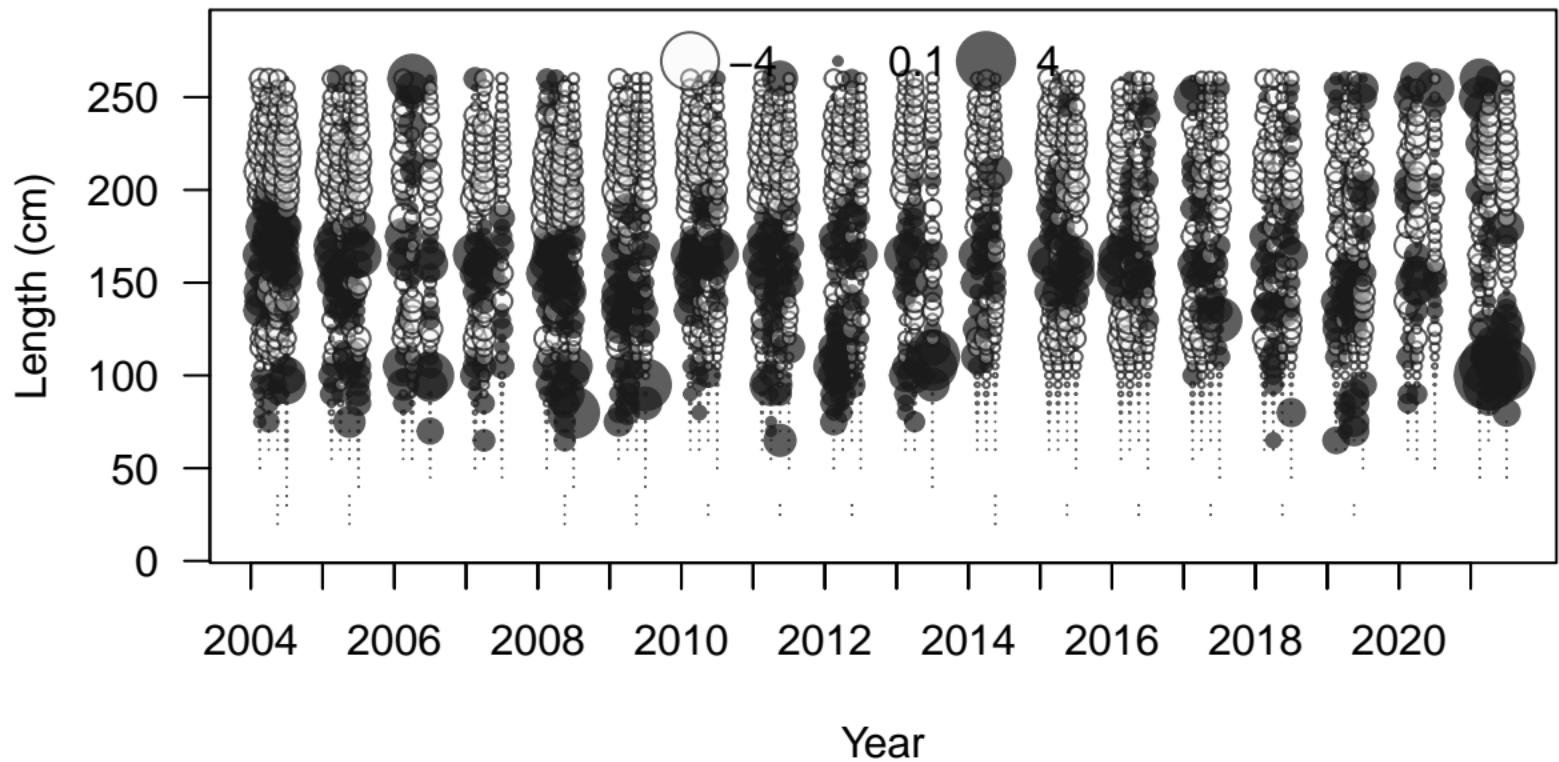


Proportion

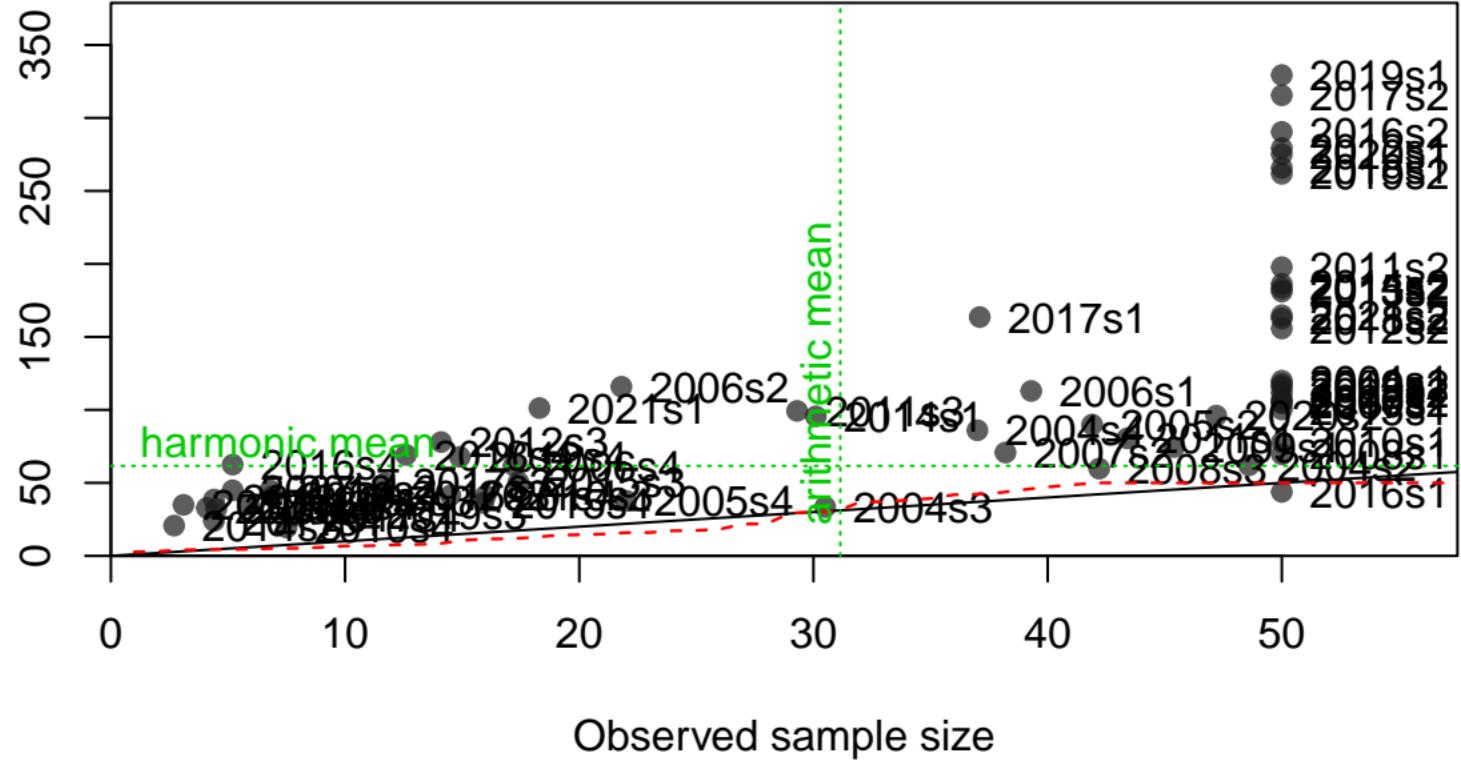


Proportion

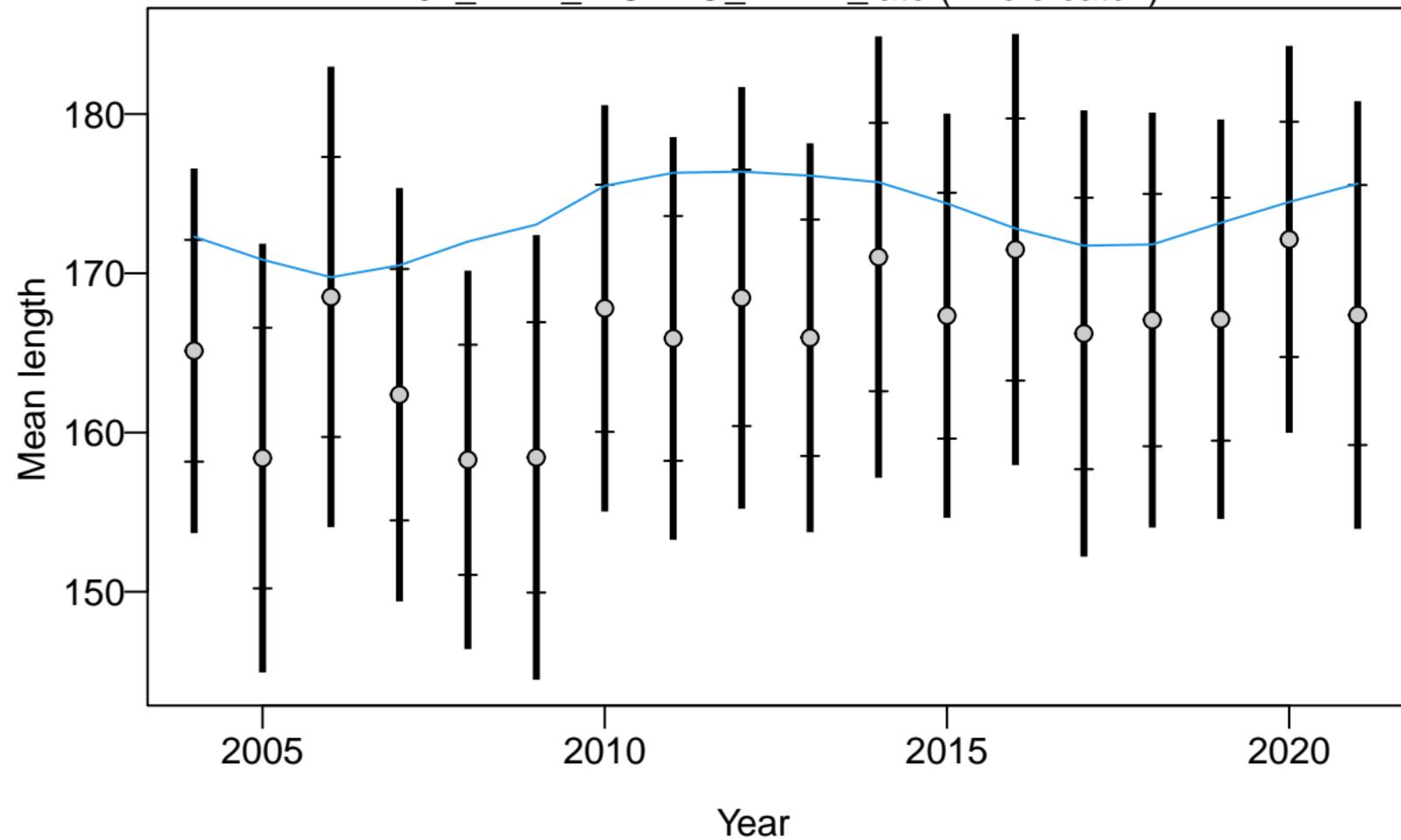




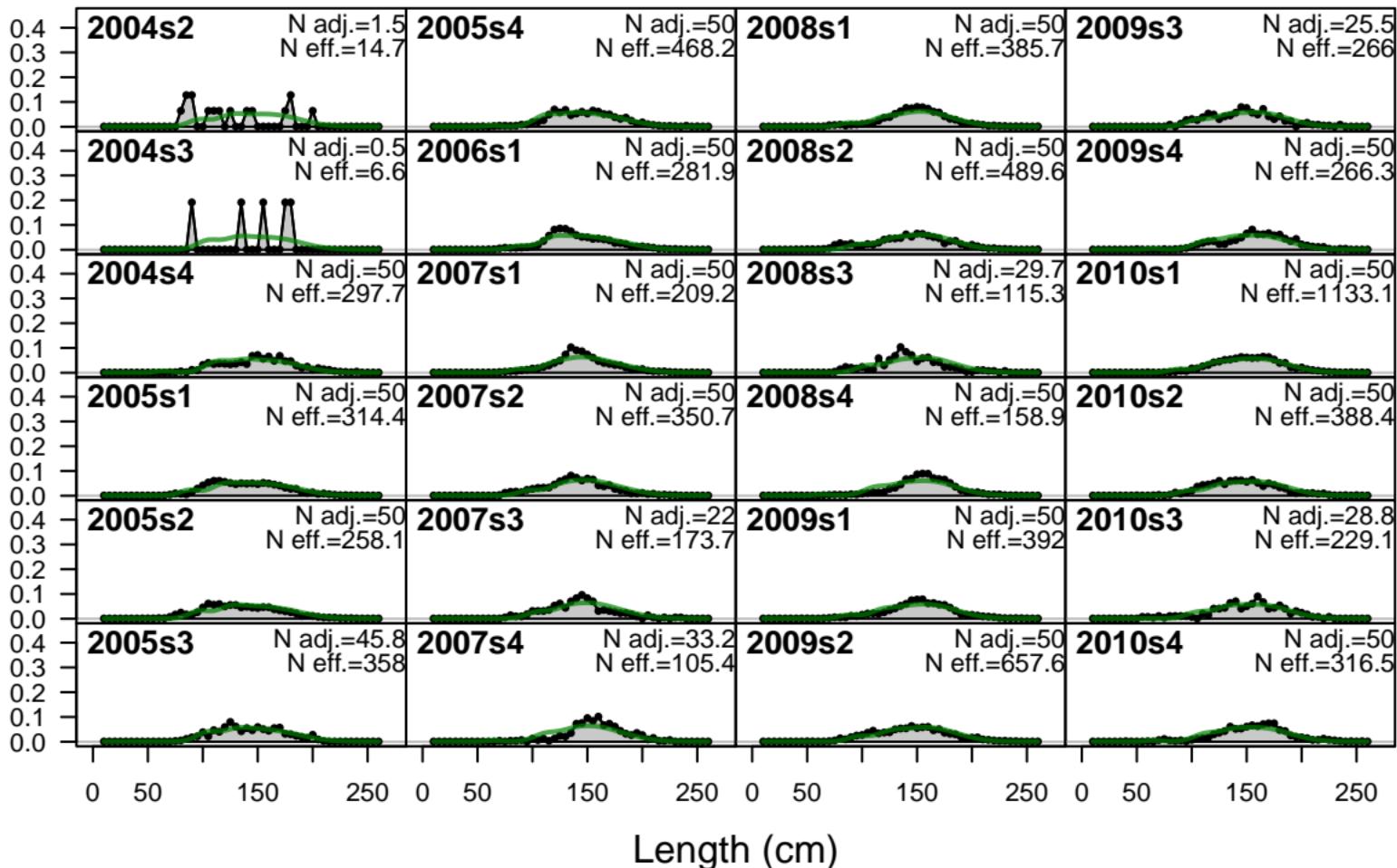
Effective sample size



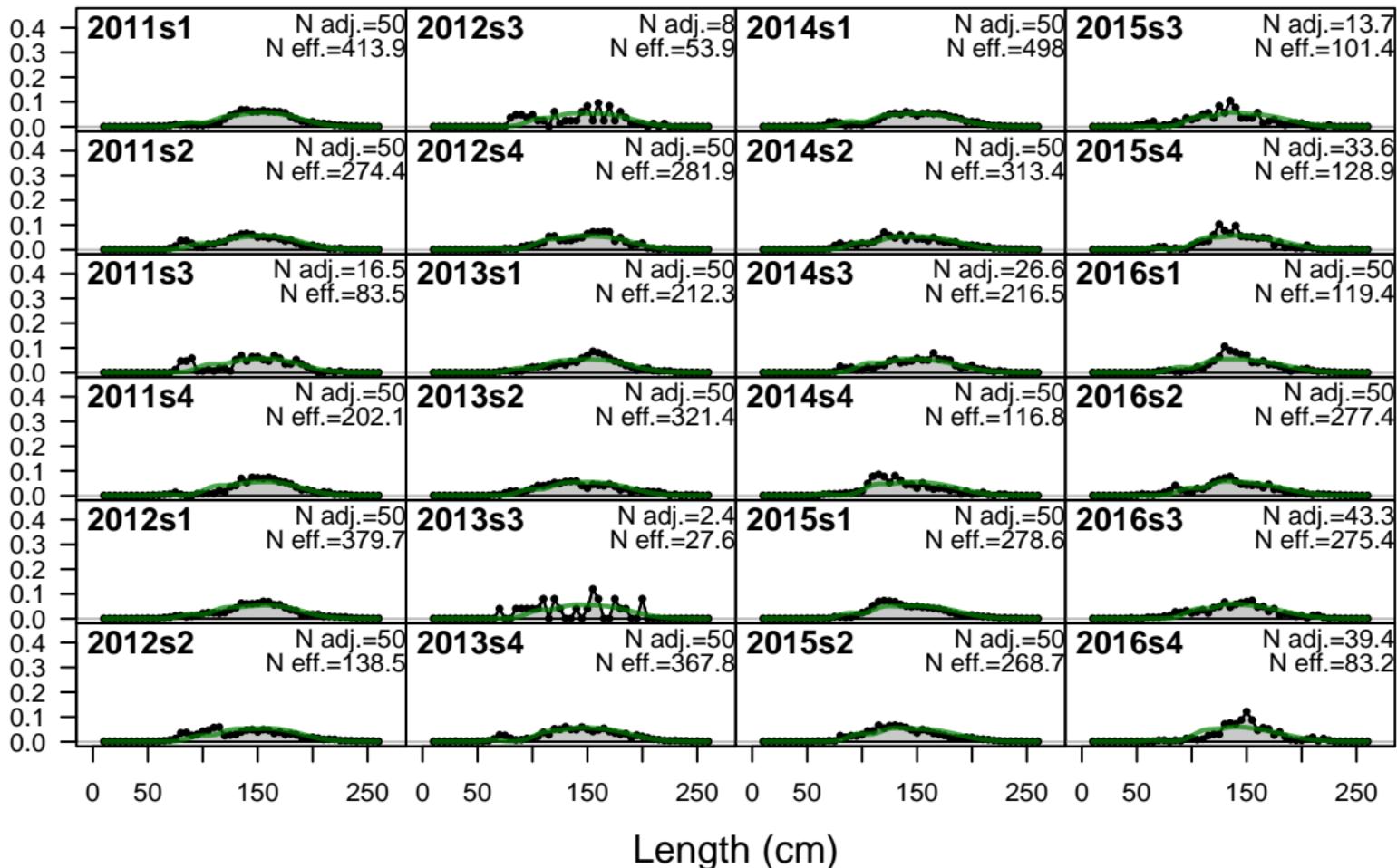
# F02\_TWN\_WCNPO\_DWLL\_late (whole catch)



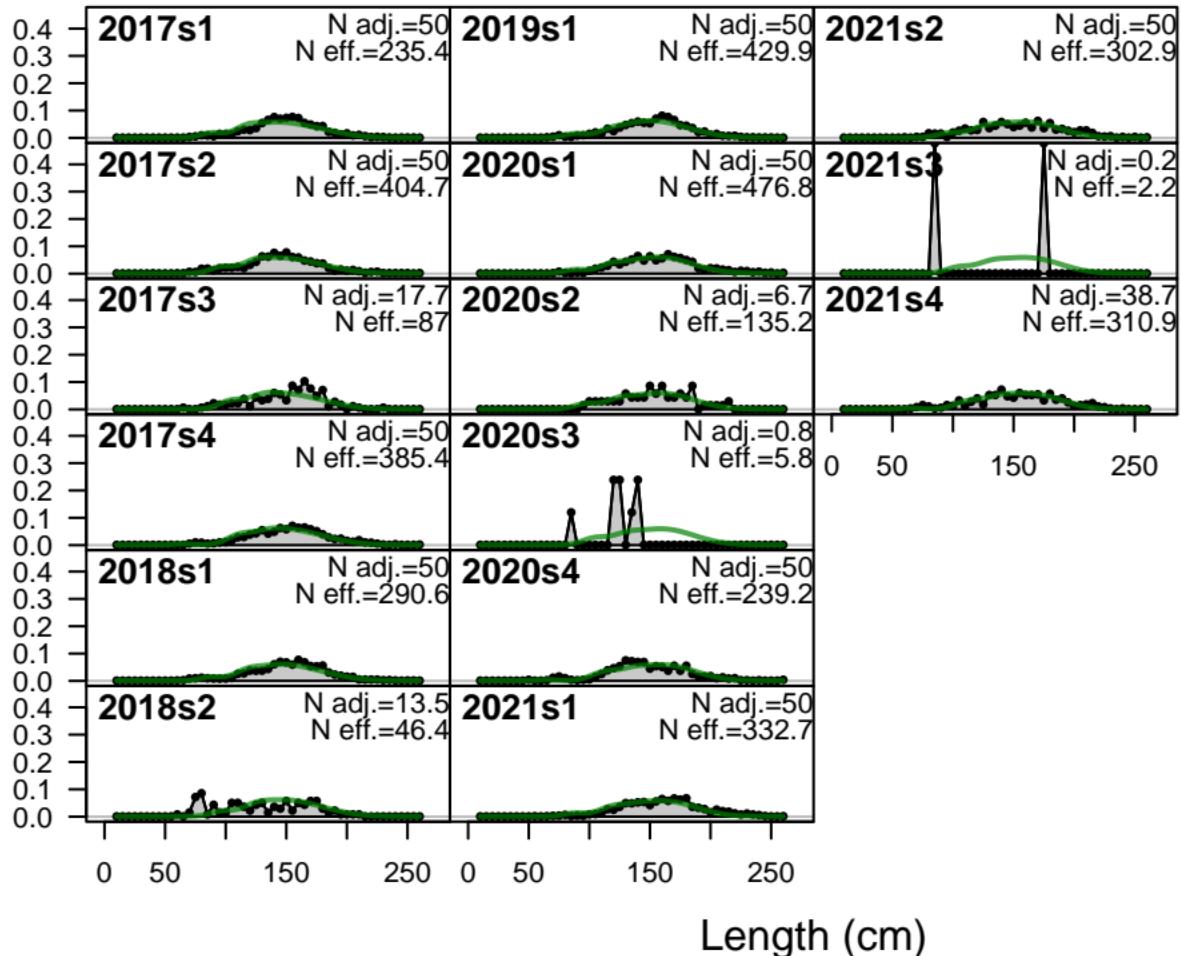
Proportion

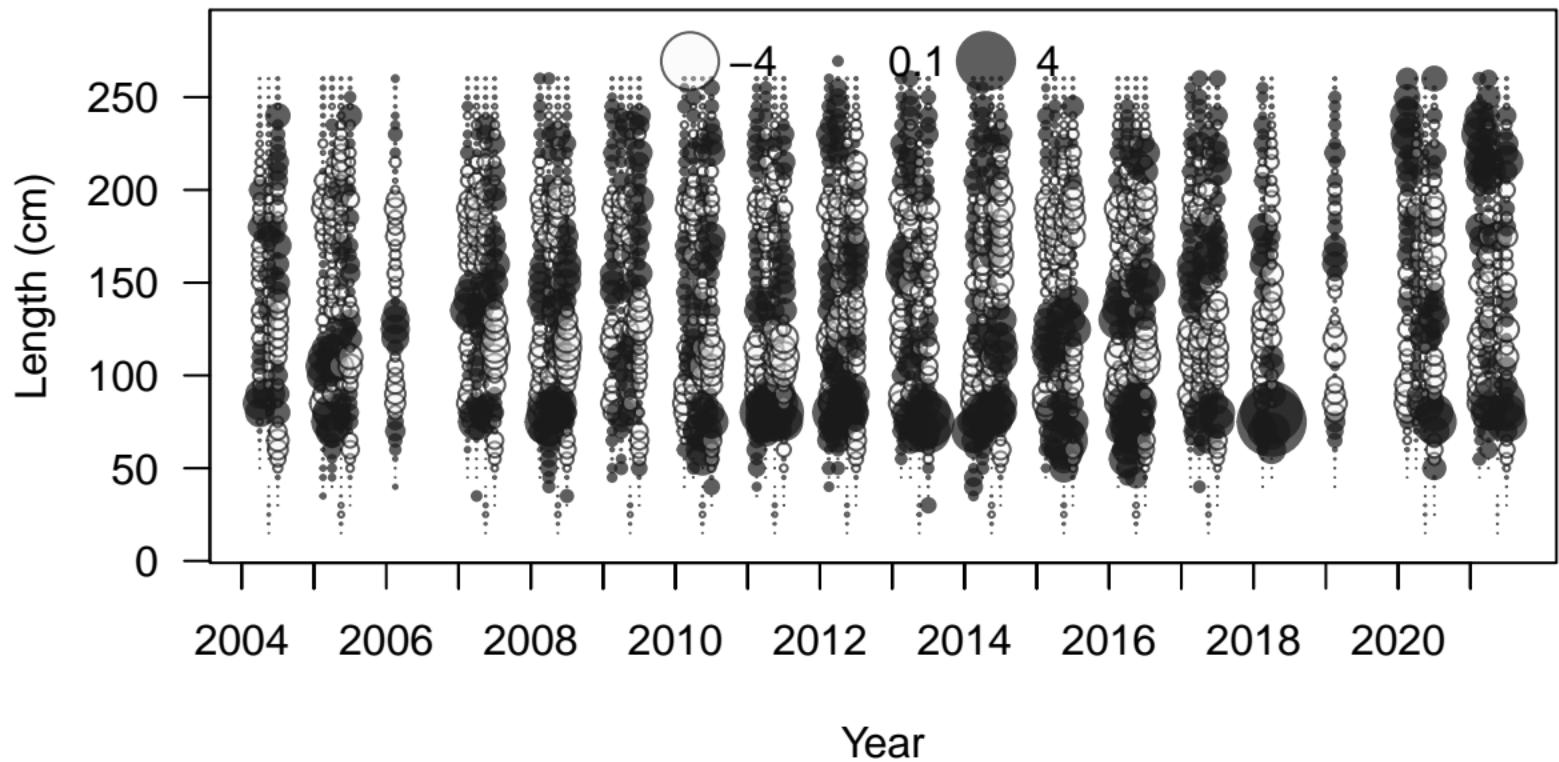


Proportion

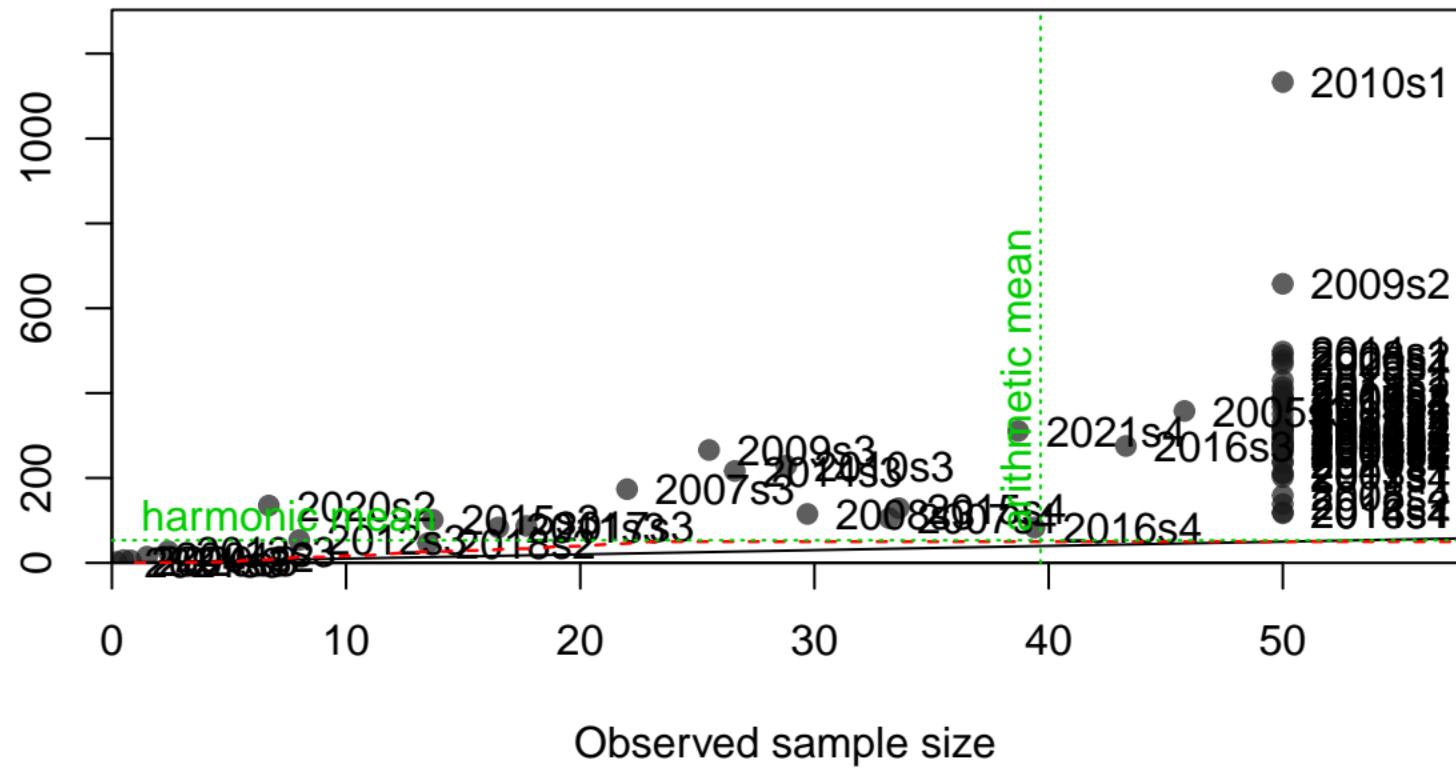


Proportion

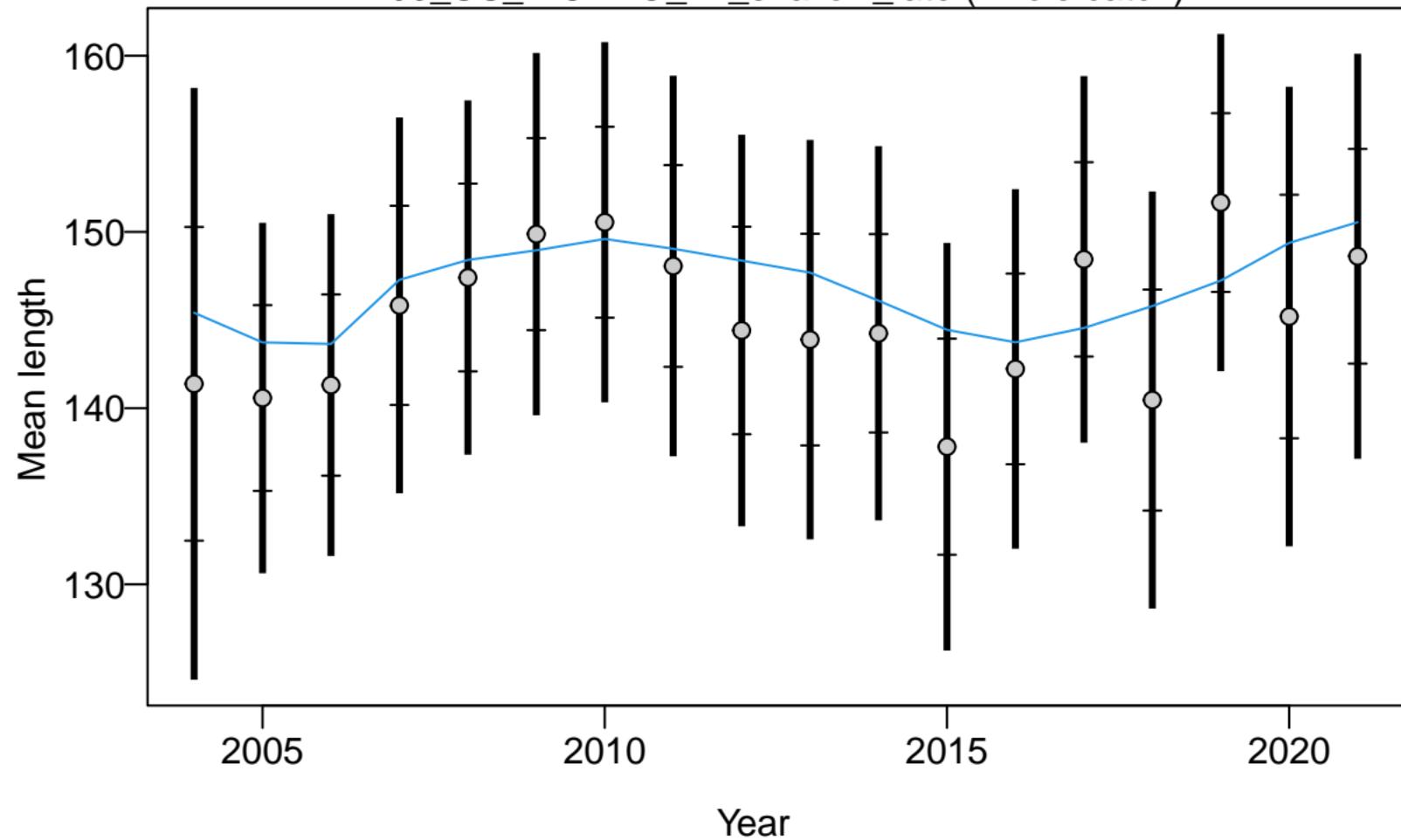




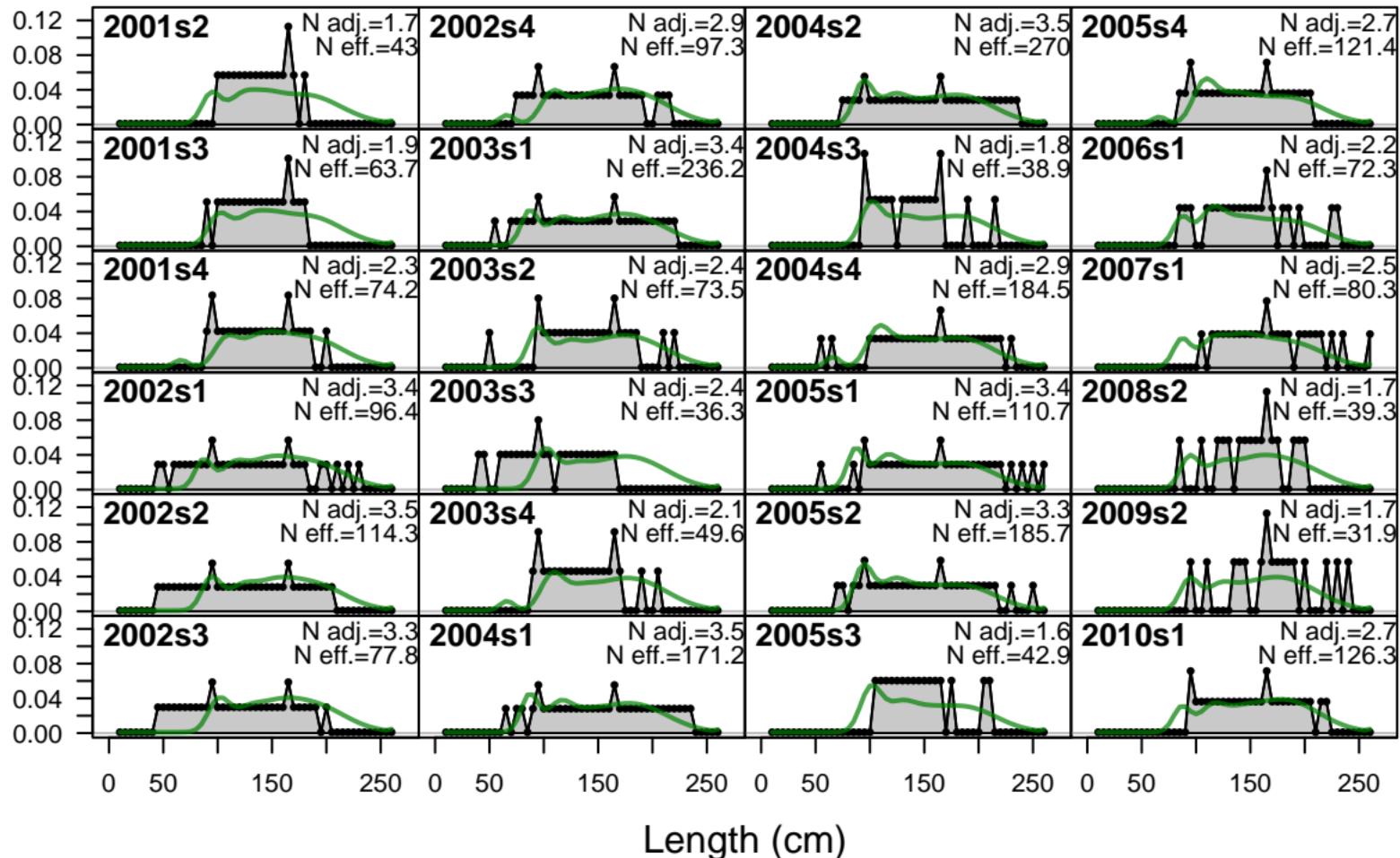
Effective sample size



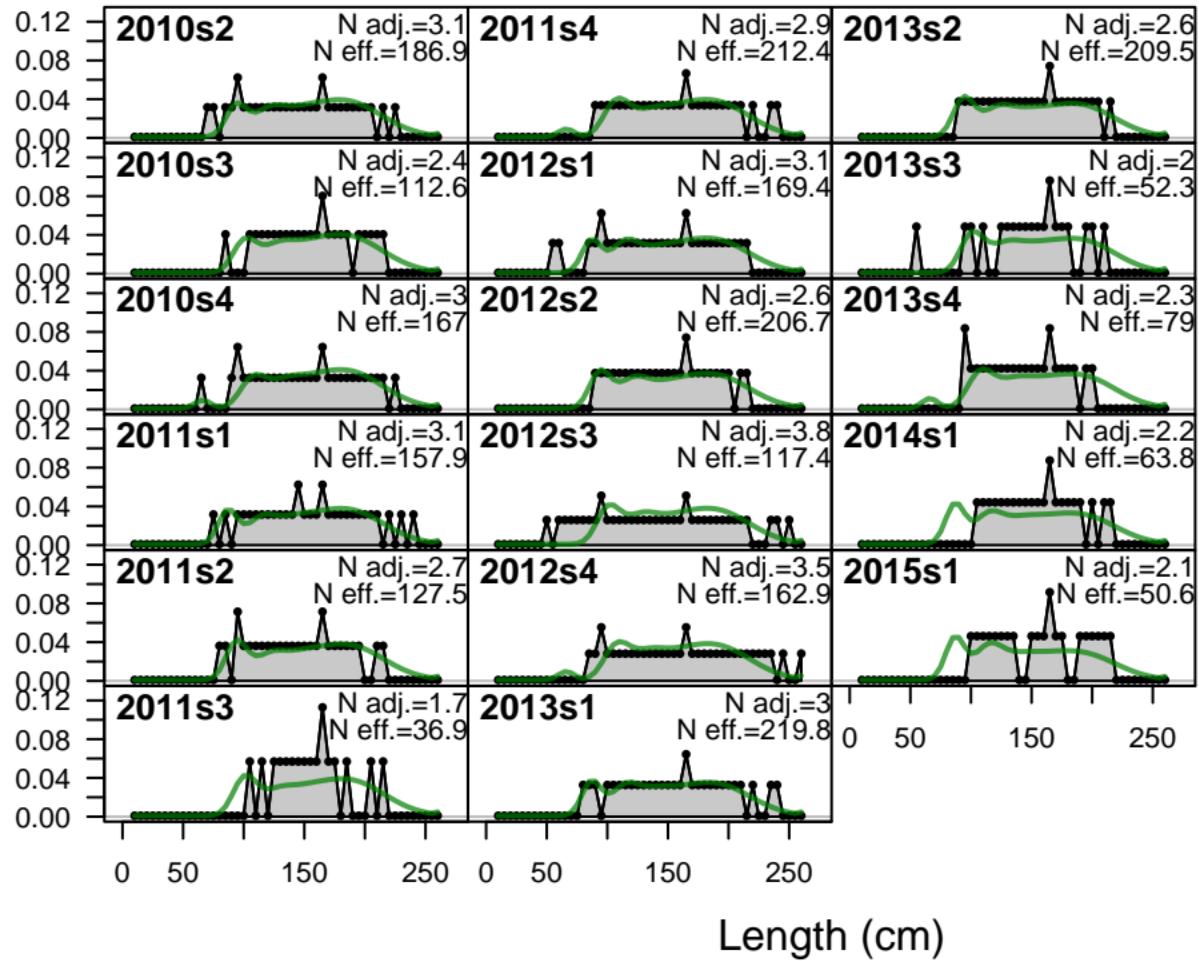
F03\_US\_WCNPO\_LL\_shallow\_late (whole catch)

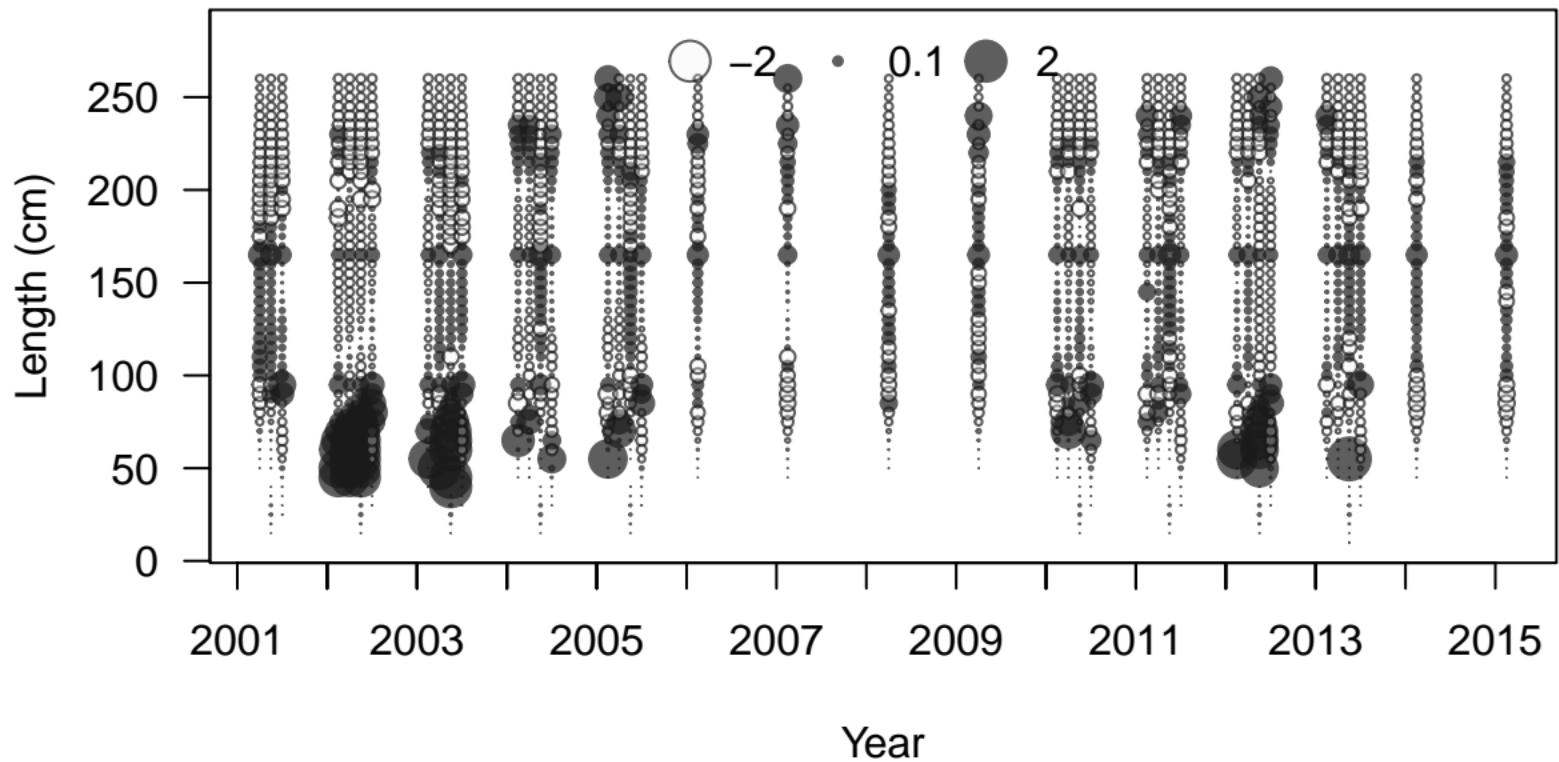


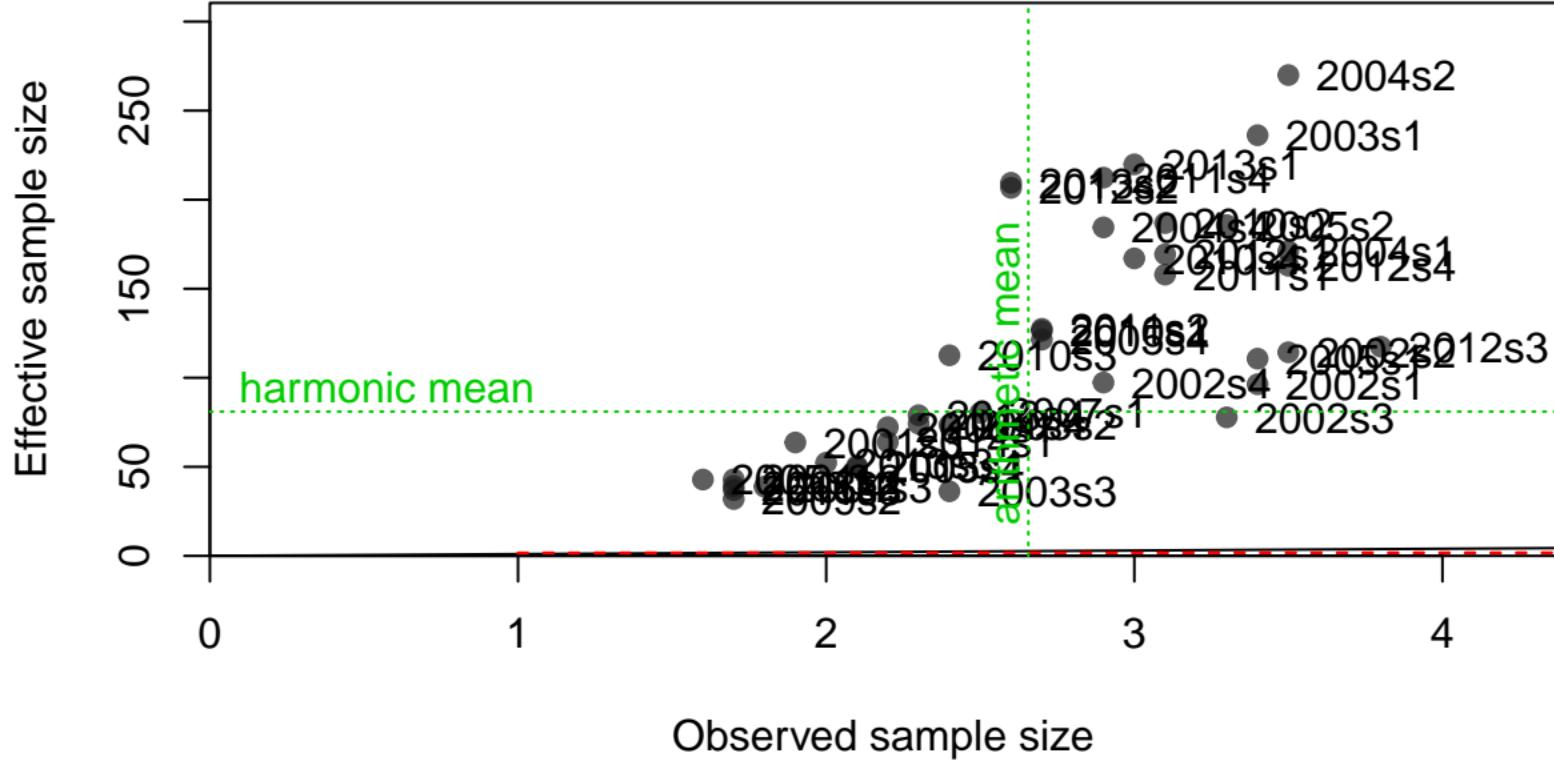
Proportion



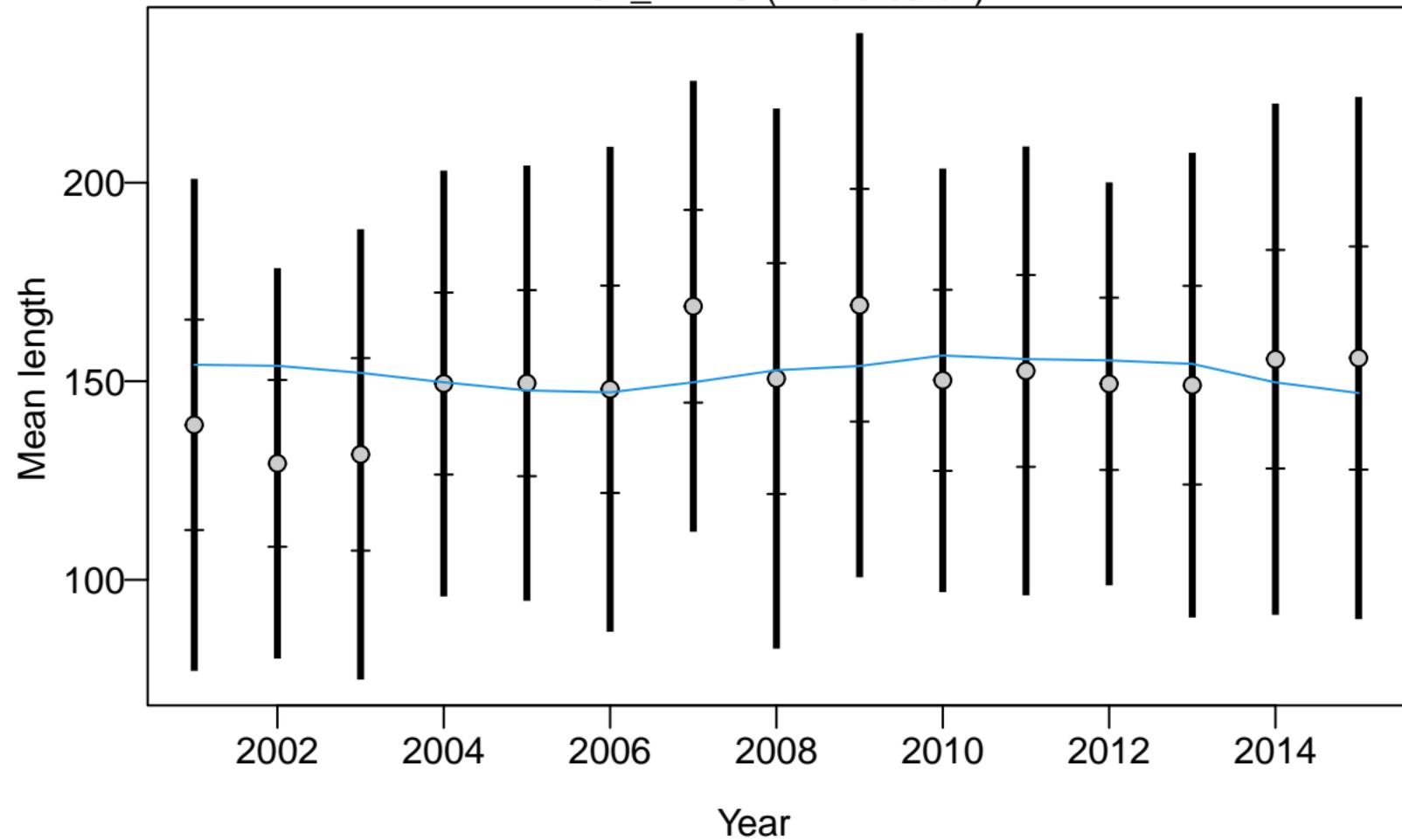
Proportion



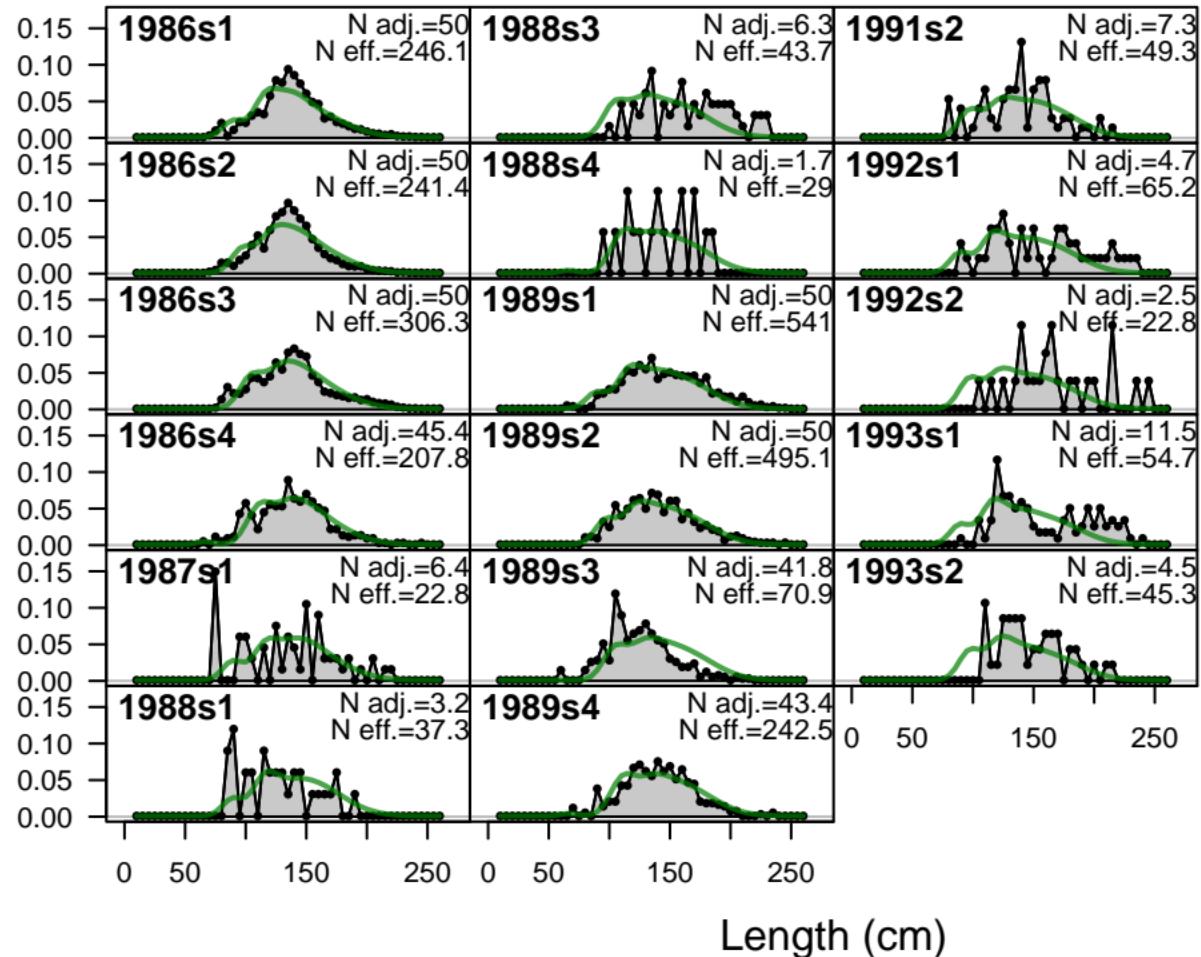


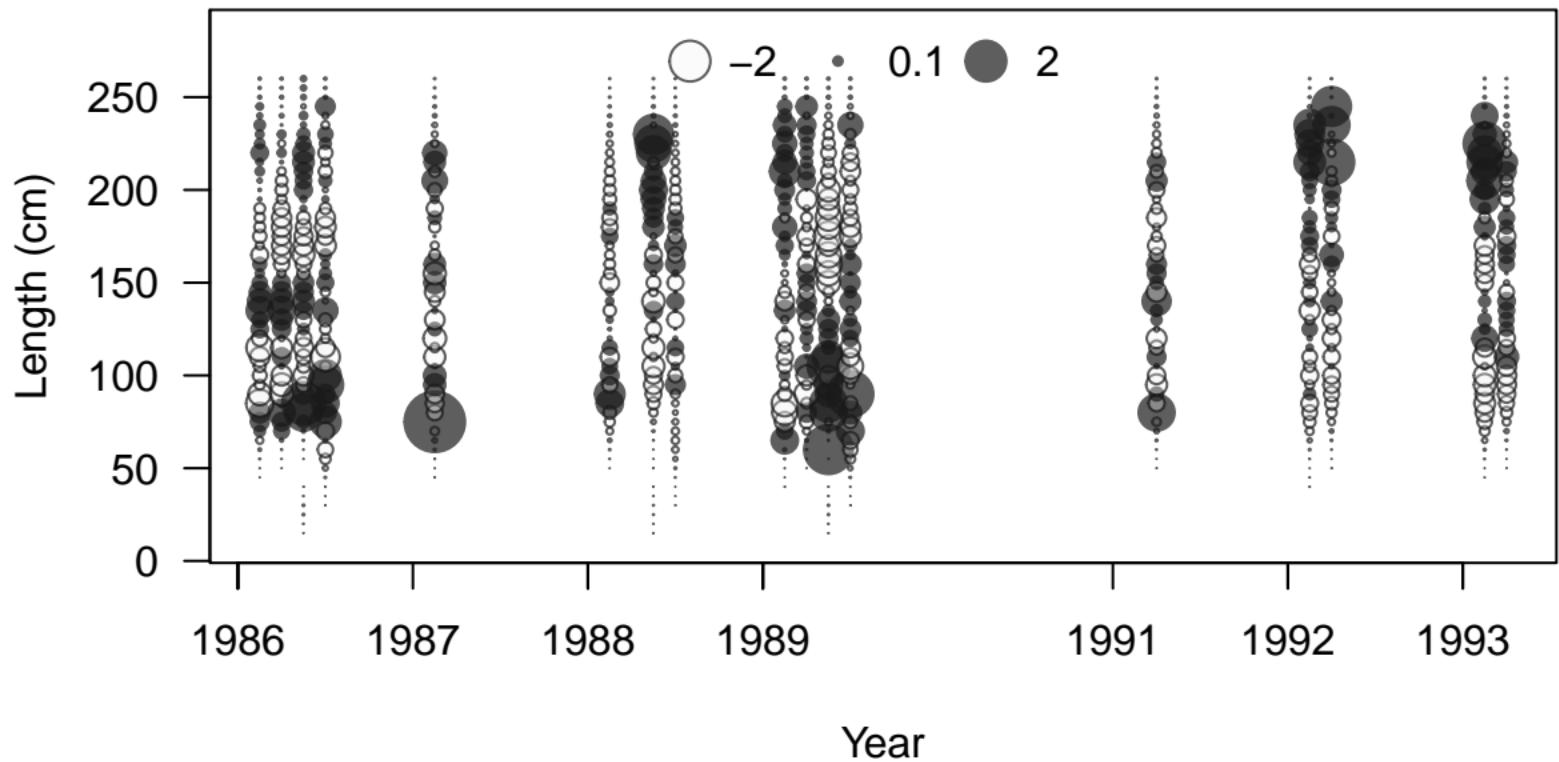


# F04\_IATTC (whole catch)

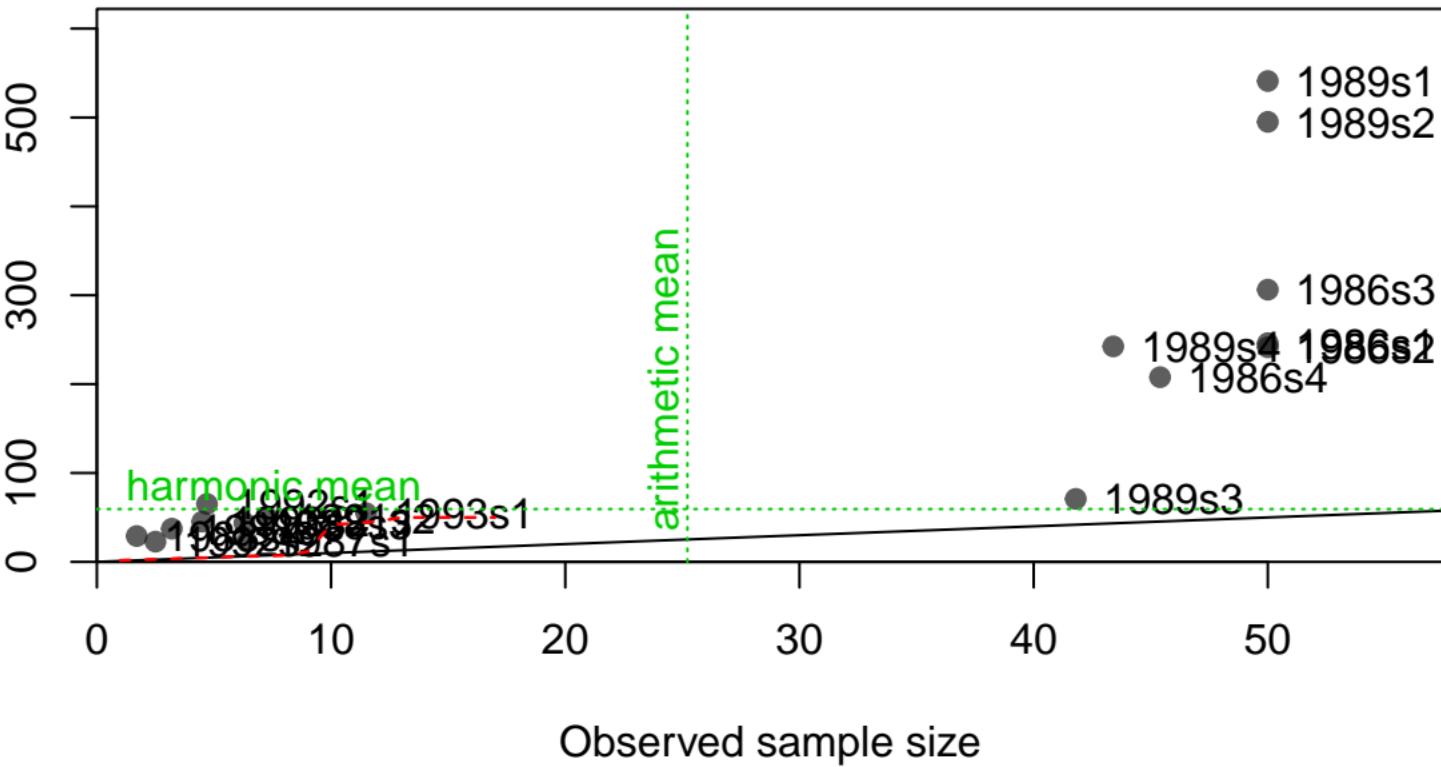


Proportion

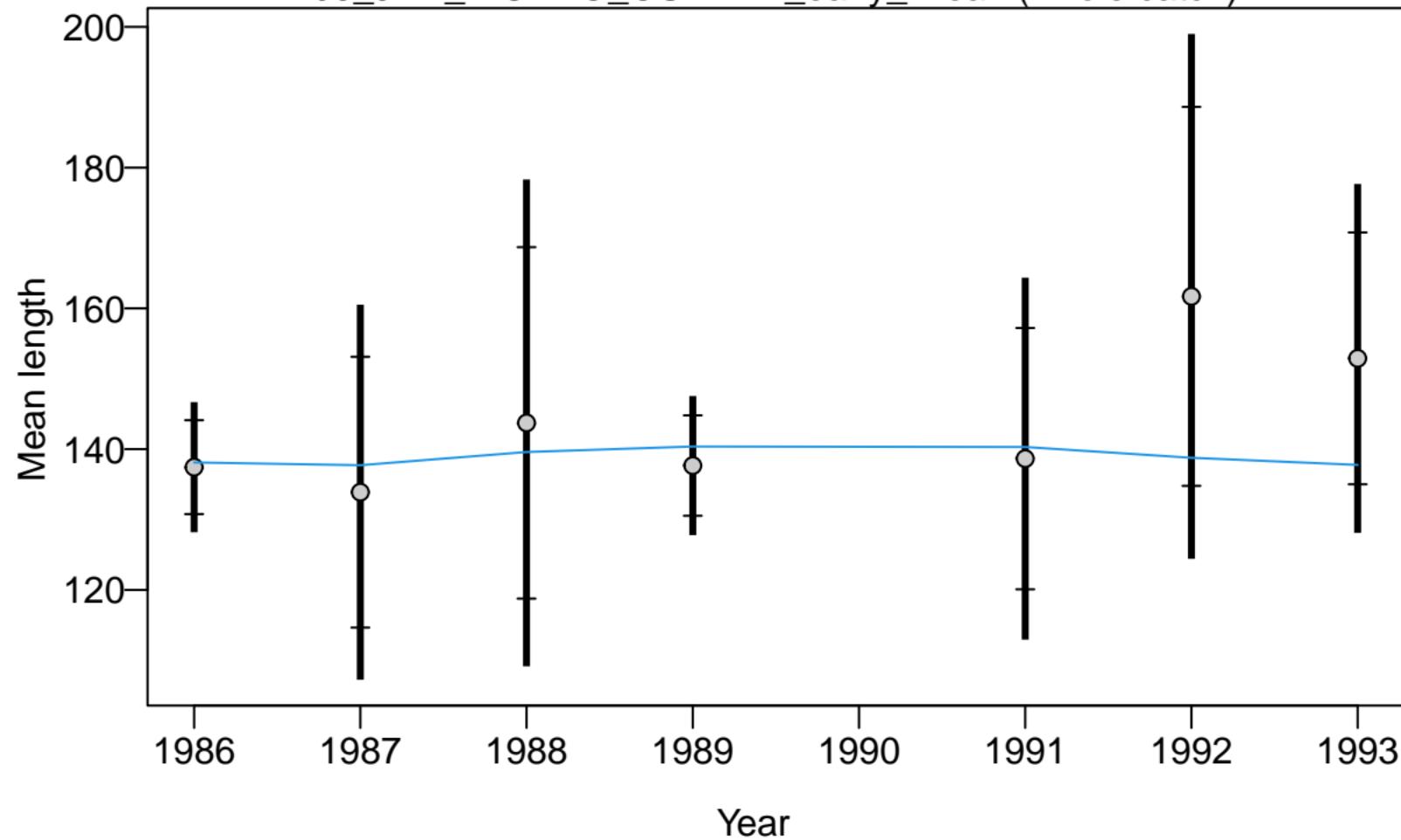




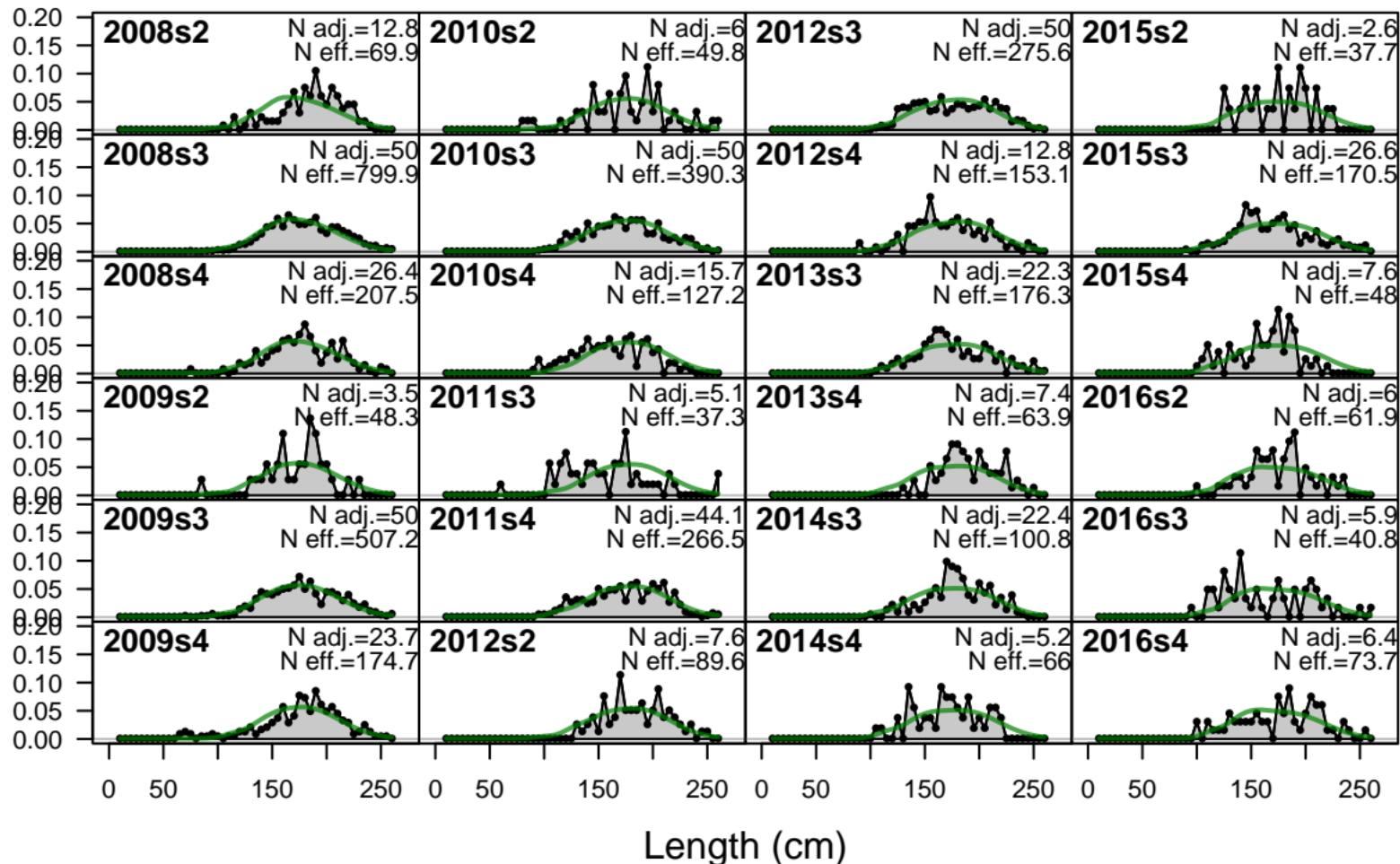
Effective sample size



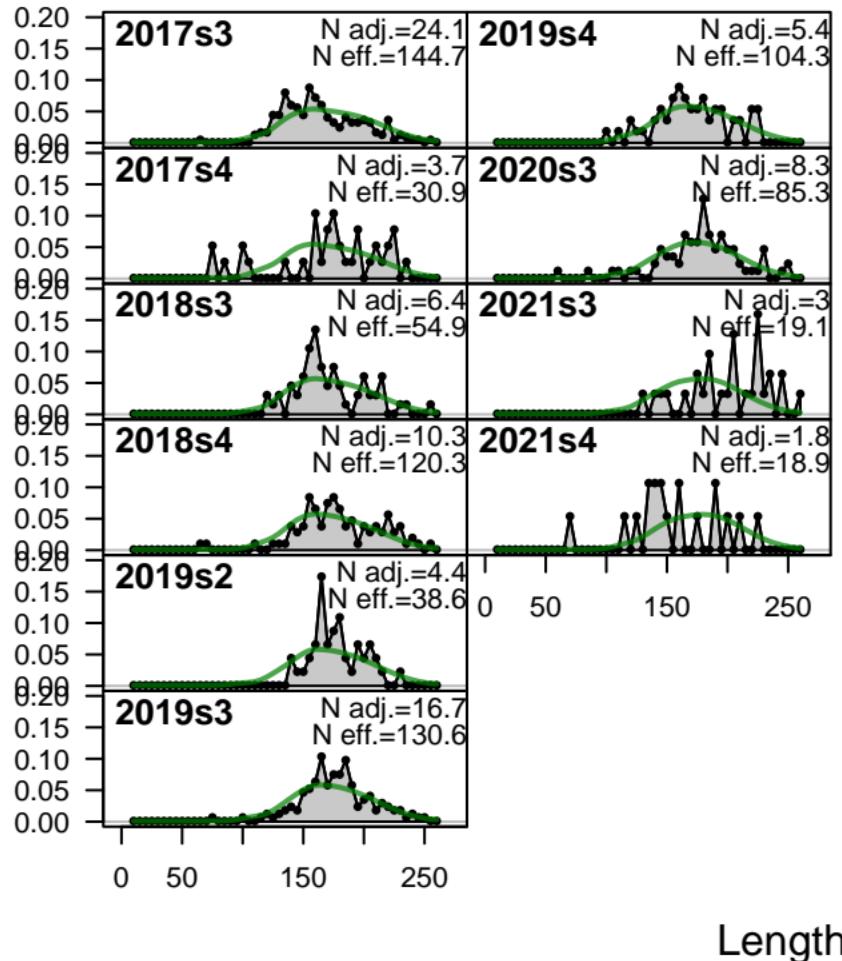
F06\_JPN\_WCNPO\_OSDWLL\_early\_Area1 (whole catch)

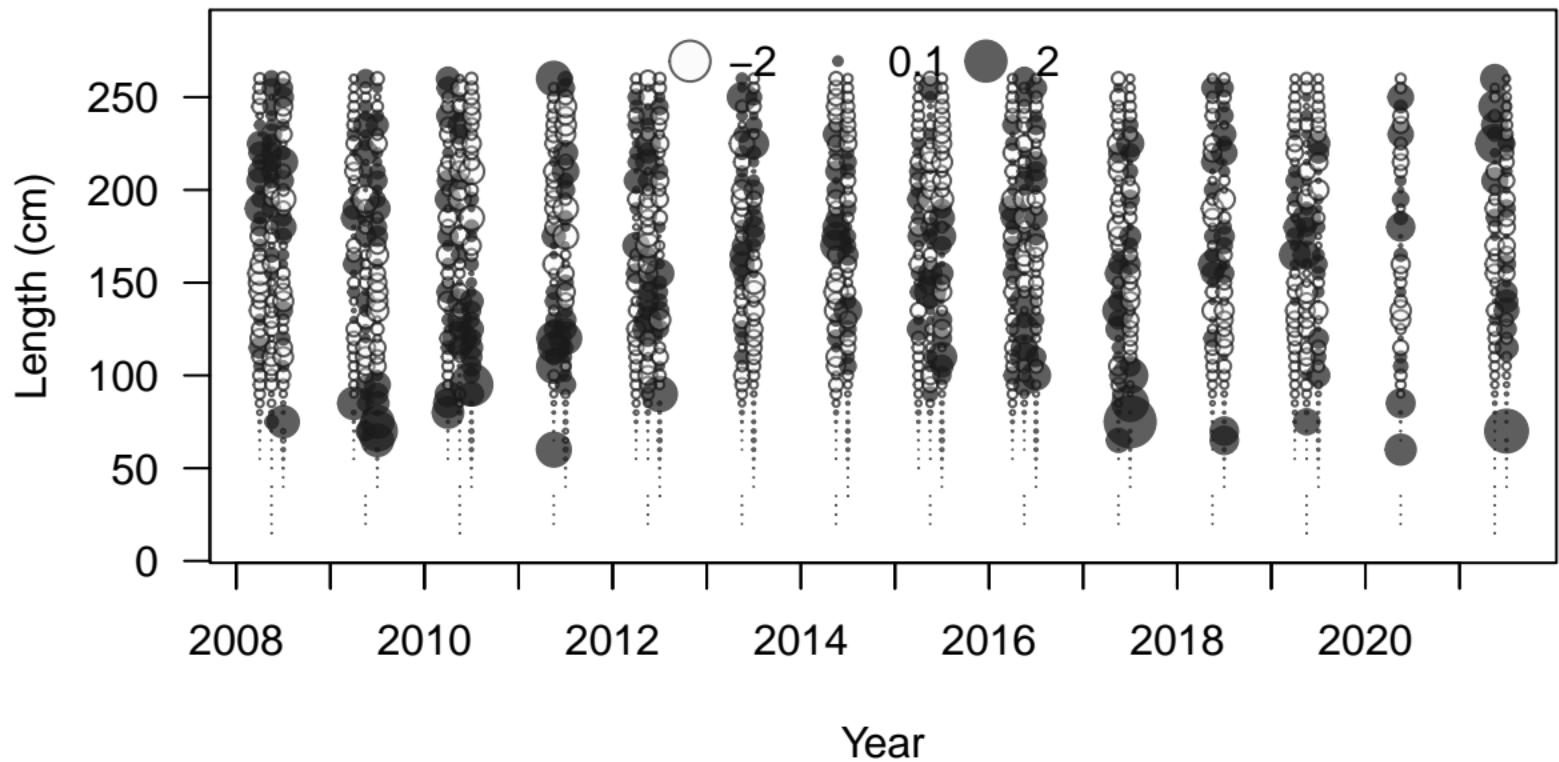


Proportion

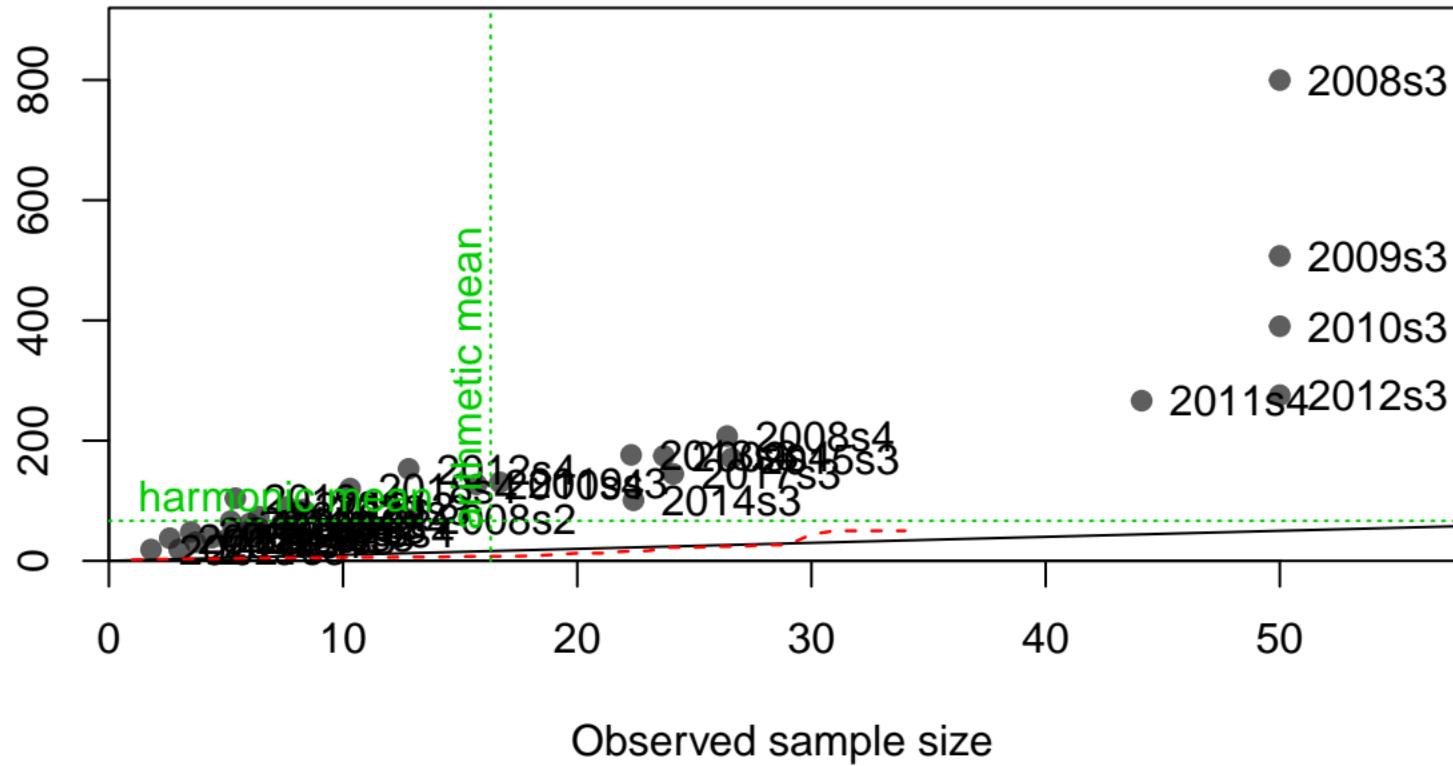


Proportion

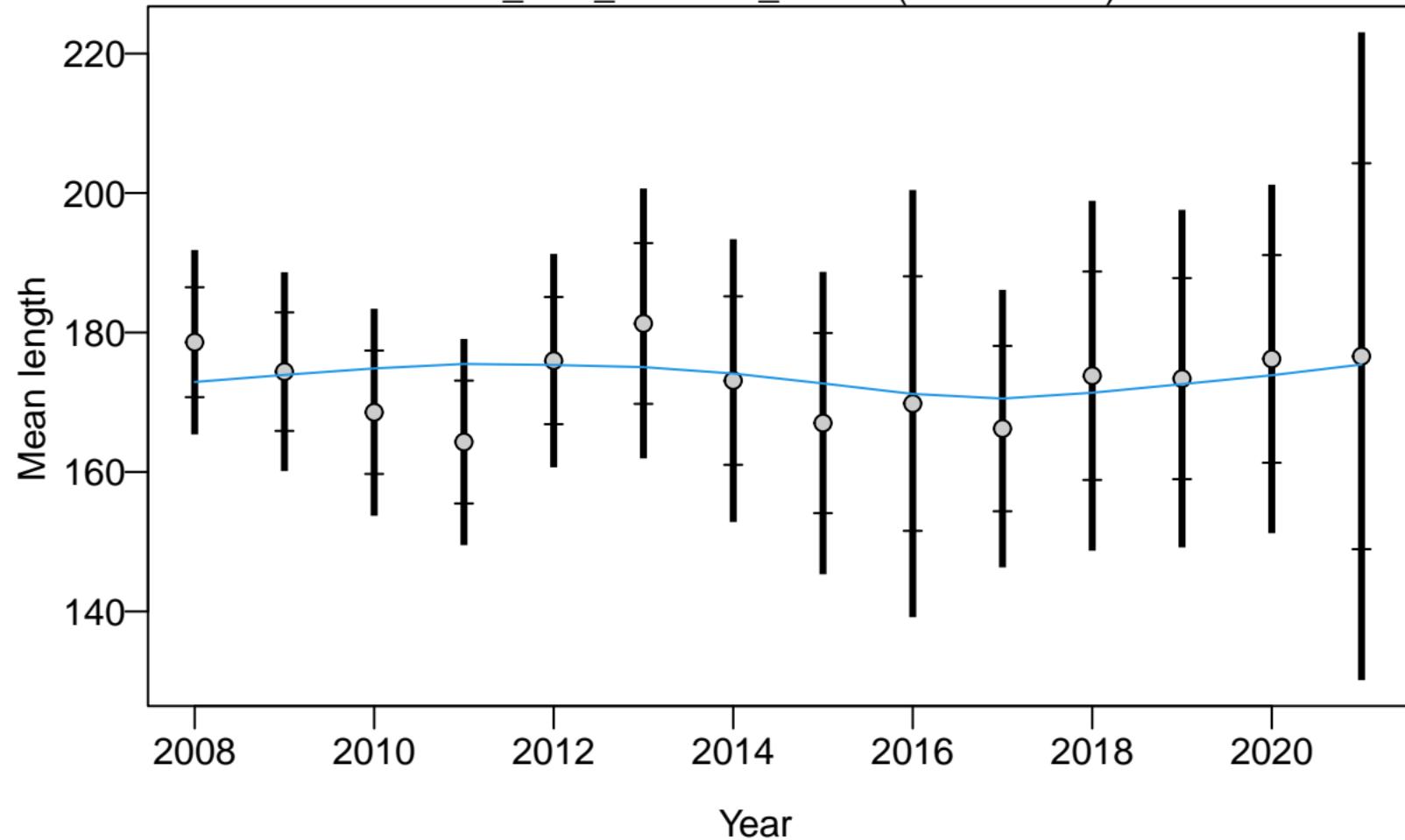




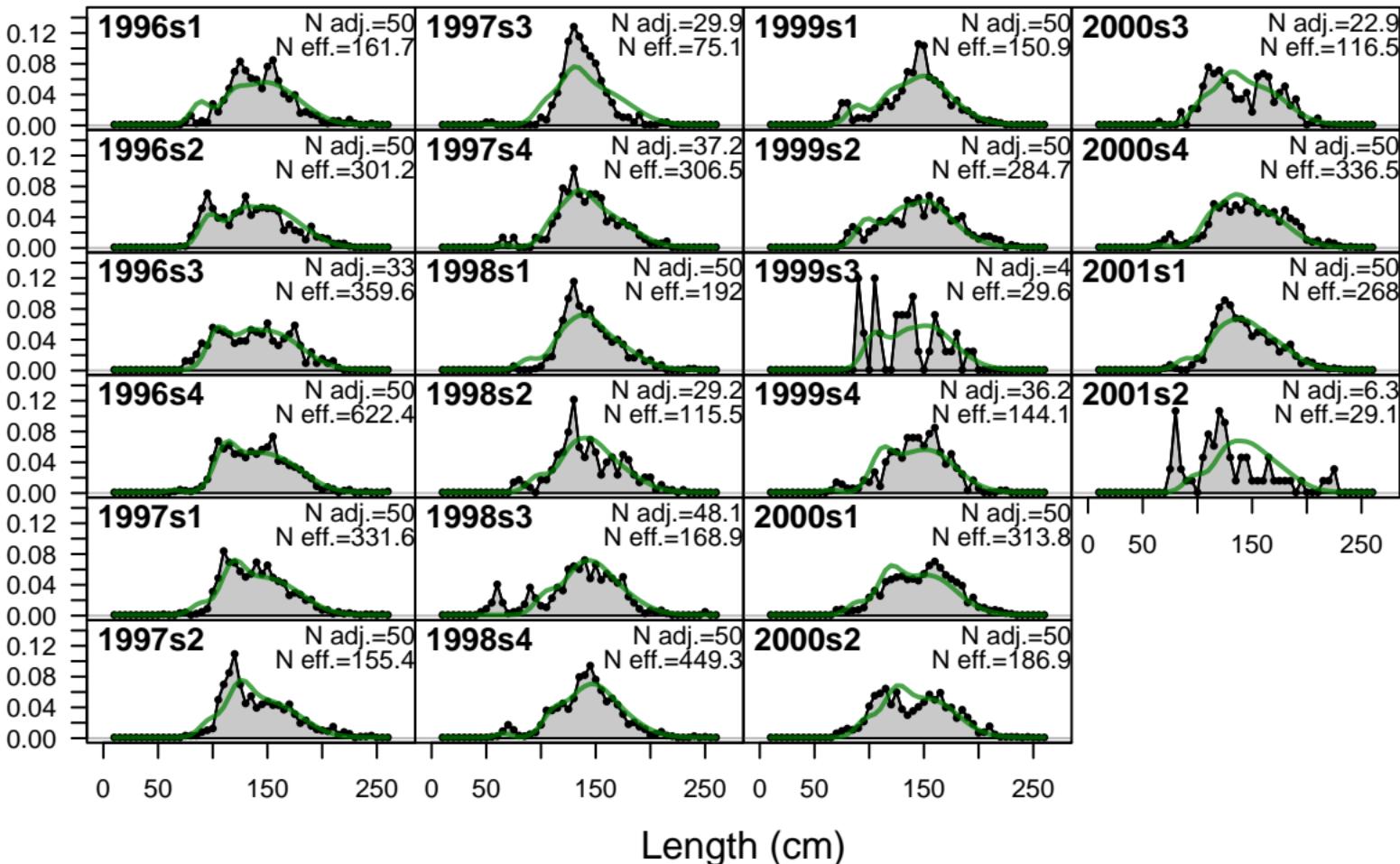
Effective sample size

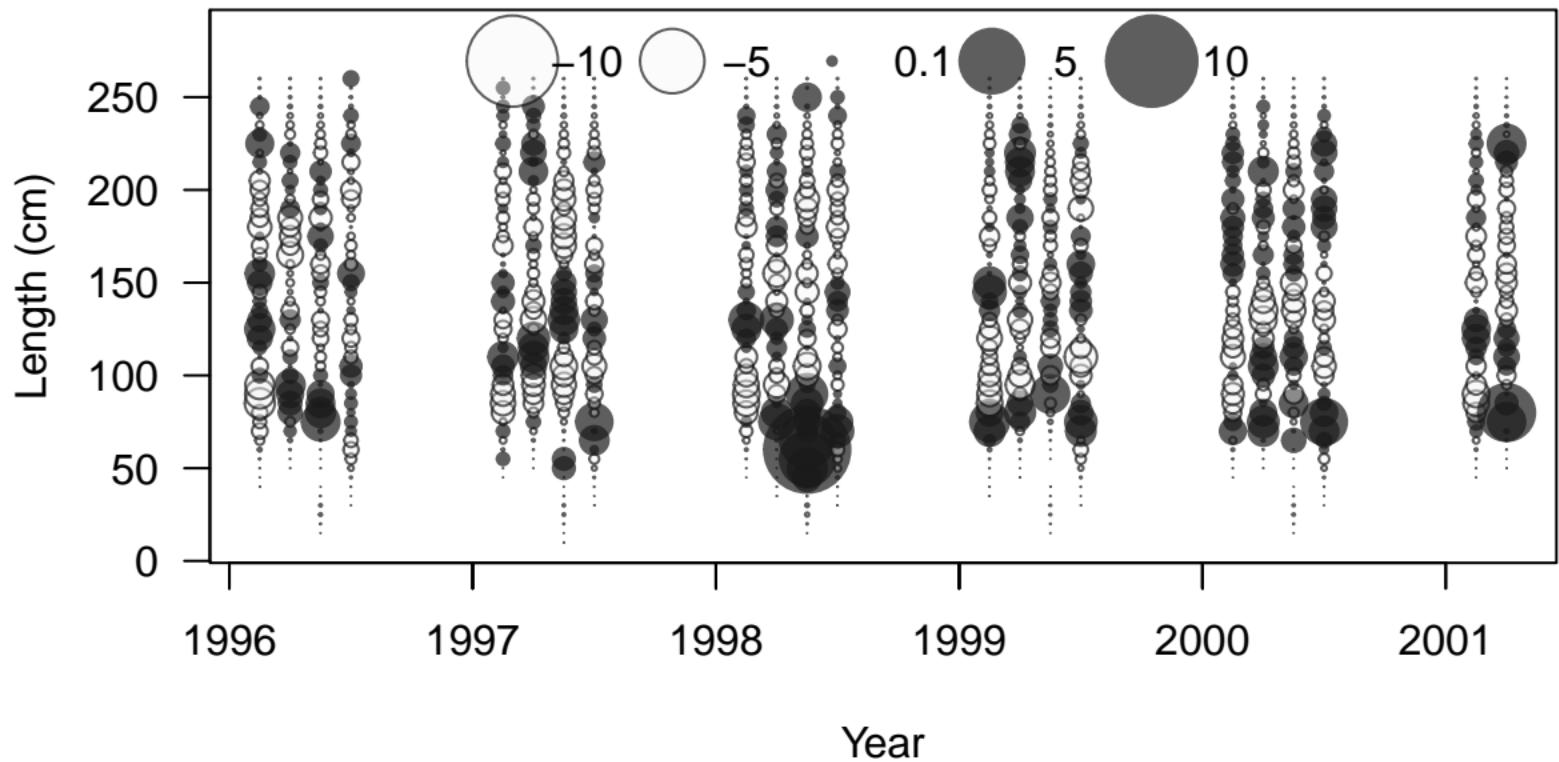


# F07\_JPN\_WCNPO\_CODF (whole catch)

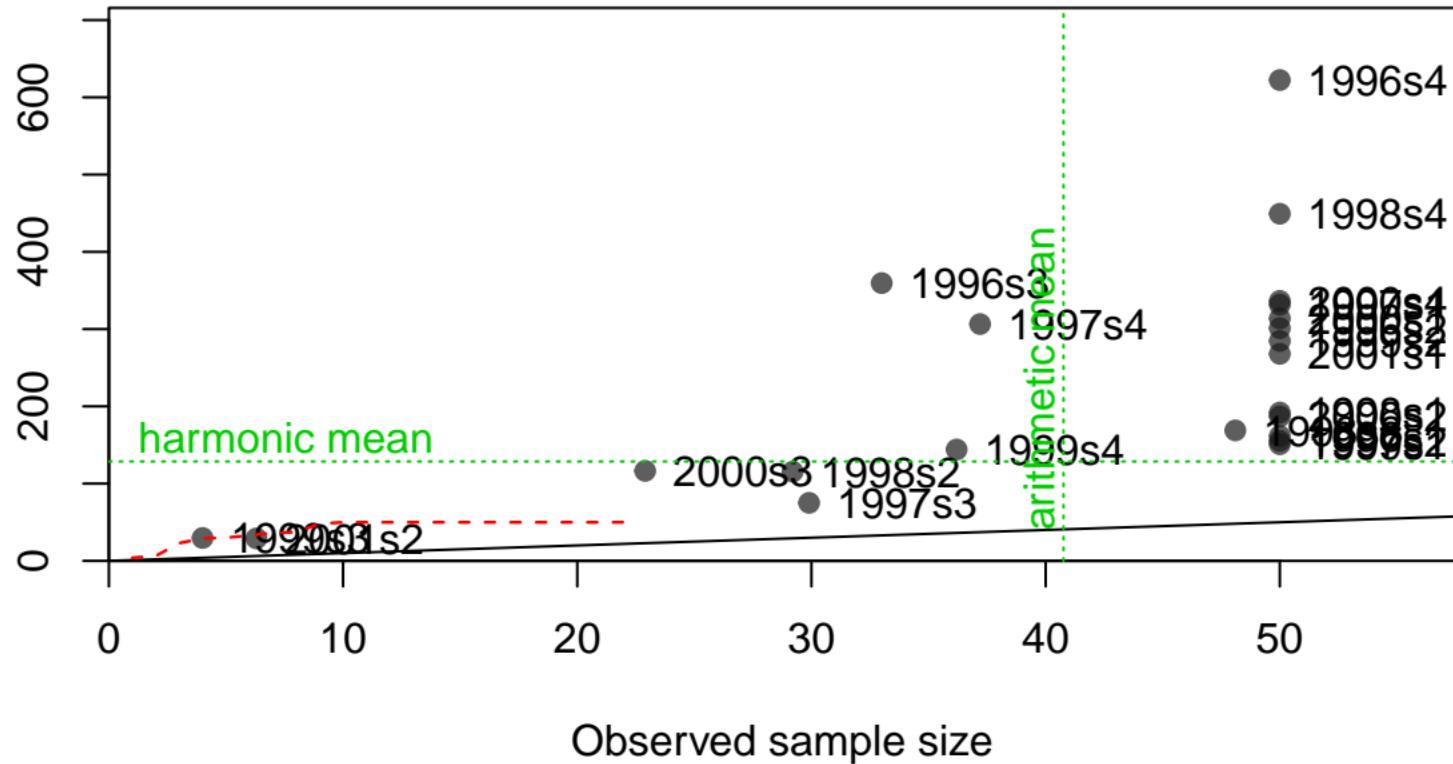


Proportion

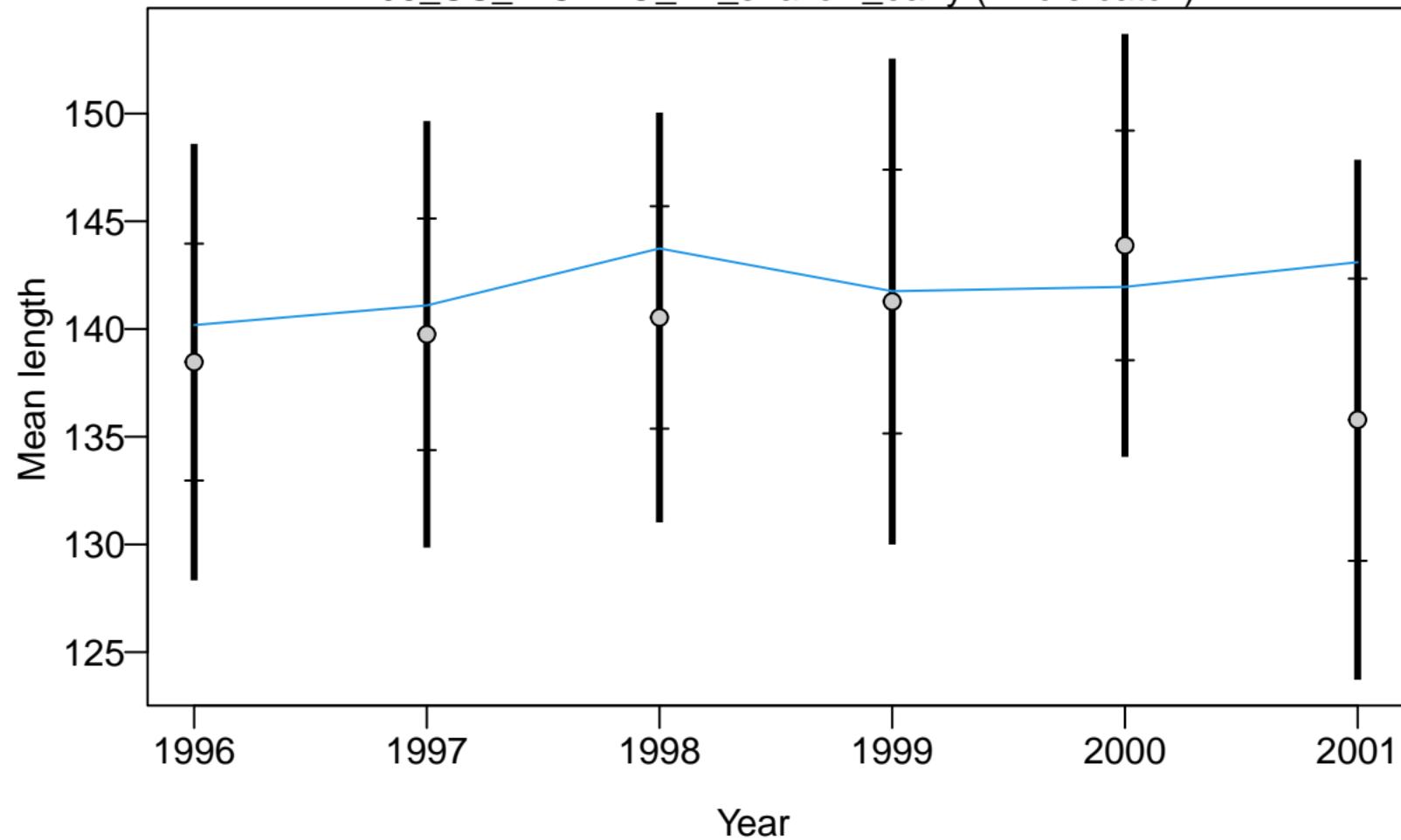




Effective sample size



F08\_US\_WCNPO\_LL\_shallow\_early (whole catch)



Equilibrium yield (mt)

1.0e+22

0.0e+00

0.0

0.2

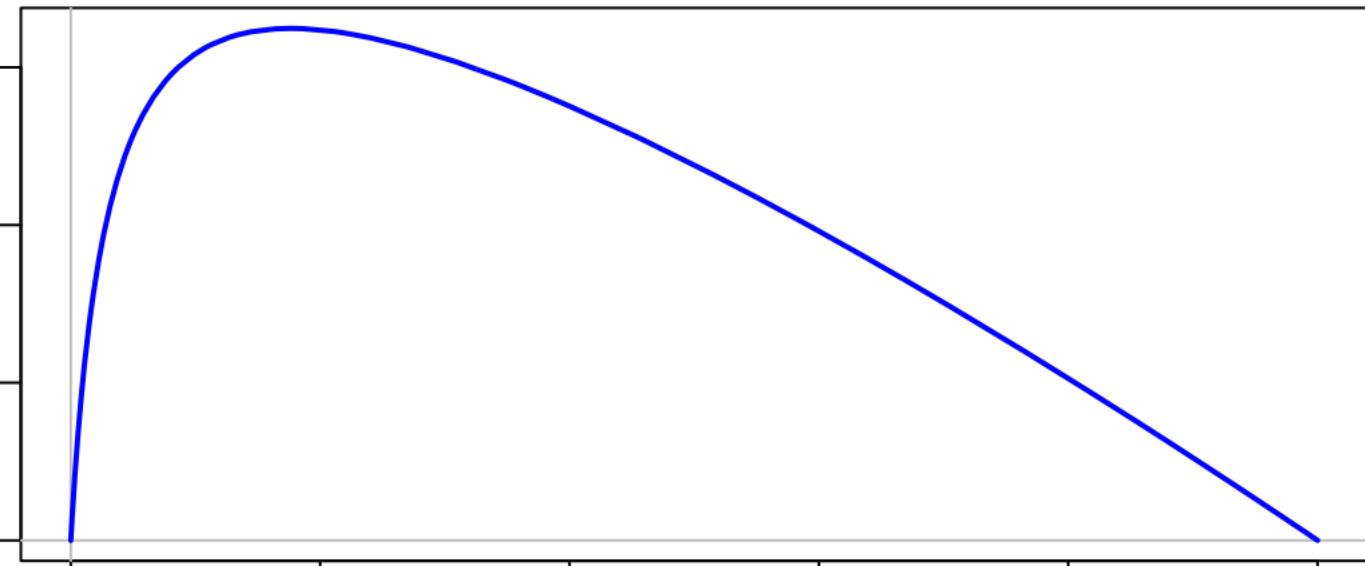
0.4

0.6

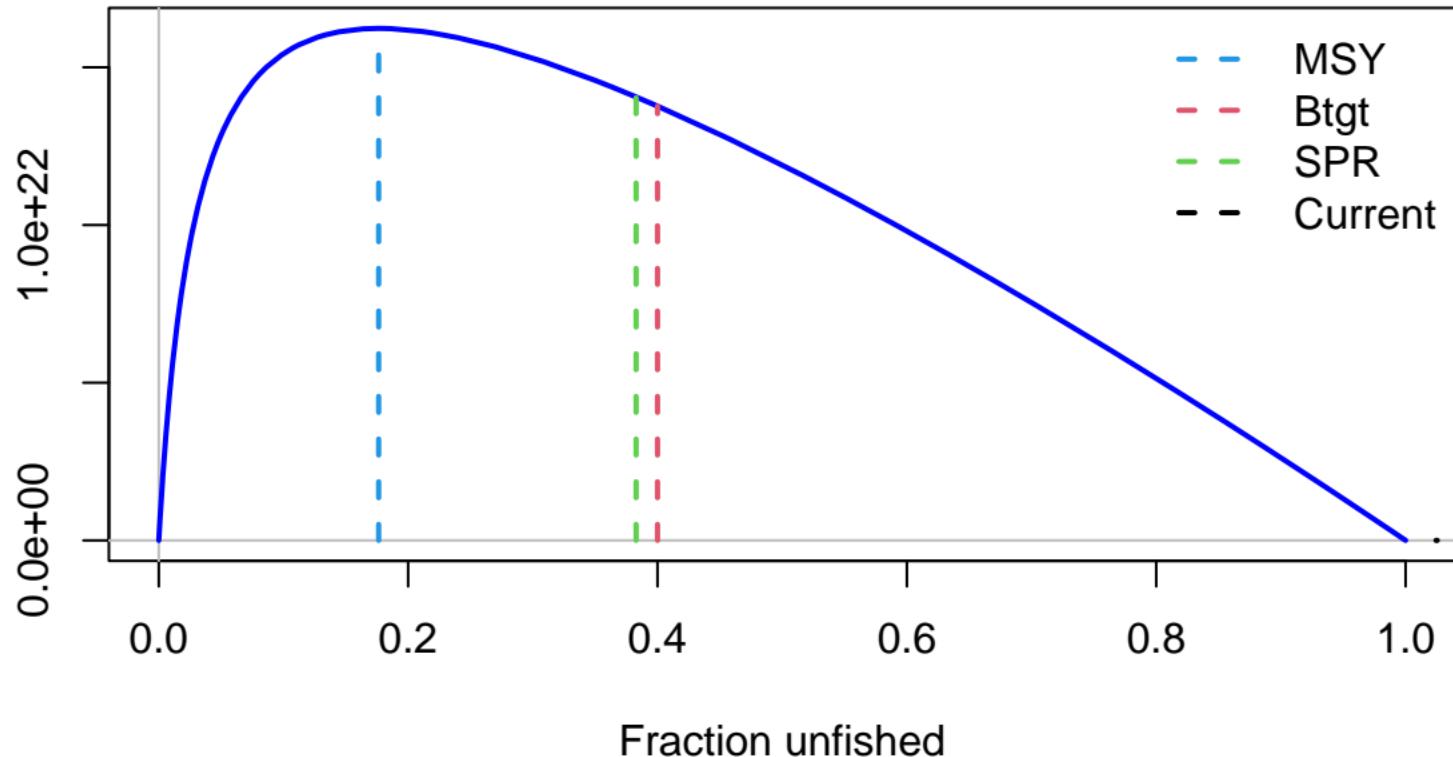
0.8

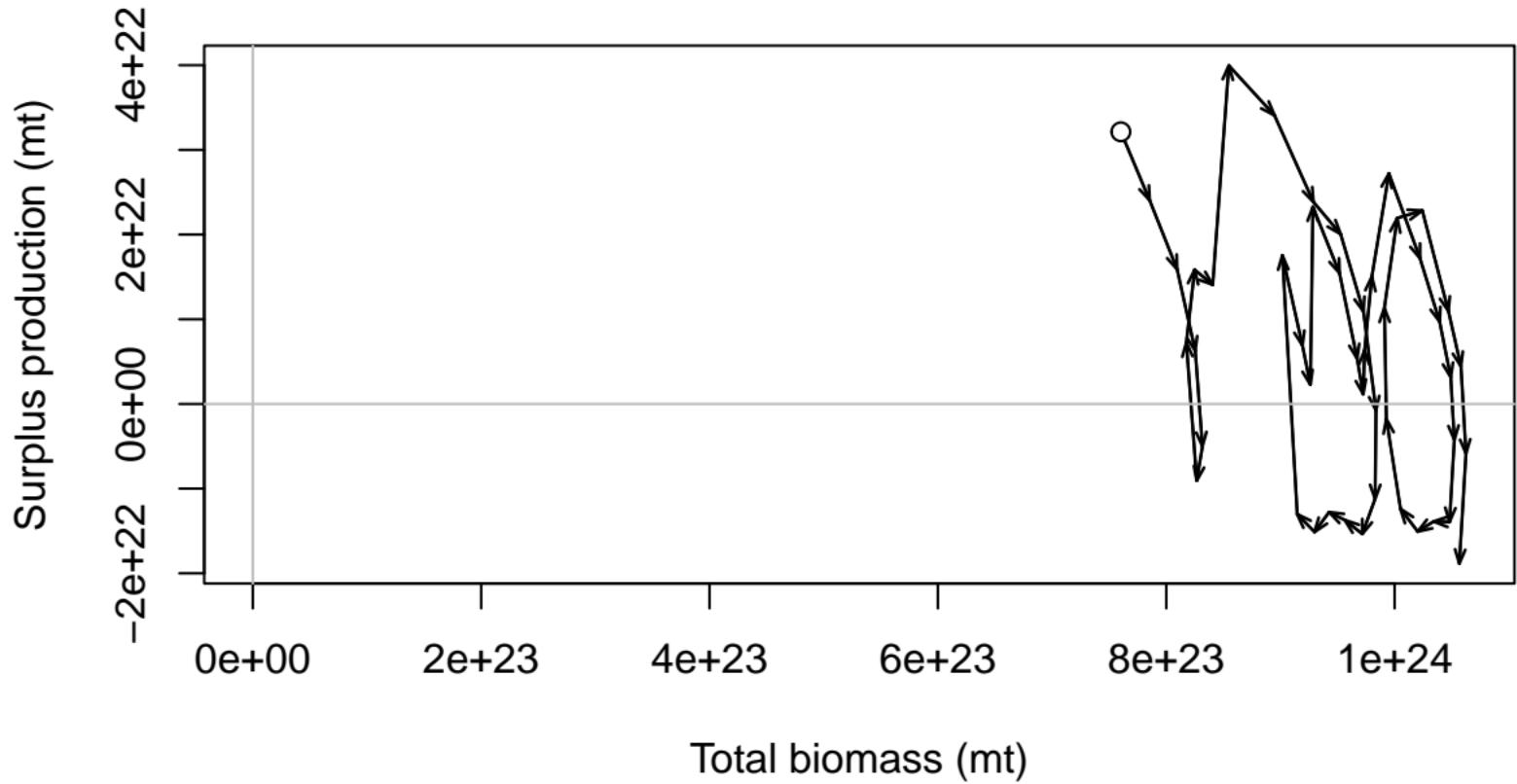
1.0

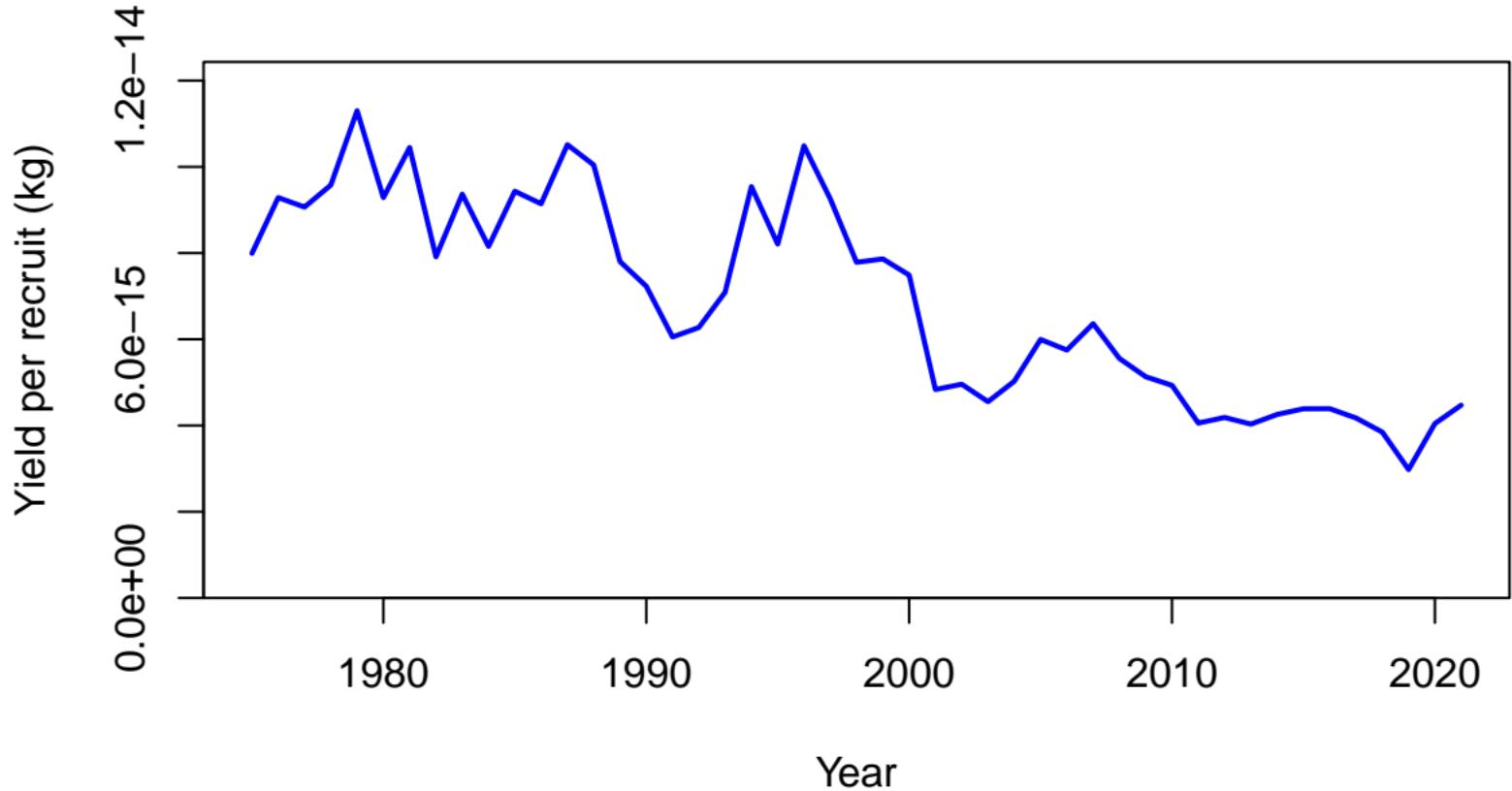
Fraction unfished

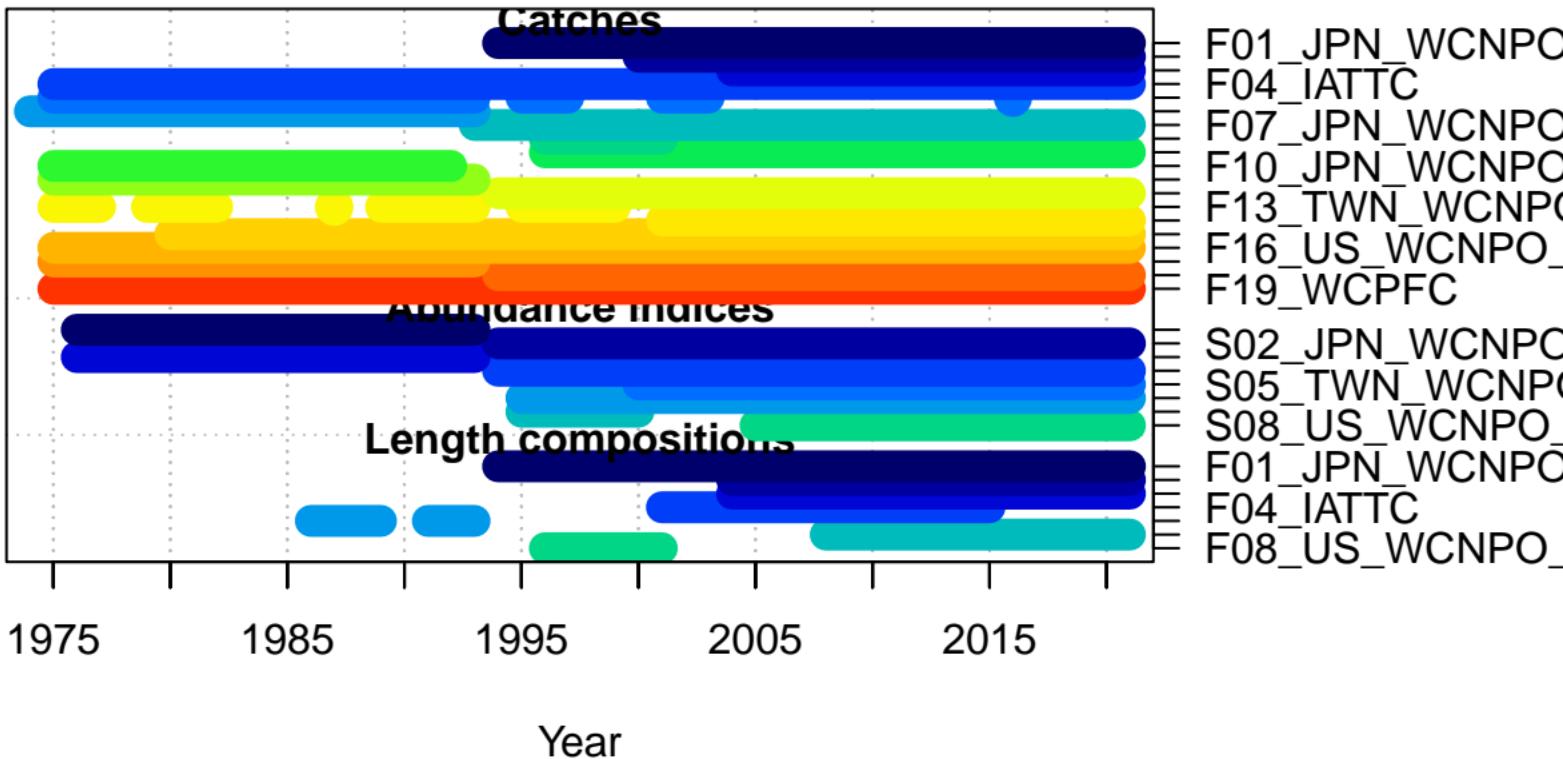


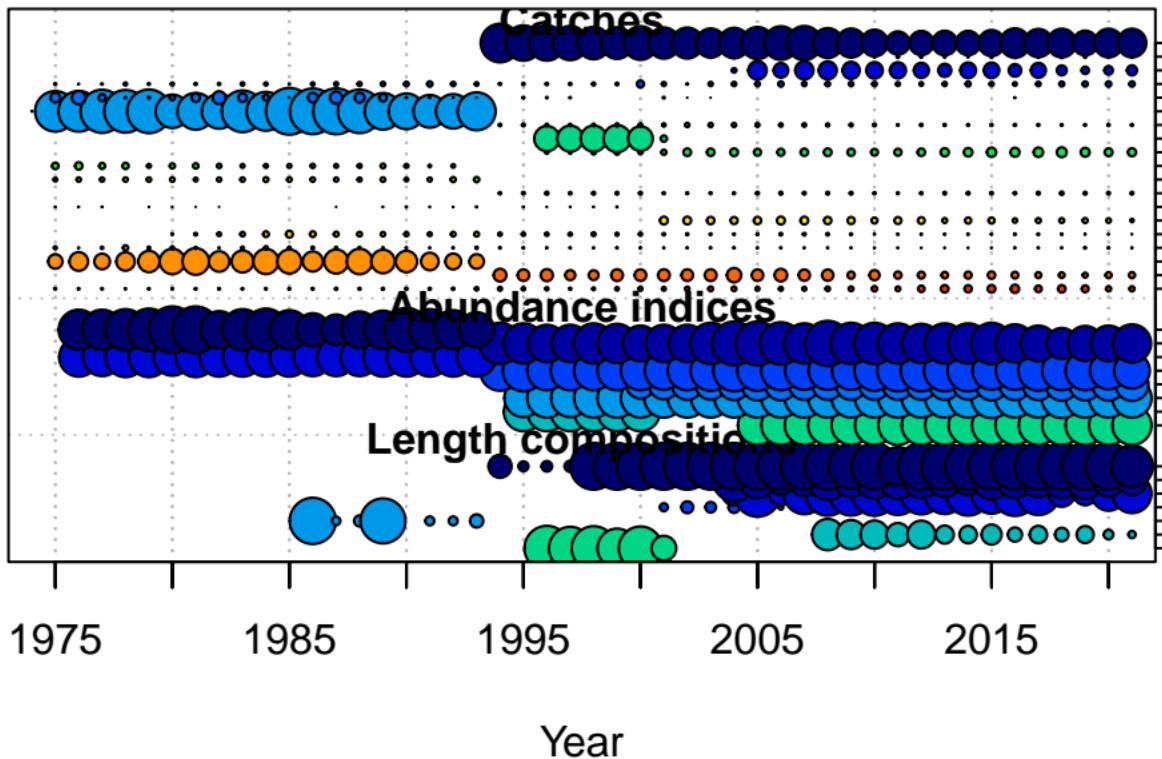
Equilibrium yield (mt)

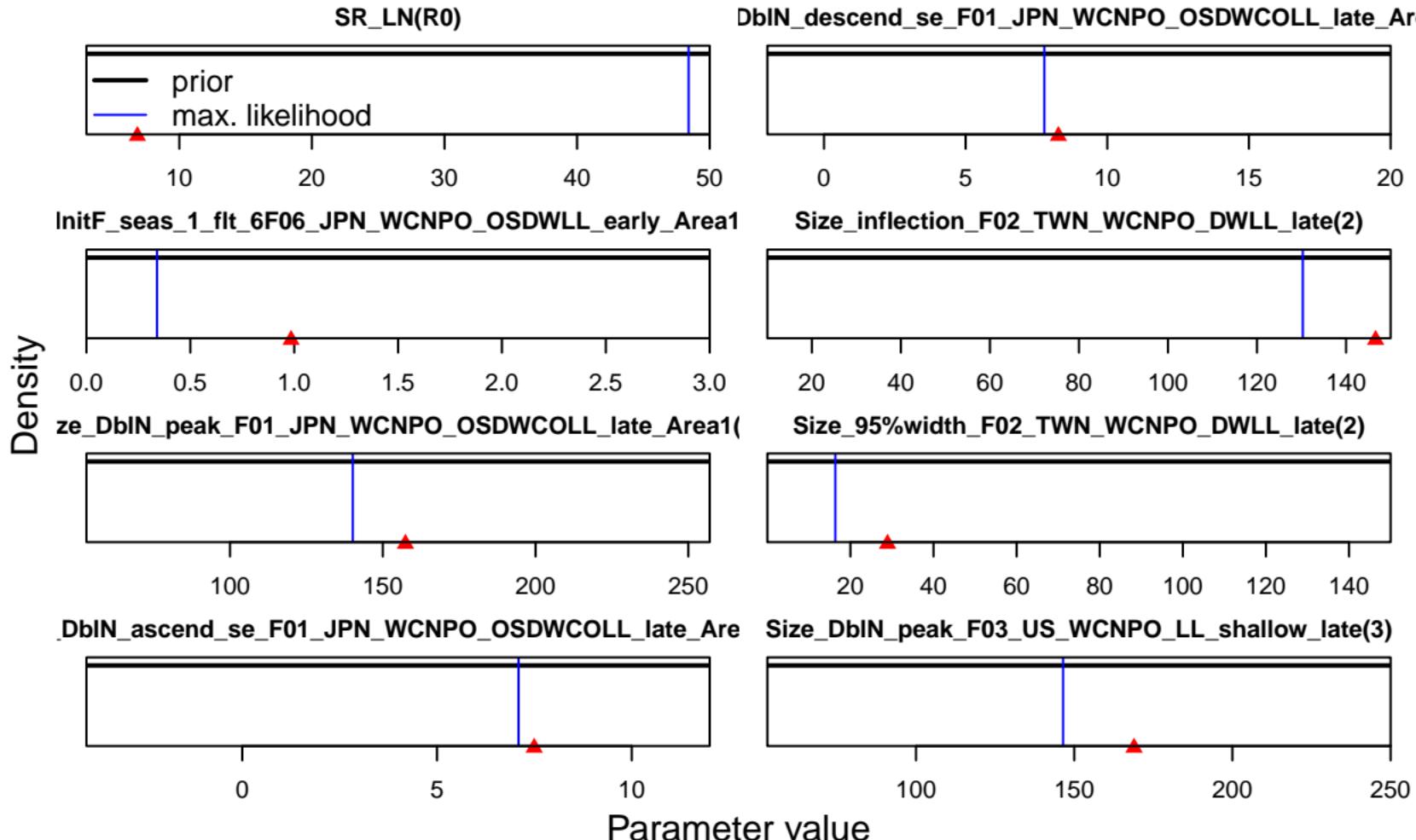


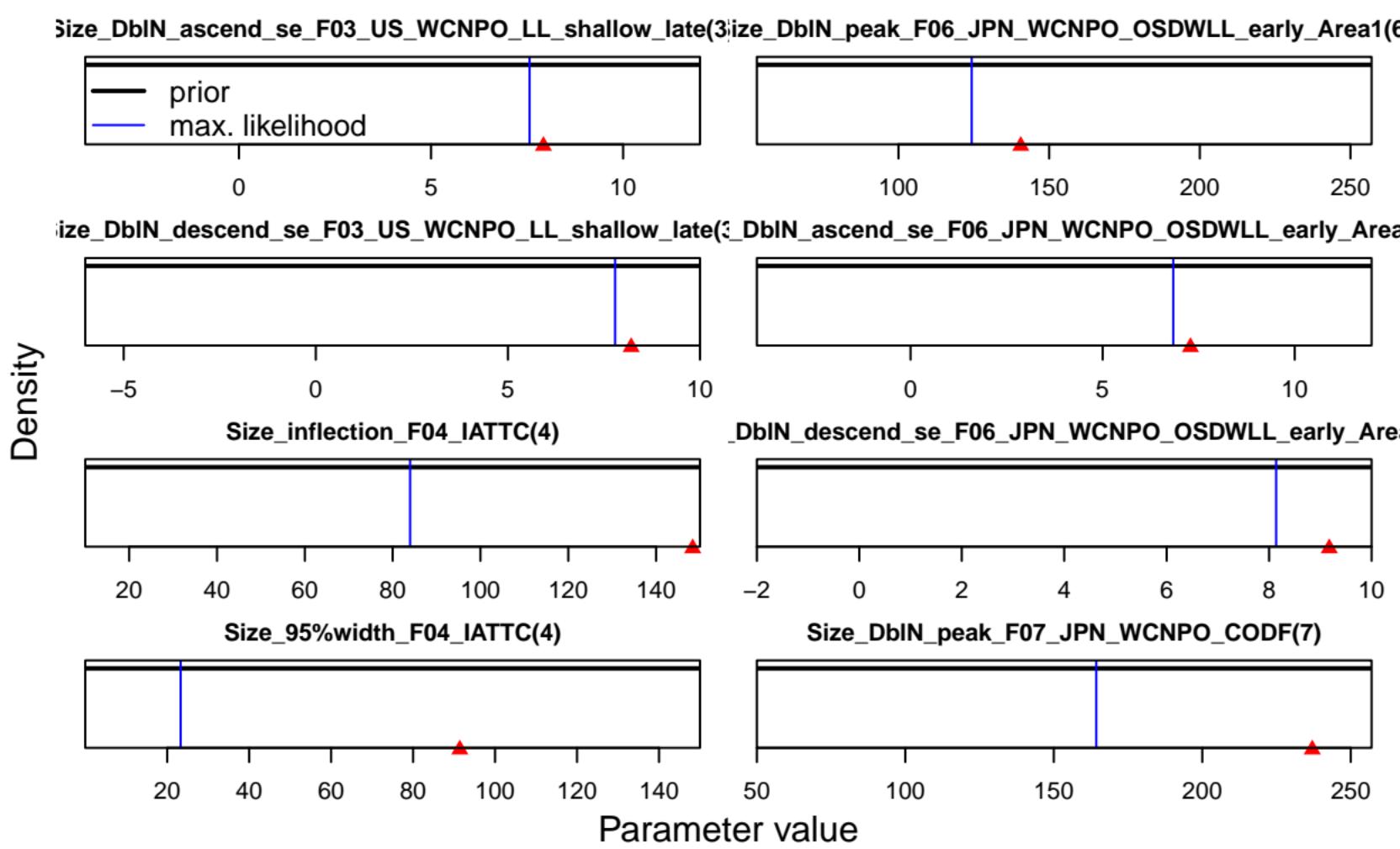




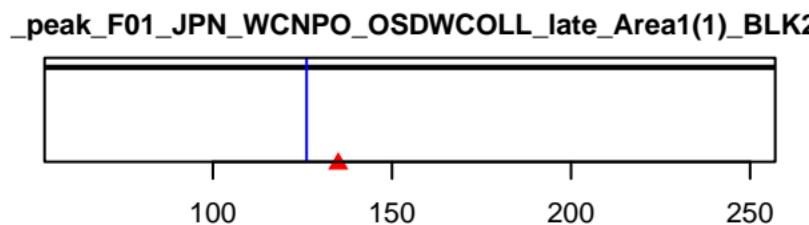
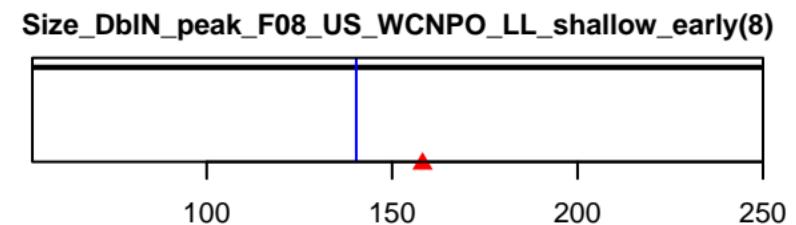
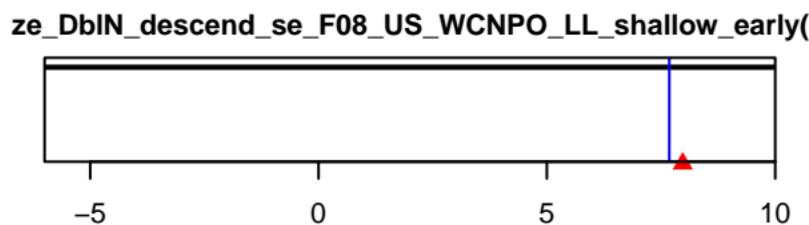
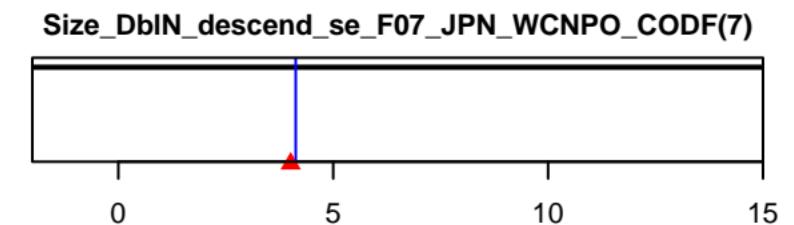
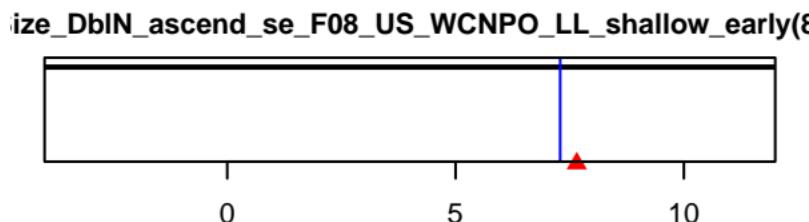
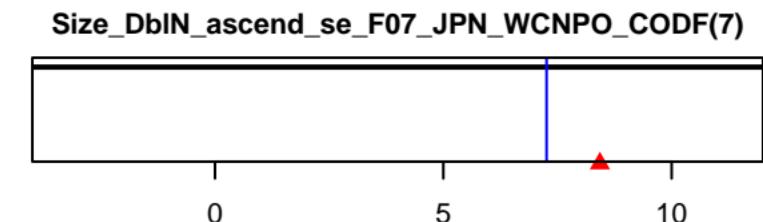
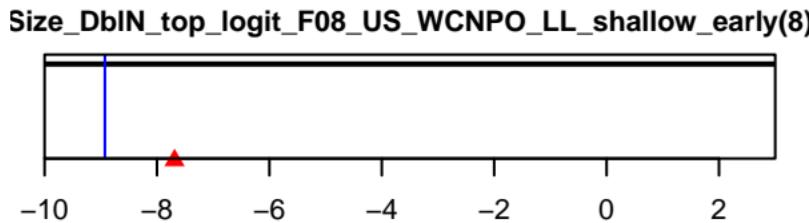
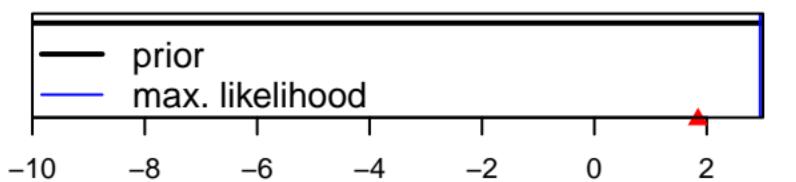






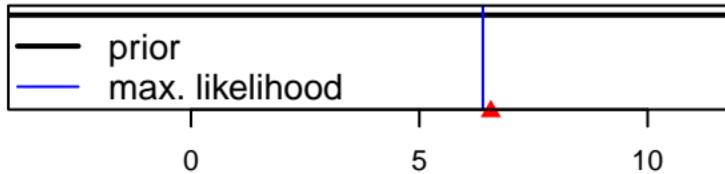


Density

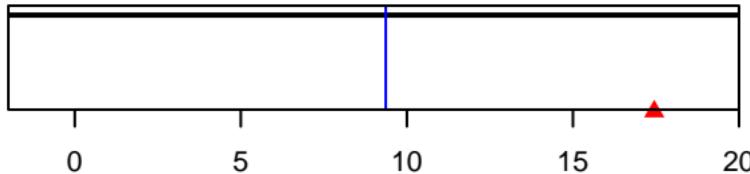


Parameter value

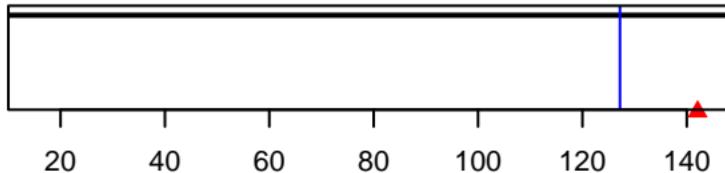
scend\_se\_F01\_JPN\_WCNPO OSDWCOLL\_late\_Area1(1)\_BI



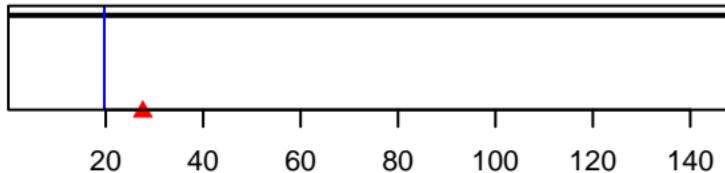
scend\_se\_F01\_JPN\_WCNPO OSDWCOLL\_late\_Area1(1)\_B



e\_inflection\_F02\_TWN\_WCNPO DWLL\_late(2)\_BLK1repl\_2



e\_95%width\_F02\_TWN\_WCNPO DWLL\_late(2)\_BLK1repl\_2



Parameter value