East area SSB increases like VPA

ABT-MSE Operating model fitting report

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July 26, 2017

Operating model scenario is:

From 2008 - 2015 East area SSB has a four fold increase
a derivative of OM1

Area definitions for operating model:

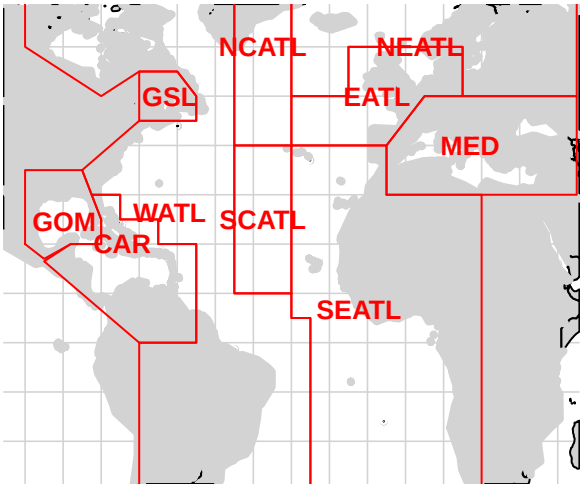
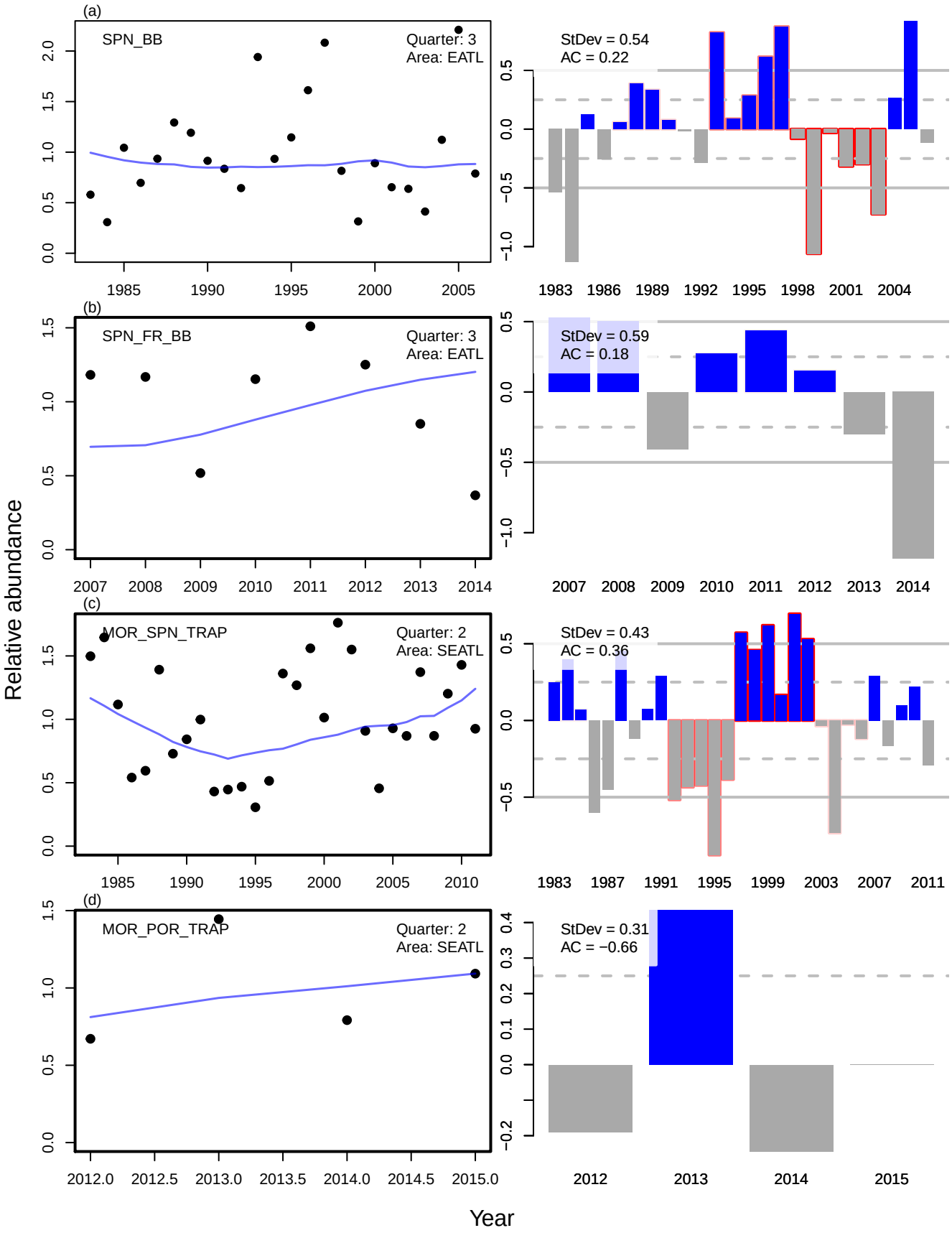


Figure 1. Area definitions for operating model

Fits to CPUE indices of relative abundance

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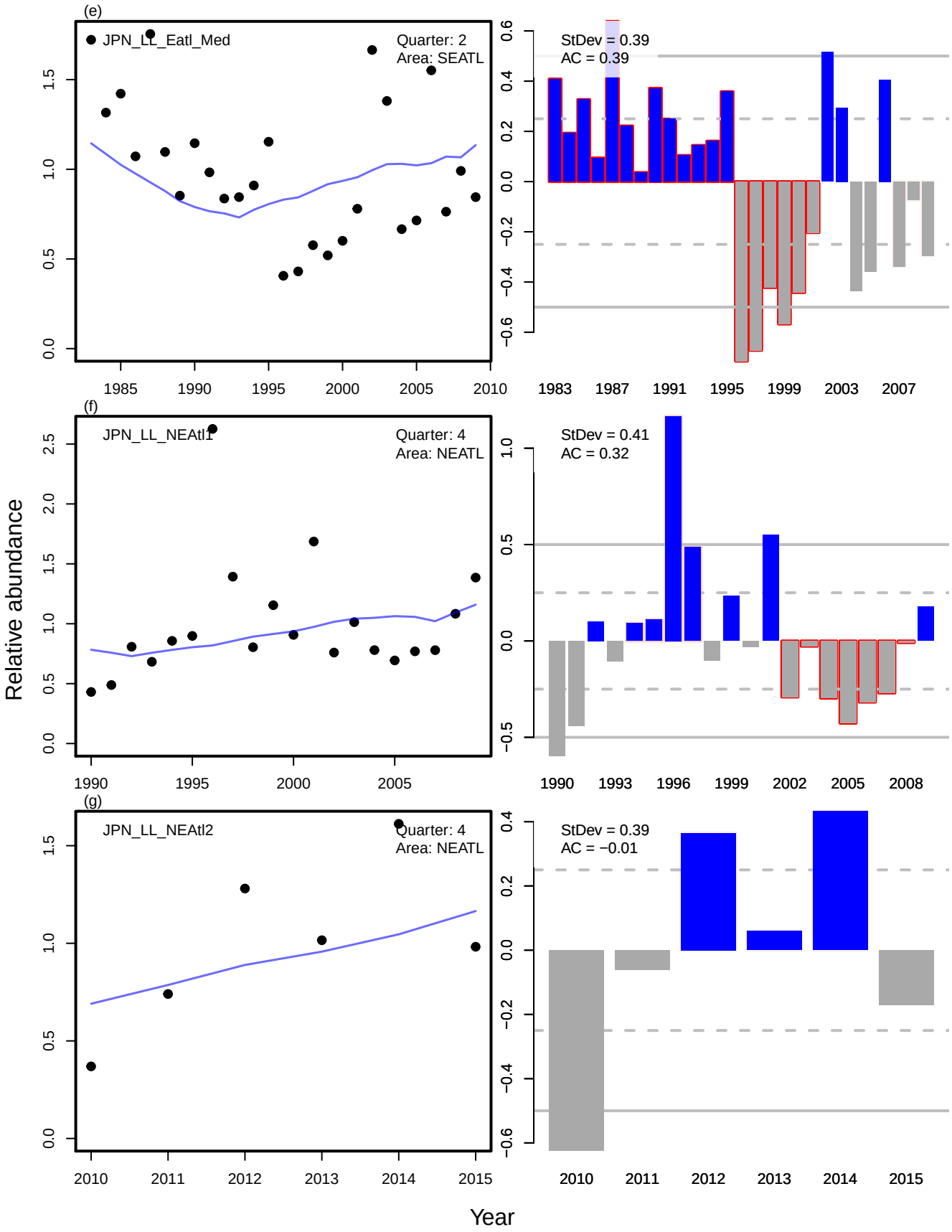
(e)
JPN_LL_Eatl_Med
Quarter: 2
Area: SEATL
StDev = 0.39
AC = 0.39
(f)
JPN_LL_NEAtl1
Quarter: 4
Area: NEATL
StDev = 0.41
AC = 0.32
(g)
JPN_LL_NEAtl2
Quarter: 4
Area: NEATL
StDev = 0.39
AC = −0.01
Relative abundance
Year

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##
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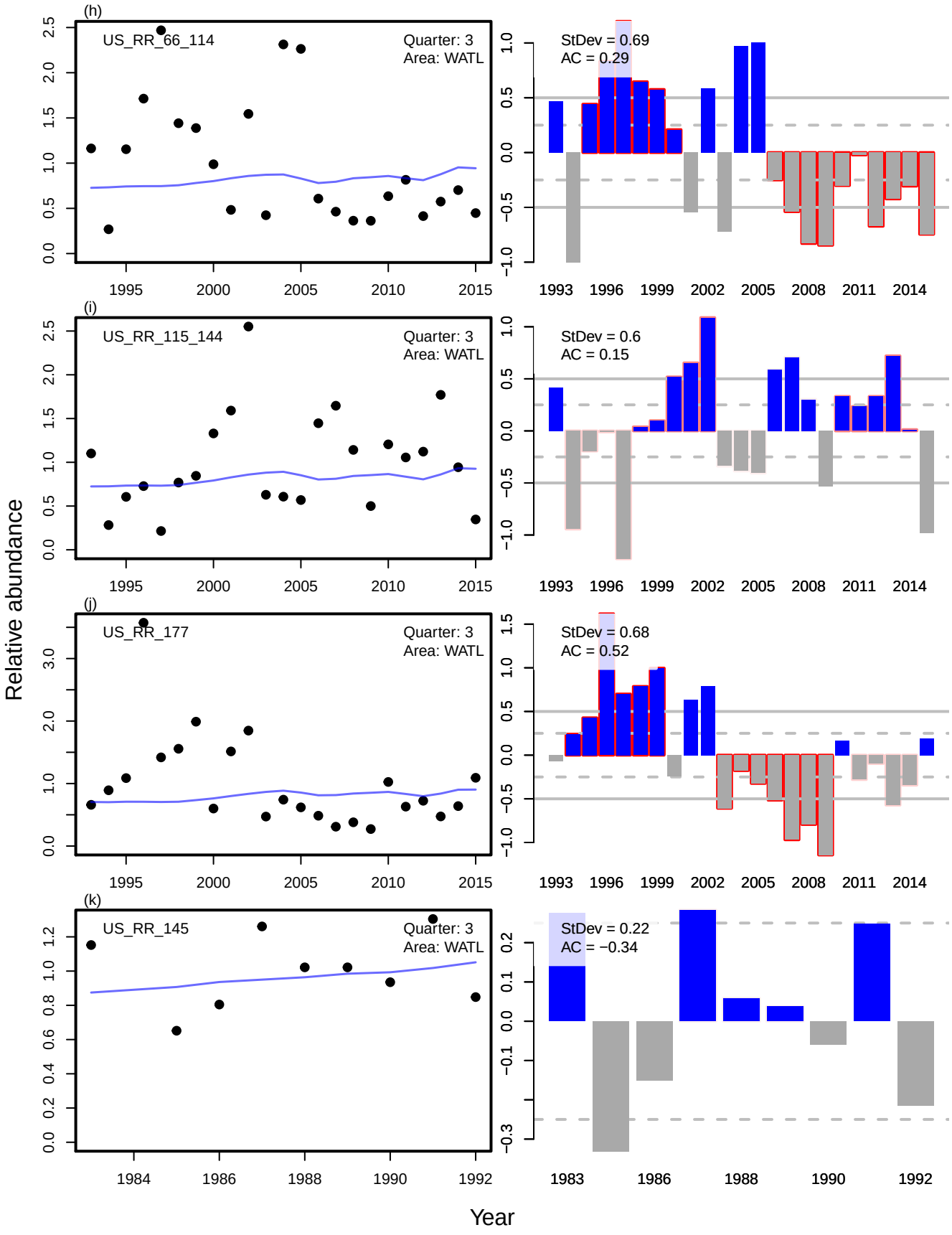
(h)
US_RR_66_114
Quarter: 3
Area: WATL
StDev = 0.69
AC = 0.29
(i)
US_RR_115_144
Quarter: 3
Area: WATL
StDev = 0.6
AC = 0.15
(j)
US_RR_177
Quarter: 3
Area: WATL
StDev = 0.68
AC = 0.52
(k)
US_RR_145
Quarter: 3
Area: WATL
StDev = 0.22
AC = −0.34
Relative abundance
Year

```
##
##
## \pagebreak
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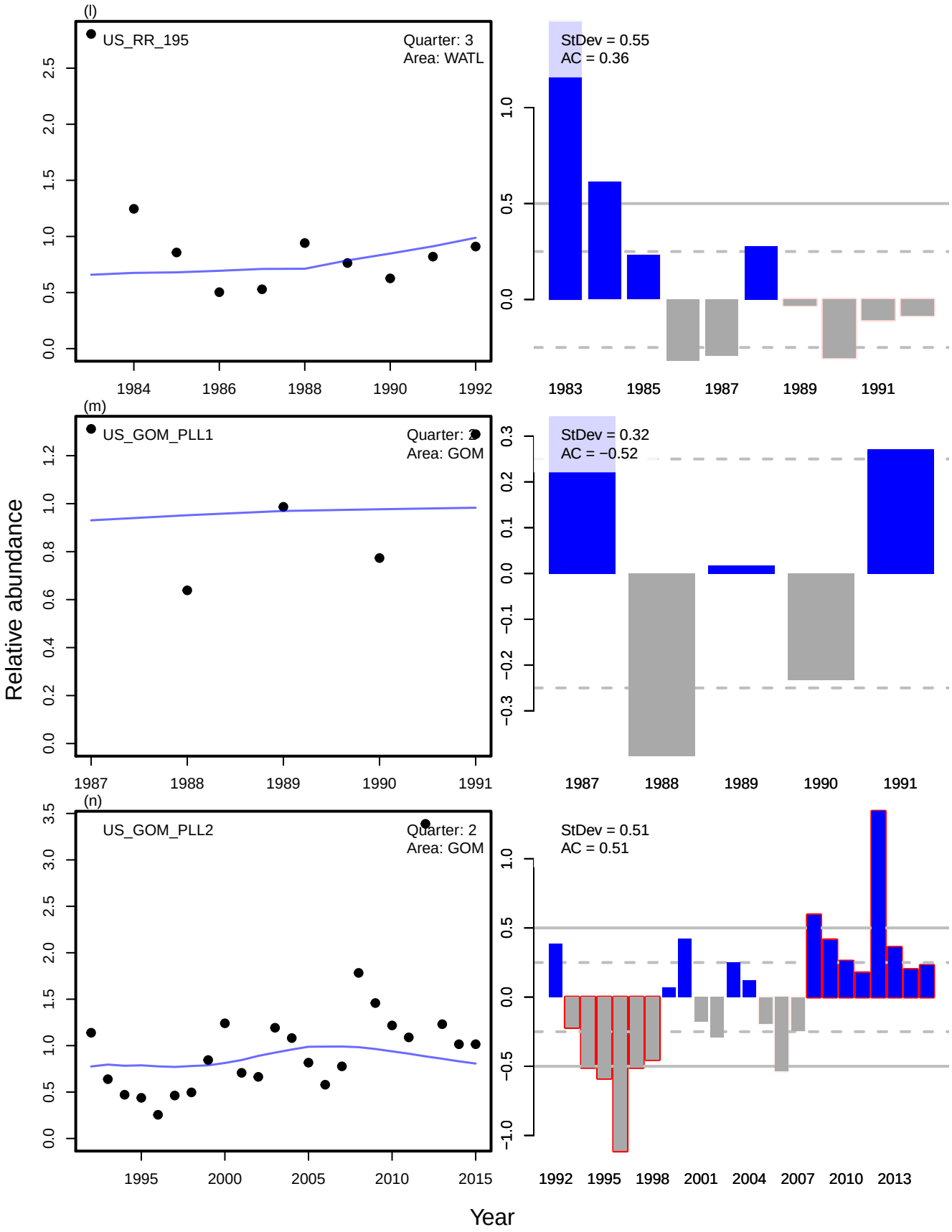
(l)
US_RR_195
Quarter: 3
Area: WATL
StDev = 0.55
AC = 0.36
(m)
US_GOM_PLL1
Quarter: 2
Area: GOM
StDev = 0.32
AC = −0.52
(n)
US_GOM_PLL2
Quarter: 2
Area: GOM
StDev = 0.51
AC = 0.51
Relative abundance
Year

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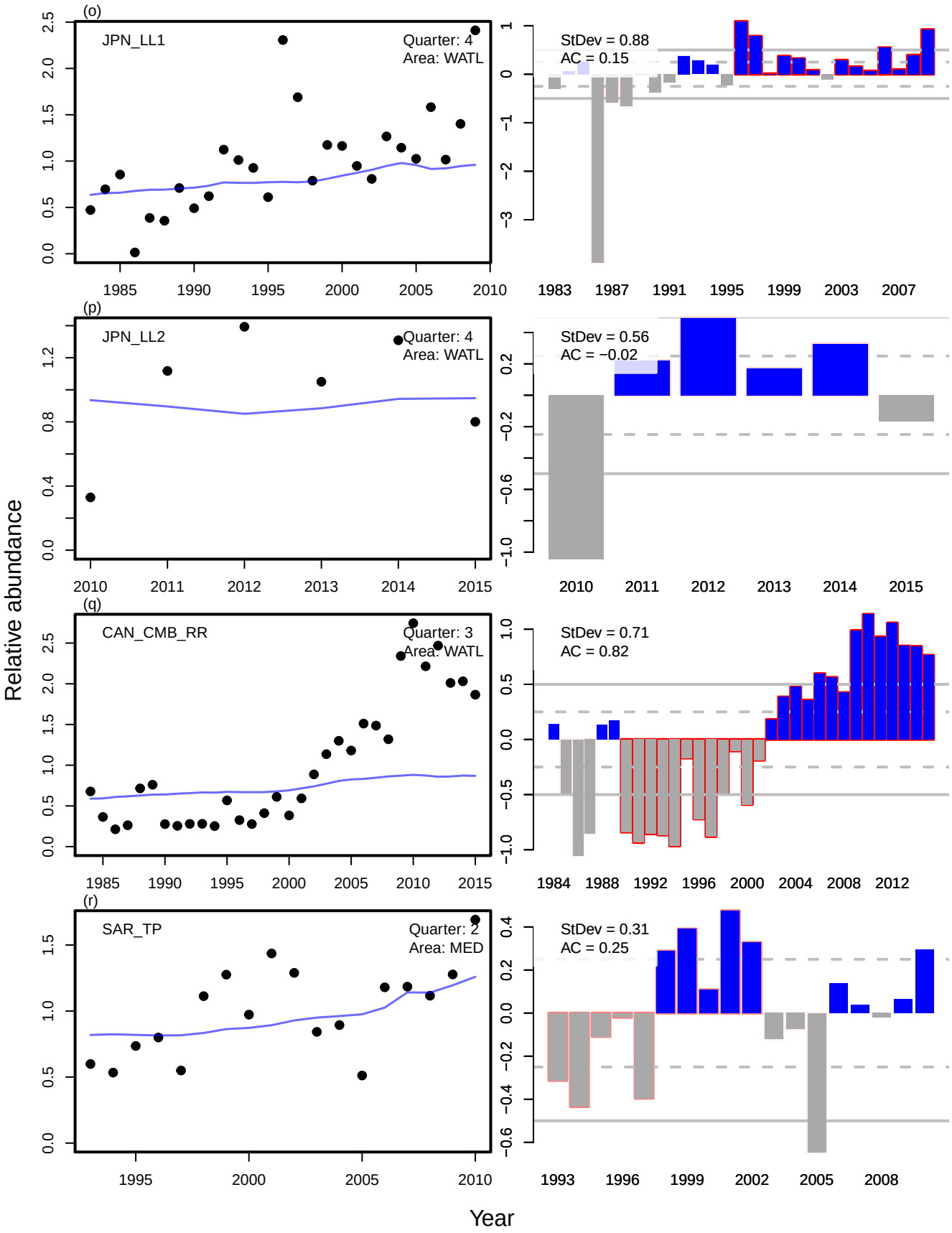
(o)
JPN_LL1
Quarter: 4
Area: WATL
StDev = 0.88
AC = 0.15
(p)
JPN_LL2
Quarter: 4
Area: WATL
StDev = 0.56
AC = −0.02
(q)
CAN_CMB_RR
Quarter: 3
Area: WATL
StDev = 0.71
AC = 0.82
(r)
SAR_TP
Quarter: 2
Area: MED
StDev = 0.31
AC = 0.25
Relative abundance
Year

```
##
##
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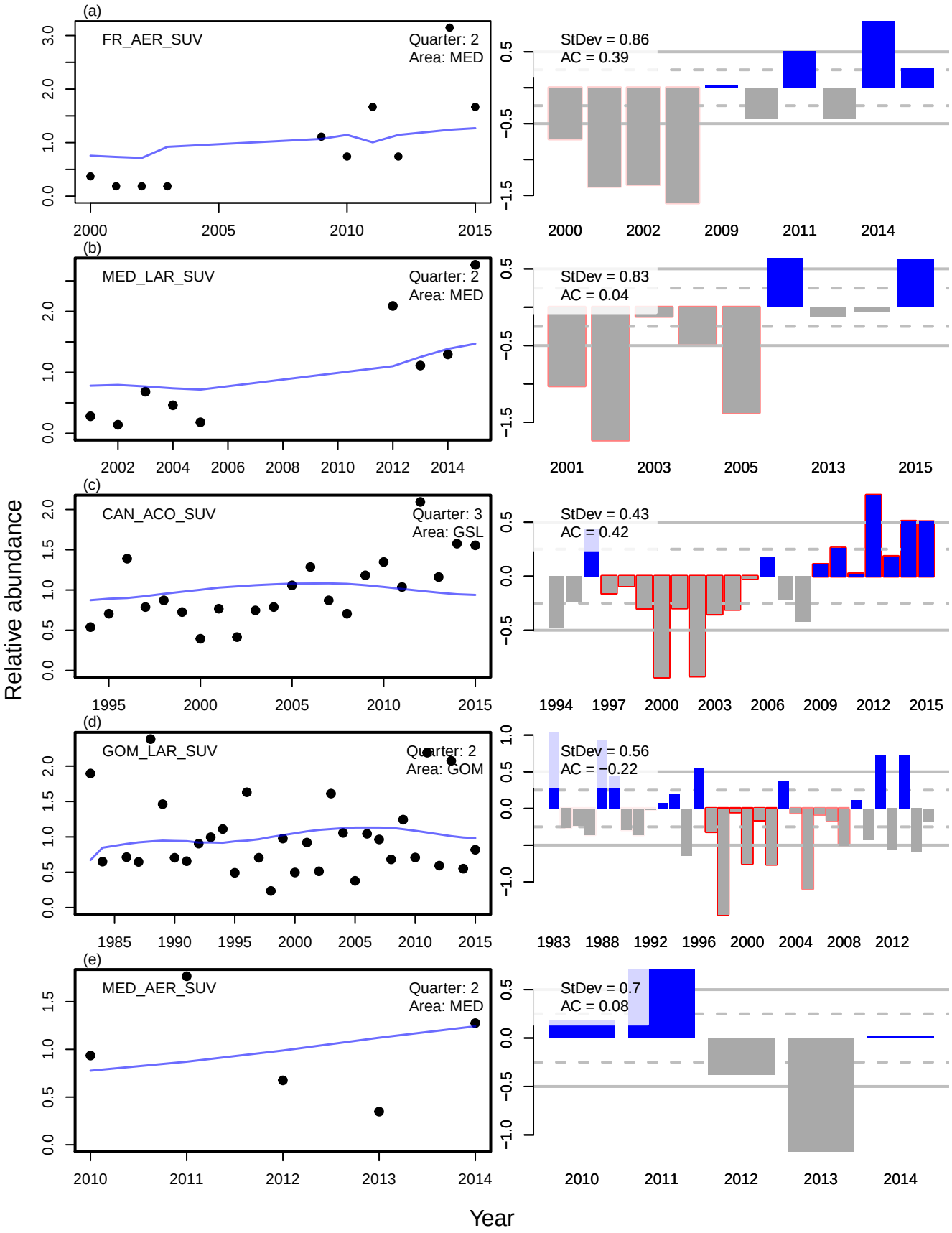
Fits to FI indices of relative abundance

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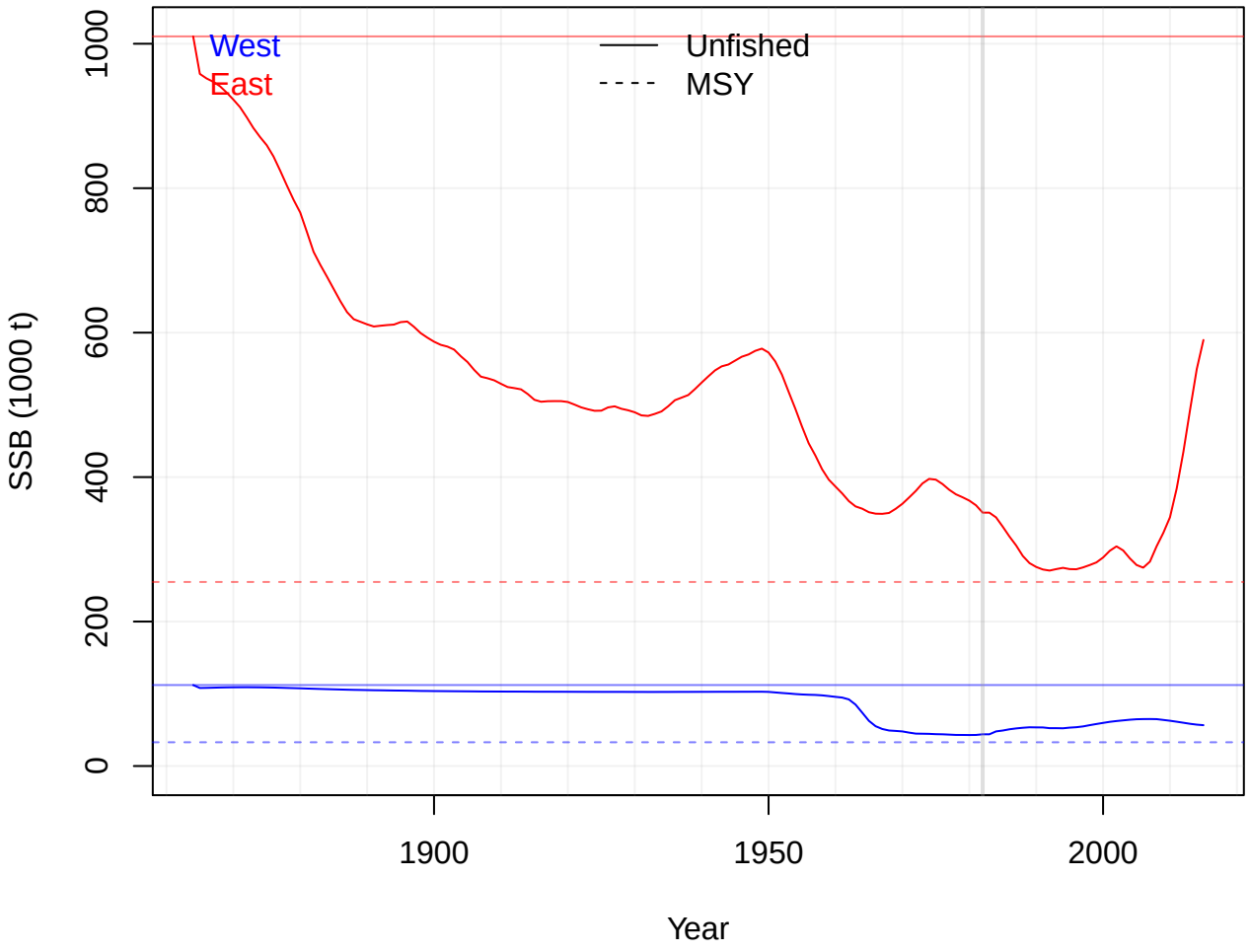
Historical Spawning biomass

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## Warning in OMI@years:OMI@years[2]: numerical expression has 2 elements:
## only the first used
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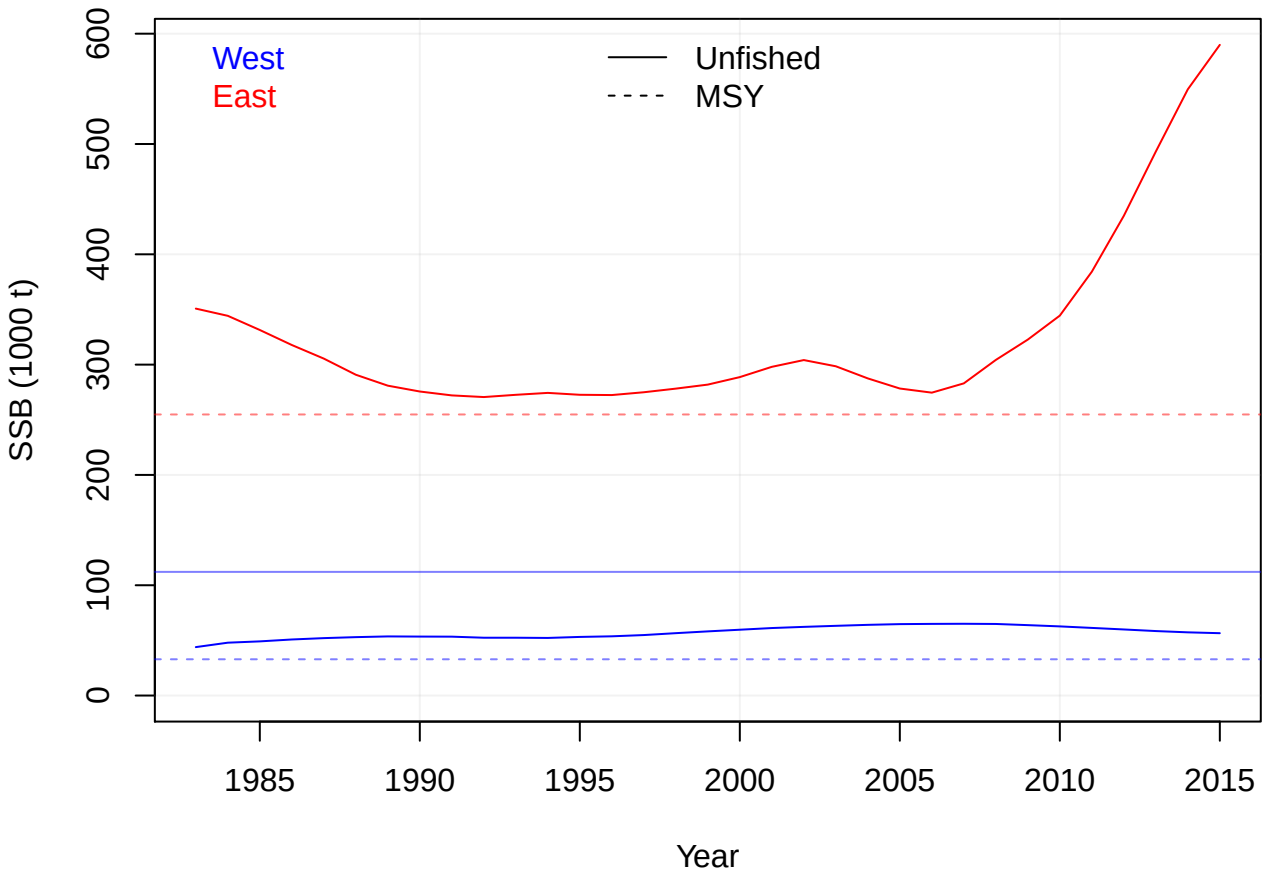

West
East
Unfished
MSY
SSB (1000 t)
0
100
200
300
400
500
600
1985
1990
1995
2000
2005
2010
2015
Year

SSB, recruitment and F comparison with 2017 assessment (by East/West area, not East/West stock)

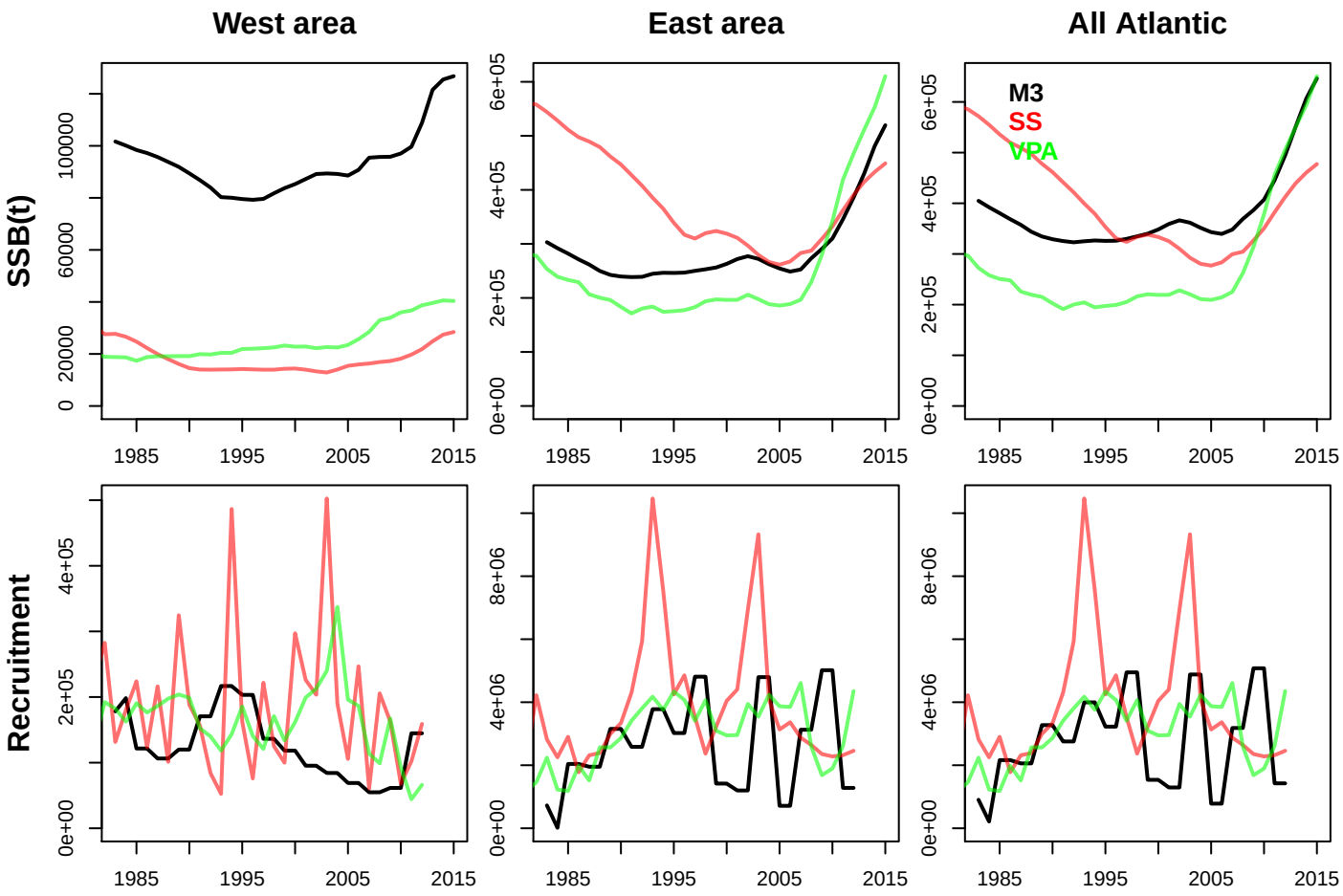


Figure 3.Regional comparisons (45deg W) with 2014 stock assessment. Note that annual estimates from the operating model are calculated from average of the seasonal predictions. Harvest rates from the operating model are based on total stock biomass not vulnerable biomass which is fleet specific (and hence may not be comparable with assessments).

Stock-recruitment relationships (R0 is unfished mean recruitment)

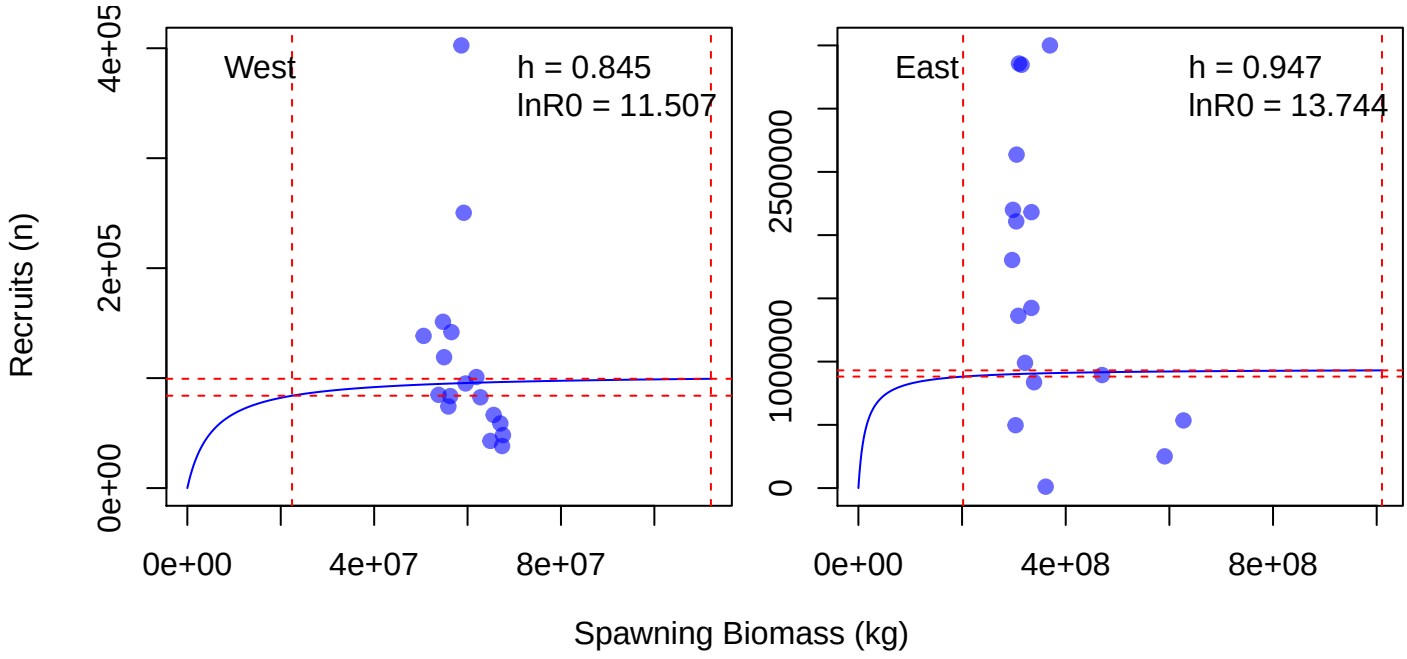


Figure 4. Model predicted pairs of SSB and recruitment(with a fitted Bev Holt for illustration)

MSY reference points (2013 for comparison with previous assessment)

Table 1. Reference points by stock.

	MSY	FMSYap	UMSY	BMSY	SSBMSY	BMSY_B0	SSBMSY_SSB0	RMSY_R0	F_FMSY	SSB_SSB0
East	24784	0.144	0.108	230255	212612	0.272	0.252	0.960	0.423	0.488
West	2539	0.126	0.099	25727	24598	0.307	0.293	0.901	0.484	0.522

2014 Assessment MSY reference points (by East/West area)

Table 2. Where available, reference points from most recent assessments

	MSY	FMSYap	UMSY	BMSY	SSBMSY	BMSY_B0	SSBMSY_SSB0	RMSY_R0	F_FMSY	SSB_SSB0
East	-	-	-	-	-	-	-	-	0.75	0.45
West	3056	0.23	-	-	13268	-	-	-	0.47-0.85	0.35-2.1

Current annual mean F-at-age profile, all fleets, seasons, areas

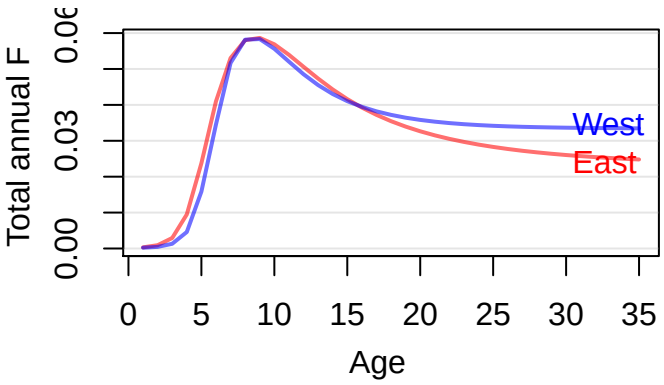


Figure 5. The current profile of F at age summed over all fleets.

Estimated size selectivity by fleet

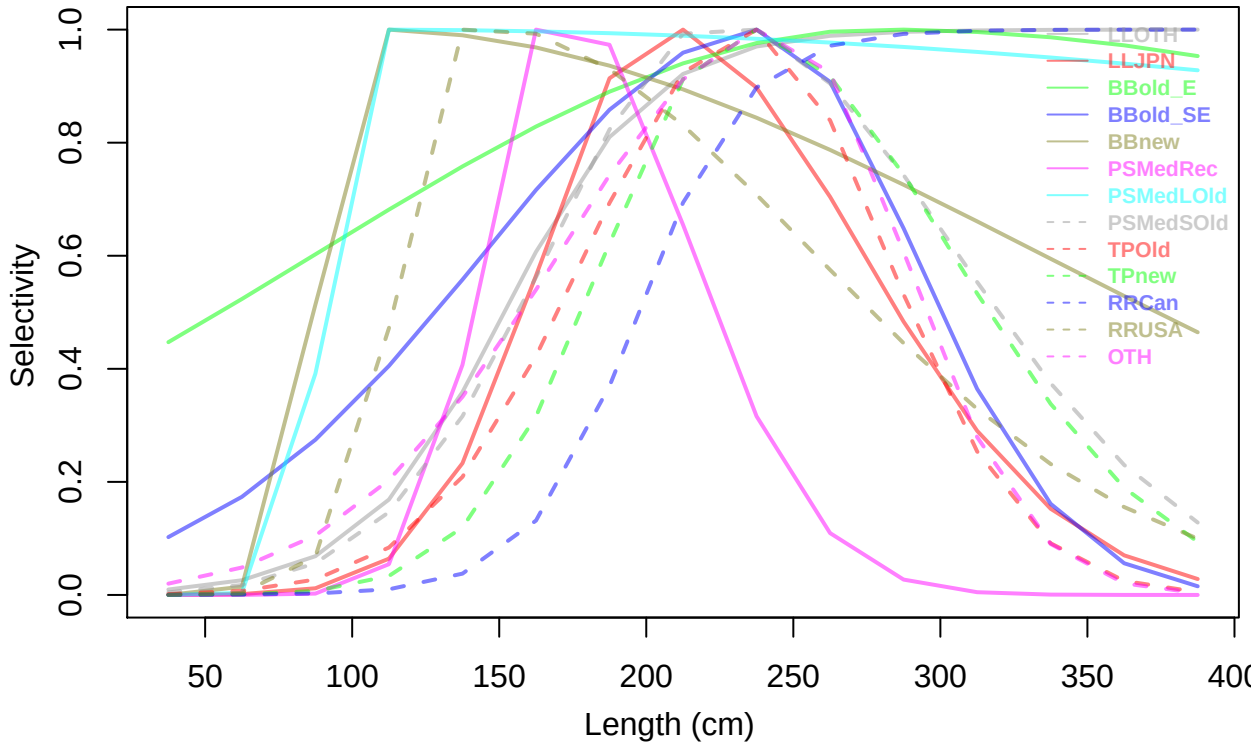


Figure 6.

Fit to aggregate catches

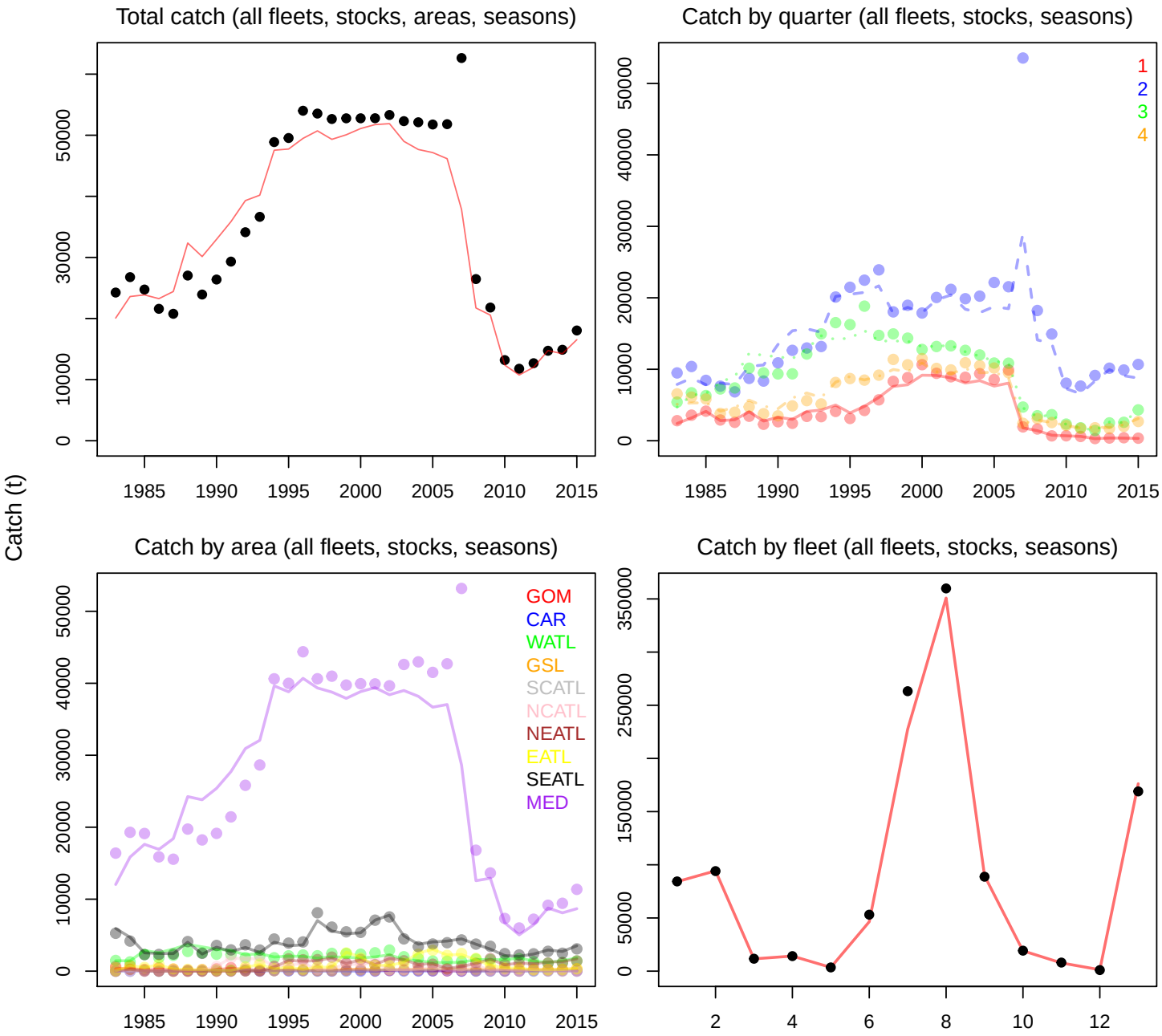


Figure 8. Fit to a observed total catches aggregated over various axes (lines = predicted, points = observed)

Fit to aggregate length composition

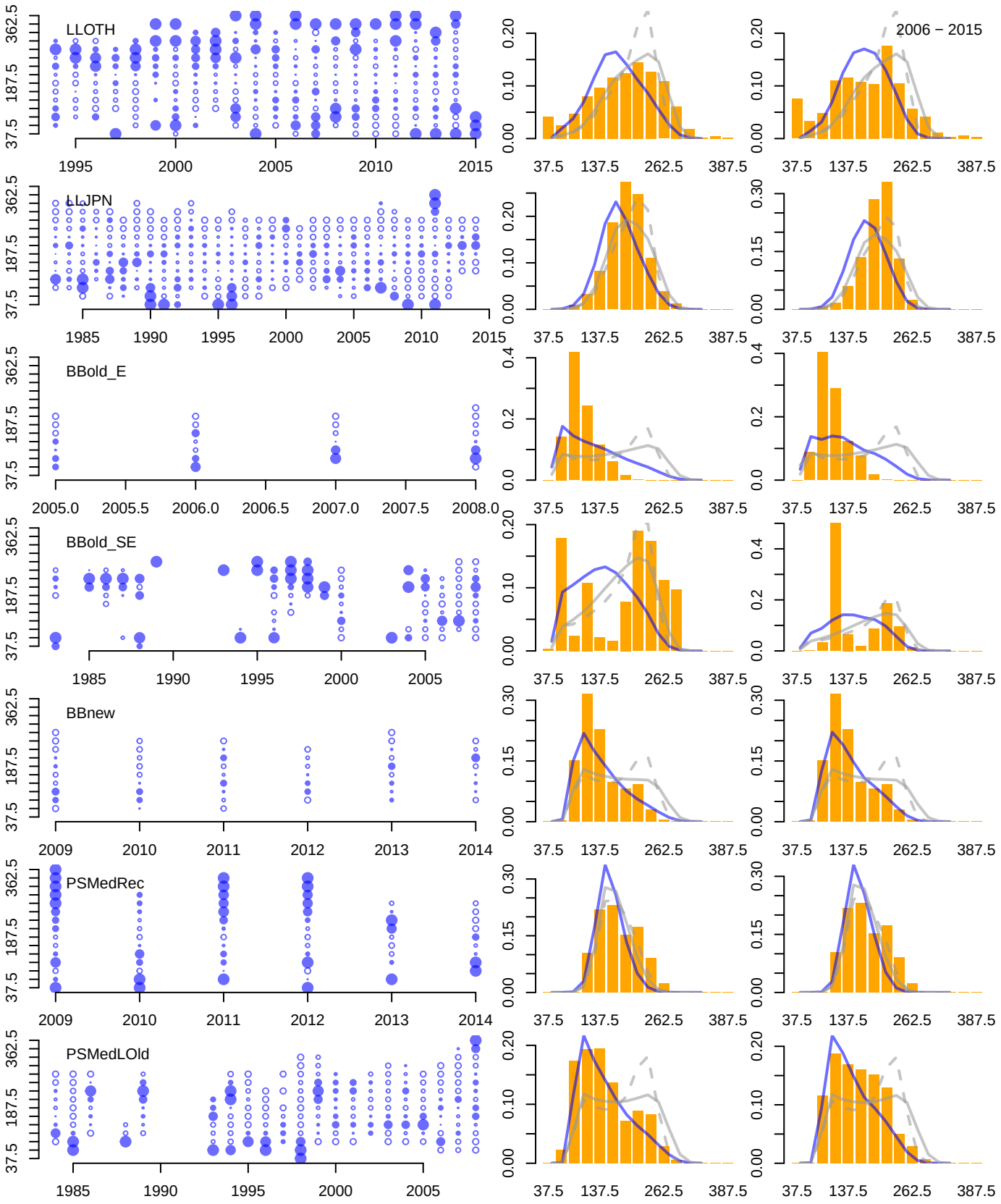


Figure 9a.Length composition residuals. Red points are negative Pearson residuals (predicted is higher than observed), blue circles are positive (predicted is lower than observed). Orange bars are observed, blue lines are model predicttions.

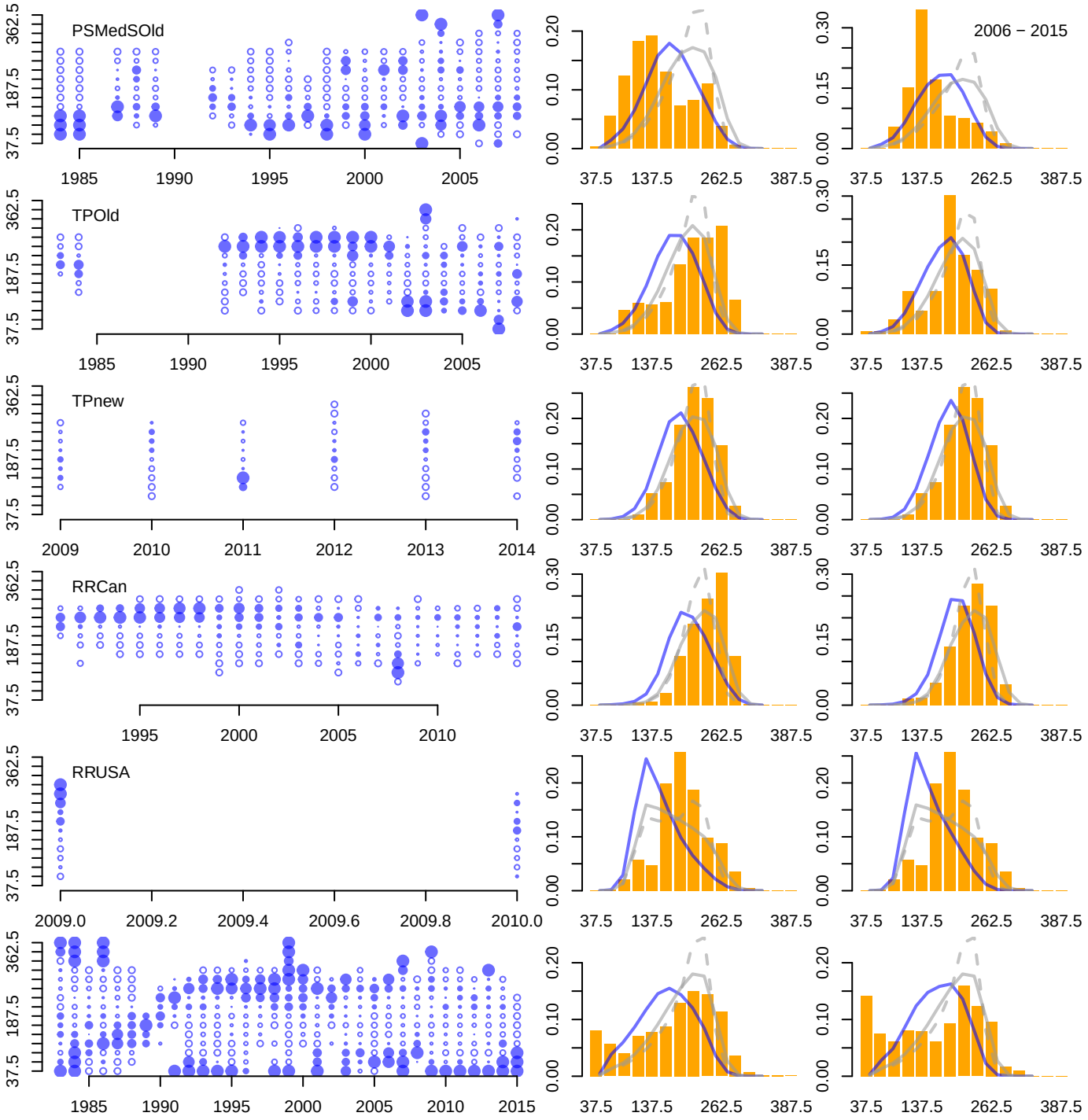
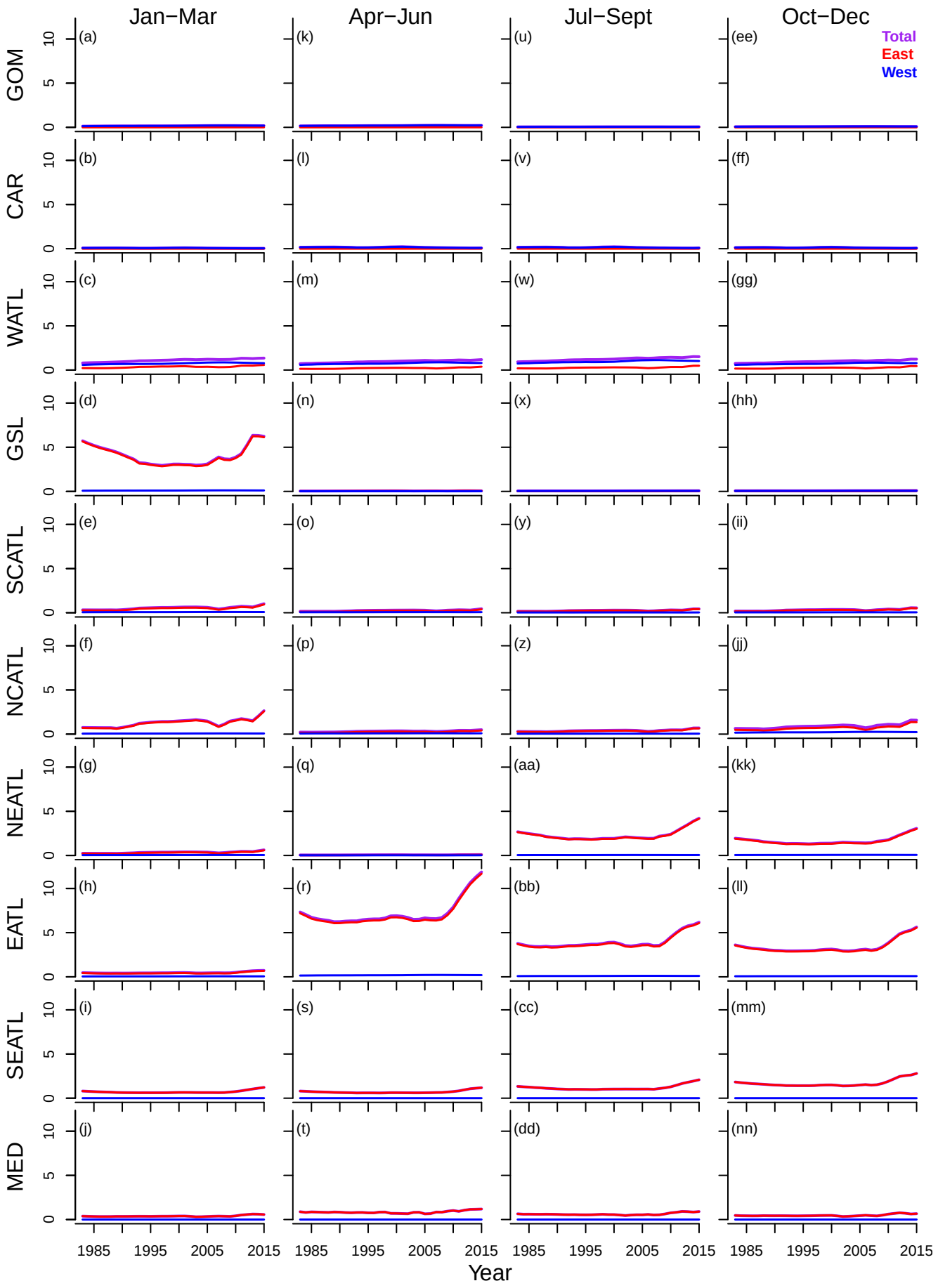


Figure 9b.Length composition residuals. Red points are negative Pearson residuals (predicted is higher than observed), blue circles are positive (predicted is lower than observed).Orange bars are observed, blue lines are model predicttions.

Predicted seasonal and spatial biomass of Atlantic bluefin tuna



Estimated unfished movement

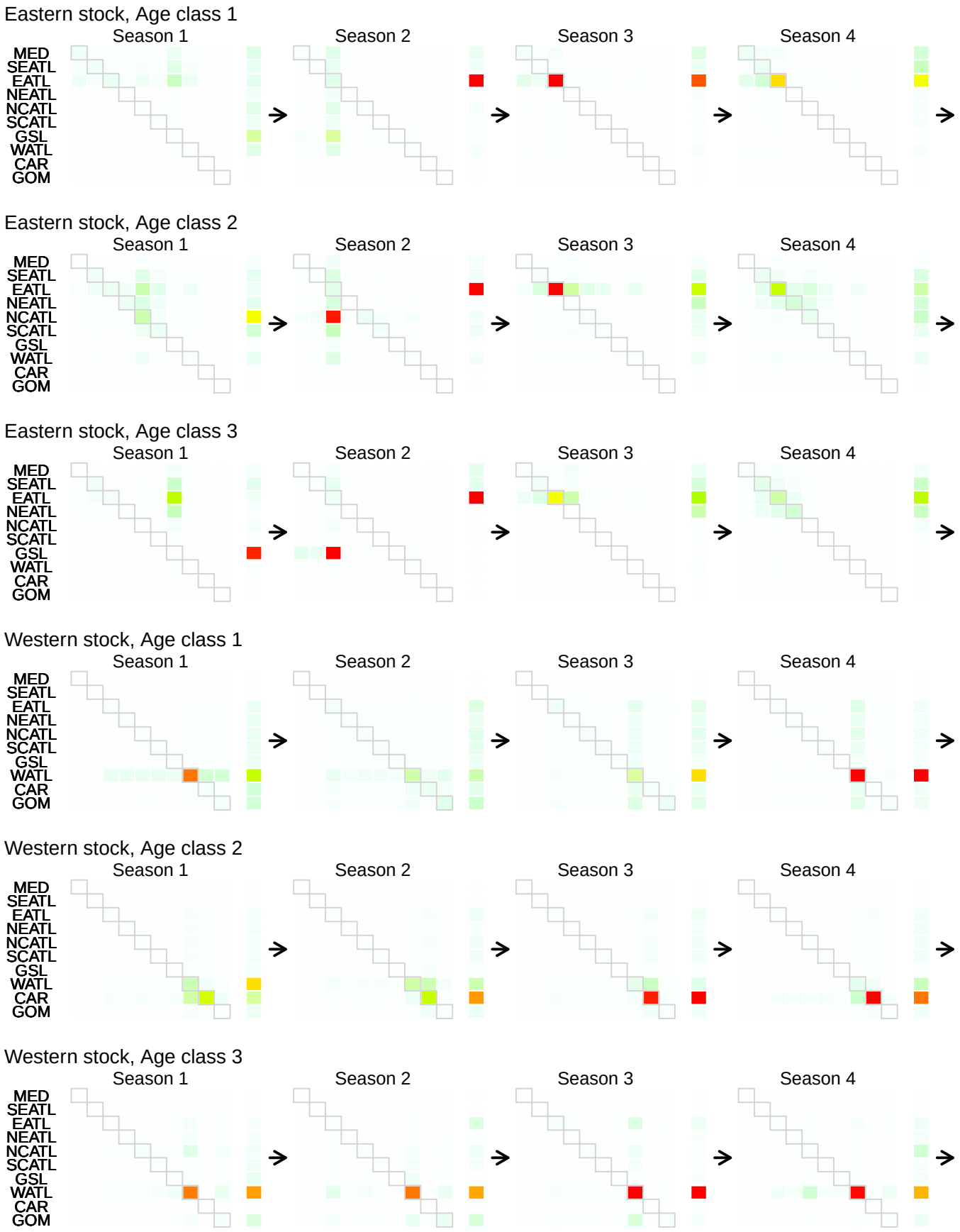


Figure 7. The implied asymptotic distribution of fish under unfished conditions (red-orange-green-white, more to less)