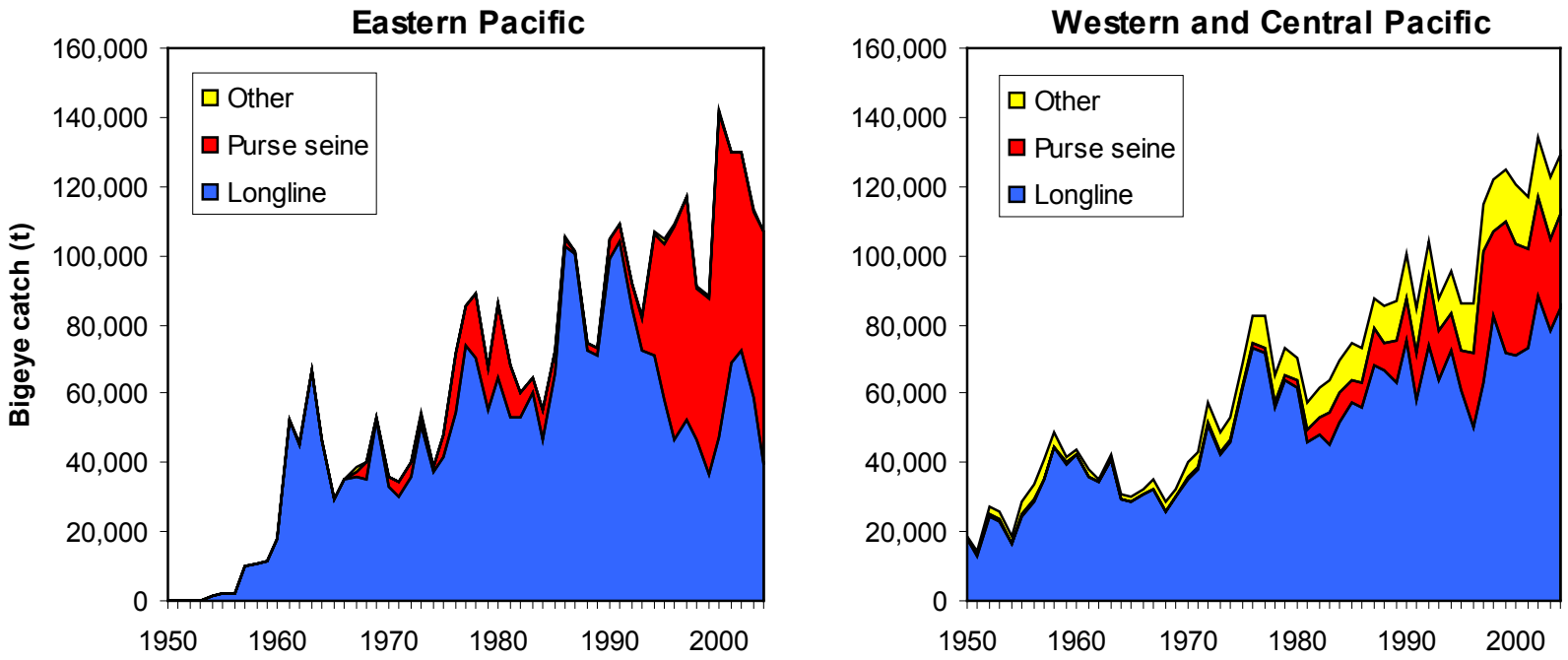
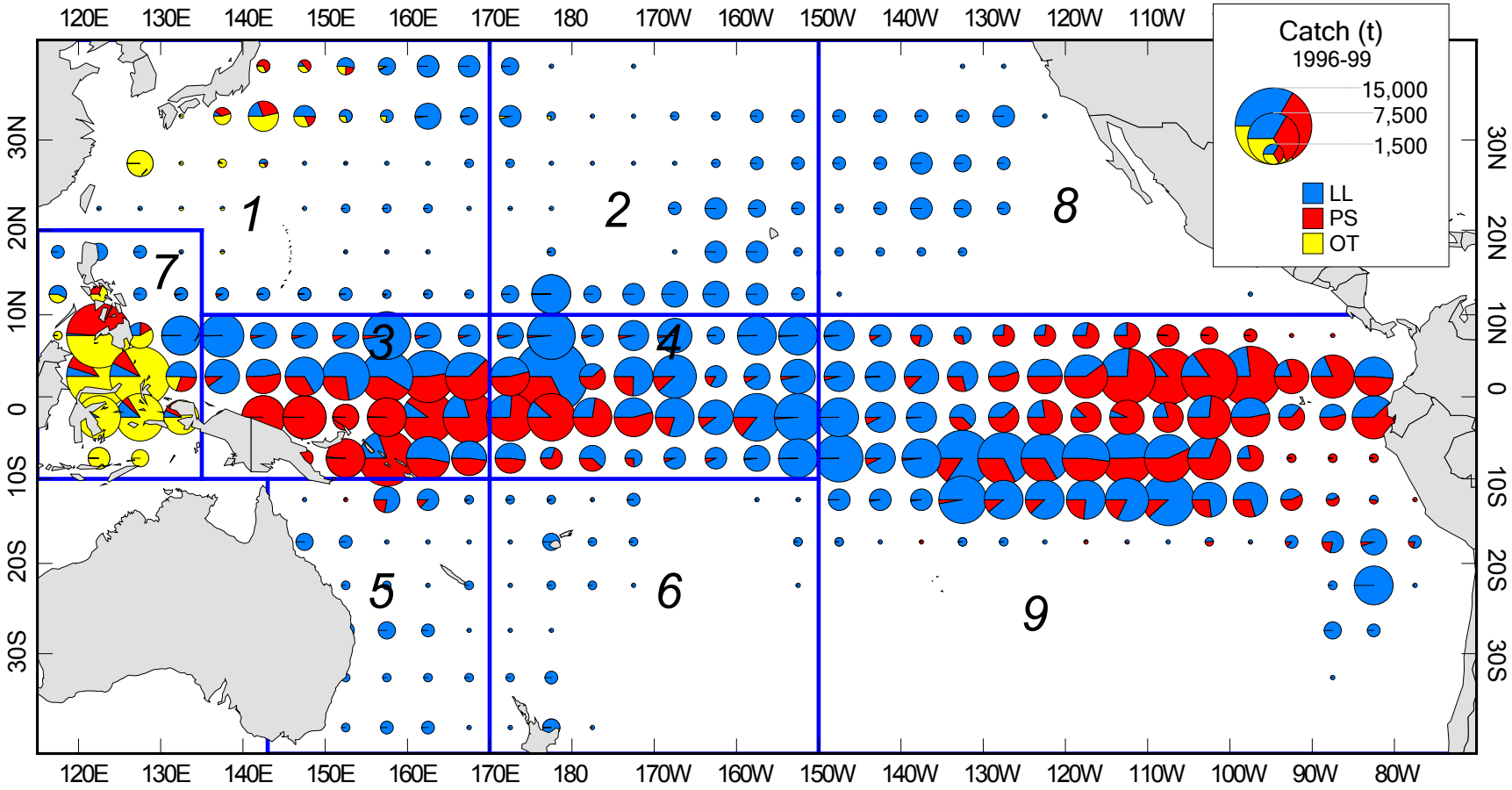
Pacific-Wide Assessment of Bigeye Tuna

John Hampton & Mark Maunder

Catch History



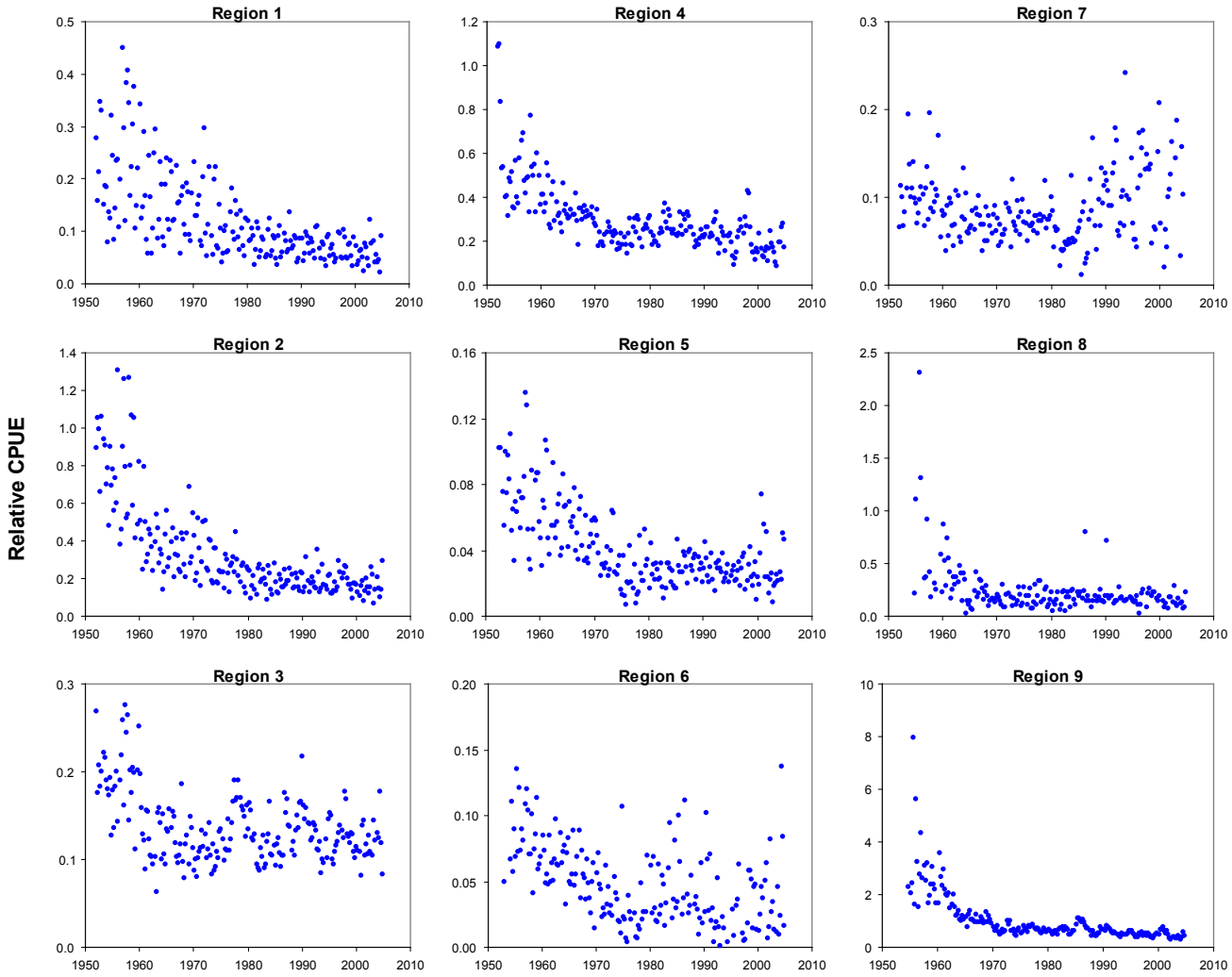
Spatial Structure



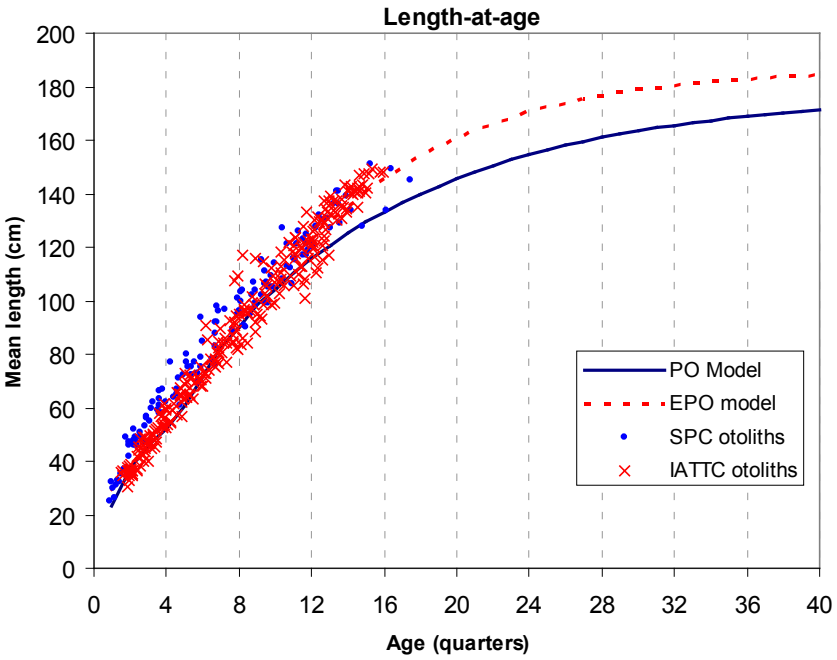
Model Structure

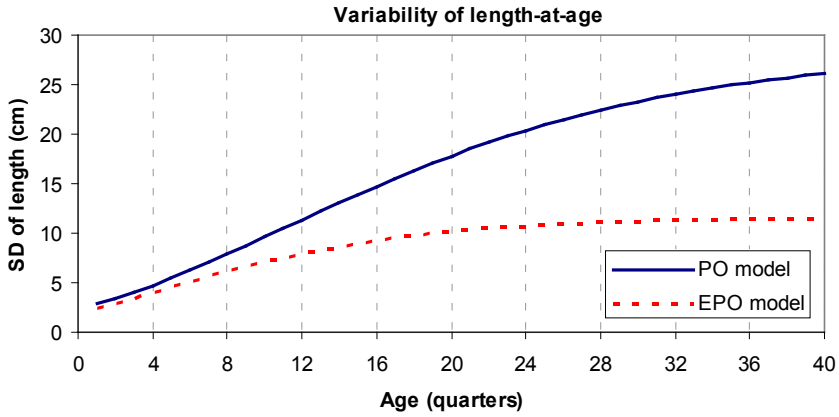
- 9 region spatial structure, including 2 regions comprising the EPO. Movement parameters for adjacent regions are estimated.
- 28 fisheries differentiated by fishing method, nationality, and region.
- Time period referenced is 1952–2004 (with quarterly stratification).
- Tagging data are included.
- Weight-frequency as well as length-frequency data used for the longline fisheries.
- CPUE and effort for the main (primarily Japanese) longline fisheries standardised using a GLM. CPUEs therefore provide an index of relative abundance for each region.
- Catchability of the main longline fishery in each region assumed to be constant over time and among regions.
- Selectivity of longline fisheries is monotonically increasing with age.
- Use the same (fixed) natural mortality at age (40 quarterly age classes) as for the EPO assessment. Also used the same female maturity at age.

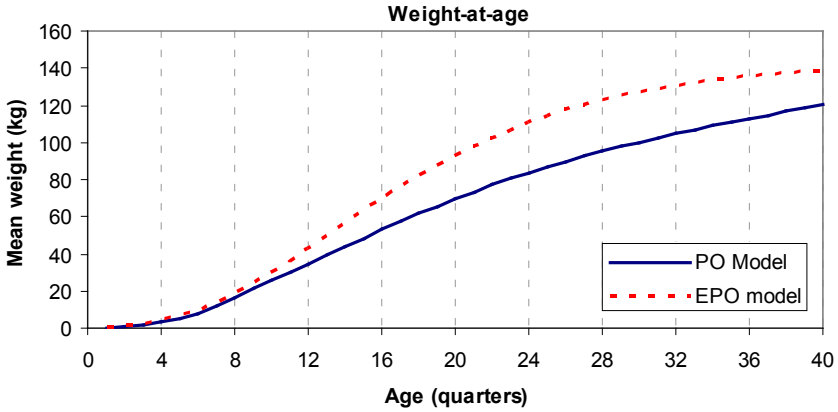
Longline CPUE – abundance index



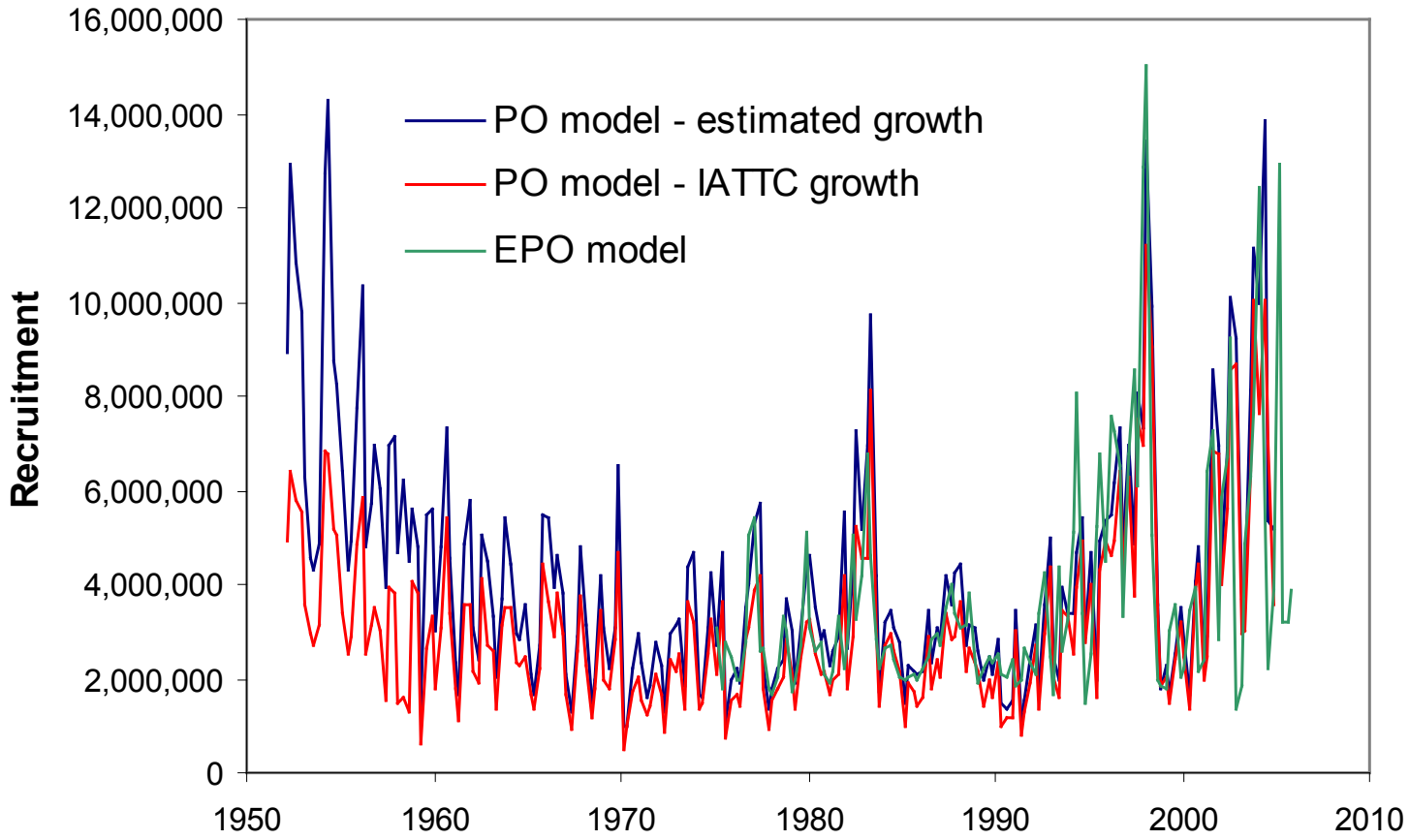
Growth Estimates



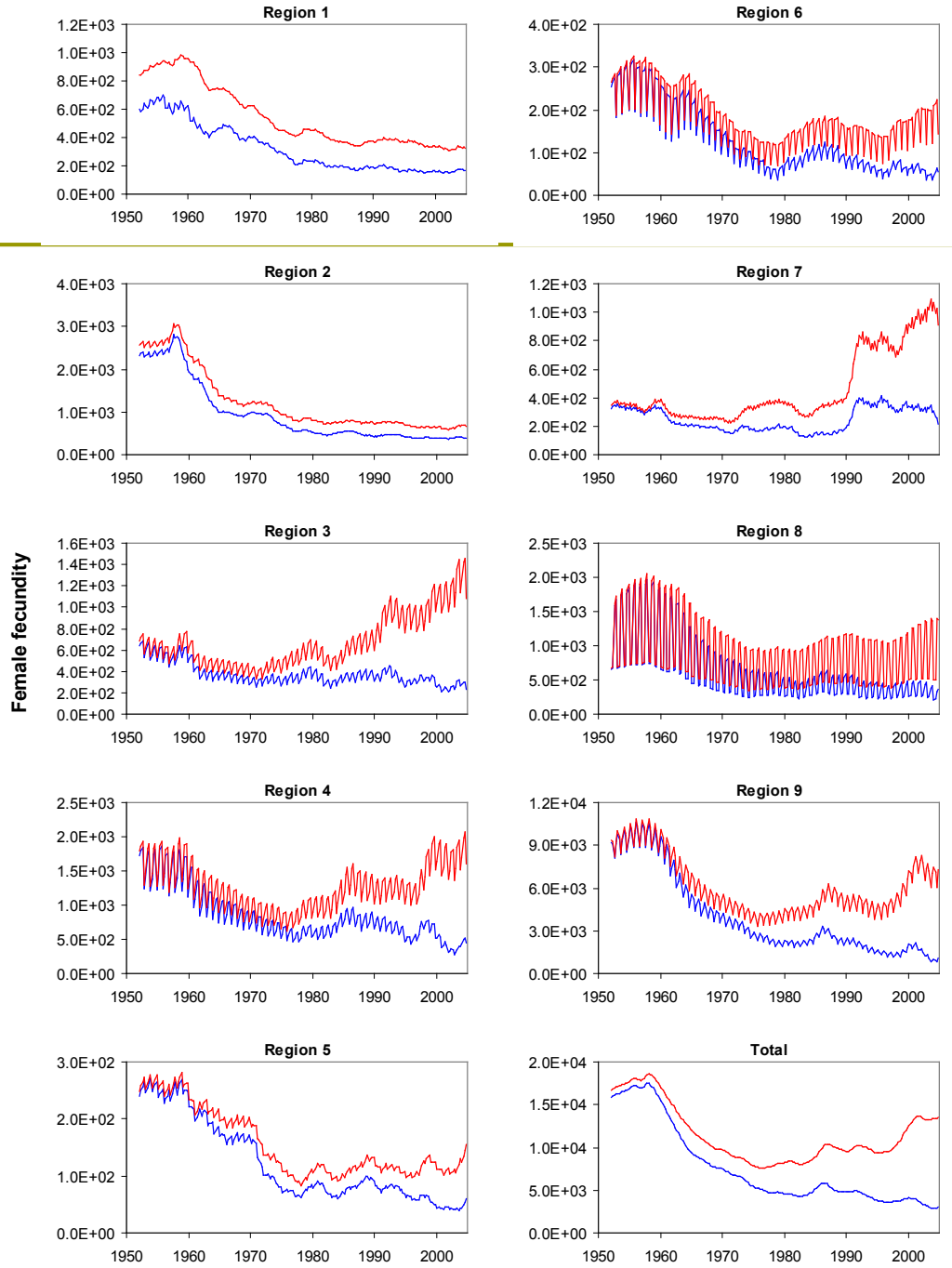




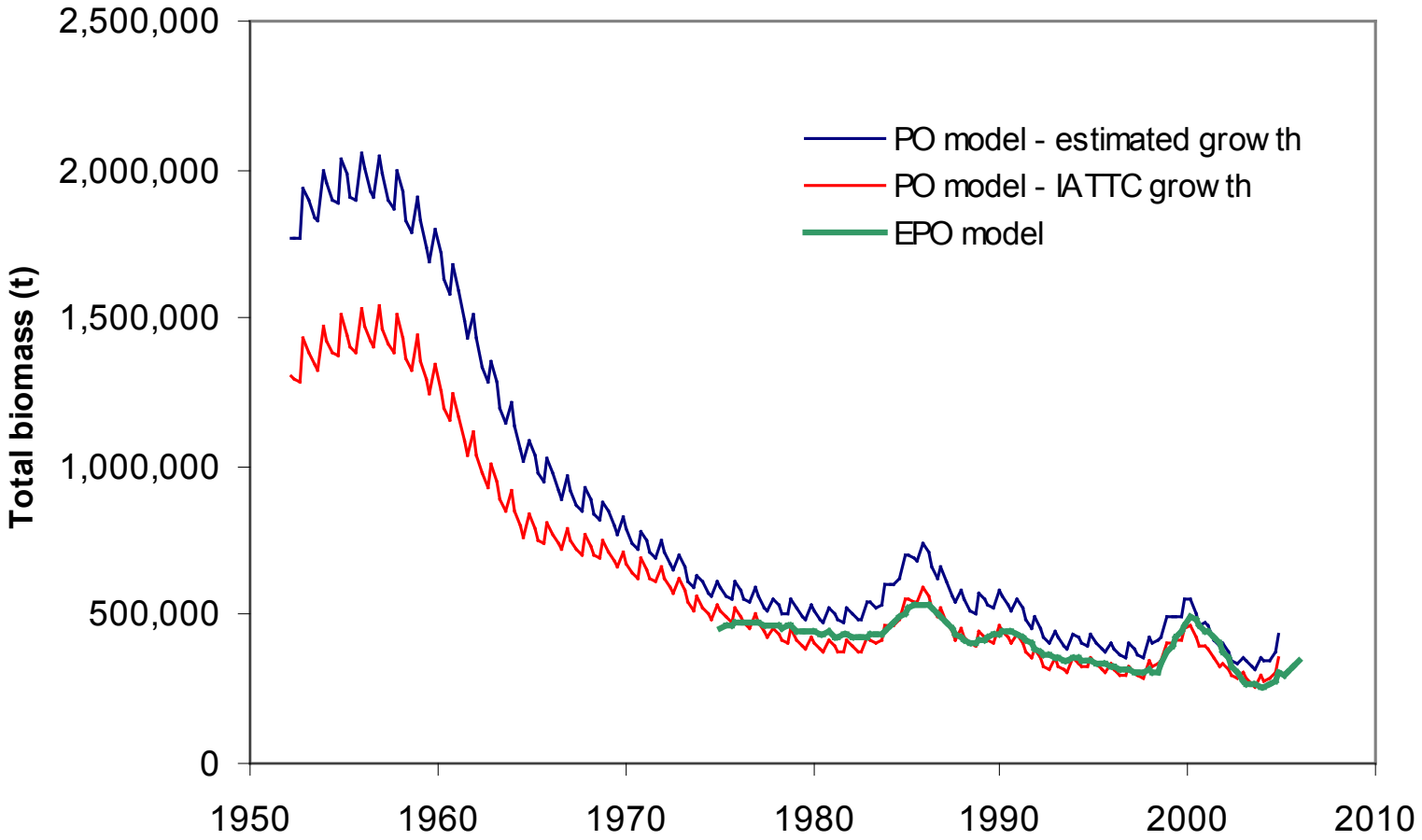
Recruitment Estimates



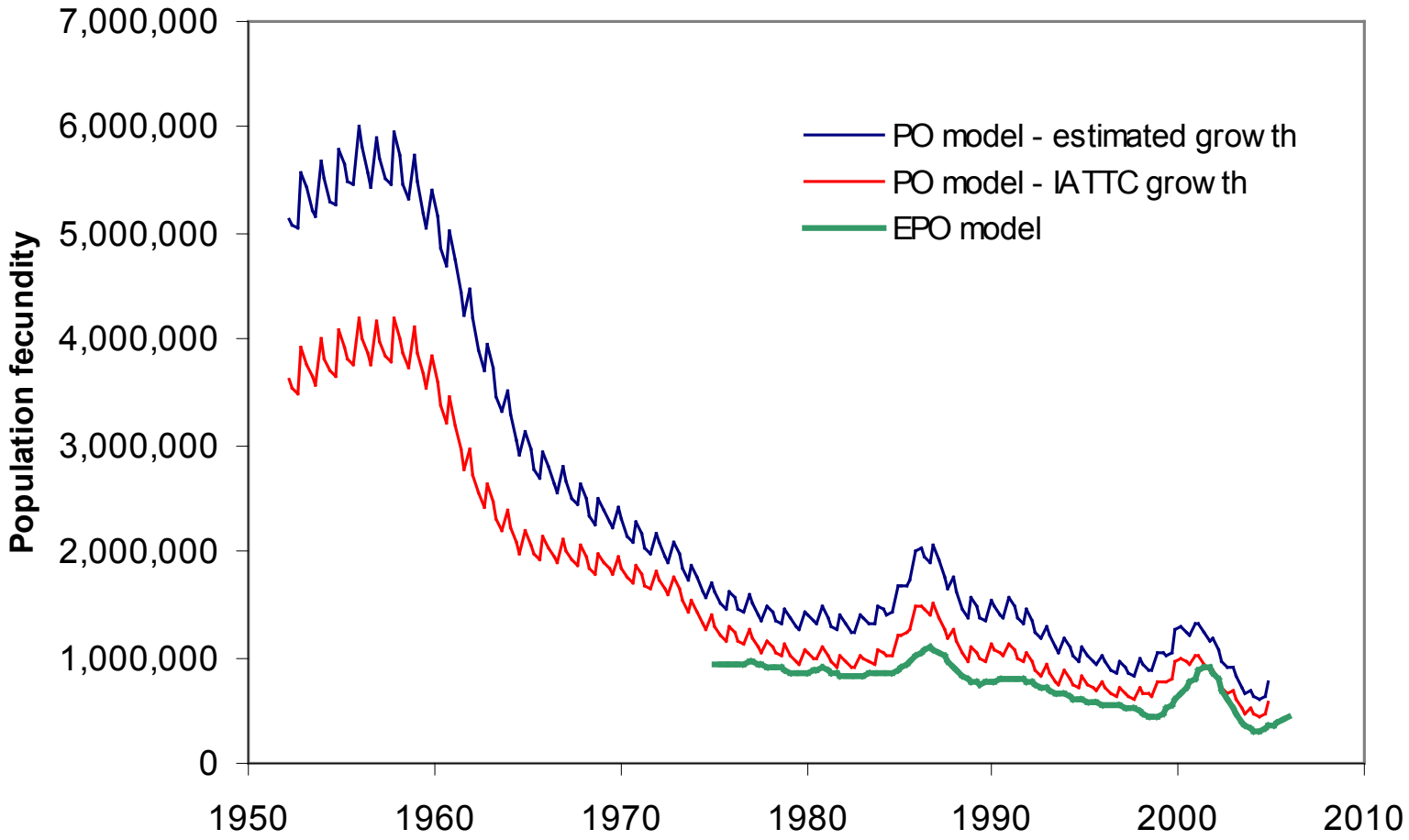
Biomass Estimates



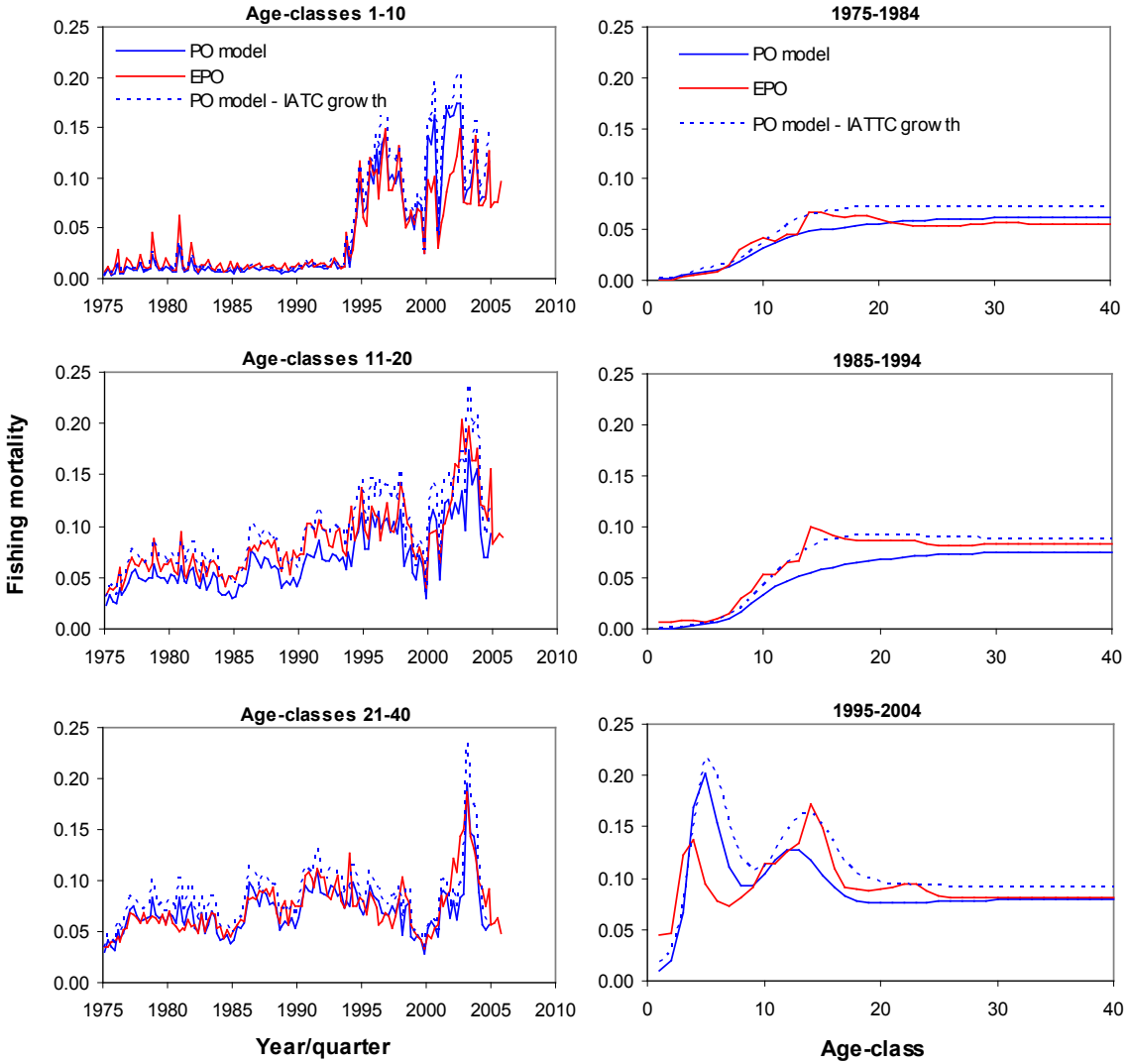
Total Biomass – EPO



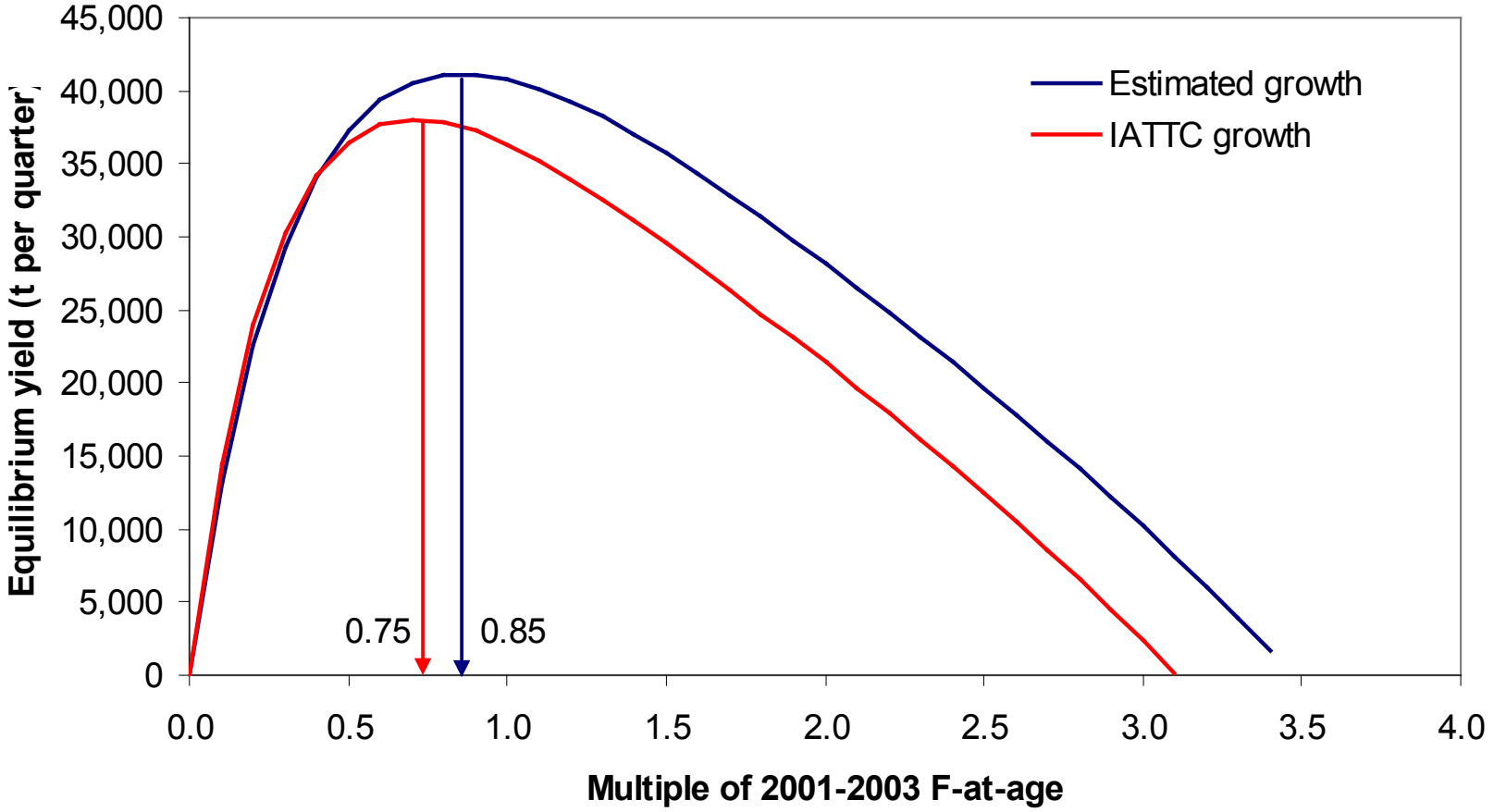
Relative Fecundity – EPO



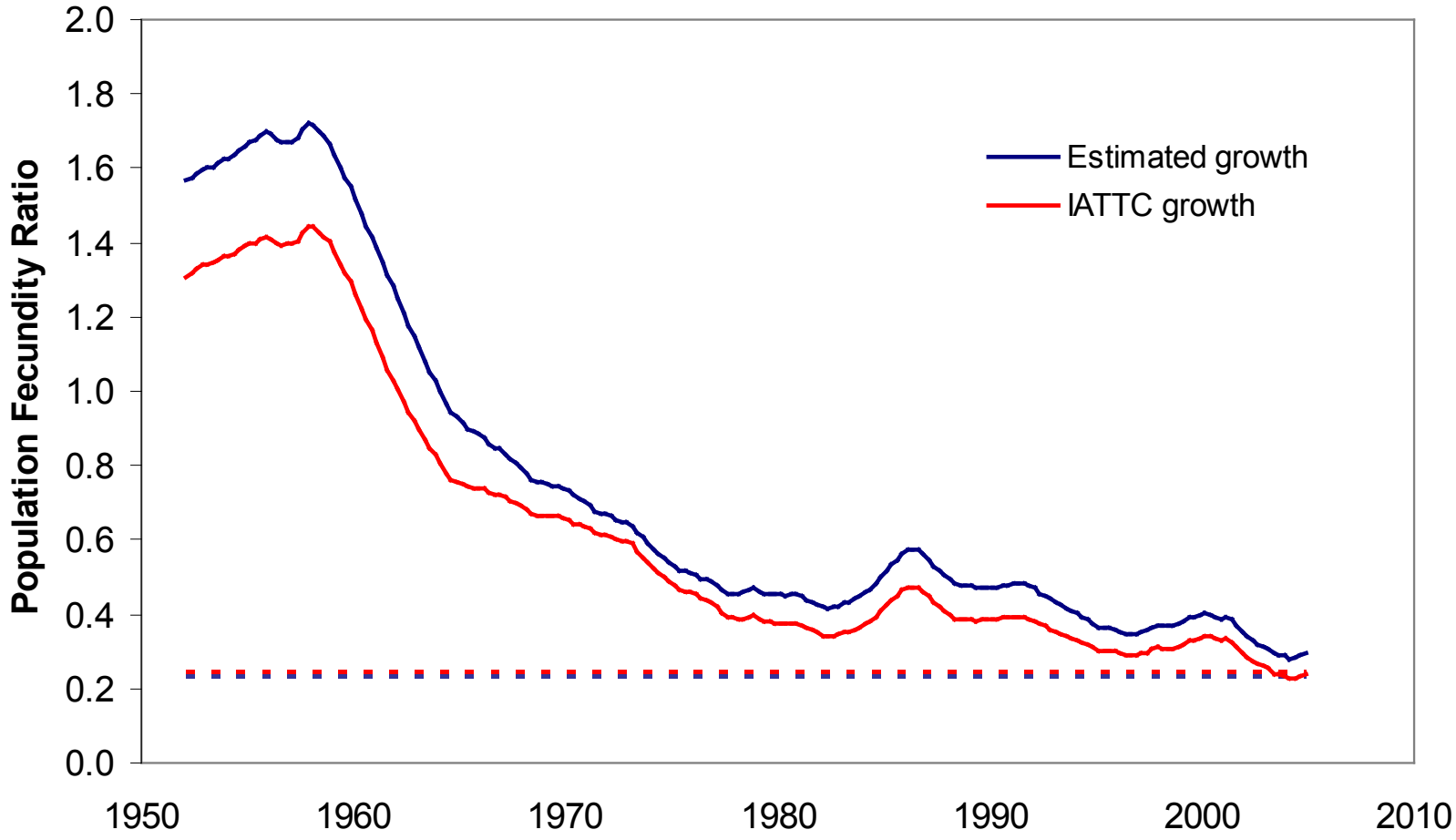
Fishing Mortality – EPO



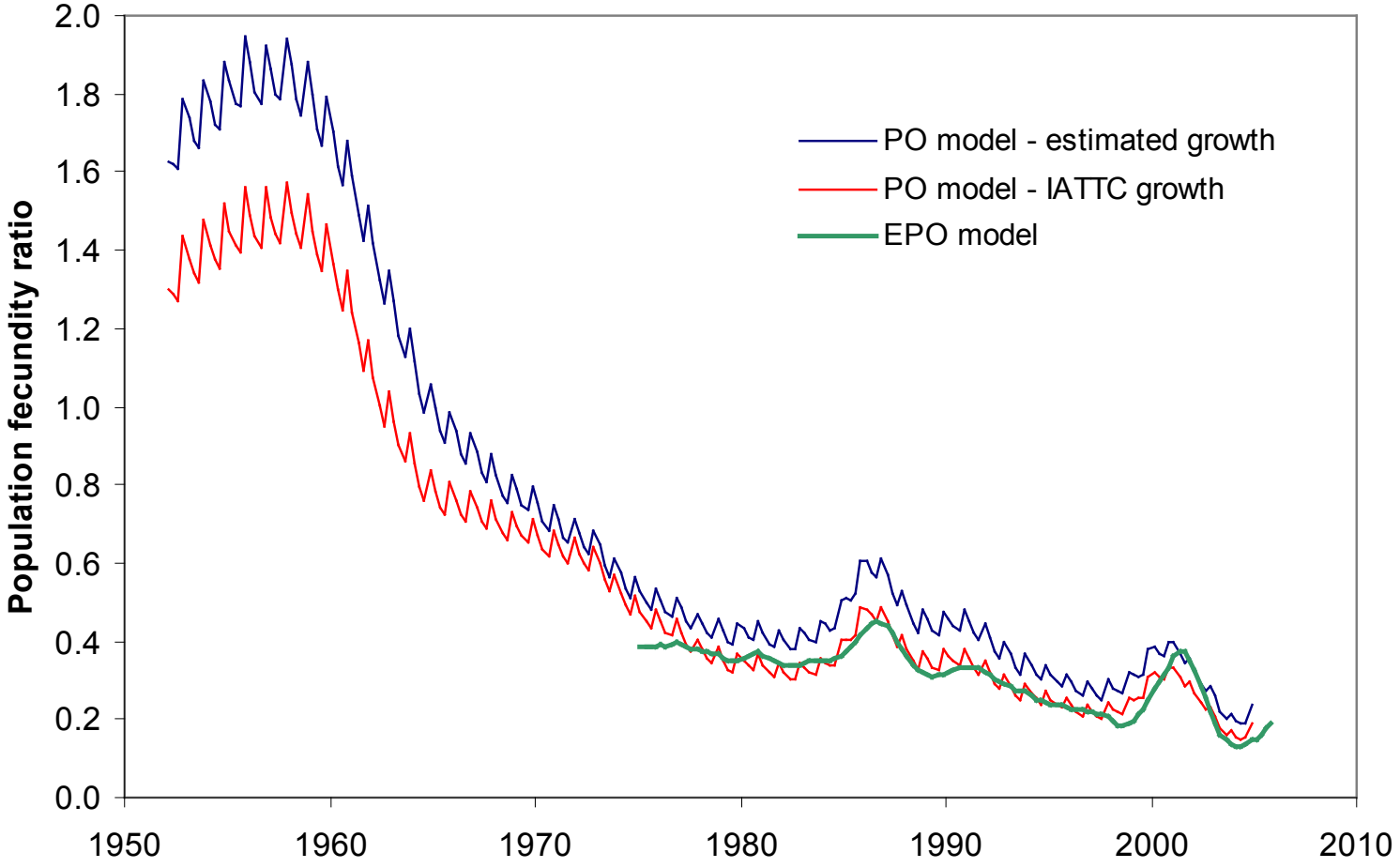
Yield Estimates – Whole PO



“SBR” – Whole PO


Population Fecundity Ratio
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1950
1960
1970
1980
1990
2000
2010
Estimated growth
IATTC growth

“SBR” – EPO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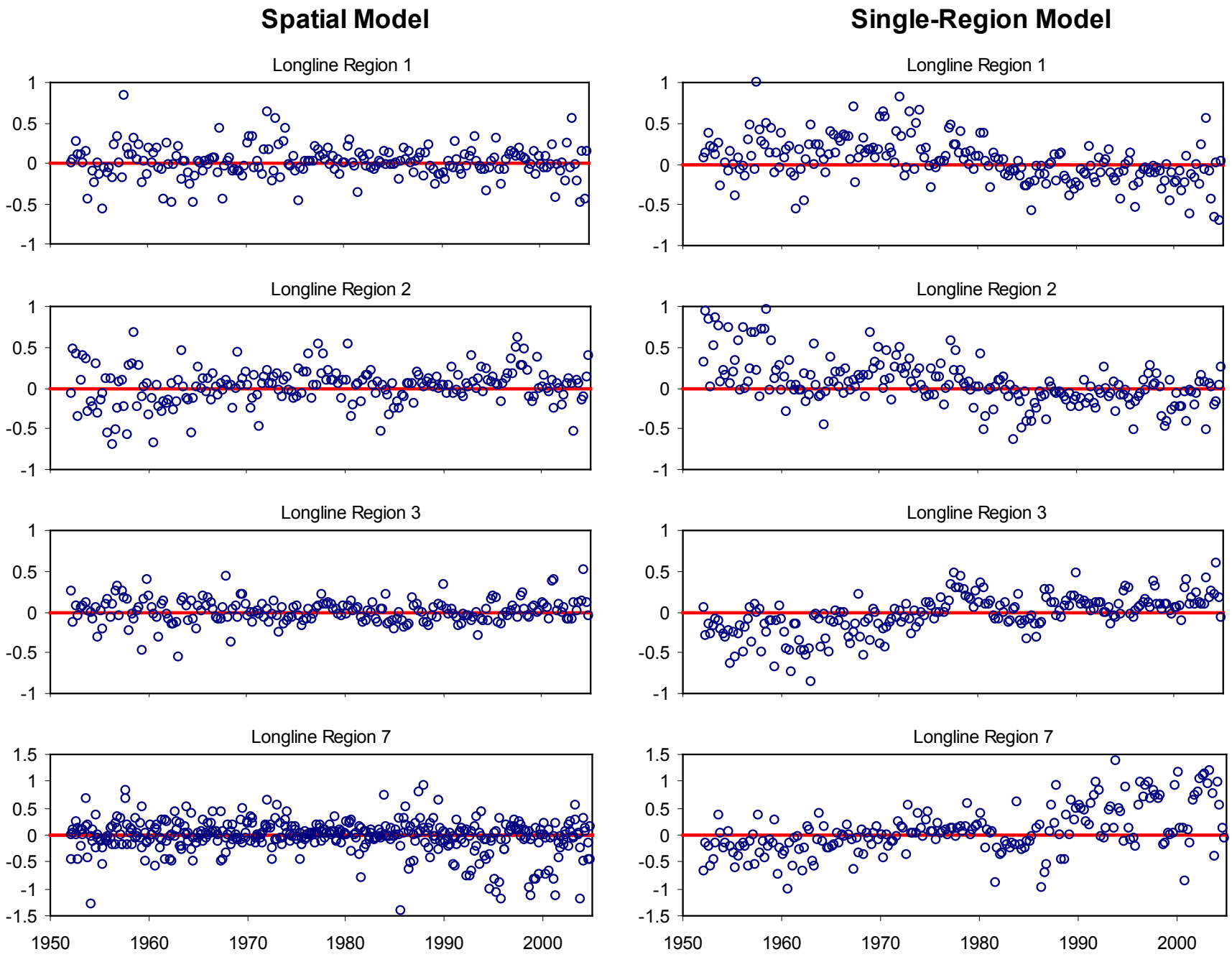
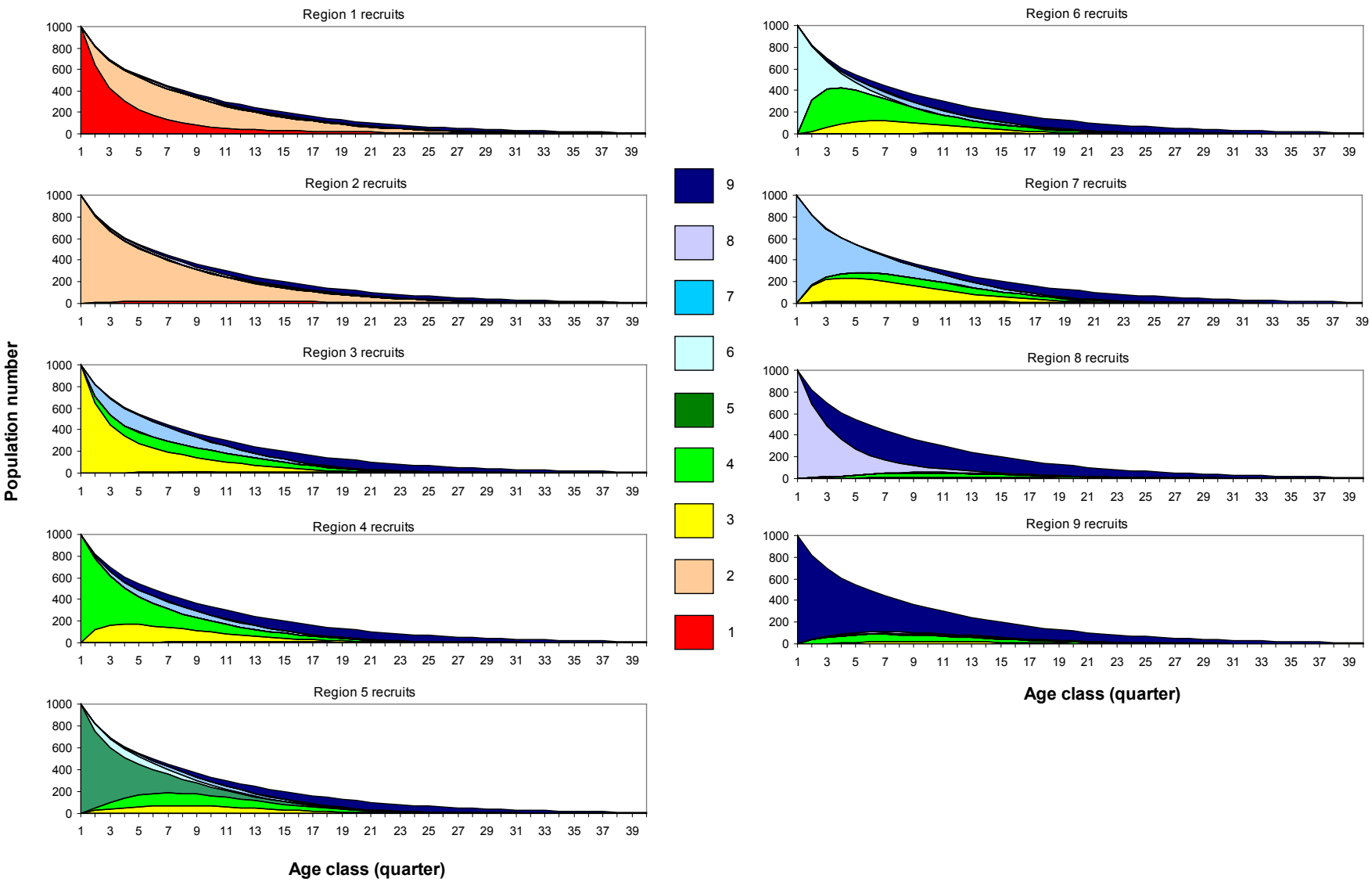
0.0
1950
1960
1970
1980
1990
2000
2010
PO model - estimated growth
PO model - IATTC growth
EPO model

Movement & Stock Structure

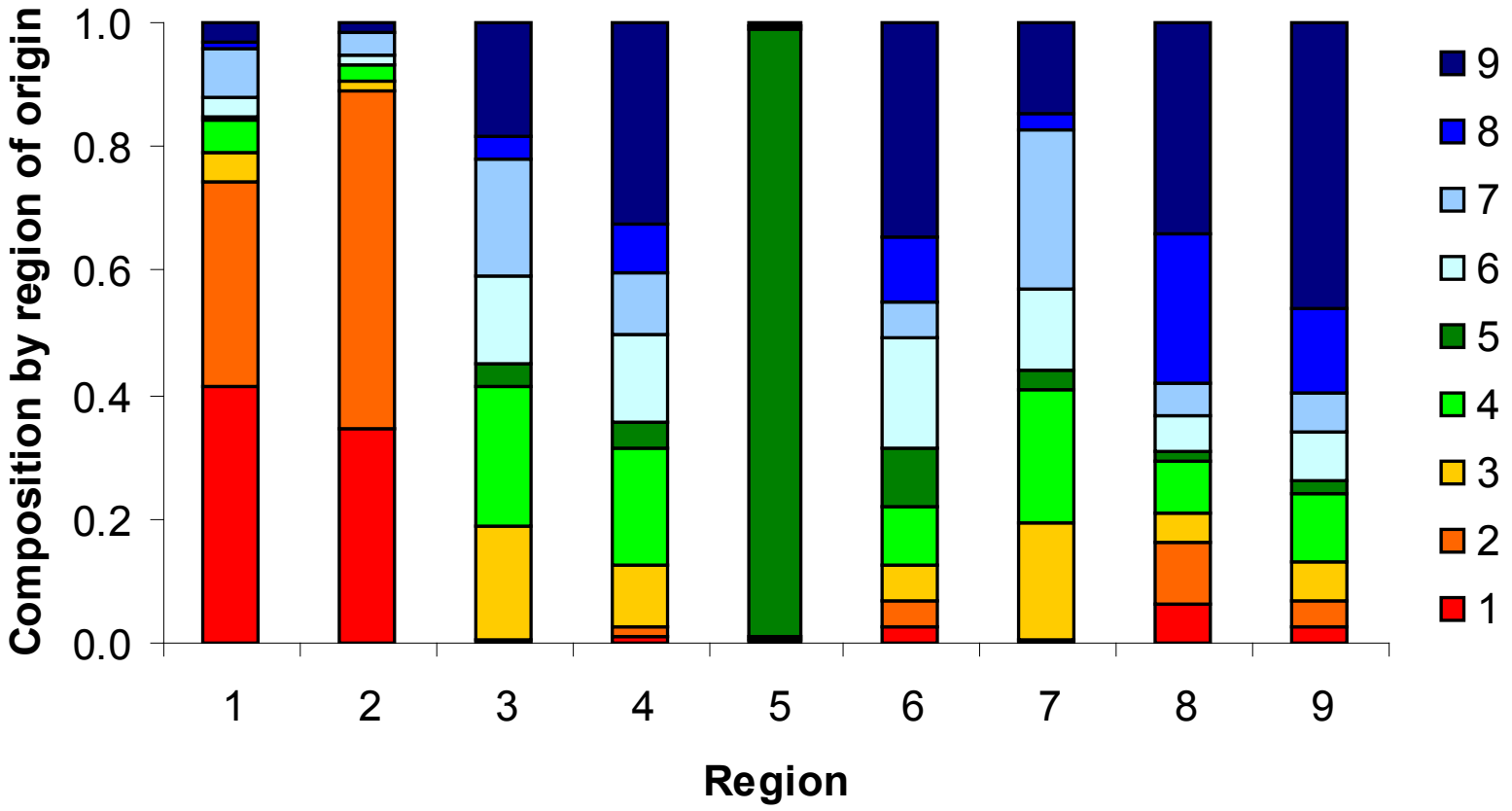
Likelihood component	With Spatial Structure	Without Spatial Structure
Total catches	787.64	934.86
Length frequency	-497,948.10	-495,336.30
Weight frequency	-728,036.41	-725,739.09
Tagging	3,237.05	
Penalties	7,911.64	8,998.31
Total	-1,214,048.18	-1,211,142.22


Spatial Model
Single-Region Model
Longline Region 1
Longline Region 2
Longline Region 3
Longline Region 7
1
0.5
0
-0.5
-1
1.5
-1.5
1950
1960
1970
1980
1990
2000

Movement


Region 1 recruits
Region 2 recruits
Region 3 recruits
Region 4 recruits
Region 5 recruits
Region 6 recruits
Region 7 recruits
Region 8 recruits
Region 9 recruits
Population number
Age class (quarter)
9
8
7
6
5
4
3
2
1

Stock Composition



Summary

- On a Pacific-wide basis, over-fishing is occurring, stock approaching over-fished state
- Very consistent results from EPO regions of PO model and EPO assessment – some discrepancies in absolute estimates due to differences is estimated growth patterns
- Stock mixing across the Pacific is restricted – a single, instantaneously mixed stock assumption results in a poor fit to the data
  - But growth assumptions may impact this interpretation