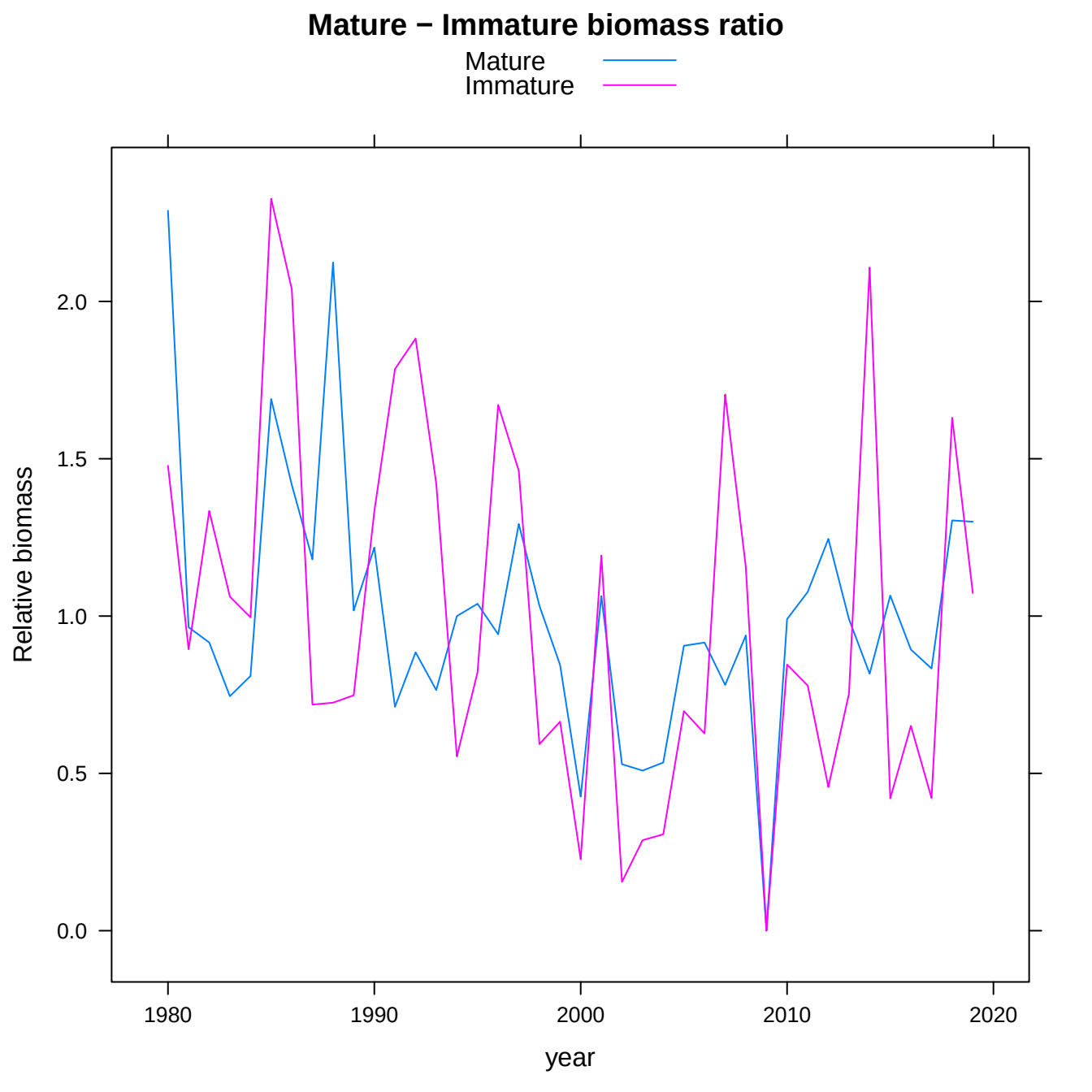
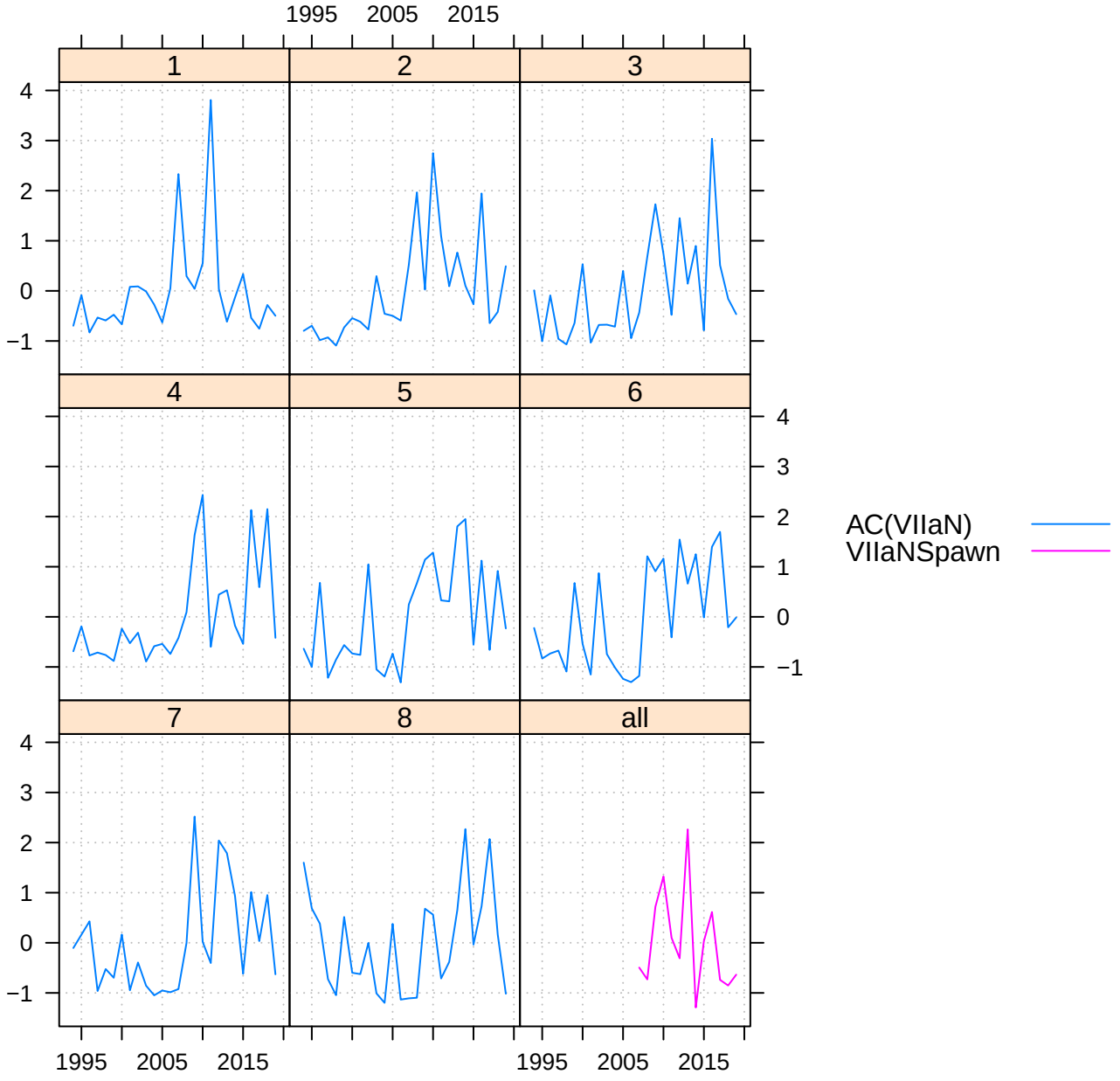
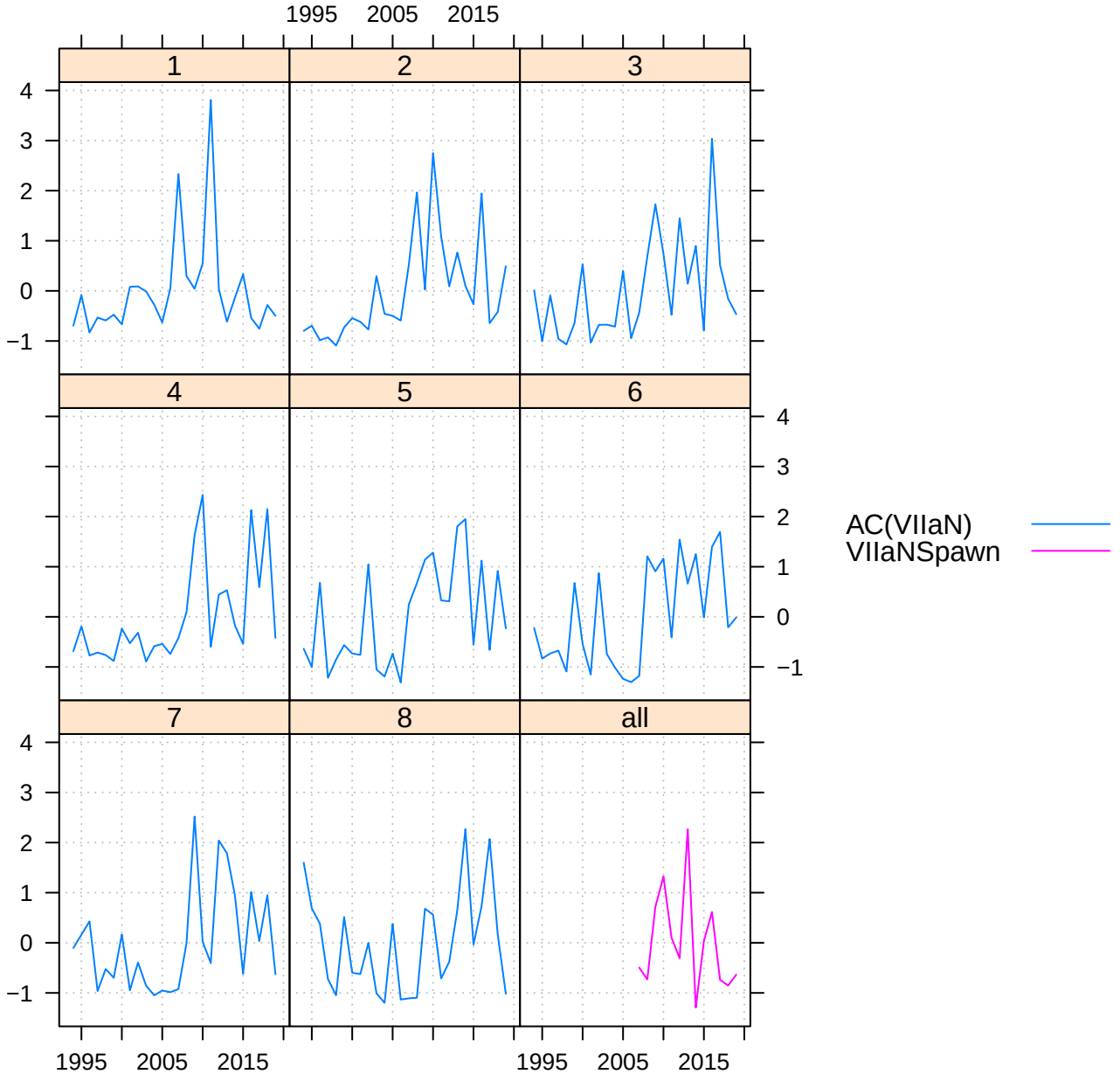
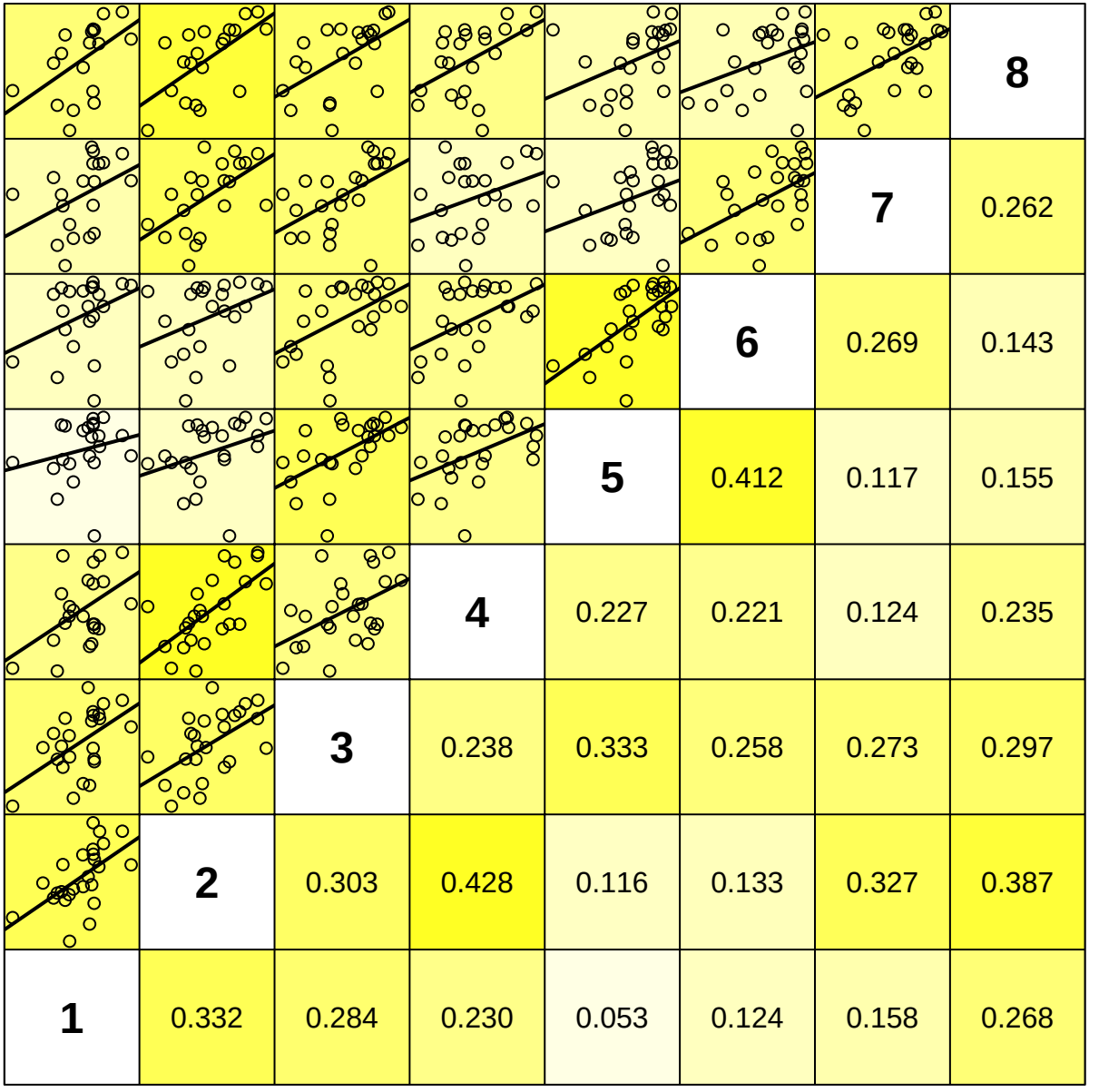
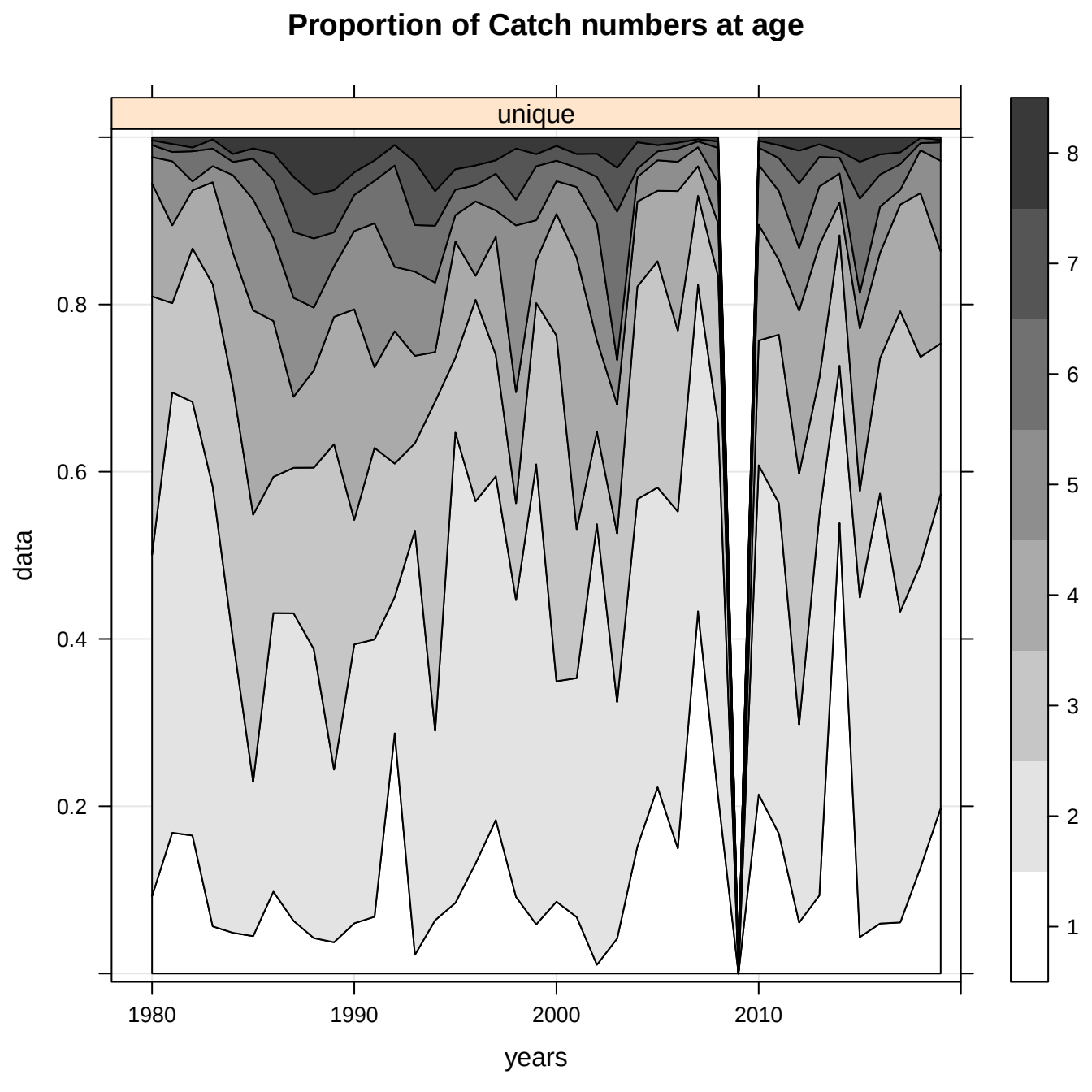

Mature − Immature biomass ratio
Mature
Immature
Relative biomass
0.0
0.5
1.0
1.5
2.0
1980
1990
2000
2010
2020
year

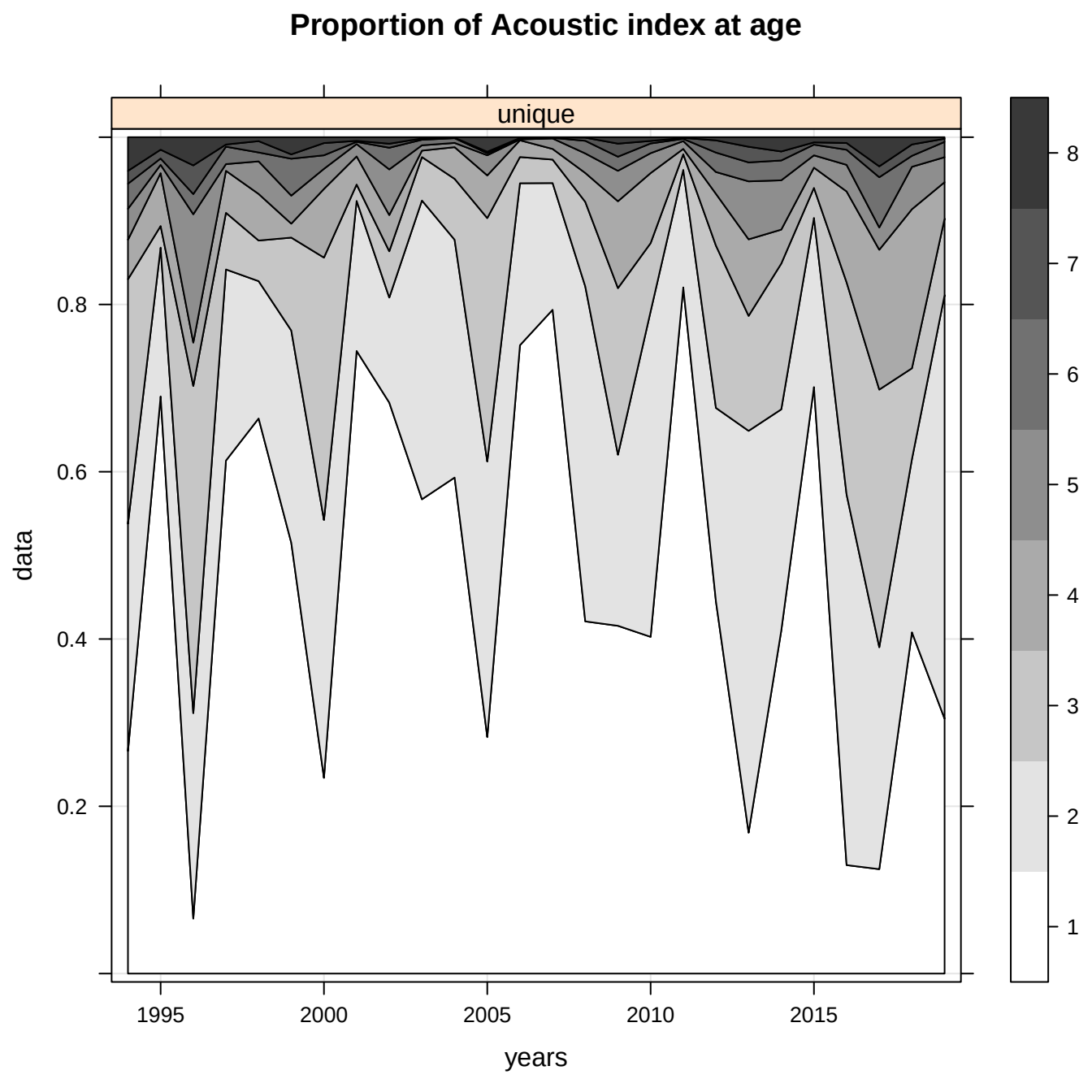

1995
2005
2015
1
2
3
4
5
6
7
8
all
AC(VIIaN)
VIIaNSpawn

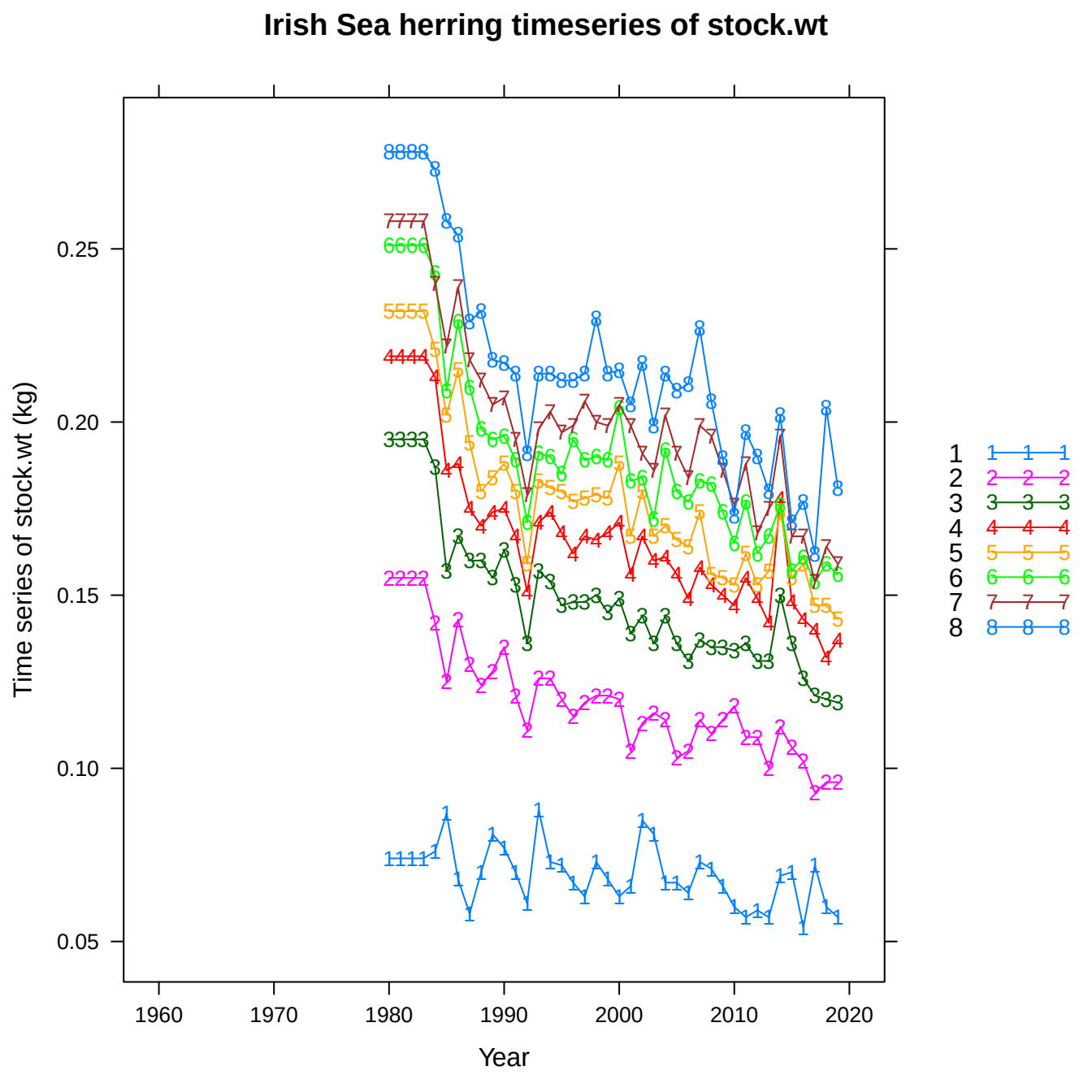

1995
2005
2015
1
2
3
4
5
6
7
8
all
AC(VIIaN)
VIIaNSpawn

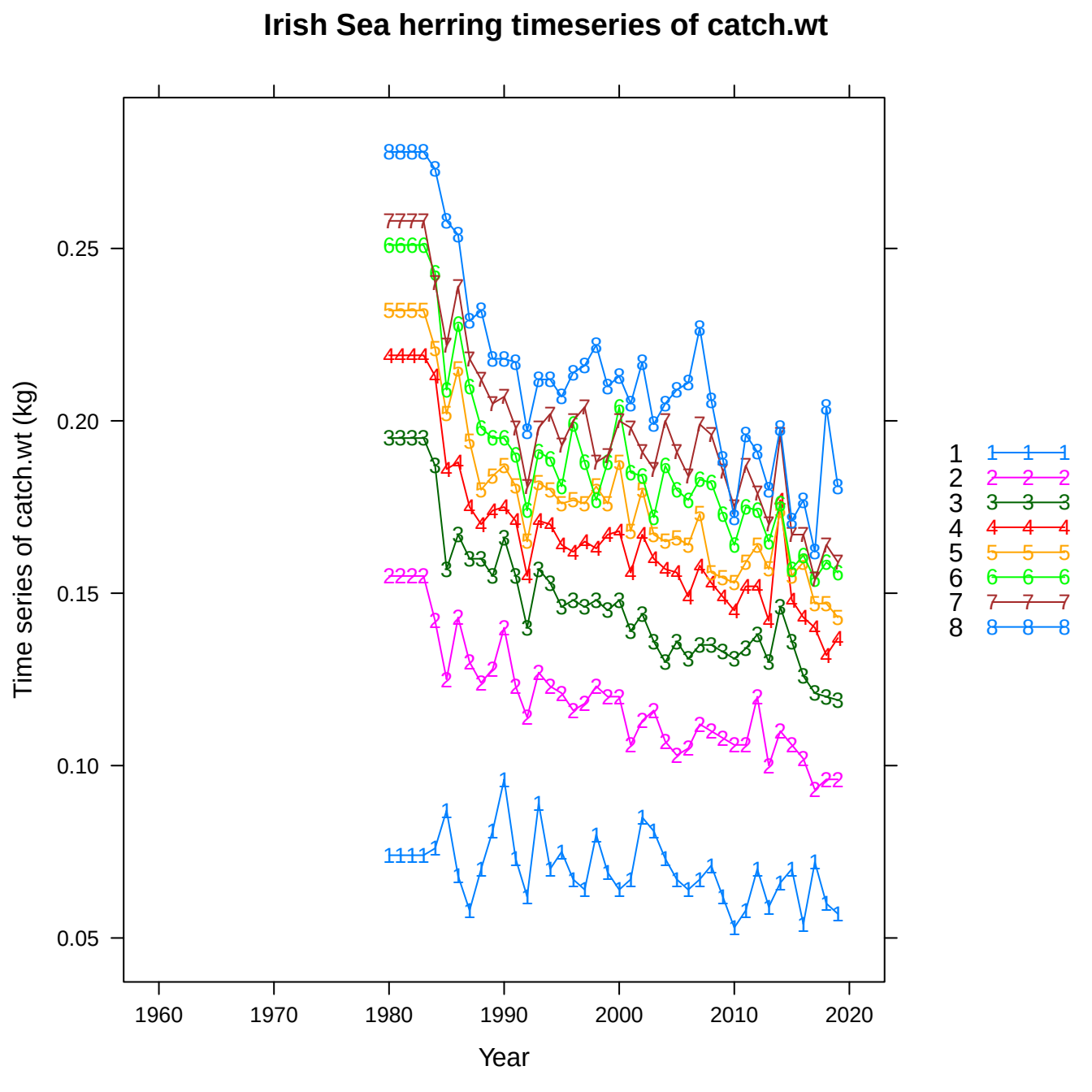


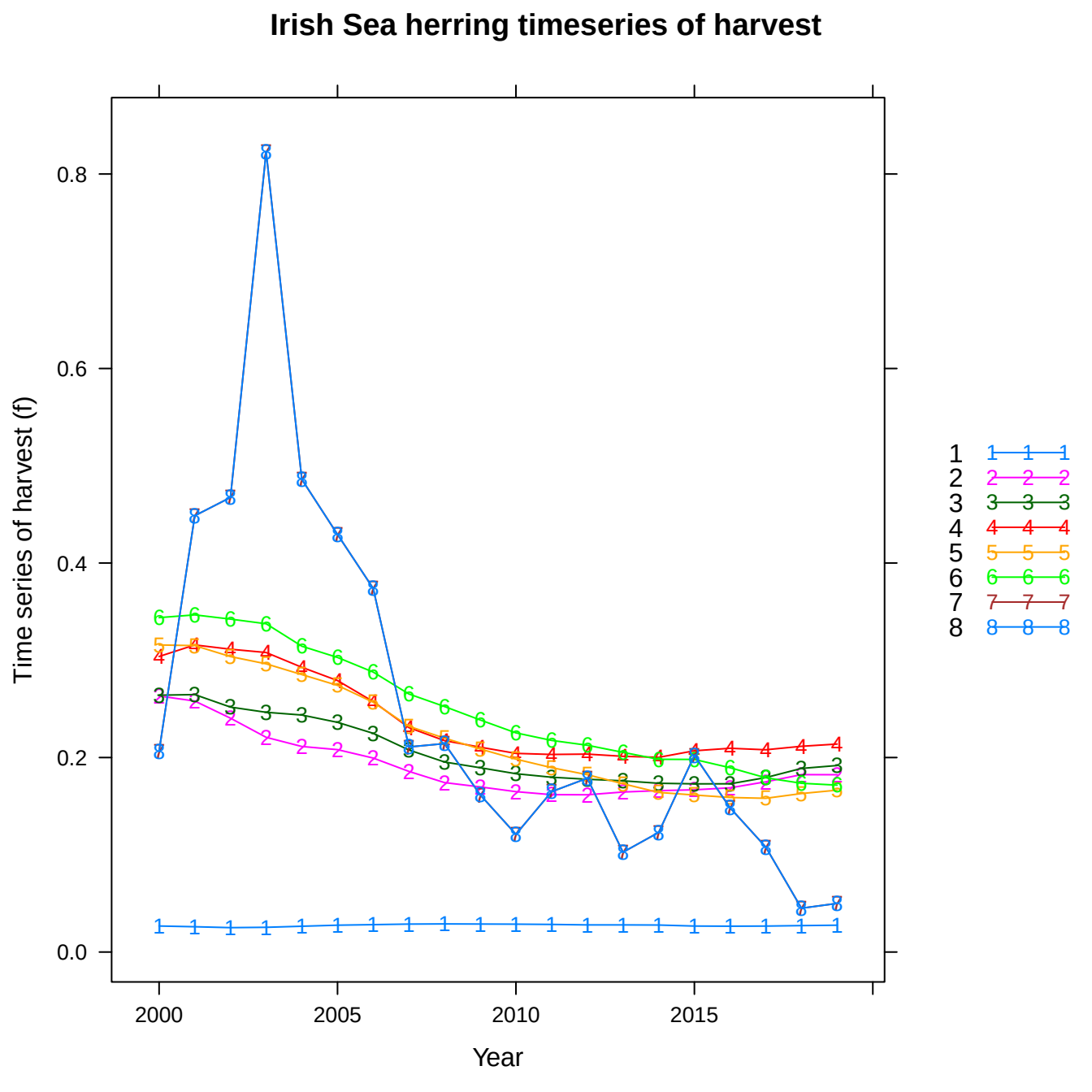
Lower right panels show the Coefficient of Determination (r^2)

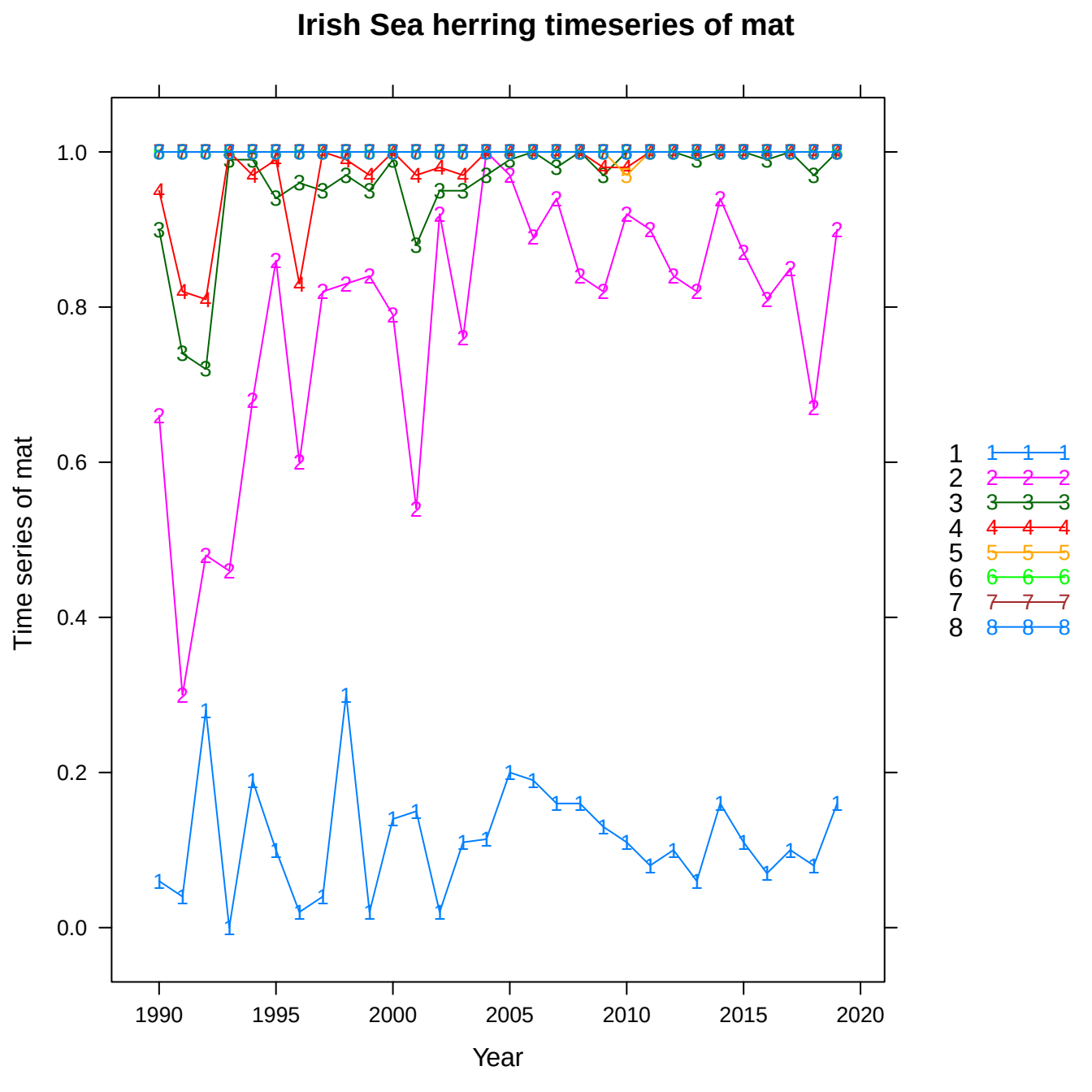

Proportion of Catch numbers at age
unique
data
0.2
0.4
0.6
0.8
1980
1990
2000
2010
years
1
2
3
4
5
6
7
8

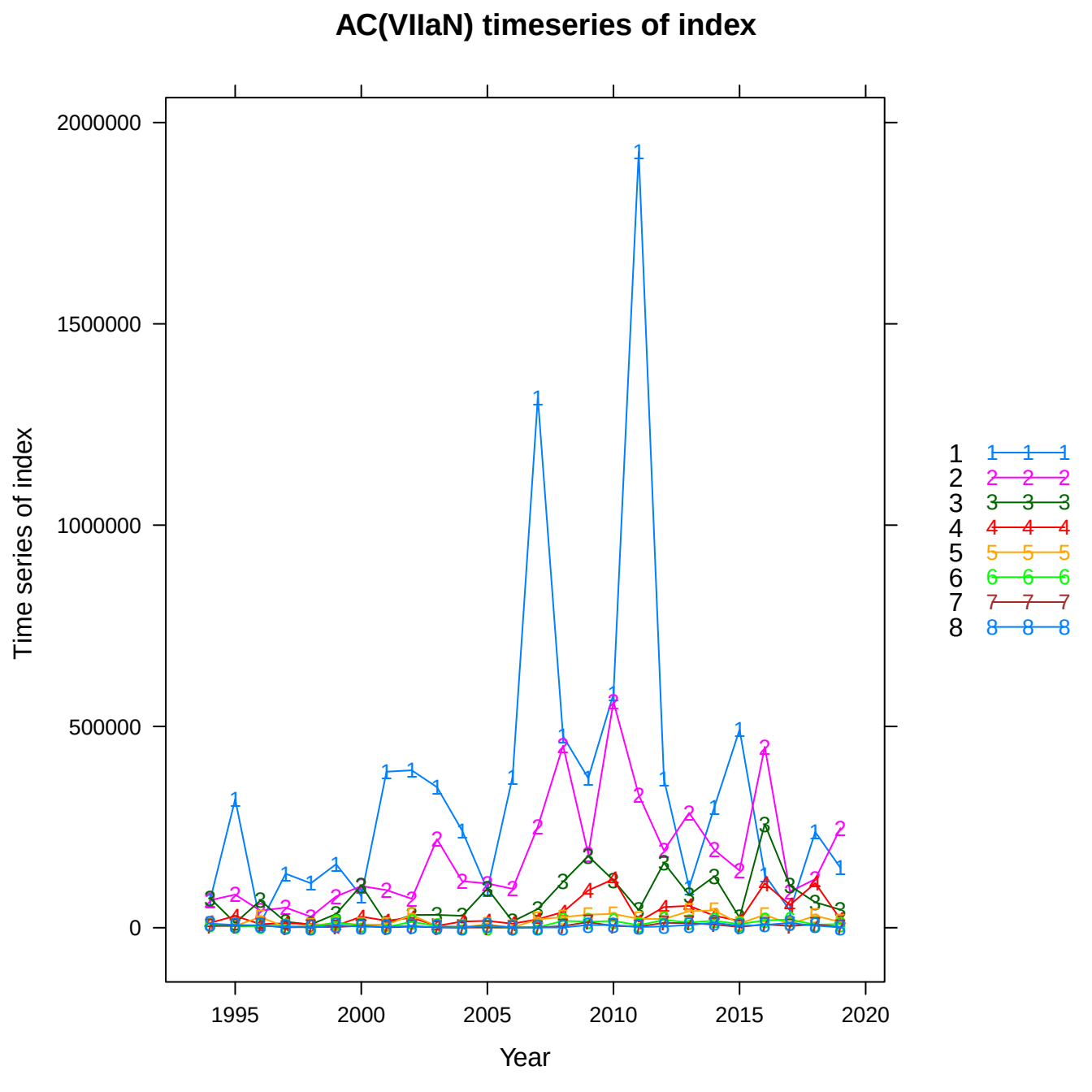

Proportion of Acoustic index at age
unique
data
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015
years
1
2
3
4
5
6
7
8

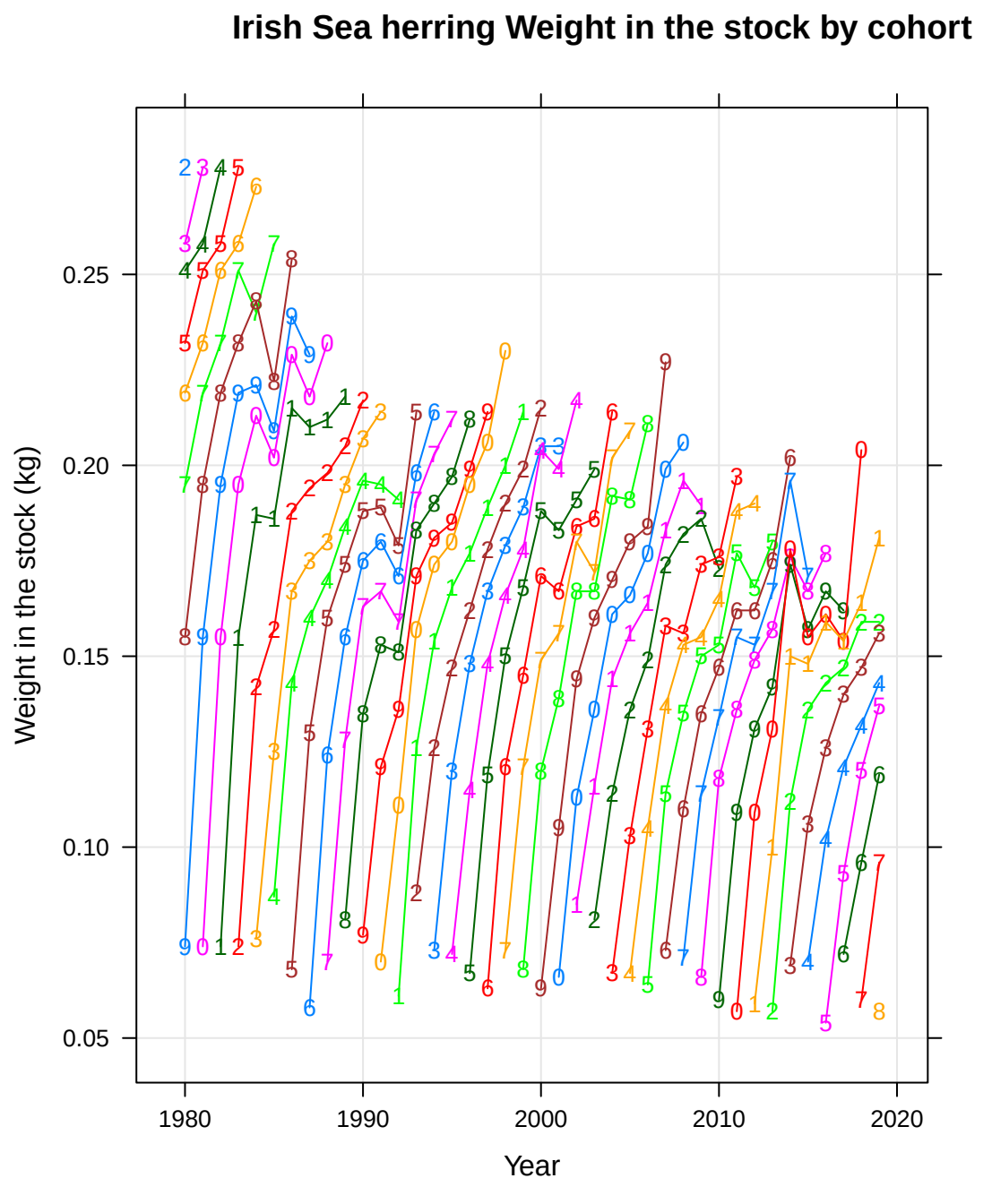

Irish Sea herring timeseries of stock.wt
Time series of stock.wt (kg)
0.05
0.10
0.15
0.20
0.25
1960
1970
1980
1990
2000
2010
2020
Year
1
2
3
4
5
6
7
8

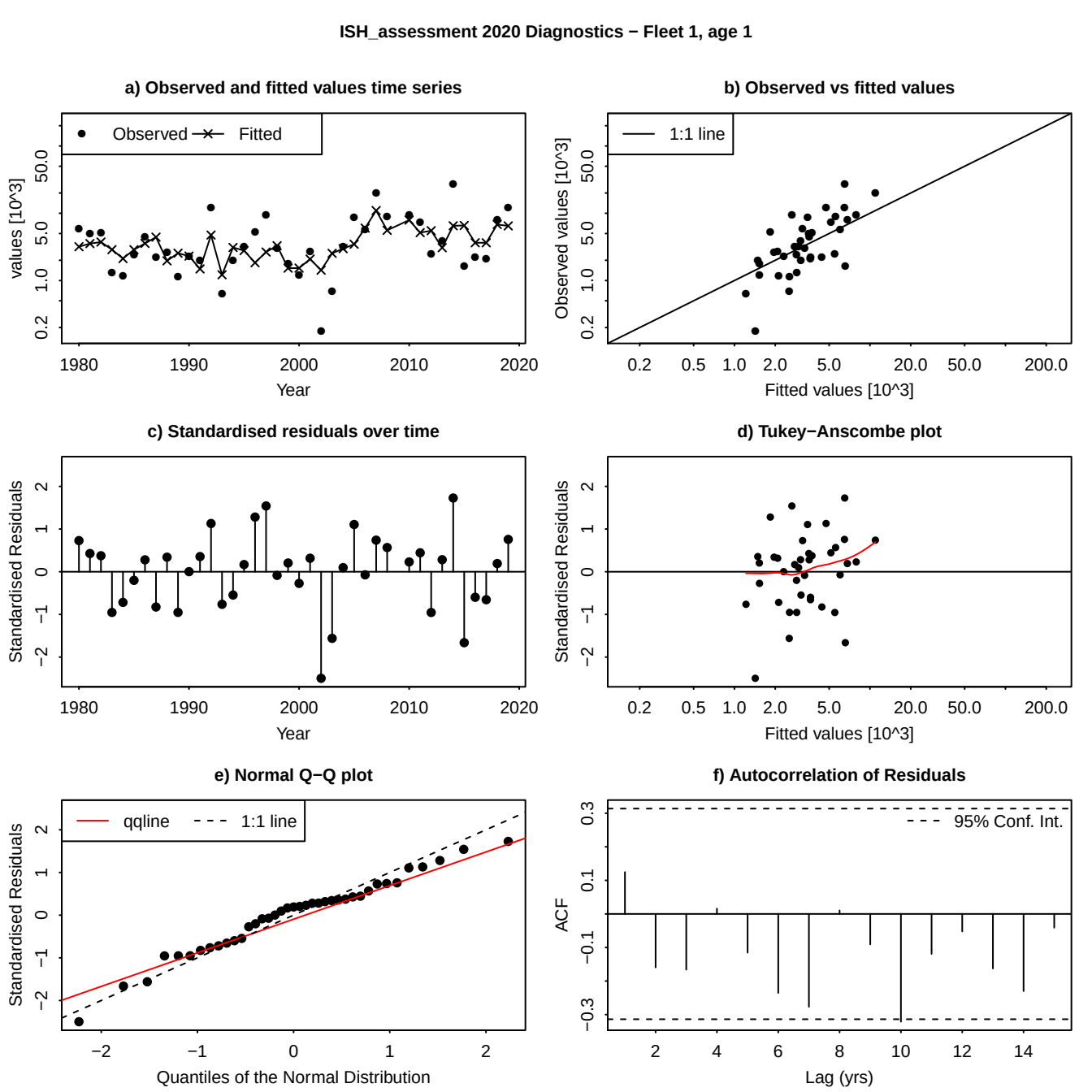

Irish Sea herring timeseries of catch.wt
Time series of catch.wt (kg)
0.05
0.10
0.15
0.20
0.25
1960
1970
1980
1990
2000
2010
2020
Year
1
2
3
4
5
6
7
8

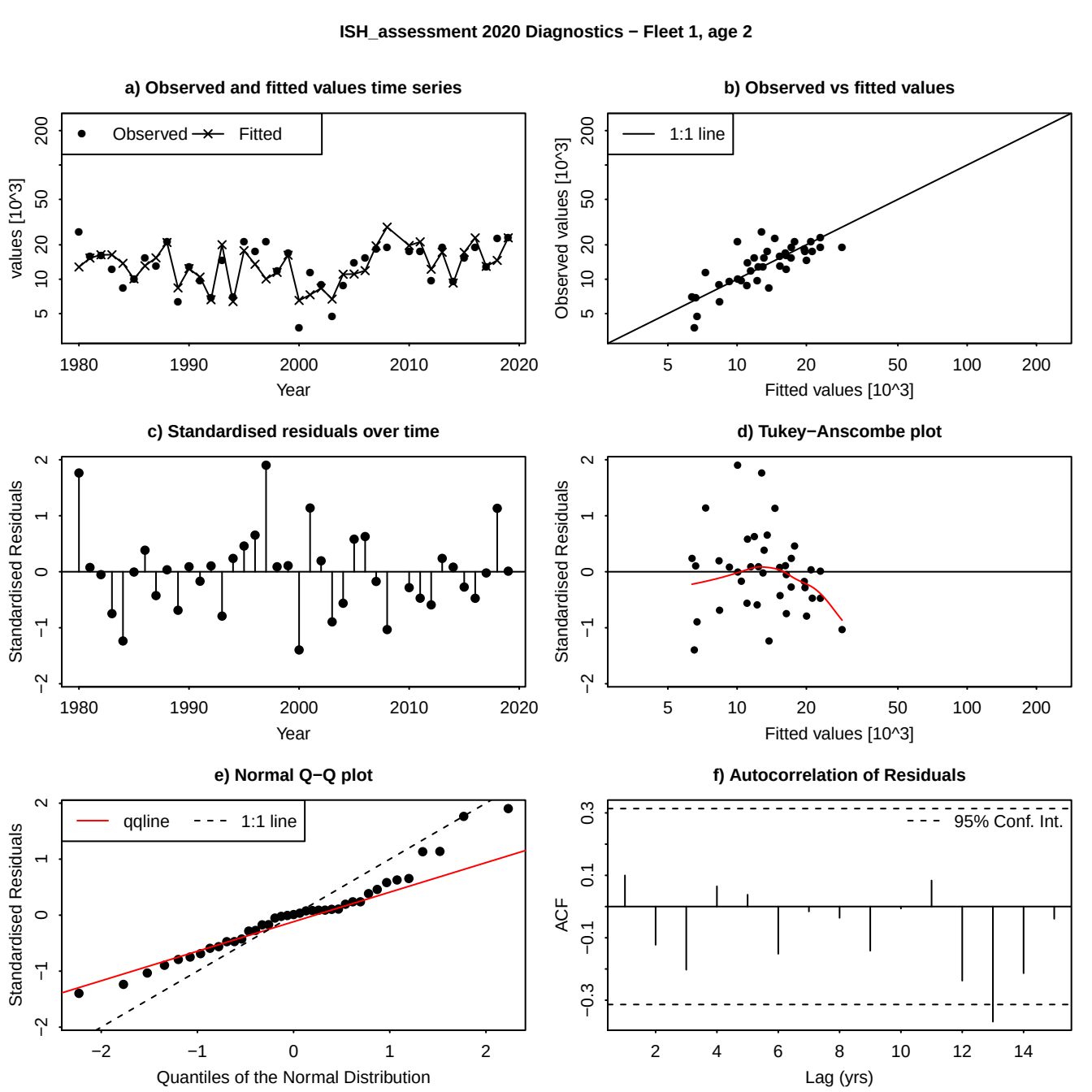

Irish Sea herring timeseries of harvest
Time series of harvest (f)
0.0
0.2
0.4
0.6
0.8
2000
2005
2010
2015
Year
1
2
3
4
5
6
7
8

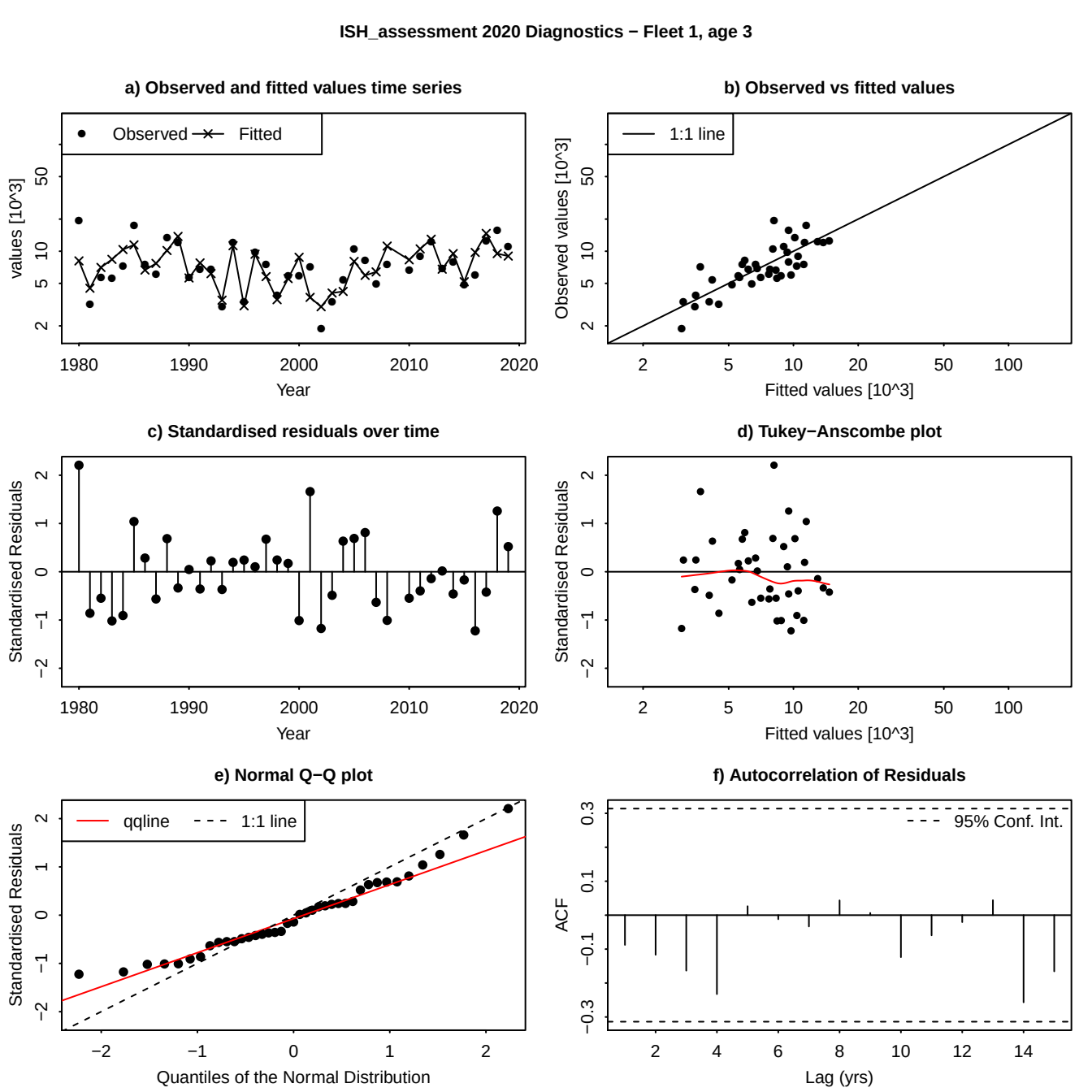

Irish Sea herring timeseries of mat
Time series of mat
Year
1.0
0.8
0.6
0.4
0.2
0.0
1990
1995
2000
2005
2010
2015
2020
1
2
3
4
5
6
7
8


AC(VIIaN) timeseries of index
Time series of index
Year
2000000
1500000
1000000
500000
0
1995
2000
2005
2010
2015
2020
1
2
3
4
5
6
7
8


Irish Sea herring Weight in the stock by cohort
Weight in the stock (kg)
0.05
0.10
0.15
0.20
0.25
1980
1990
2000
2010
2020
Year
1974 4 4 4
1975 5 5 5
1976 6 6 6
1977 7 7 7
1978 8 8 8
1979 9 9 9
1980 0 0 0
1981 1 1 1
1982 2 2 2
1983 3 3 3
1984 4 4 4
1985 5 5 5
1986 6 6 6
1987 7 7 7
1988 8 8 8
1989 9 9 9
1990 0 0 0
1991 1 1 1
1992 2 2 2
1993 3 3 3
1994 4 4 4
1995 5 5 5
1996 6 6 6
1997 7 7 7
1998 8 8 8
1999 9 9 9
2000 0 0 0
2001 1 1 1
2002 2 2 2
2003 3 3 3
2004 4 4 4
2005 5 5 5
2006 6 6 6
2007 7 7 7
2008 8 8 8
2009 9 9 9
2010 0 0 0
2011 1 1 1
2012 2 2 2
2013 3 3 3
2014 4 4 4
2015 5 5 5
2016 6 6 6
2017 7 7 7

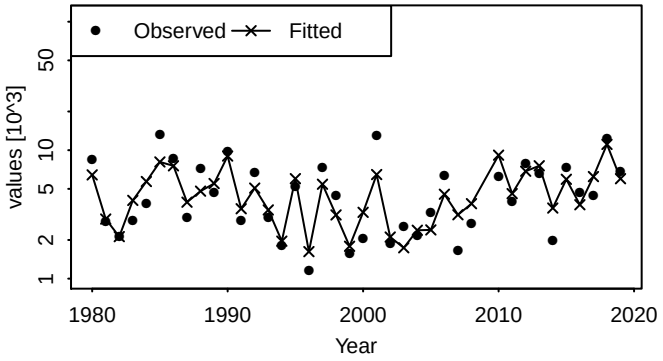

ISH_assessment 2020 Diagnostics − Fleet 1, age 1
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)


ISH_assessment 2020 Diagnostics − Fleet 1, age 2
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

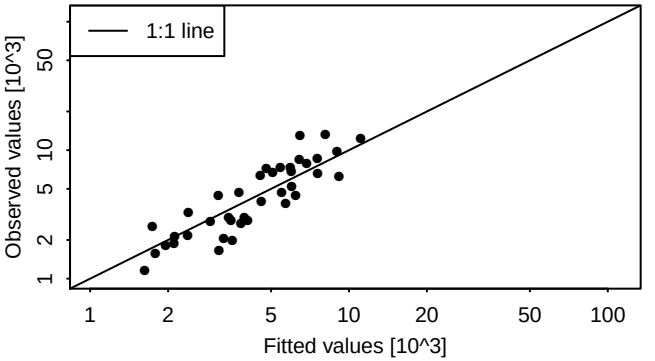

ISH_assessment 2020 Diagnostics − Fleet 1, age 3
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

ISH_assessment 2020 Diagnostics − Fleet 1, age 4

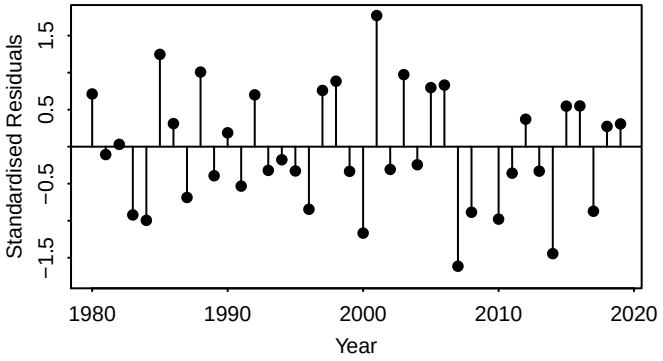
a) Observed and fitted values time series



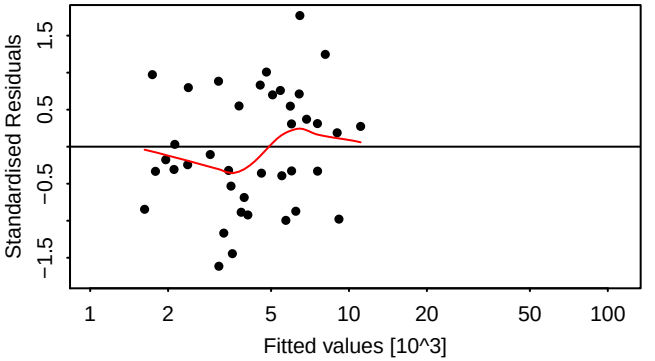
b) Observed vs fitted values



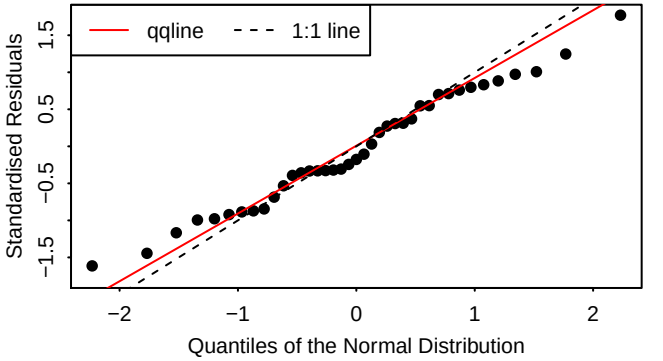
c) Standardised residuals over time



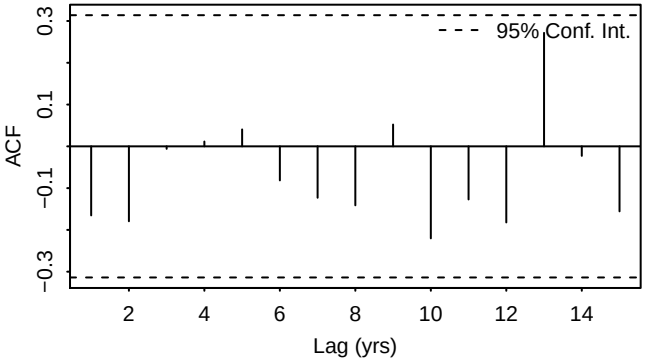
d) Tukey−Anscombe plot

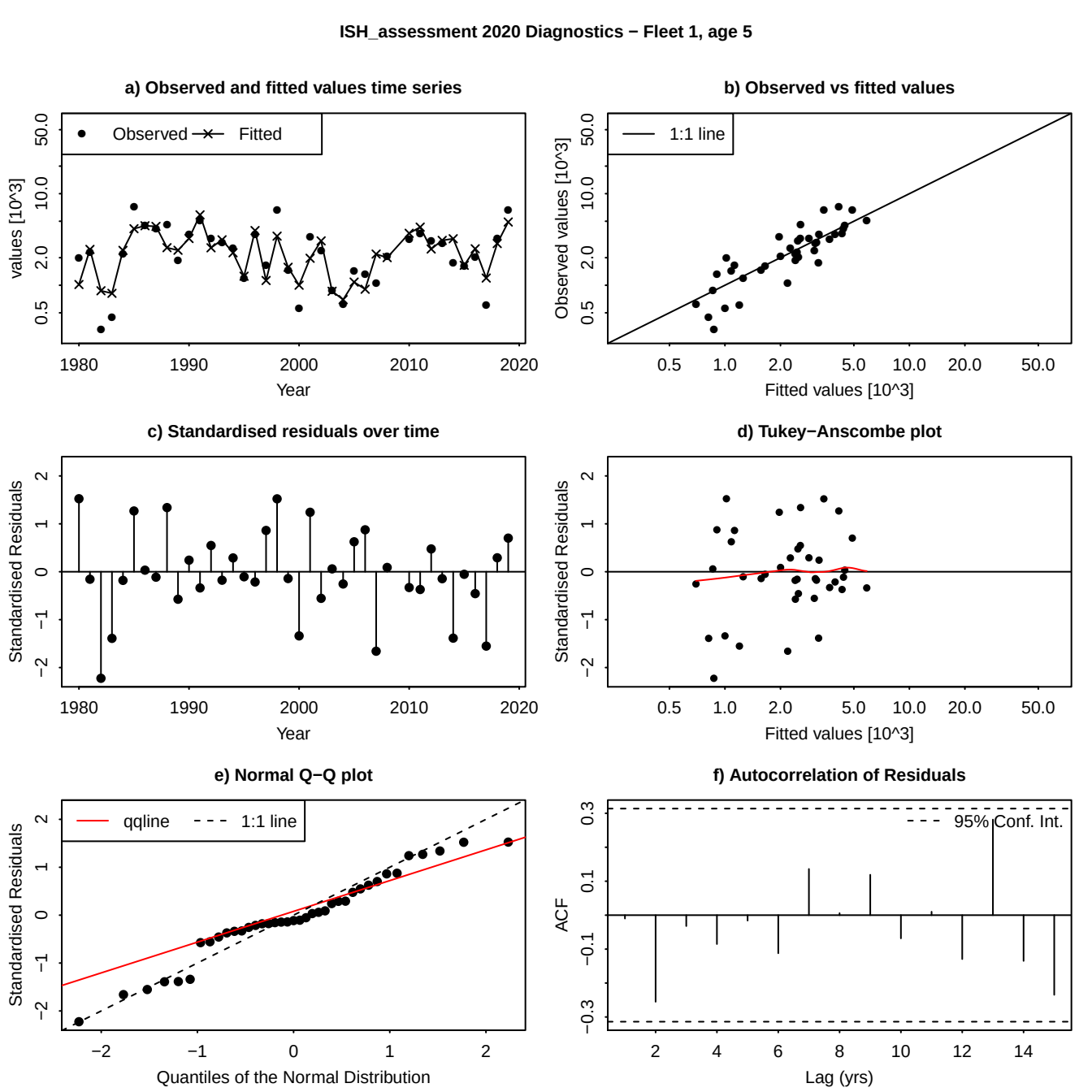


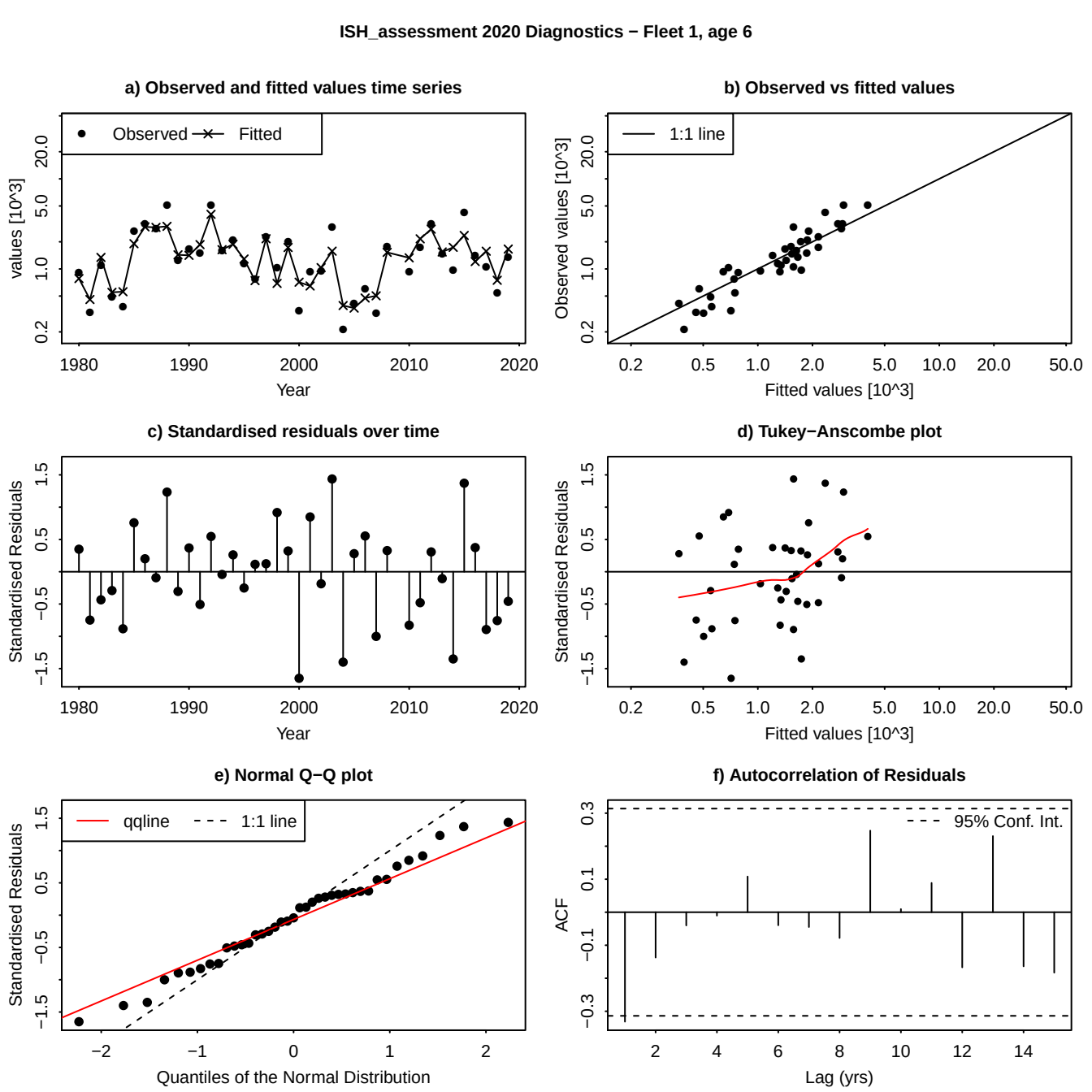
e) Normal Q−Q plot

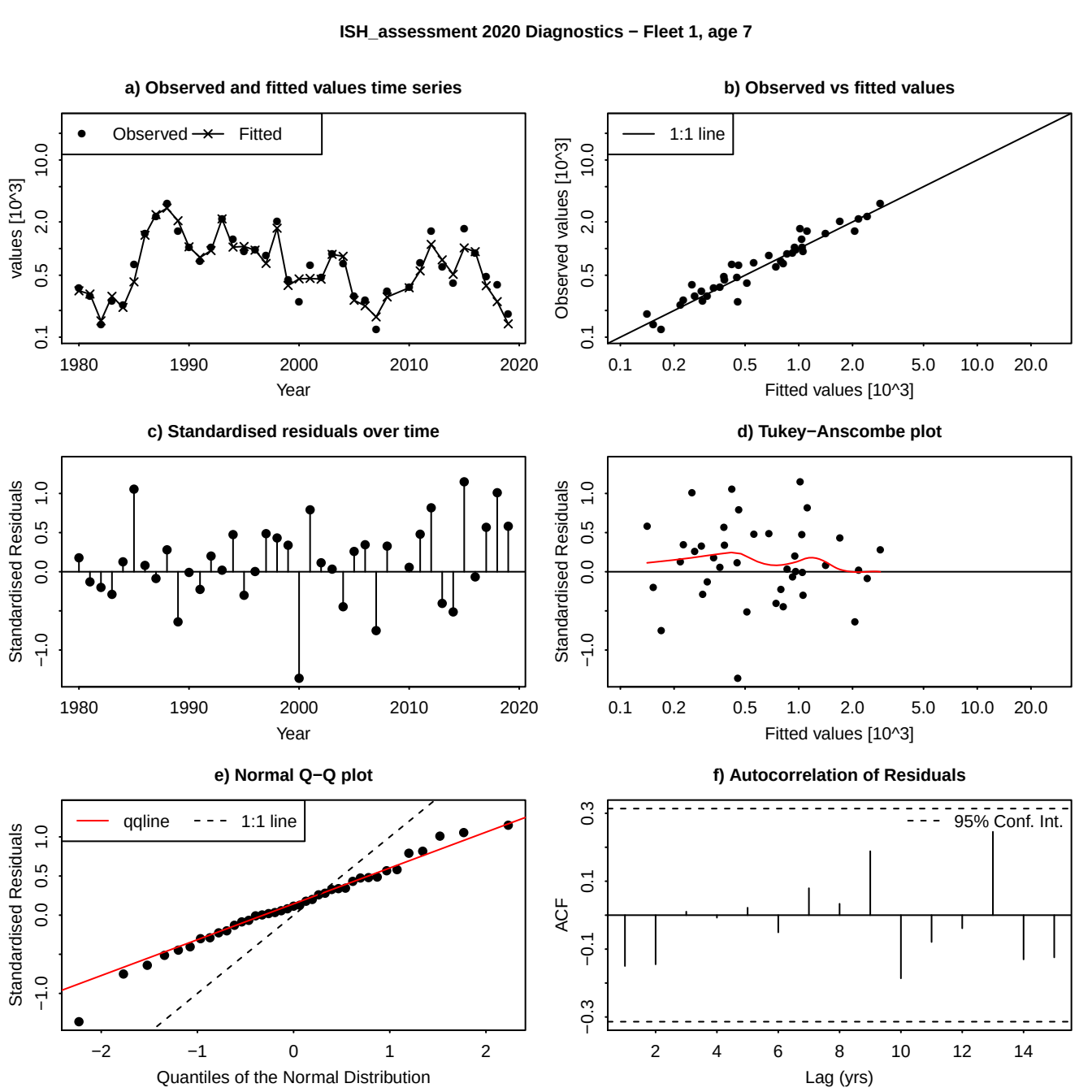


f) Autocorrelation of Residuals

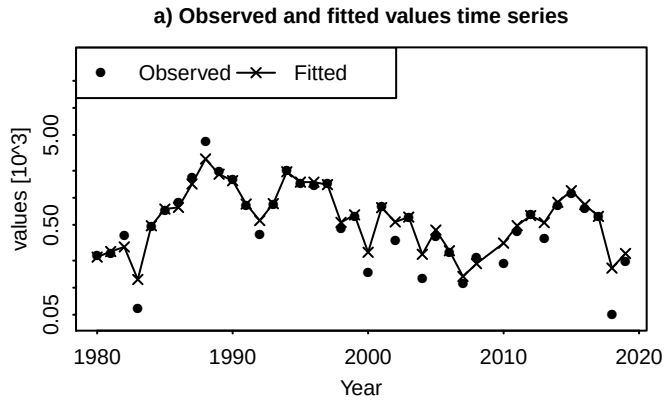


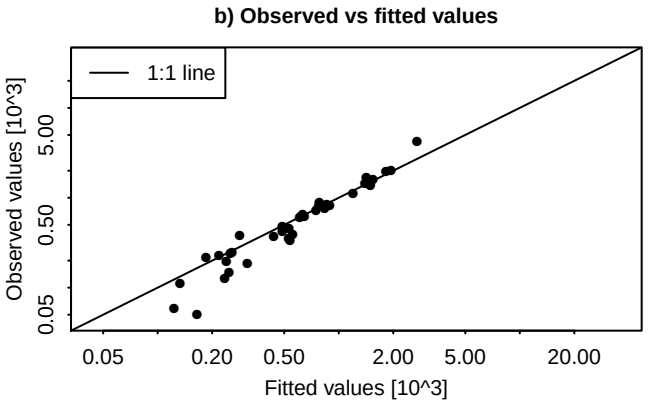

ISH_assessment 2020 Diagnostics − Fleet 1, age 5
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

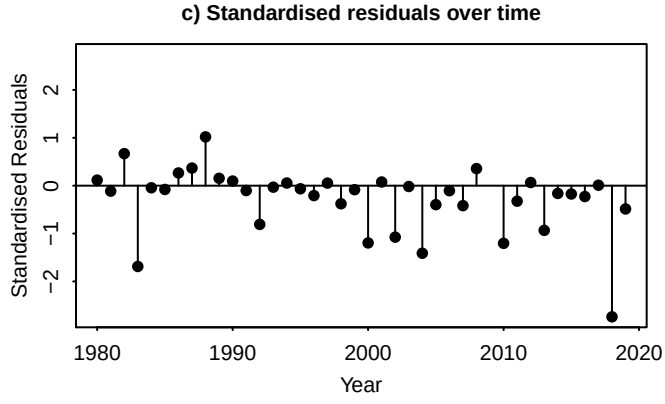

ISH_assessment 2020 Diagnostics − Fleet 1, age 6
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

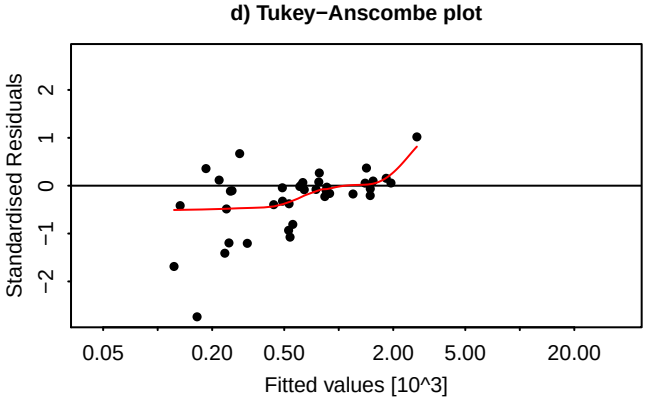

ISH_assessment 2020 Diagnostics − Fleet 1, age 7
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
0.1
0.5
2.0
10.0
1980
1990
2000
2010
2020
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
0.1
0.2
0.5
1.0
2.0
5.0
10.0
20.0
c) Standardised residuals over time
Standardised Residuals
−1.0
0.0
0.5
1.0
Year
d) Tukey−Anscombe plot
e) Normal Q−Q plot
qqline
1:1 line
Quantiles of the Normal Distribution
−2
−1
0
1
2
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
−0.3
−0.1
0.1
0.3
2
4
6
8
10
12
14
Lag (yrs)

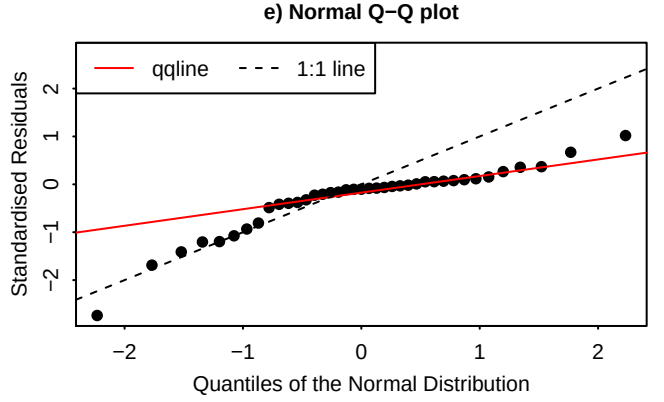
ISH_assessment 2020 Diagnostics − Fleet 1, age 8

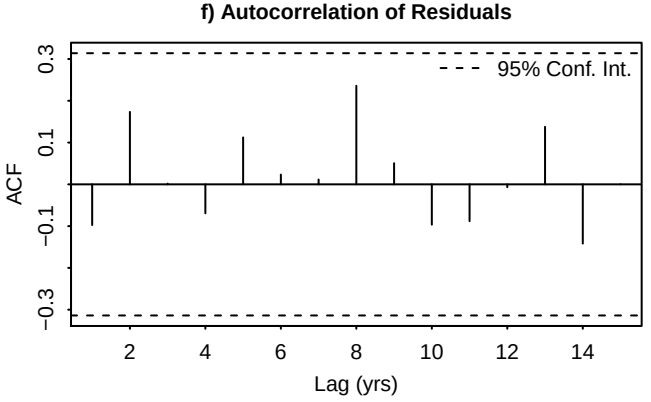


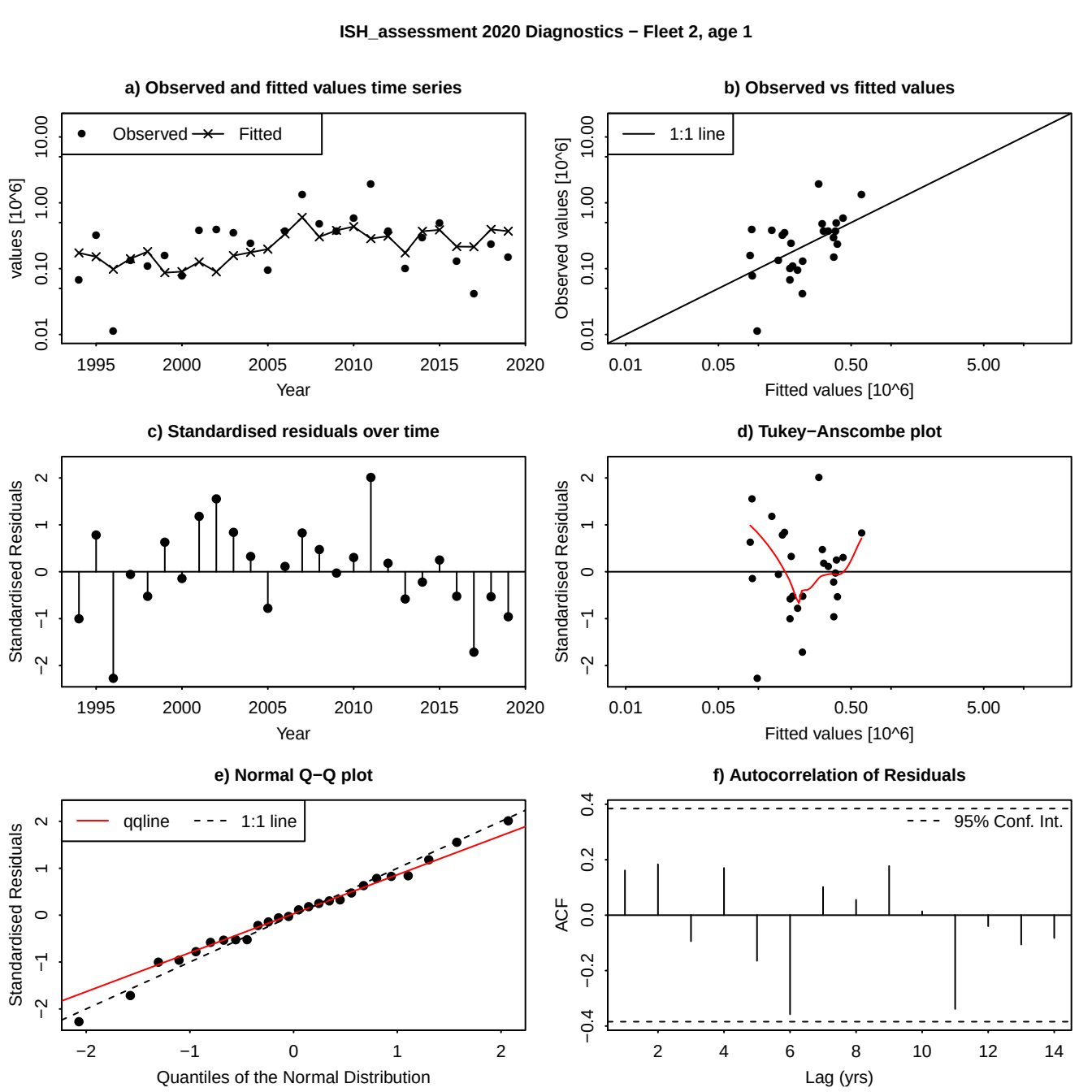


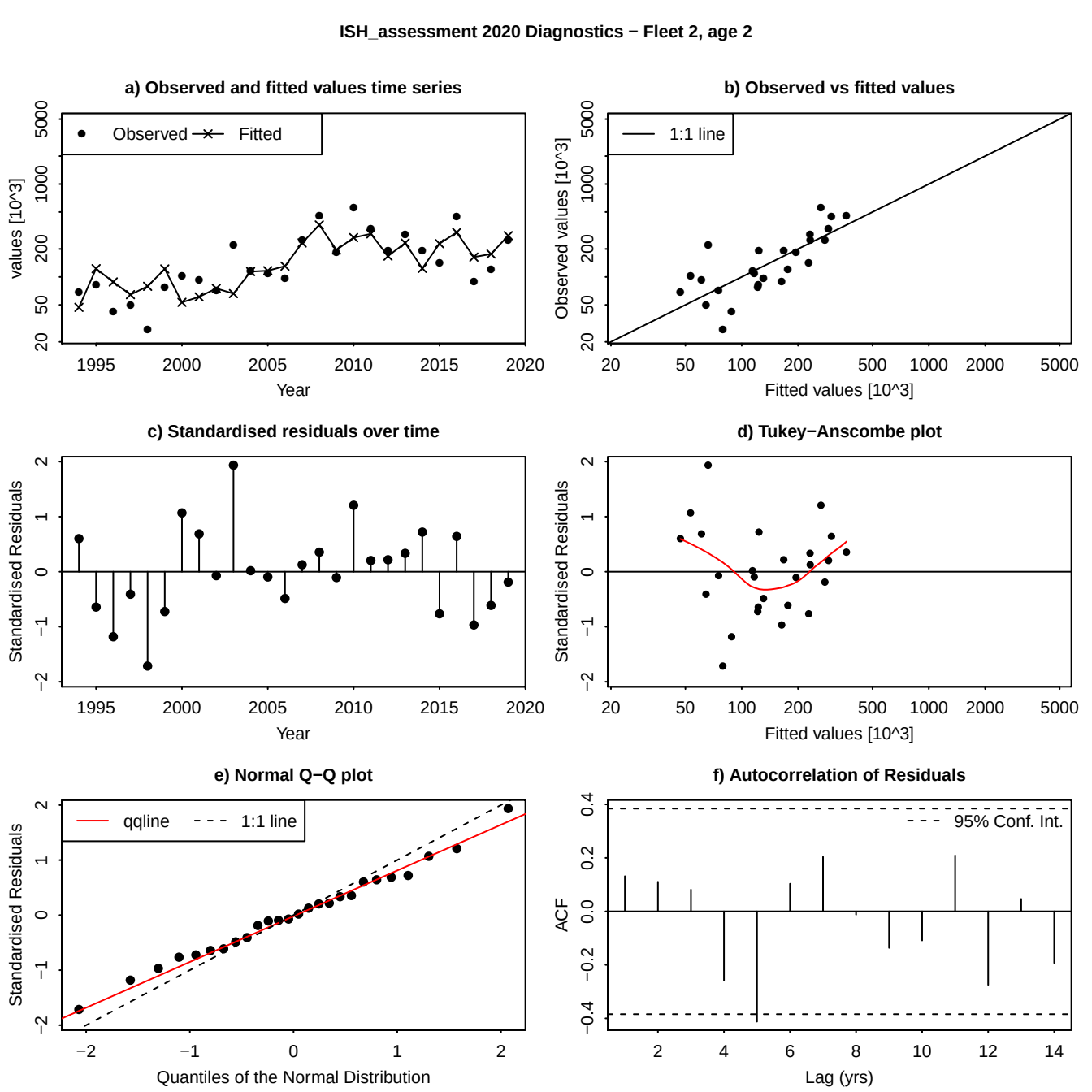


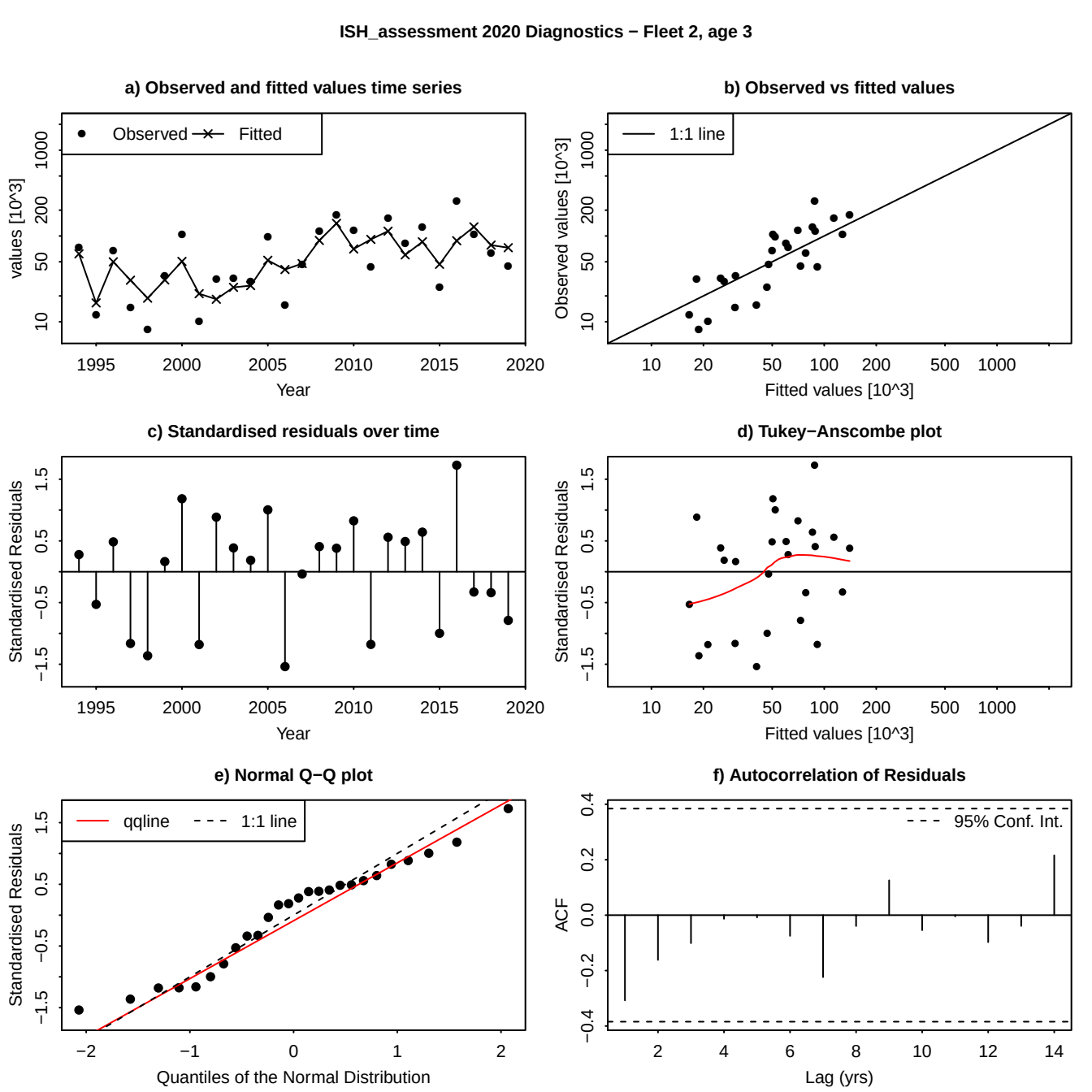


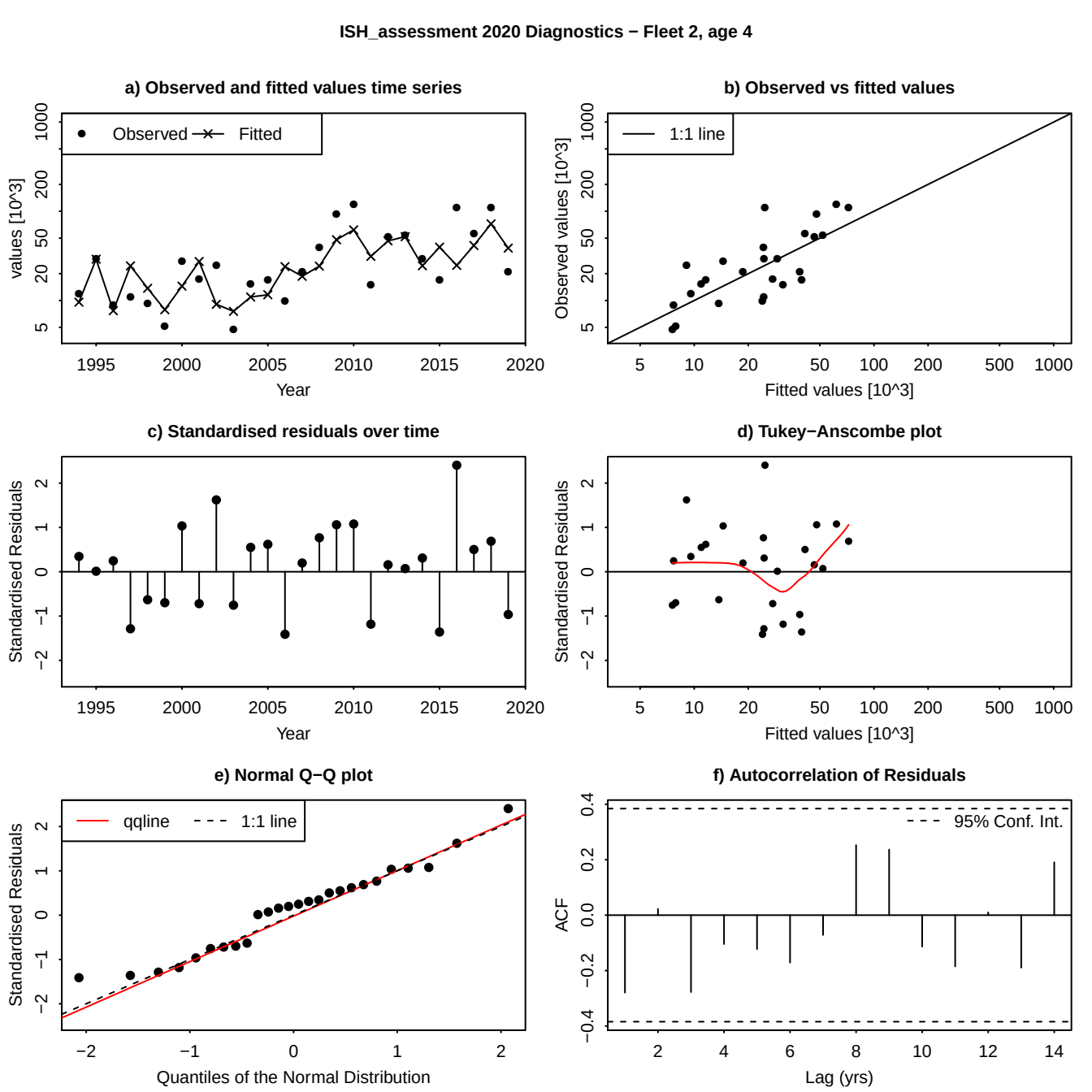


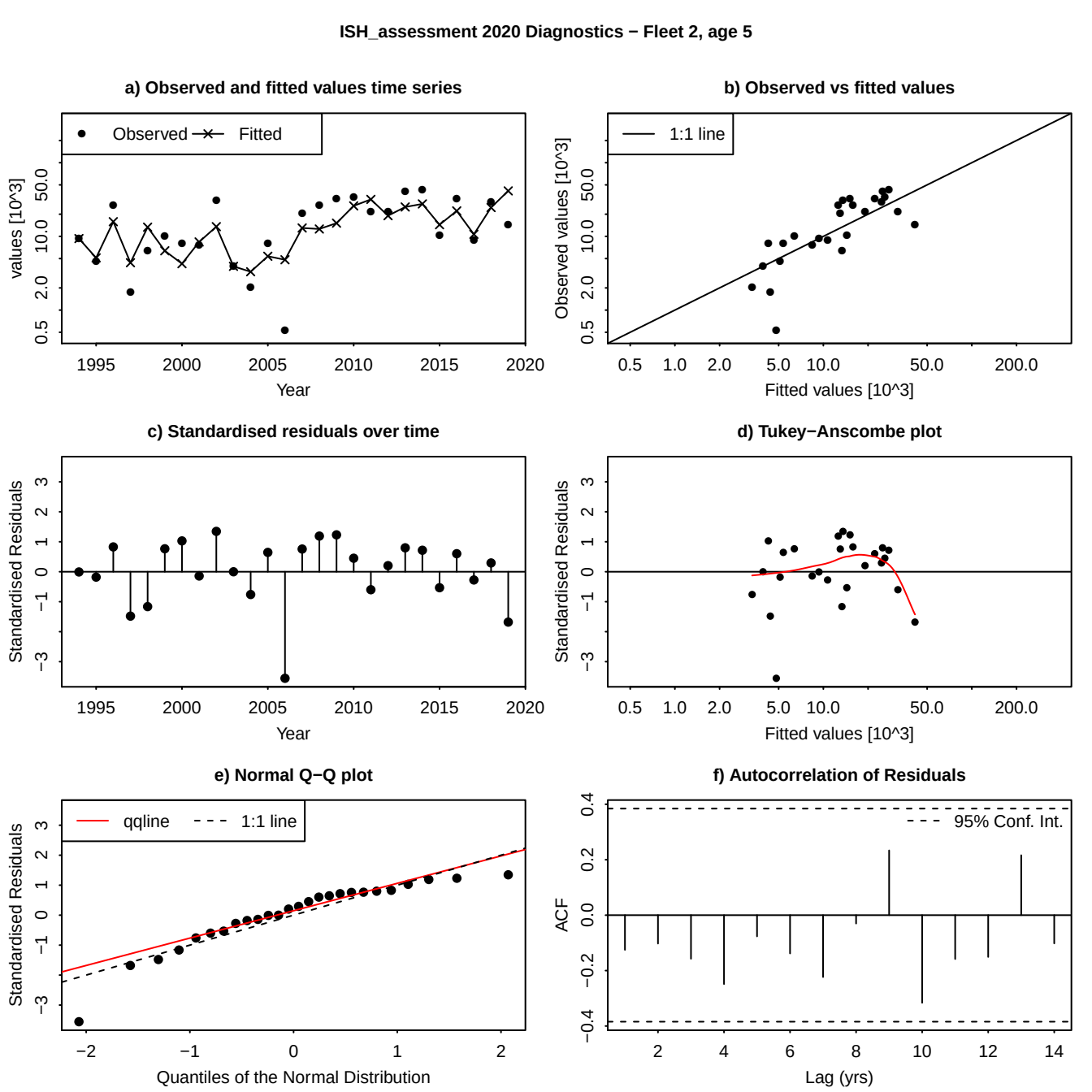


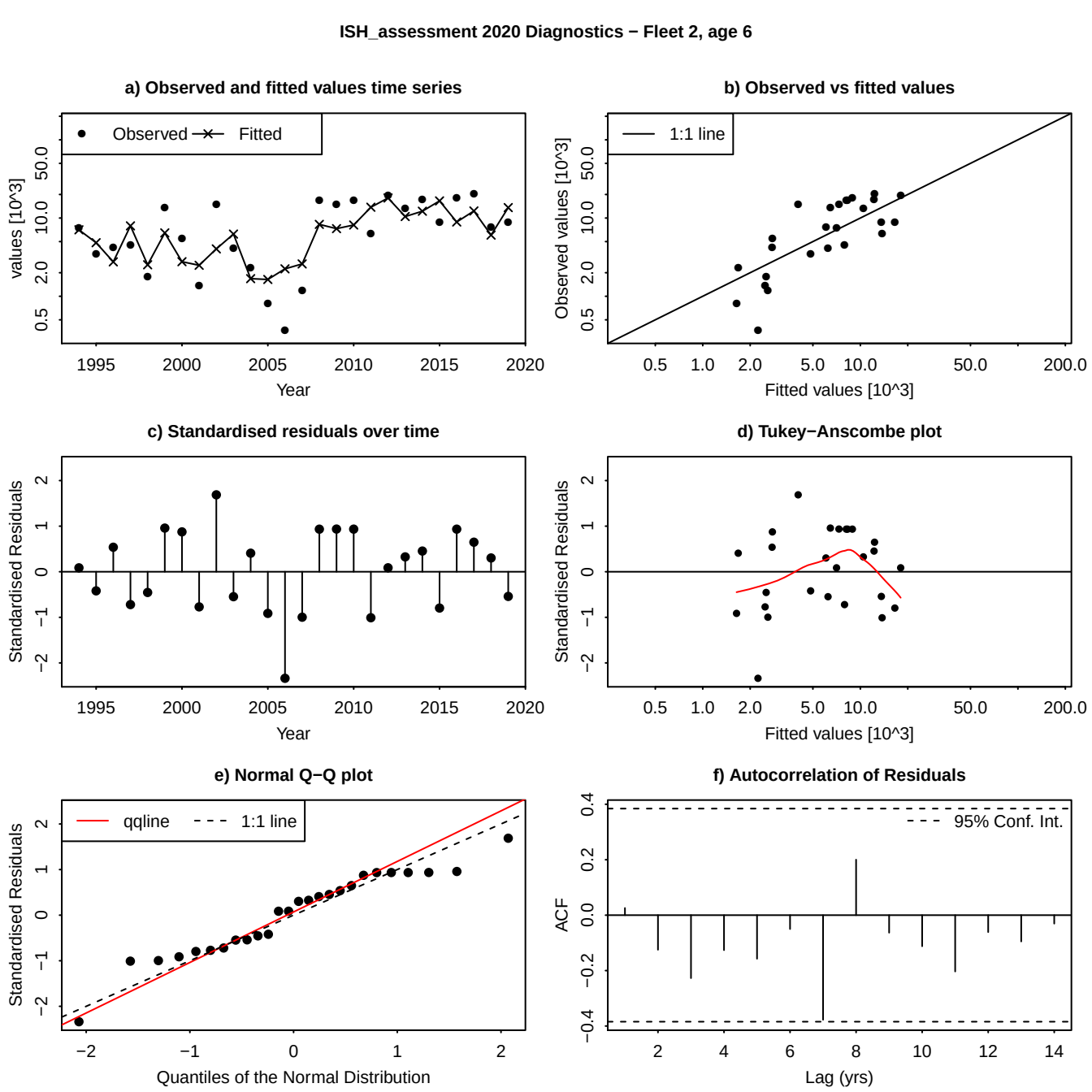

ISH_assessment 2020 Diagnostics − Fleet 2, age 1
a) Observed and fitted values time series
Observed
Fitted
values [10^6]
10.00
1.00
0.10
0.01
1995
2000
2005
2010
2015
2020
Year
b) Observed vs fitted values
1:1 line
Observed values [10^6]
Fitted values [10^6]
0.01
0.05
0.50
5.00
c) Standardised residuals over time
Standardised Residuals
2
1
0
−1
−2
d) Tukey−Anscombe plot
e) Normal Q−Q plot
qqline
1:1 line
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
0.4
0.2
0.0
−0.2
−0.4
Lag (yrs)

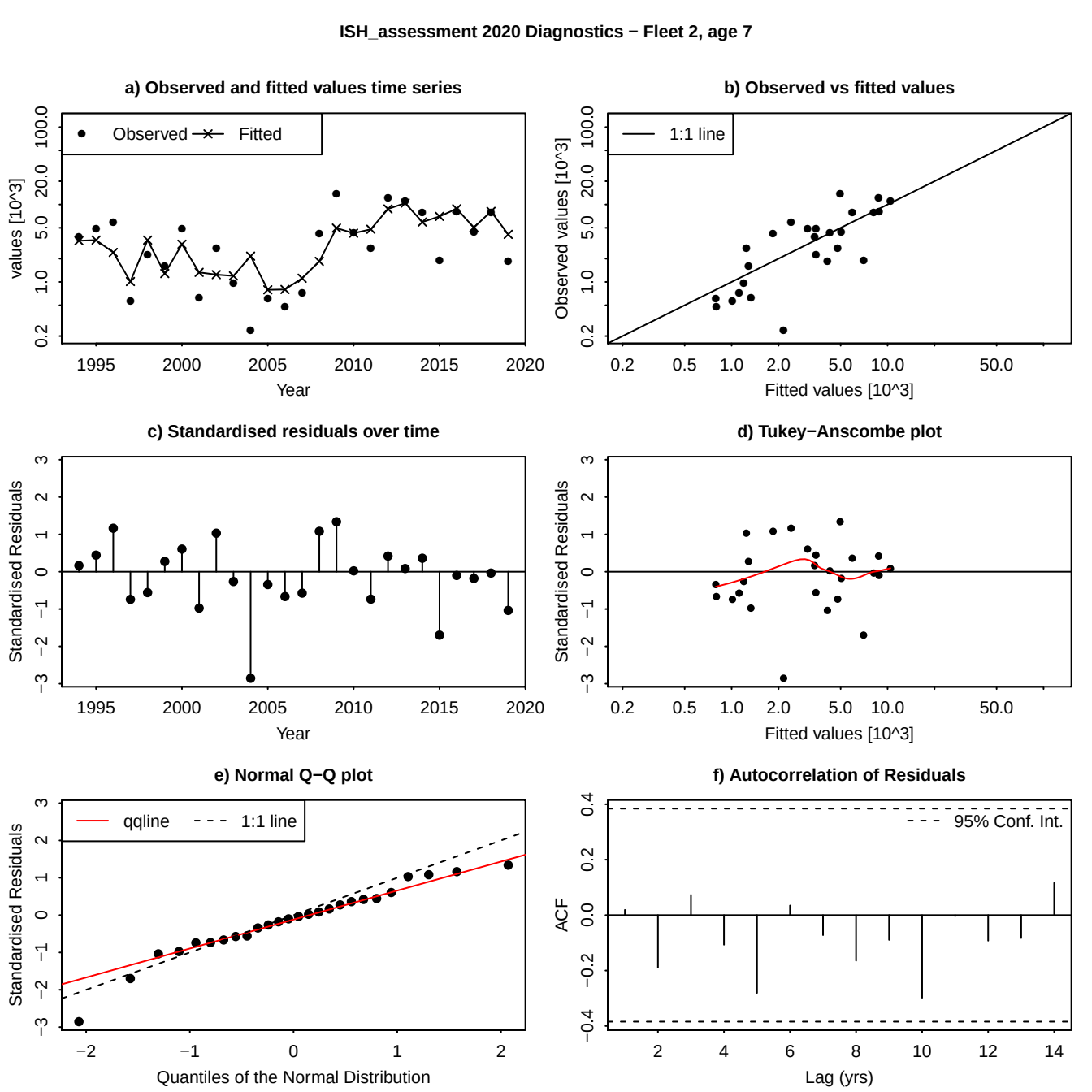

ISH_assessment 2020 Diagnostics − Fleet 2, age 2
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

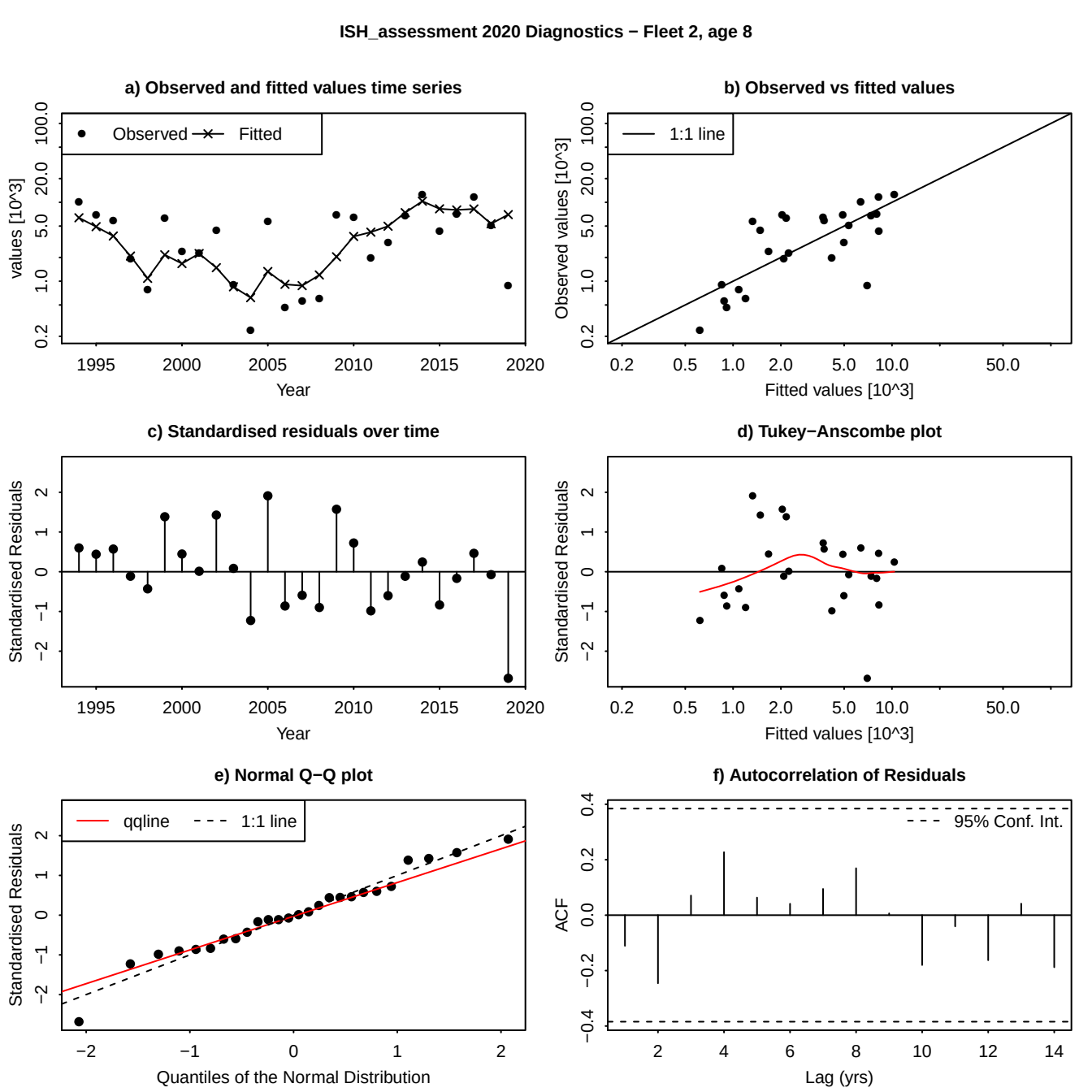

ISH_assessment 2020 Diagnostics − Fleet 2, age 3
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

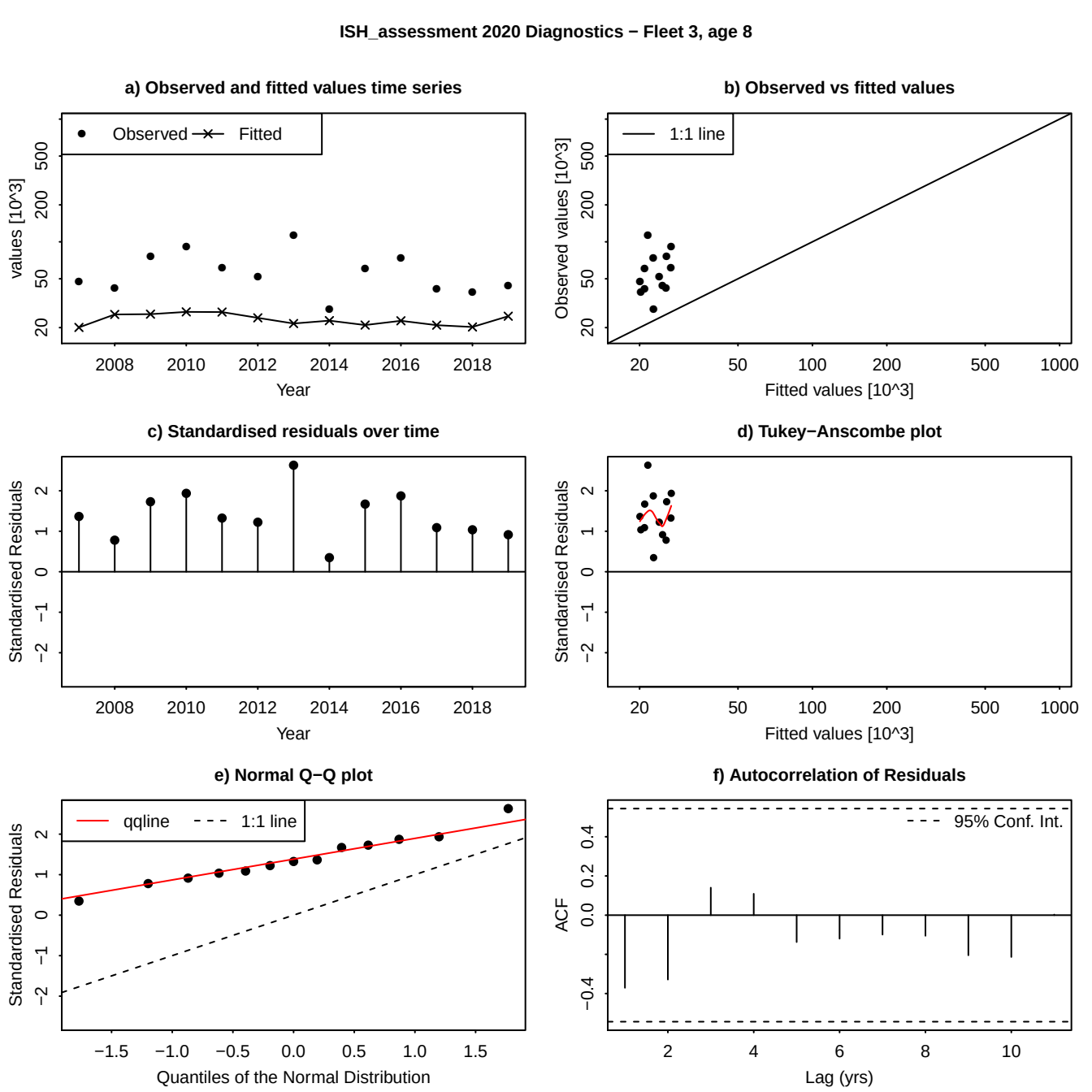

ISH_assessment 2020 Diagnostics − Fleet 2, age 4
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

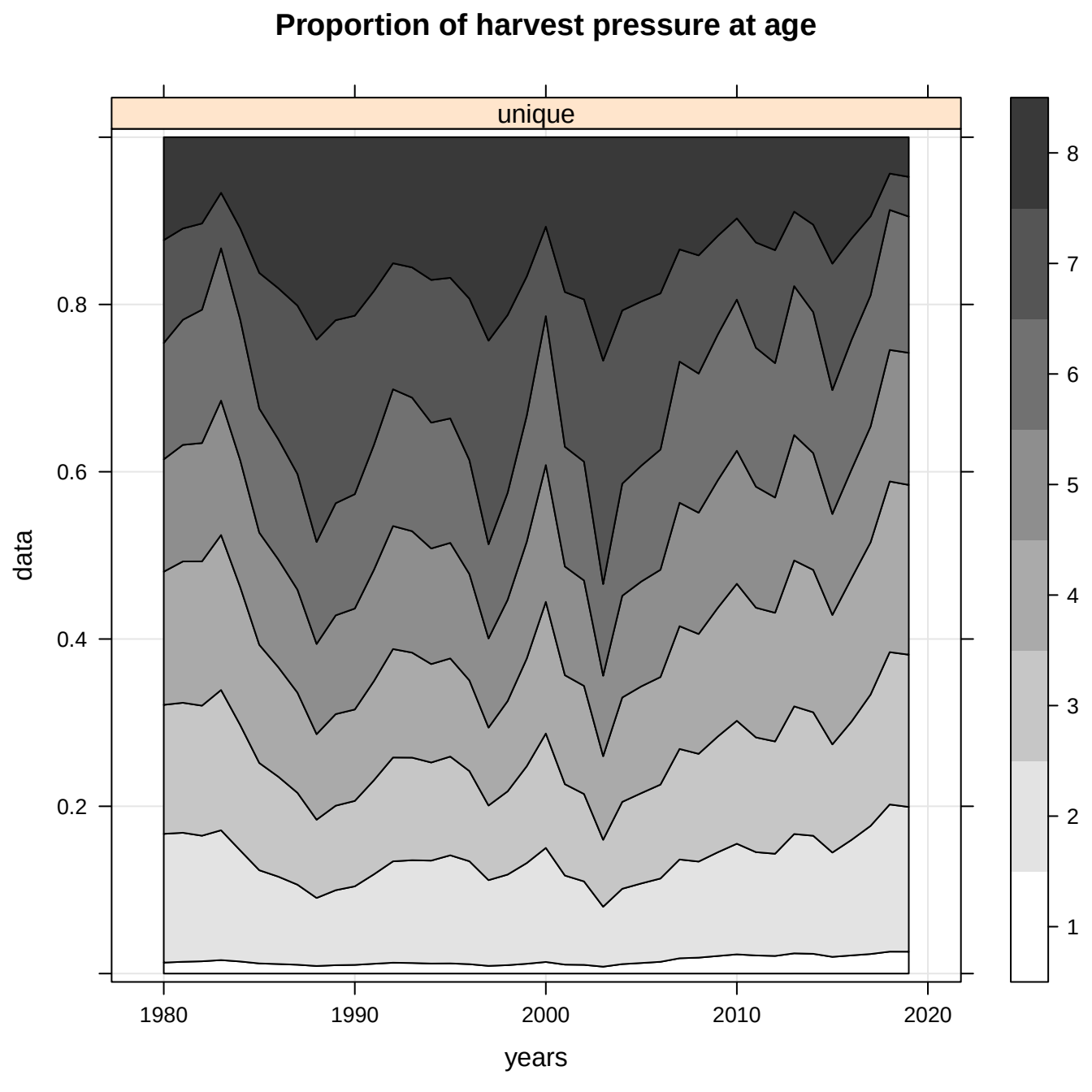

ISH_assessment 2020 Diagnostics − Fleet 2, age 5
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

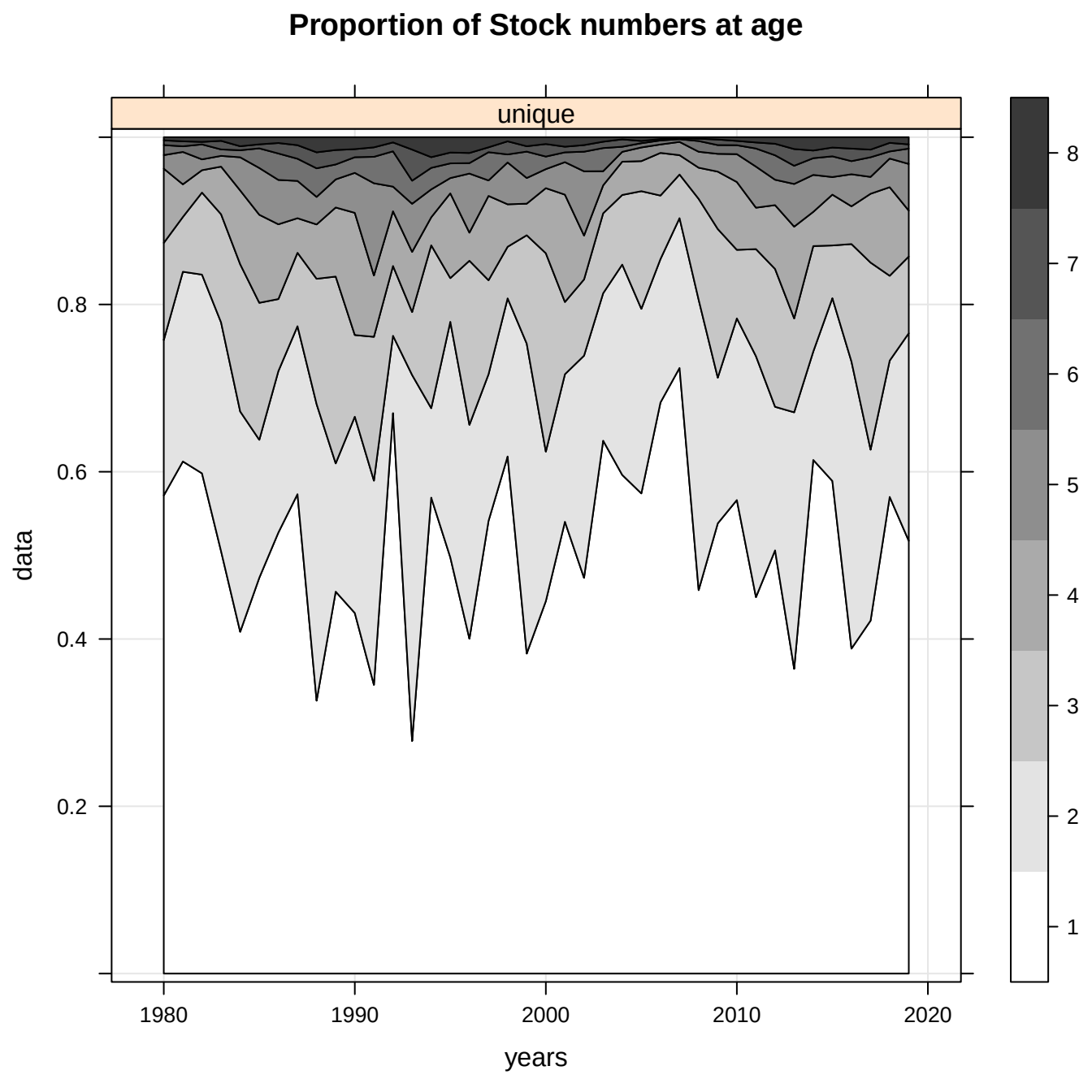

ISH_assessment 2020 Diagnostics − Fleet 2, age 6
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

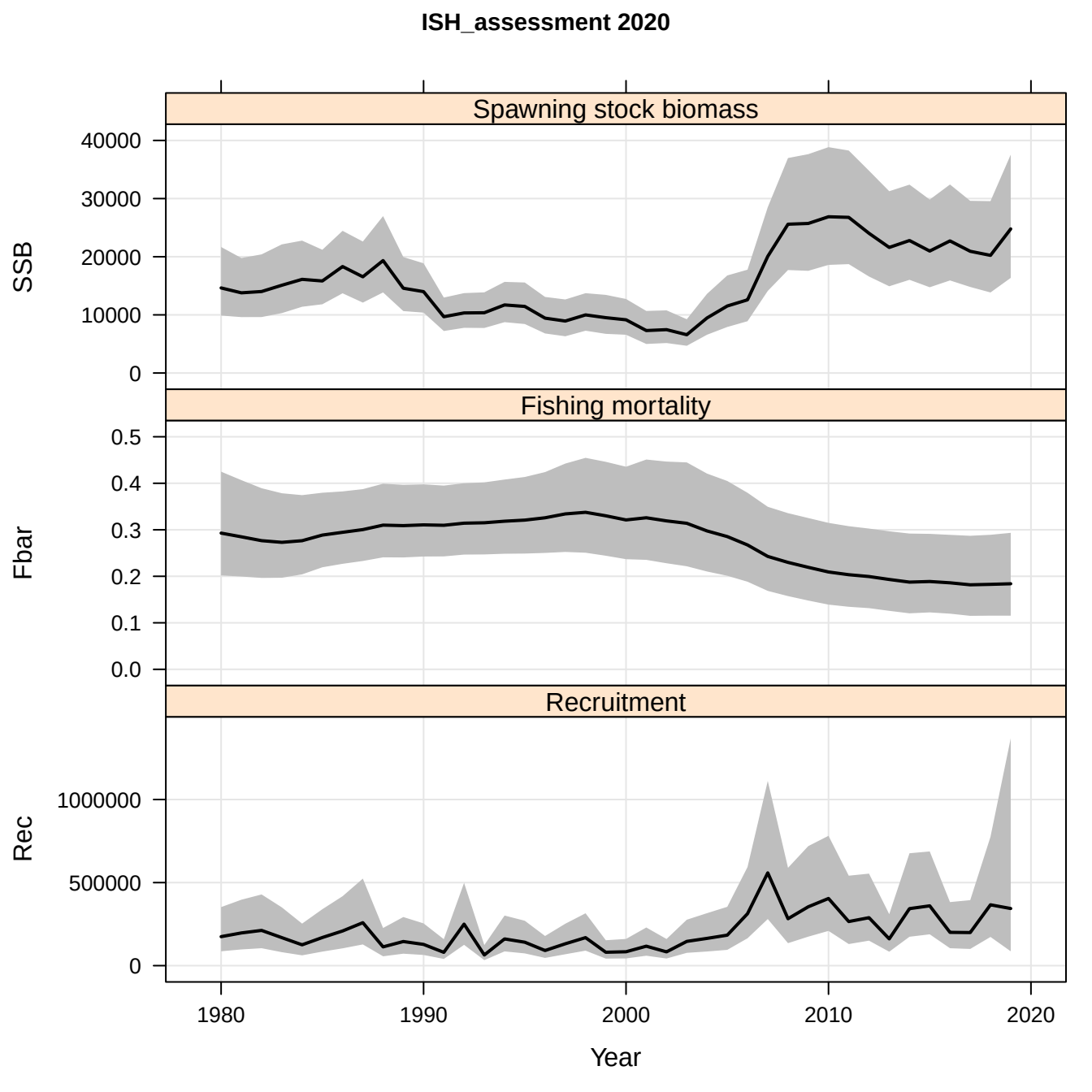

ISH_assessment 2020 Diagnostics − Fleet 2, age 7
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
0.2
1.0
5.0
20.0
100.0
1995
2000
2005
2010
2015
2020
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
0.2
0.5
1.0
2.0
5.0
10.0
50.0
c) Standardised residuals over time
Standardised Residuals
−3
−2
−1
0
1
2
3
Year
d) Tukey−Anscombe plot
e) Normal Q−Q plot
qqline
1:1 line
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
−0.4
−0.2
0.0
0.2
0.4
Lag (yrs)
2
4
6
8
10
12
14

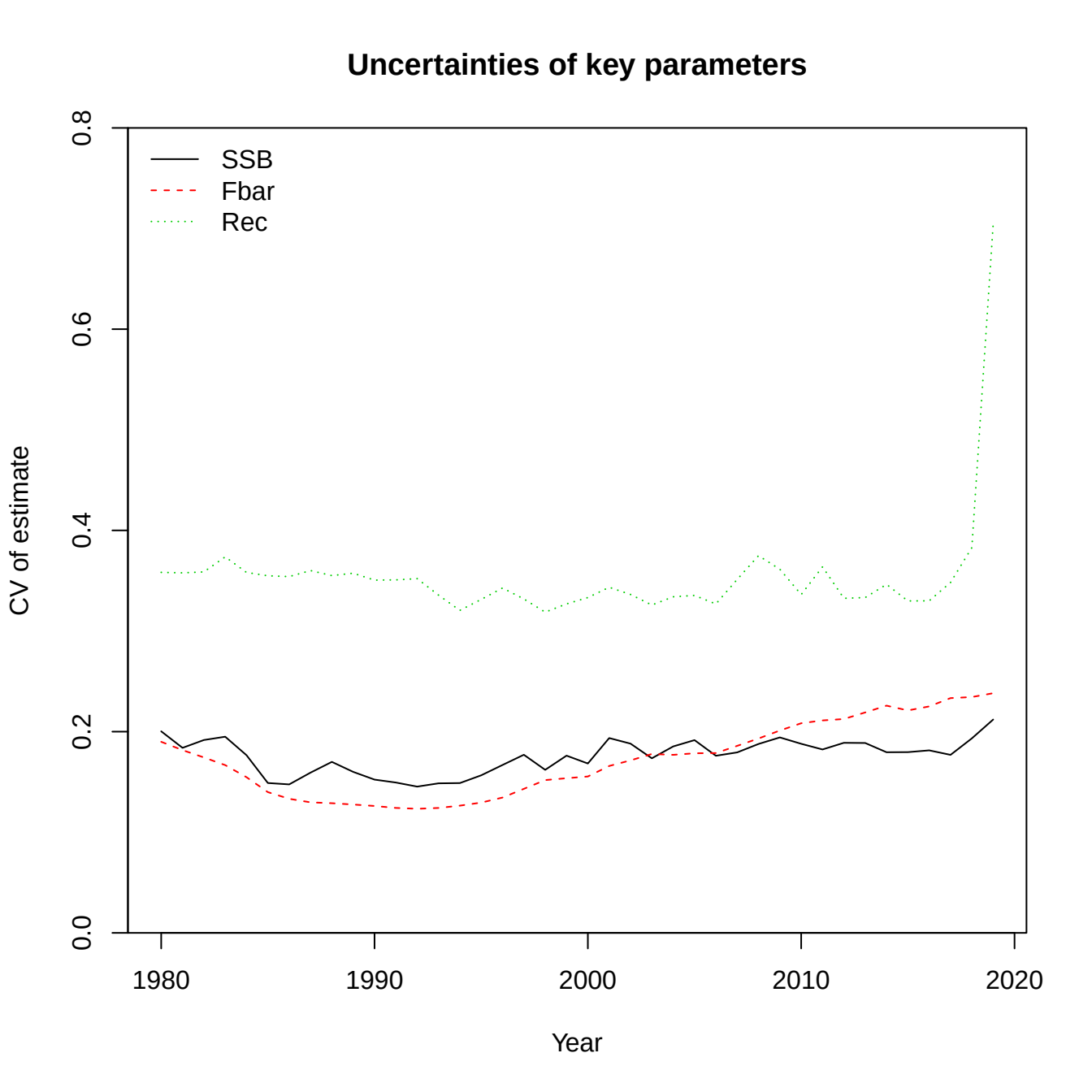

ISH_assessment 2020 Diagnostics − Fleet 2, age 8
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

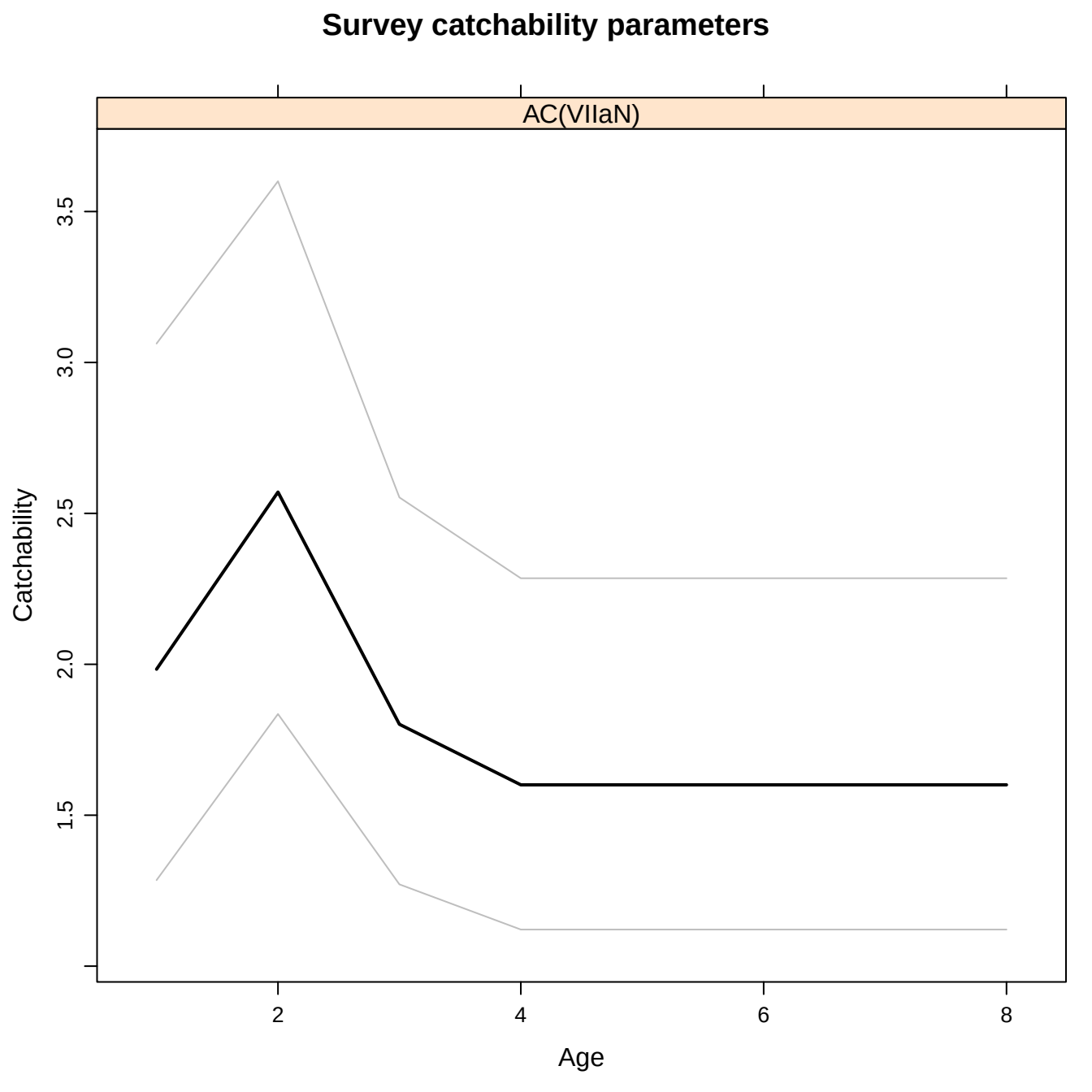

ISH_assessment 2020 Diagnostics − Fleet 3, age 8
a) Observed and fitted values time series
Observed
Fitted
values [10^3]
Year
b) Observed vs fitted values
1:1 line
Observed values [10^3]
Fitted values [10^3]
c) Standardised residuals over time
Standardised Residuals
Year
d) Tukey−Anscombe plot
Standardised Residuals
Fitted values [10^3]
e) Normal Q−Q plot
qqline
1:1 line
Standardised Residuals
Quantiles of the Normal Distribution
f) Autocorrelation of Residuals
95% Conf. Int.
ACF
Lag (yrs)

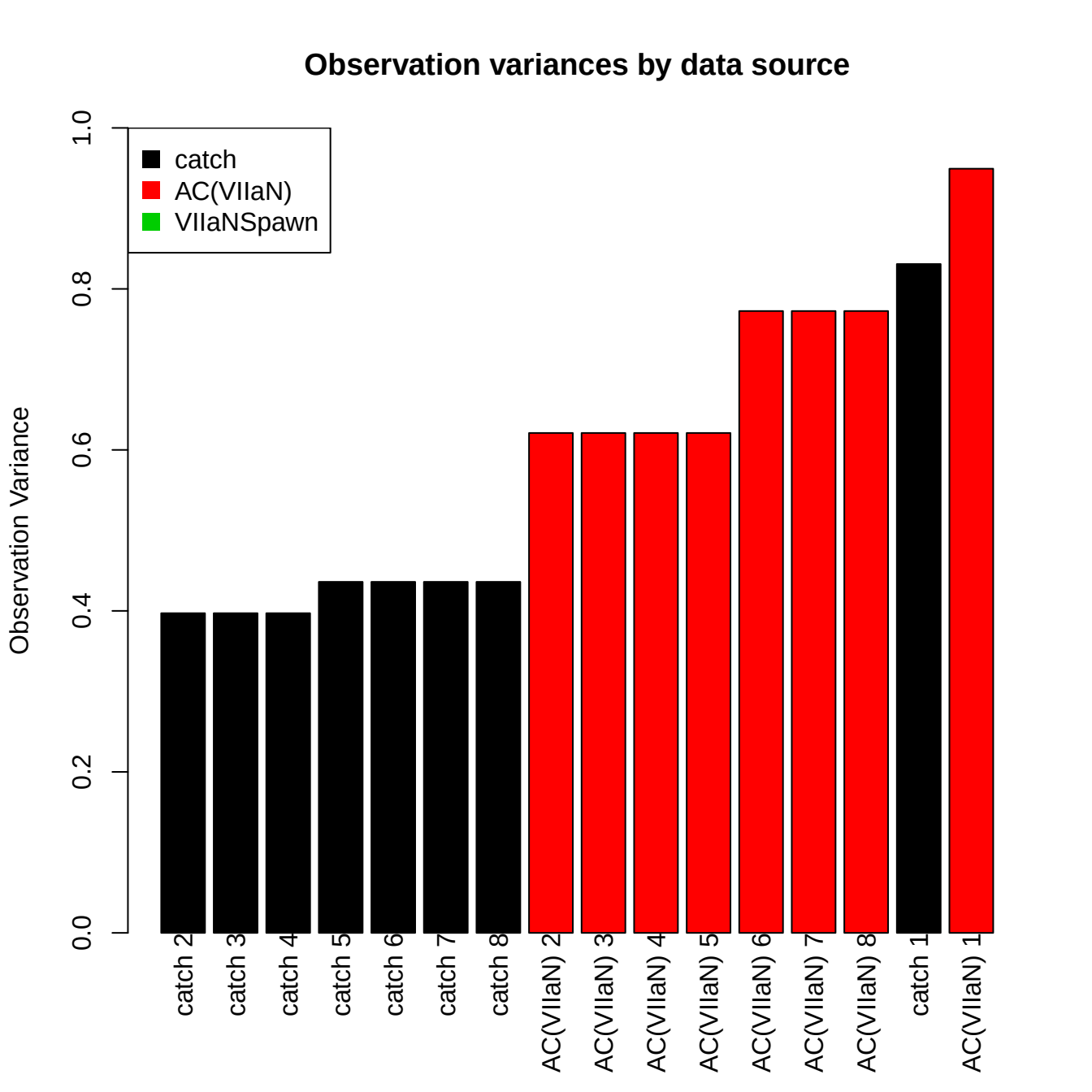

Proportion of harvest pressure at age
unique
data
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
years
1
2
3
4
5
6
7
8

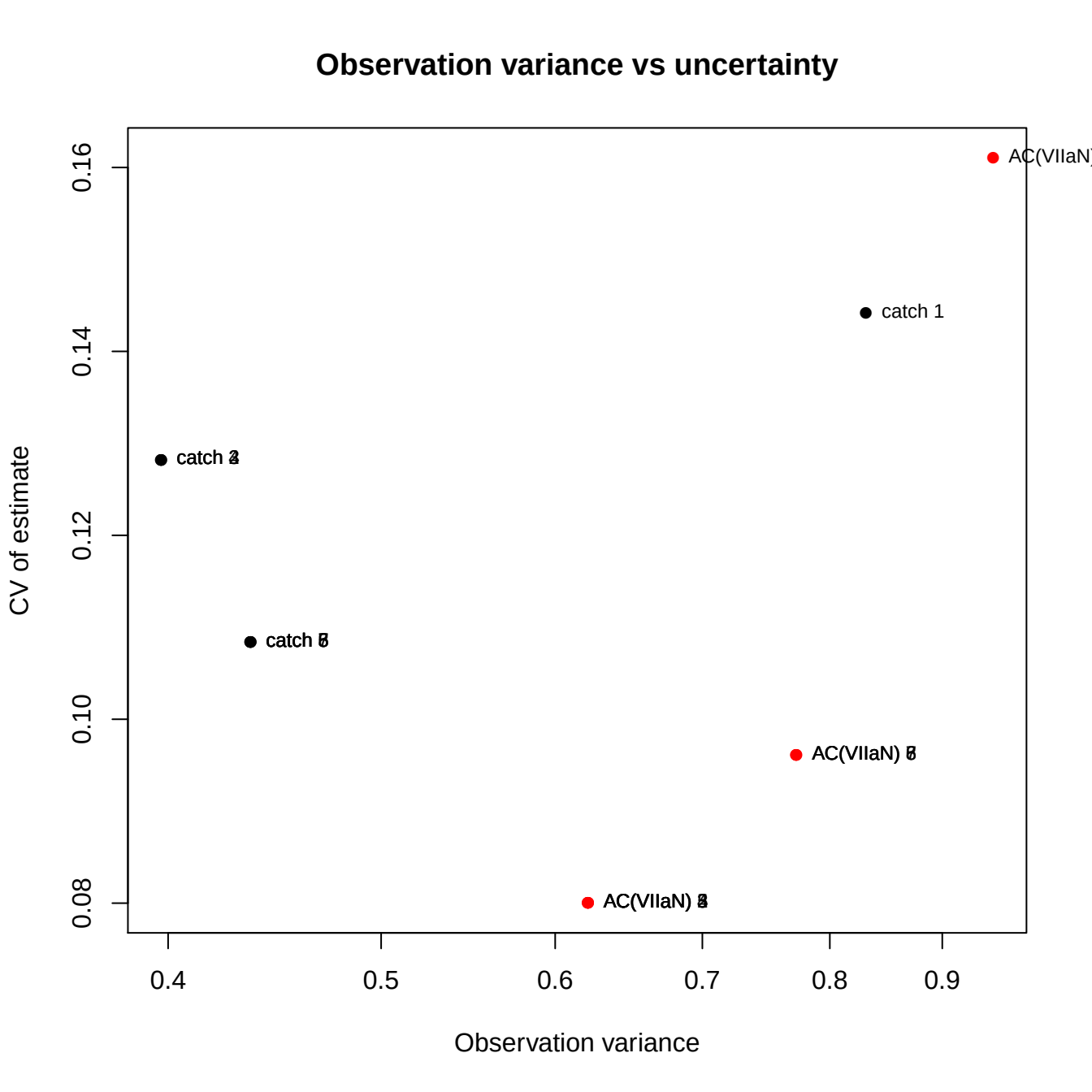

Proportion of Stock numbers at age
unique
data
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
years
1
2
3
4
5
6
7
8

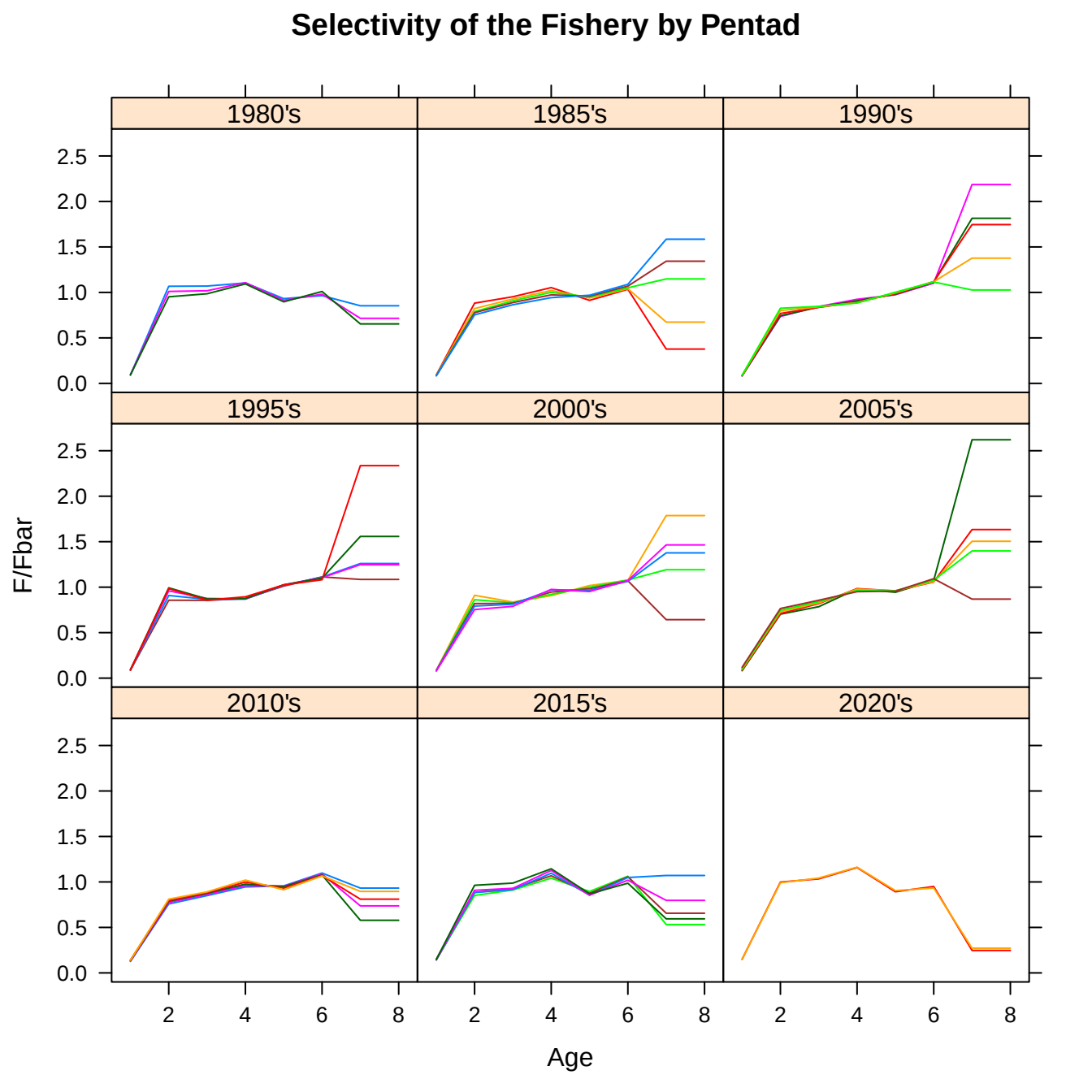

ISH_assessment 2020
Spawning stock biomass
SSB
40000
30000
20000
10000
0
Fishing mortality
Fbar
0.5
0.4
0.3
0.2
0.1
0.0
Recruitment
Rec
1000000
500000
0
1980
1990
2000
2010
2020
Year

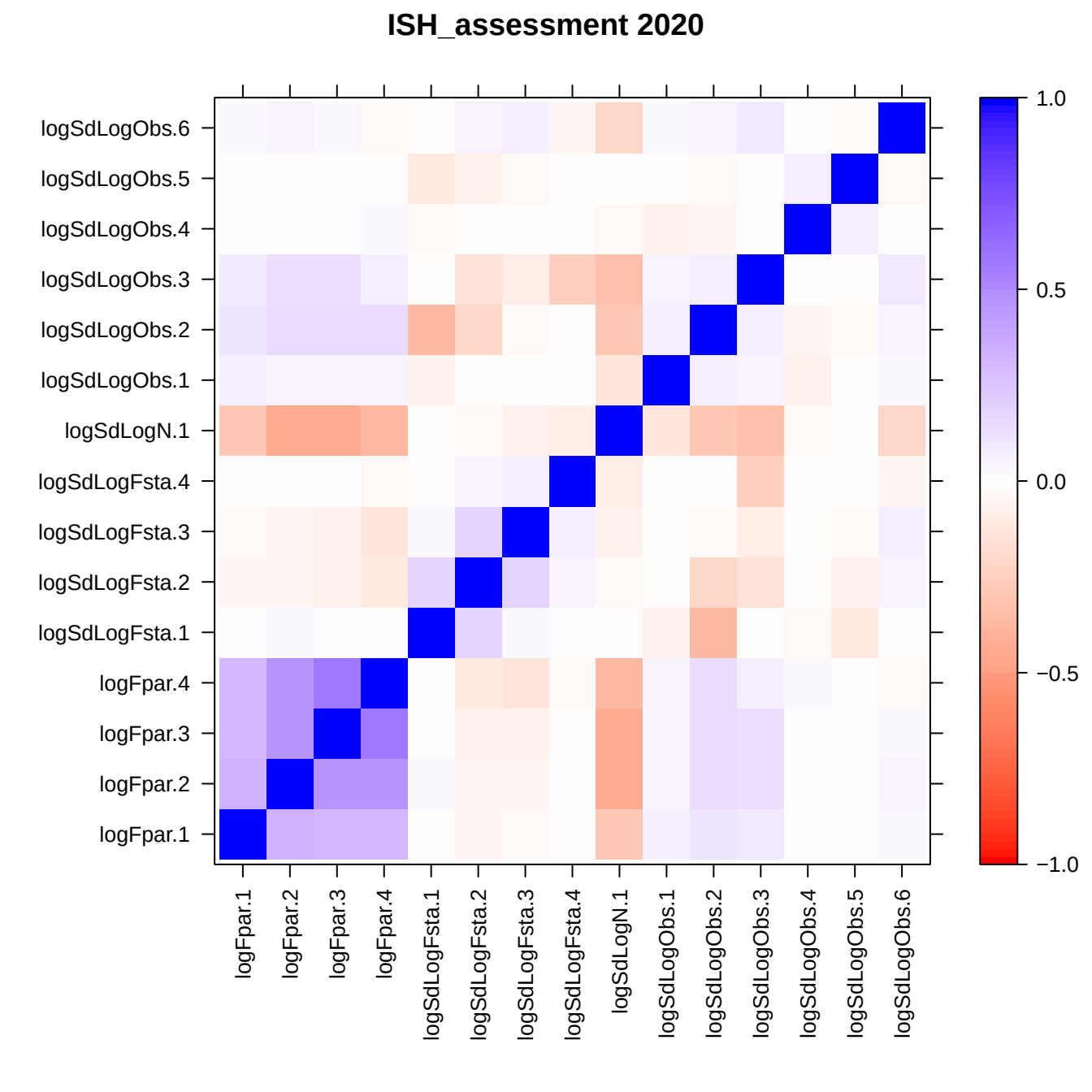

Uncertainties of key parameters
SSB
Fbar
Rec
CV of estimate
0.0
0.2
0.4
0.6
0.8
1980
1990
2000
2010
2020
Year


Survey catchability parameters
AC(VIIaN)
Catchability
3.5
3.0
2.5
2.0
1.5
2
4
6
8
Age


Observation variances by data source
Observation Variance
0.0
0.2
0.4
0.6
0.8
1.0
catch
AC(VIIaN)
VIIaNSpawn
catch 2
catch 3
catch 4
catch 5
catch 6
catch 7
catch 8
AC(VIIaN) 2
AC(VIIaN) 3
AC(VIIaN) 4
AC(VIIaN) 5
AC(VIIaN) 6
AC(VIIaN) 7
AC(VIIaN) 8
catch 1
AC(VIIaN) 1


Observation variance vs uncertainty
CV of estimate
Observation variance
0.08
0.10
0.12
0.14
0.16
0.4
0.5
0.6
0.7
0.8
0.9
AC(VIIaN)
catch 1
catch 2
catch 3
AC(VIIaN) 3
AC(VIIaN) 2


Selectivity of the Fishery by Pentad
1980's
1985's
1990's
1995's
2000's
2005's
2010's
2015's
2020's
F/Fbar
Age
0.0
0.5
1.0
1.5
2.0
2.5
2
4
6
8


ISH_assessment 2020
logSdLogObs.6
logSdLogObs.5
logSdLogObs.4
logSdLogObs.3
logSdLogObs.2
logSdLogObs.1
logSdLogN.1
logSdLogFsta.4
logSdLogFsta.3
logSdLogFsta.2
logSdLogFsta.1
logFpar.4
logFpar.3
logFpar.2
logFpar.1
logFpar.1
logFpar.2
logFpar.3
logFpar.4
logSdLogFsta.1
logSdLogFsta.2
logSdLogFsta.3
logSdLogFsta.4
logSdLogN.1
logSdLogObs.1
logSdLogObs.2
logSdLogObs.3
logSdLogObs.4
logSdLogObs.5
logSdLogObs.6
1.0
0.5
0.0
−0.5
−1.0