

# 22/24 : 1-B-IV

## ABT-MSE Operating model fitting report

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*July 16, 2017*

### Operating model scenario is:

1: West - Hockey stick, East - '83+ B-H  $h=0.98$

B: West - Current SSB is 75% of best estimate, East - Current SSB is 50% of best estimate

IV: West - older spawning, East - older spawning

### Area definitions for operating model:

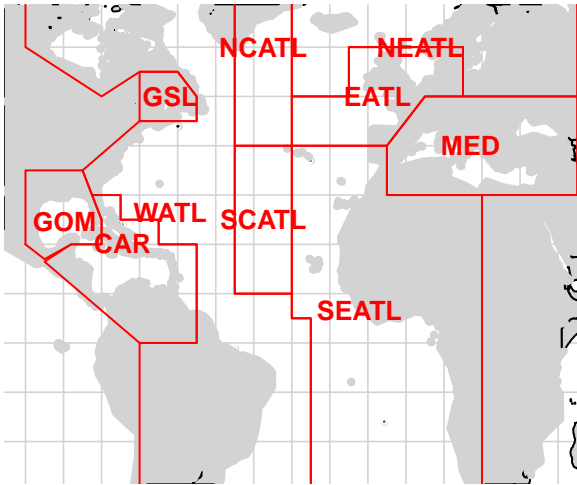


Figure 1. Area definitions for operating model

# Fits to CPUE indices of relative abundance

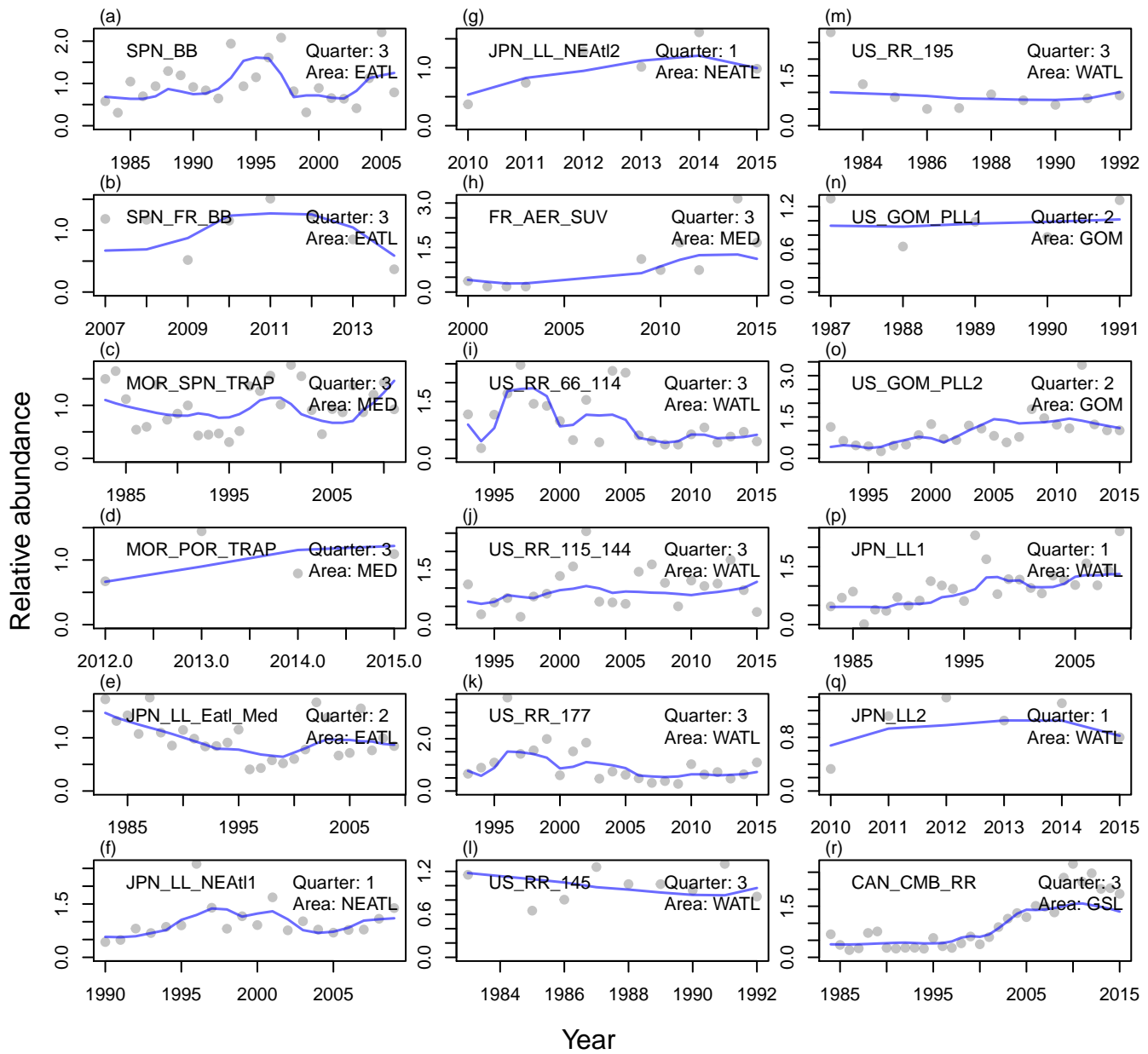


Figure 2. Assessment CPUE index fits (blue line = predicted, grey dots = index)

# Predicted seasonal and spatial biomass of Atlantic bluefin tuna

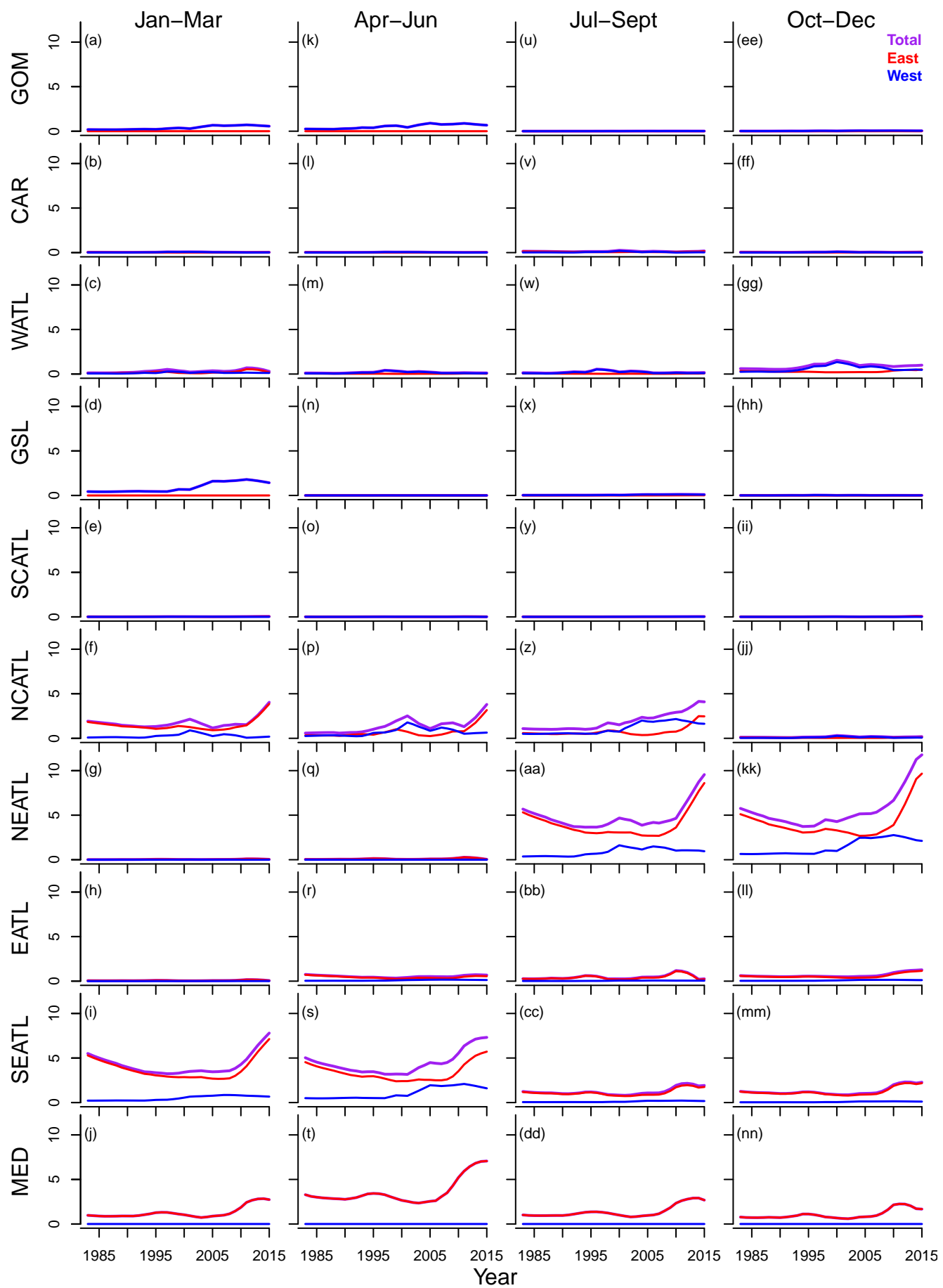


Figure 3. Predicted seasonal and spatial biomass of Atlantic bluefin tuna (Recent period).

## Historical Spawning biomass

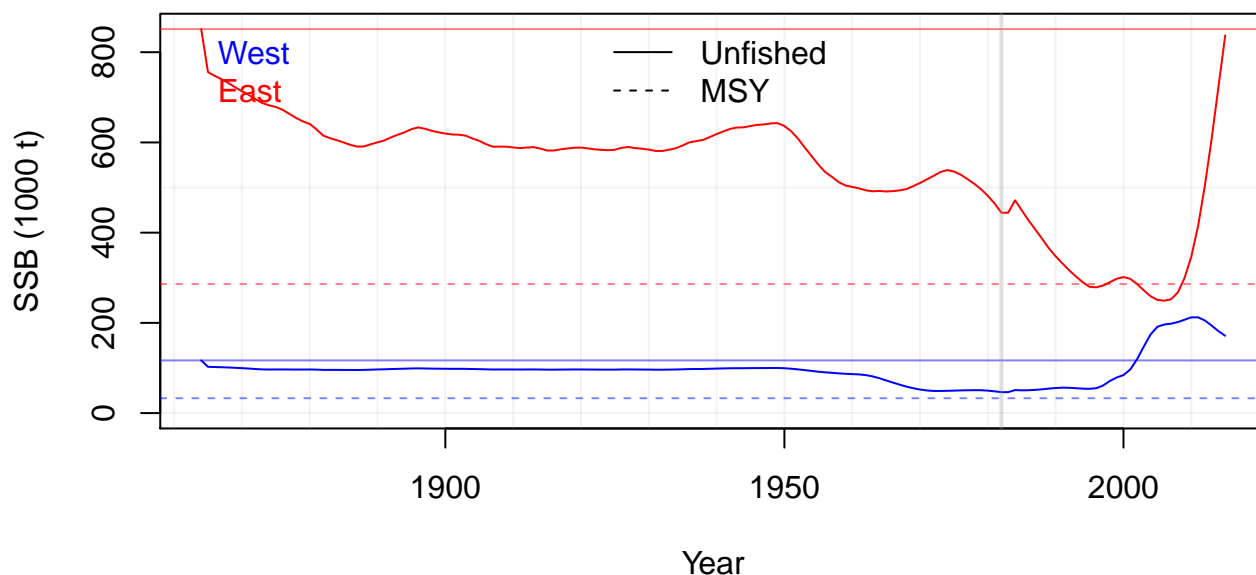


Figure 4. Predicted seasonal and spatial biomass of Atlantic bluefin tuna (Recent period).

SSB, recruitment and F comparison with 2014 assessment (by East/West area, not East/West stock)

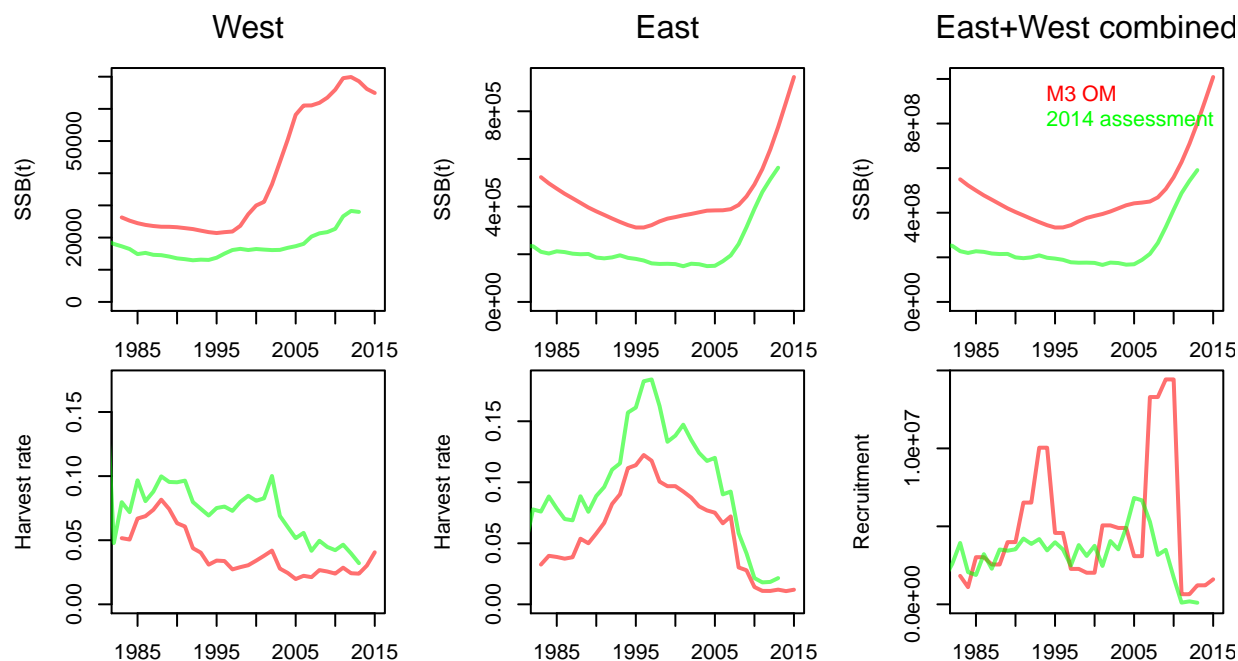


Figure 3. Regional comparisons (45deg W) with 2014 stock assessment. Note that annual estimates from the operating model are calculated from average of the seasonal predictions. Harvest rates from the operating model are based on total stock biomass not vulnerable biomass which is fleet specific (and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

# Stock-recruitment relationships (R0 is unfished mean recruitment)

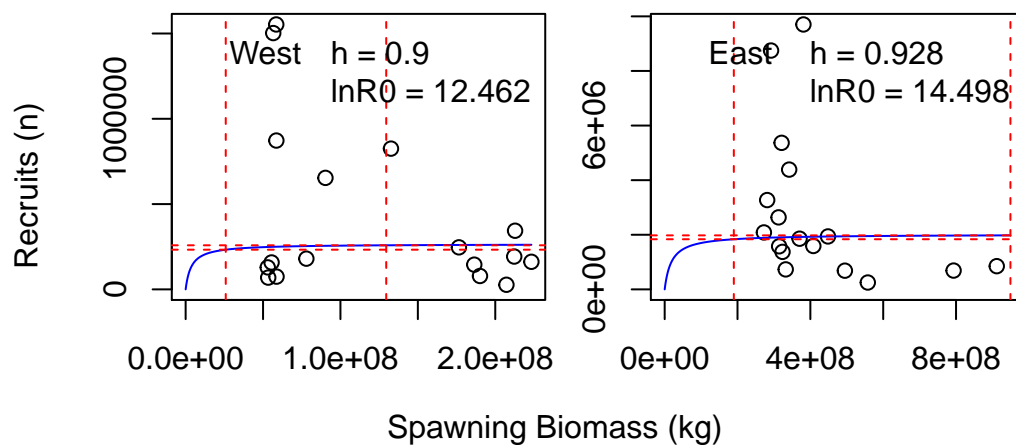


Figure 4. Model predicted pairs of SSB and recruitment(with a fitted Bev Holt for illustration)

## MSY reference points (2013 for comparison with previous assessment)

Table 1. Reference points by stock.

	MSY	FMSY <sub>ap</sub>	UMSY	BMSY	SSBMSY	BMSY_B0	SSBMSY_SSB0	RMSY_R0	F_FMSY	SSB_SSB0
East	33850	0.214	0.149	227642	166661	0.427	0.336	0.963	0.231	0.715
West	5049	0.183	0.147	34331	17424	0.437	0.282	0.934	0.270	1.660

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

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

	MSY	FMSY <sub>ap</sub>	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

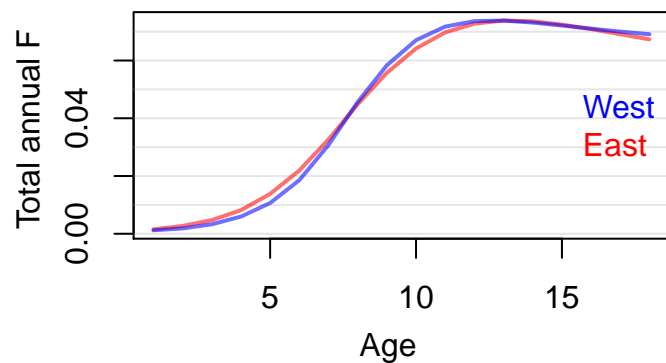


Figure 5. The current profile of F at age summed over all fleets.

## Estimated size selectivity by fleet

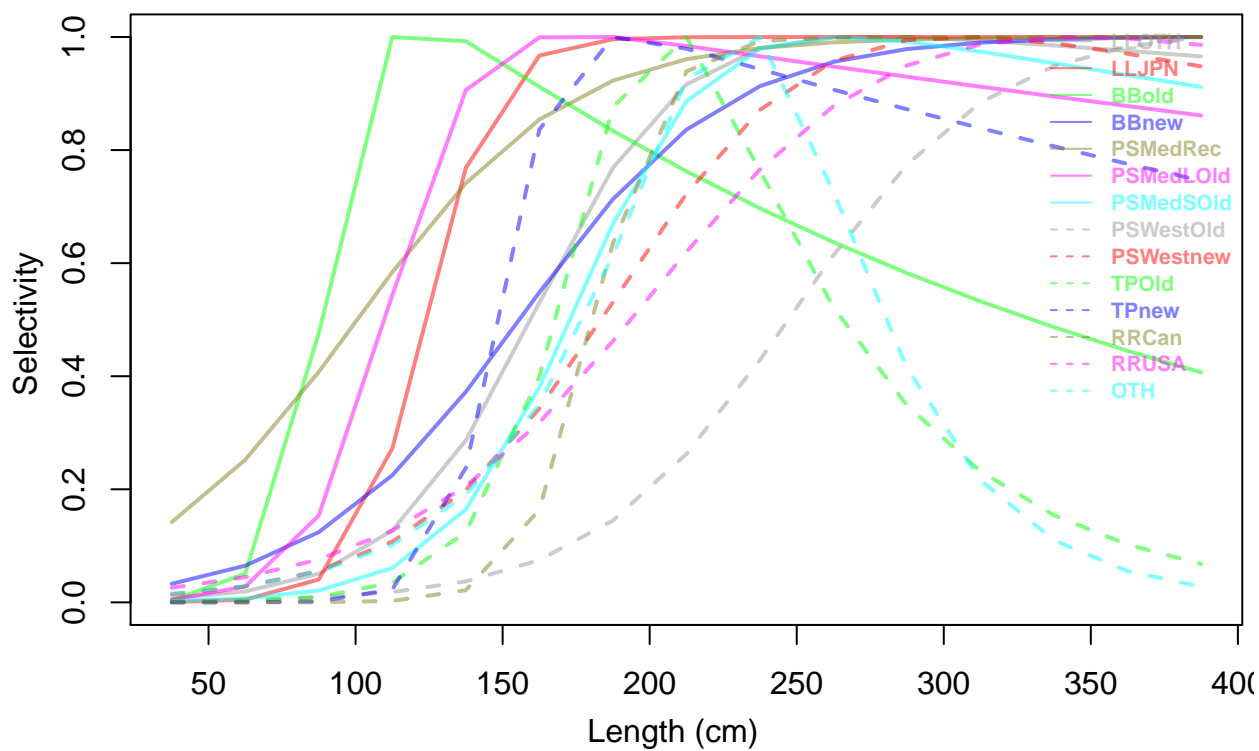
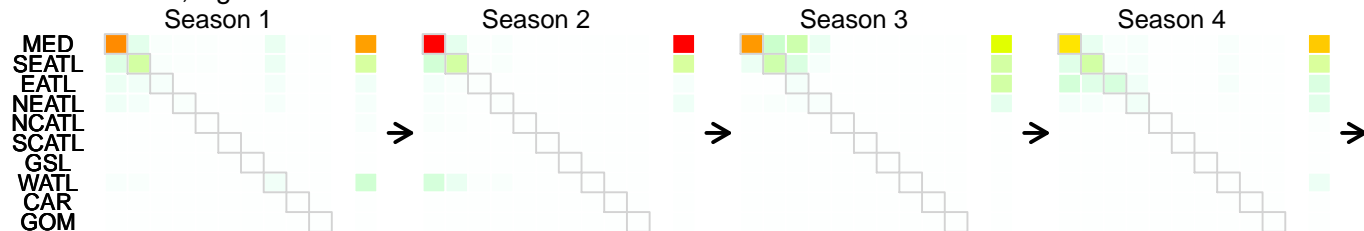


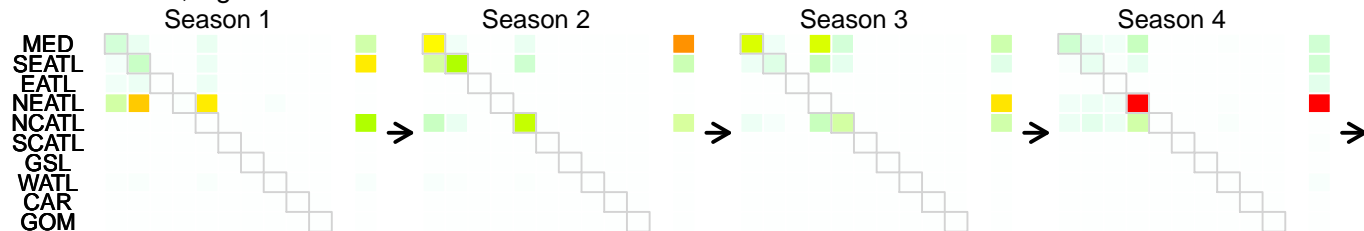
Figure 6.

## Estimated unfished movement and spatial distribution

### Eastern stock, Age class 1



### Eastern stock, Age class 2



### Eastern stock, Age class 3

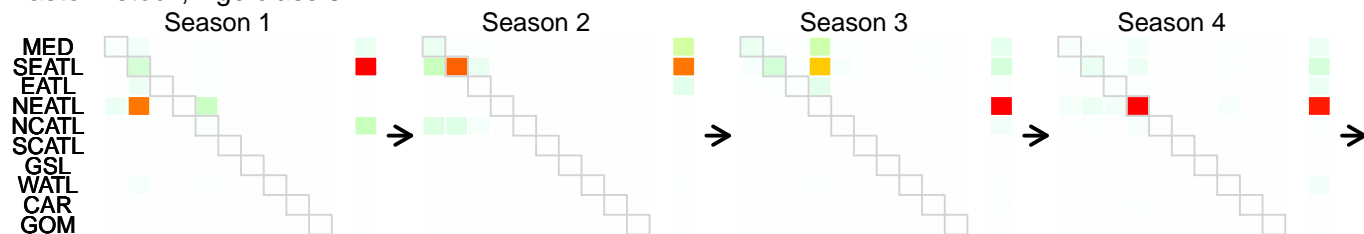




Figure 7. The implied asymptotic distribution of fish under unfished conditions (red-orange-green-white, more to less)

## Fit to aggregate catches

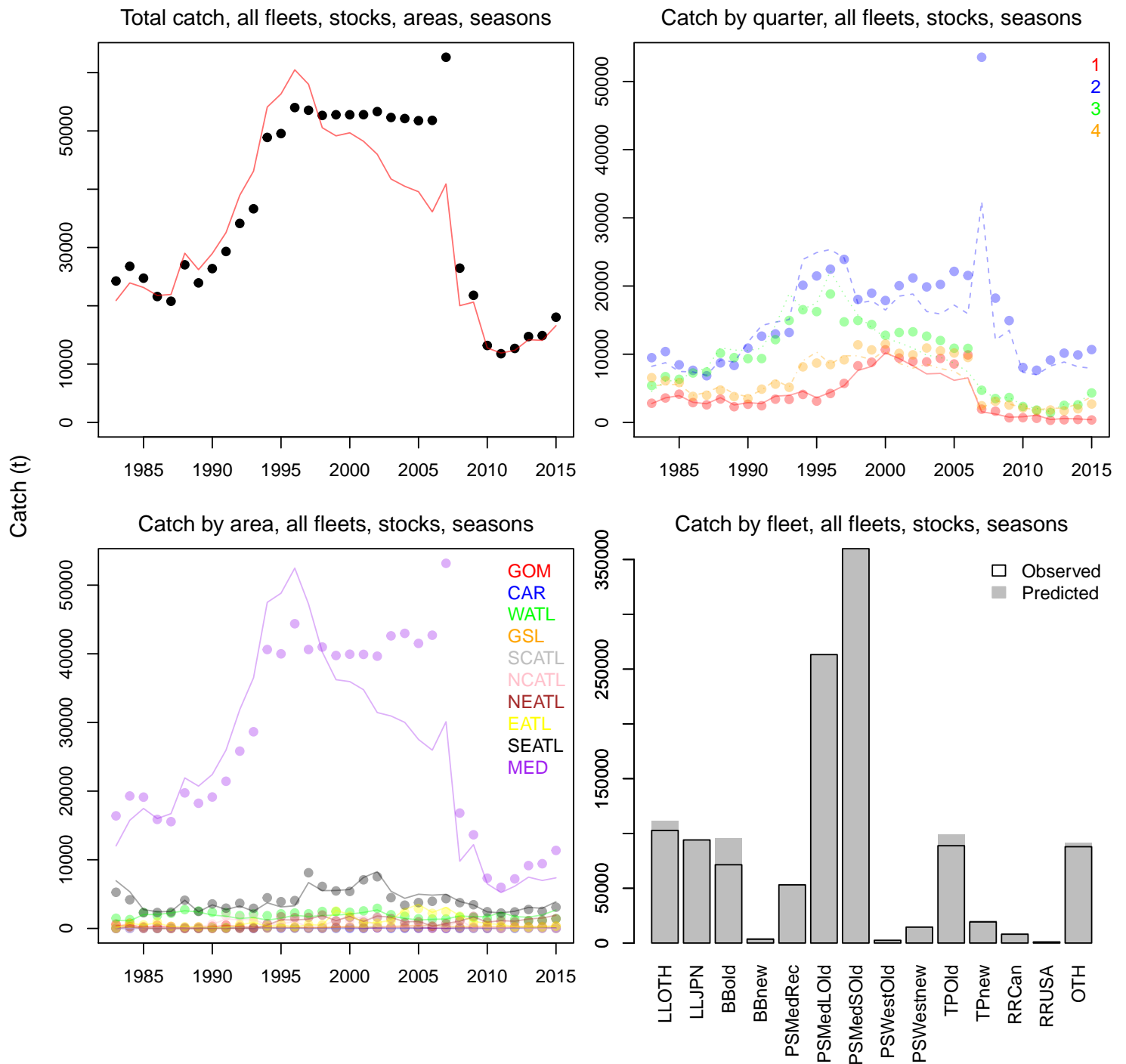


Figure 8. Fit to a observed total catches aggregated over various axes (lines = predicted, points = observed)



# Fit to aggregate length composition

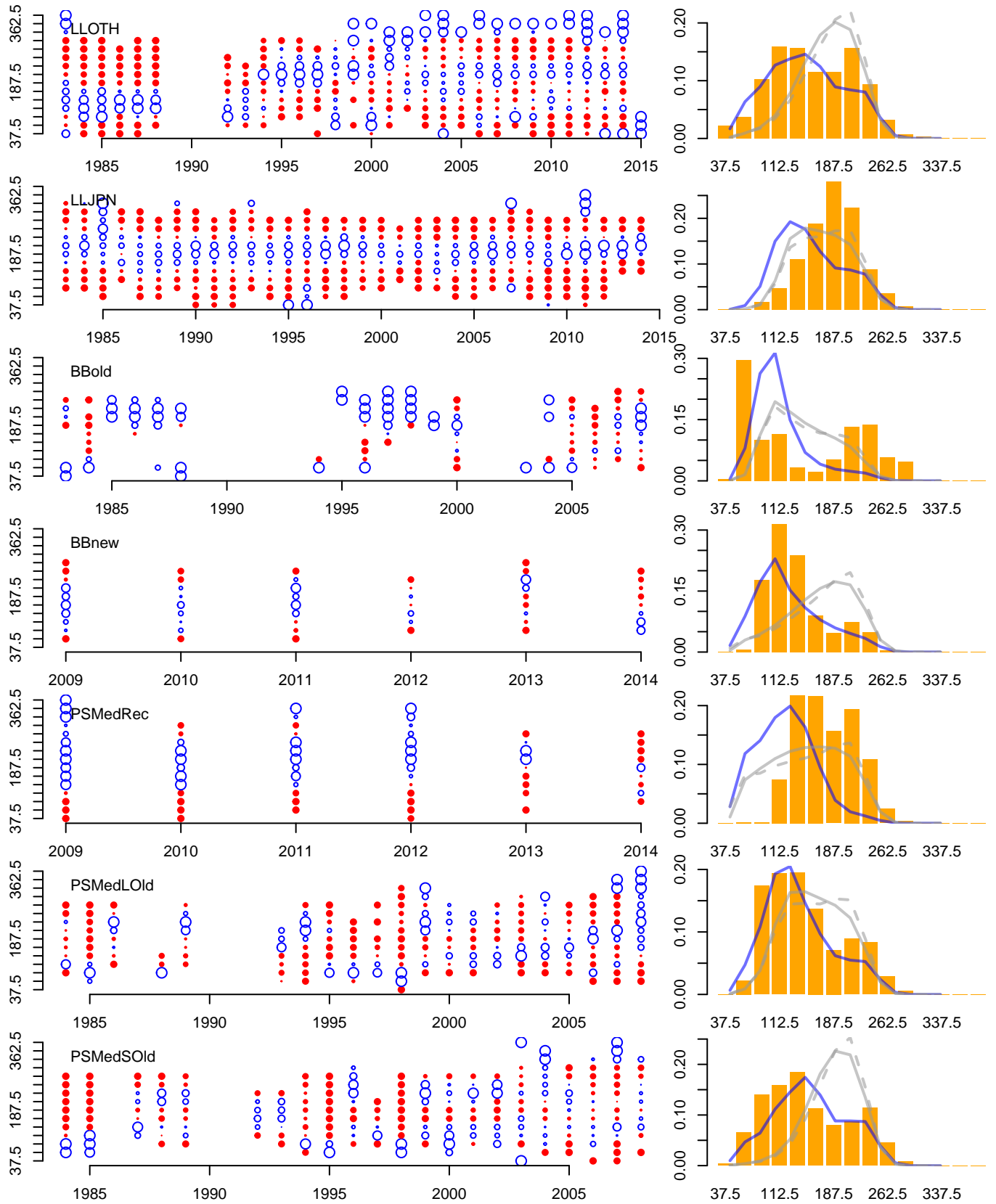


Figure 9a.Length composition residuals. Red points are negative Pearson residuals (predicted is higher than observed), blue circles are positive (predicted is lower than observed). Orange bars are observed, blue lines are model predictions.

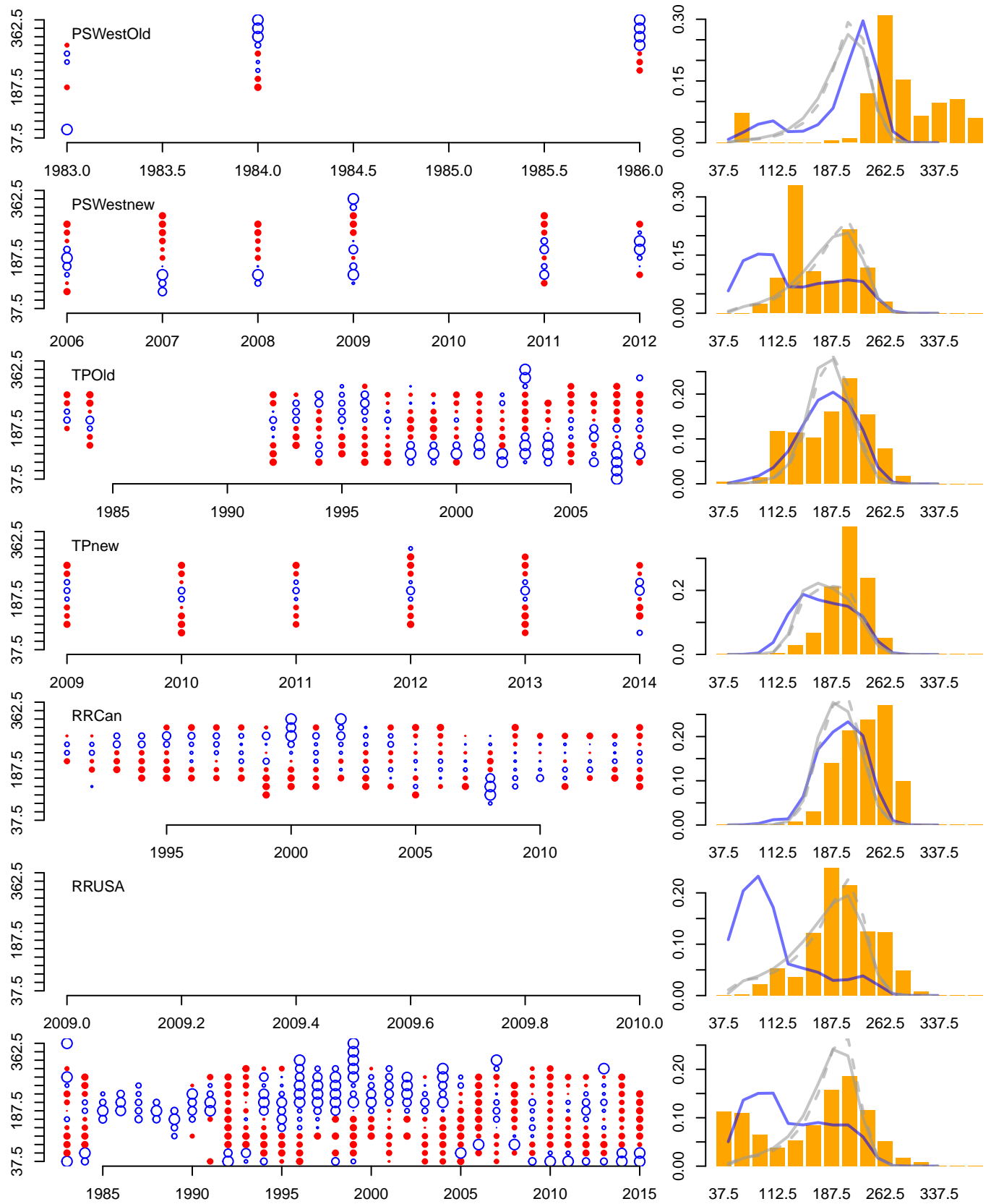
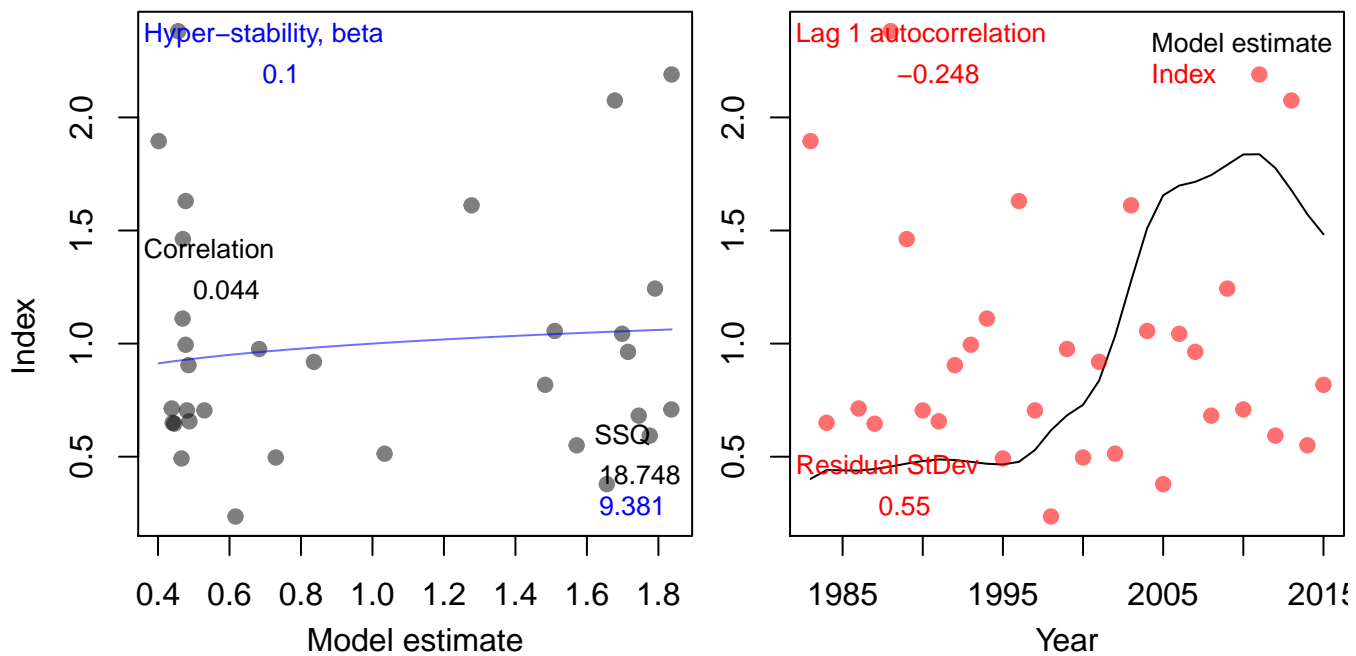


Figure 9b.Length composition residuals. Red points are negative Pearson residuals (predicted is higher than observed), blue circles are positive (predicted is lower than observed).Orange bars are observed, blue lines are model predictions.

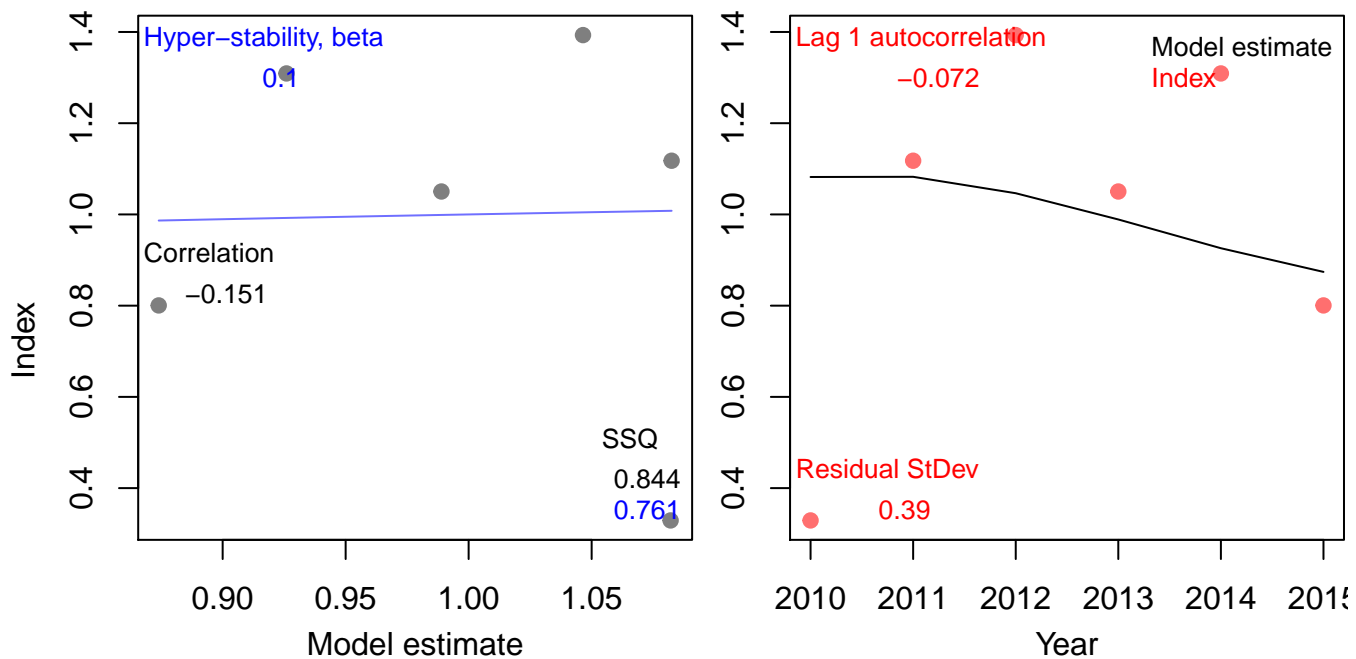
## Other model estimates and fits

### Statistical properties of indices for use in Management Procedures

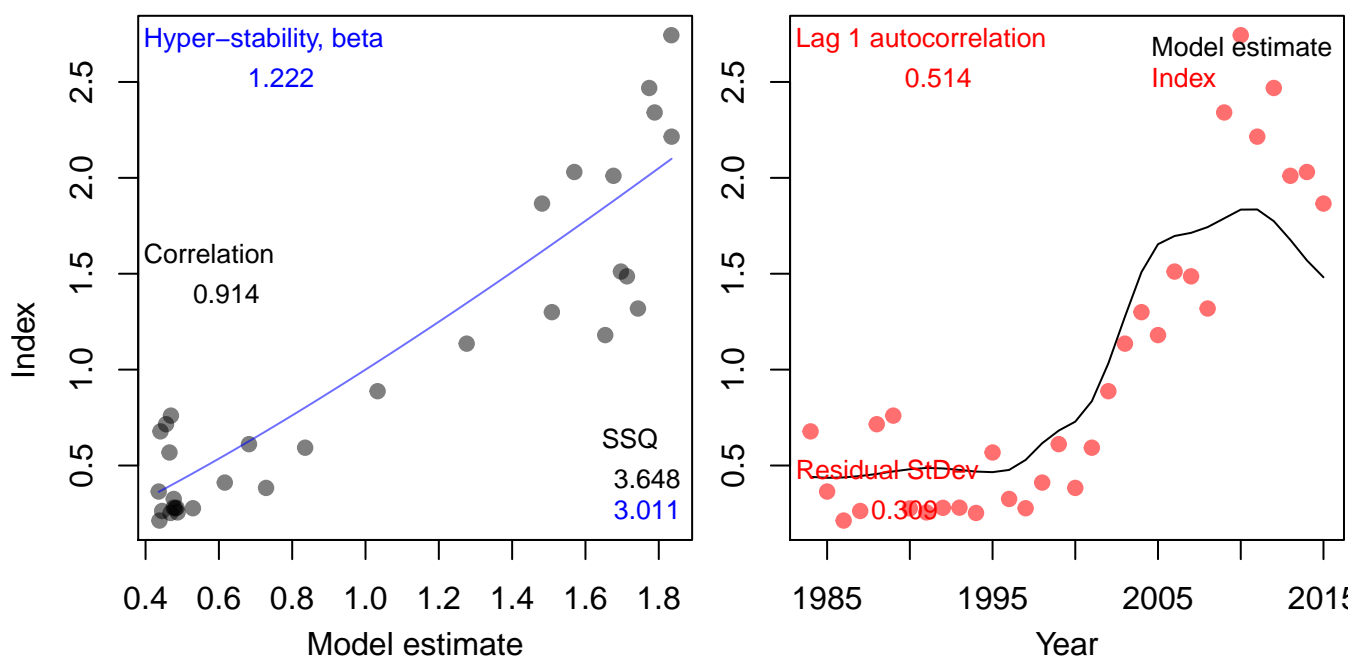
#### Index fit and statistical properties for GOM\_Larval



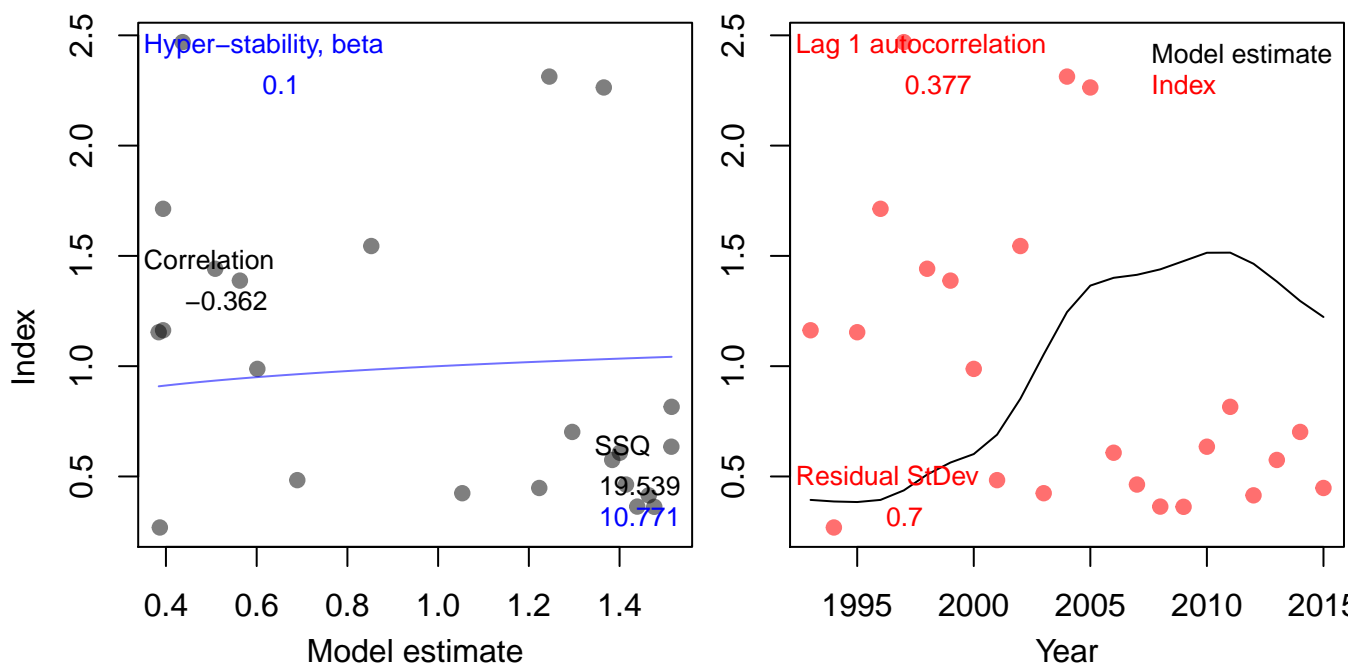
#### Index fit and statistical properties for JP\_LL\_W



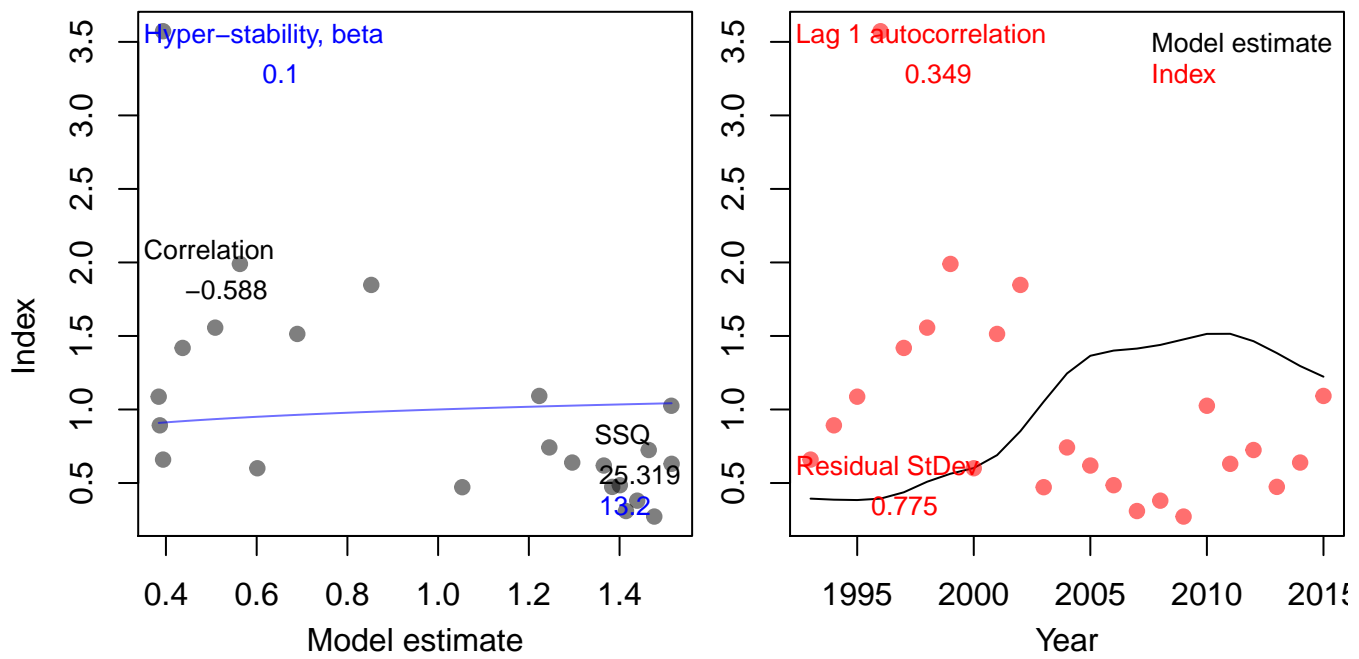
# Index fit and statistical properties for CAN-comb-RR



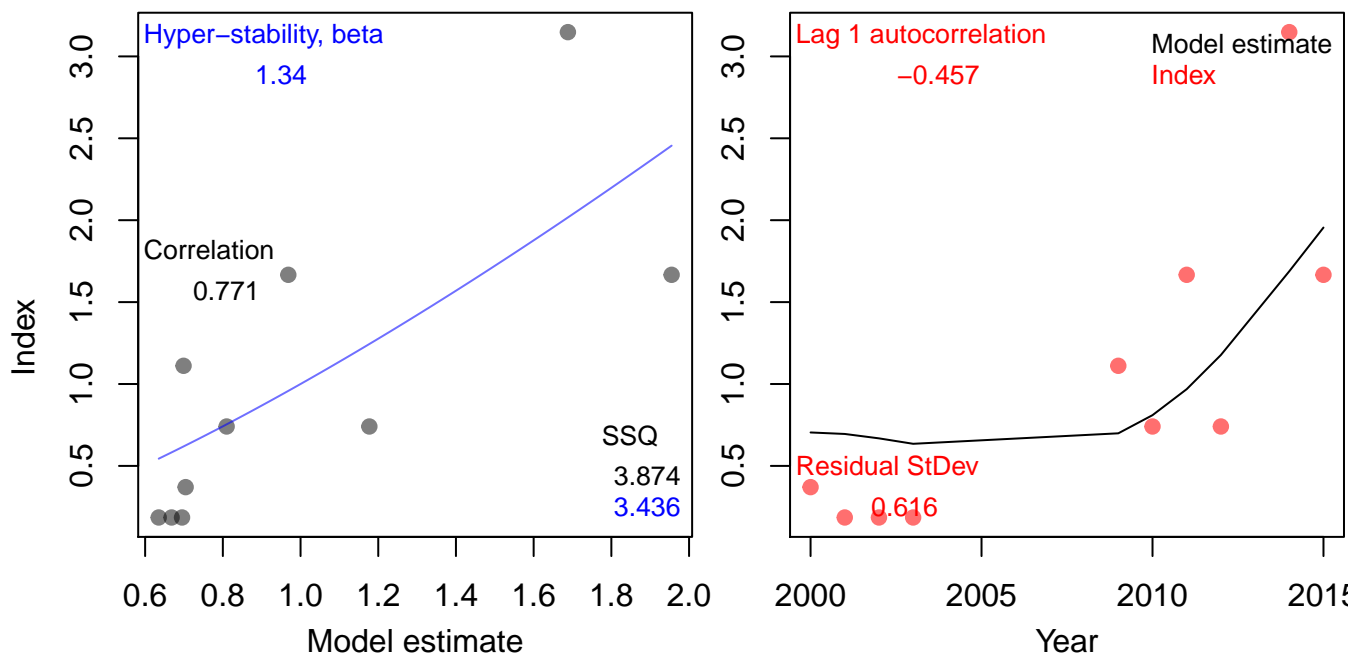
# Index fit and statistical properties for US\_RR\_66\_114



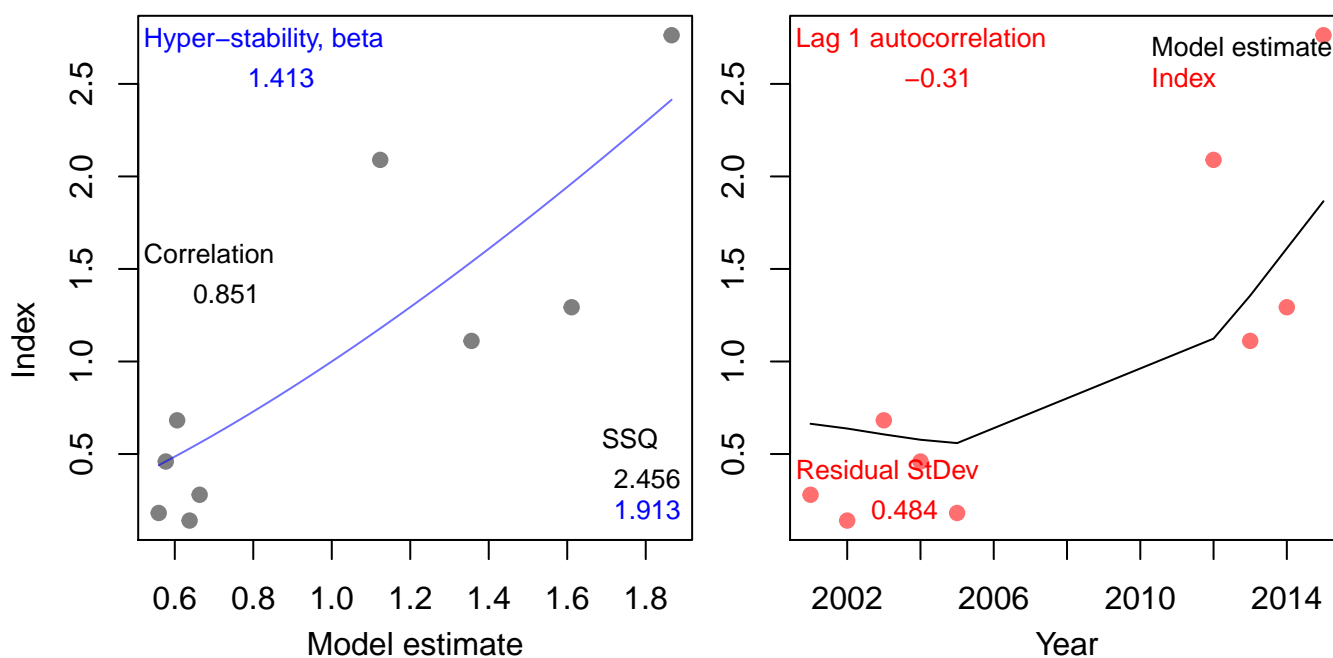
Index fit and statistical properties for US\_RR\_177



Index fit and statistical properties for FR\_Aerial



# Index fit and statistical properties for MED\_Larval



# Index fit and statistical properties for JP\_LL\_NE

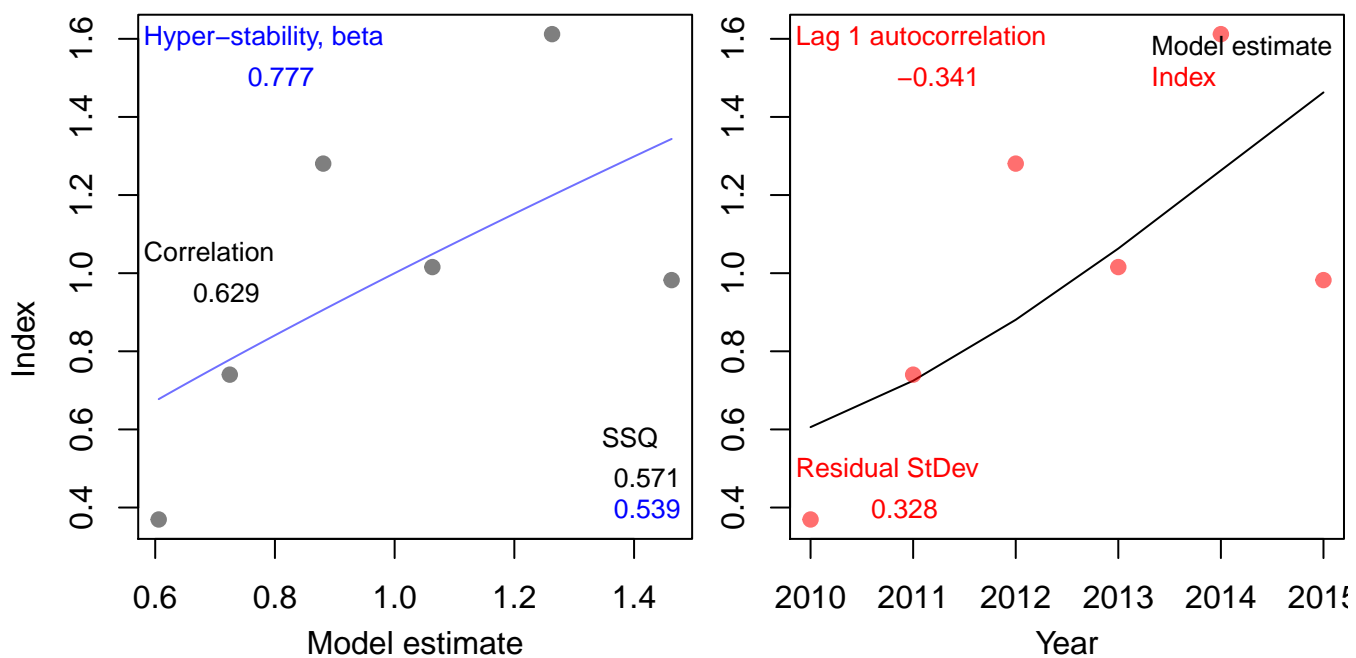


Figure 10.