

File = y1995r9c1m2.5s111111\_000.dat

ASAP3 run on Tuesday, 22 Oct 2019 at 14:14:37

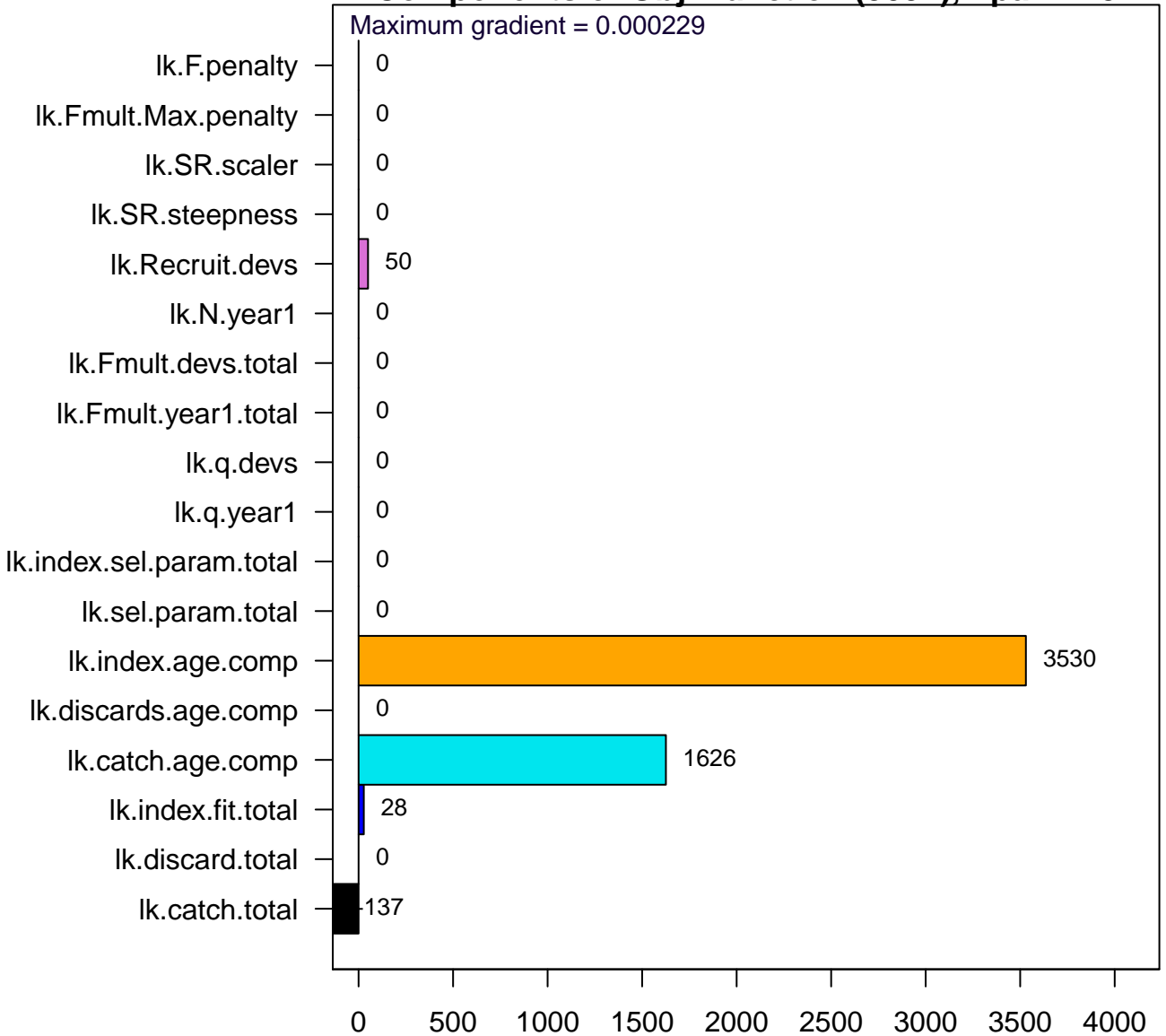
·s\chris.legault\Documents\Working\ICES–WKFORBIAS 2019\GBYT\Rose\wor

ASAPplots version = 0.2.14

npar = 118, maximum gradient = 0.000228896

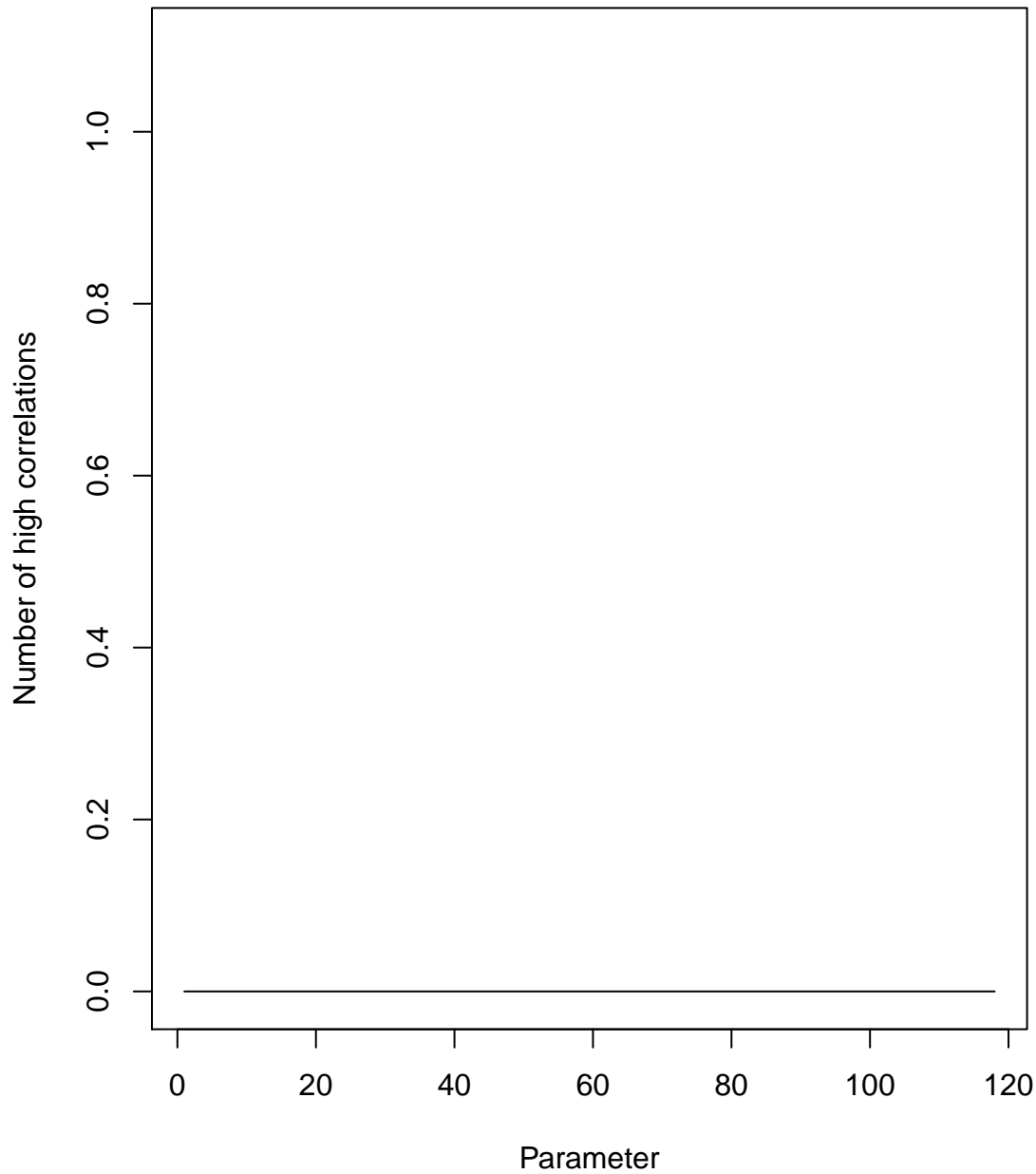
# Components of Obj. Function (5097), npar=118

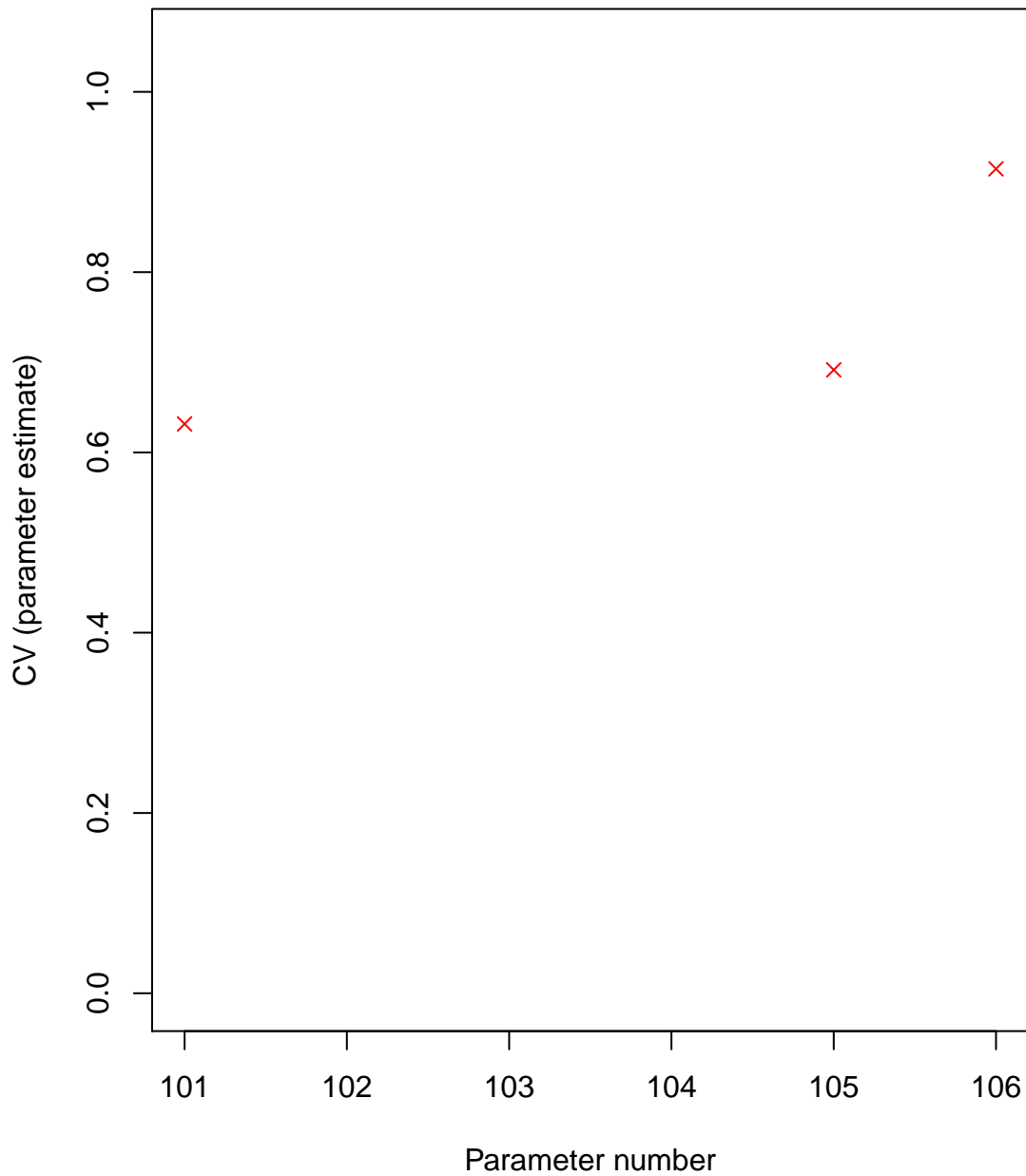
Maximum gradient = 0.000229



Likelihood Contribution

Model: y1995r9c1m2.5s111111\_000 Tuesday, 22 Oct 2019 at 14:14:3

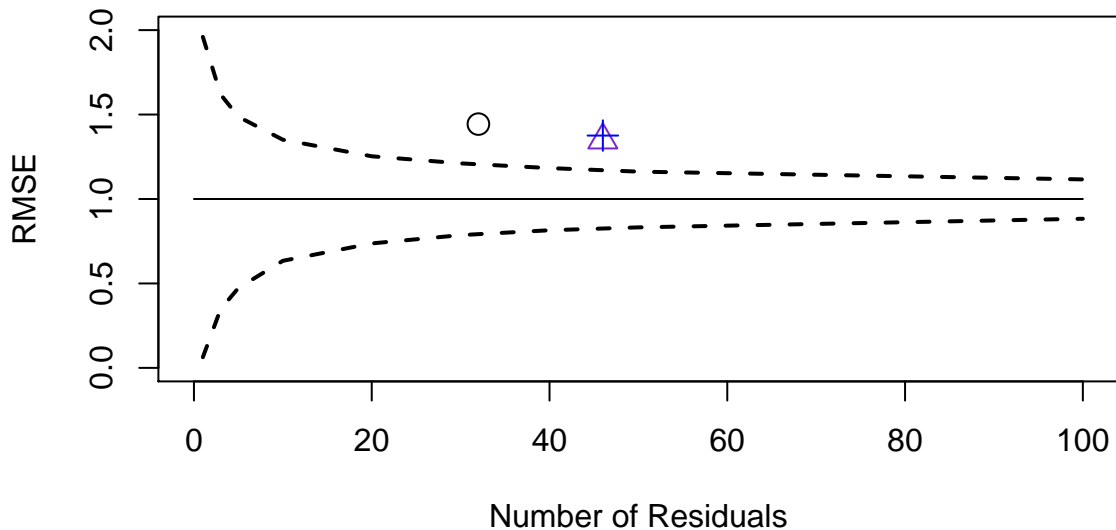




## Root Mean Square Error computed from Standardized Residuals

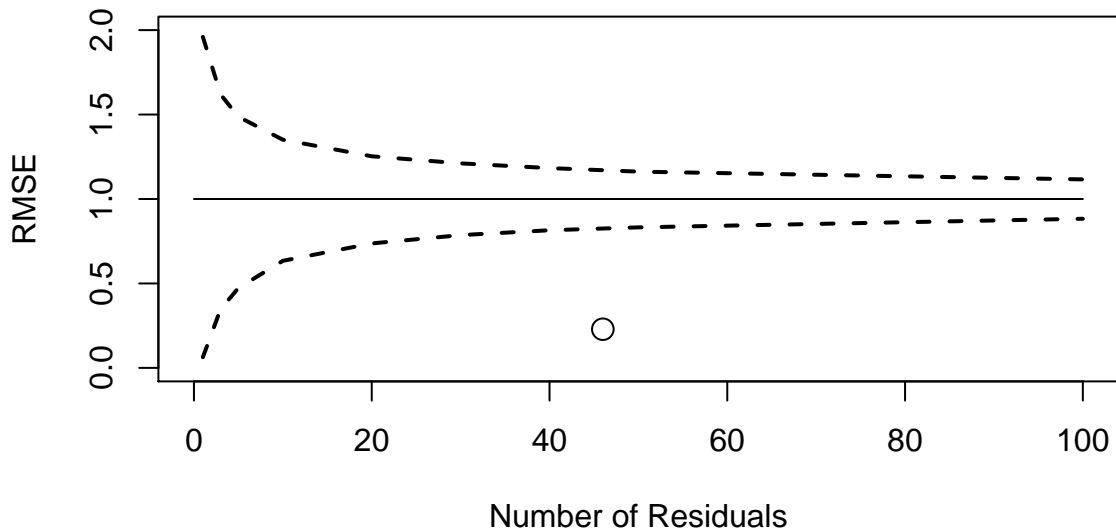
Component	# resids	RMSE
catch.tot	46	0.229
discard.tot	0	0
ind01	32	1.44
ind02	46	1.35
ind03	46	1.38
ind.total	124	1.38
N.year1	0	0
Fmult.year1	0	0
Fmult.devs.total	0	0
recruit.devs	46	1.83
fleet.sel.params	0	0
index.sel.params	0	0
q.year1	0	0
q.devs	0	0
SR.steepness	0	0
SR.scaler	0	0

Root Mean Square Error for Indices



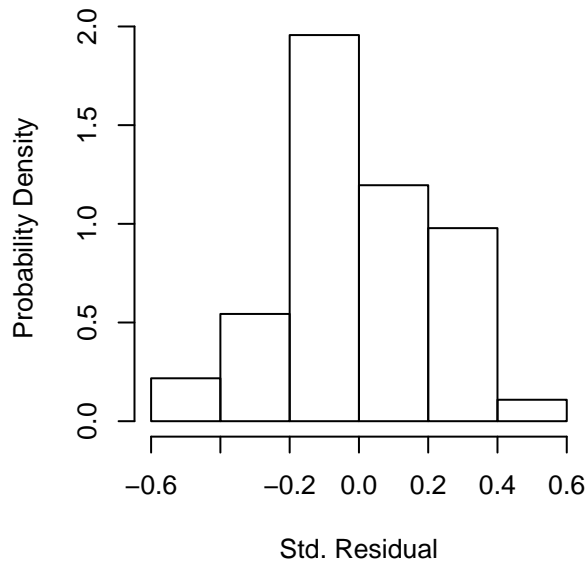
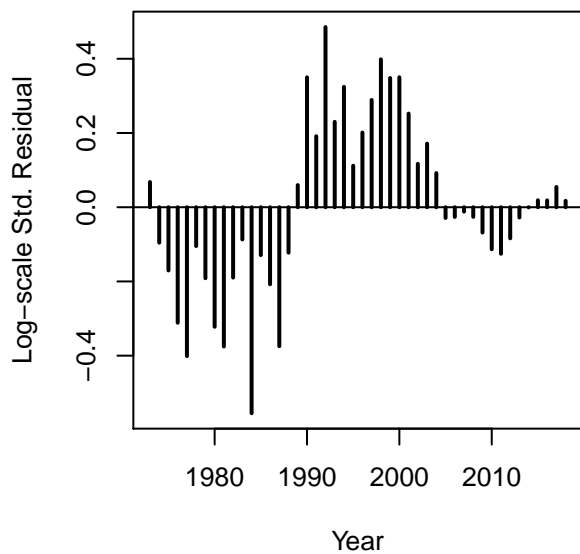
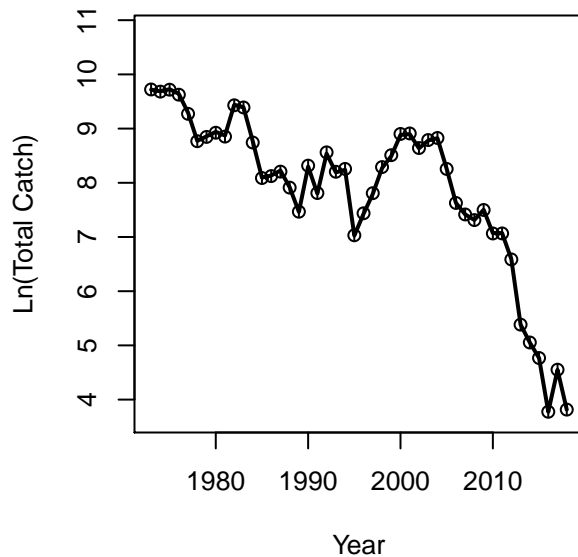
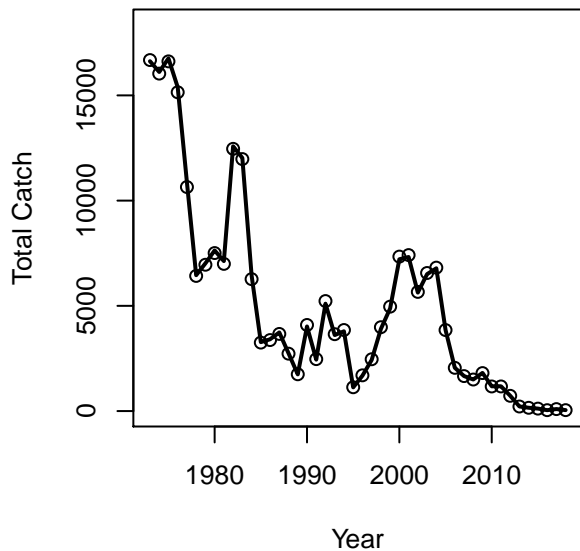
ind total  
INDEX-3  
INDEX-2  
INDEX-1

## Root Mean Square Error for Catch



○ catch.tot

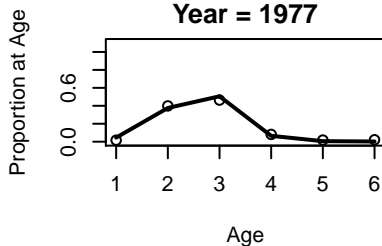
# Fleet 1 Catch (FLEET-1)



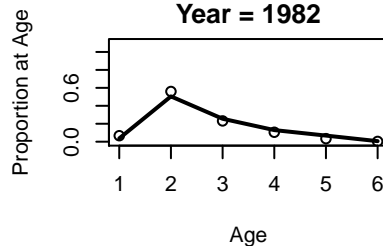


# Catch

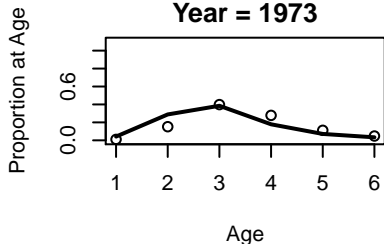
Year = 1977



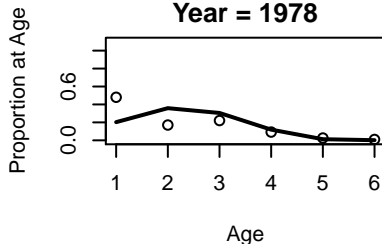
Year = 1982



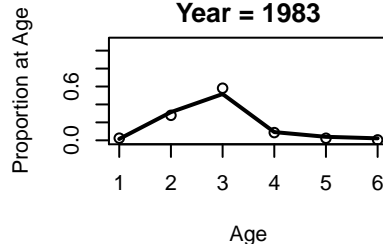
Year = 1973



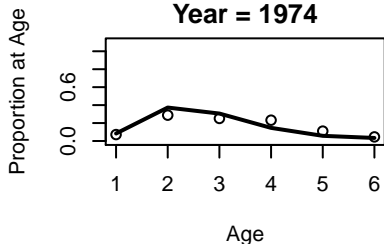
Year = 1978



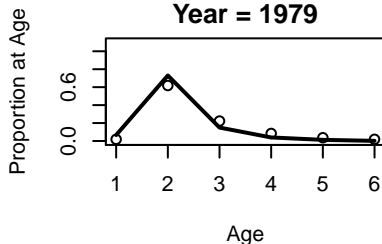
Year = 1983



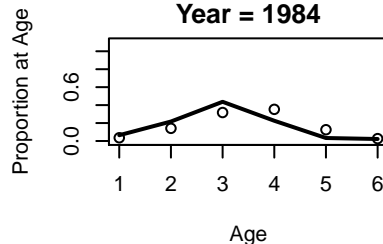
Year = 1974



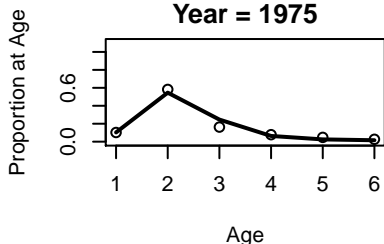
Year = 1979



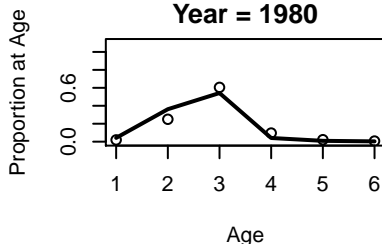
Year = 1984



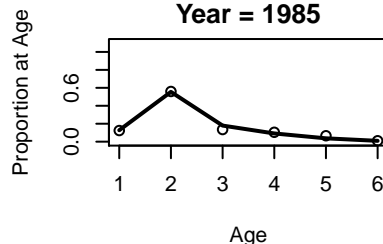
Year = 1975



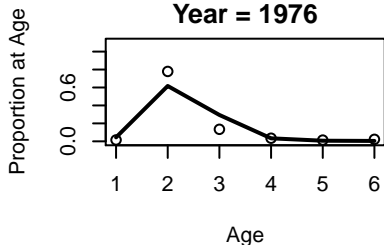
Year = 1980



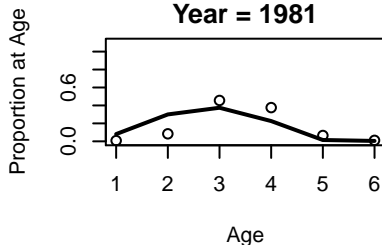
Year = 1985



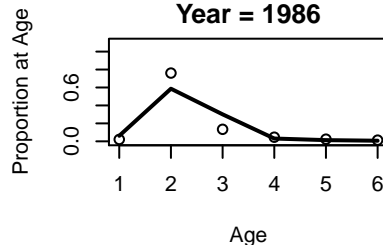
Year = 1976



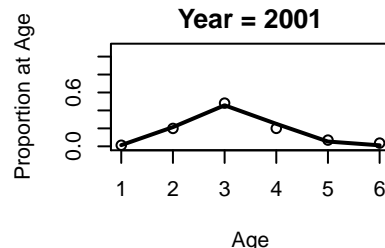
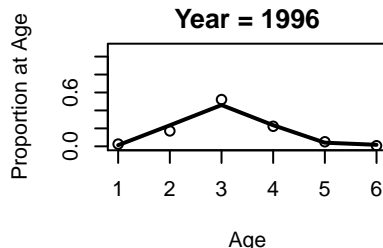
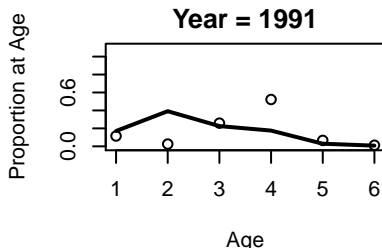
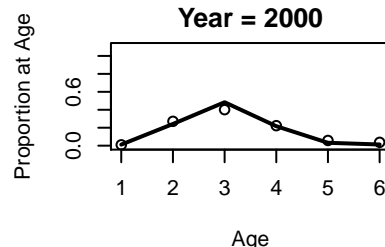
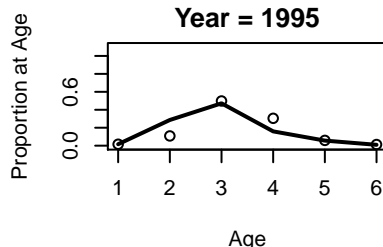
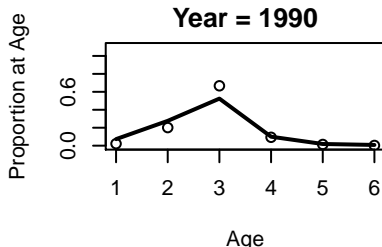
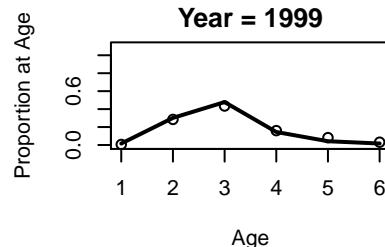
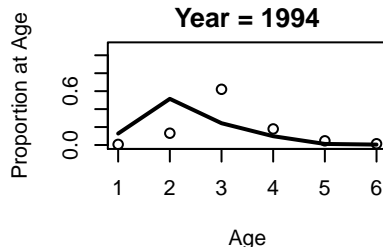
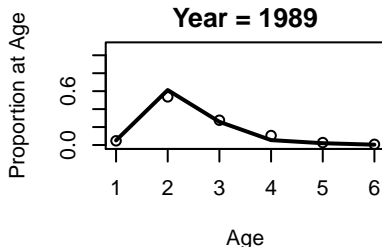
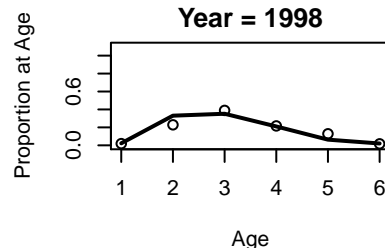
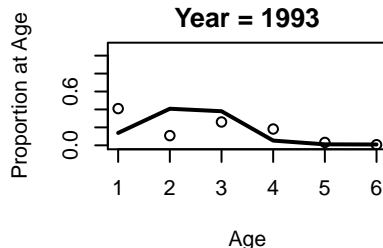
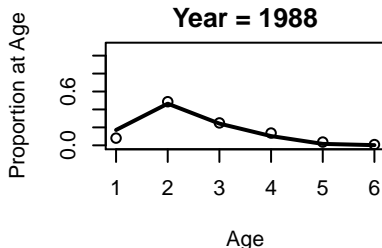
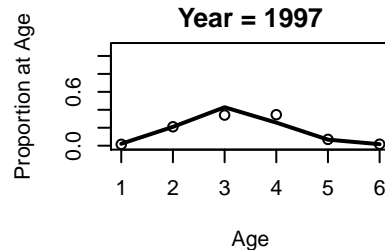
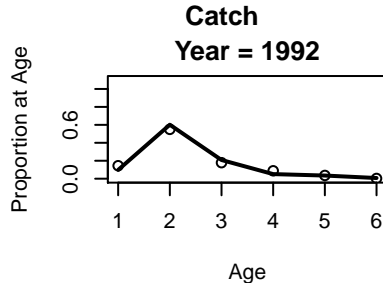
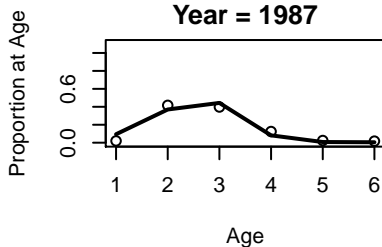
Year = 1981



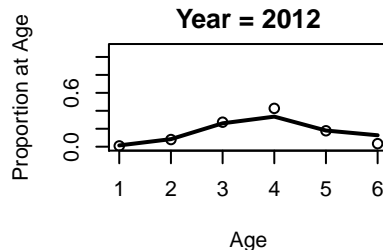
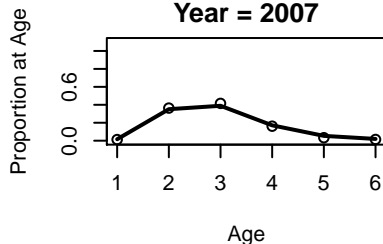
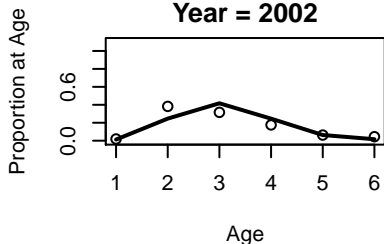
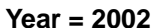
Year = 1986



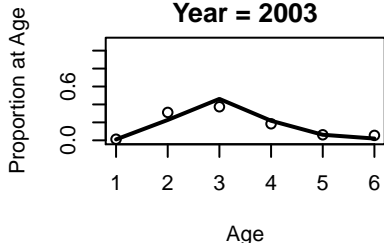
Fleet 1  
FLEET-1  
↓



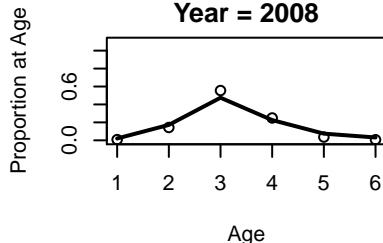
**Year = 2007**



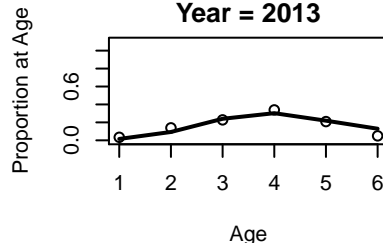
**Year = 2003**



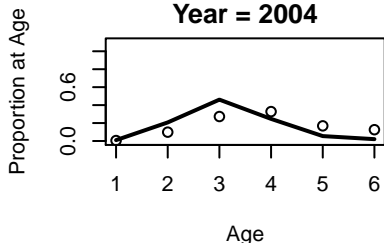
**Year = 2008**



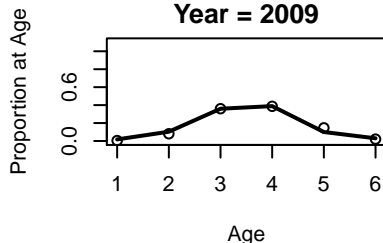
**Year = 2013**



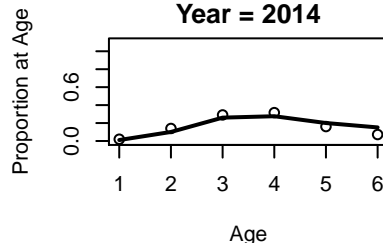
**Year = 2004**



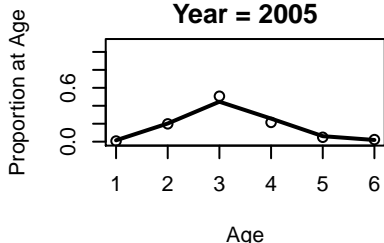
**Year = 2009**



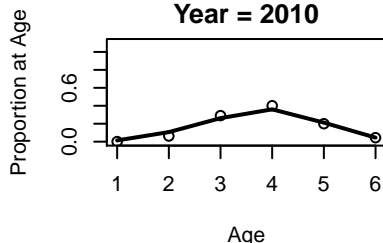
**Year = 2014**



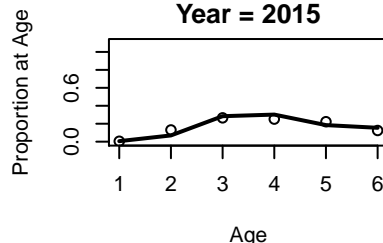
**Year = 2005**



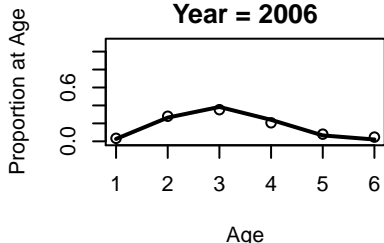
**Year = 2010**



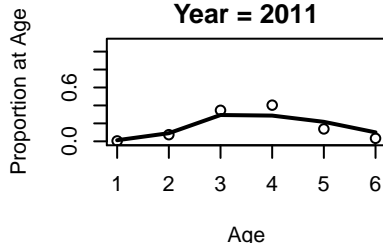
**Year = 2015**



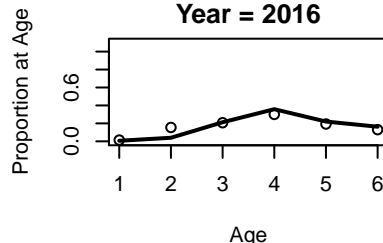
**Year = 2006**



**Year = 2011**

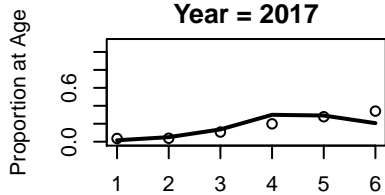


**Year = 2016**

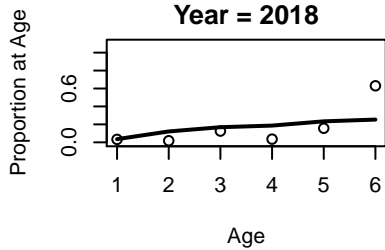


## Catch

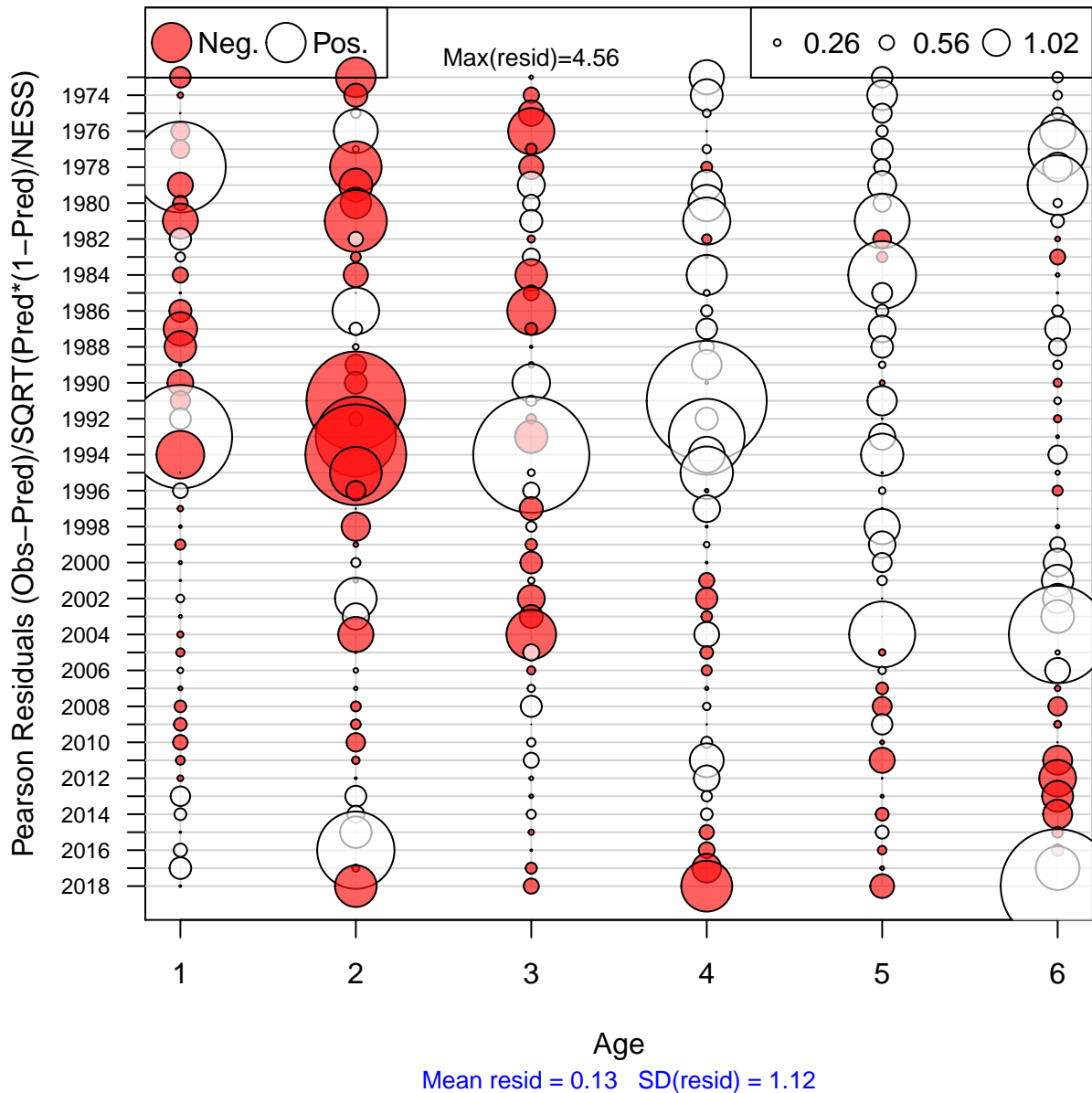
Year = 2017



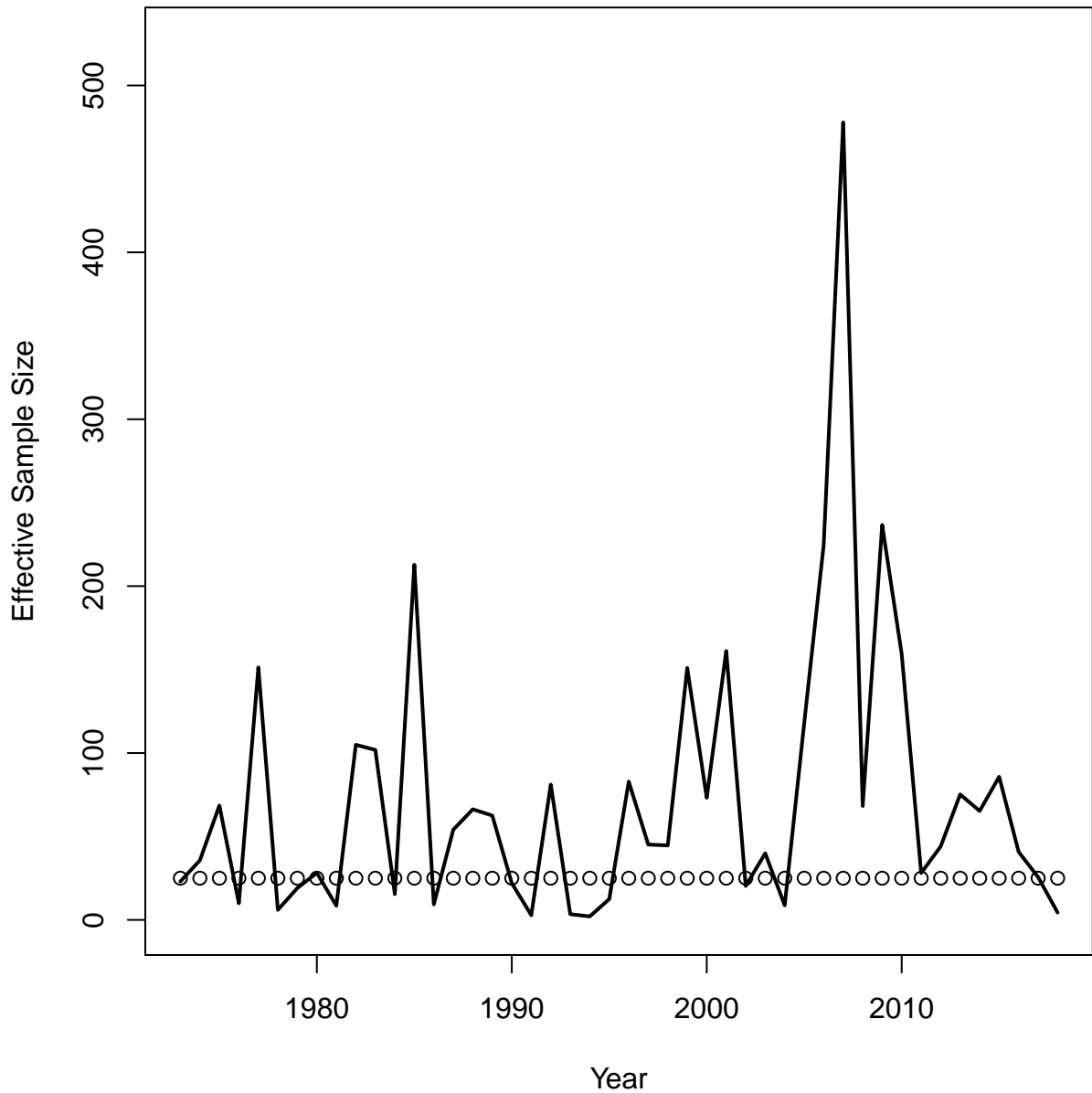
Year = 2018



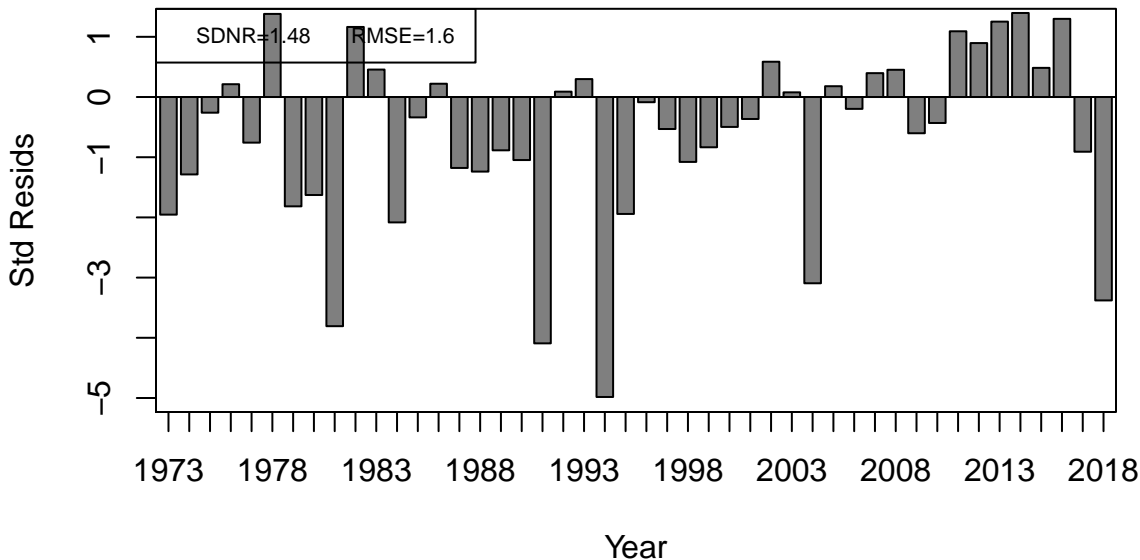
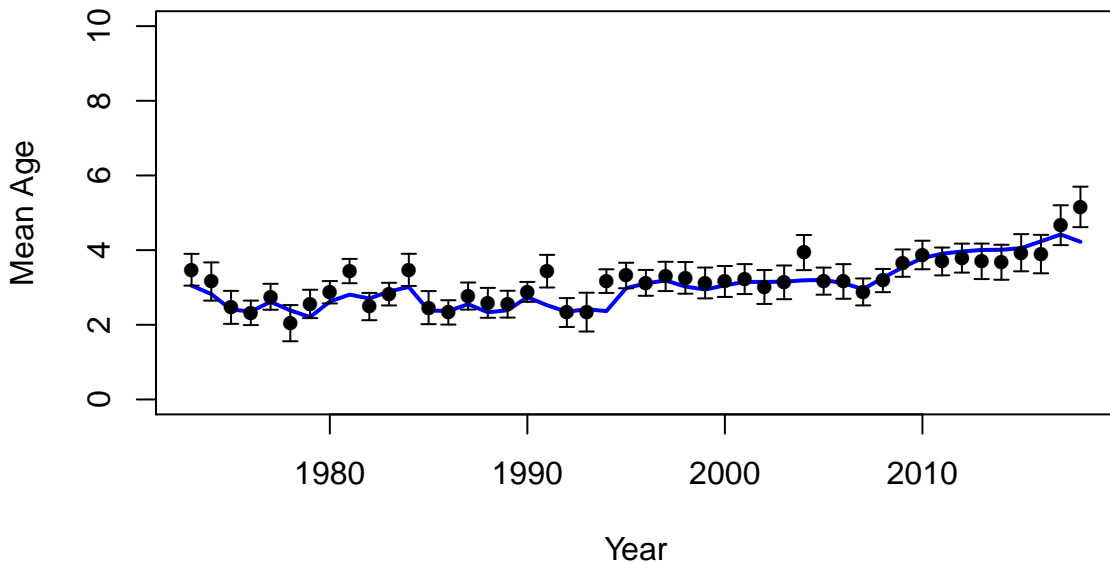
# Age Comp Residuals for Catch by Fleet 1 (FLEET-1)



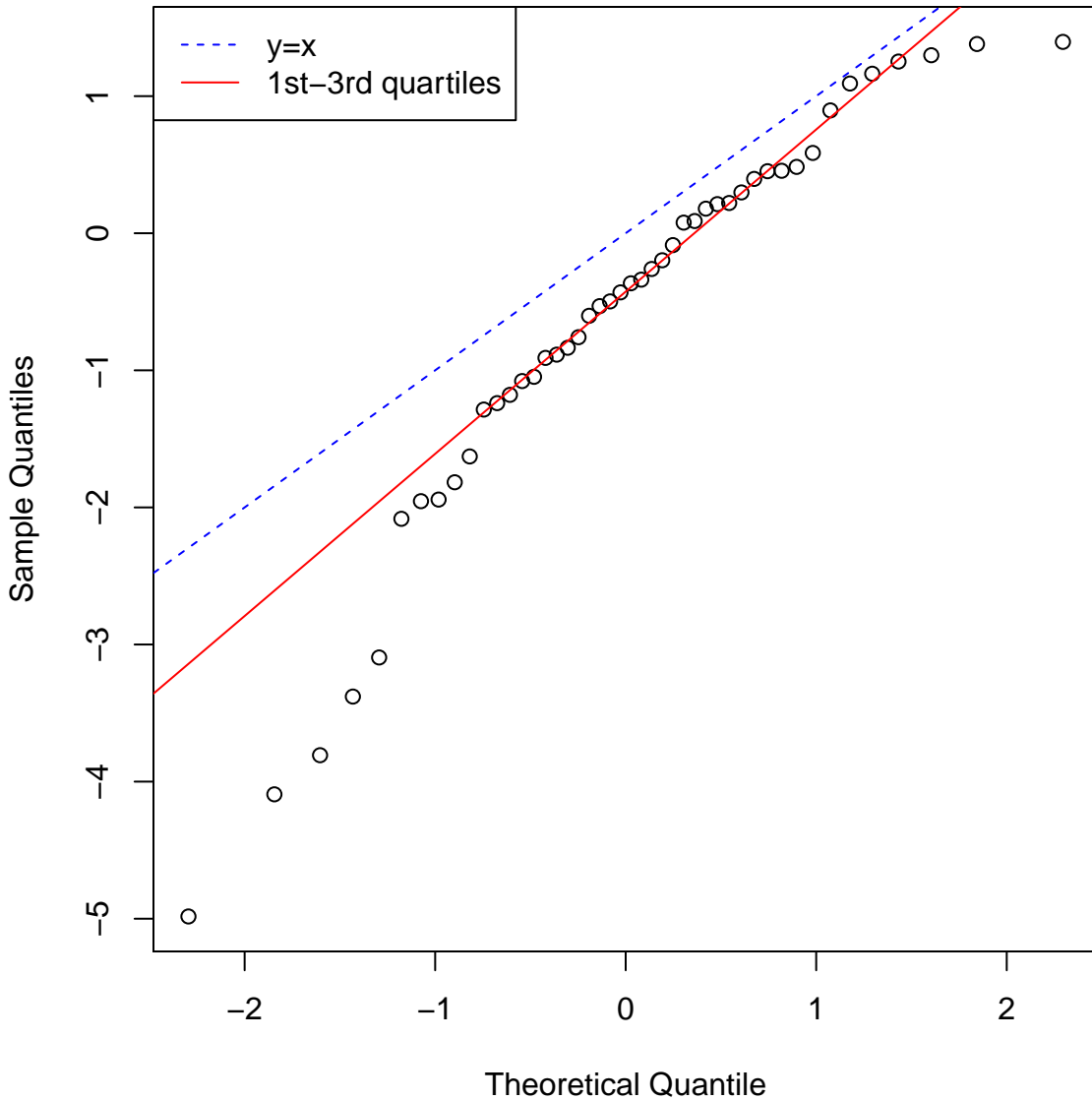
# Catch Neff Fleet 1 (FLEET-1)



# Catch Fleet 1 (FLEET-1) ESS = 25

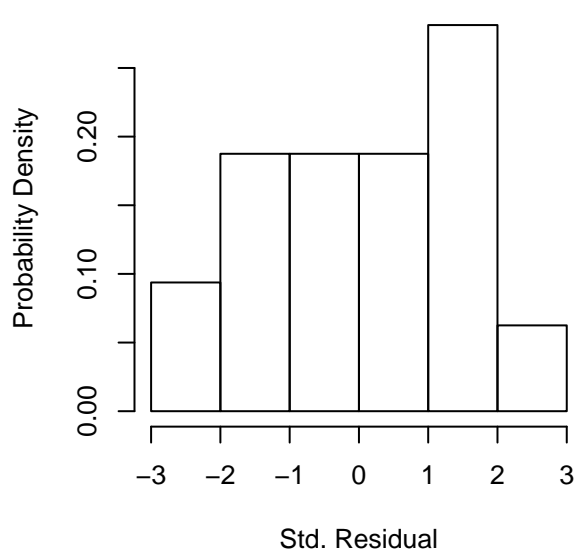
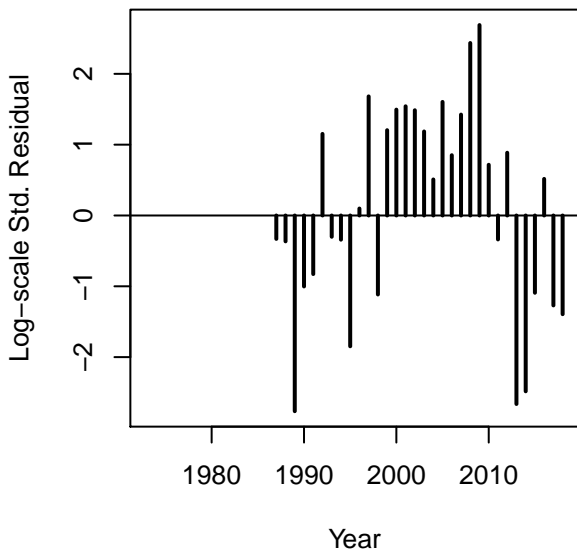
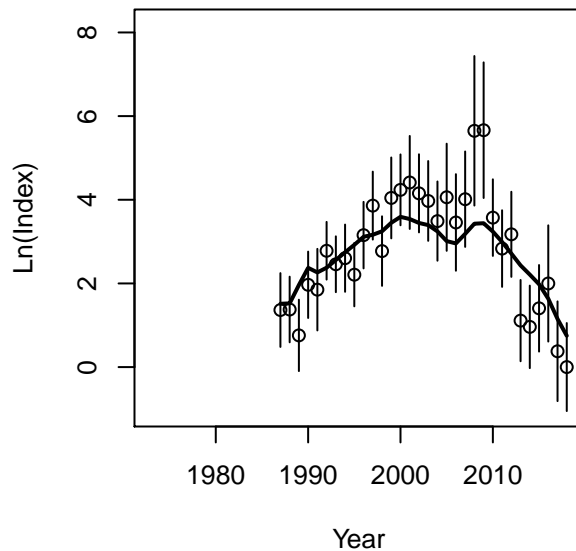
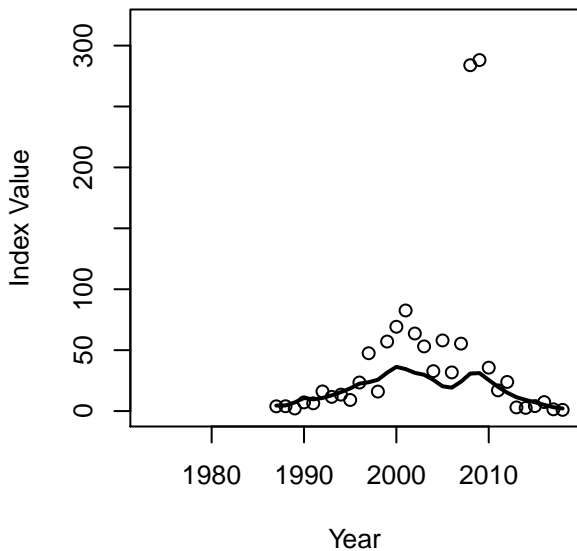


# Catch Fleet 1 (FLEET-1) ESS = 25

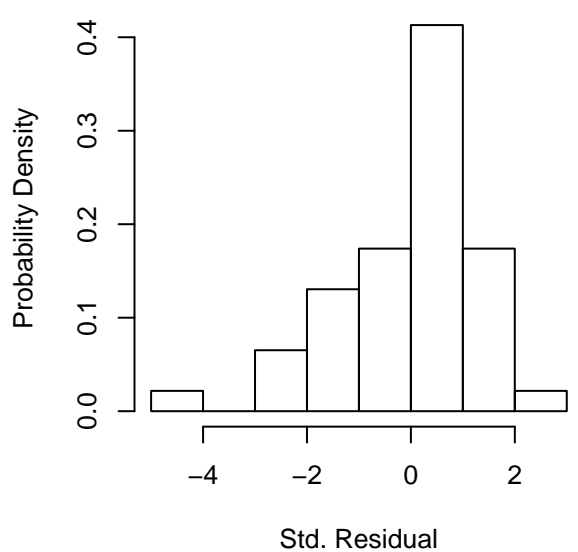
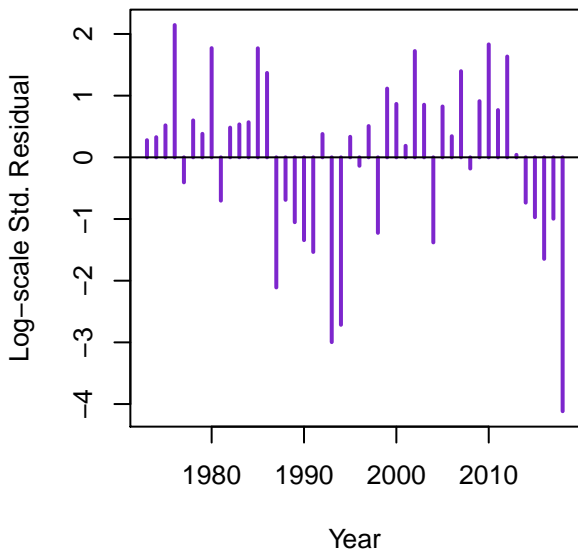
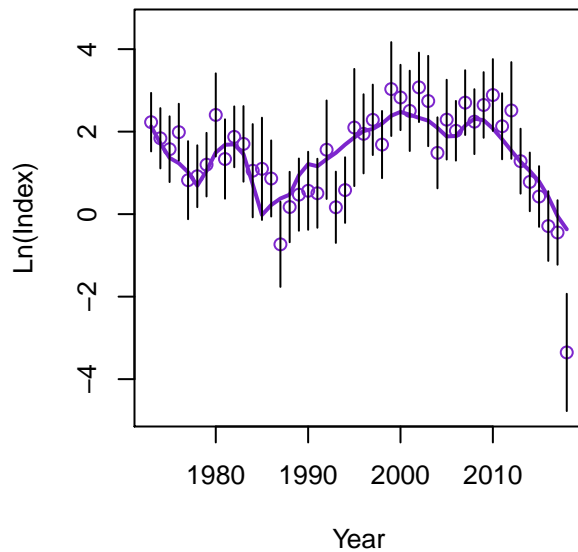
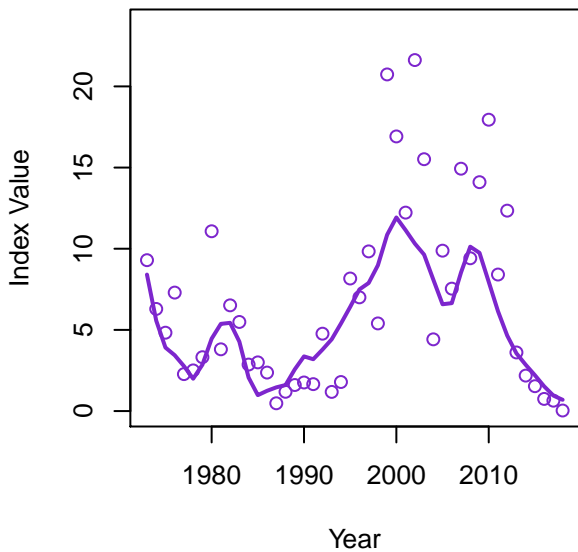




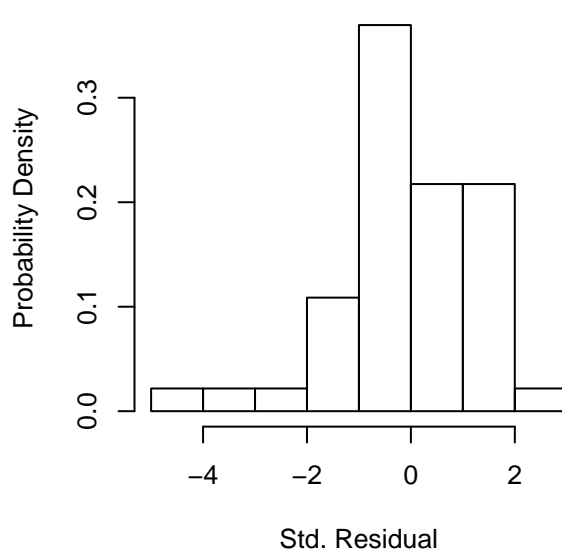
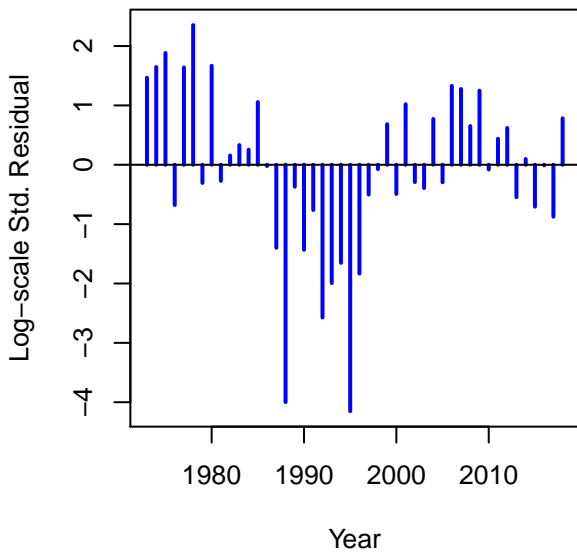
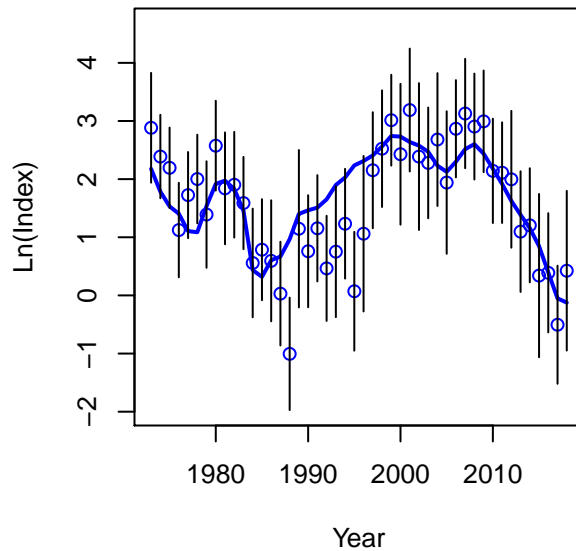
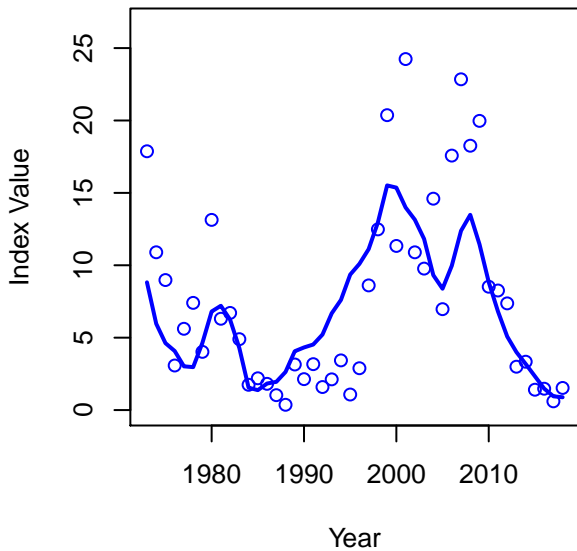
Index 1 (INDEX-1)



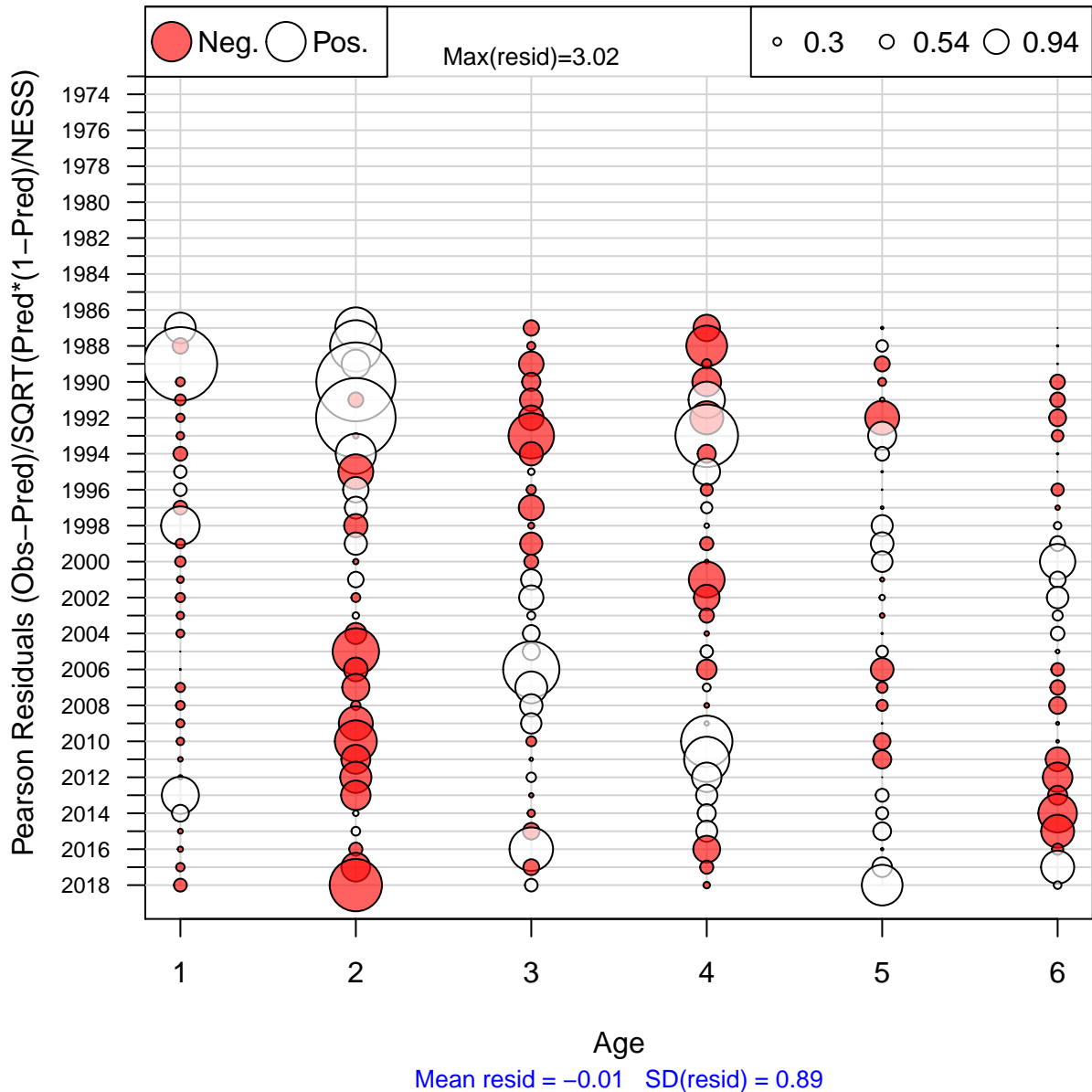
## Index 2 (INDEX-2)



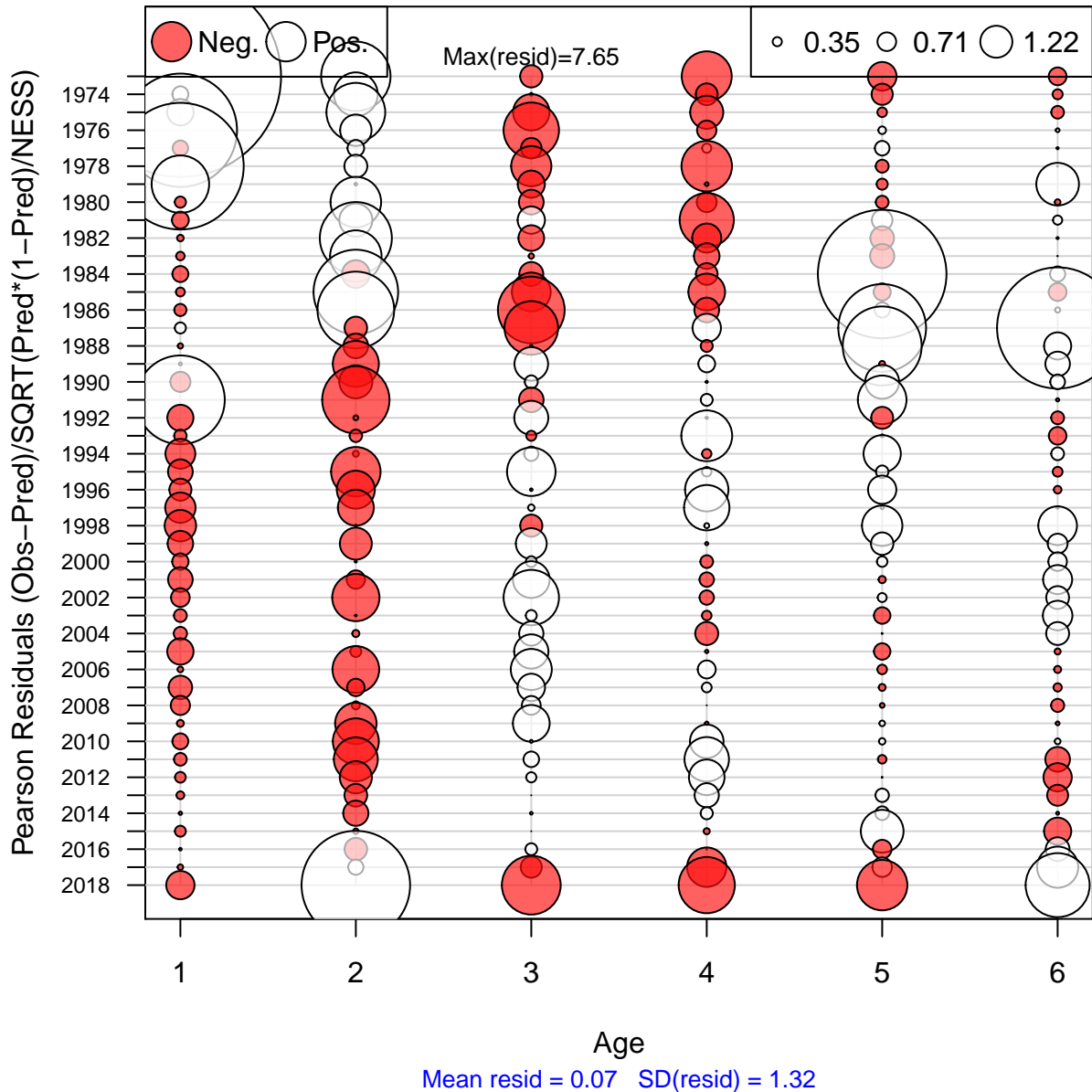
Index 3 (INDEX-3)



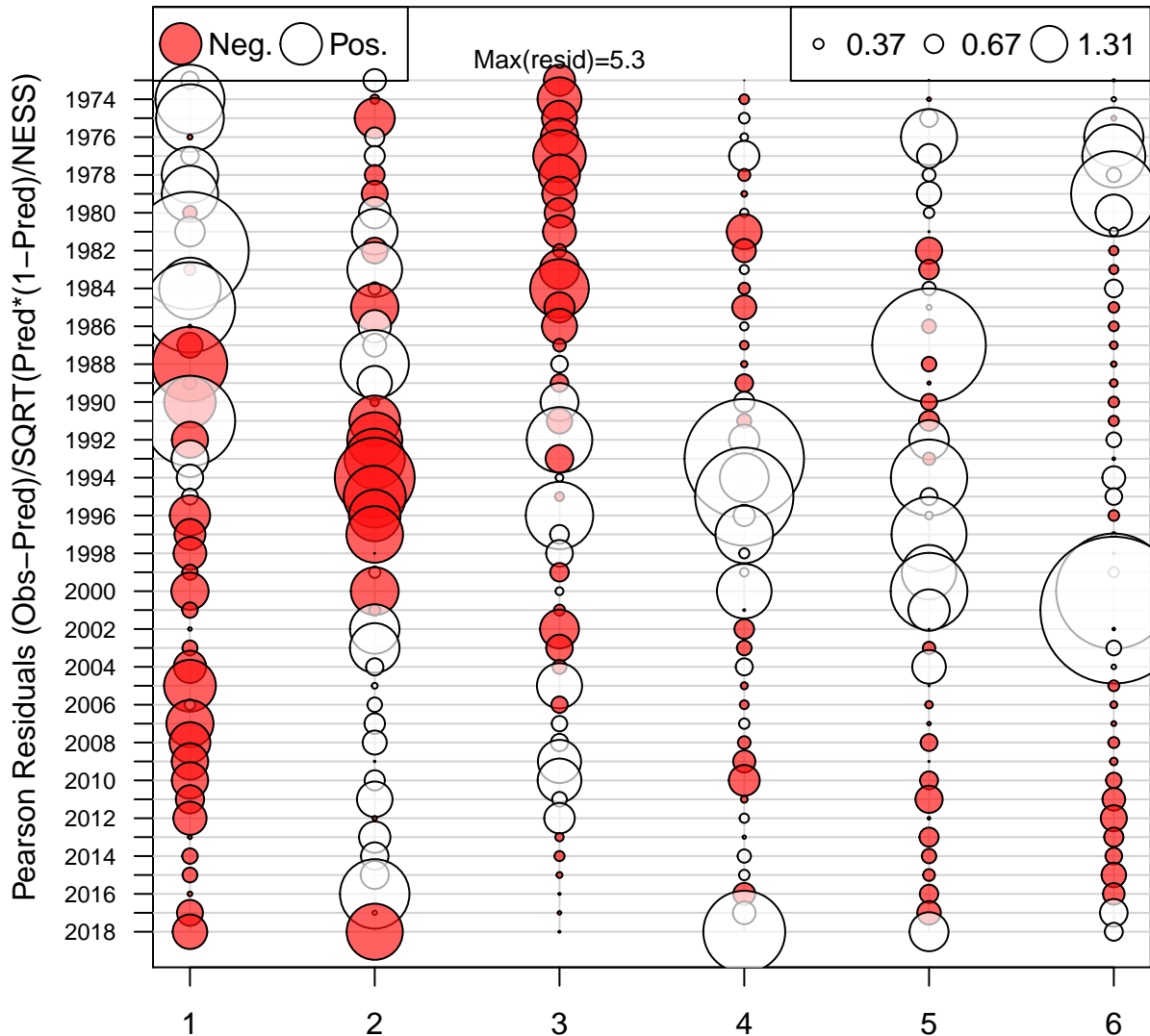
# Age Comp Residuals for Index 1 (INDEX-1)



## Age Comp Residuals for Index 2 (INDEX-2)

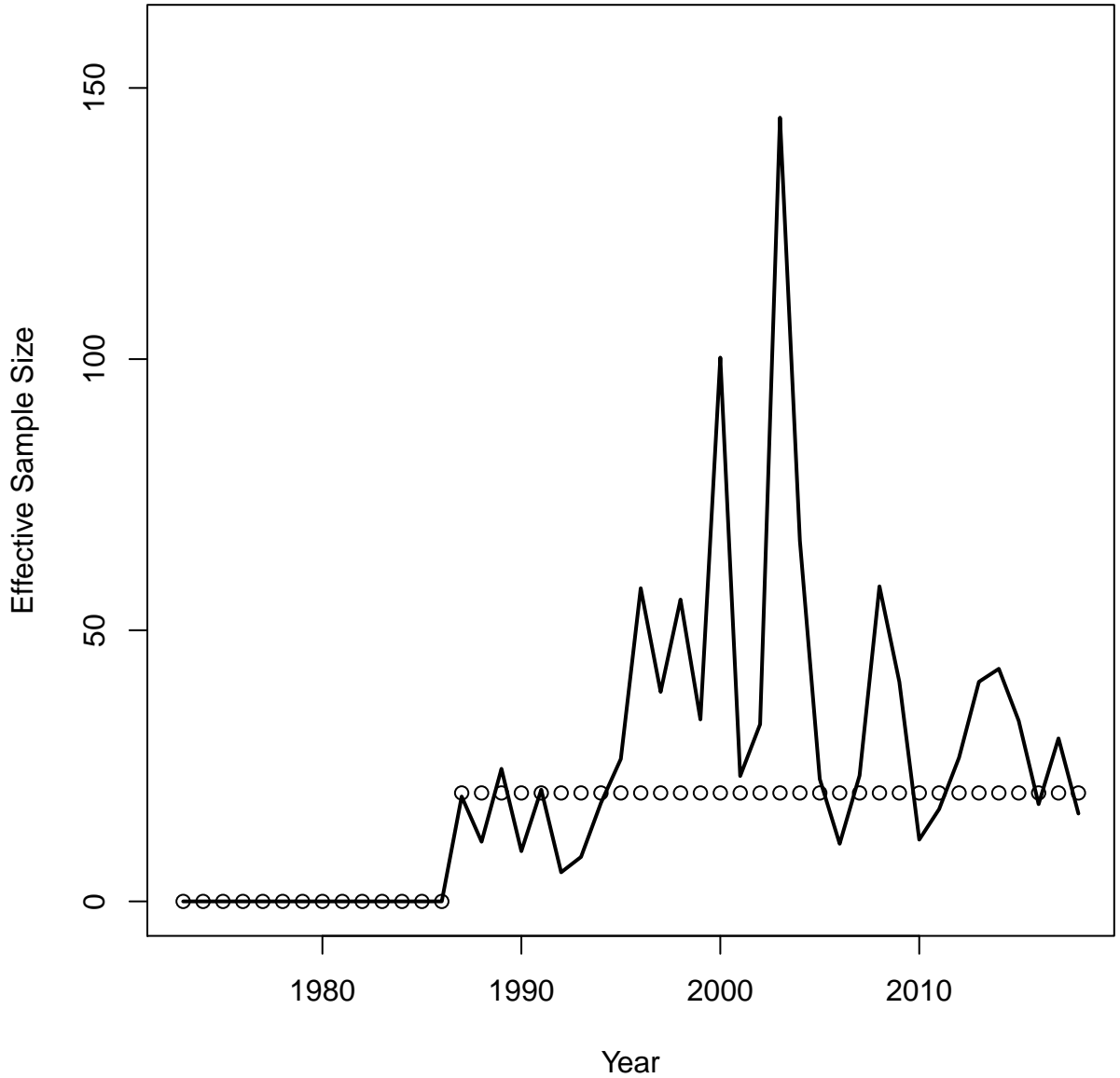


# Age Comp Residuals for Index 3 (INDEX-3)

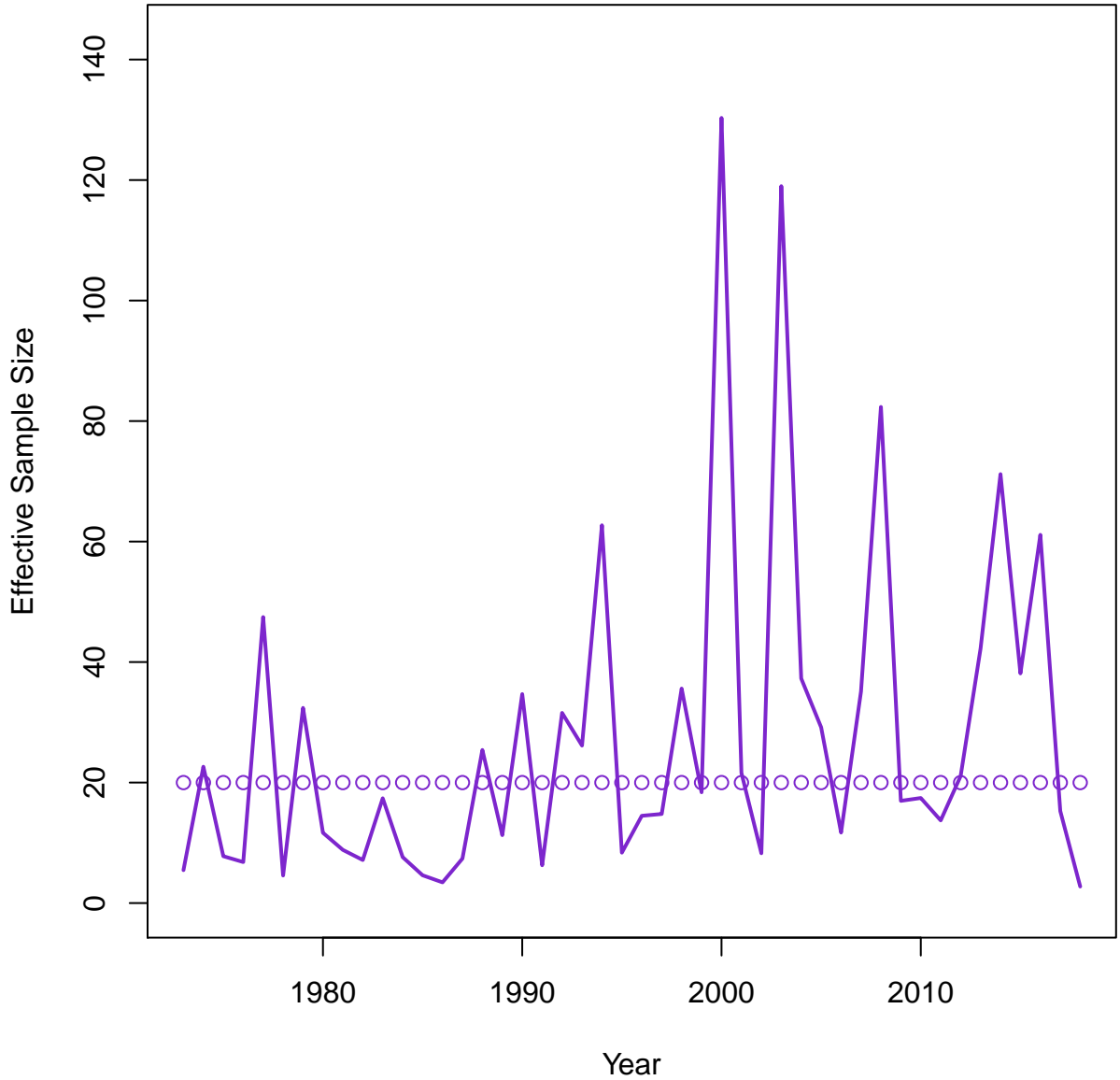


Mean resid = 0.12 SD(resid) = 1.29

# Index Neff 1 (INDEX-1)

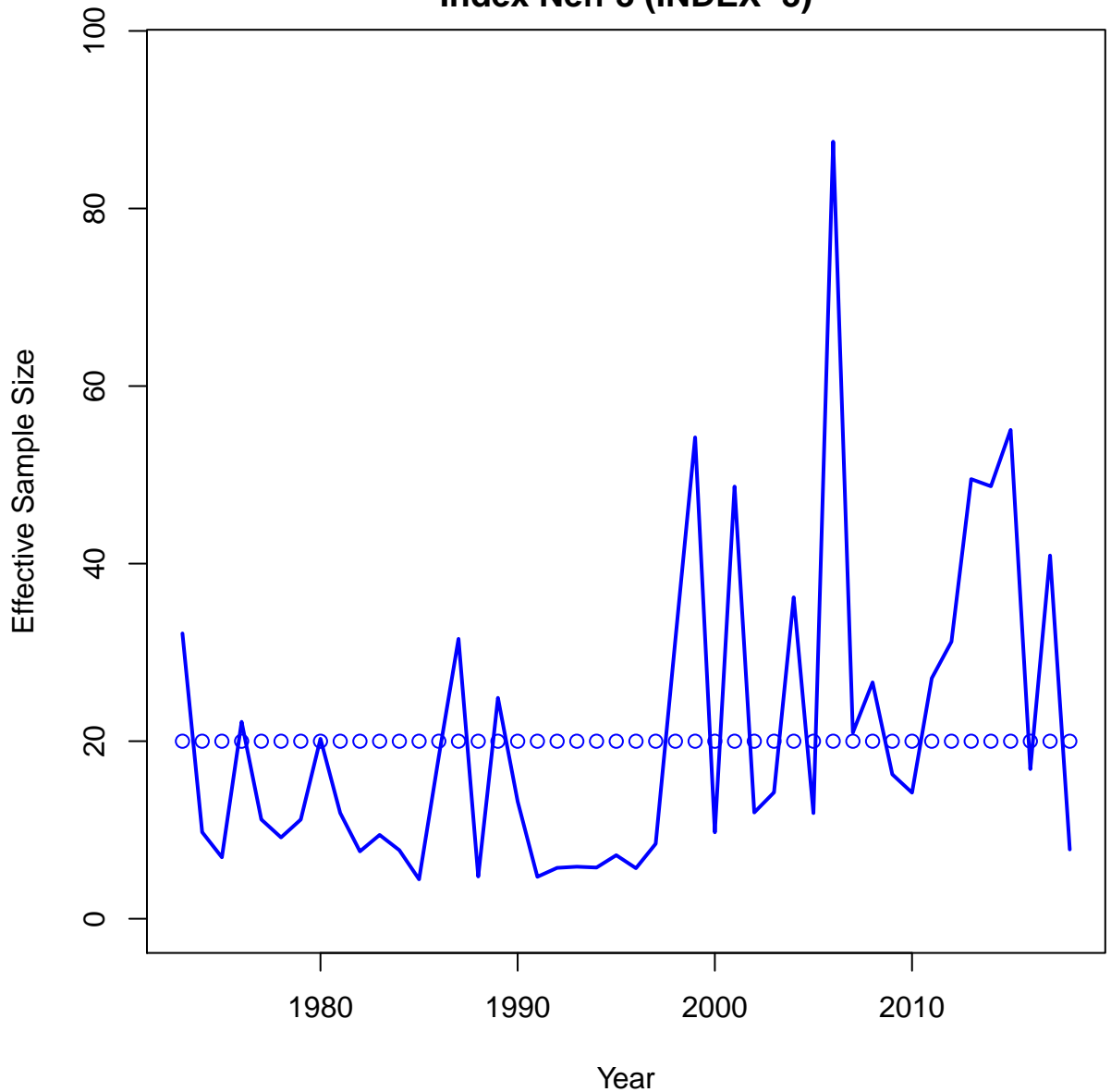


## Index Neff 2 (INDEX-2)

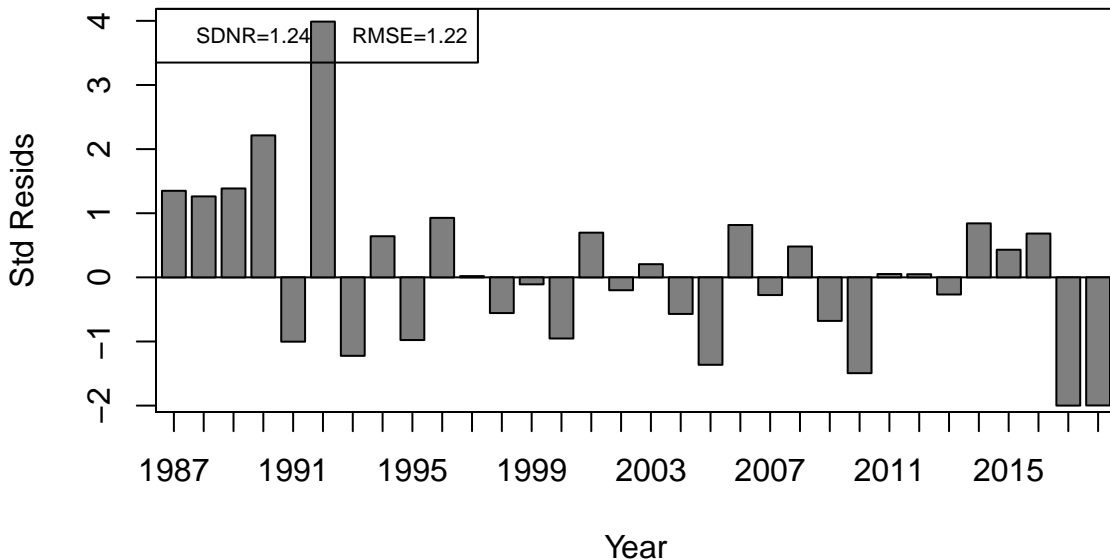
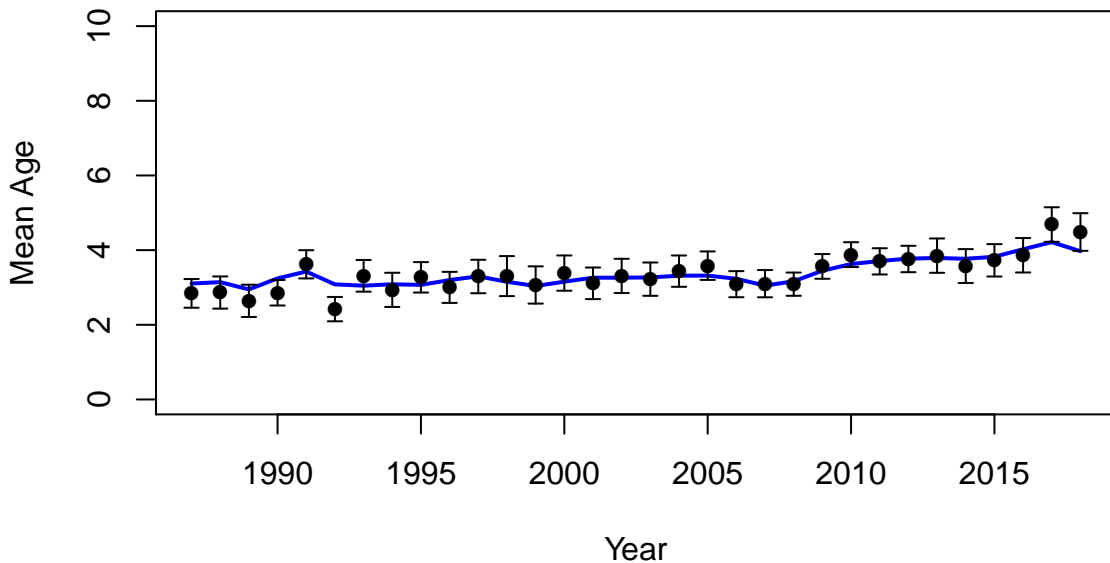




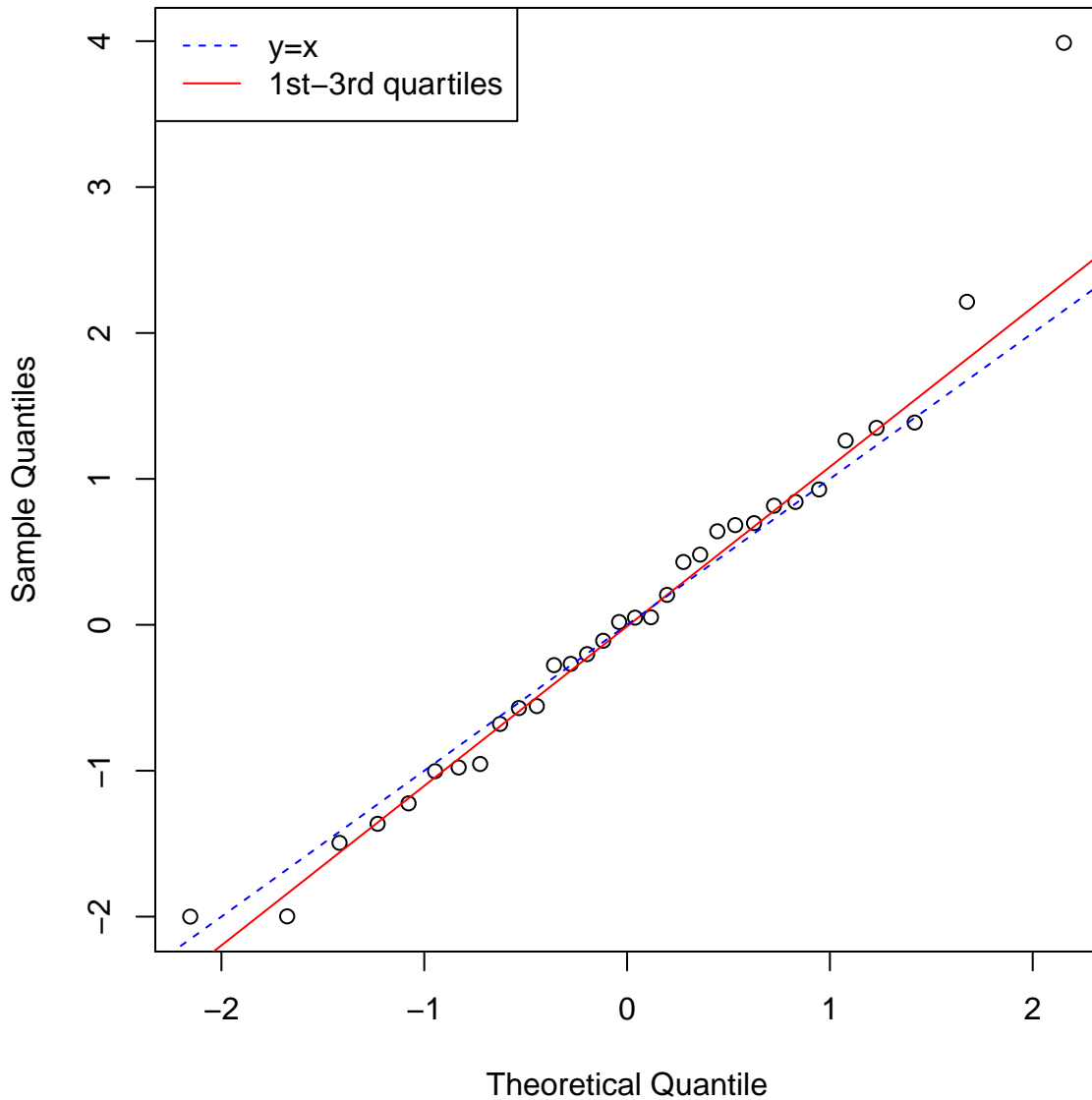
# Index Neff 3 (INDEX-3)



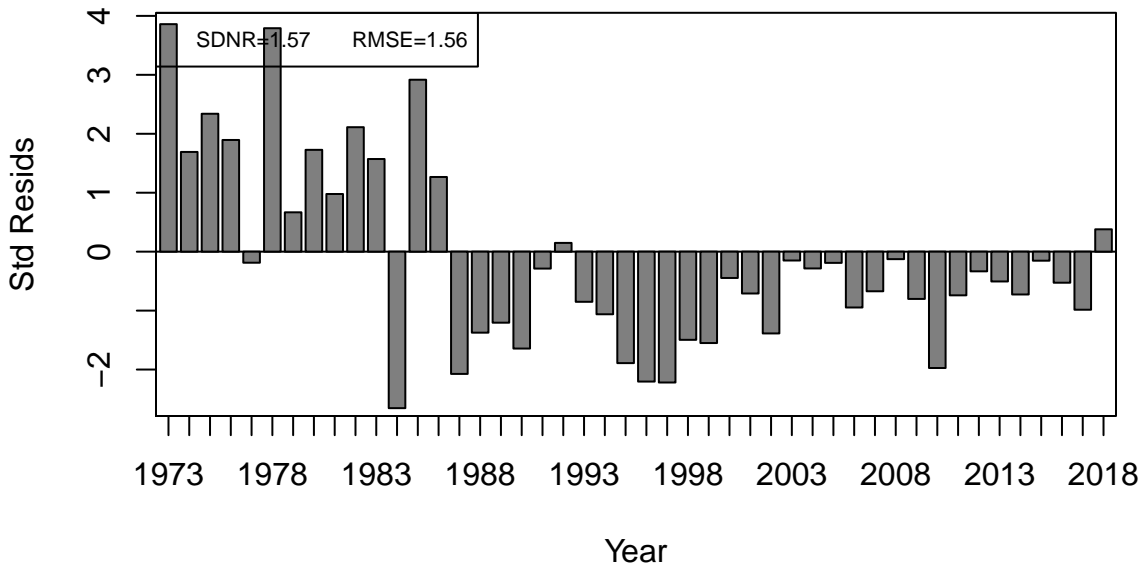
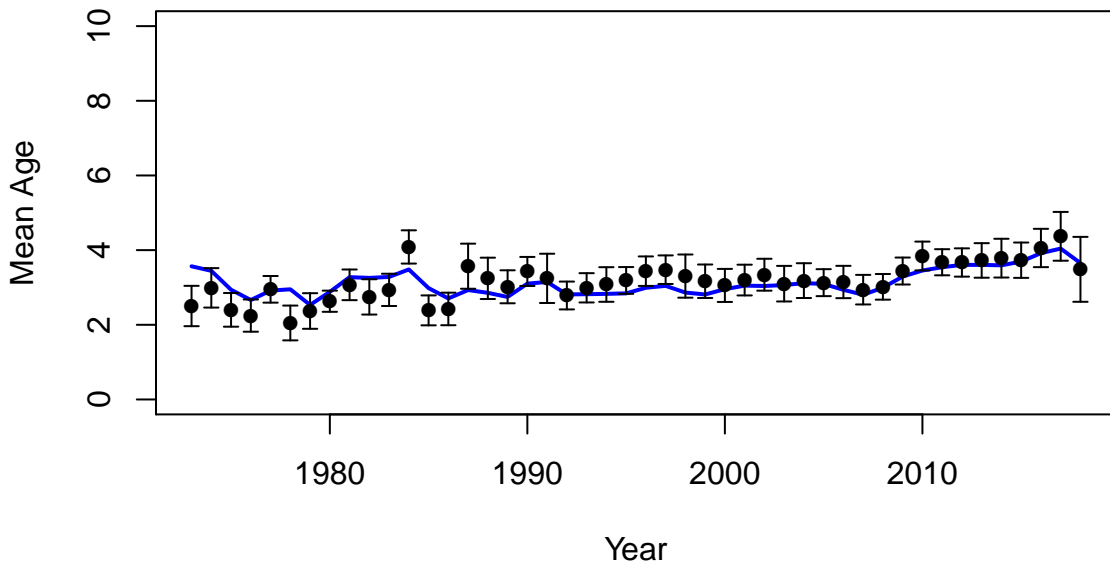
# Index 1 (INDEX-1) ESS = 20



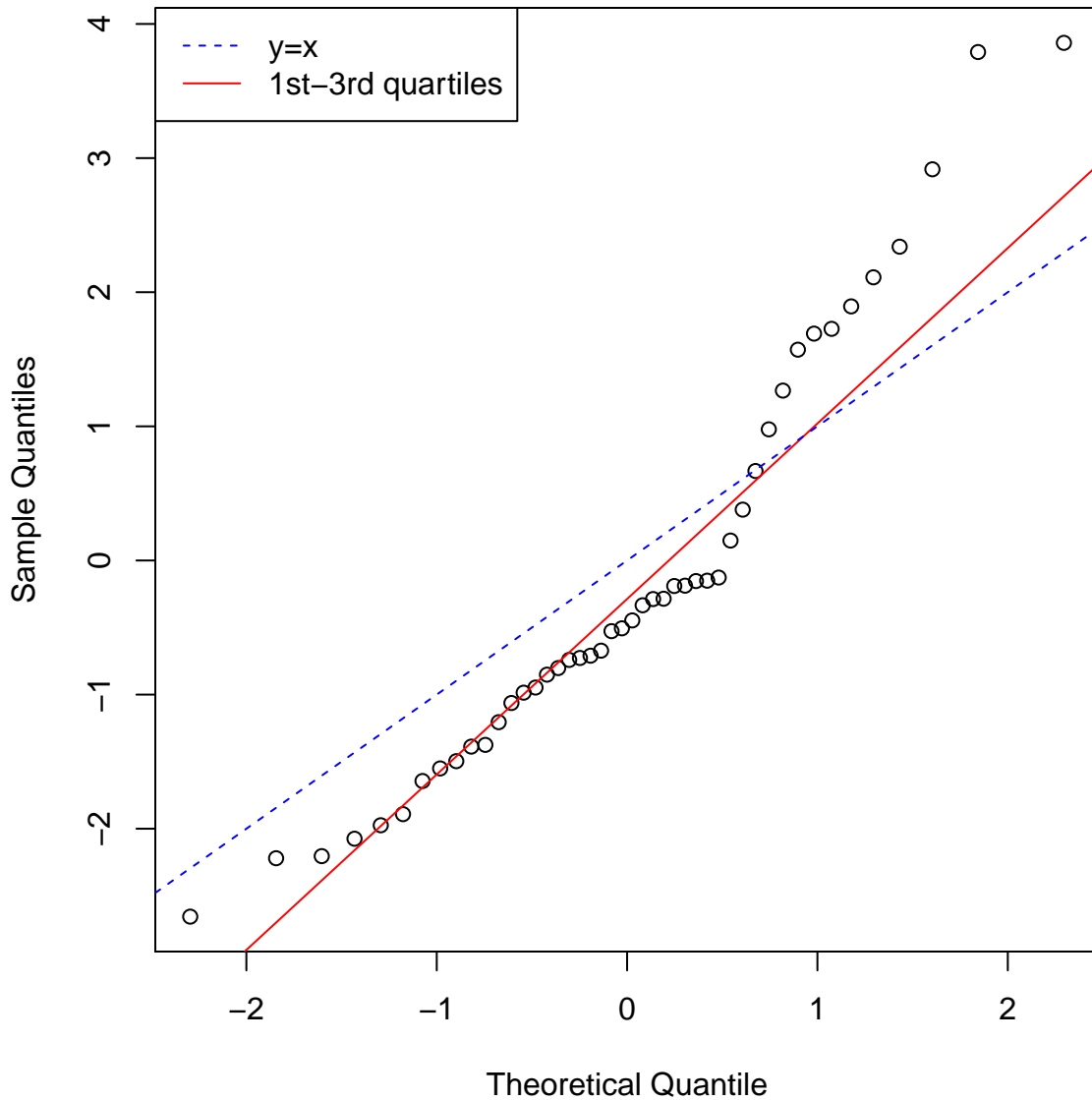
# Index 1 (INDEX-1) ESS = 20



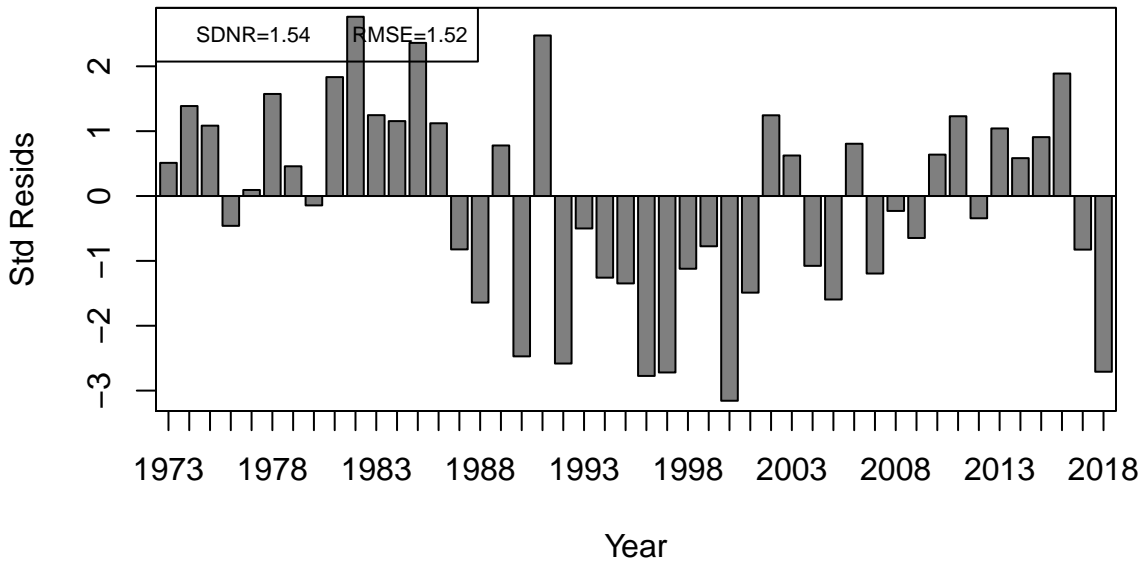
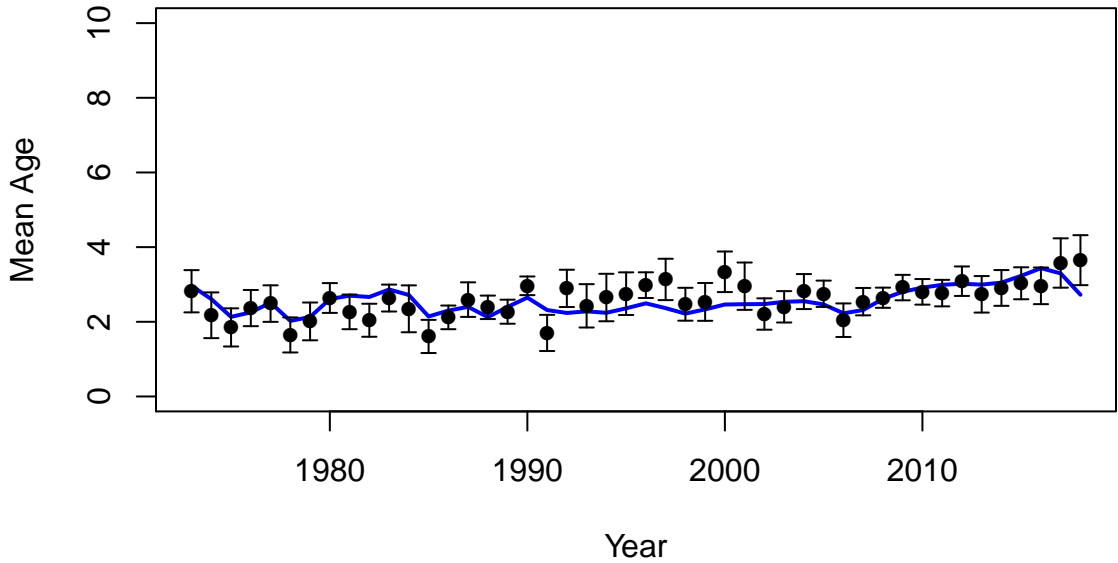
## Index 2 (INDEX-2) ESS = 20



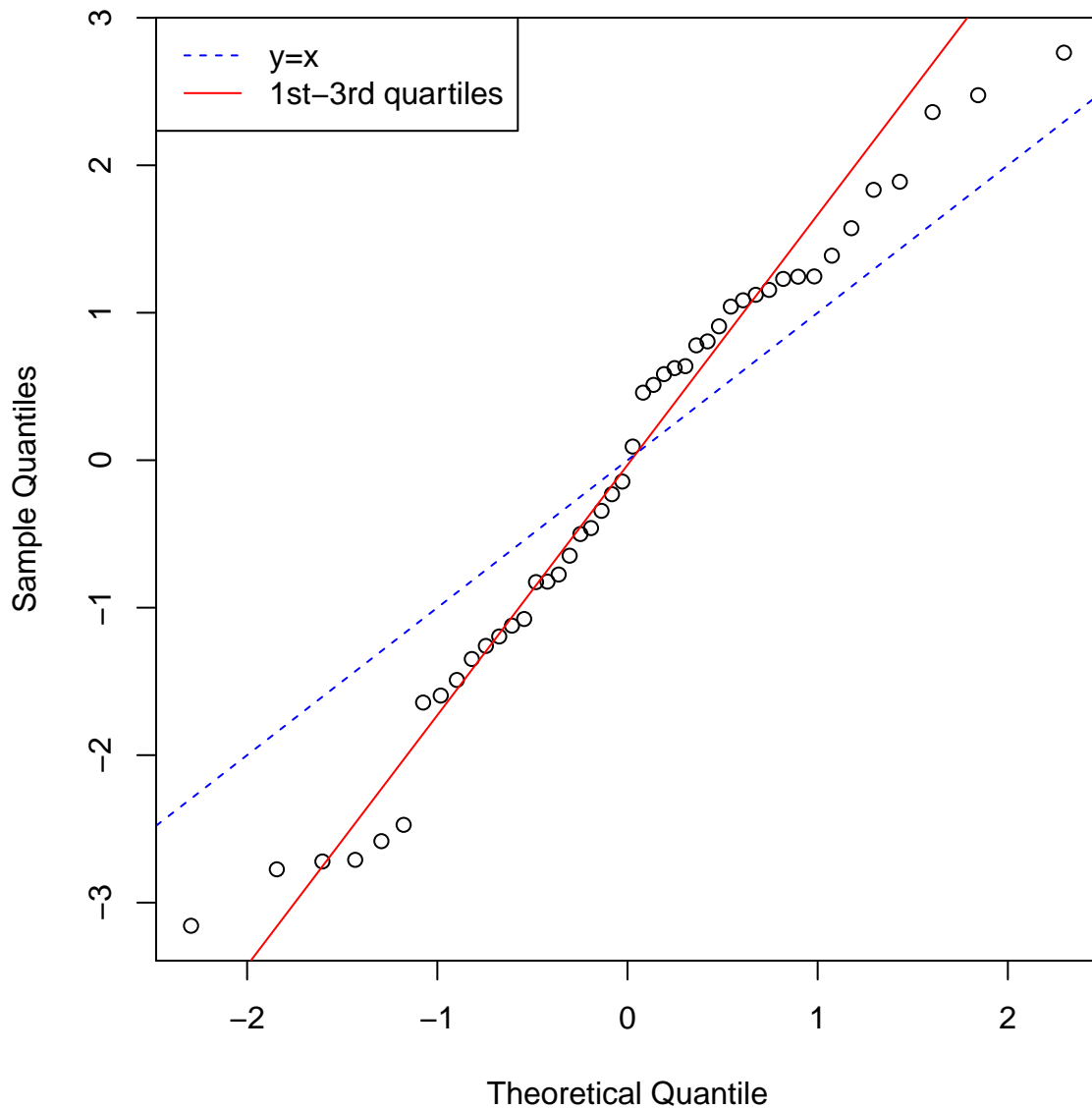
## Index 2 (INDEX-2) ESS = 20



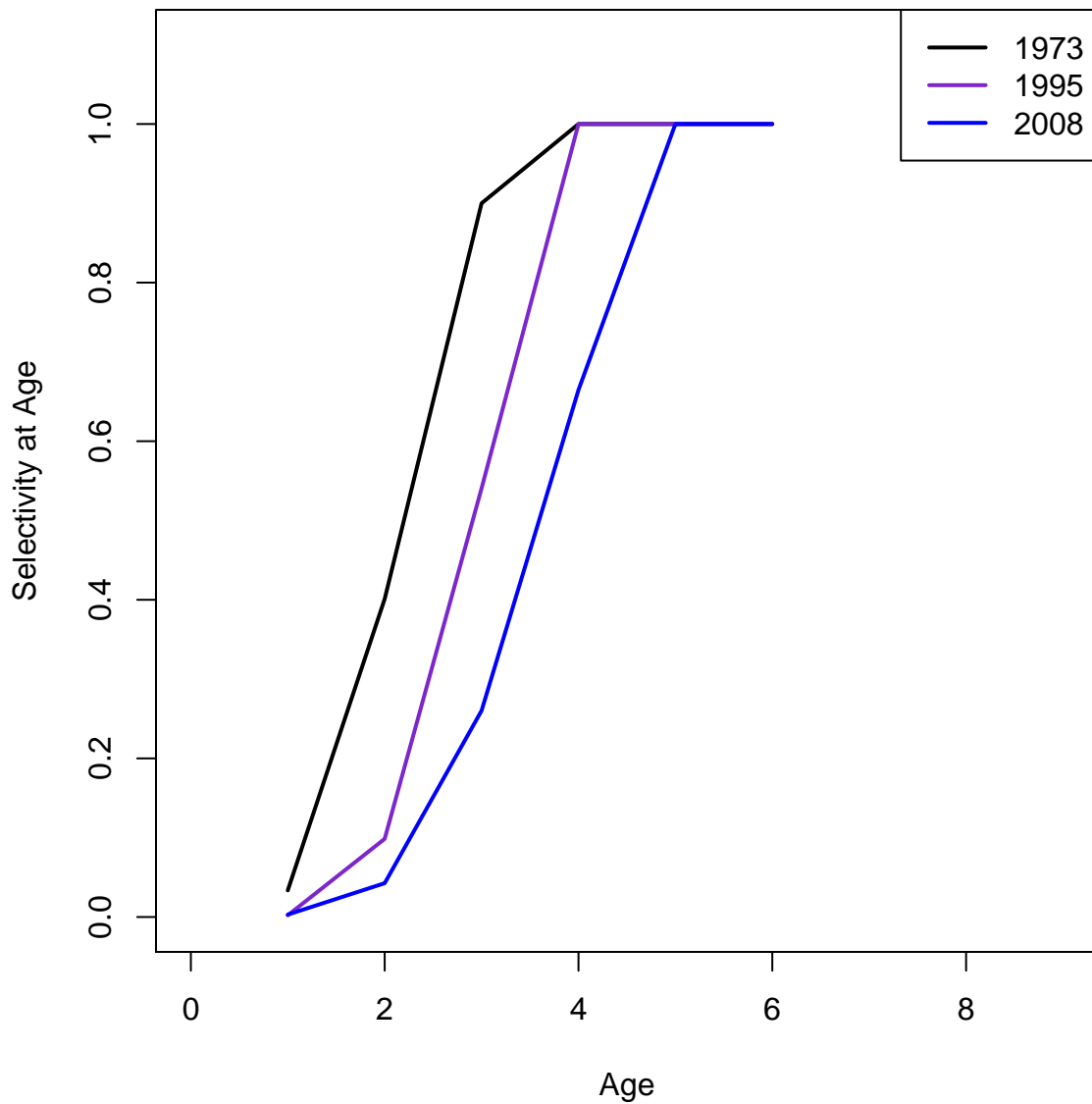
### Index 3 (INDEX-3) ESS = 20



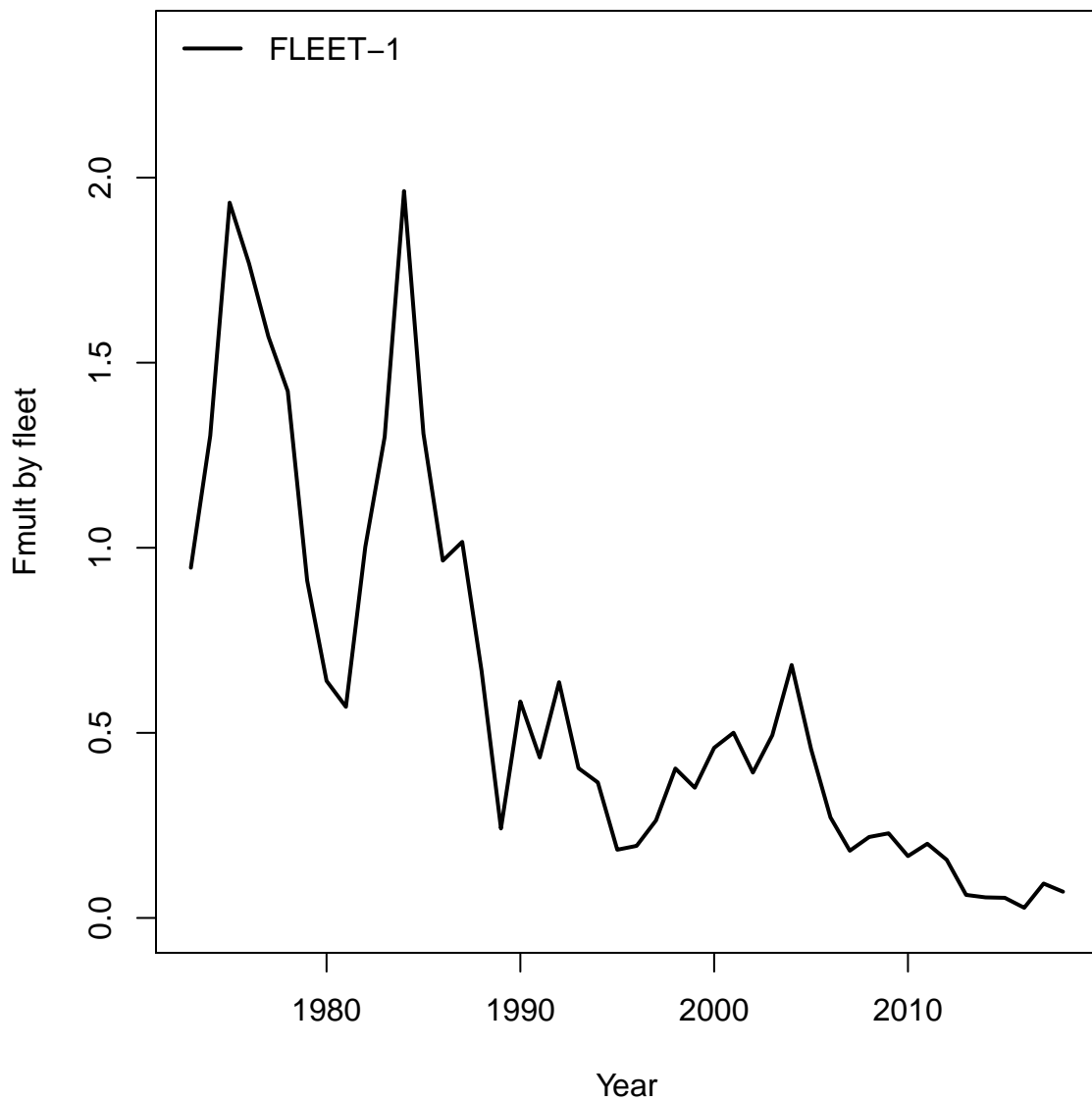
# Index 3 (INDEX-3) ESS = 20



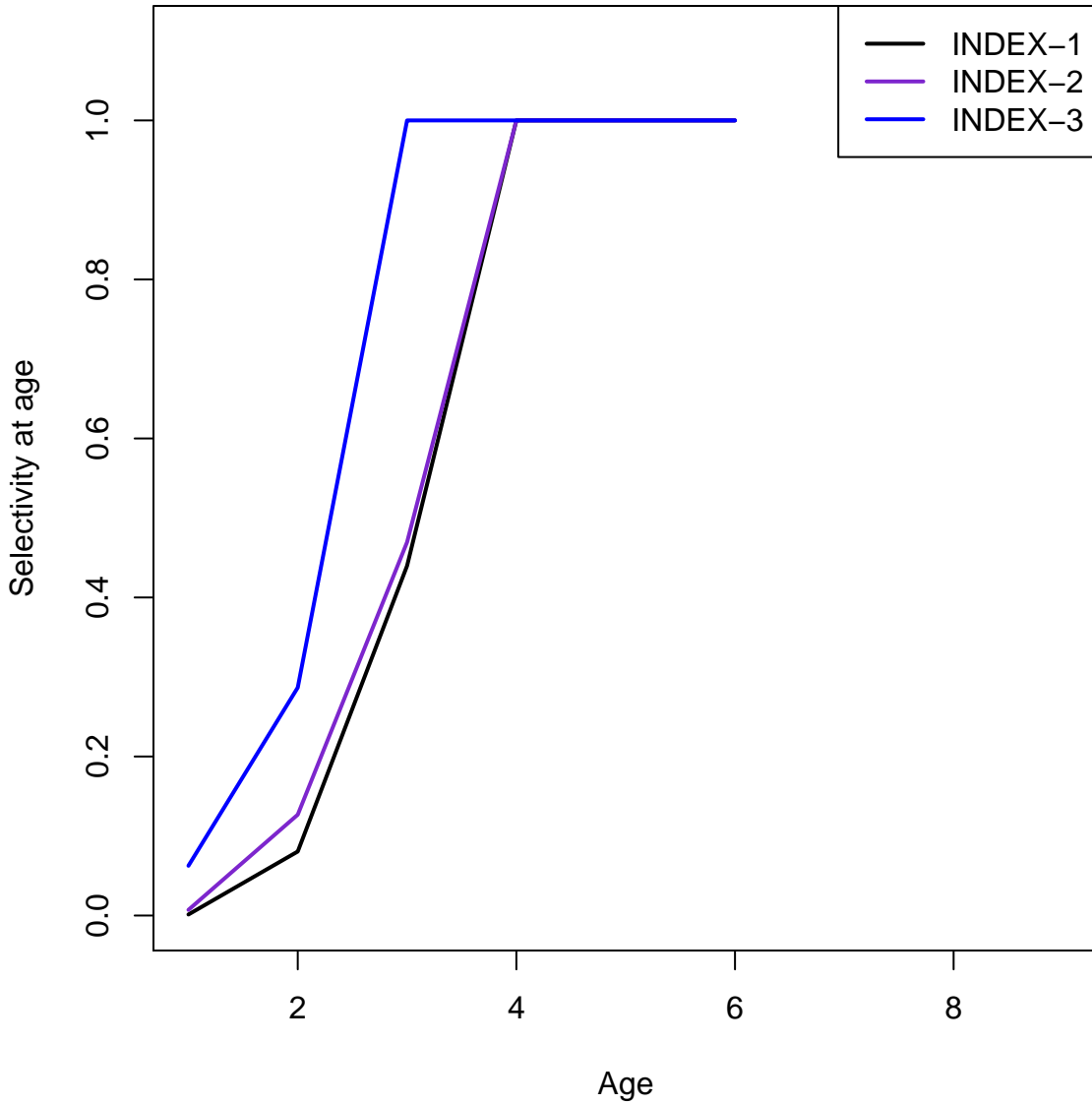
# Fleet 1 (FLEET-1)



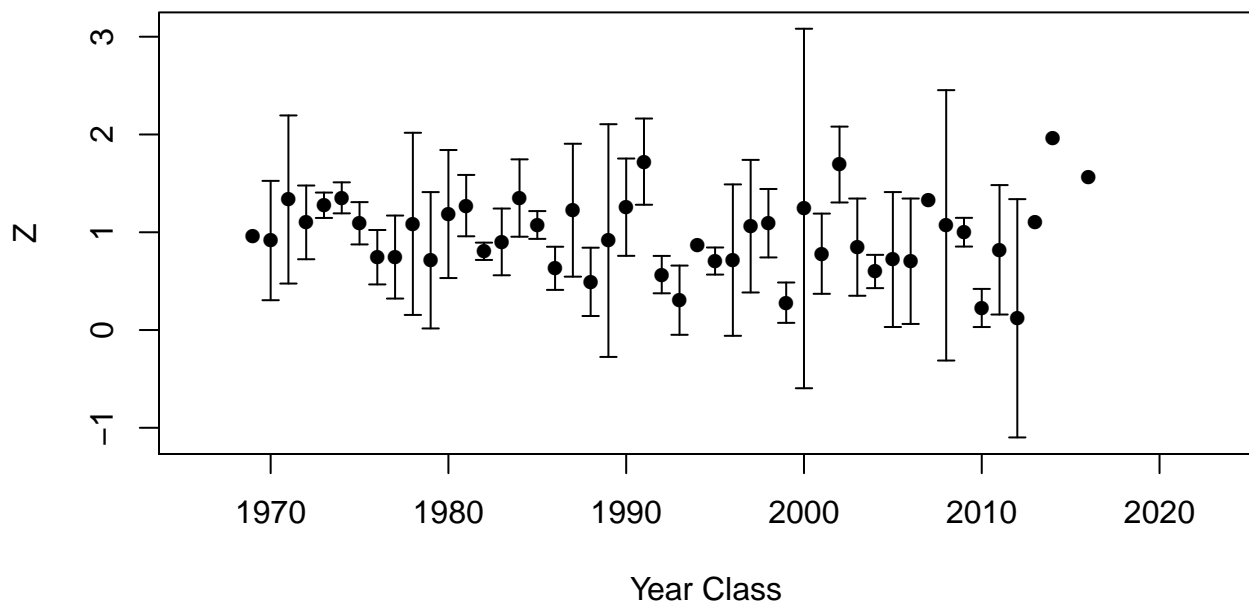
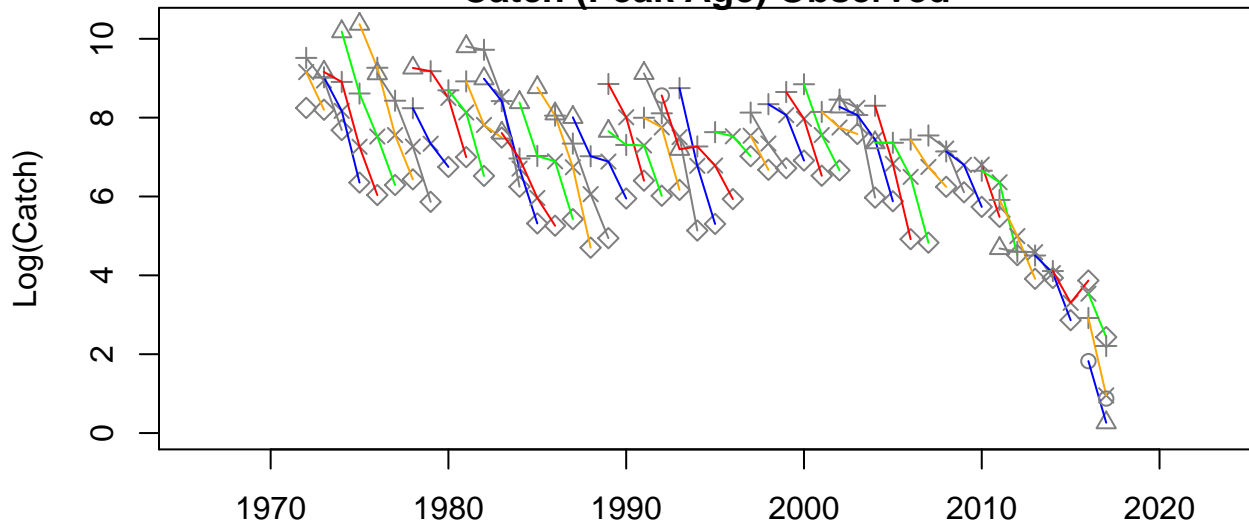




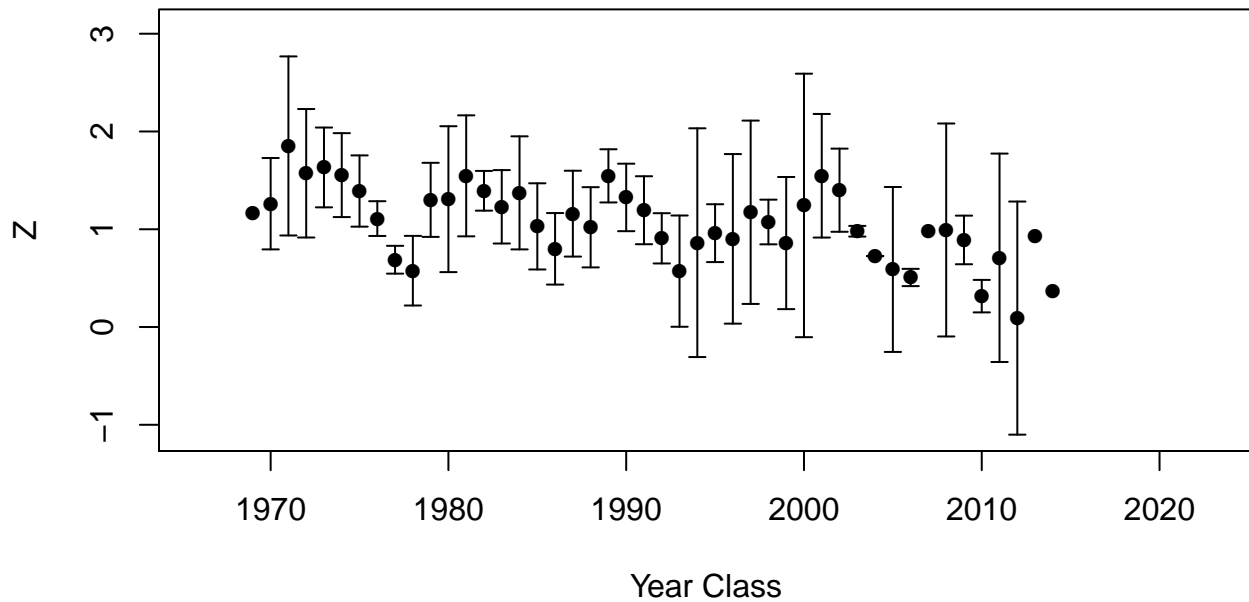
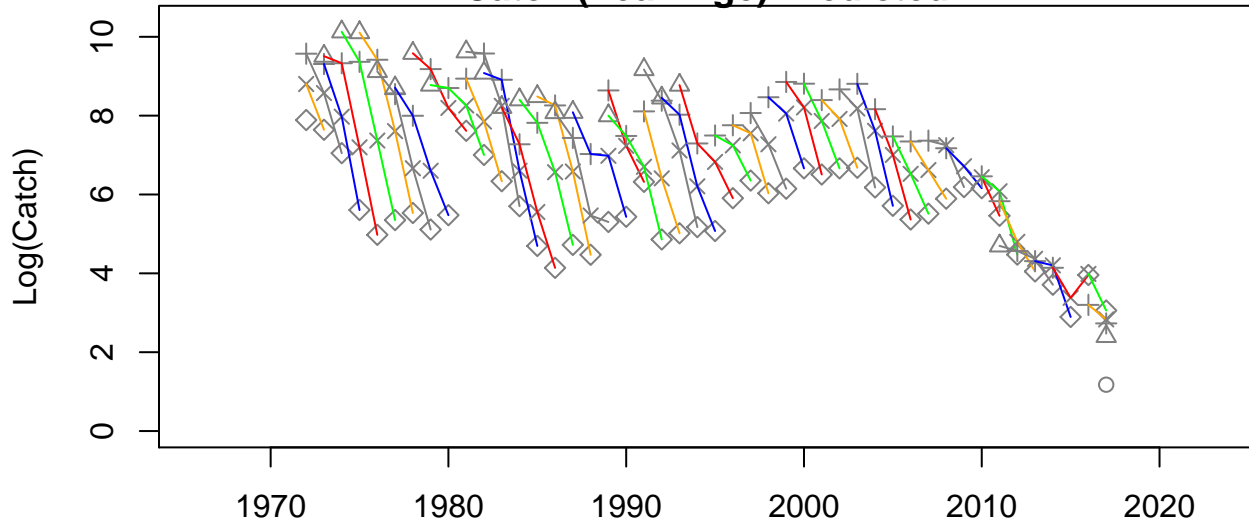
# Indices



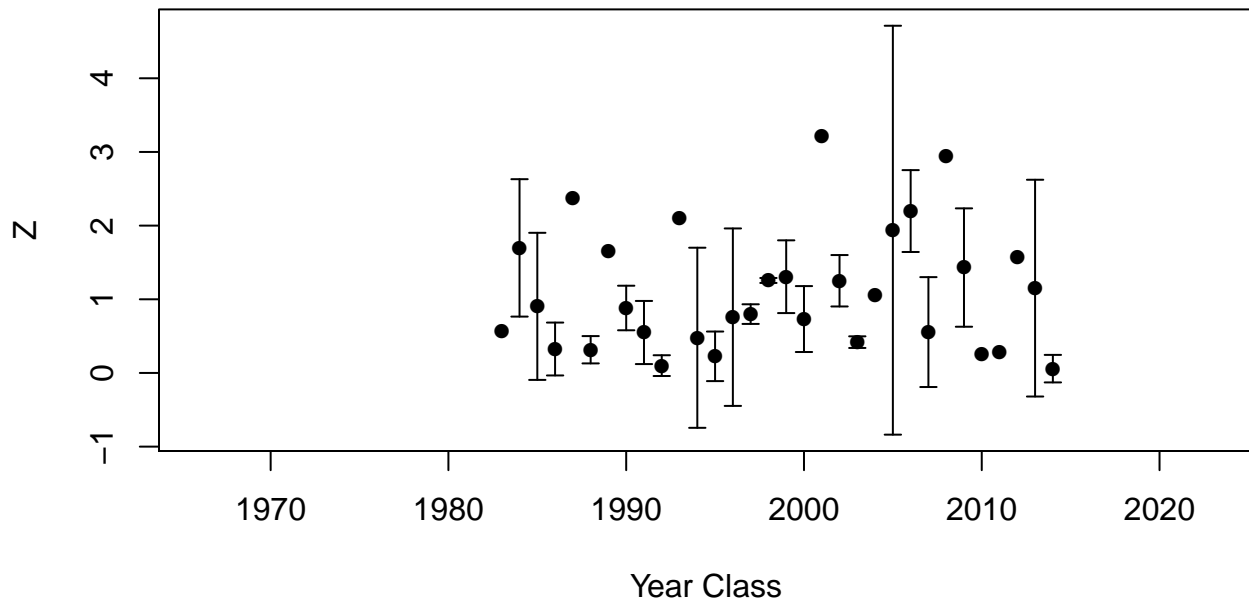
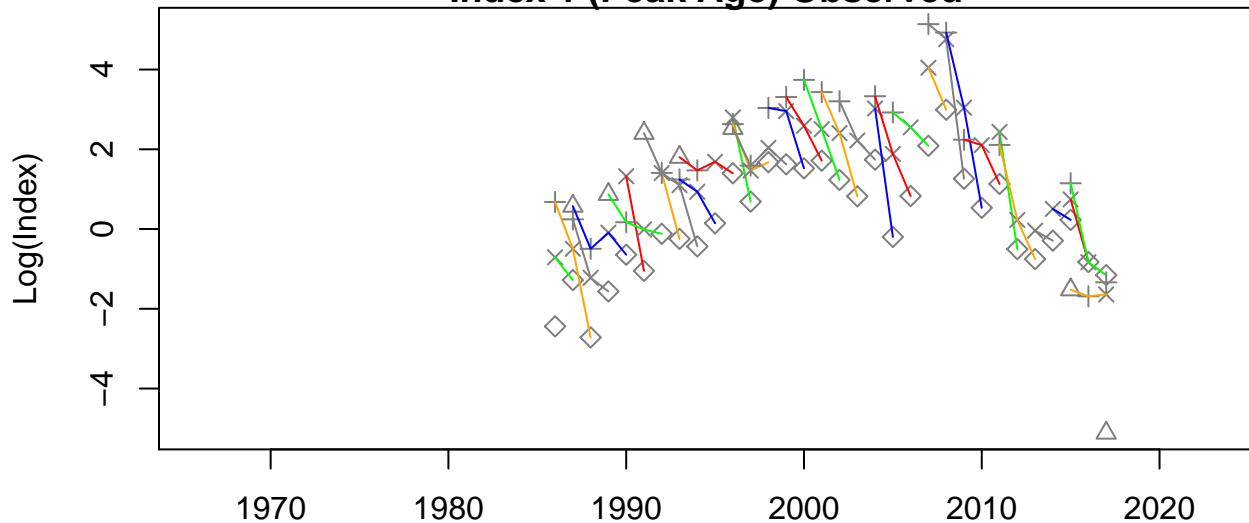
**Catch (Peak Age) Observed**



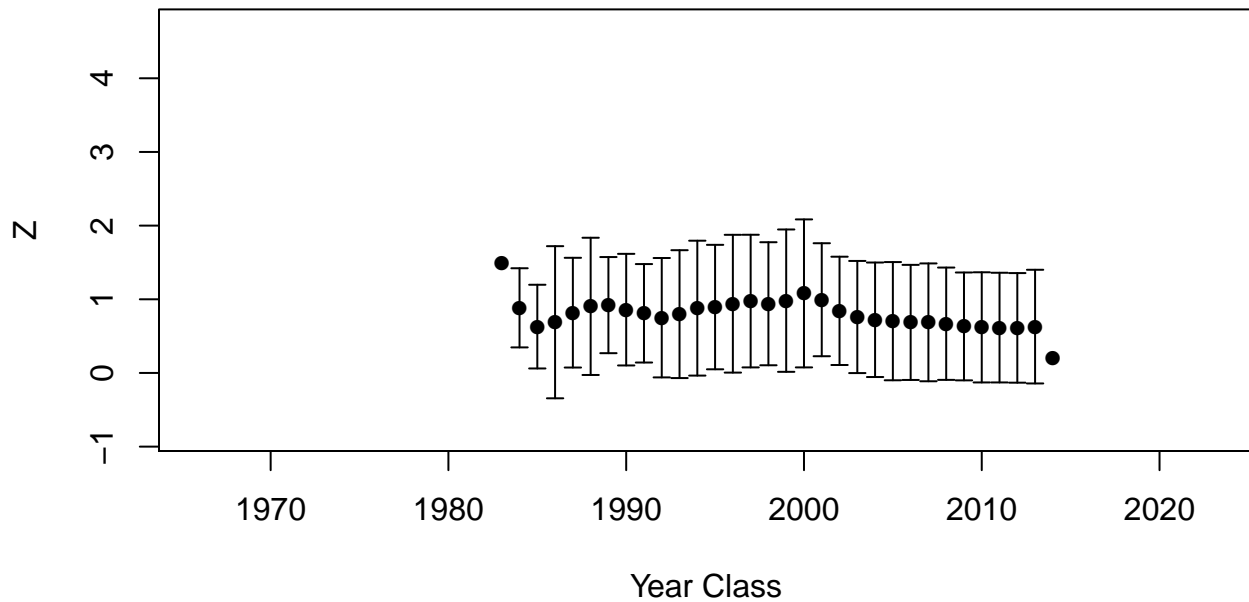
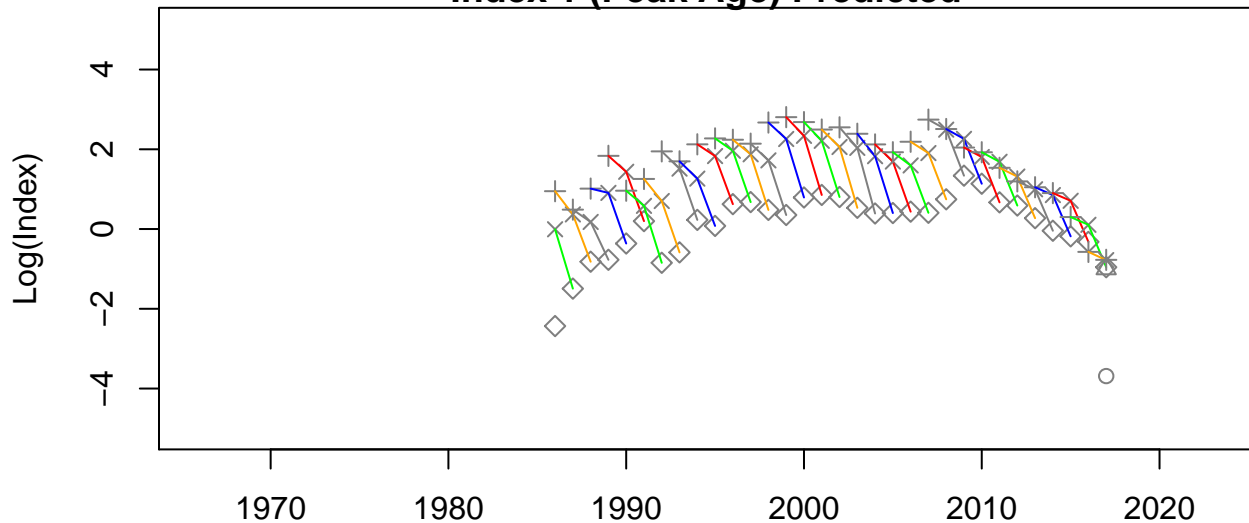
**Catch (Peak Age) Predicted**



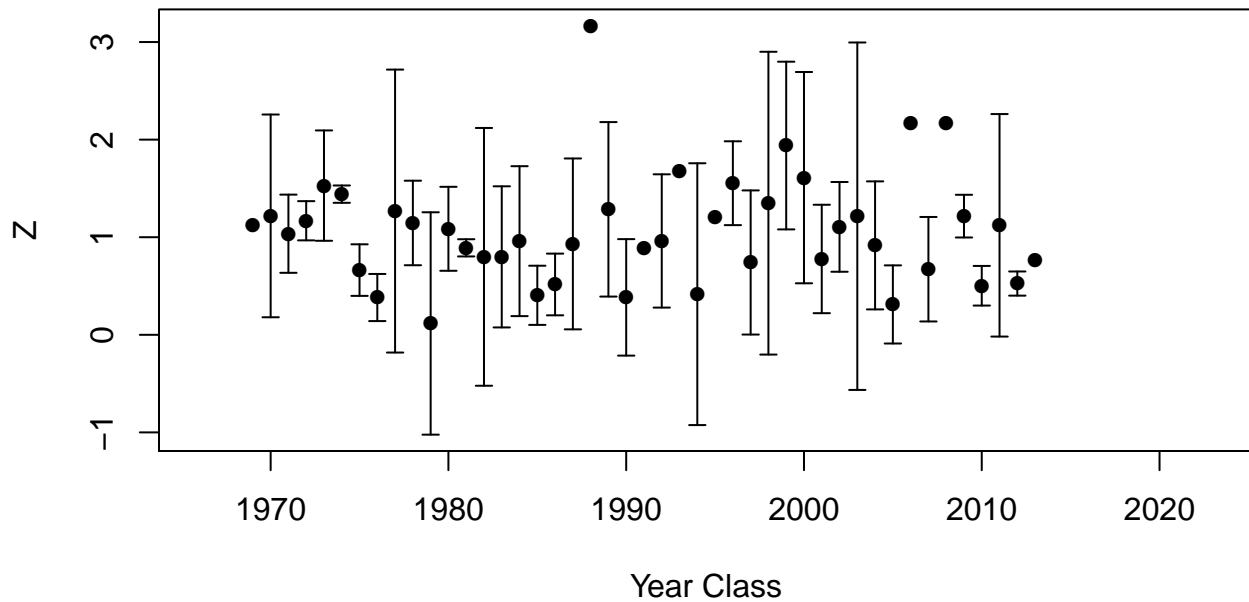
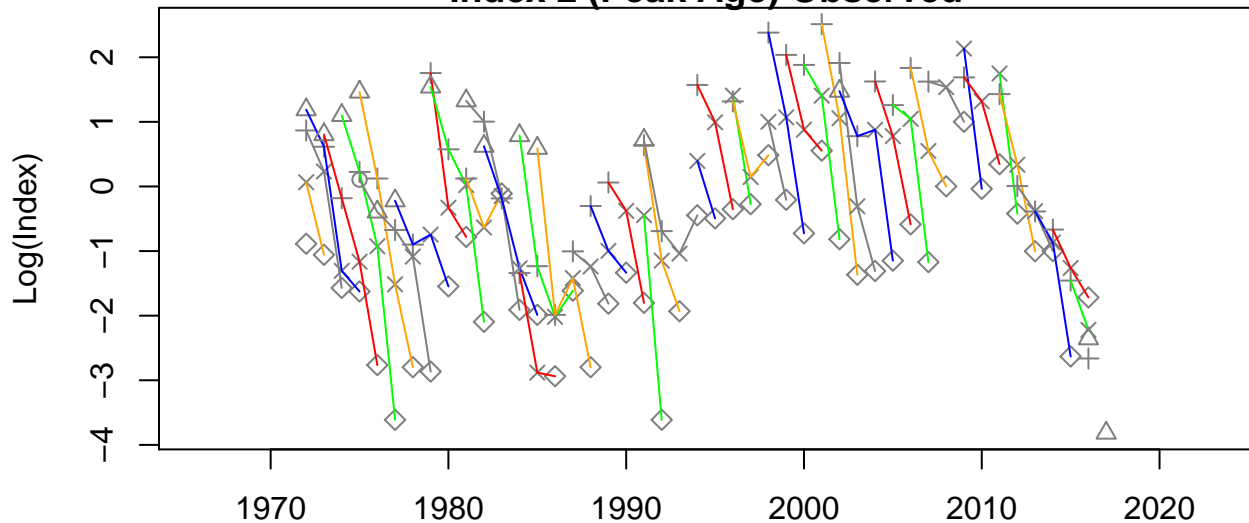
**Index 1 (Peak Age) Observed**



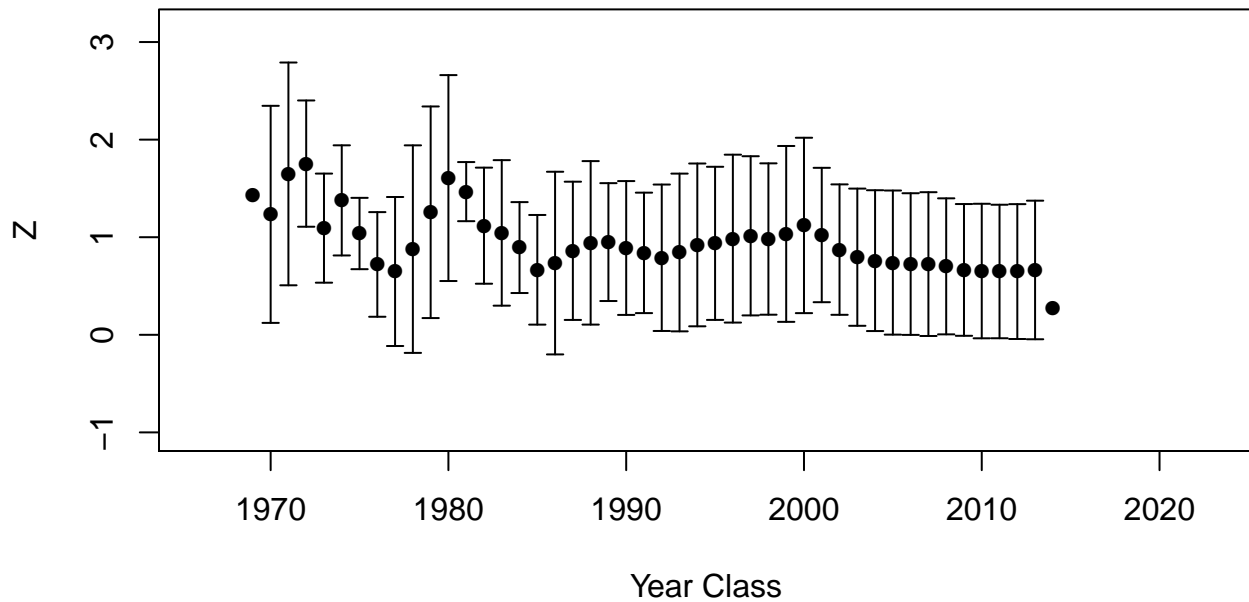
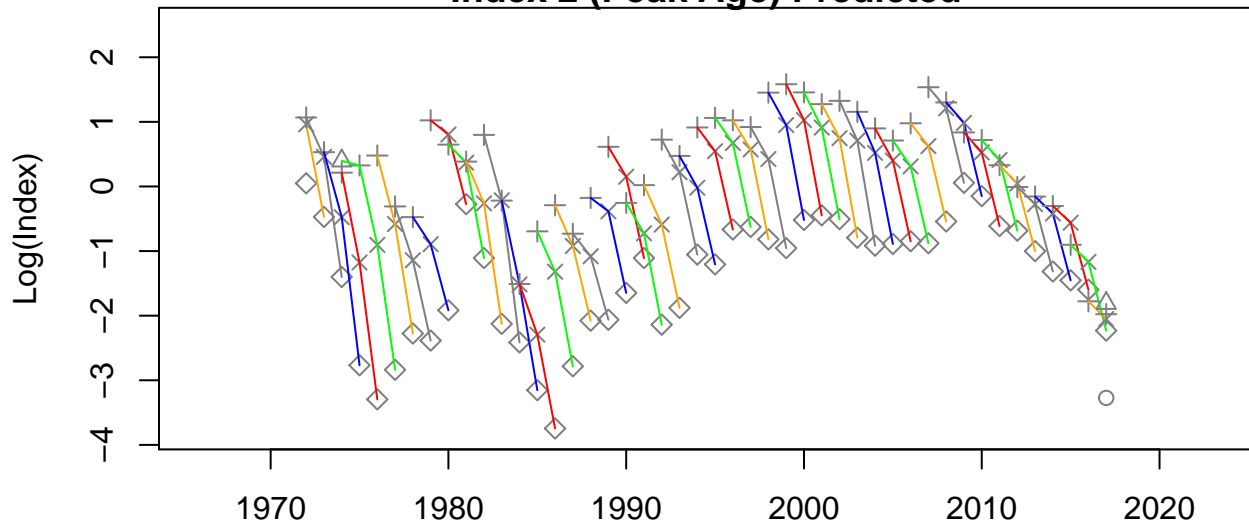
**Index 1 (Peak Age) Predicted**



**Index 2 (Peak Age) Observed**

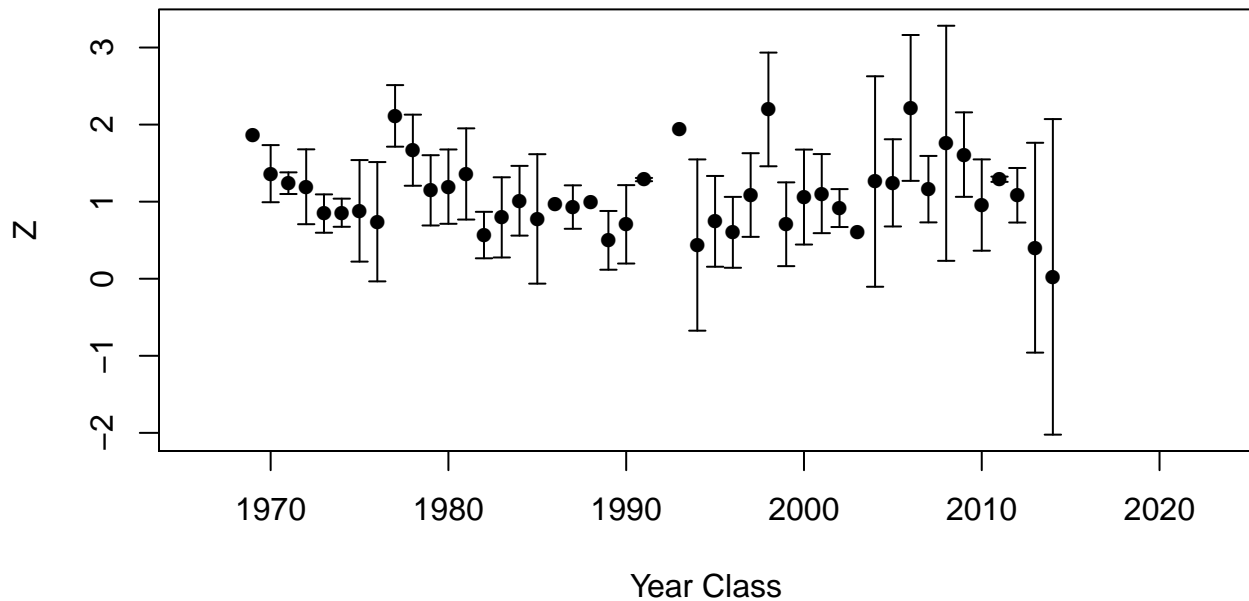
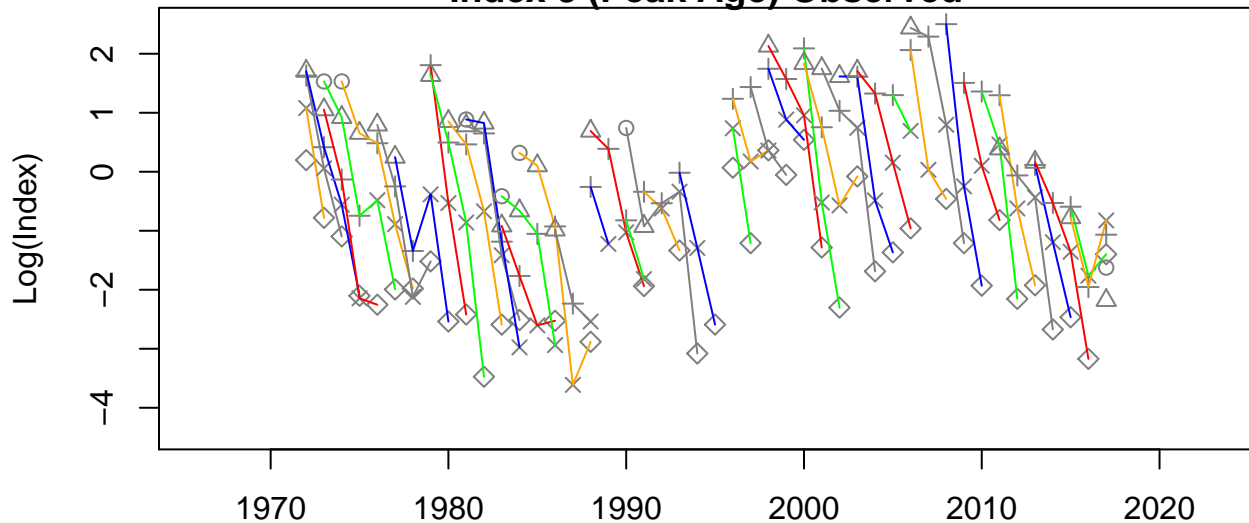


**Index 2 (Peak Age) Predicted**

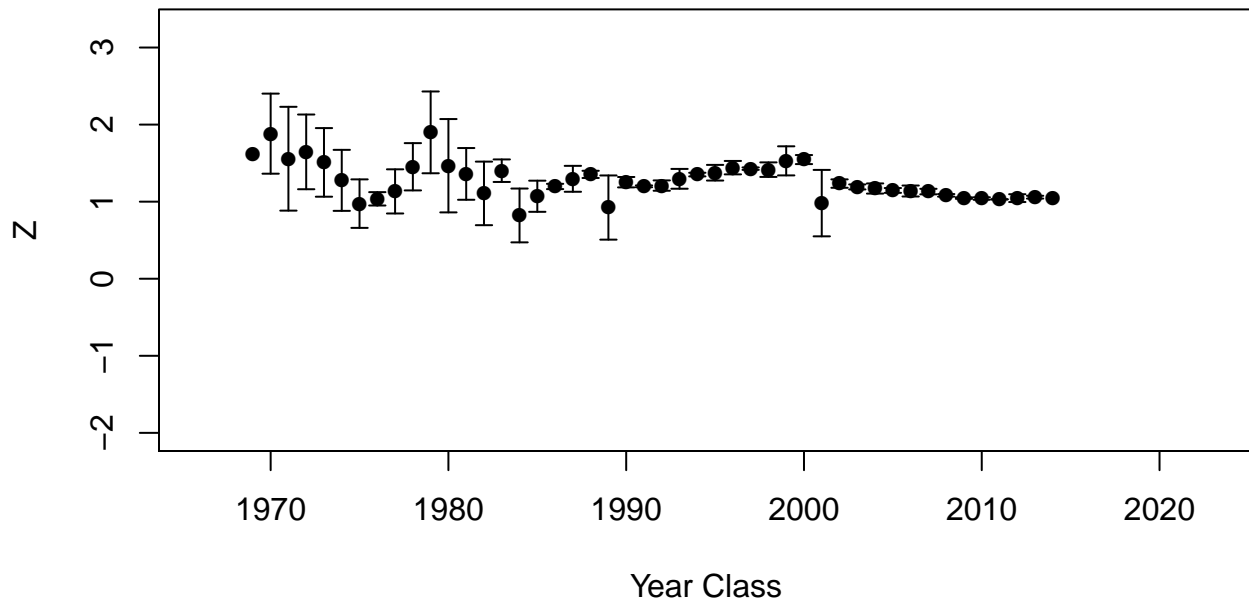
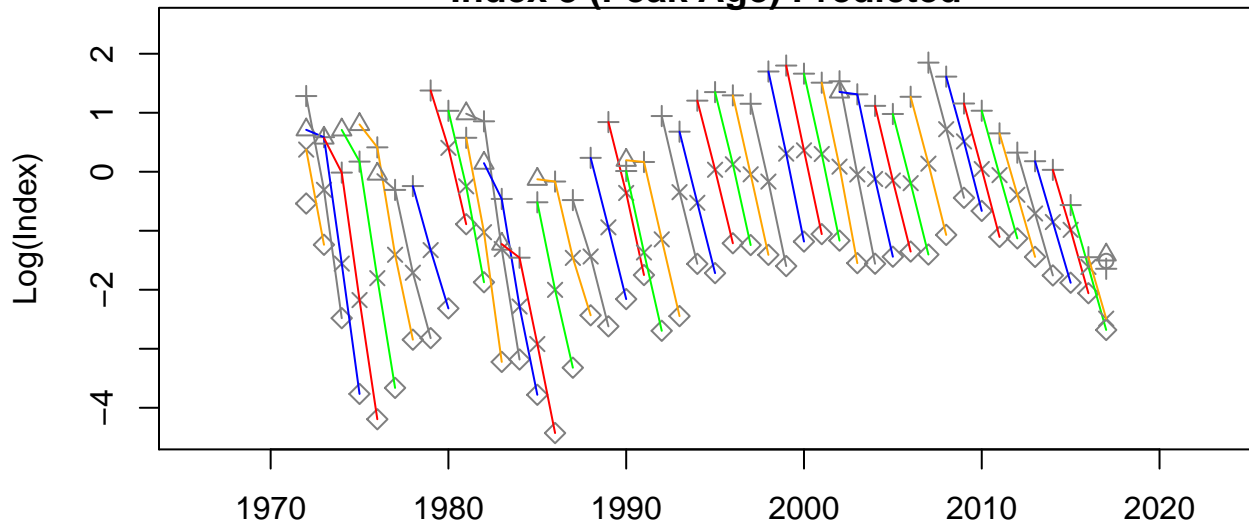




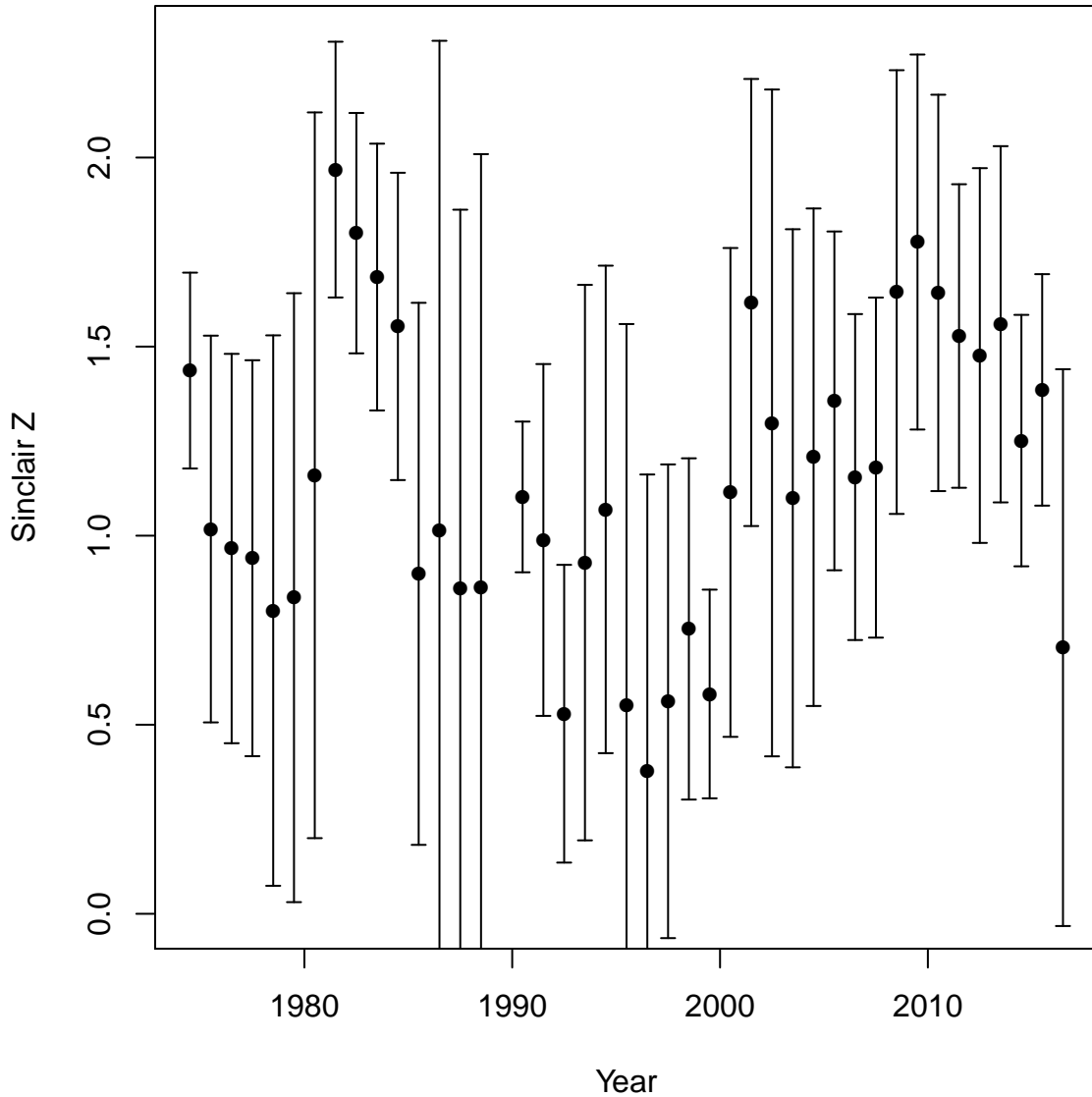
**Index 3 (Peak Age) Observed**



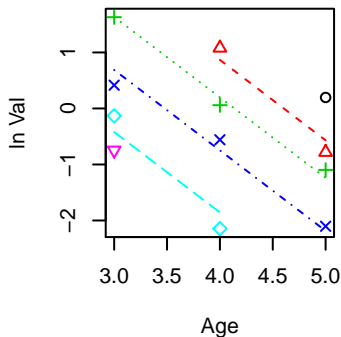
**Index 3 (Peak Age) Predicted**



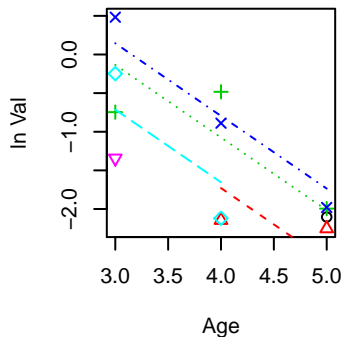
# INDEX-3



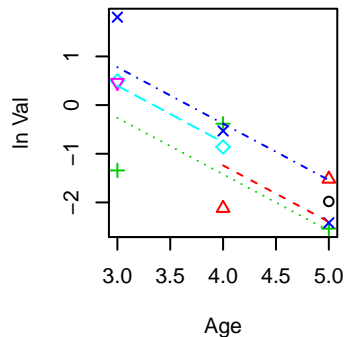
**Years 1973 to 1976**  
**Z = 1.437**



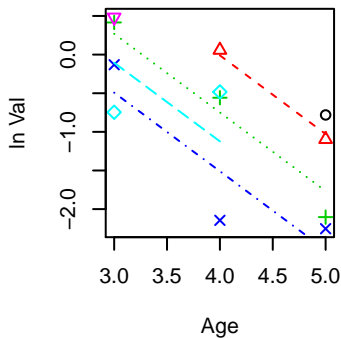
**Years 1976 to 1979**  
**Z = 0.94**



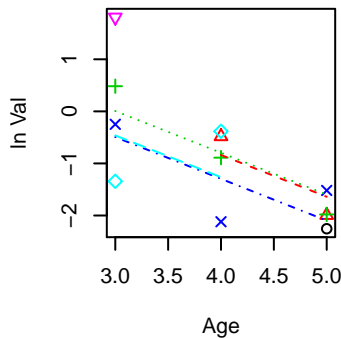
**Years 1979 to 1982**  
**Z = 1.16**



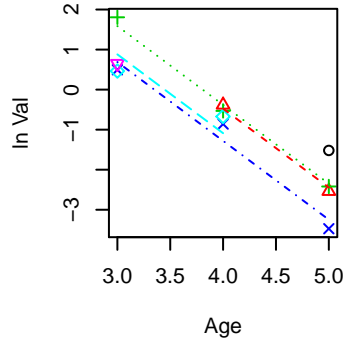
**Years 1974 to 1977**  
**Z = 1.018**



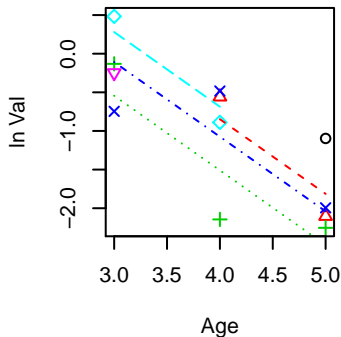
**Years 1977 to 1980**  
**Z = 0.802**



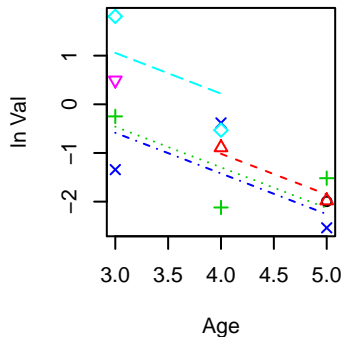
**Years 1980 to 1983**  
**Z = 1.968**



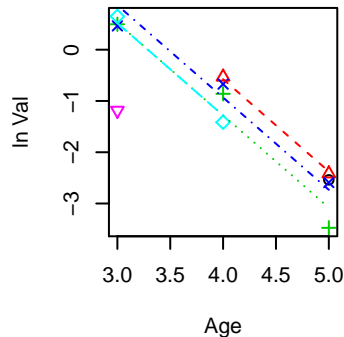
**Years 1975 to 1978**  
**Z = 0.966**



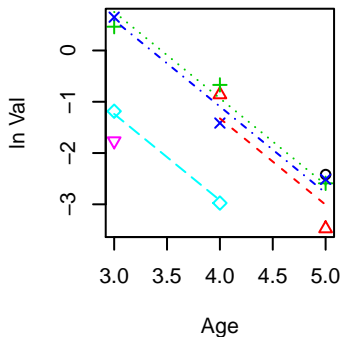
**Years 1978 to 1981**  
**Z = 0.836**



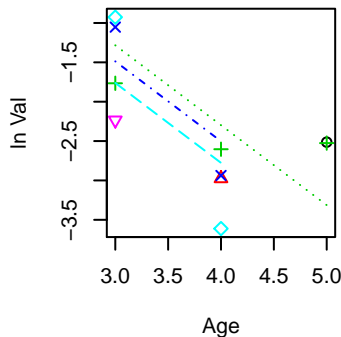
**Years 1981 to 1984**  
**Z = 1.8**



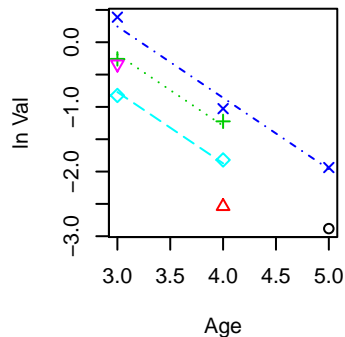
**Years 1982 to 1985**  
**Z = 1.684**



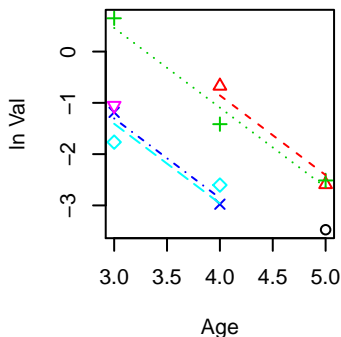
**Years 1985 to 1988**  
**Z = 1.015**



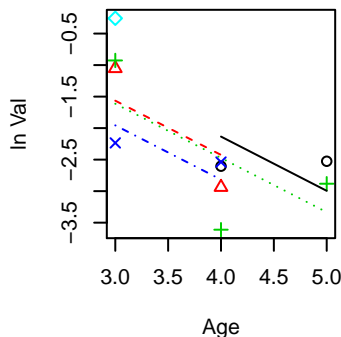
**Years 1989 to 1992**  
**Z = 1.102**



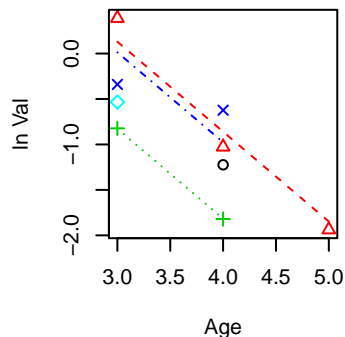
**Years 1983 to 1986**  
**Z = 1.553**



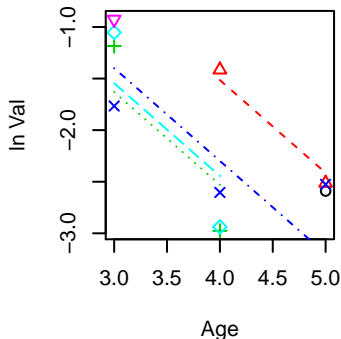
**Years 1986 to 1989**  
**Z = 0.86**



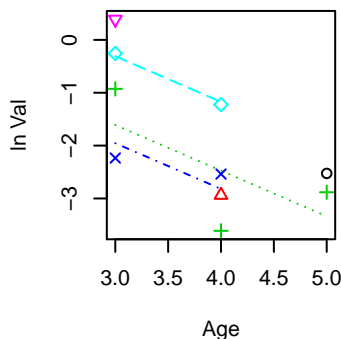
**Years 1990 to 1993**  
**Z = 0.989**



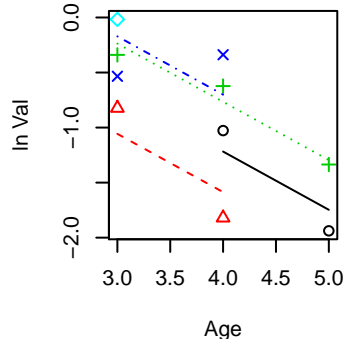
**Years 1984 to 1987**  
**Z = 0.899**



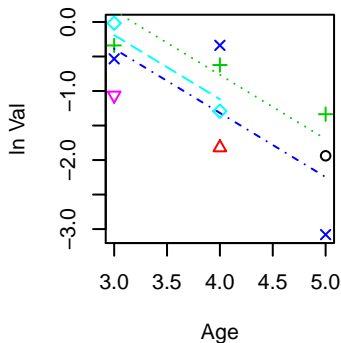
**Years 1987 to 1990**  
**Z = 0.864**



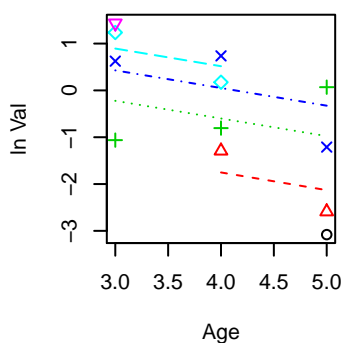
**Years 1991 to 1994**  
**Z = 0.529**



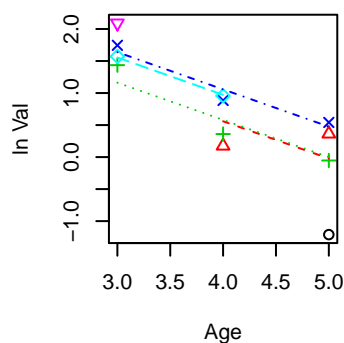
**Years 1992 to 1995**  
**Z = 0.929**



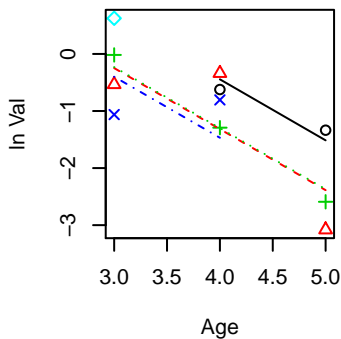
**Years 1995 to 1998**  
**Z = 0.377**



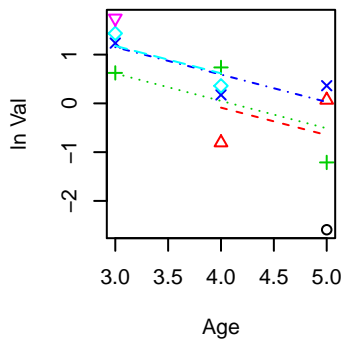
**Years 1998 to 2001**  
**Z = 0.581**



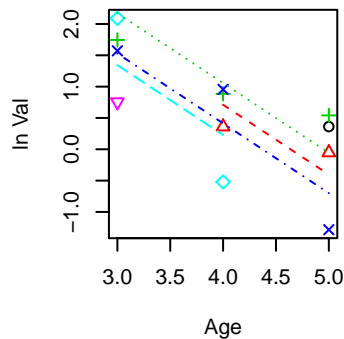
**Years 1993 to 1996**  
**Z = 1.069**



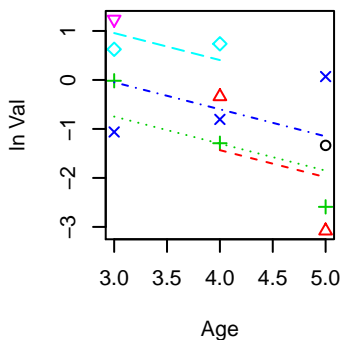
**Years 1996 to 1999**  
**Z = 0.562**



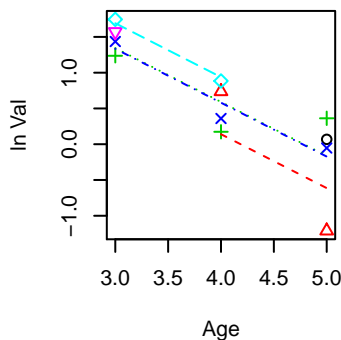
**Years 1999 to 2002**  
**Z = 1.114**



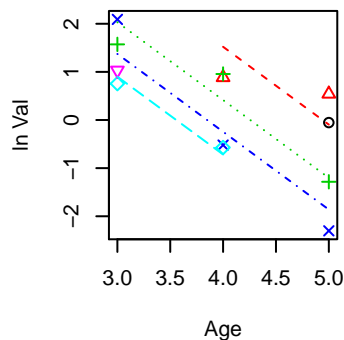
**Years 1994 to 1997**  
**Z = 0.551**



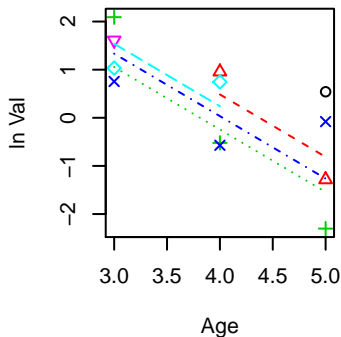
**Years 1997 to 2000**  
**Z = 0.753**



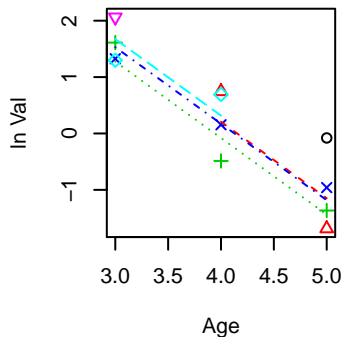
**Years 2000 to 2003**  
**Z = 1.617**



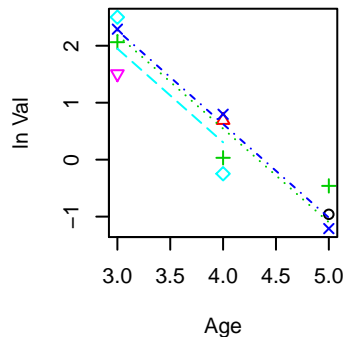
**Years 2001 to 2004**  
**Z = 1.298**



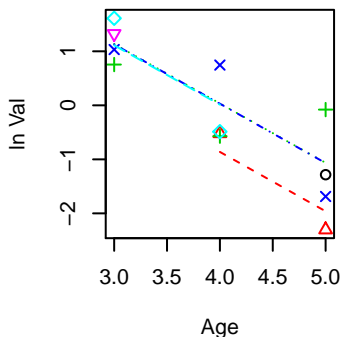
**Years 2004 to 2007**  
**Z = 1.356**



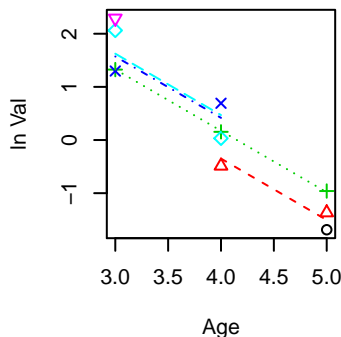
**Years 2007 to 2010**  
**Z = 1.644**



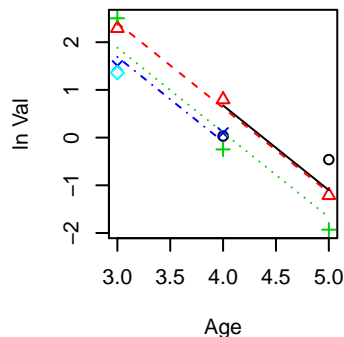
**Years 2002 to 2005**  
**Z = 1.099**



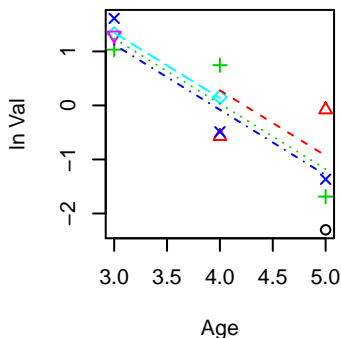
**Years 2005 to 2008**  
**Z = 1.155**



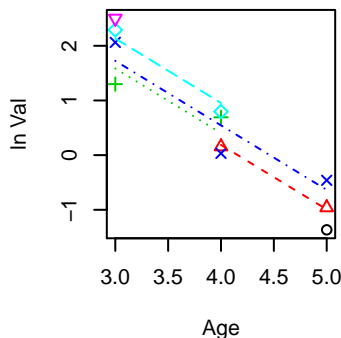
**Years 2008 to 2011**  
**Z = 1.777**



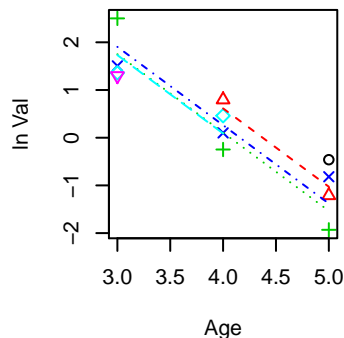
**Years 2003 to 2006**  
**Z = 1.207**



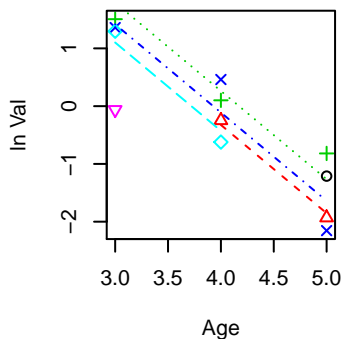
**Years 2006 to 2009**  
**Z = 1.18**



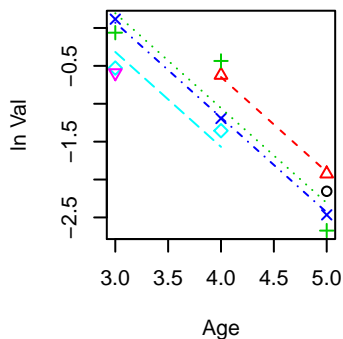
**Years 2009 to 2012**  
**Z = 1.642**



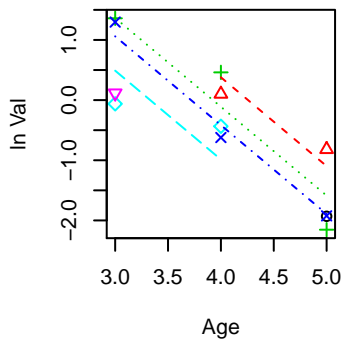
**Years 2010 to 2013**  
**Z = 1.528**



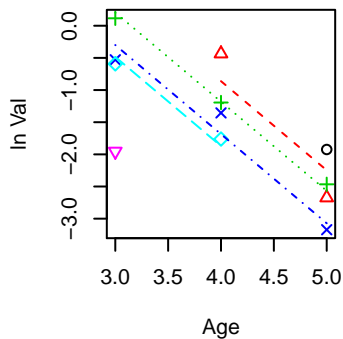
**Years 2013 to 2016**  
**Z = 1.251**



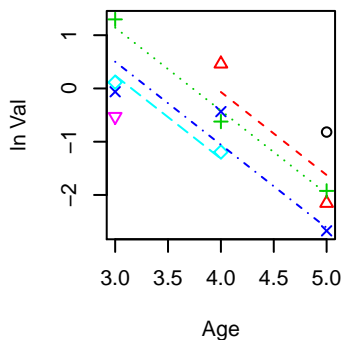
**Years 2011 to 2014**  
**Z = 1.476**



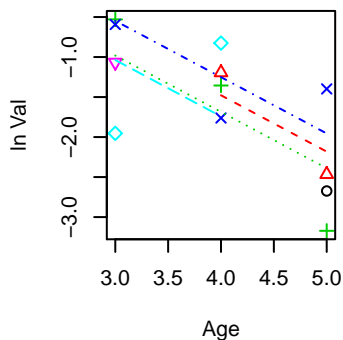
**Years 2014 to 2017**  
**Z = 1.386**



**Years 2012 to 2015**  
**Z = 1.559**

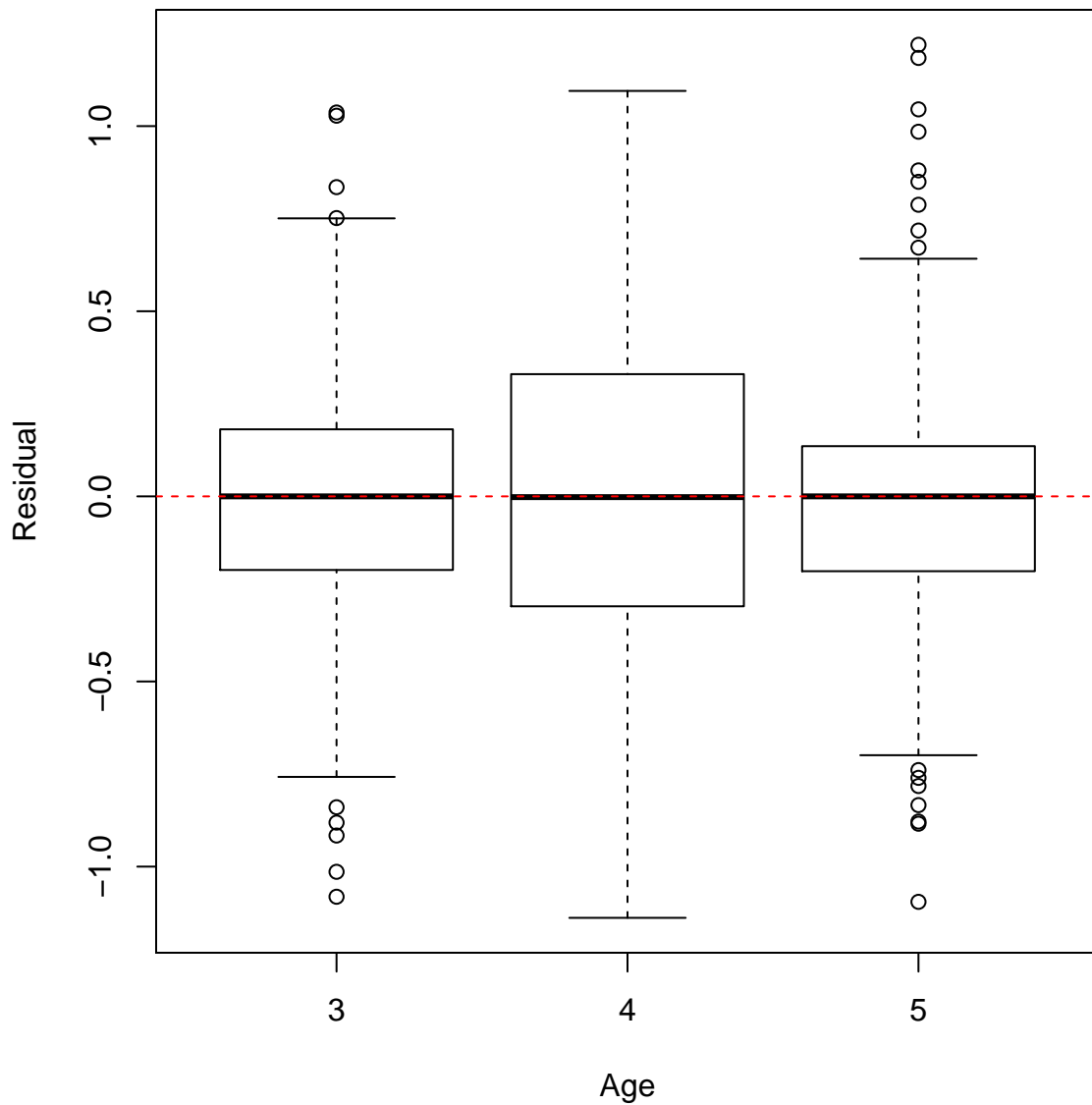


**Years 2015 to 2018**  
**Z = 0.704**

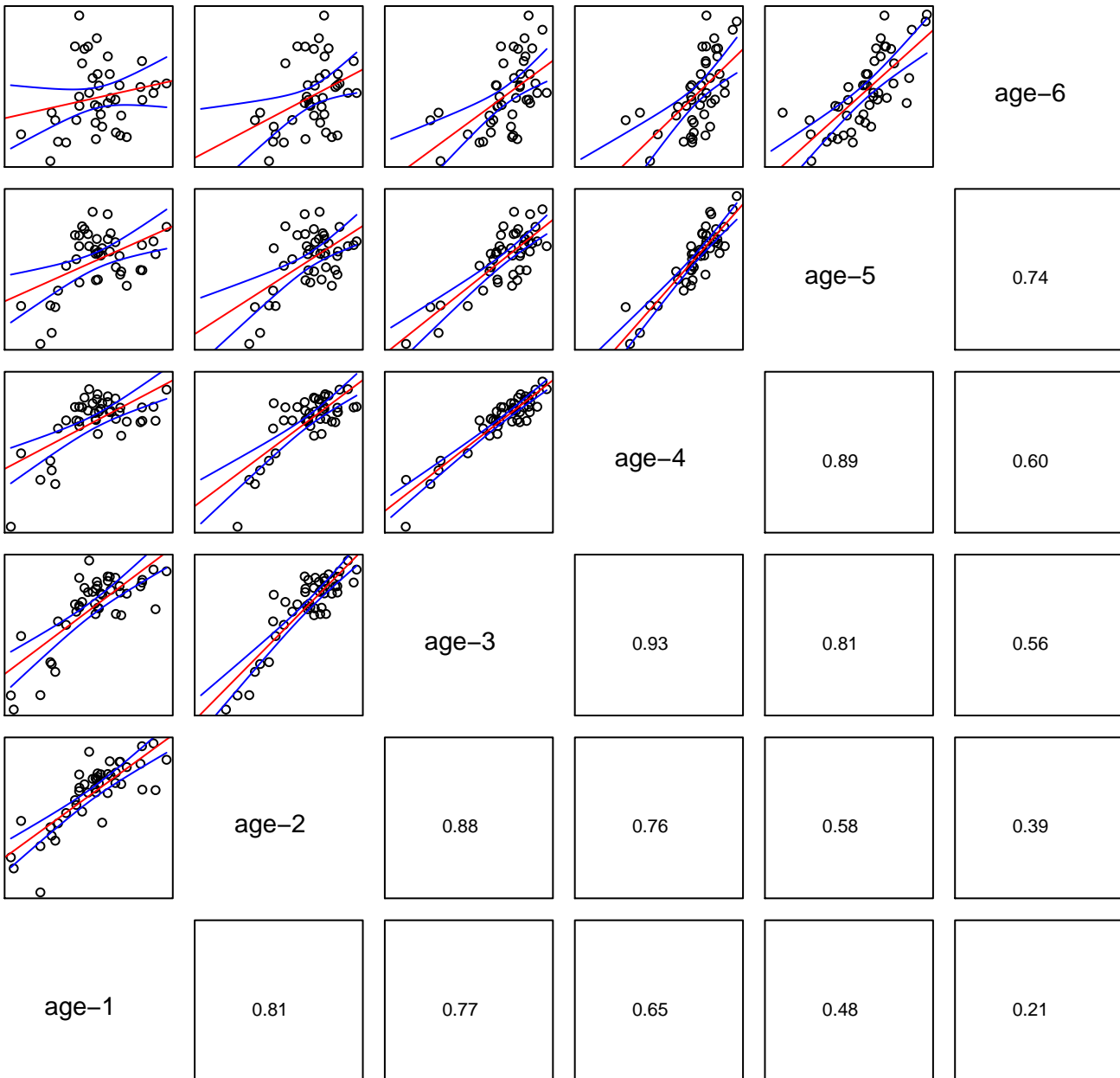




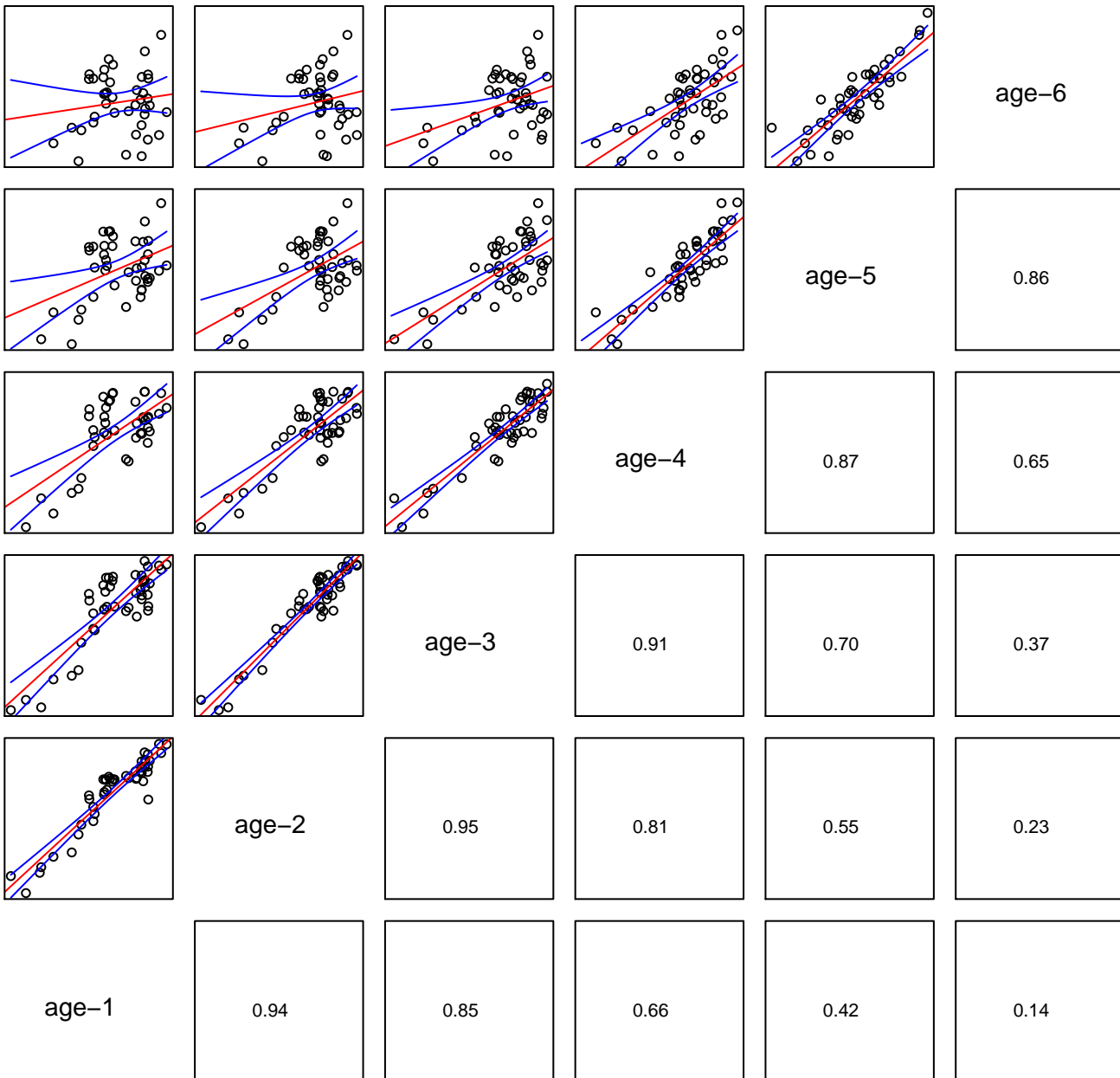
# INDEX-3



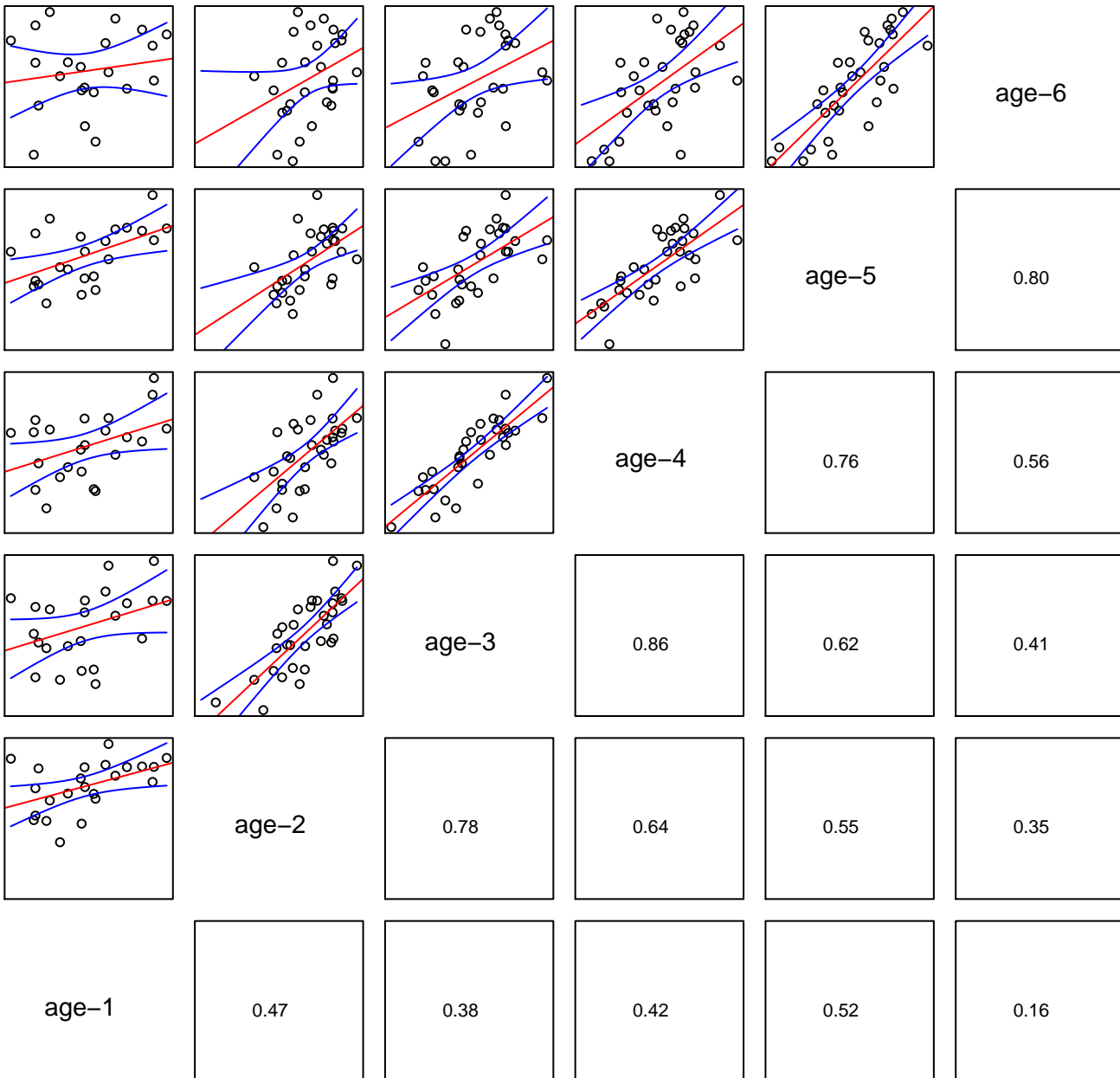
# Catch Observed



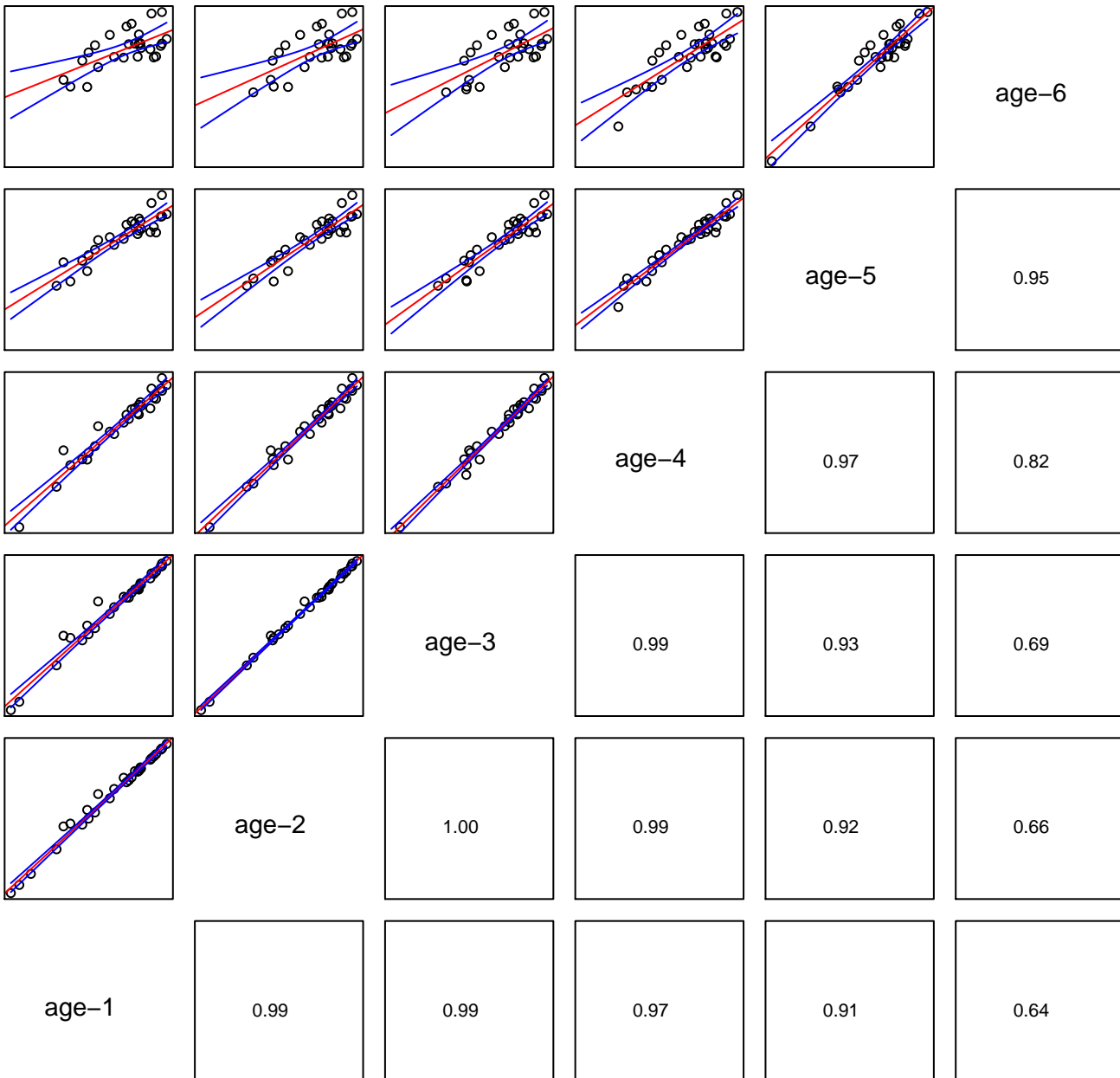
# Catch Predicted



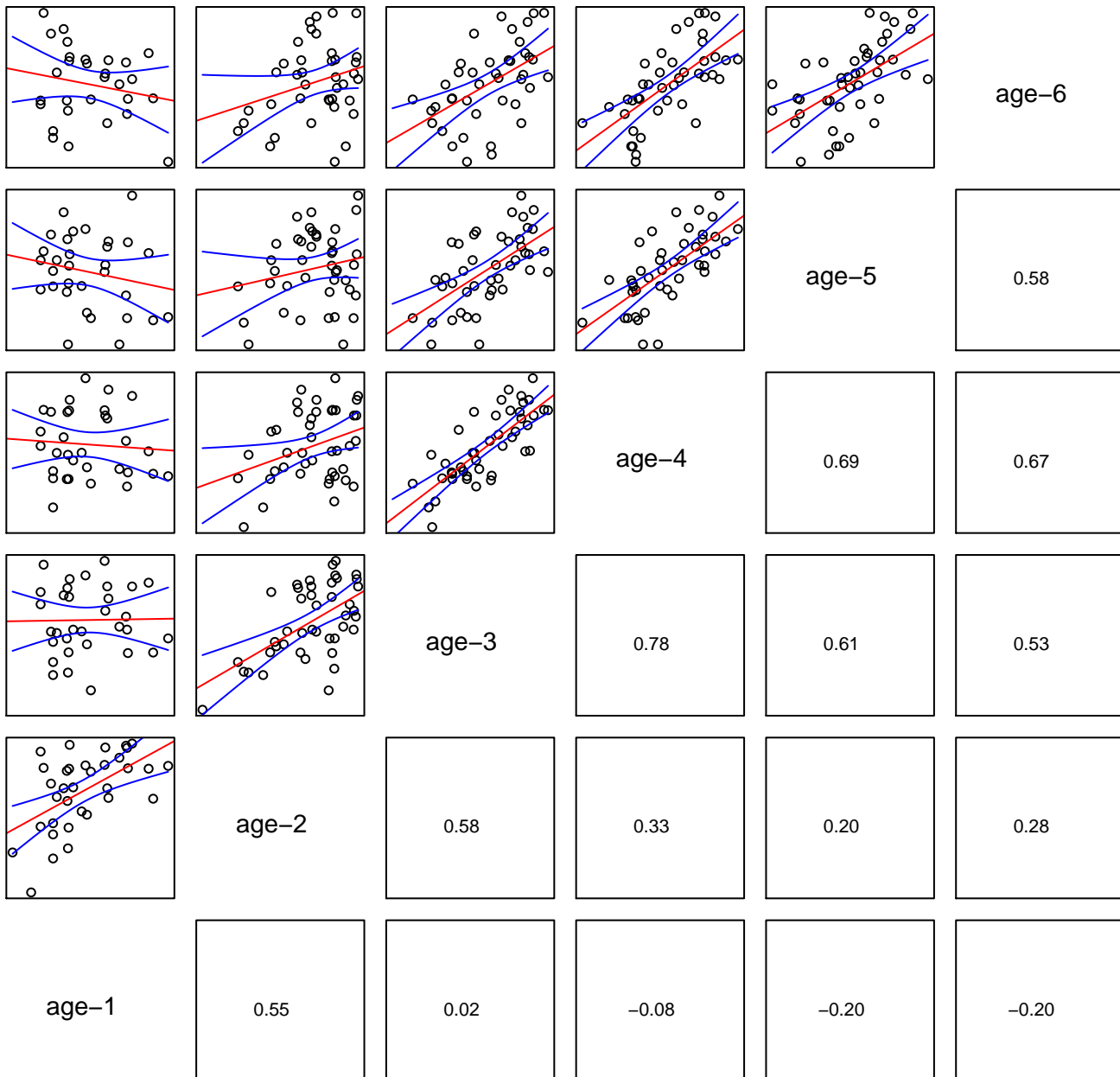
Index 1 (INDEX-1) Observed



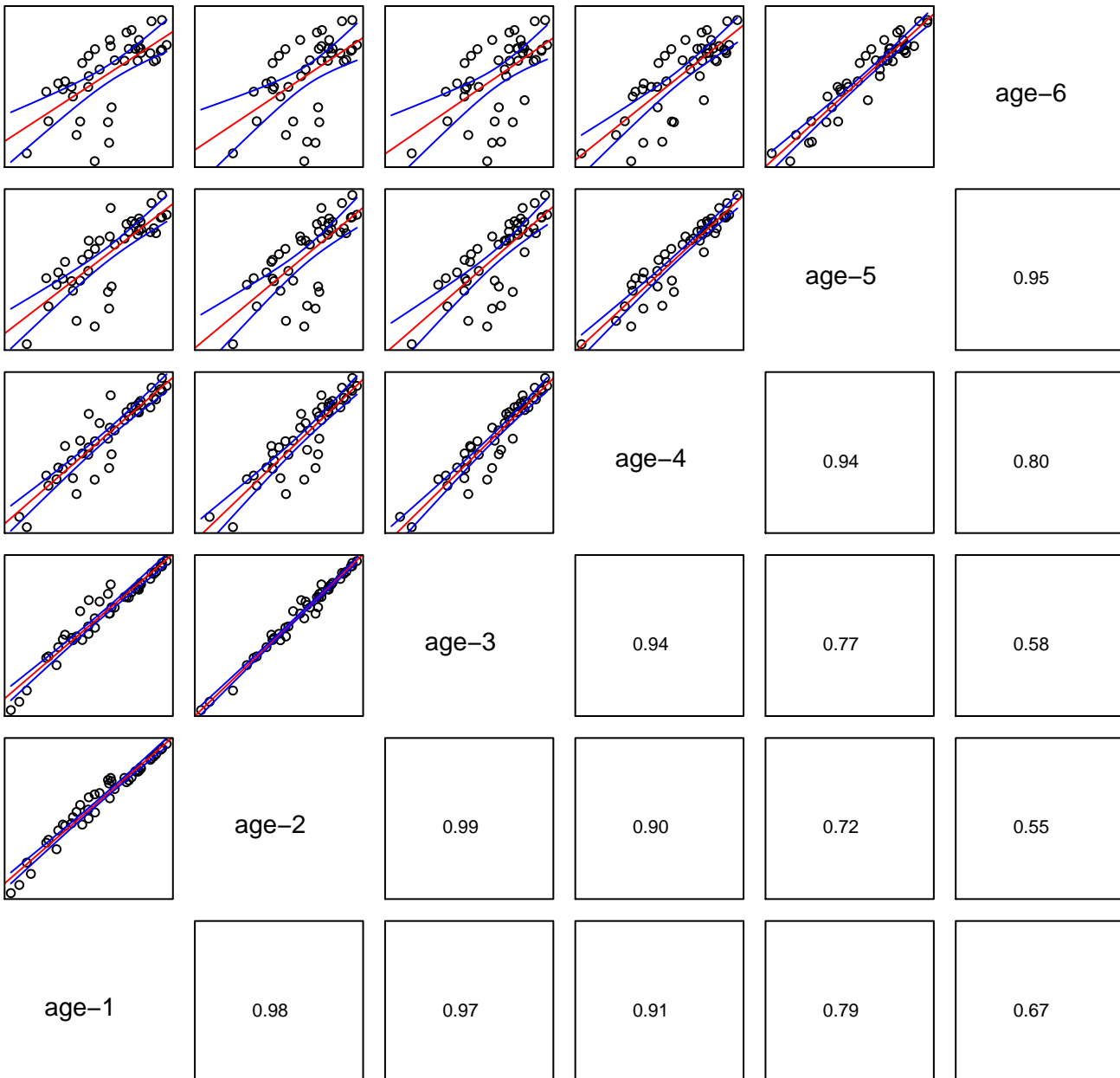
Index 1 (INDEX-1) Predicted



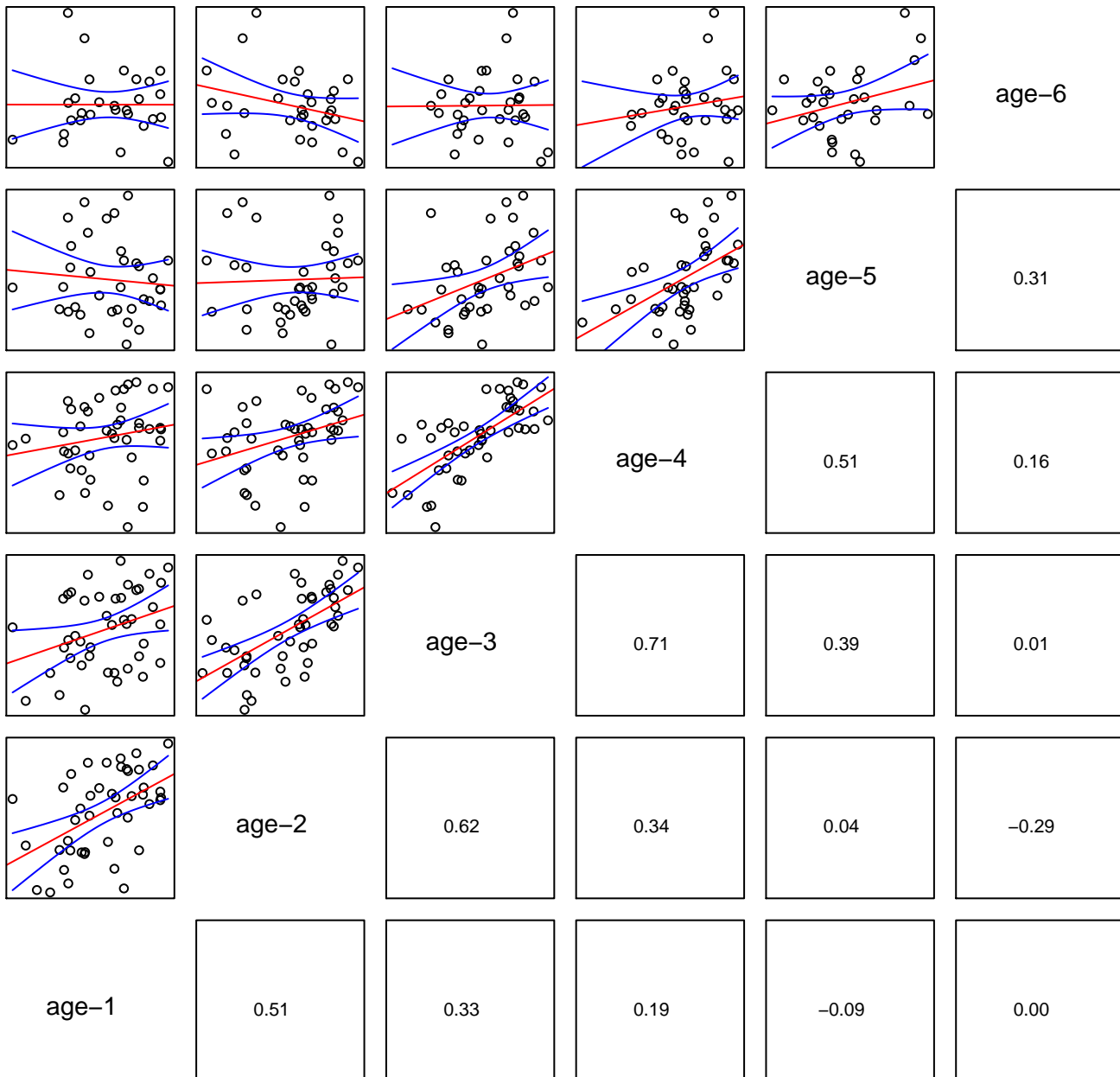
# Index 2 (INDEX-2) Observed



Index 2 (INDEX-2) Predicted

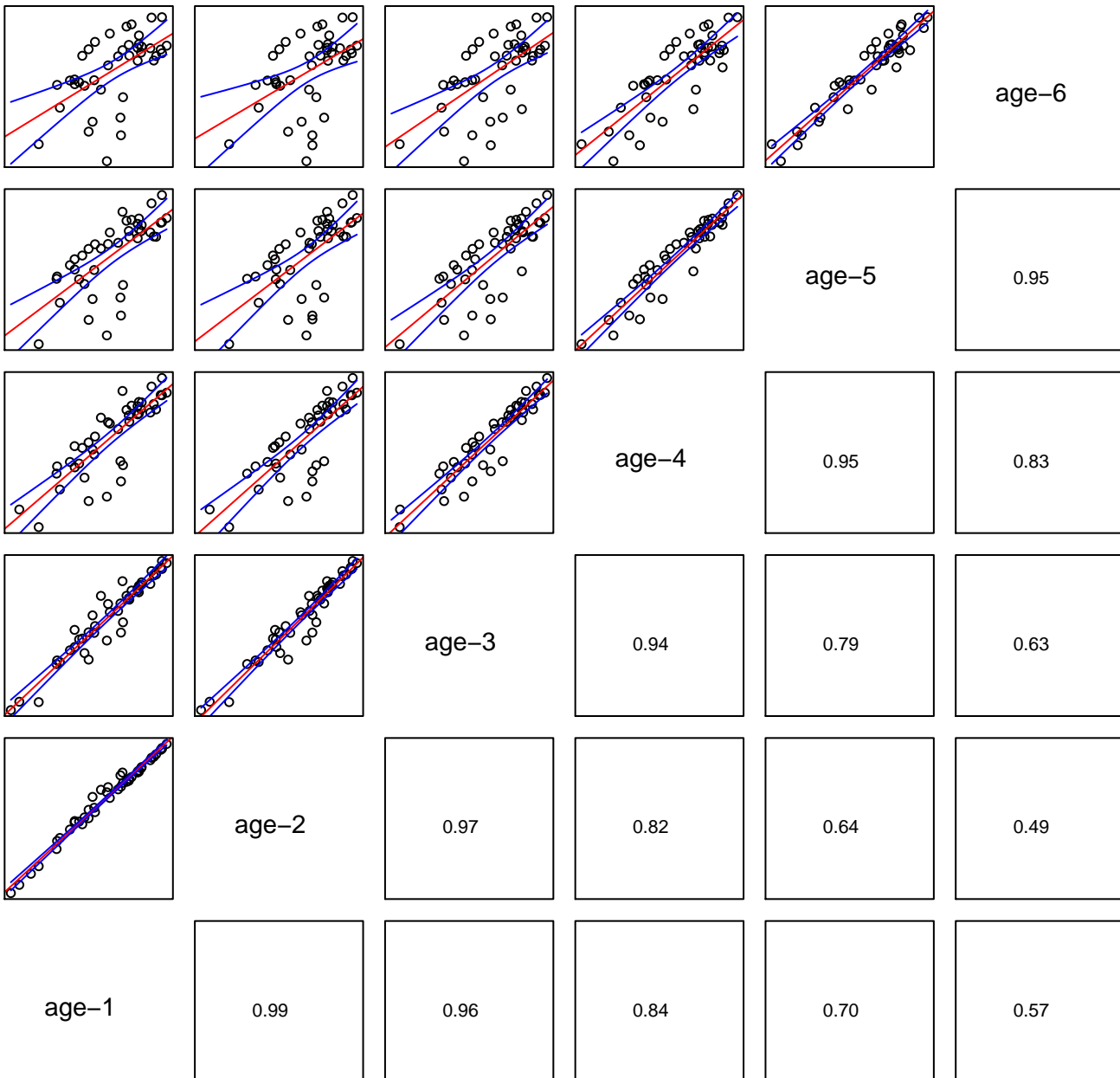


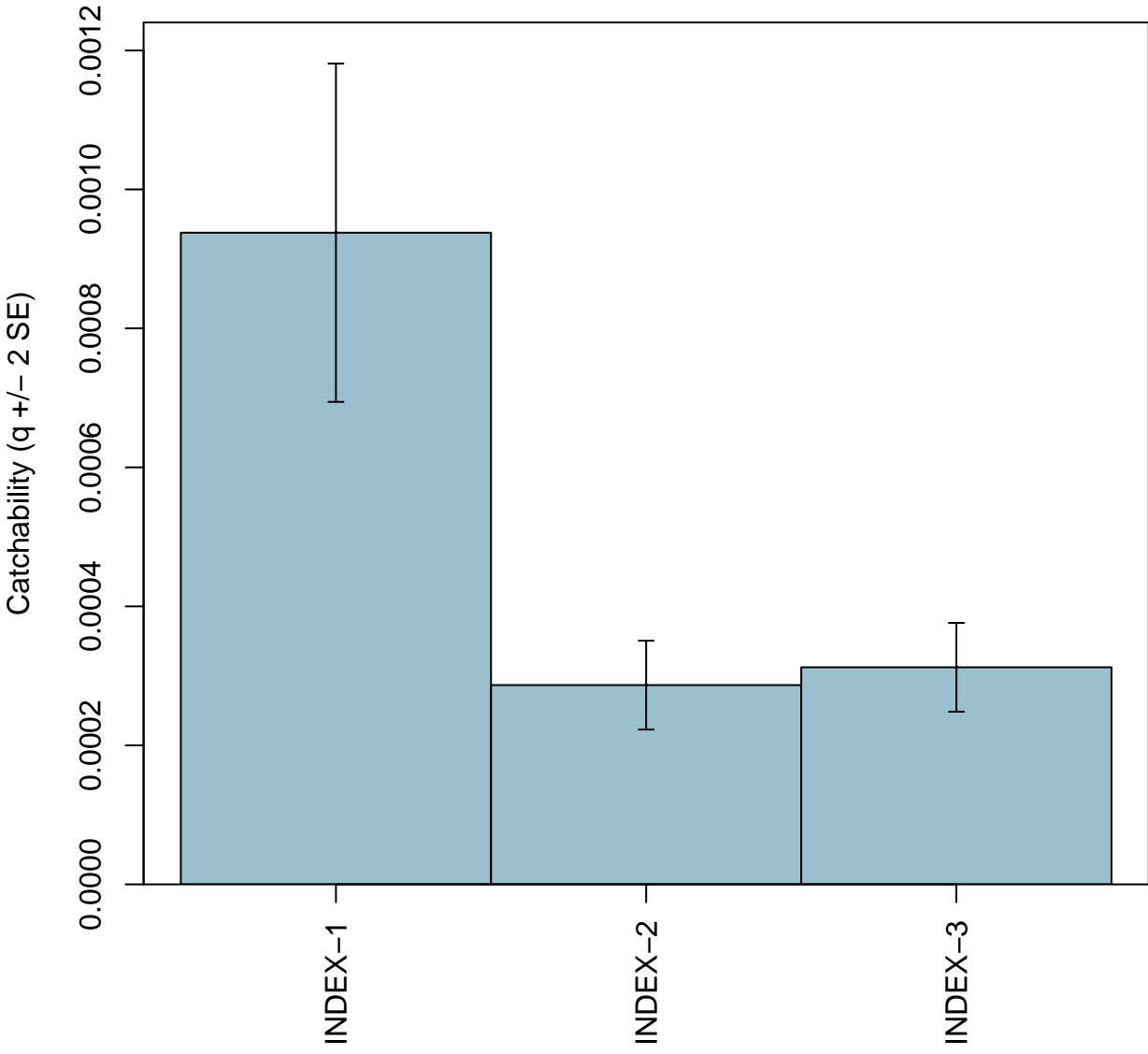
# Index 3 (INDEX-3) Observed

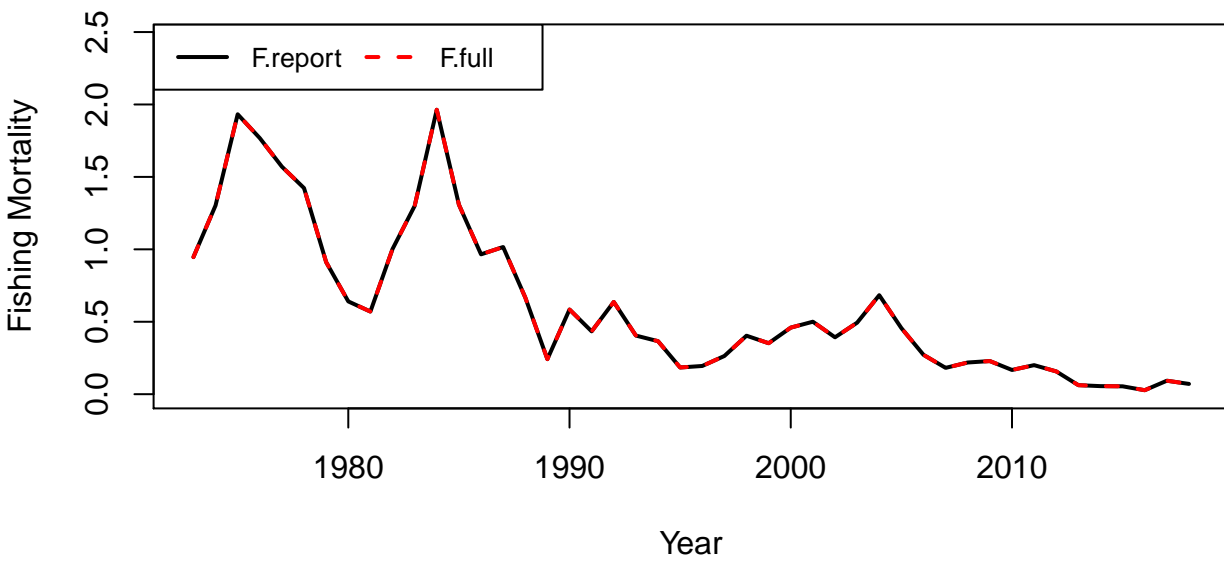
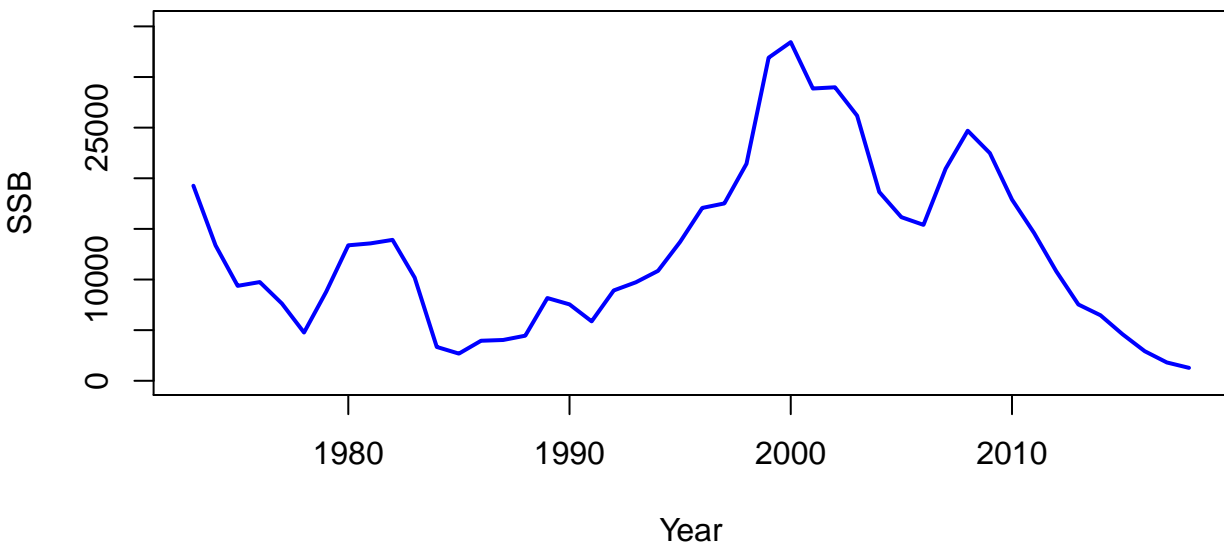




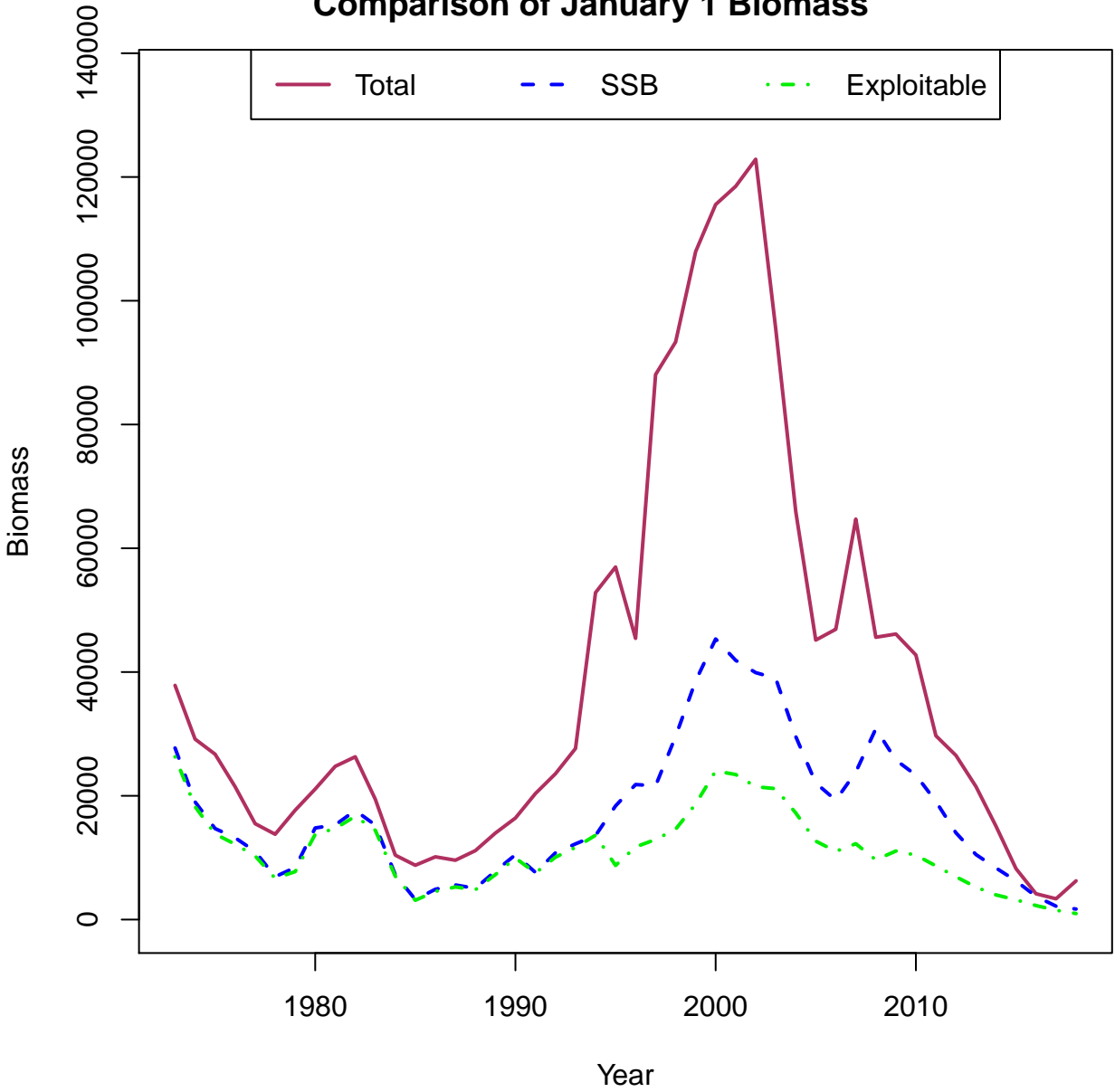
# Index 3 (INDEX-3) Predicted



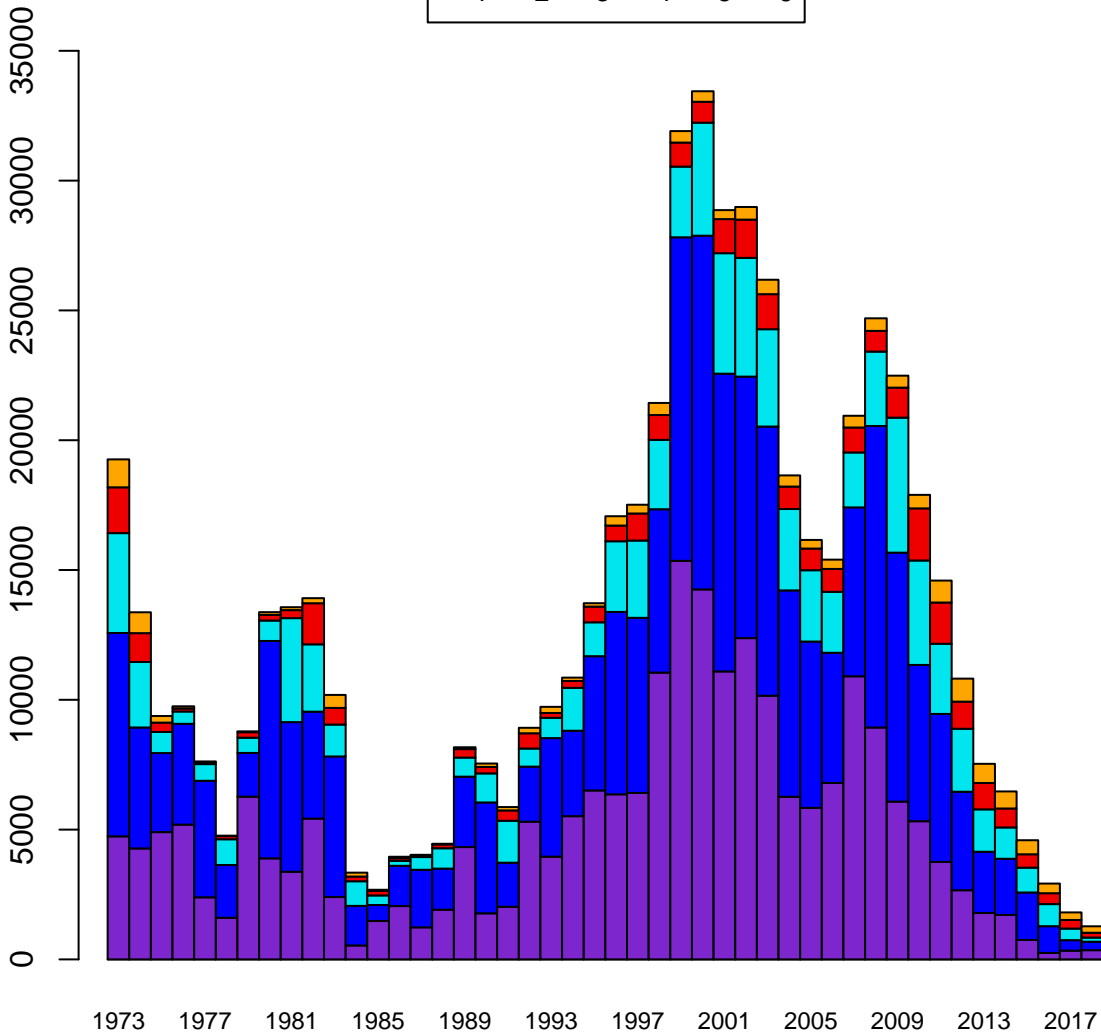




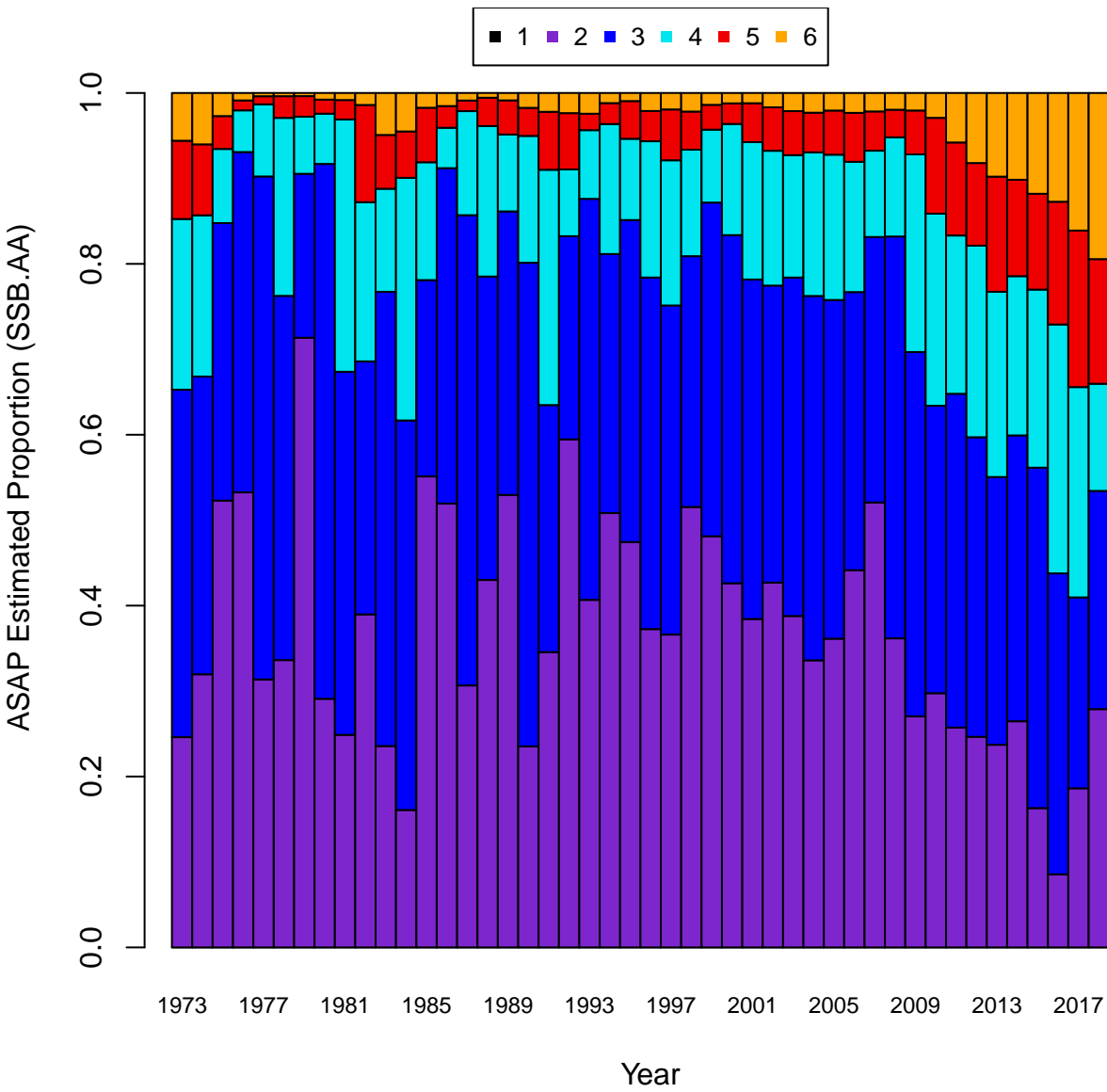
**Comparison of January 1 Biomass**

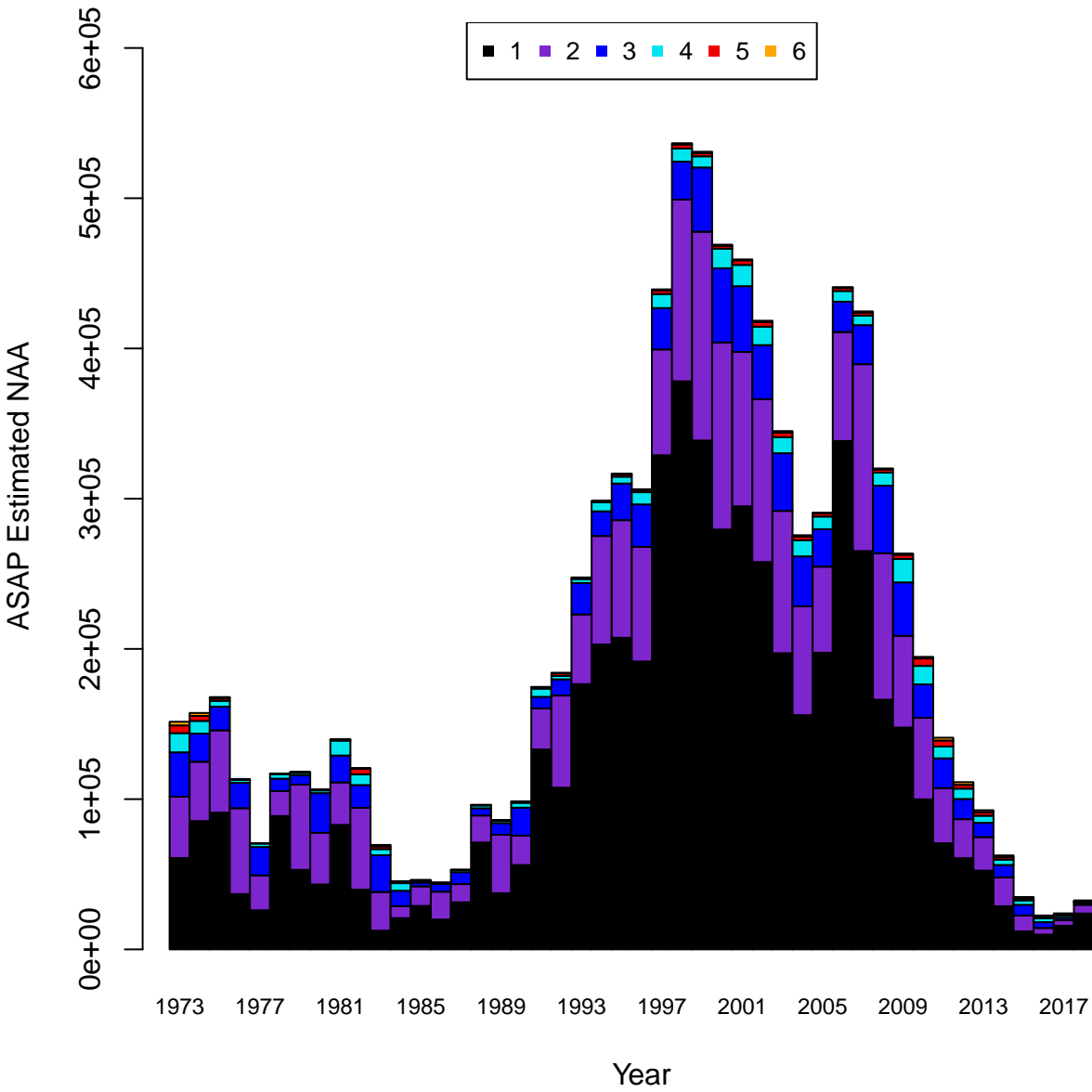


ASAP Estimated SSB.AA

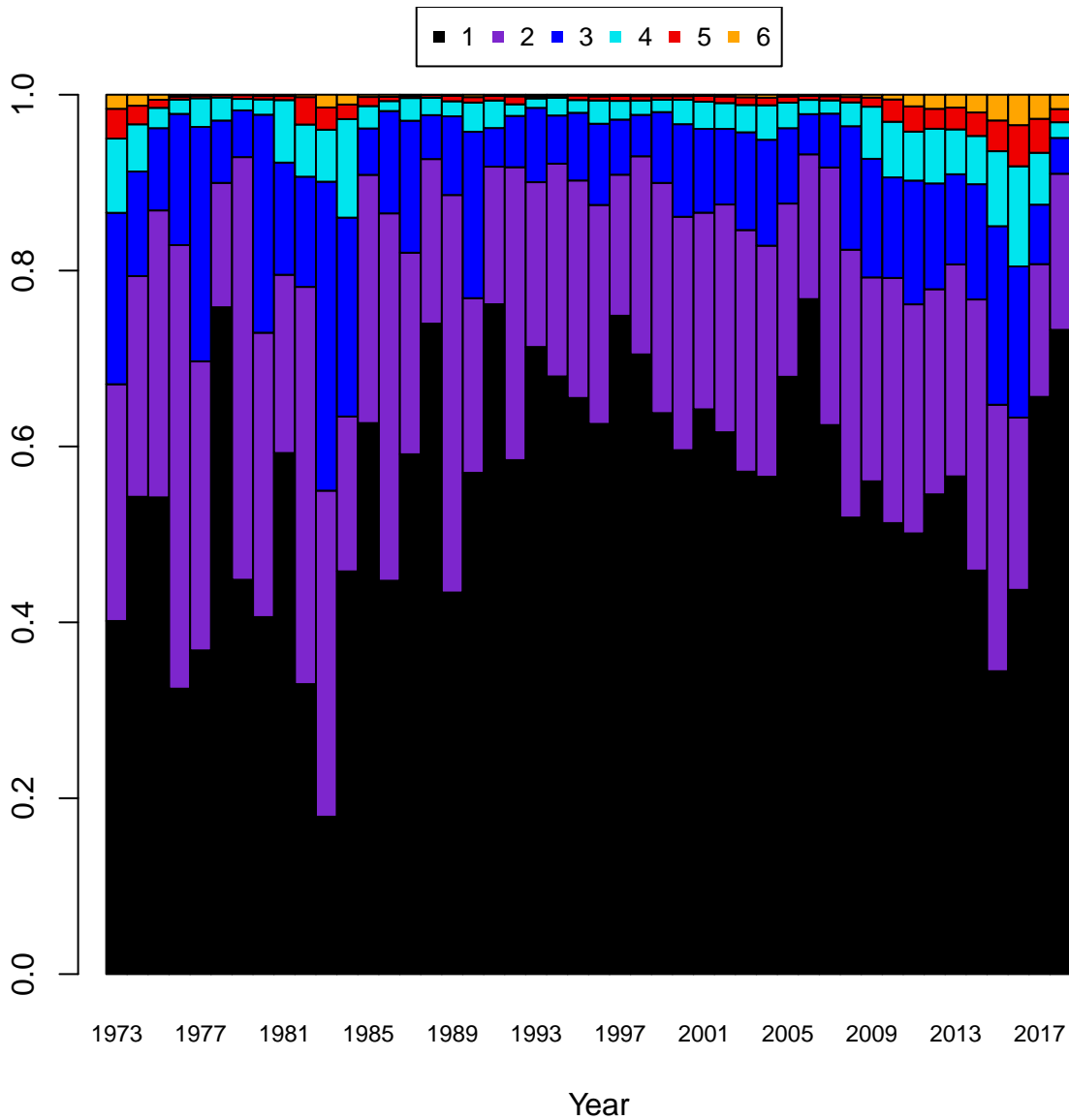


Year

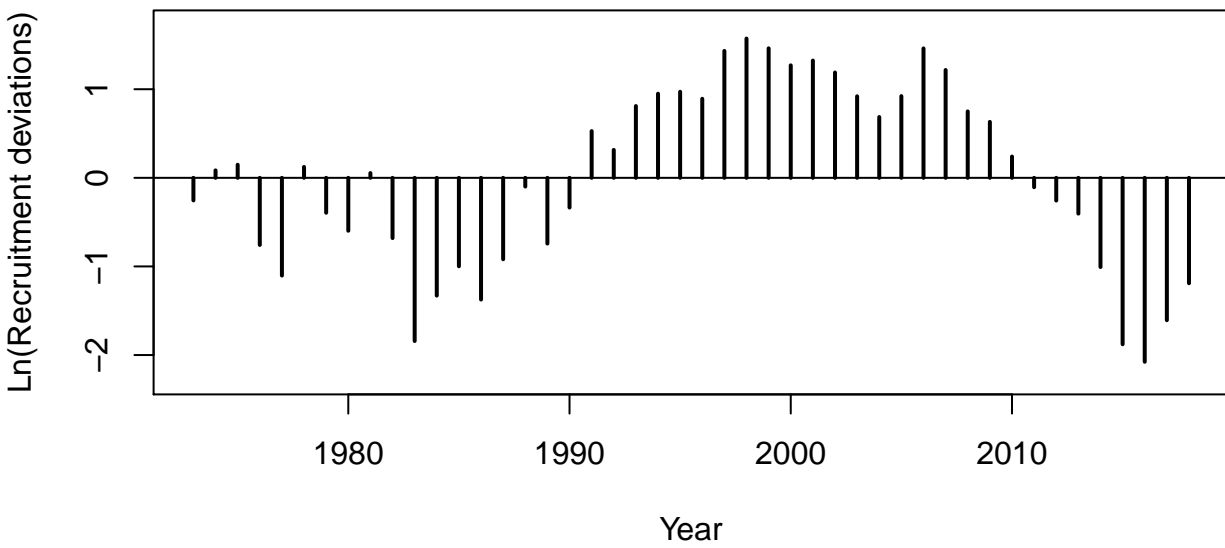
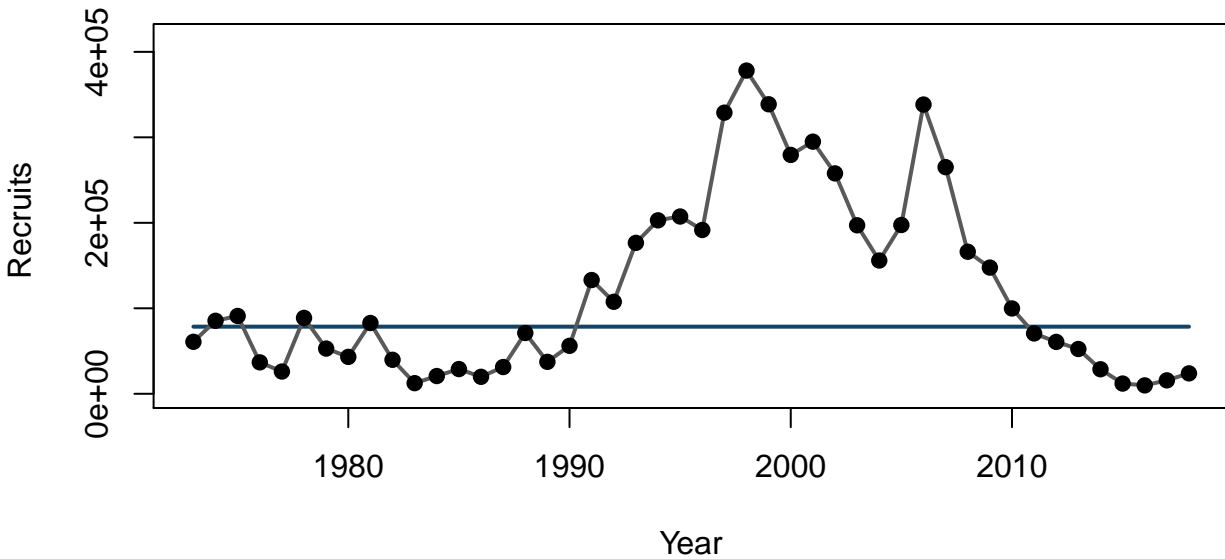


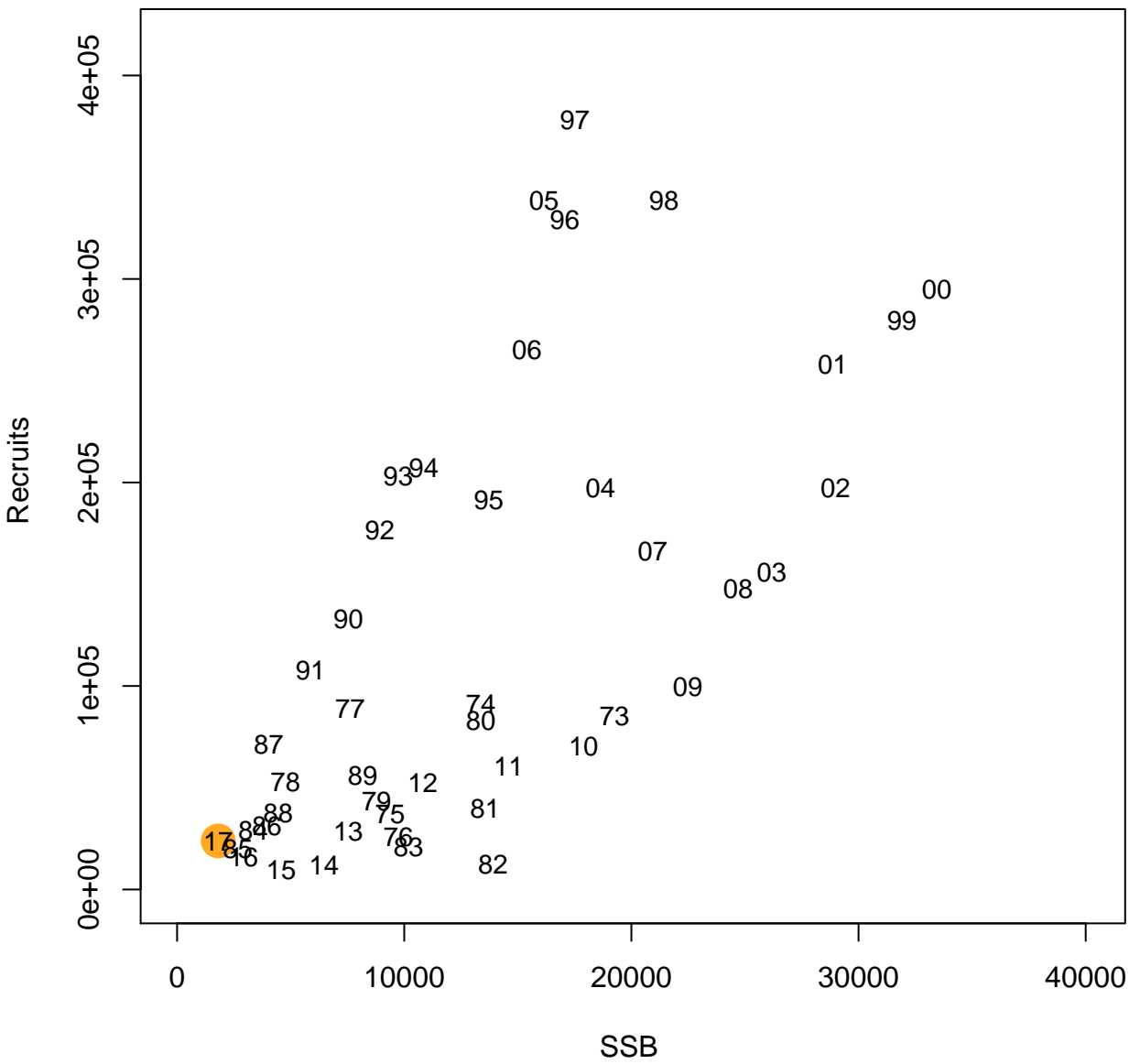


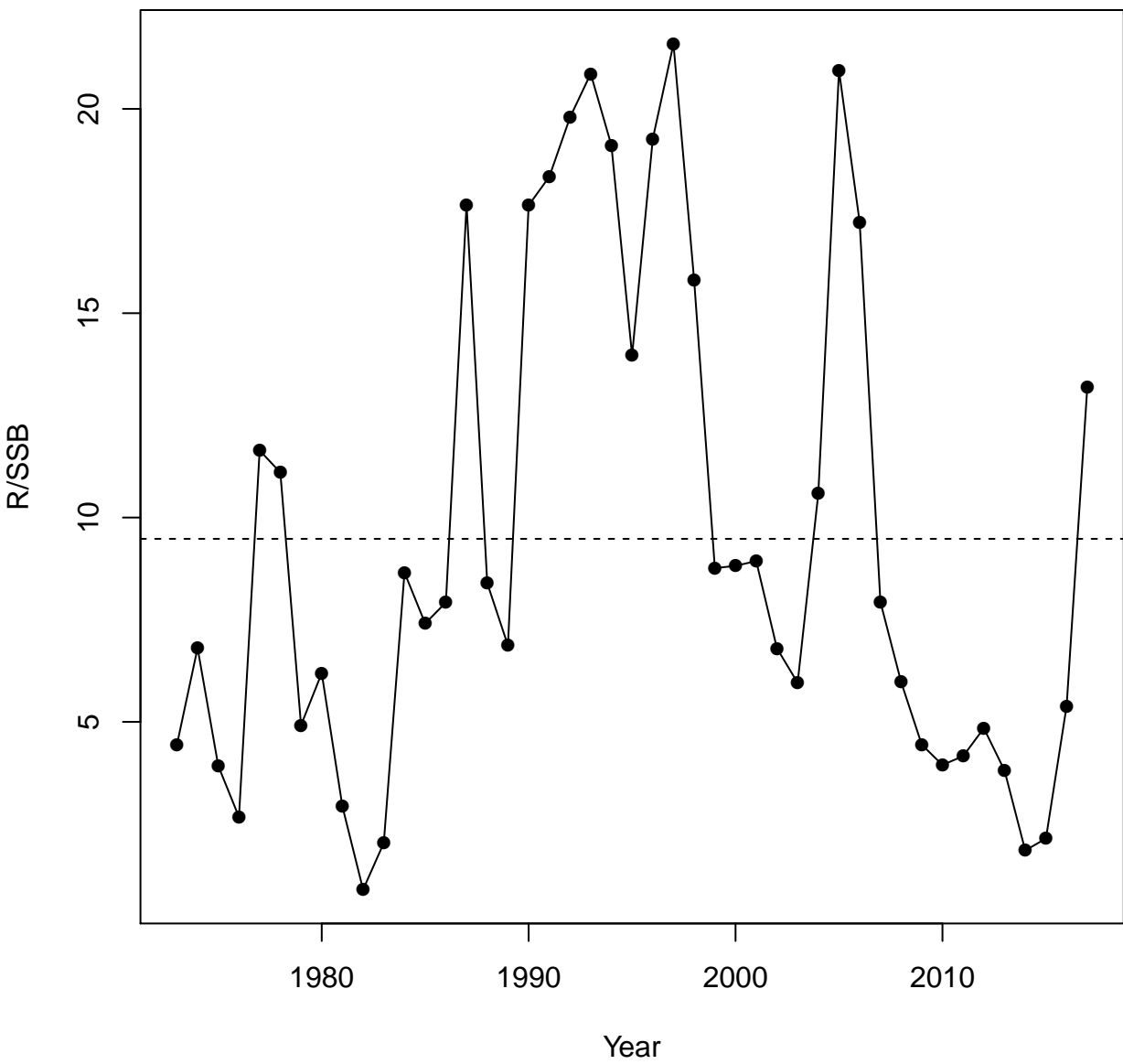
ASAP Estimated Proportion (NAA)

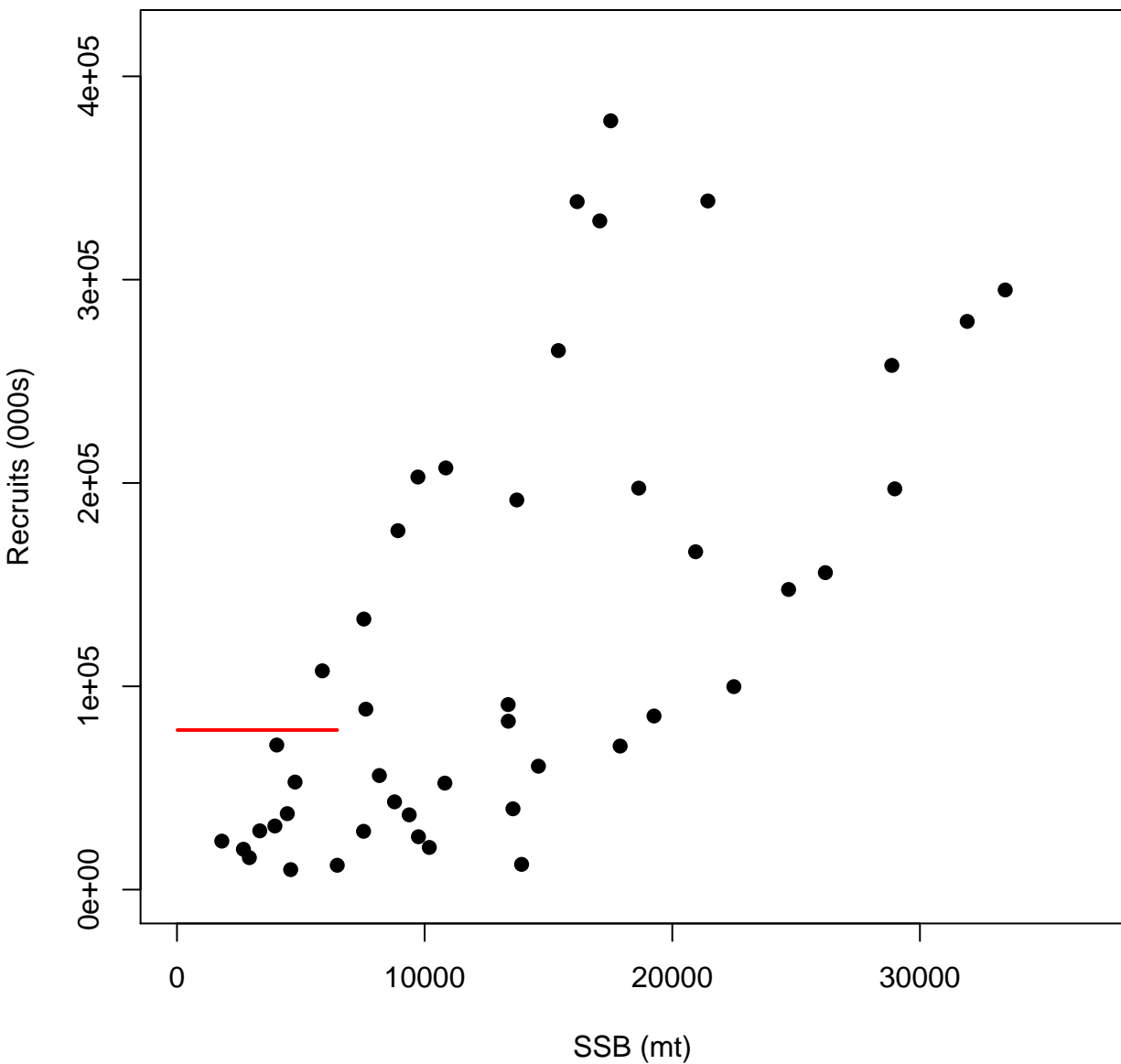


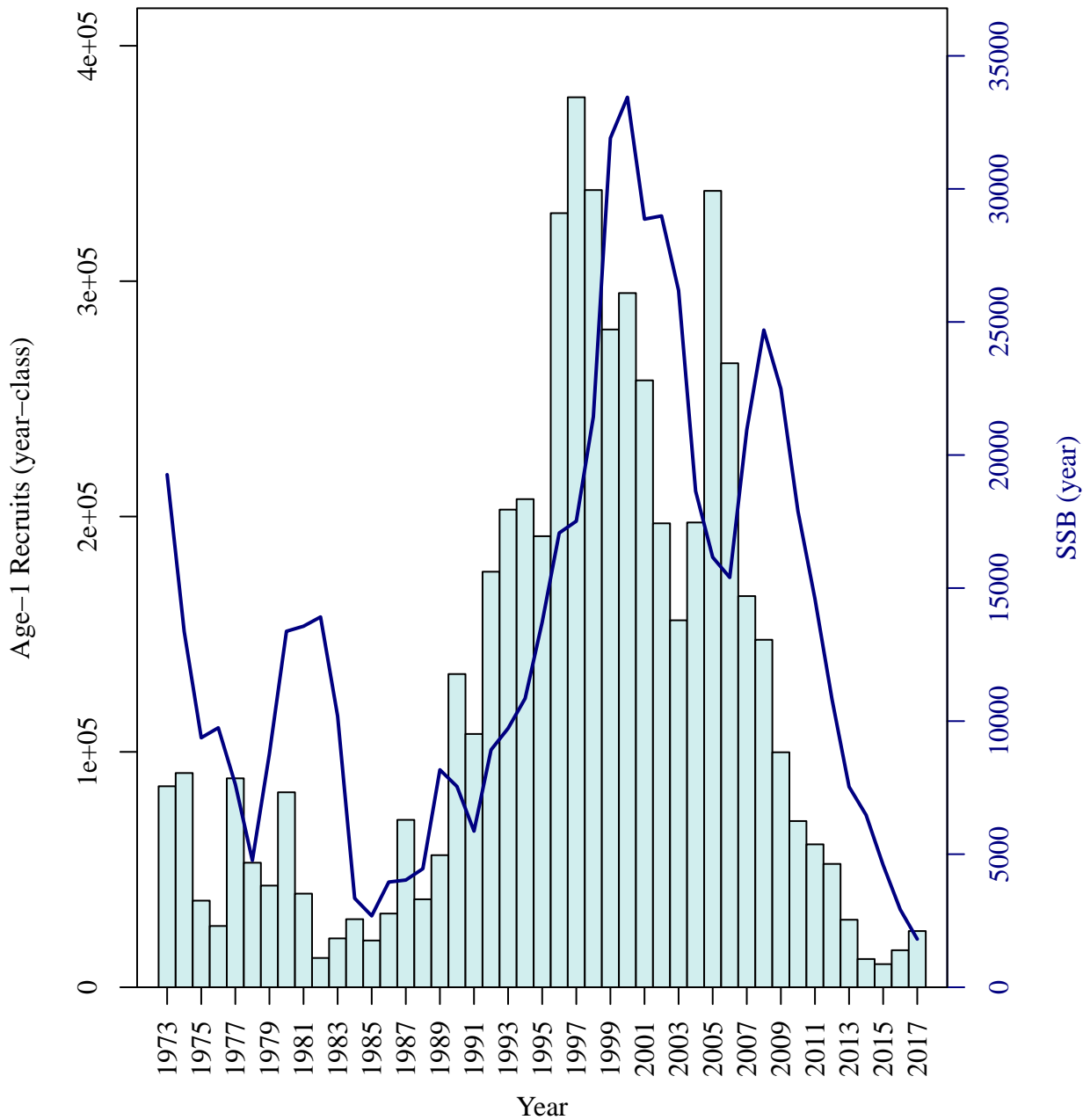


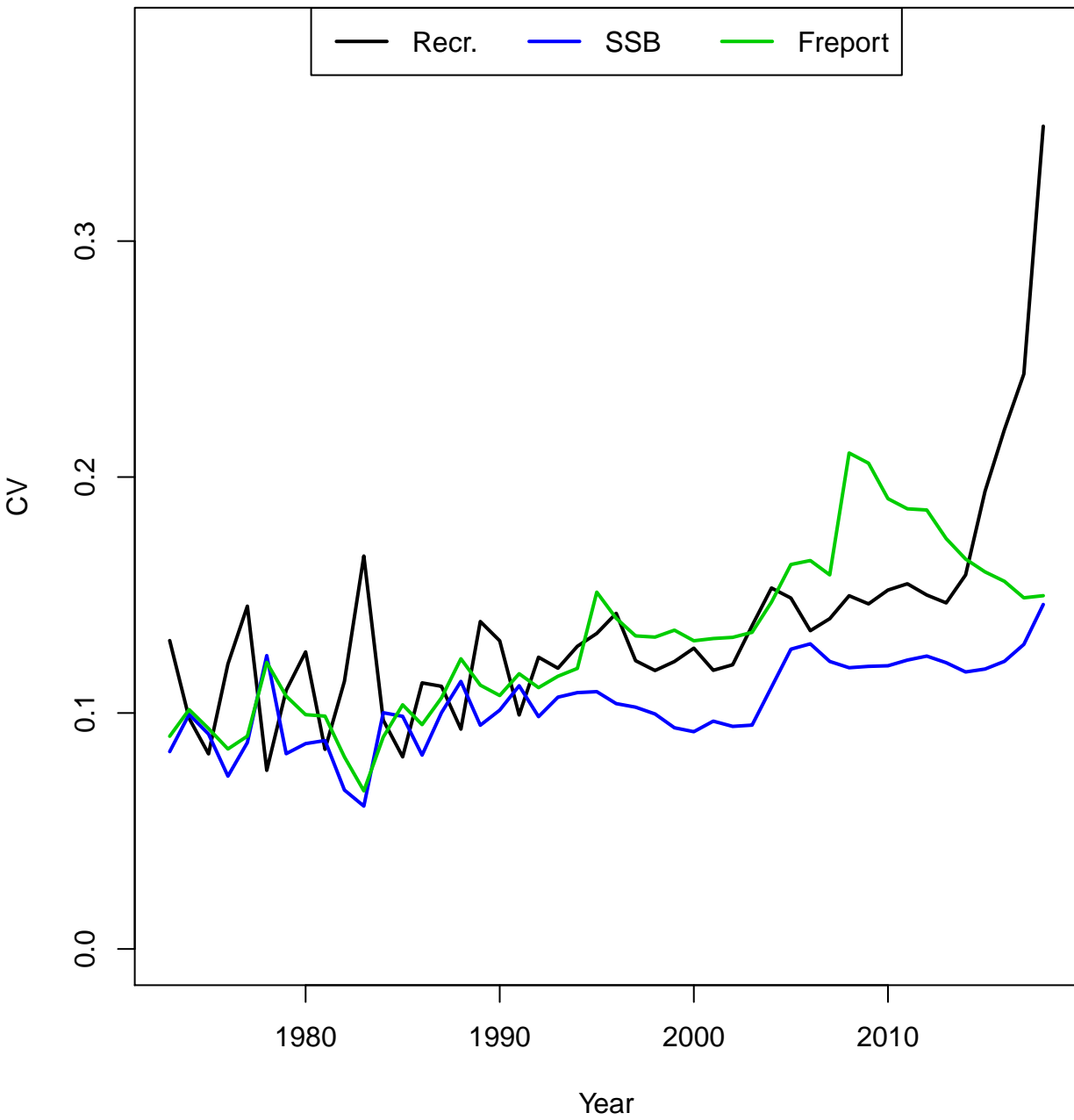




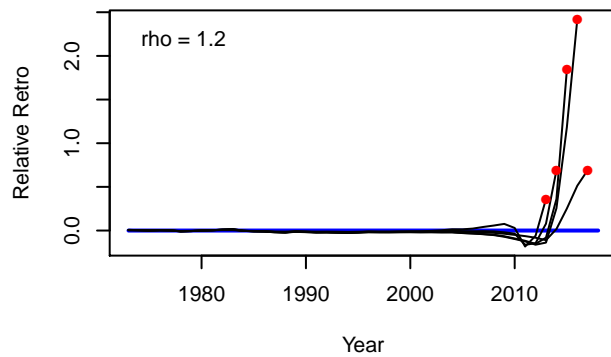
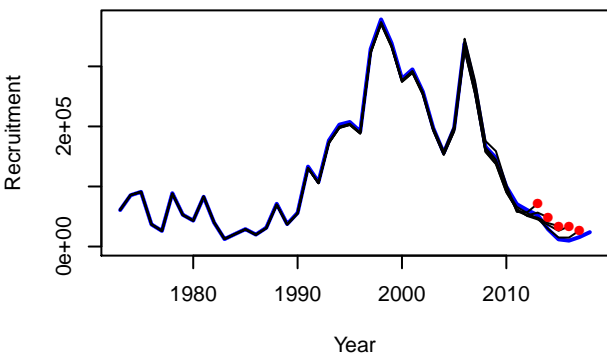
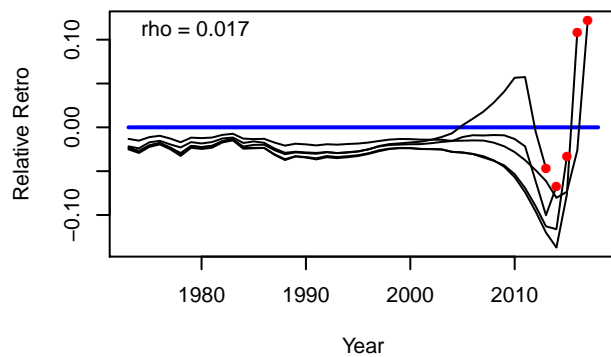
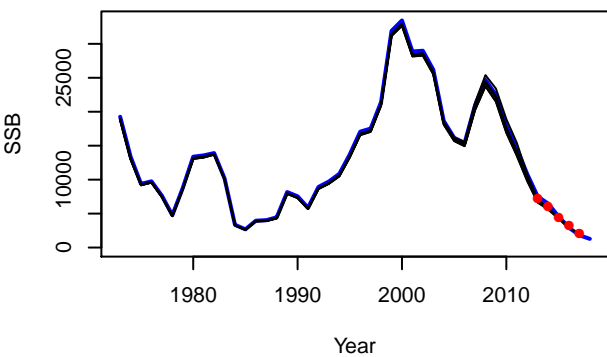
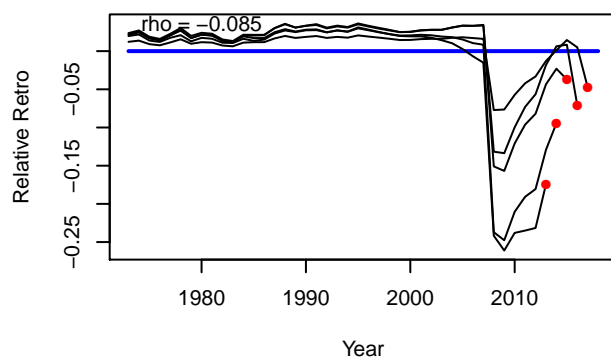
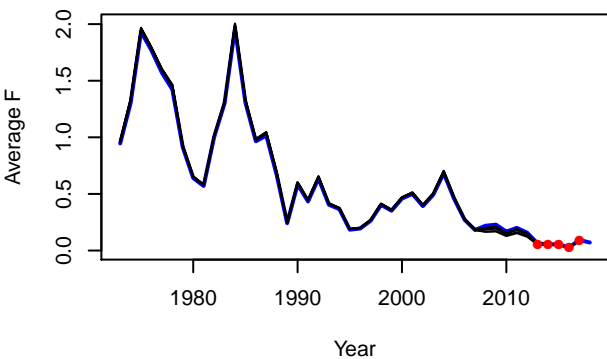






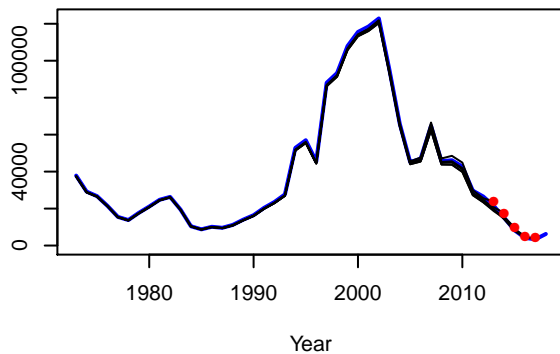


# F, SSB, R

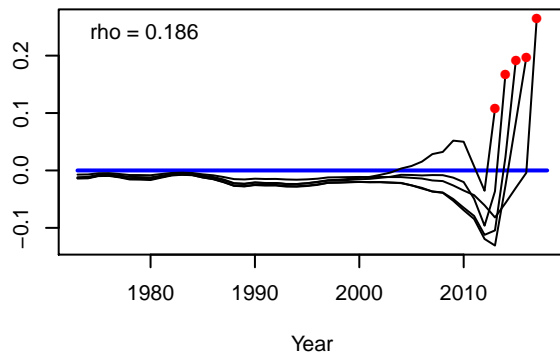


# Jan-1 B, Exploitable B, Total Stock N

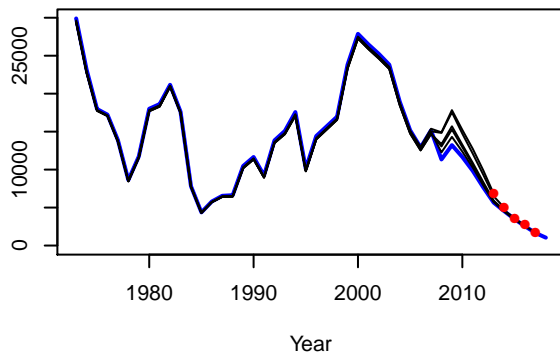
Jan-1 B



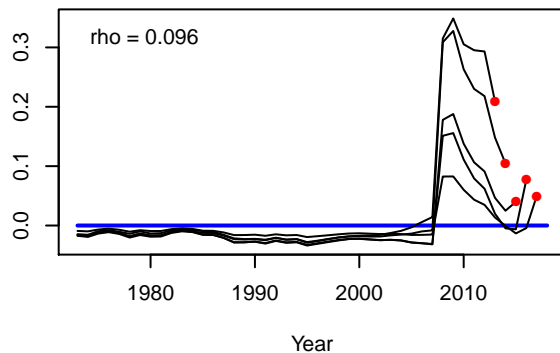
Relative Retro



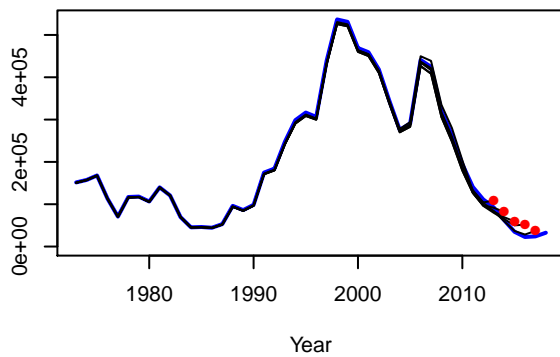
Exploitable B



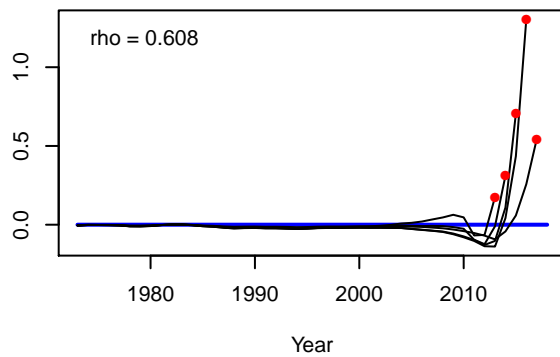
Relative Retro



Total Stock N

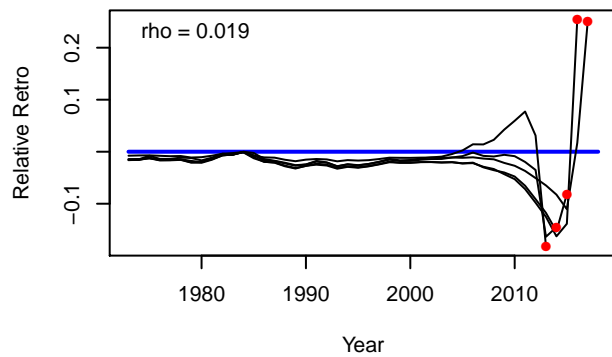
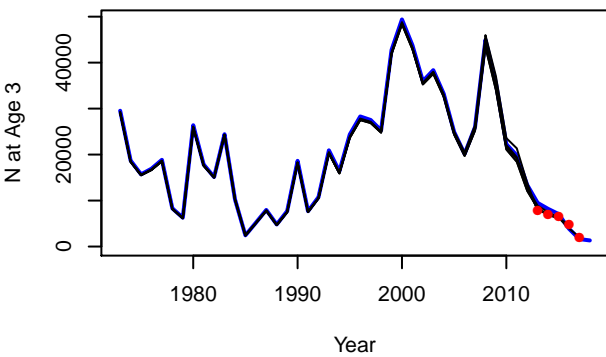
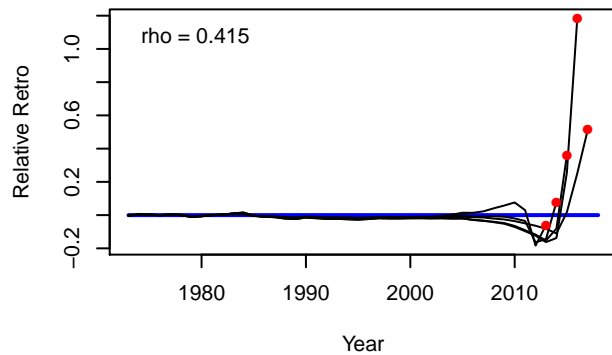
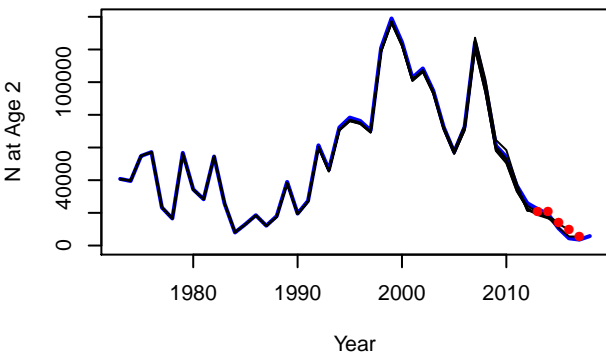
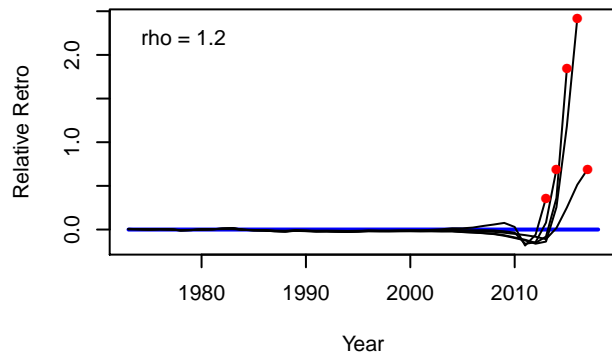
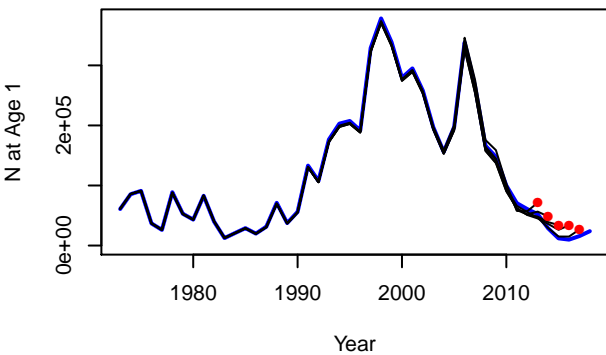


Relative Retro

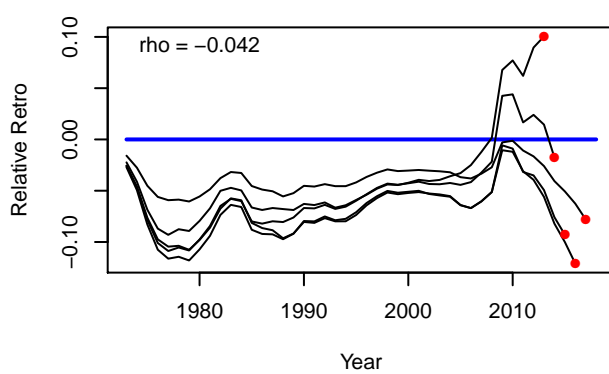
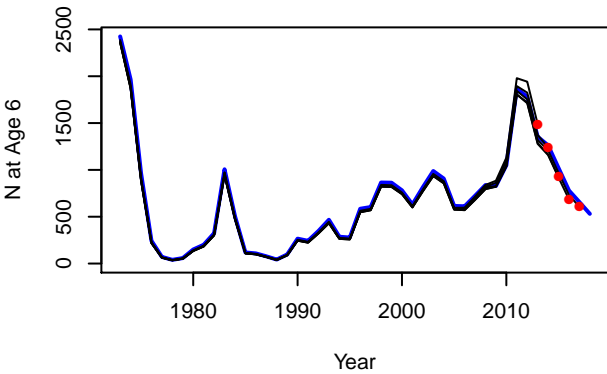
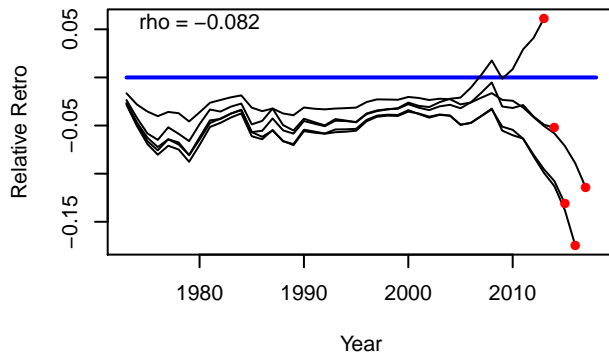
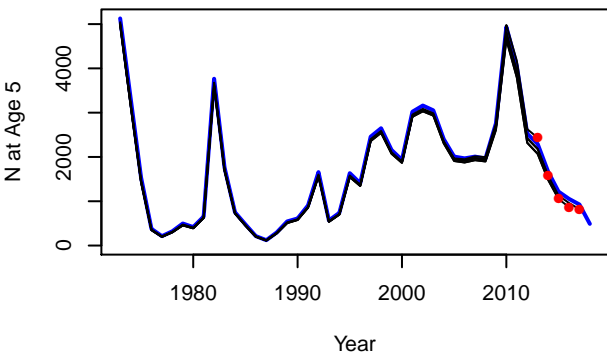
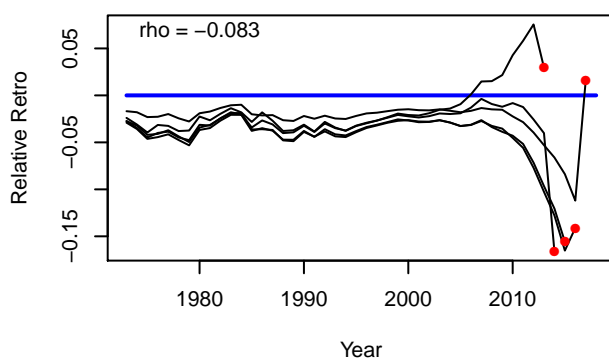
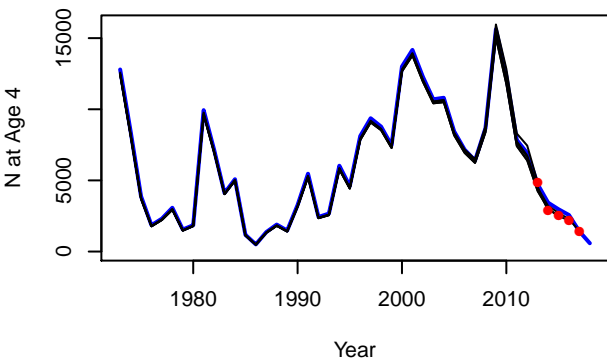




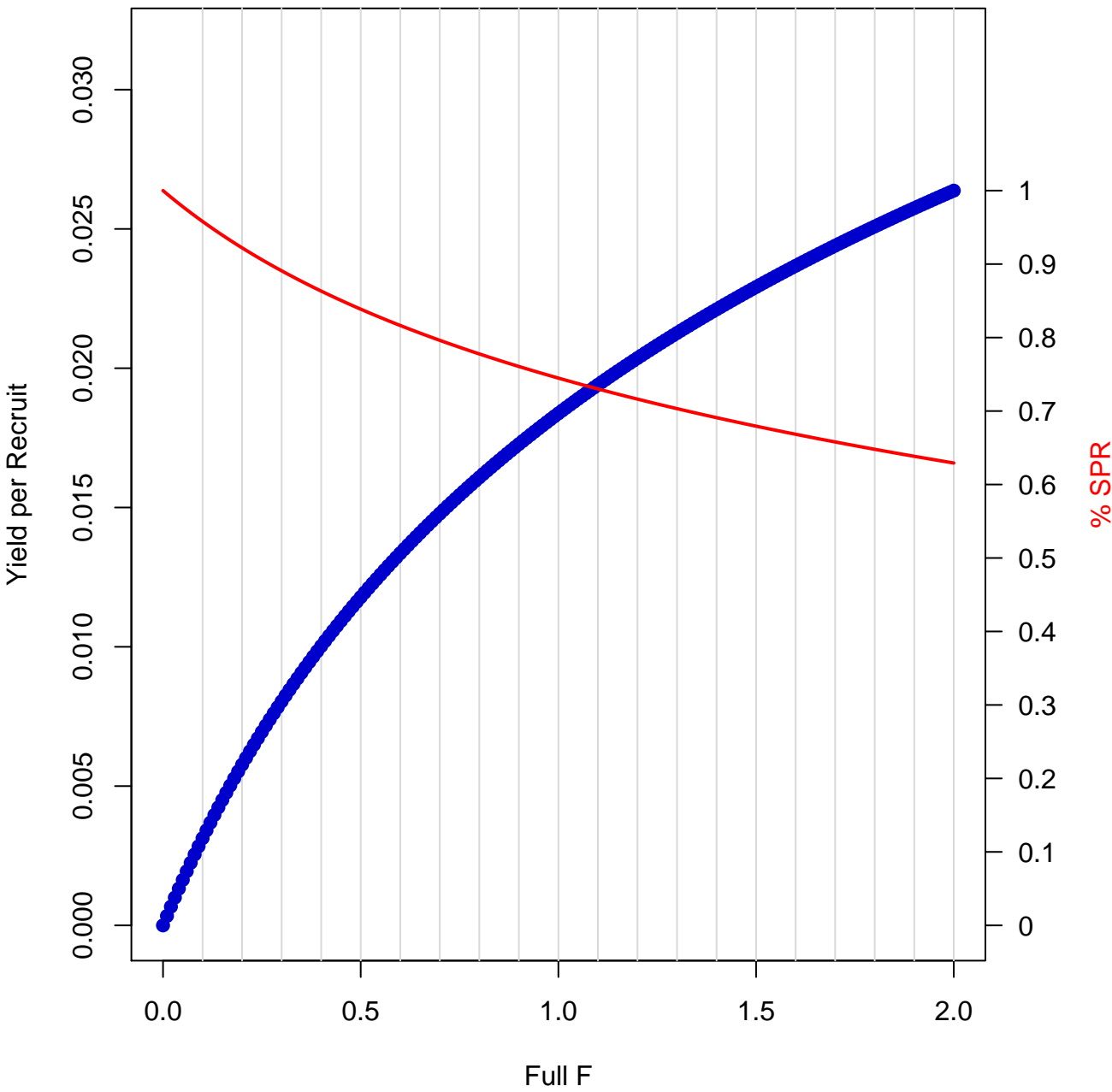
# Stock Numbers at Age



# Stock Numbers at Age



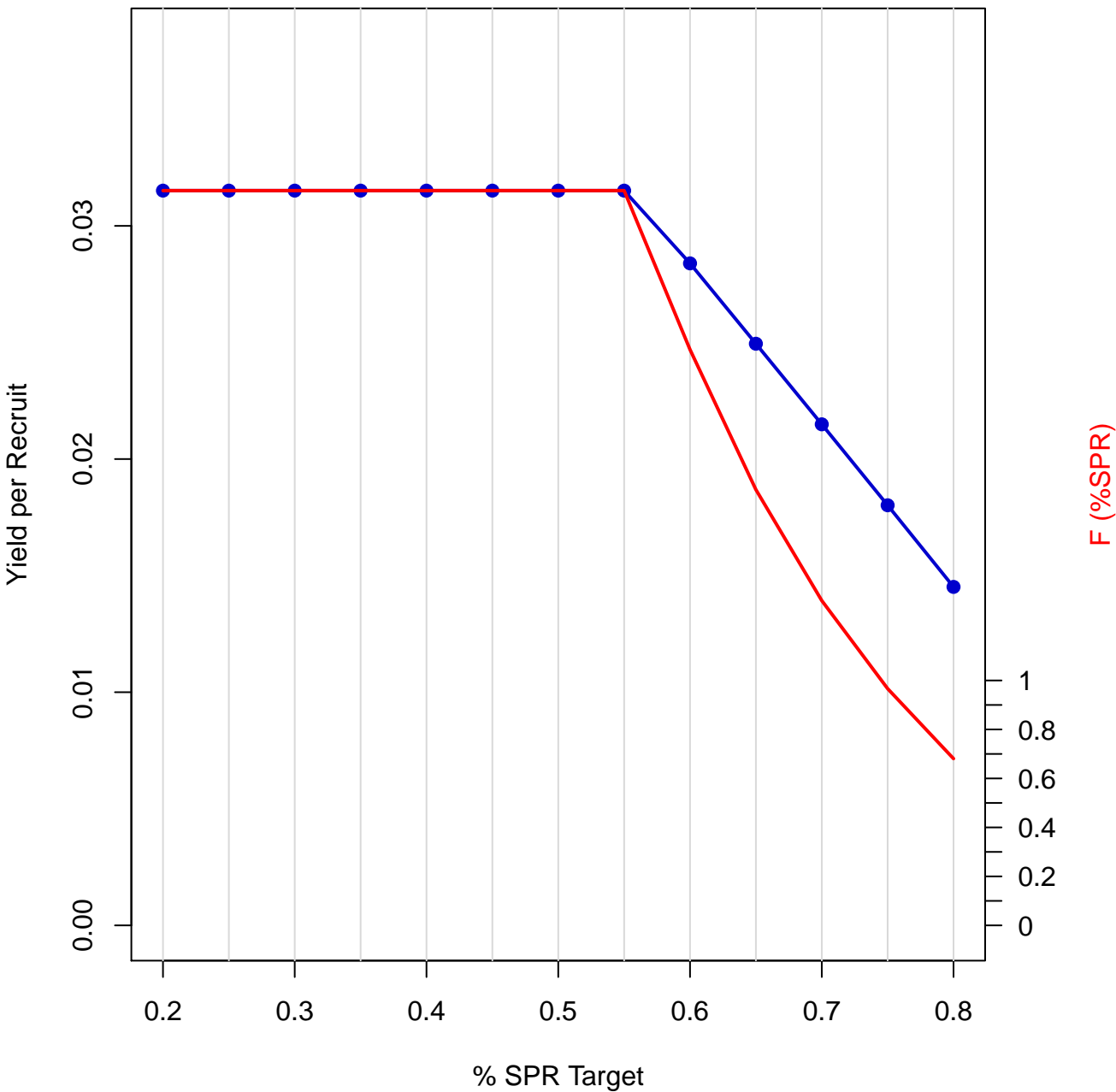
YPR-SPR Reference Points (Years Avg = 5)



# YPR–SPR Reference Points (Years Avg = 5)

F	YPR	SPR	F	YPR	SPR	F	YPR	SPR
0	0	1	0.35	0.0091	0.8766	0.7	0.0148	0.7962
0.01	3e-04	0.9955	0.36	0.0093	0.8739	0.71	0.0149	0.7943
0.02	7e-04	0.991	0.37	0.0095	0.8712	0.72	0.0151	0.7924
0.03	0.001	0.9867	0.38	0.0096	0.8685	0.73	0.0152	0.7905
0.04	0.0013	0.9824	0.39	0.0098	0.8659	0.74	0.0153	0.7886
0.05	0.0016	0.9782	0.4	0.01	0.8633	0.75	0.0154	0.7868
0.06	0.0019	0.974	0.41	0.0102	0.8607	0.76	0.0156	0.7849
0.07	0.0022	0.9699	0.42	0.0104	0.8581	0.77	0.0157	0.7831
0.08	0.0025	0.9659	0.43	0.0106	0.8556	0.78	0.0158	0.7813
0.09	0.0028	0.9619	0.44	0.0108	0.8531	0.79	0.016	0.7795
0.1	0.0031	0.958	0.45	0.0109	0.8506	0.8	0.0161	0.7777
0.11	0.0034	0.9542	0.46	0.0111	0.8482	0.81	0.0162	0.776
0.12	0.0037	0.9504	0.47	0.0113	0.8458	0.82	0.0163	0.7742
0.13	0.004	0.9467	0.48	0.0114	0.8434	0.83	0.0164	0.7725
0.14	0.0042	0.943	0.49	0.0116	0.841	0.84	0.0166	0.7707
0.15	0.0045	0.9394	0.5	0.0118	0.8386	0.85	0.0167	0.769
0.16	0.0048	0.9359	0.51	0.0119	0.8363	0.86	0.0168	0.7673
0.17	0.005	0.9323	0.52	0.0121	0.834	0.87	0.0169	0.7656
0.18	0.0053	0.9289	0.53	0.0123	0.8317	0.88	0.017	0.764
0.19	0.0055	0.9255	0.54	0.0124	0.8295	0.89	0.0172	0.7623
0.2	0.0058	0.9221	0.55	0.0126	0.8273	0.9	0.0173	0.7607
0.21	0.006	0.9188	0.56	0.0127	0.8251	0.91	0.0174	0.759
0.22	0.0063	0.9155	0.57	0.0129	0.8229	0.92	0.0175	0.7574
0.23	0.0065	0.9123	0.58	0.0131	0.8207	0.93	0.0176	0.7558
0.24	0.0067	0.9091	0.59	0.0132	0.8186	0.94	0.0177	0.7542
0.25	0.0069	0.906	0.6	0.0134	0.8164	0.95	0.0178	0.7526
0.26	0.0072	0.9029	0.61	0.0135	0.8143	0.96	0.0179	0.751
0.27	0.0074	0.8998	0.62	0.0137	0.8122	0.97	0.0181	0.7495
0.28	0.0076	0.8968	0.63	0.0138	0.8102	0.98	0.0182	0.7479
0.29	0.0078	0.8938	0.64	0.0139	0.8081	0.99	0.0183	0.7464
0.3	0.008	0.8908	0.65	0.0141	0.8061	1	0.0184	0.7448
0.31	0.0083	0.8879	0.66	0.0142	0.8041	1.01	0.0185	0.7433
0.32	0.0085	0.8851	0.67	0.0144	0.8021	1.02	0.0186	0.7418
0.33	0.0087	0.8822	0.68	0.0145	0.8001	1.03	0.0187	0.7403
0.34	0.0089	0.8794	0.69	0.0146	0.7982	1.04	0.0188	0.7388

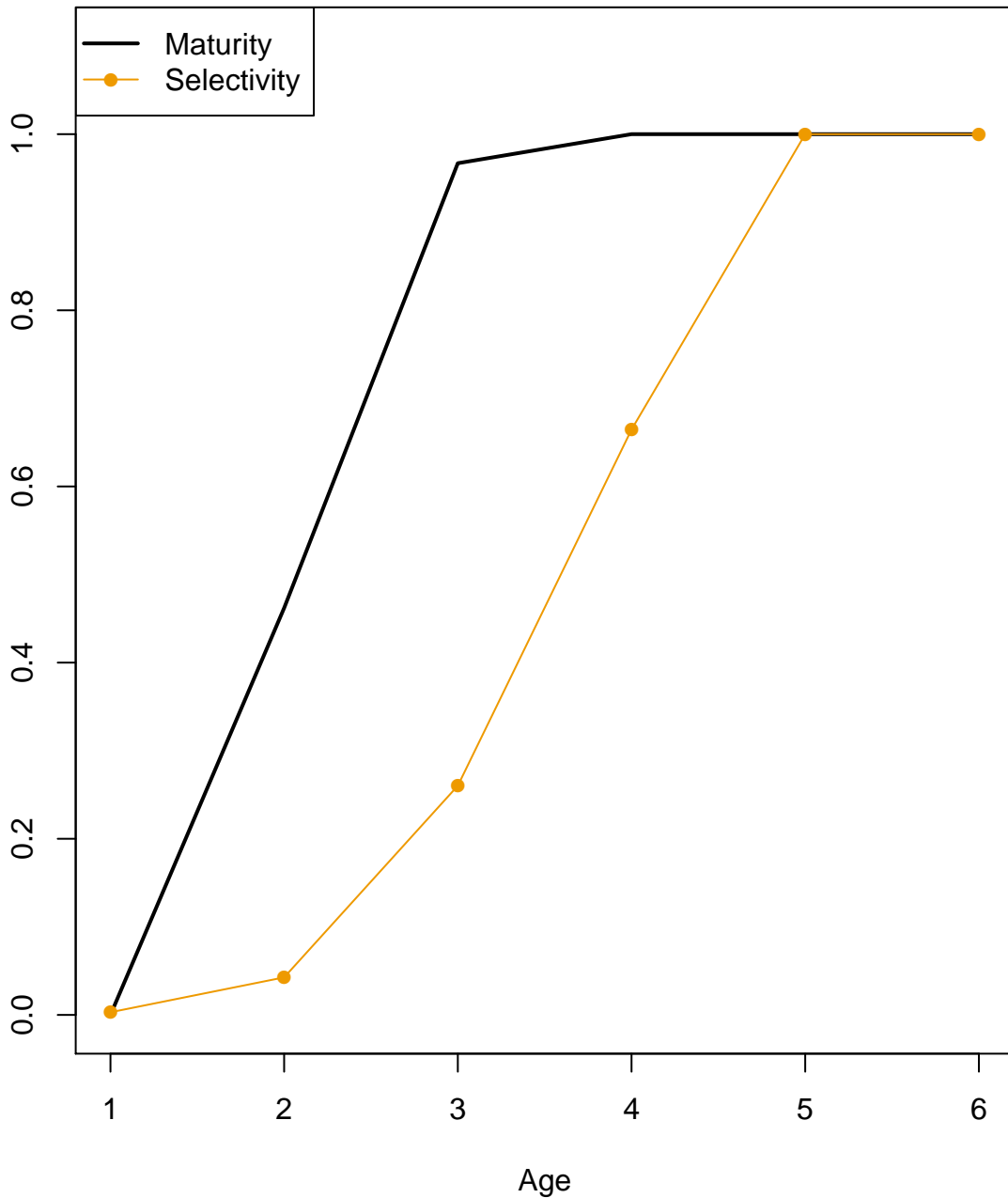
SPR Target Reference Points (Years Avg = 5)



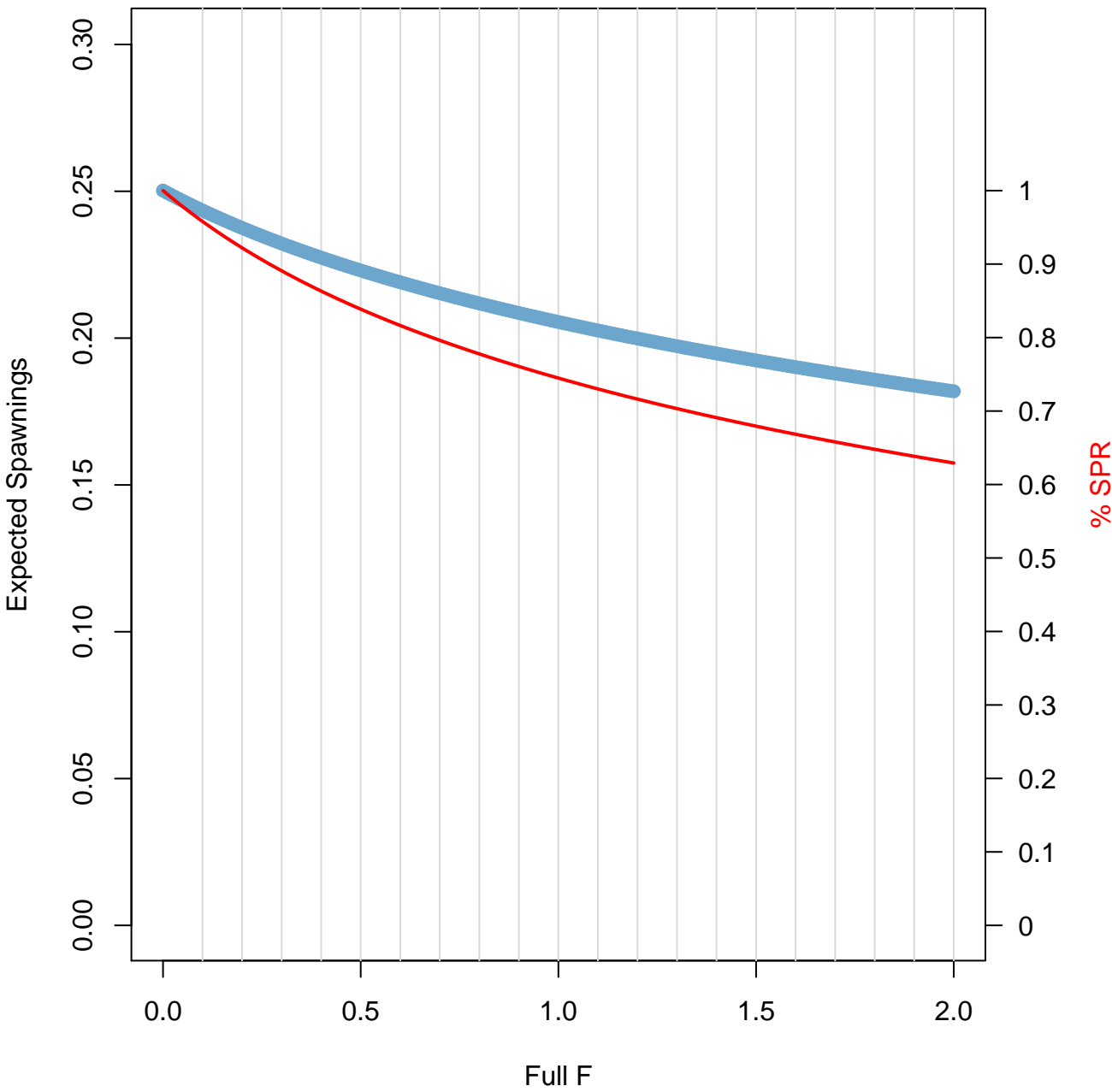
## SPR Target Reference Points (Years Avg = 5)

% SPR	F(%SPR)	YPR
0.2	3	0.0315
0.25	3	0.0315
0.3	3	0.0315
0.35	3	0.0315
0.4	3	0.0315
0.45	3	0.0315
0.5	3	0.0315
0.55	3	0.0315
0.6	2.3509	0.0284
0.65	1.779	0.0249
0.7	1.326	0.0215
0.75	0.9665	0.018
0.8	0.6807	0.0145

Selectivity or Maturity at age



**Expected Spawns and SPR Reference Points (Years Avg = 5)**

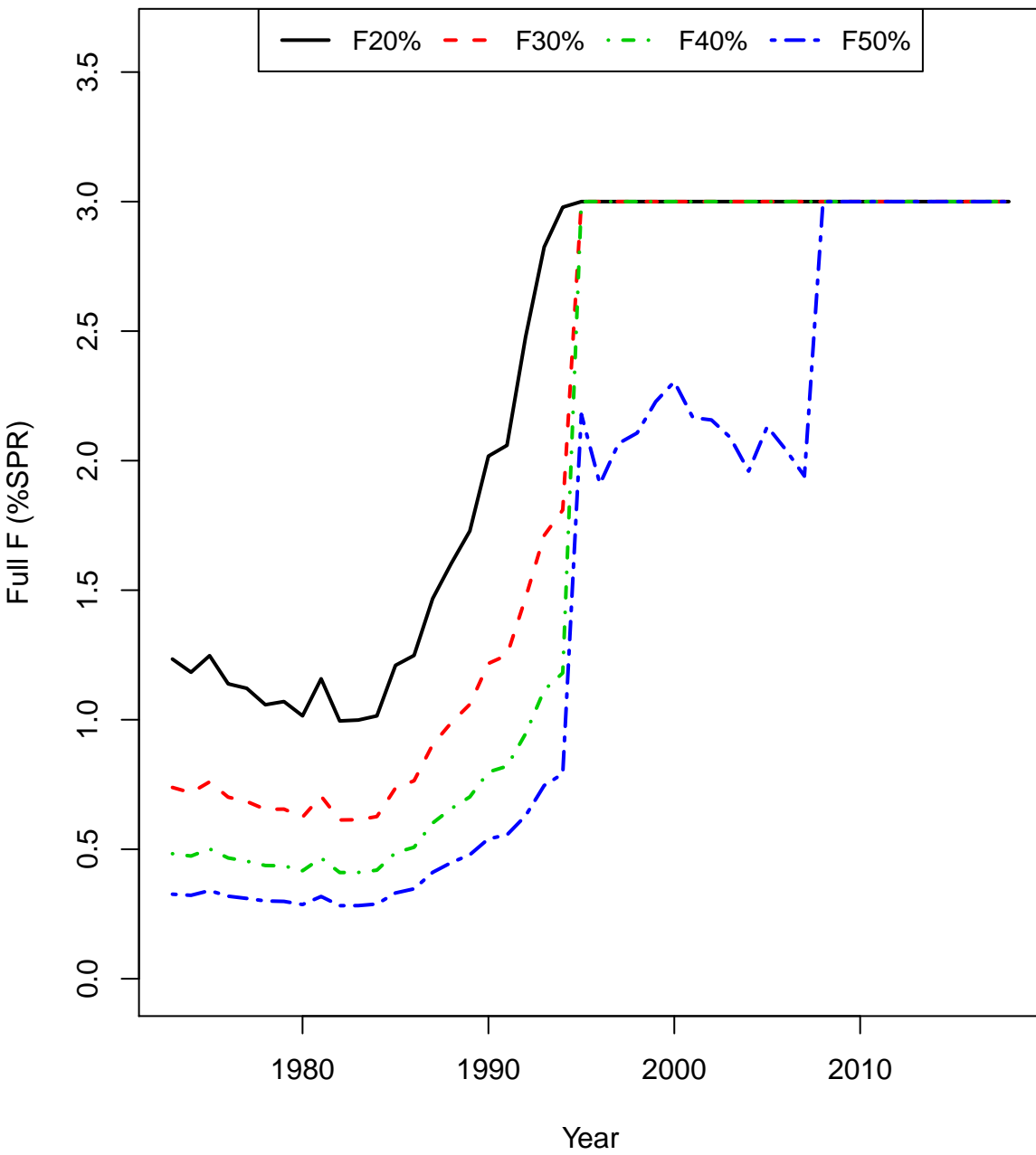




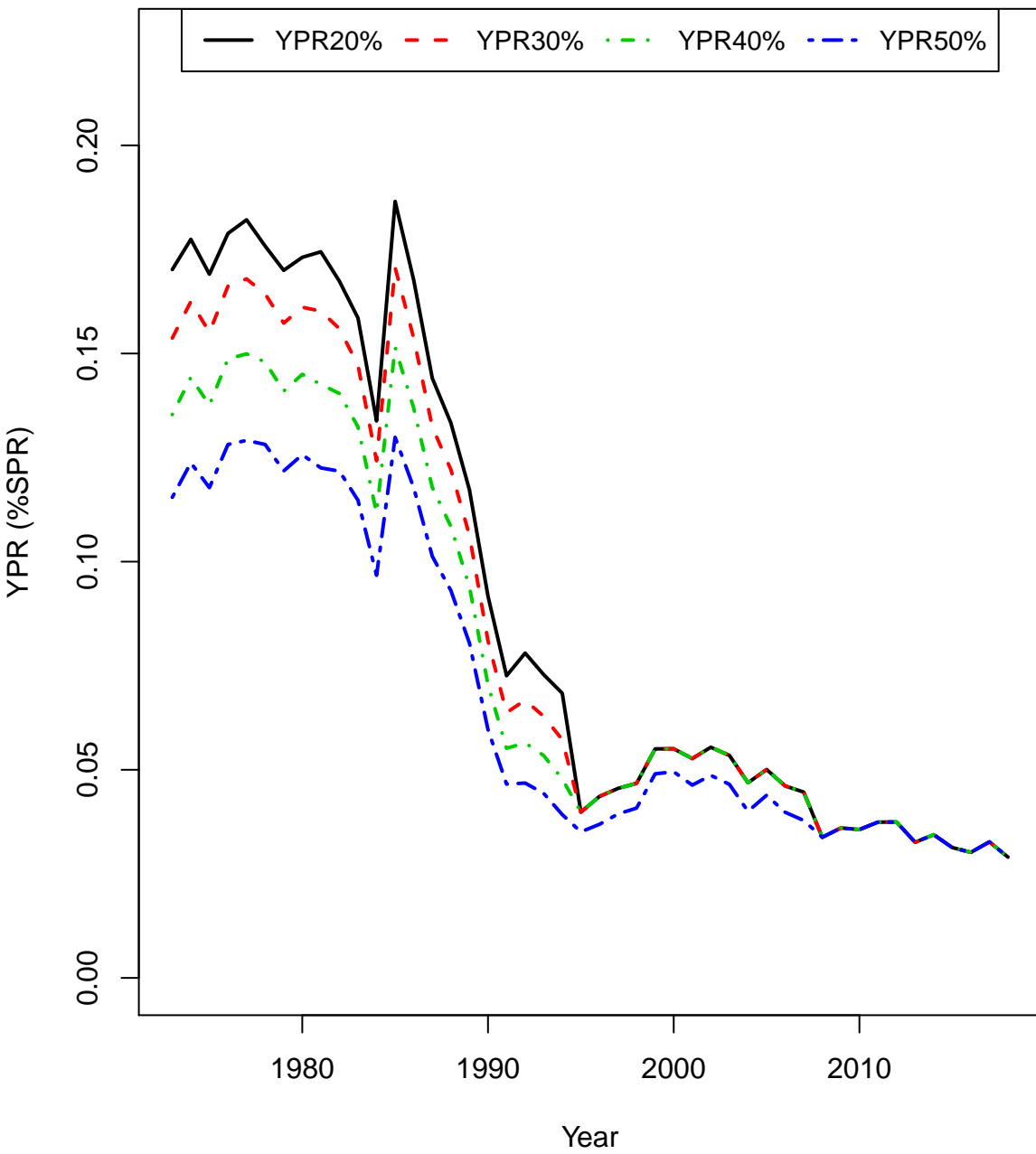
**Expected Spawnings & SPR Reference Points (Years Avg = 5)**

<b>F</b>	<b>E[Sp]</b>	<b>SPR</b>	<b>F</b>	<b>E[Sp]</b>	<b>SPR</b>	<b>F</b>	<b>E[Sp]</b>	<b>SPR</b>
0	0.2502	1	0.35	0.2298	0.8766	0.7	0.2153	0.7962
0.01	0.2495	0.9955	0.36	0.2293	0.8739	0.71	0.2149	0.7943
0.02	0.2488	0.991	0.37	0.2288	0.8712	0.72	0.2146	0.7924
0.03	0.2481	0.9867	0.38	0.2283	0.8685	0.73	0.2142	0.7905
0.04	0.2474	0.9824	0.39	0.2279	0.8659	0.74	0.2139	0.7886
0.05	0.2467	0.9782	0.4	0.2274	0.8633	0.75	0.2135	0.7868
0.06	0.2461	0.974	0.41	0.227	0.8607	0.76	0.2132	0.7849
0.07	0.2454	0.9699	0.42	0.2265	0.8581	0.77	0.2128	0.7831
0.08	0.2448	0.9659	0.43	0.2261	0.8556	0.78	0.2125	0.7813
0.09	0.2441	0.9619	0.44	0.2256	0.8531	0.79	0.2122	0.7795
0.1	0.2435	0.958	0.45	0.2252	0.8506	0.8	0.2118	0.7777
0.11	0.2428	0.9542	0.46	0.2248	0.8482	0.81	0.2115	0.776
0.12	0.2422	0.9504	0.47	0.2243	0.8458	0.82	0.2111	0.7742
0.13	0.2416	0.9467	0.48	0.2239	0.8434	0.83	0.2108	0.7725
0.14	0.241	0.943	0.49	0.2235	0.841	0.84	0.2105	0.7707
0.15	0.2404	0.9394	0.5	0.223	0.8386	0.85	0.2102	0.769
0.16	0.2398	0.9359	0.51	0.2226	0.8363	0.86	0.2098	0.7673
0.17	0.2392	0.9323	0.52	0.2222	0.834	0.87	0.2095	0.7656
0.18	0.2387	0.9289	0.53	0.2218	0.8317	0.88	0.2092	0.764
0.19	0.2381	0.9255	0.54	0.2214	0.8295	0.89	0.2089	0.7623
0.2	0.2375	0.9221	0.55	0.221	0.8273	0.9	0.2086	0.7607
0.21	0.237	0.9188	0.56	0.2206	0.8251	0.91	0.2082	0.759
0.22	0.2364	0.9155	0.57	0.2202	0.8229	0.92	0.2079	0.7574
0.23	0.2359	0.9123	0.58	0.2198	0.8207	0.93	0.2076	0.7558
0.24	0.2353	0.9091	0.59	0.2194	0.8186	0.94	0.2073	0.7542
0.25	0.2348	0.906	0.6	0.219	0.8164	0.95	0.207	0.7526
0.26	0.2343	0.9029	0.61	0.2186	0.8143	0.96	0.2067	0.751
0.27	0.2338	0.8998	0.62	0.2183	0.8122	0.97	0.2064	0.7495
0.28	0.2332	0.8968	0.63	0.2179	0.8102	0.98	0.2061	0.7479
0.29	0.2327	0.8938	0.64	0.2175	0.8081	0.99	0.2058	0.7464
0.3	0.2322	0.8908	0.65	0.2171	0.8061	1	0.2055	0.7448
0.31	0.2317	0.8879	0.66	0.2167	0.8041	1.01	0.2052	0.7433
0.32	0.2312	0.8851	0.67	0.2164	0.8021	1.02	0.2049	0.7418
0.33	0.2307	0.8822	0.68	0.216	0.8001	1.03	0.2046	0.7403
0.34	0.2302	0.8794	0.69	0.2157	0.7982	1.04	0.2043	0.7388

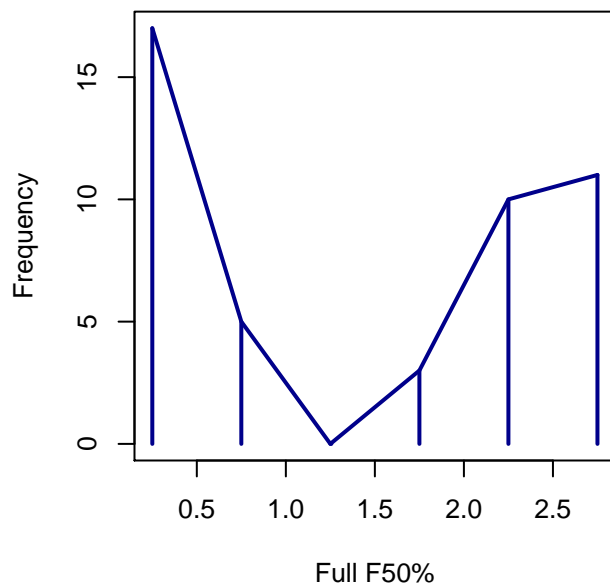
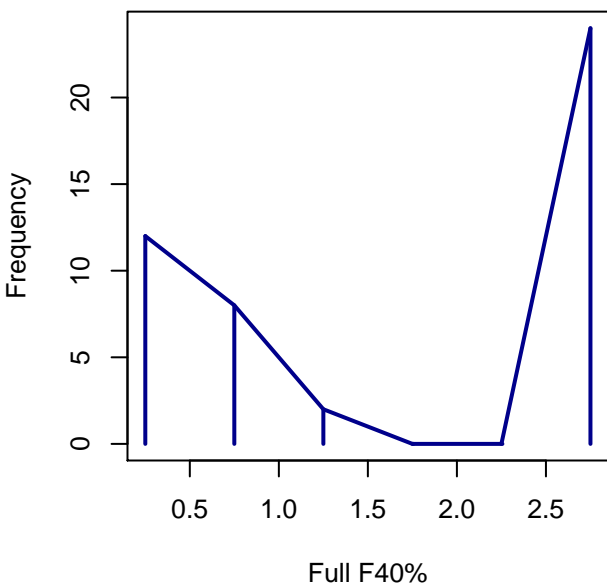
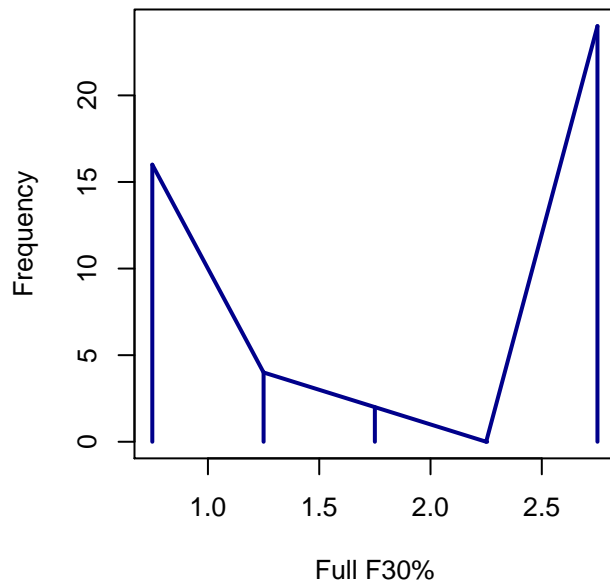
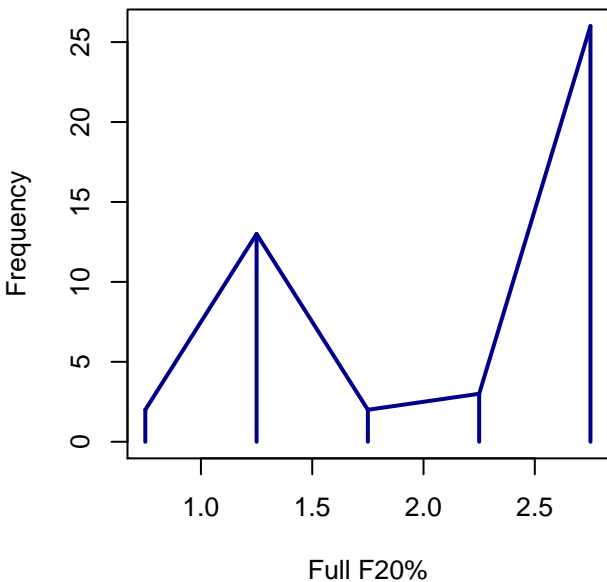
Annual F(%SPR) Reference Points



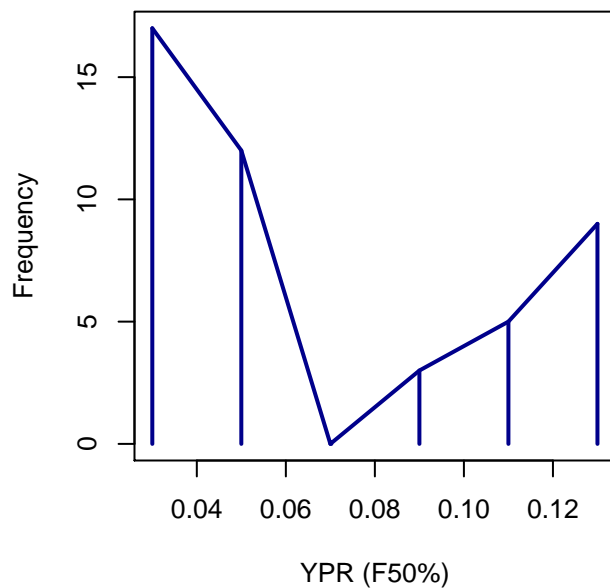
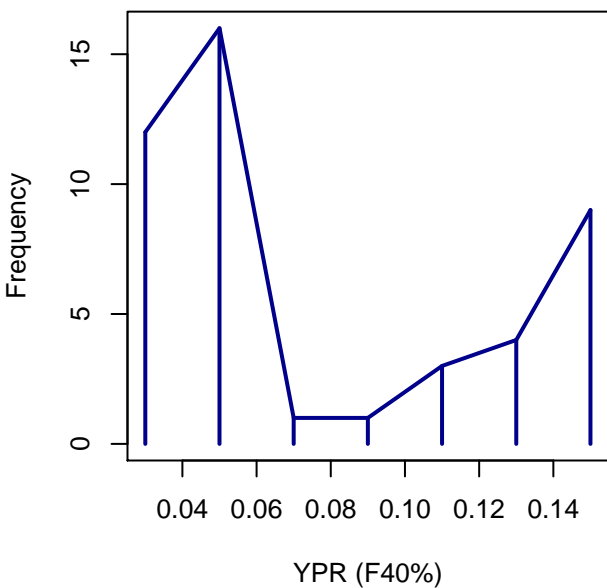
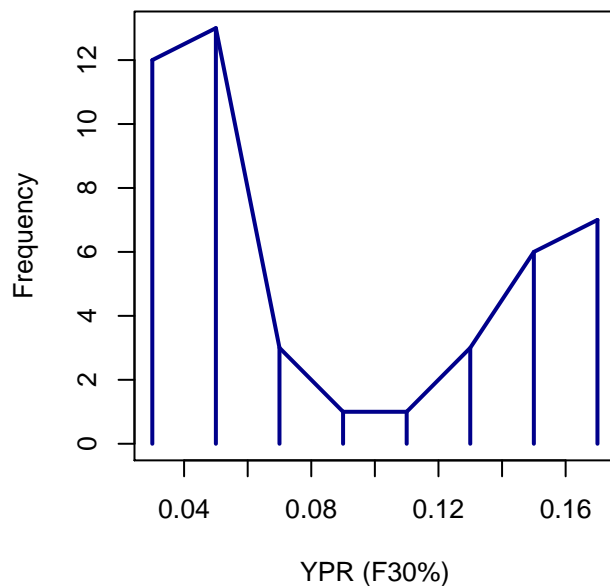
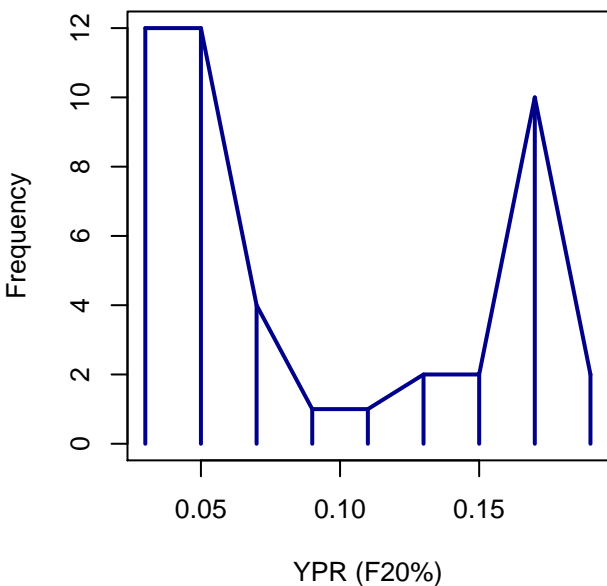
Annual YPR(%SPR) Reference Points

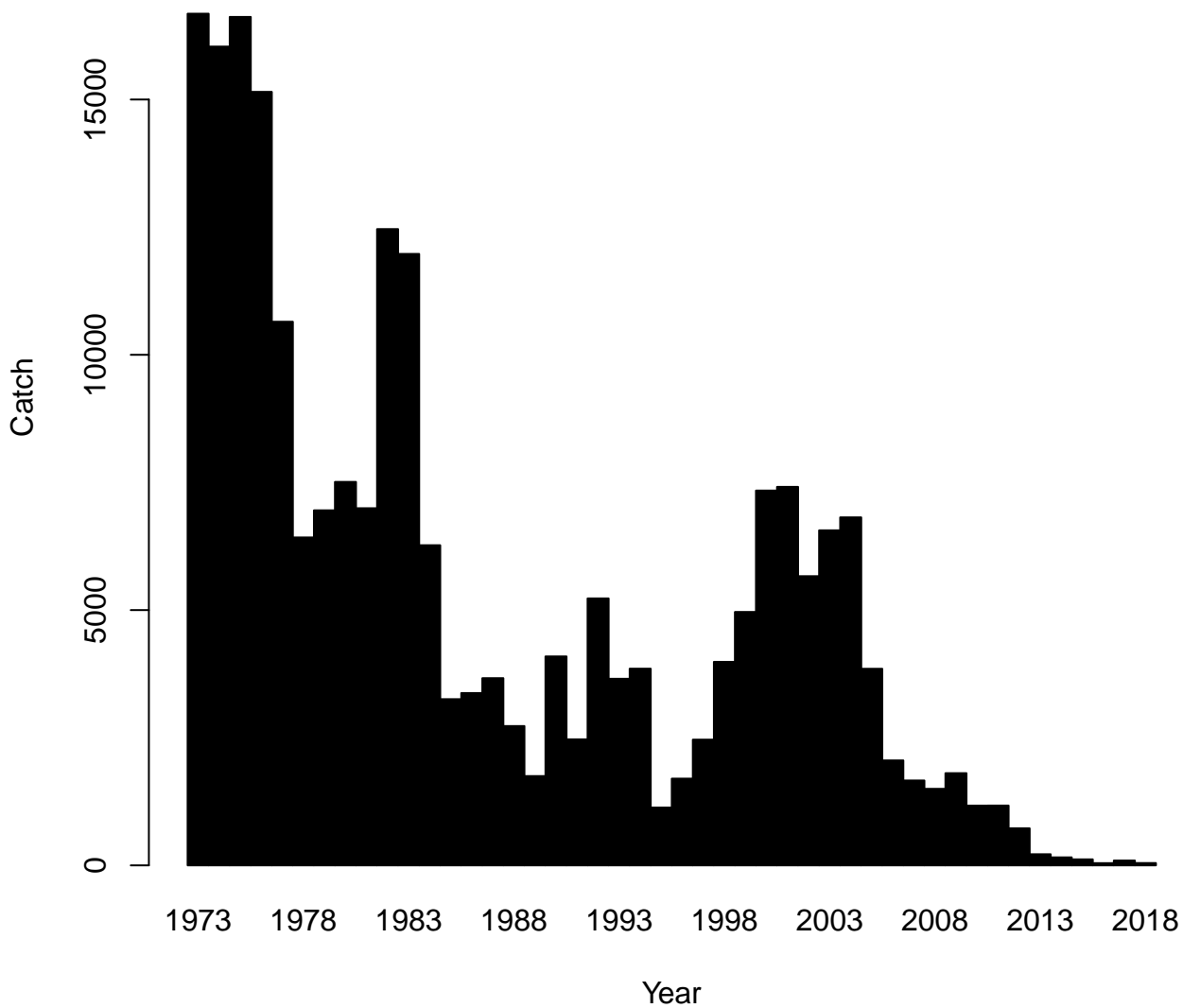


## Annual F (%SPR) Reference Points

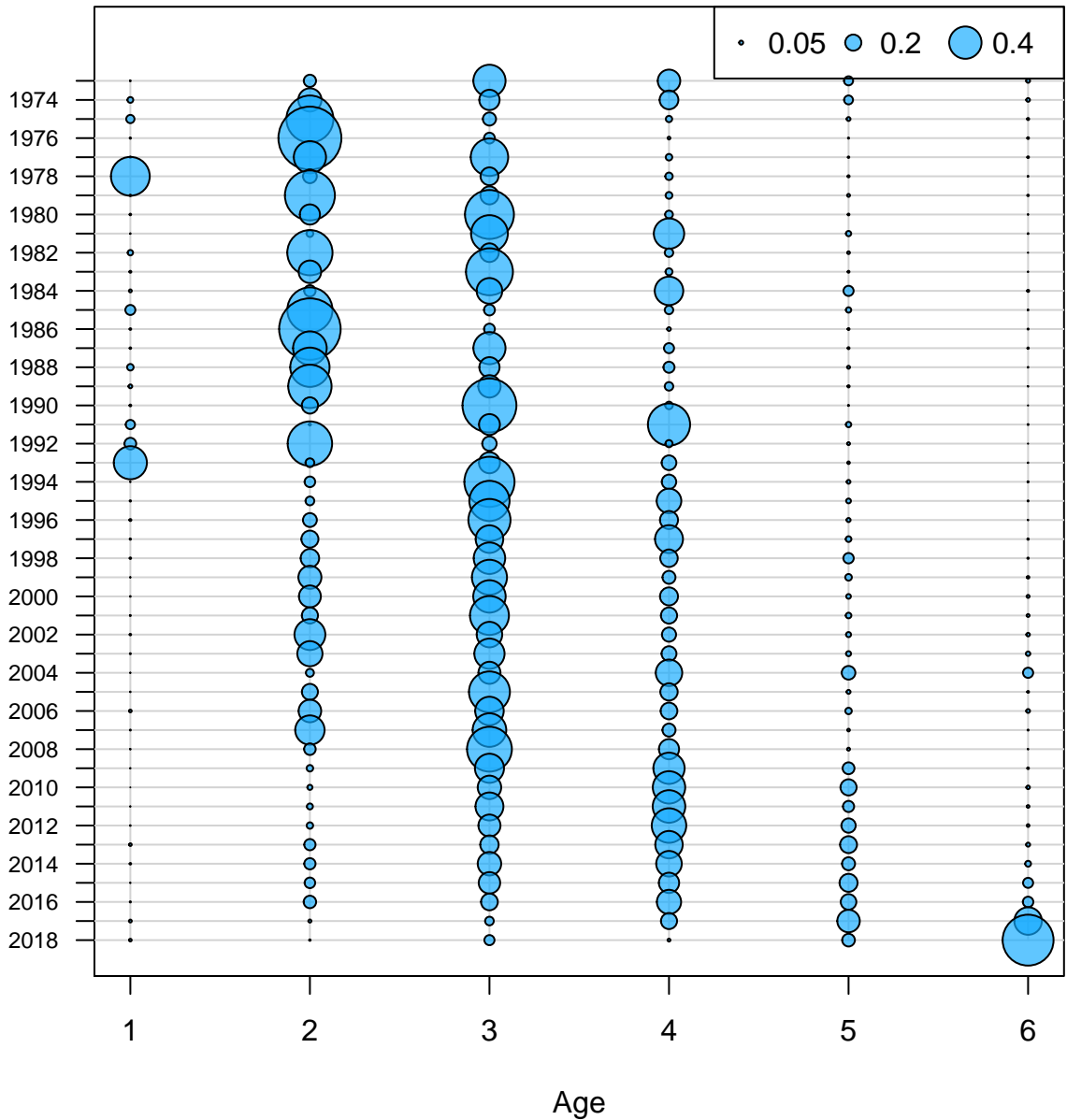


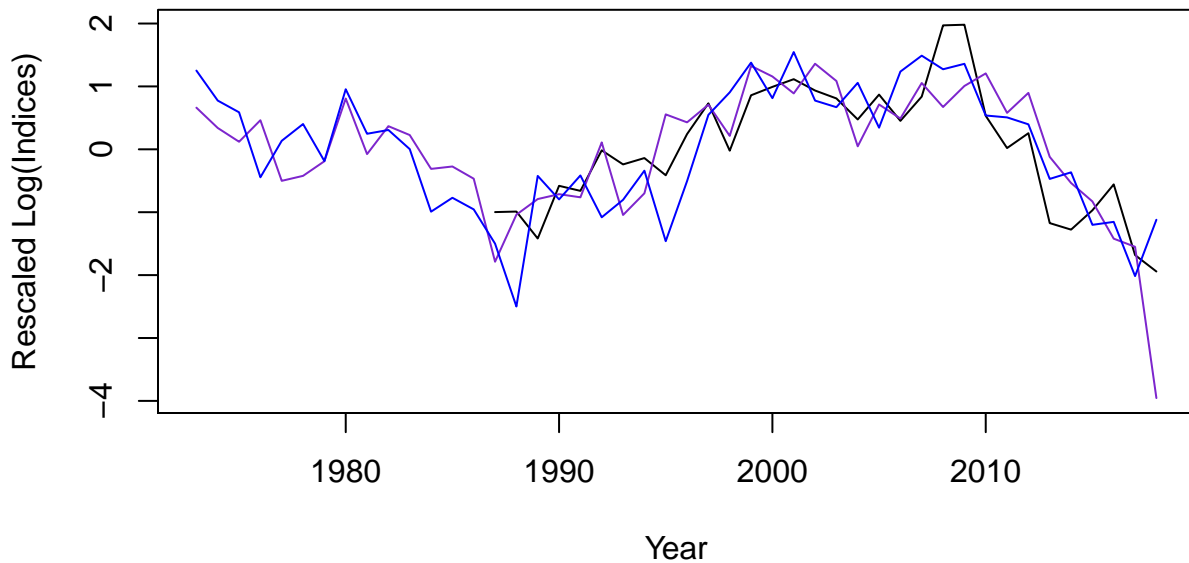
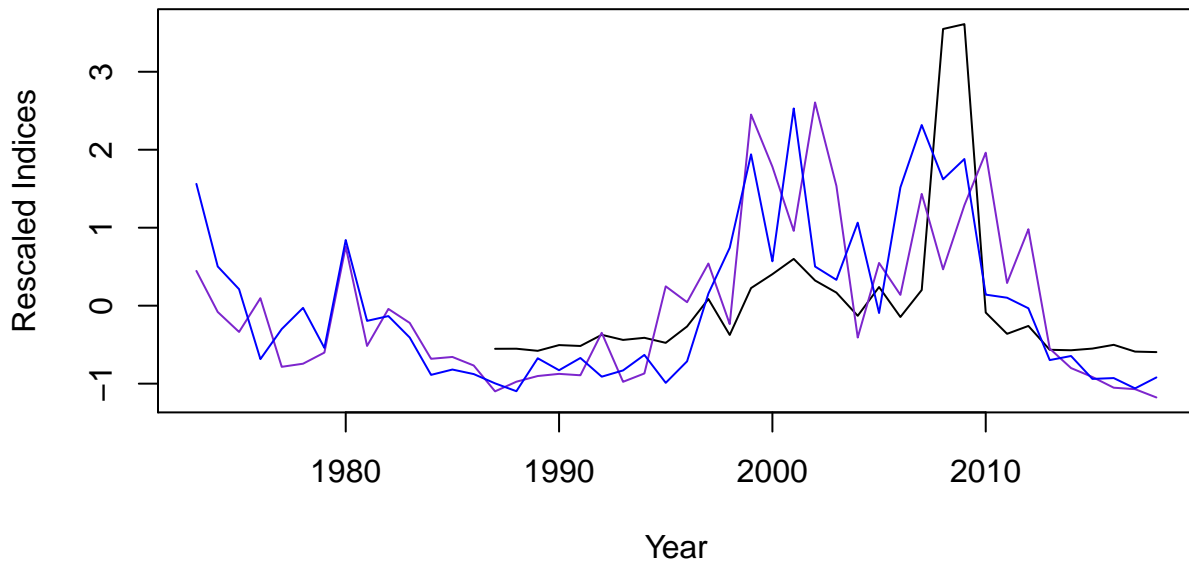
## Annual YPR (%SPR) Reference Points





# Age Comps for Catch by Fleet 1 (FLEET-1)

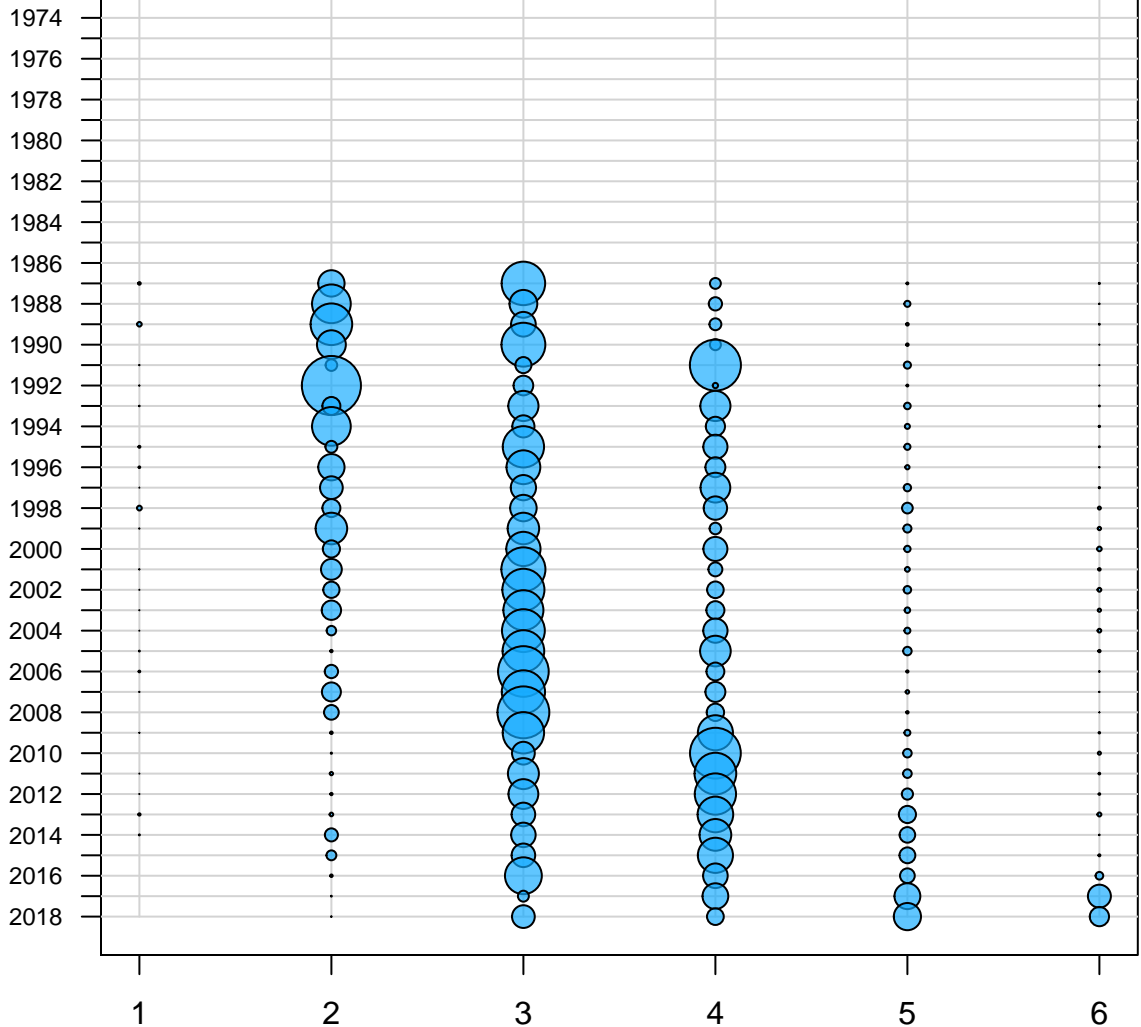






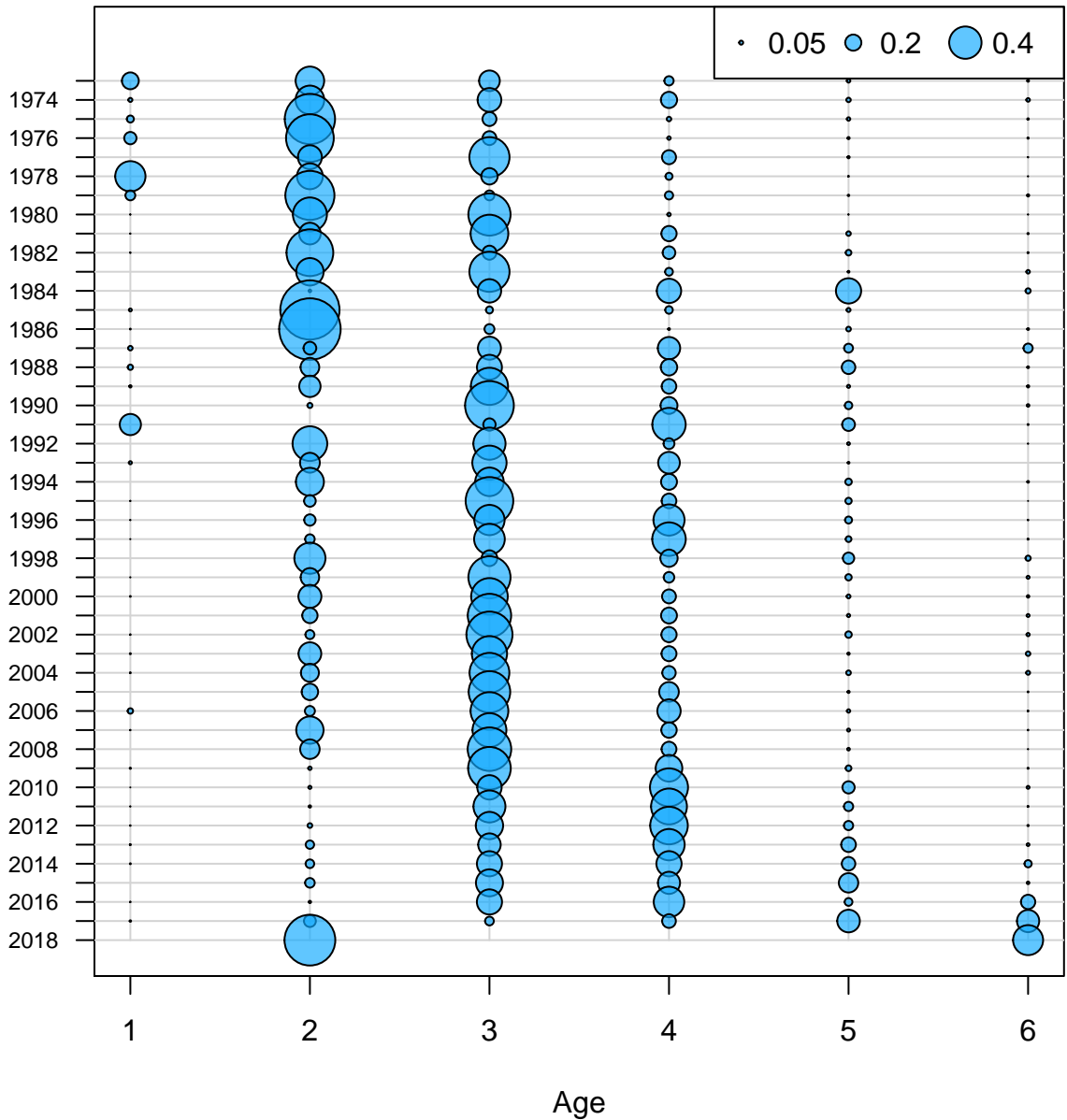
# Age Comps for Index 1 (INDEX-1)

• 0.05 • 0.2 • 0.4

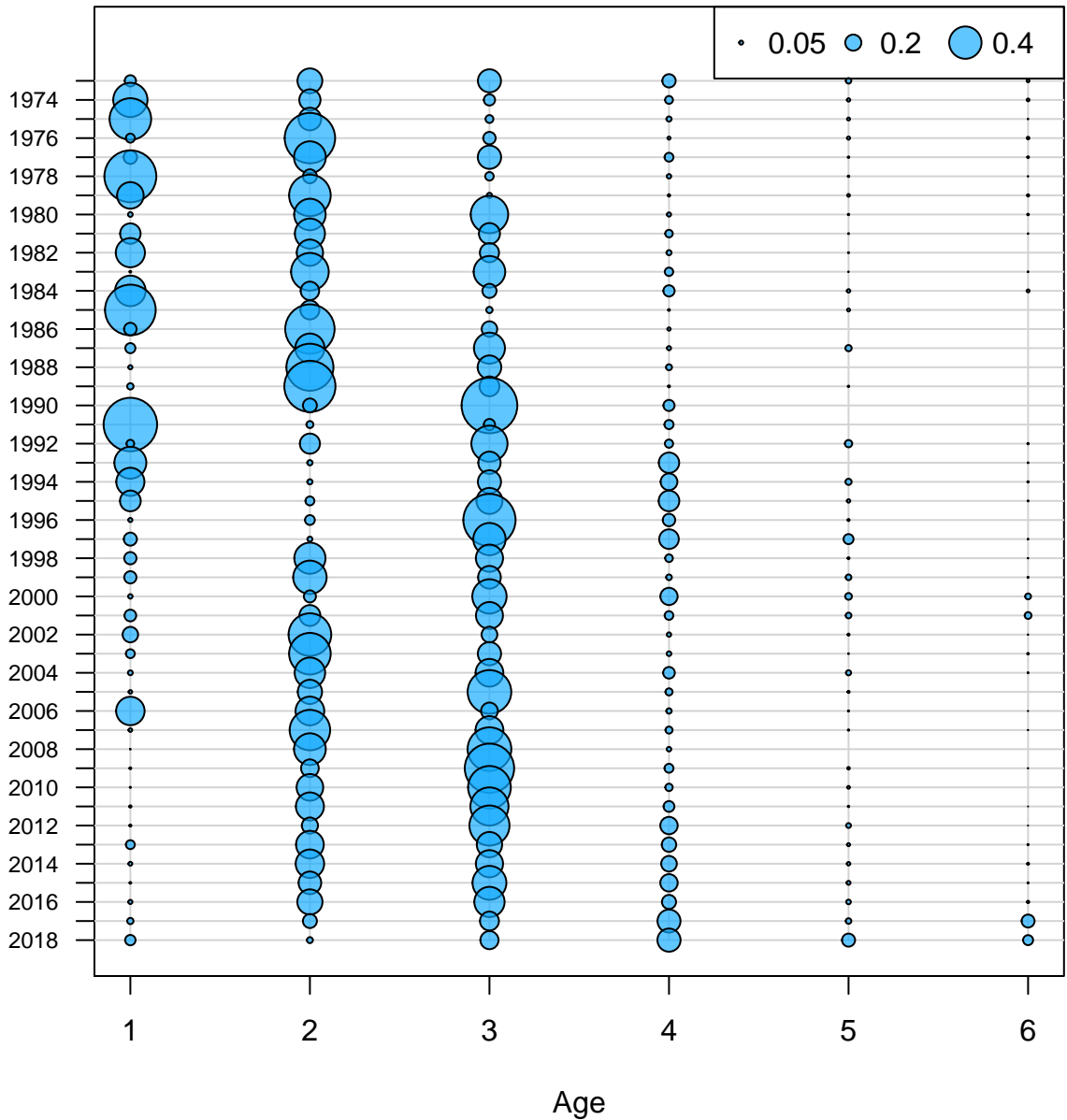


Age

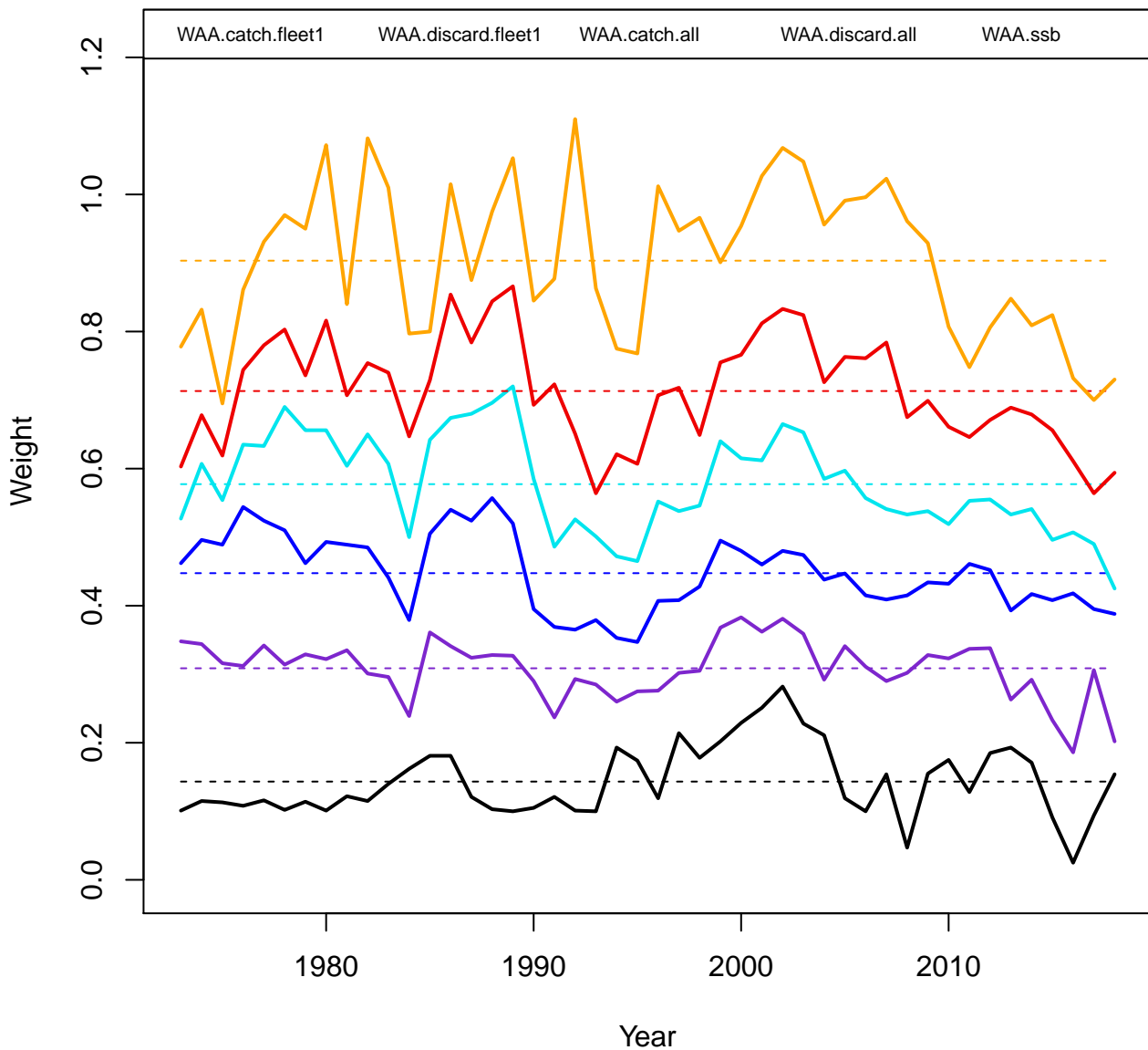
# Age Comps for Index 2 (INDEX-2)



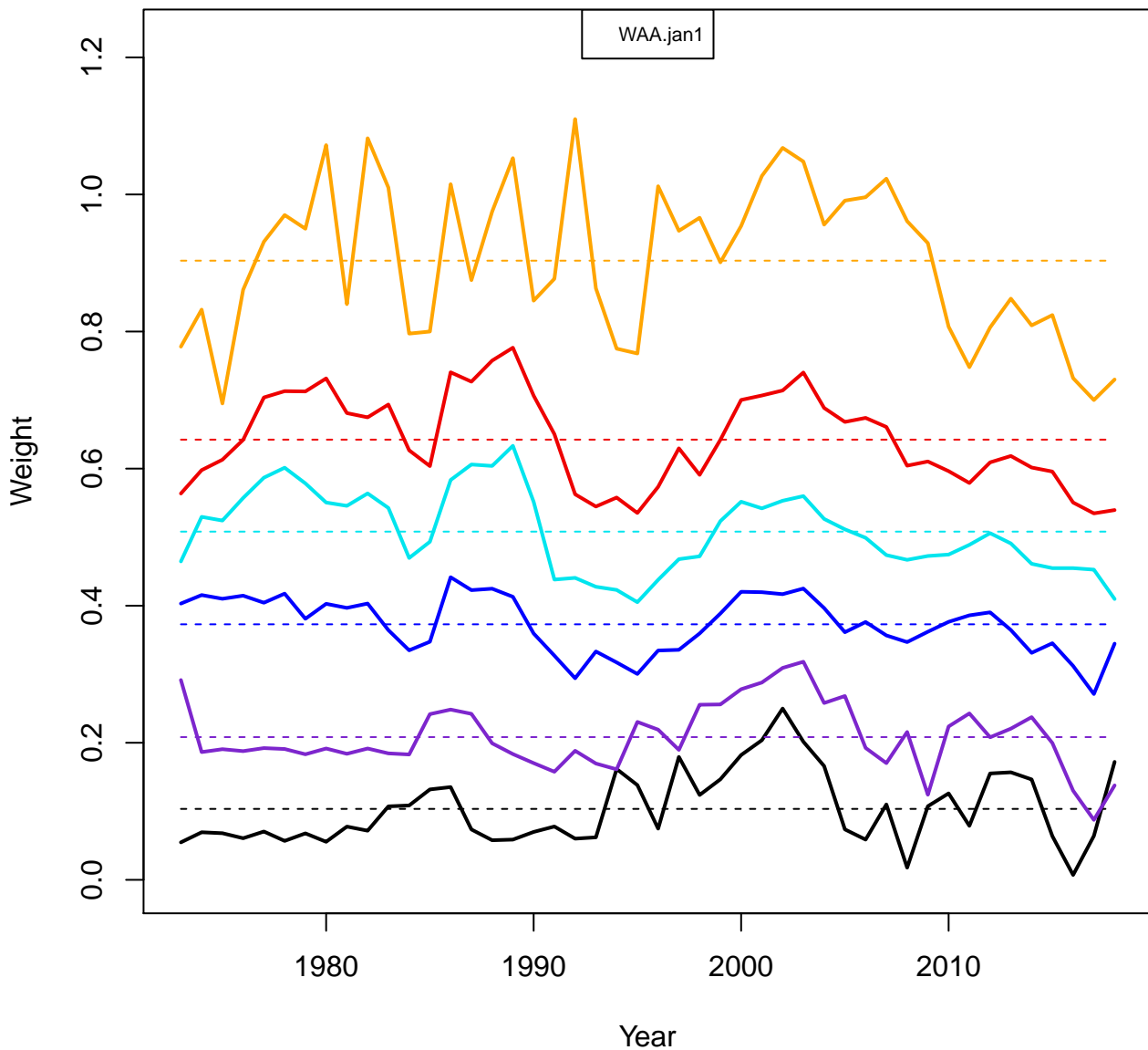
# Age Comps for Index 3 (INDEX-3)



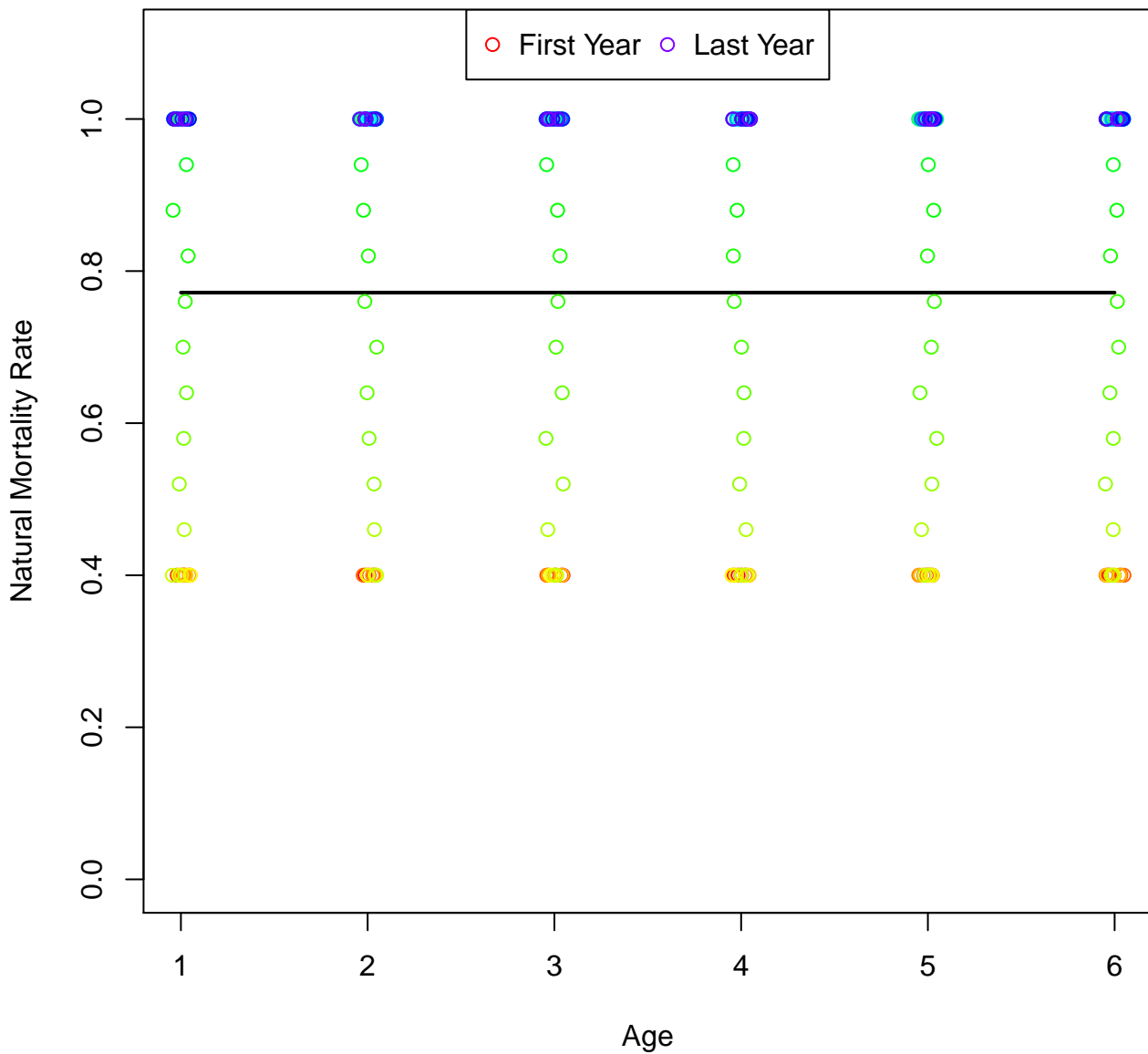
# WAA matrix 1



## WAA matrix 2



M



# Maturity

