STOCK STATUS OF PACIFIC BLUEFIN TUNA AND THE URGENT NEED FOR MANAGEMENT ACTION

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Objective

- Explore the data to determine why the stock assessment model can not fit the data

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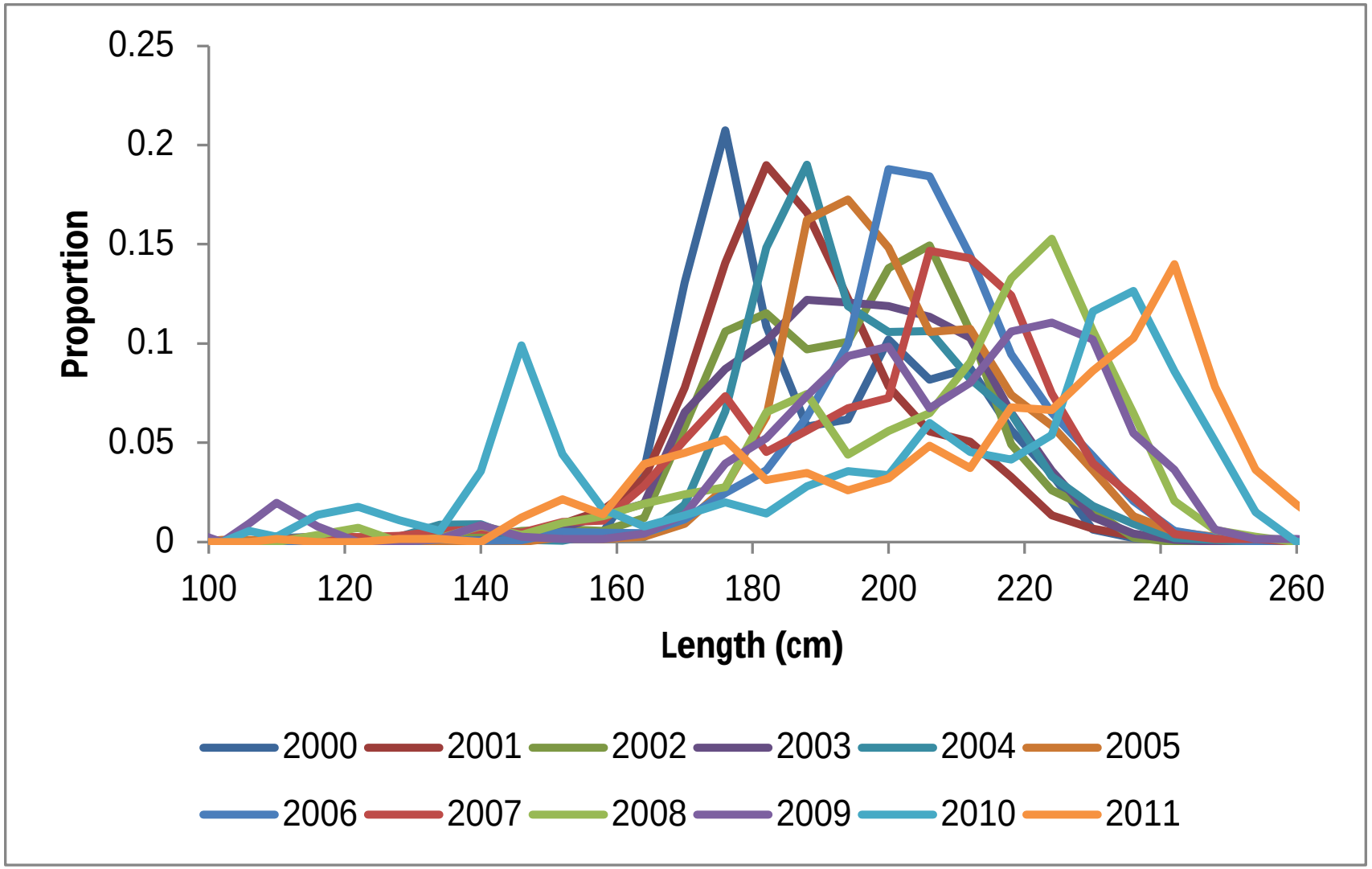
- Explore the data to determine why the stock assessment model can not fit the data
- Validate the general conclusions of the stock assessment

Outline

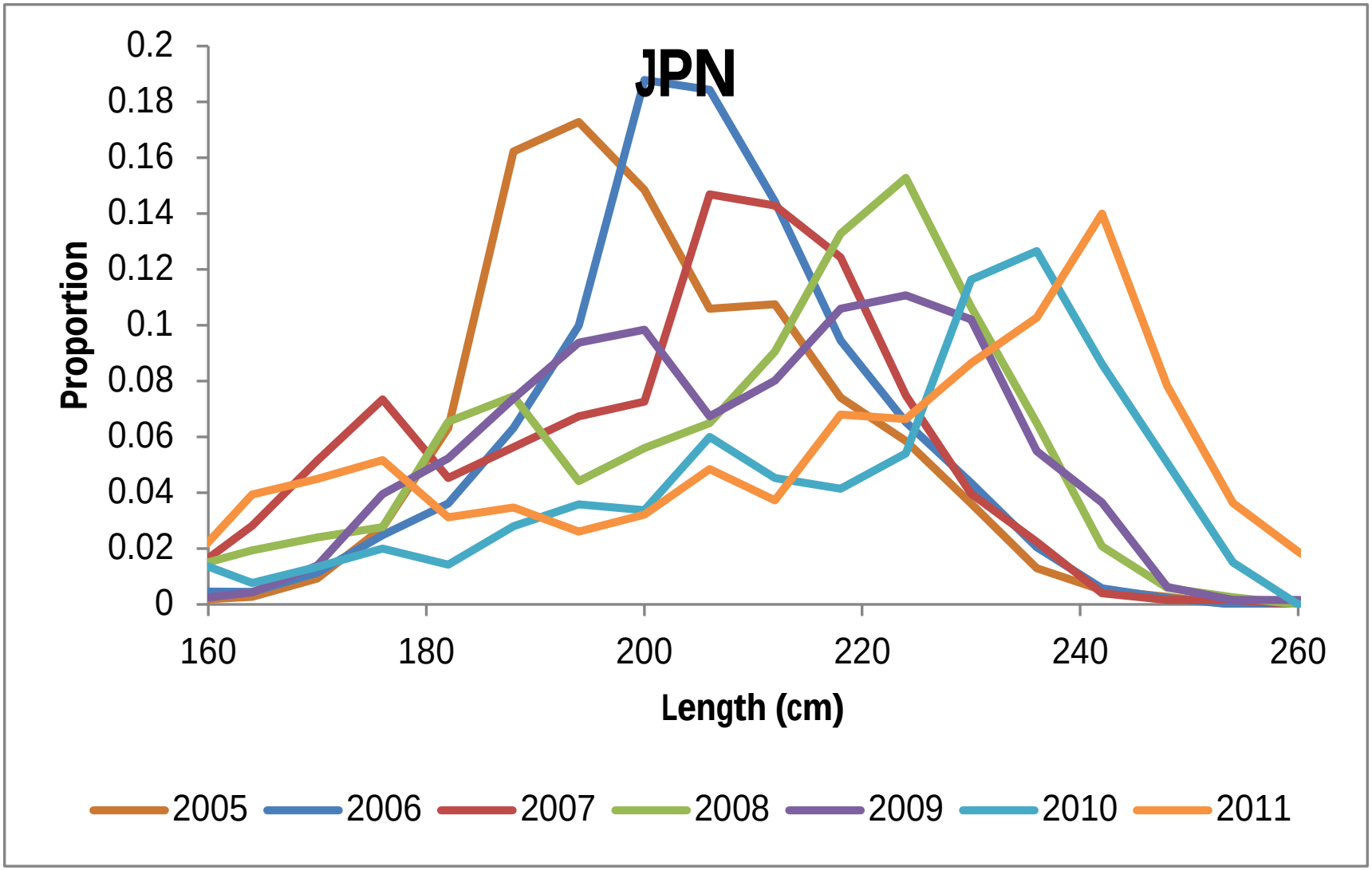
- Modes in the length composition data
- The one cohort hypothesis
- Estimating absolute abundance
- Urgent need for management

Modes in the length composition data

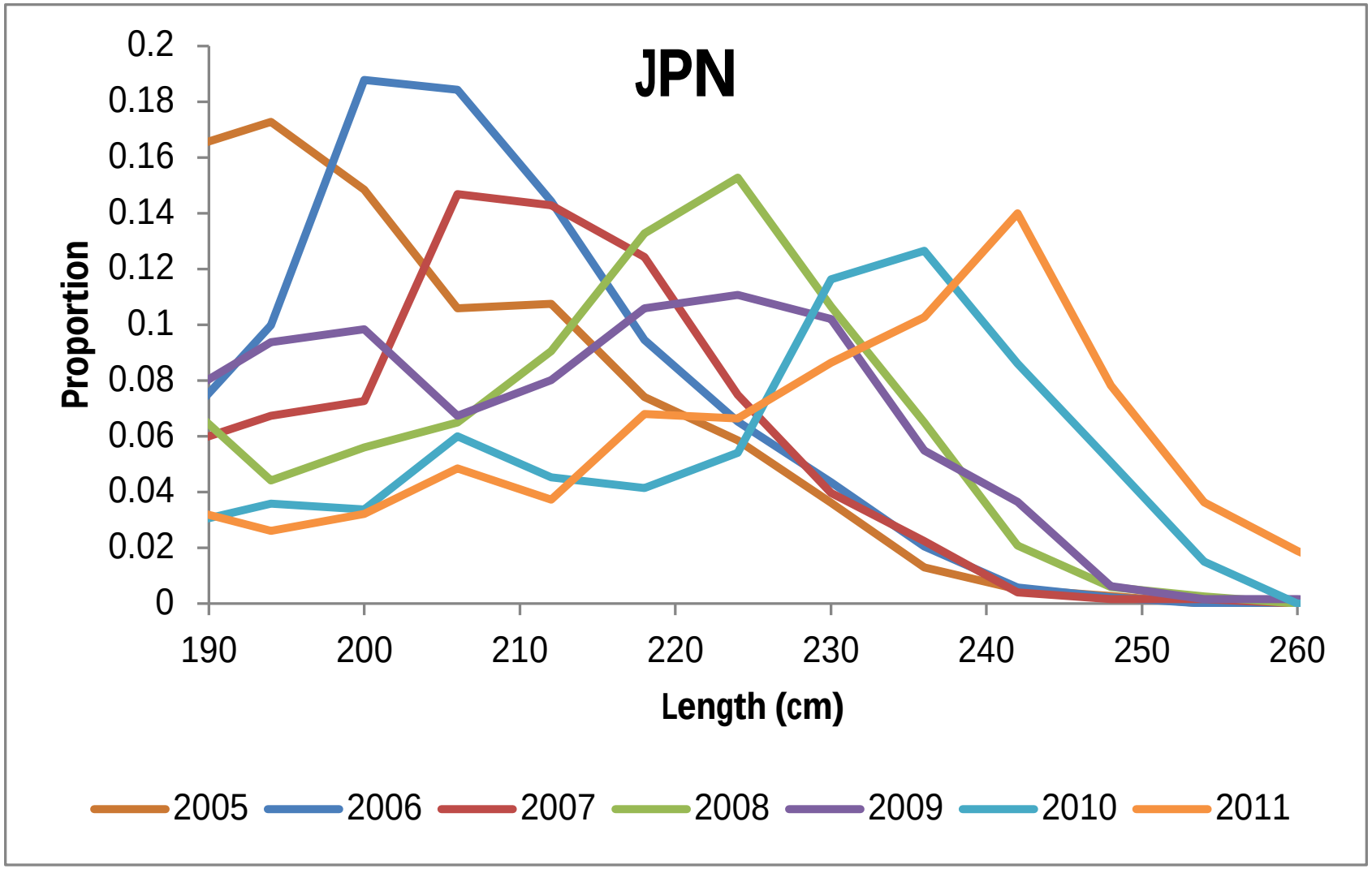
Japanese longline length composition data



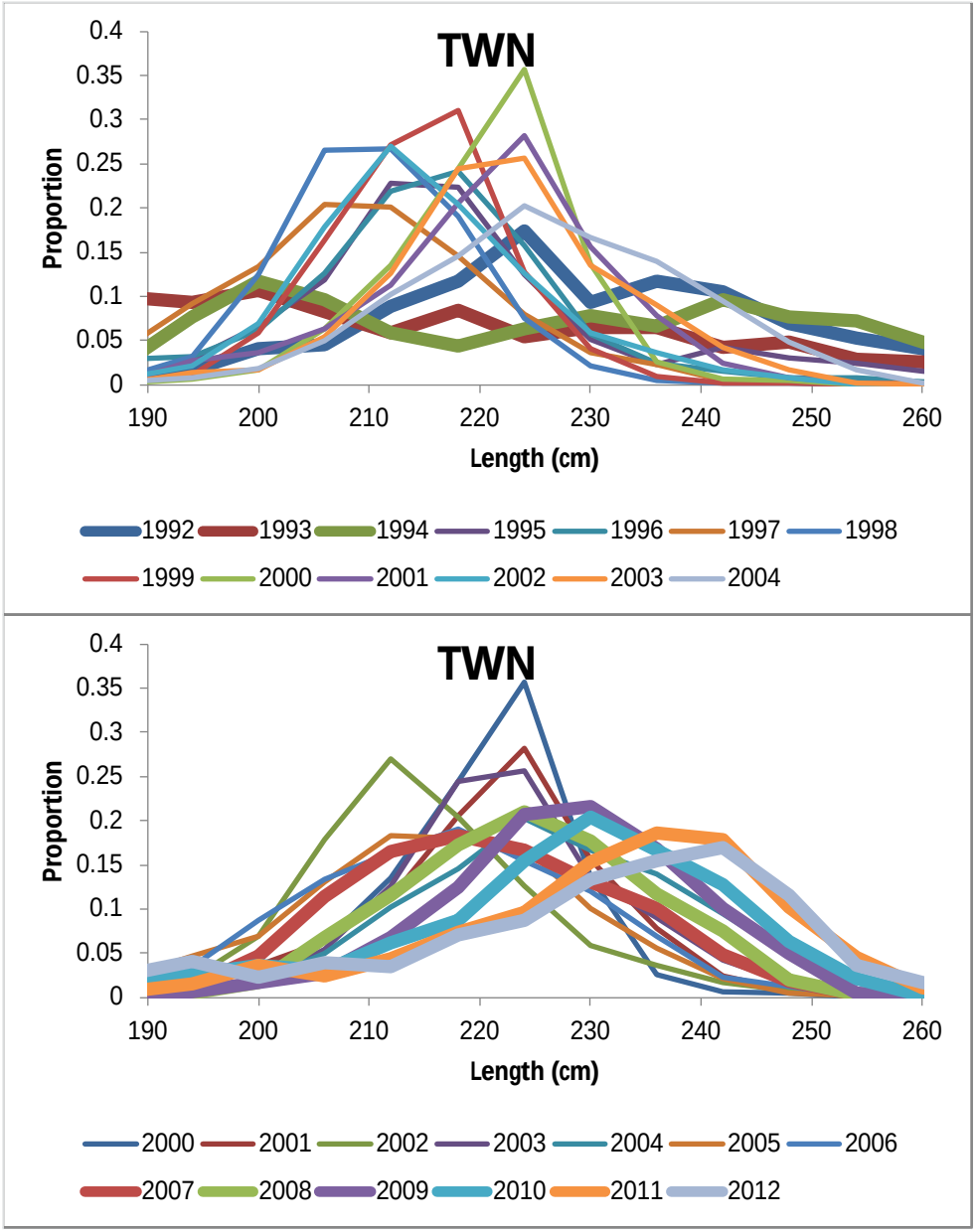
Japanese longline length composition data



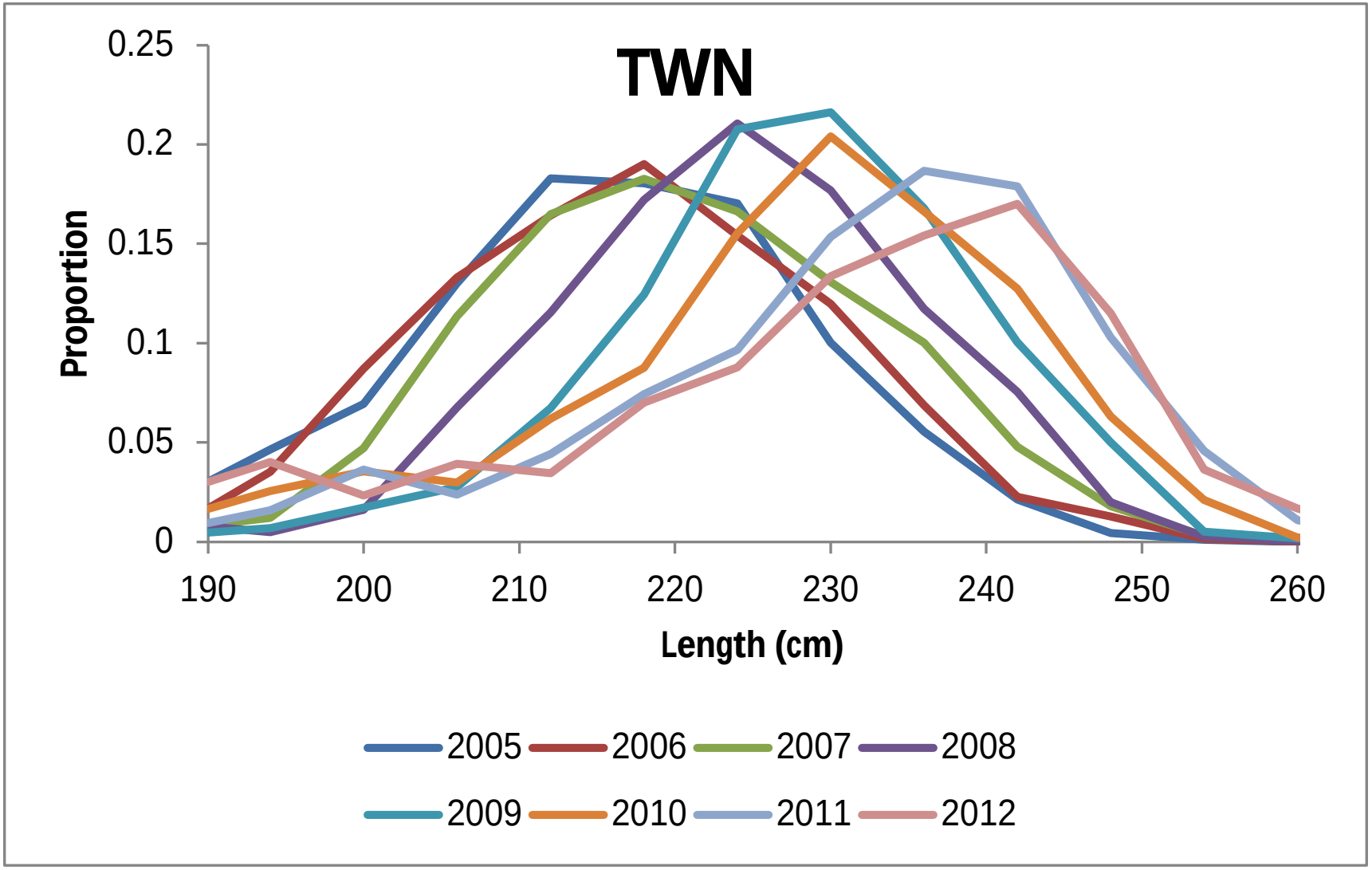
Japanese longline length composition data

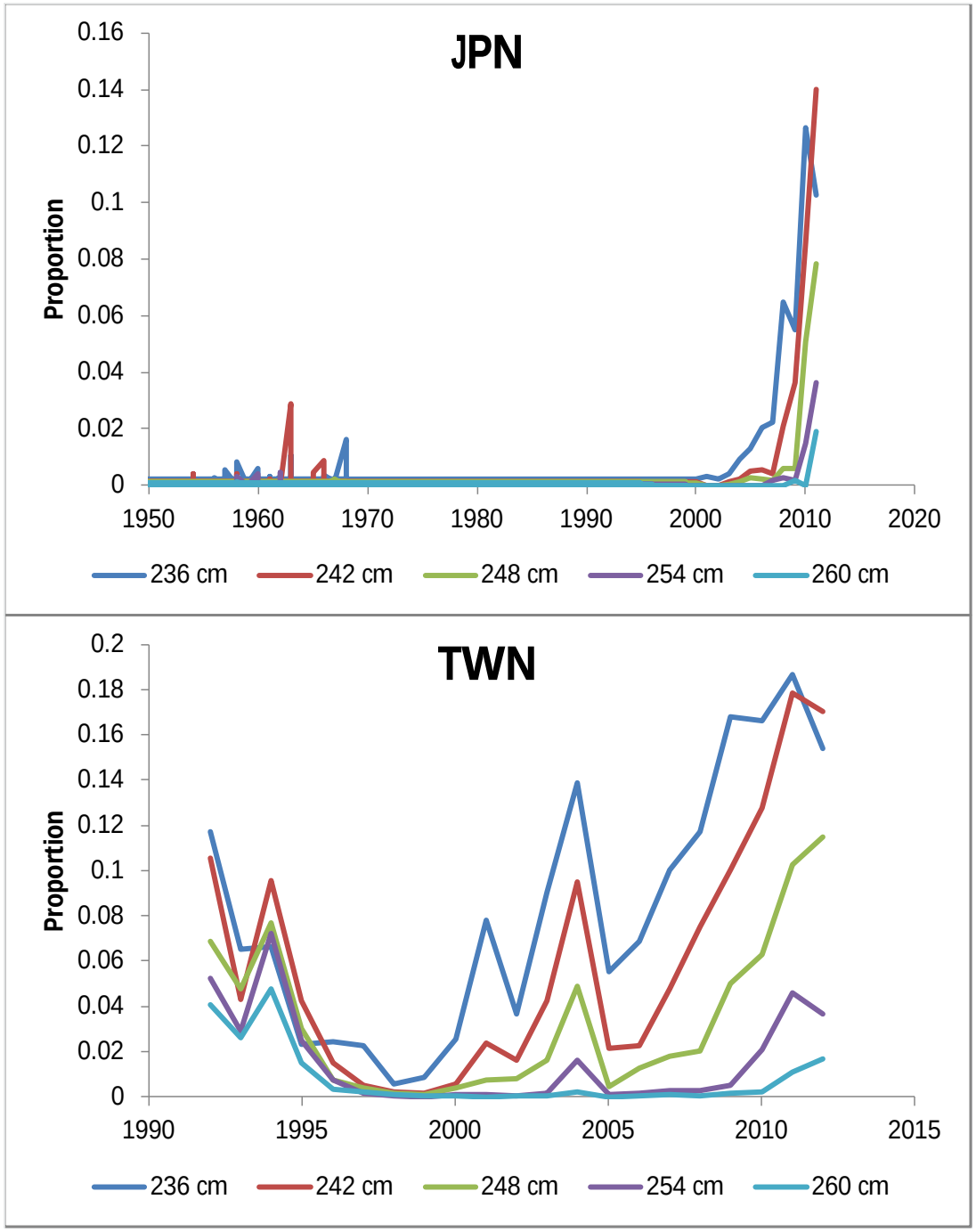


Taiwanese longline length composition data

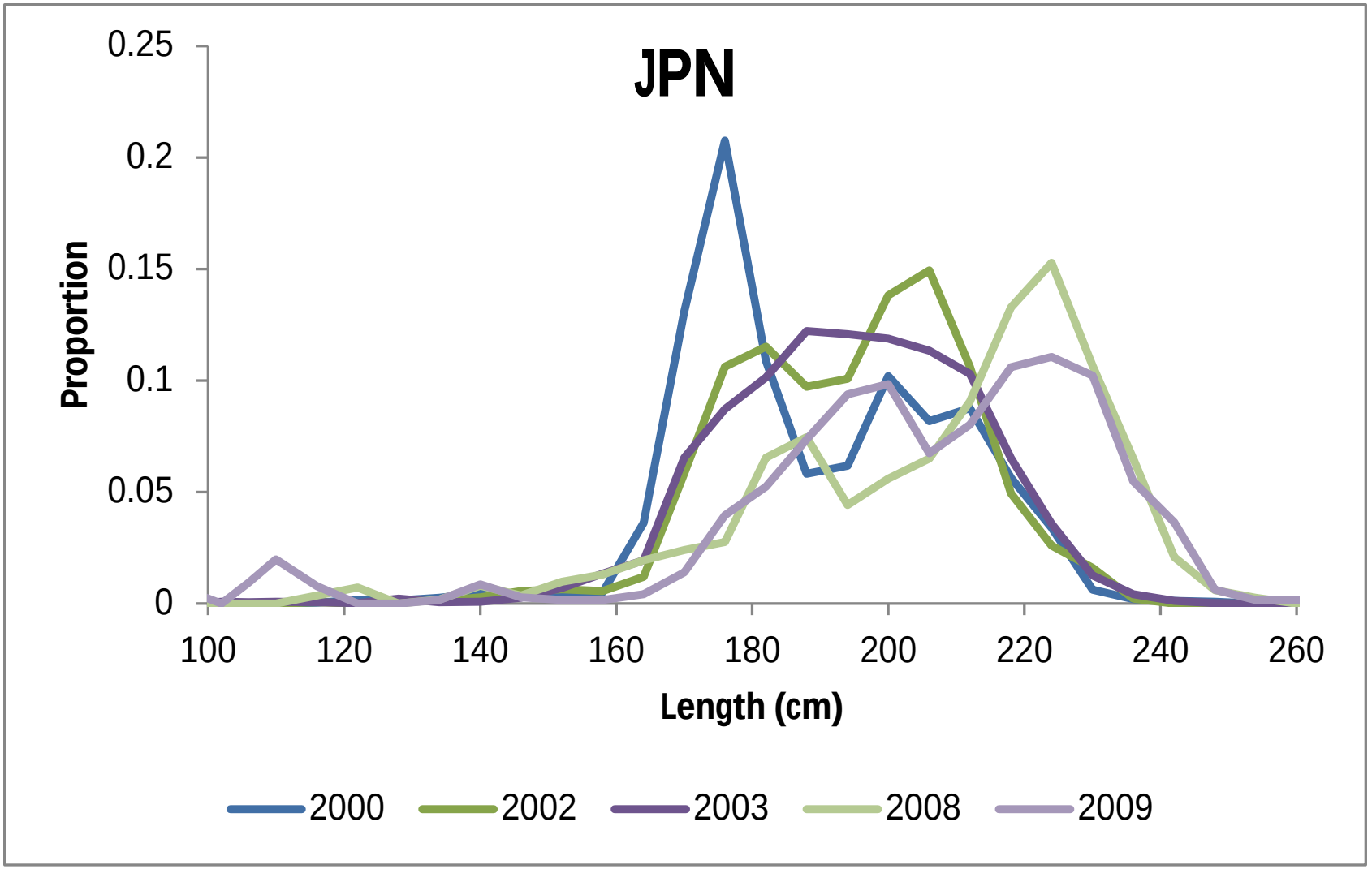


Taiwanese longline length composition data

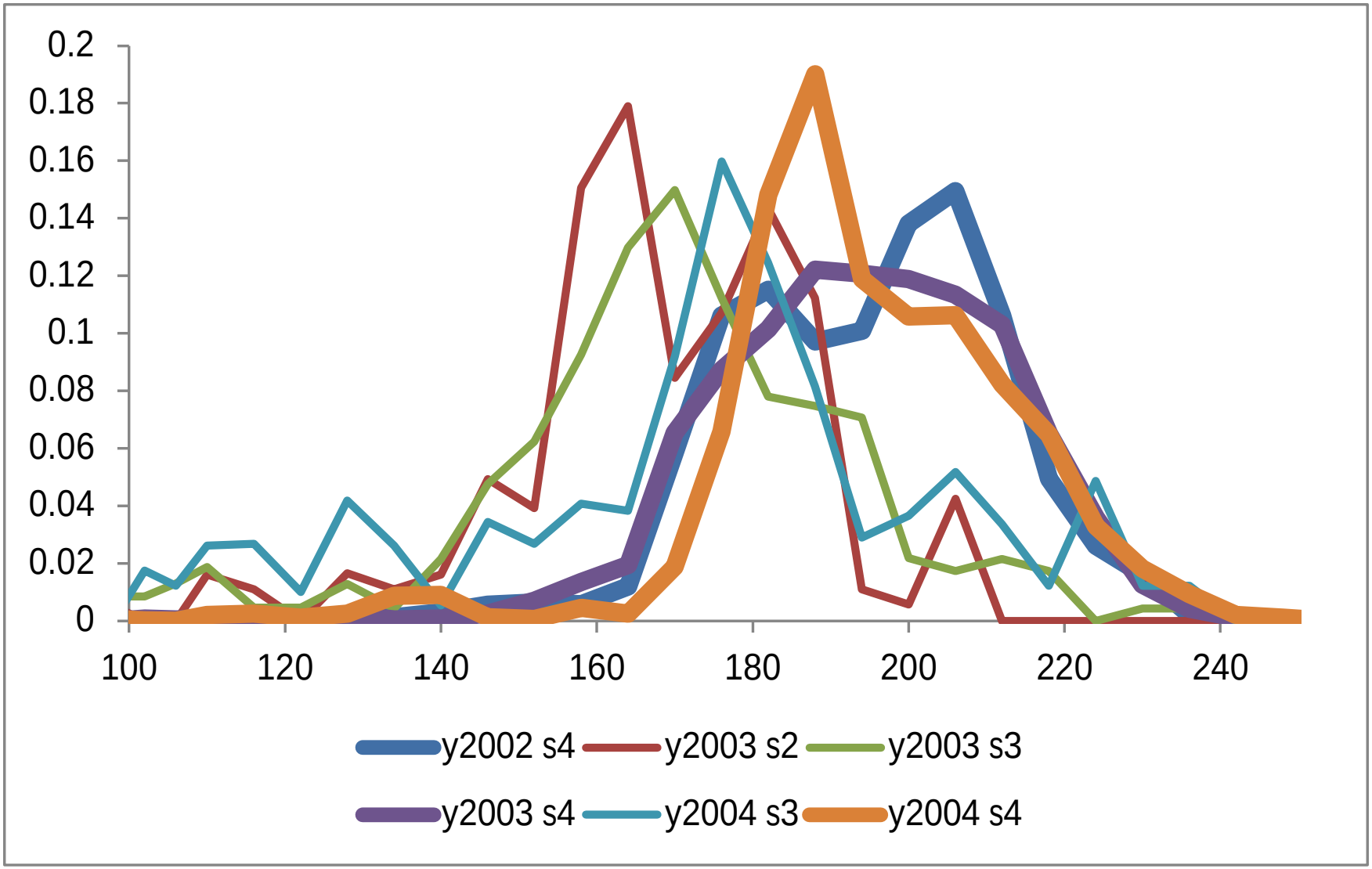



JPN
Proportion
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1950
1960
1970
1980
1990
2000
2010
2020
236 cm
242 cm
248 cm
254 cm
260 cm
TWN
Proportion
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
236 cm
242 cm
248 cm
254 cm
260 cm

Inconsistent Japanese length composition data

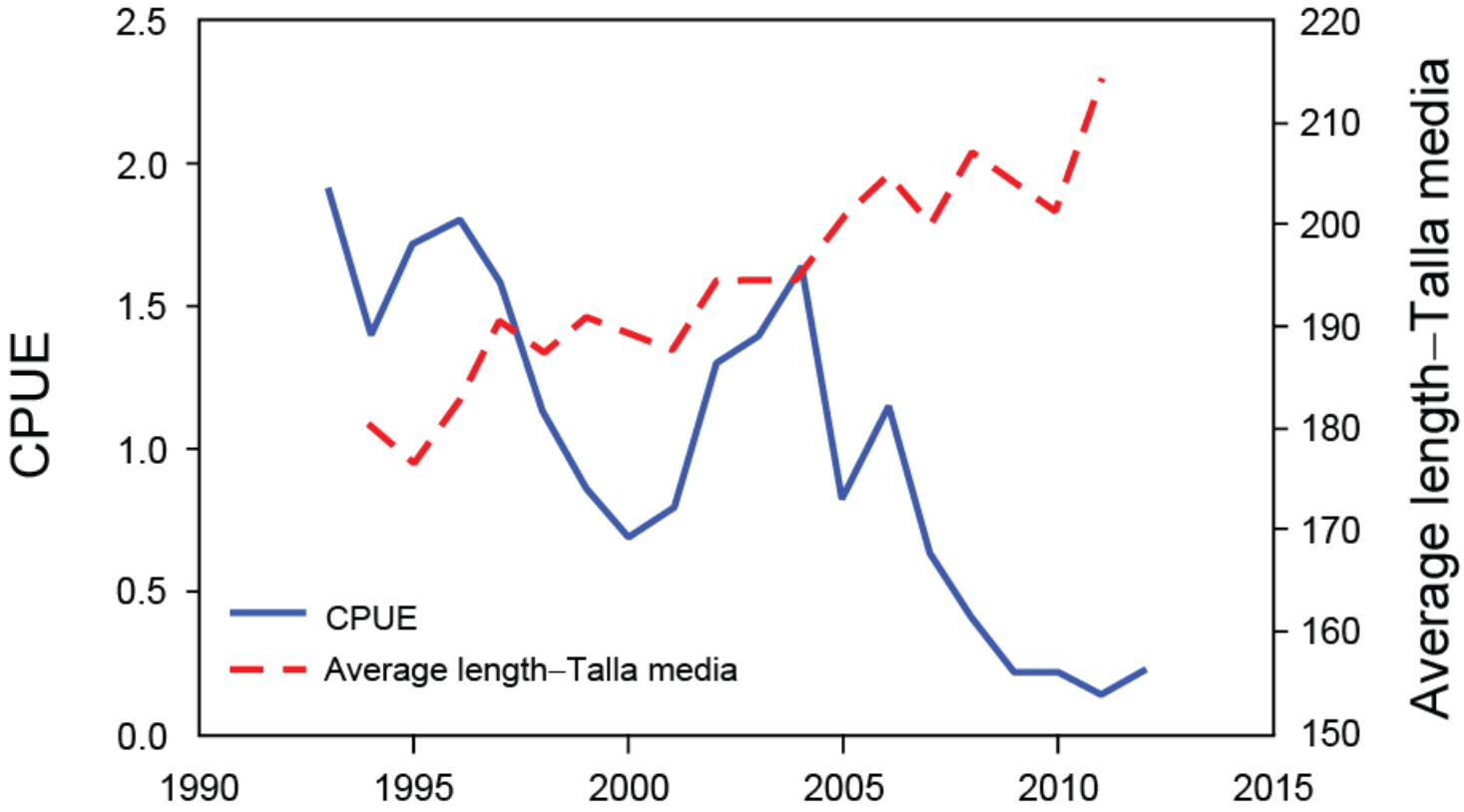


Seasons

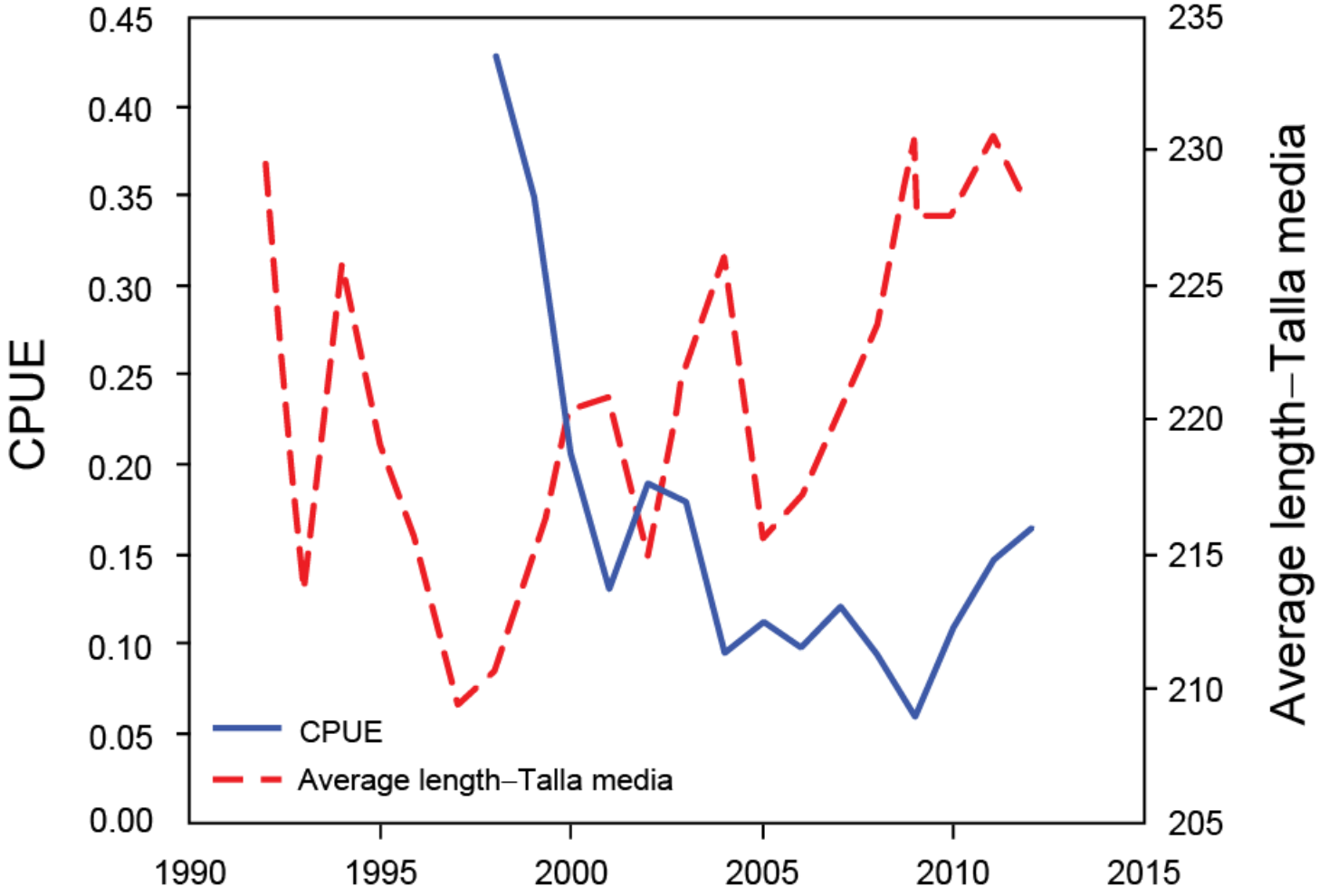

0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
100
120
140
160
180
200
220
240
y2002 s4
y2003 s2
y2003 s3
y2003 s4
y2004 s3
y2004 s4

The one cohort hypothesis

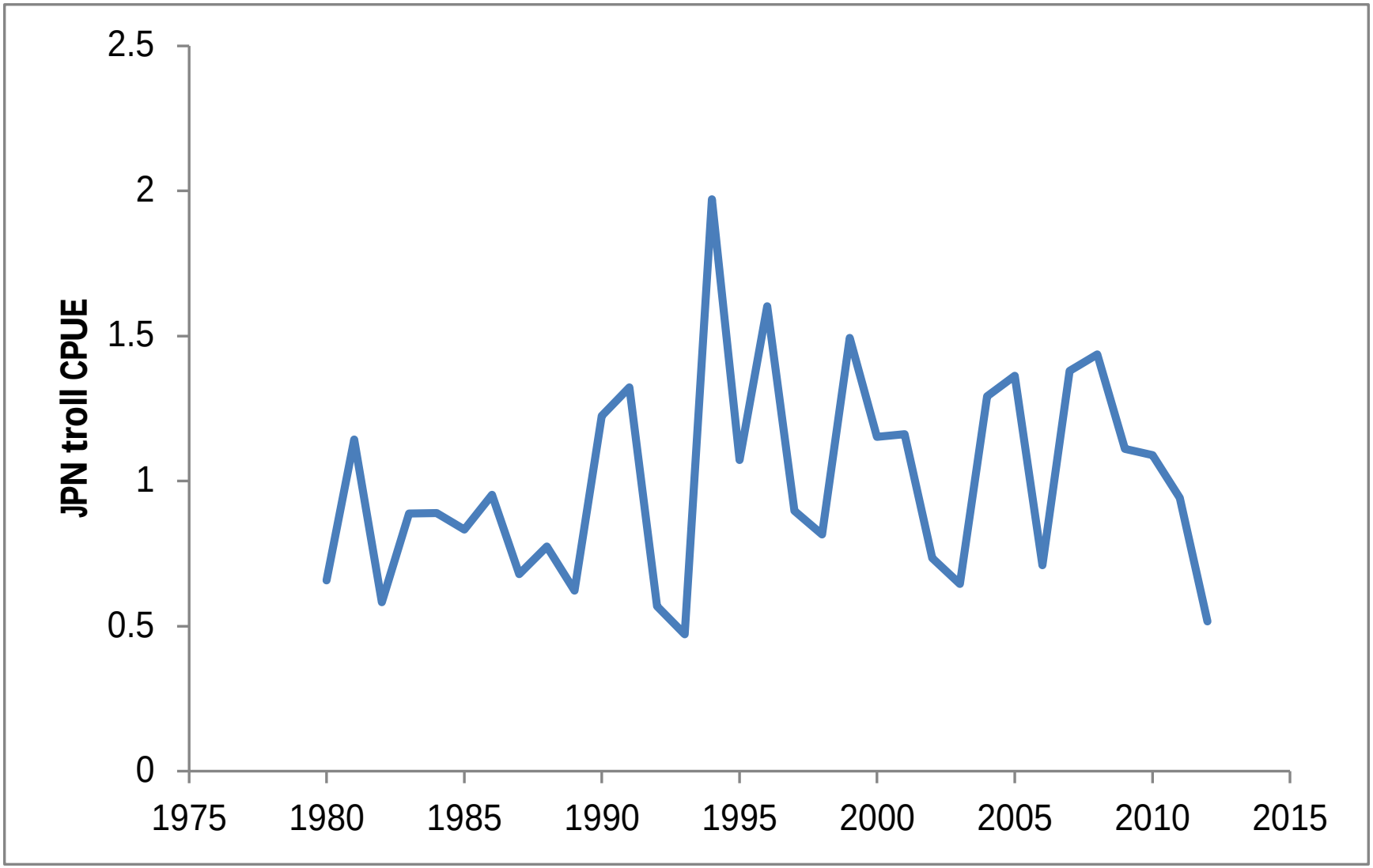
Japan length and CPUE consistent



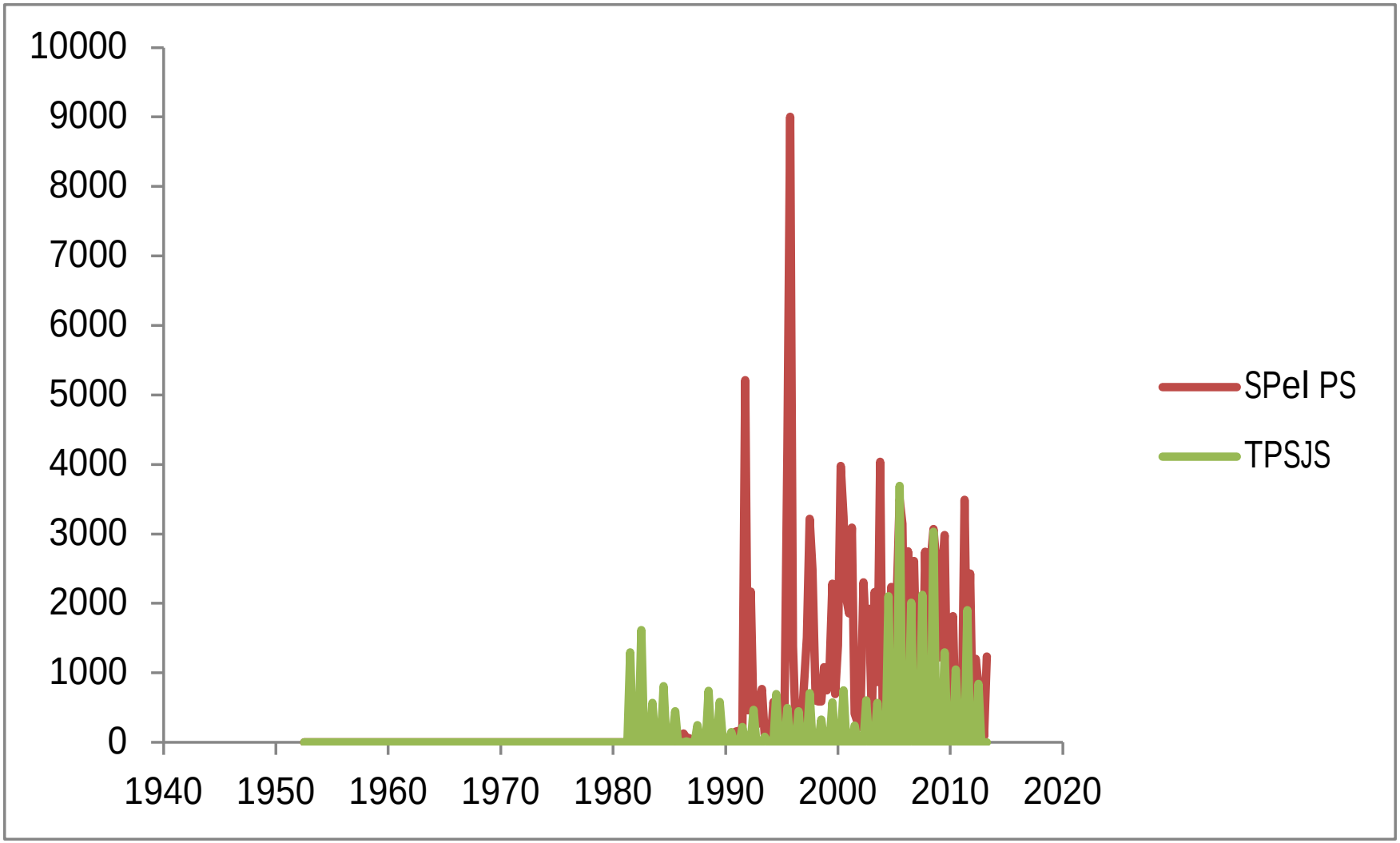
Taiwan length and CPUE consistent?



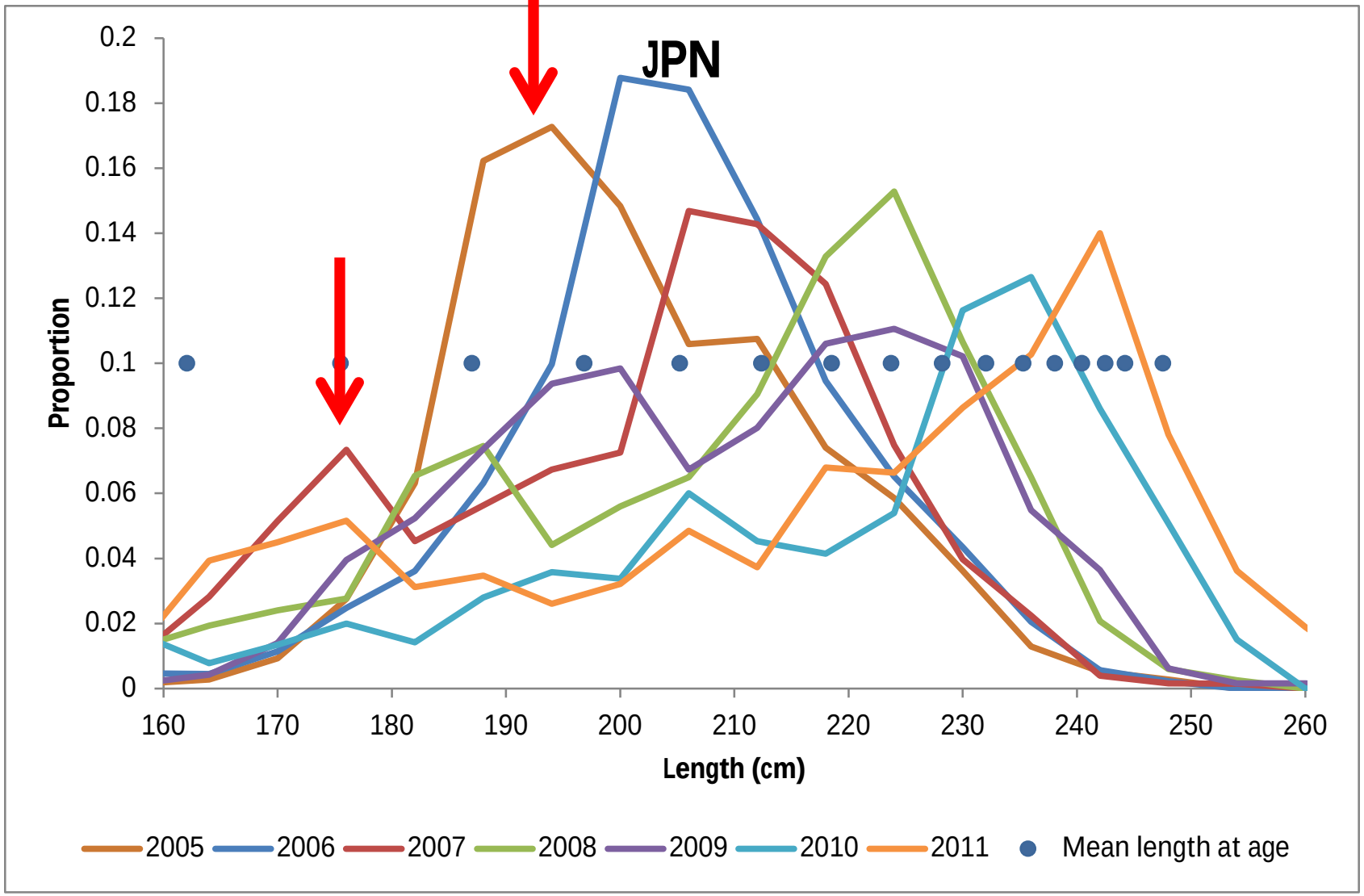
Recruitment



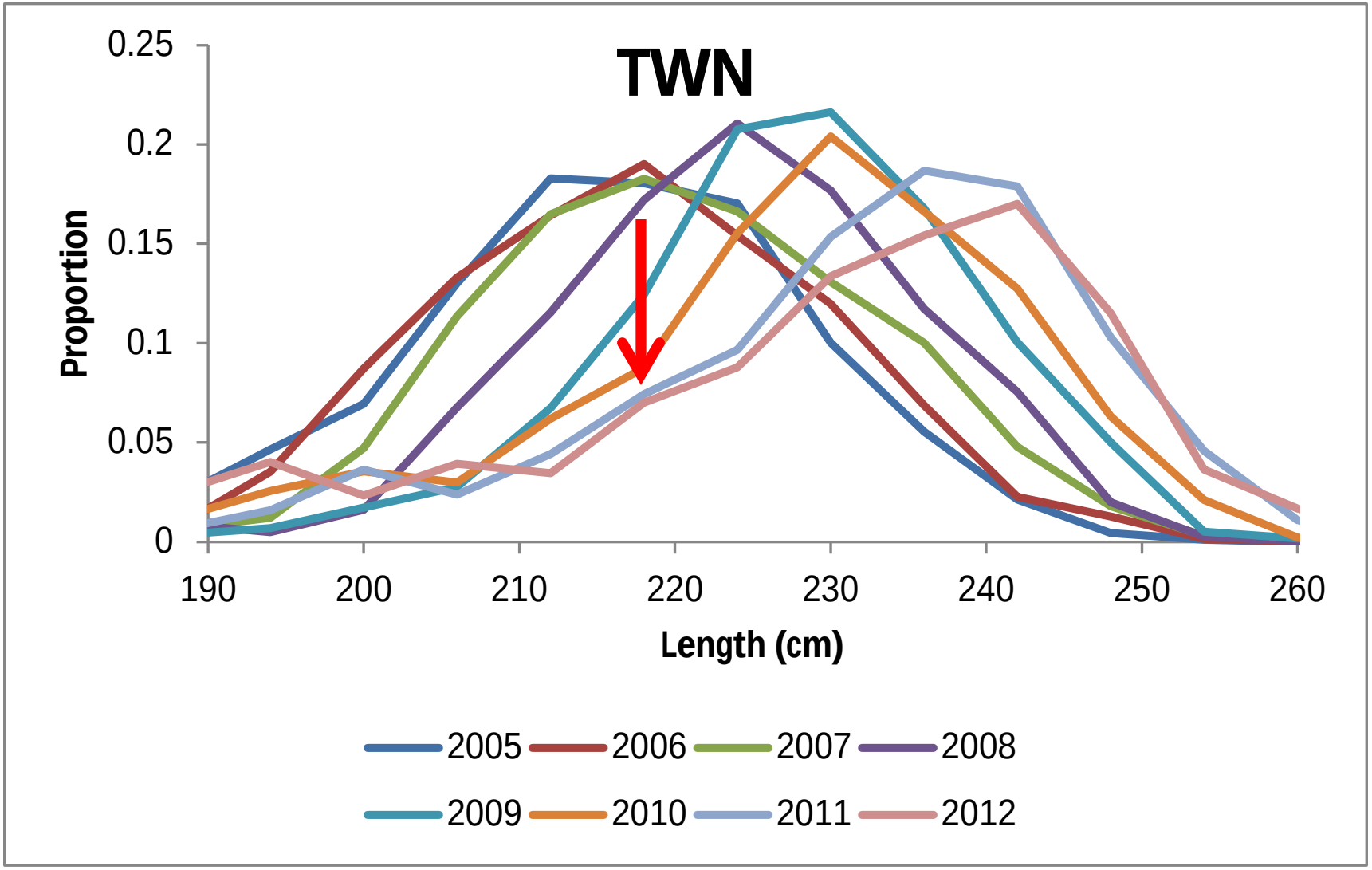
Catch


10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1940
1950
1960
1970
1980
1990
2000
2010
2020
SPeI PS
TPSJS

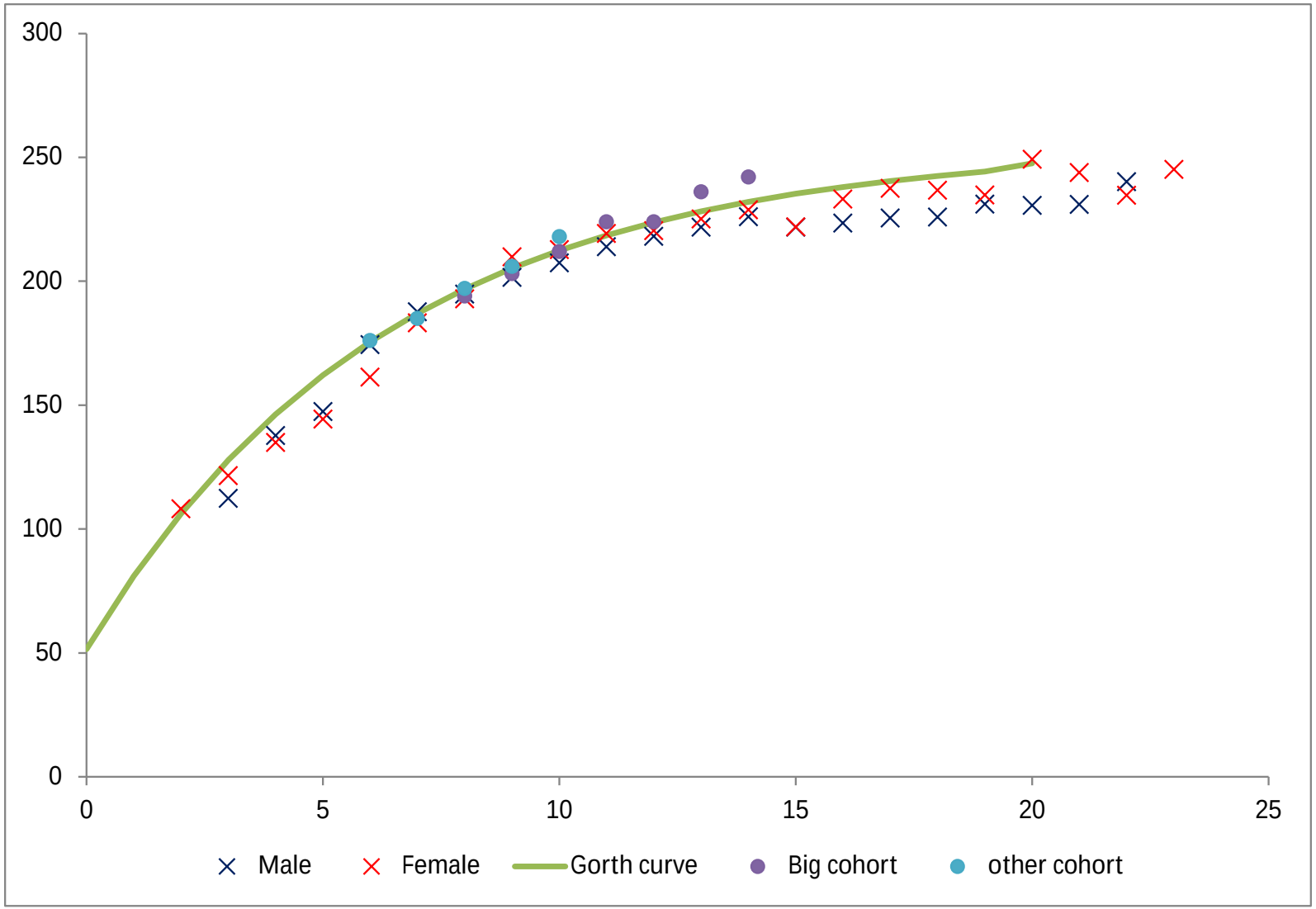
Growth


JPN
Proportion
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
160
170
180
190
200
210
220
230
240
250
260
Length (cm)
2005
2006
2007
2008
2009
2010
2011
Mean length at age

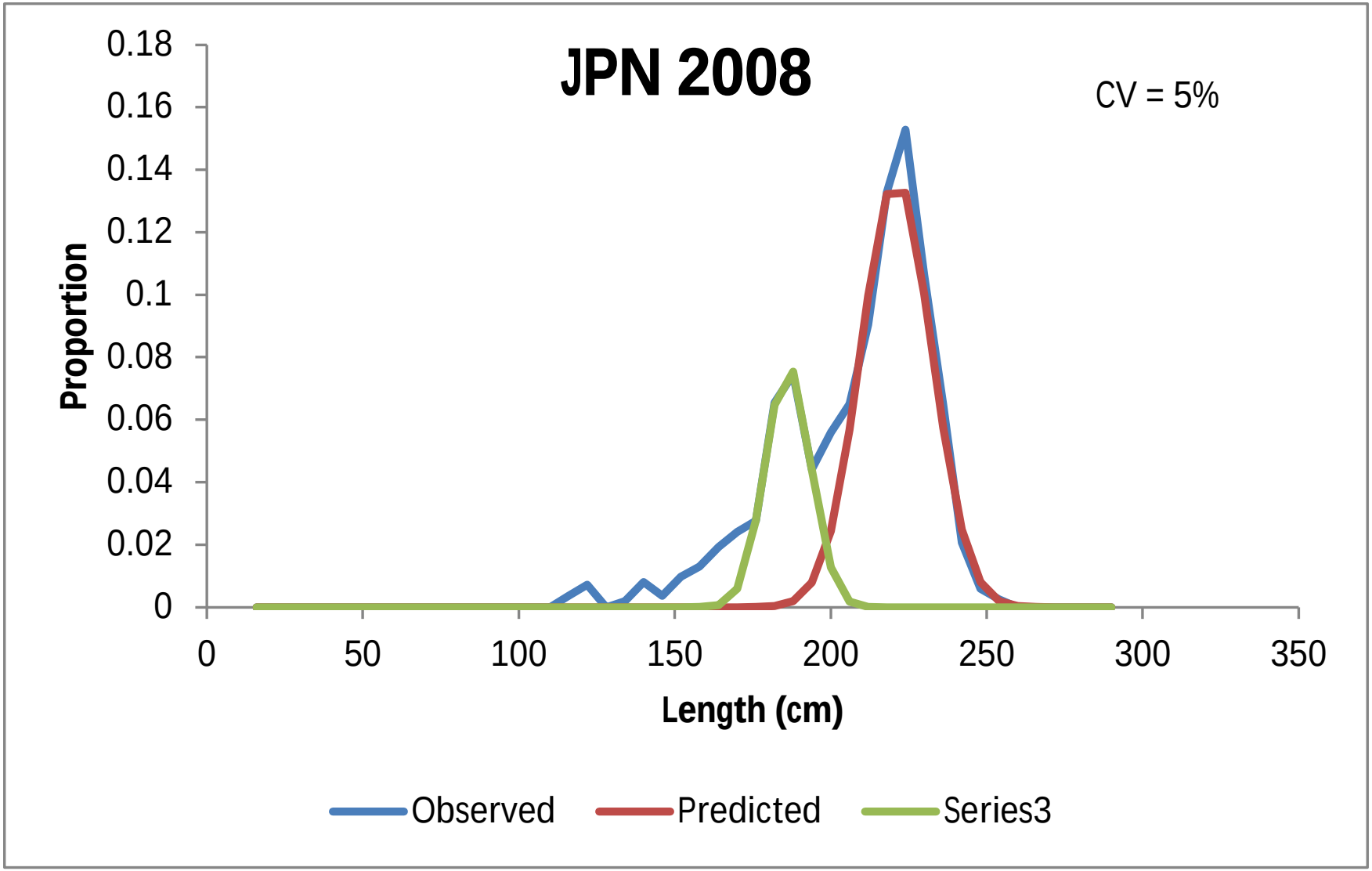
Growth

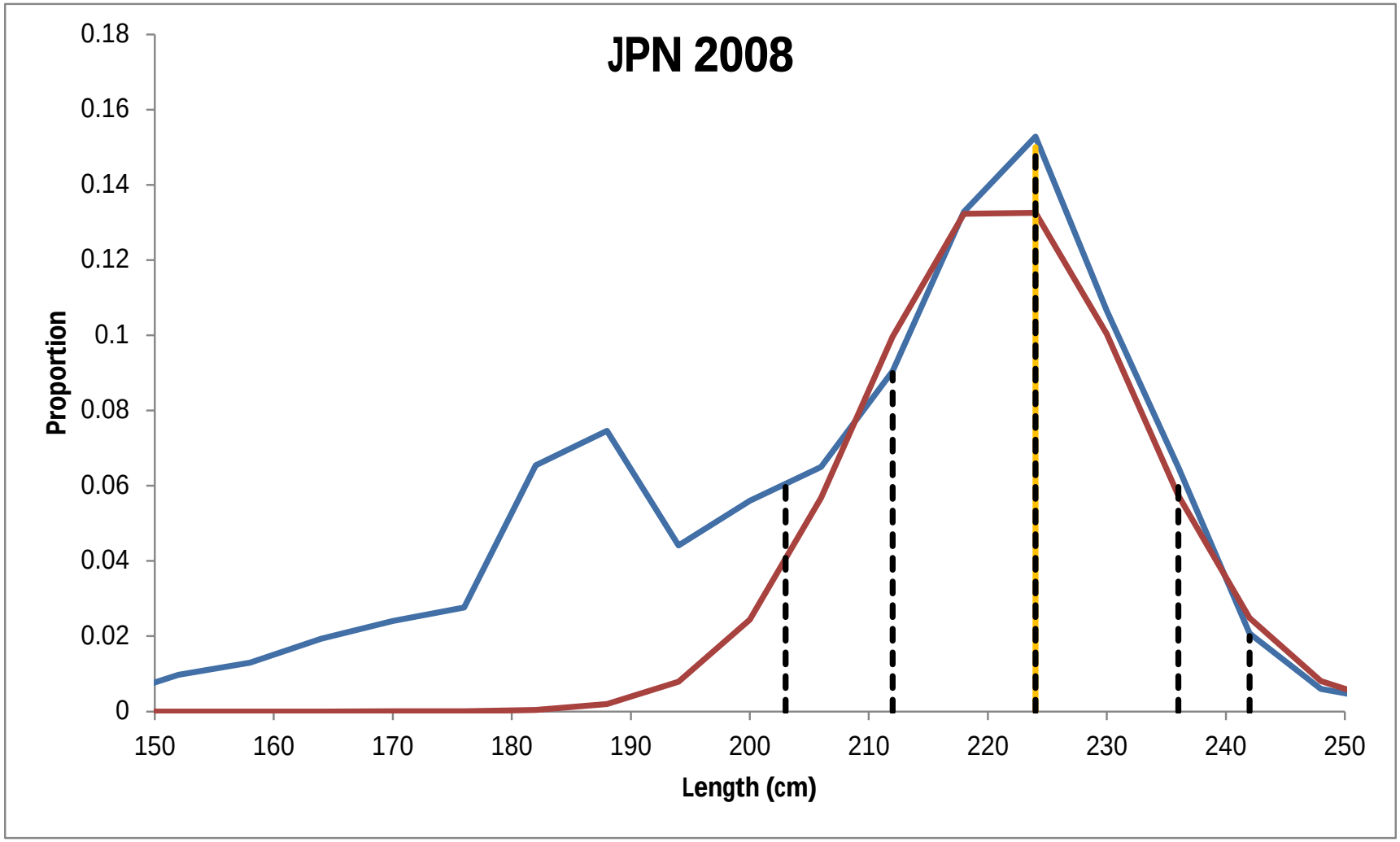

TWN
0.25
0.2
0.15
0.1
0.05
0
Proportion
190
200
210
220
230
240
250
260
Length (cm)
2005
2006
2007
2008
2009
2010
2011
2012

Growth


300
250
200
150
100
50
0
0
5
10
15
20
25
Male
Female
Gorth curve
Big cohort
other cohort

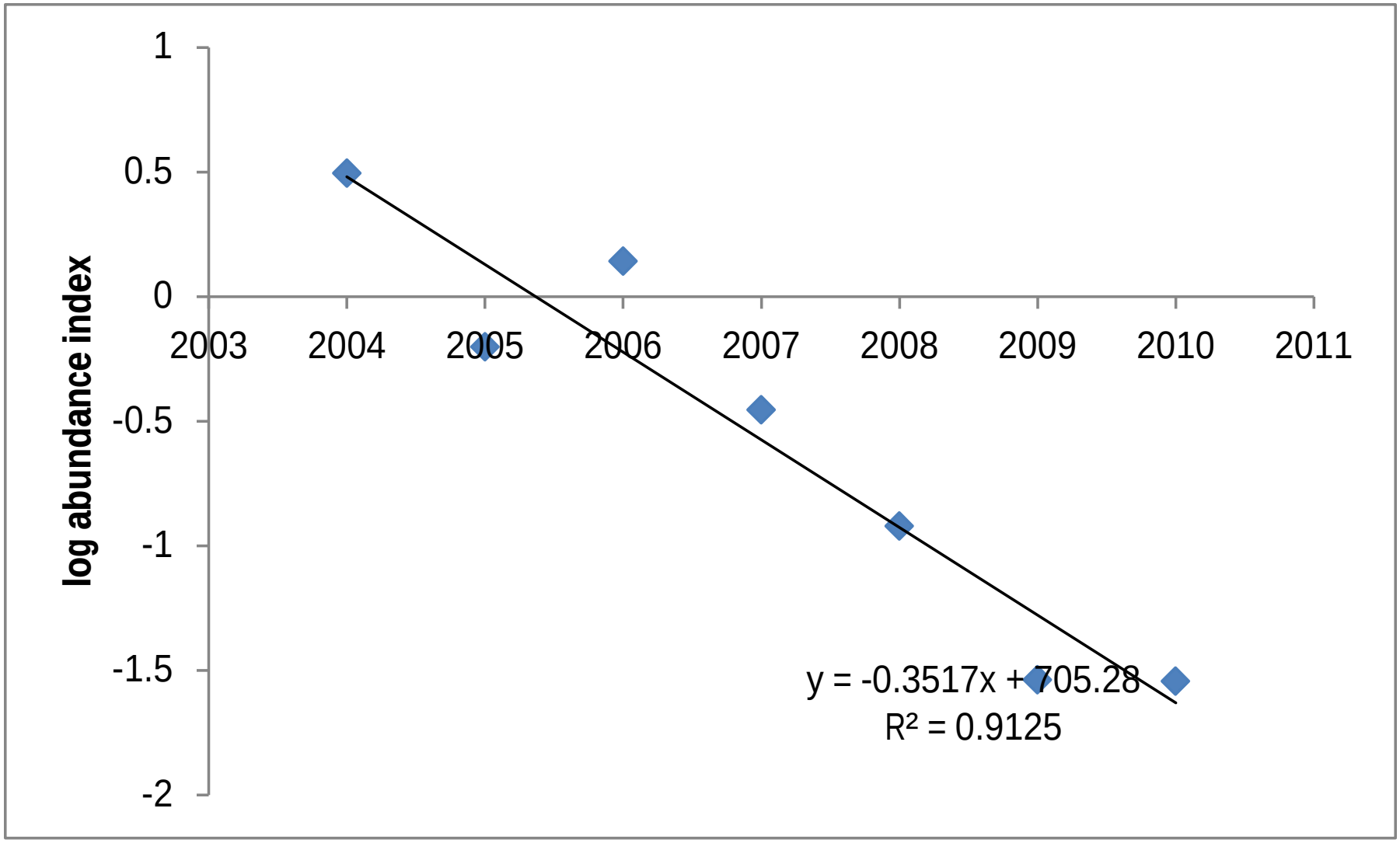
Variation of length at age




JPN 2008
Proportion
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
150
160
170
180
190
200
210
220
230
240
250
Length (cm)

Estimating absolute abundance

Mortality estimate from longline CPUE



Spawning biomass estimate from Z and longline catch

$$F = Z - M$$
$$(M = 0.25)$$

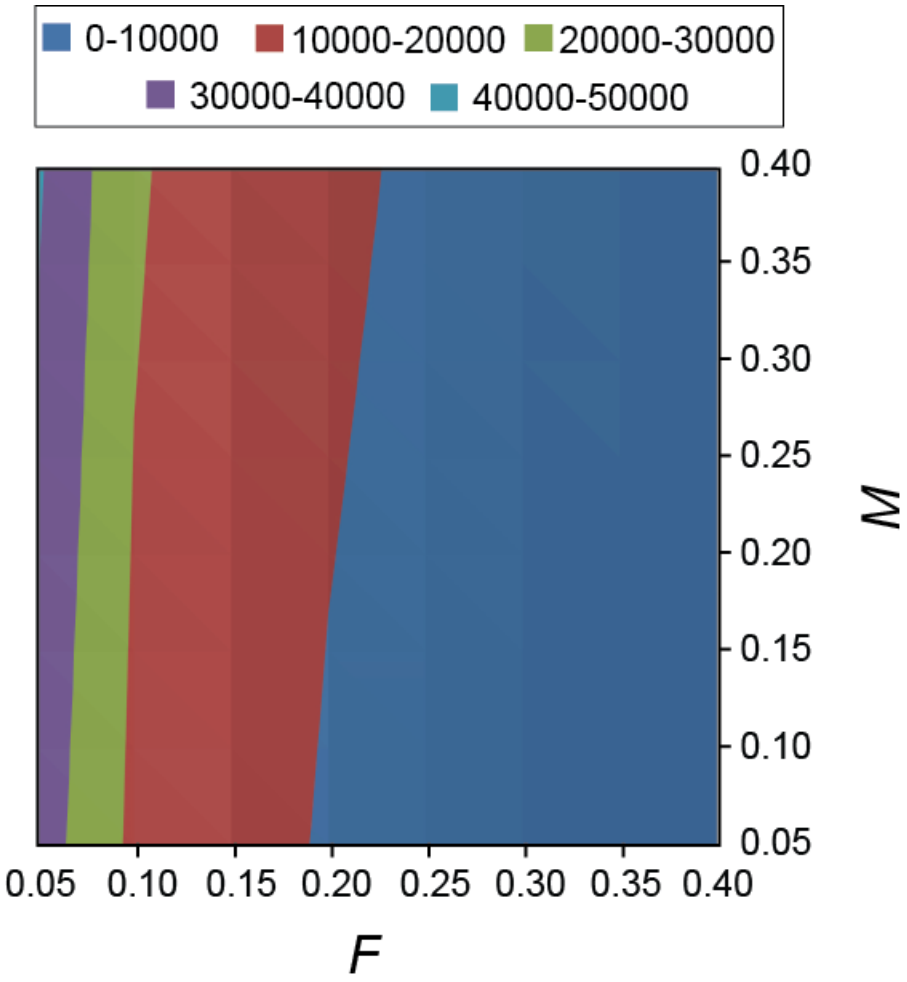
$$C = \frac{F}{Z} N(1 - \exp(-Z))$$

$$N = \frac{Z}{F(1 - \exp(-Z))} C$$

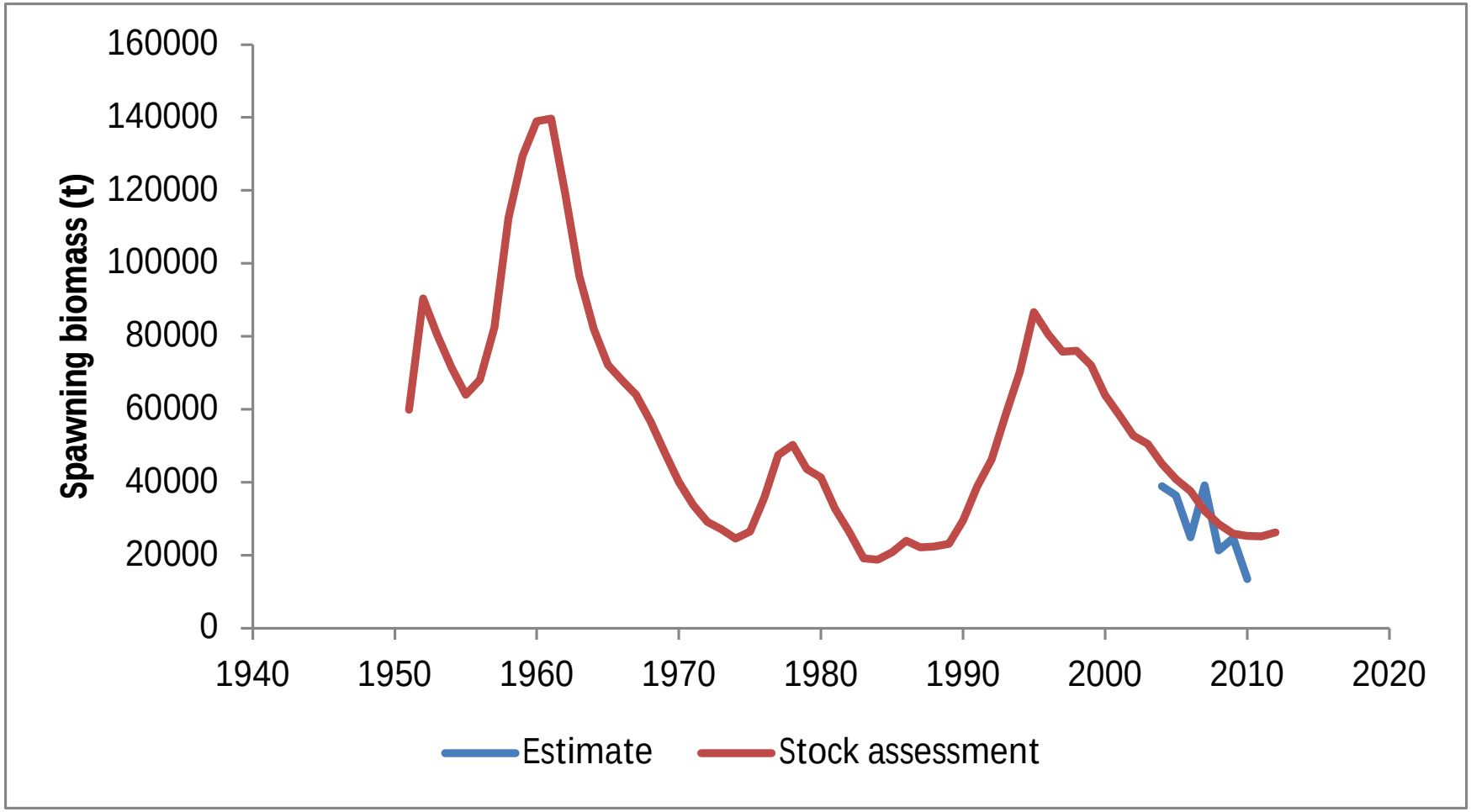
Spawning biomass estimates

Year	Catch (t)	Spawning biomass
2004	3281	38882
2005	3072	36414
2006	2099	24875
2007	3302	39136
2008	1794	21260
2009	2082	24674
2010	1139	13493

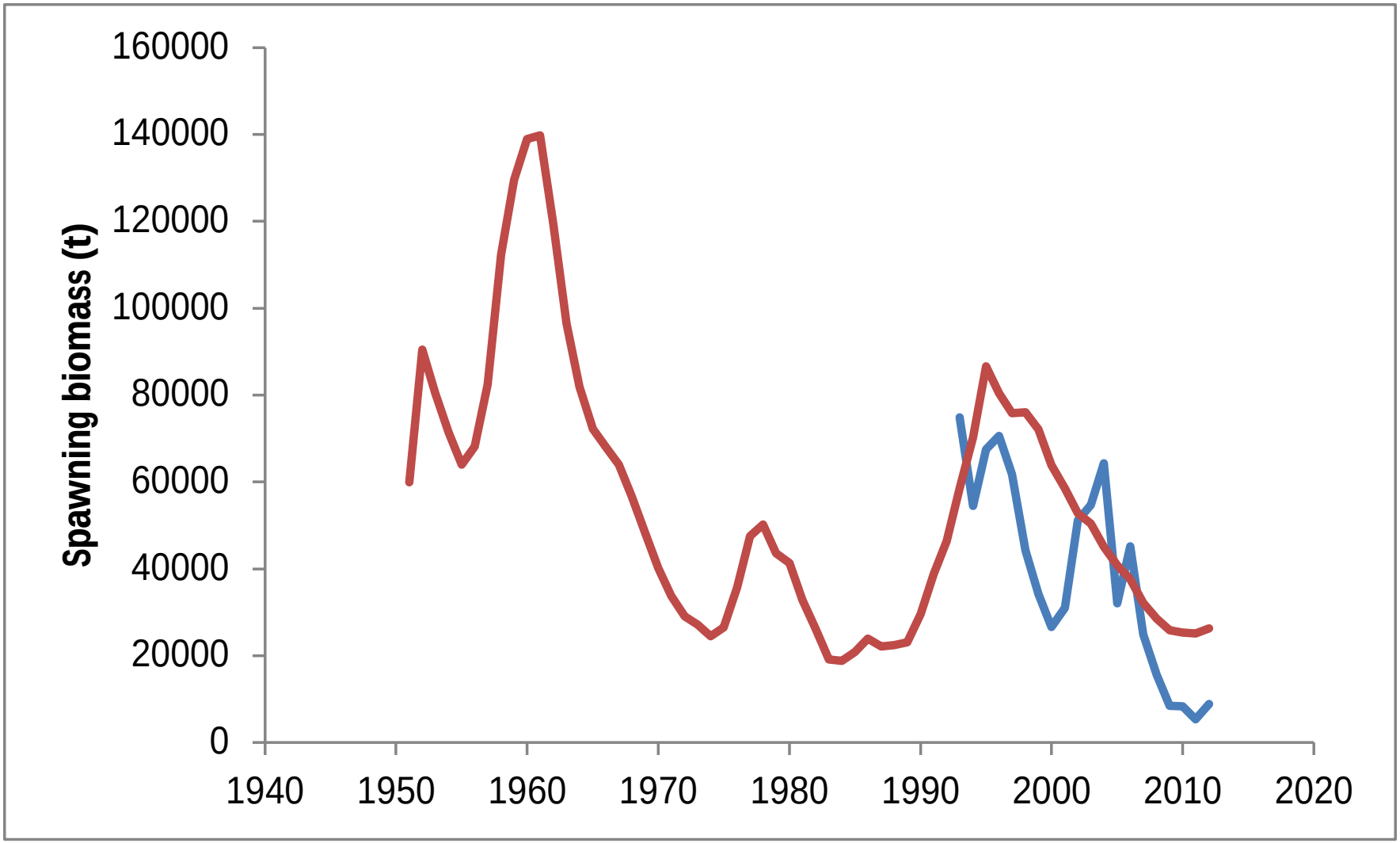
Sensitivity to F and M



Spawning biomass

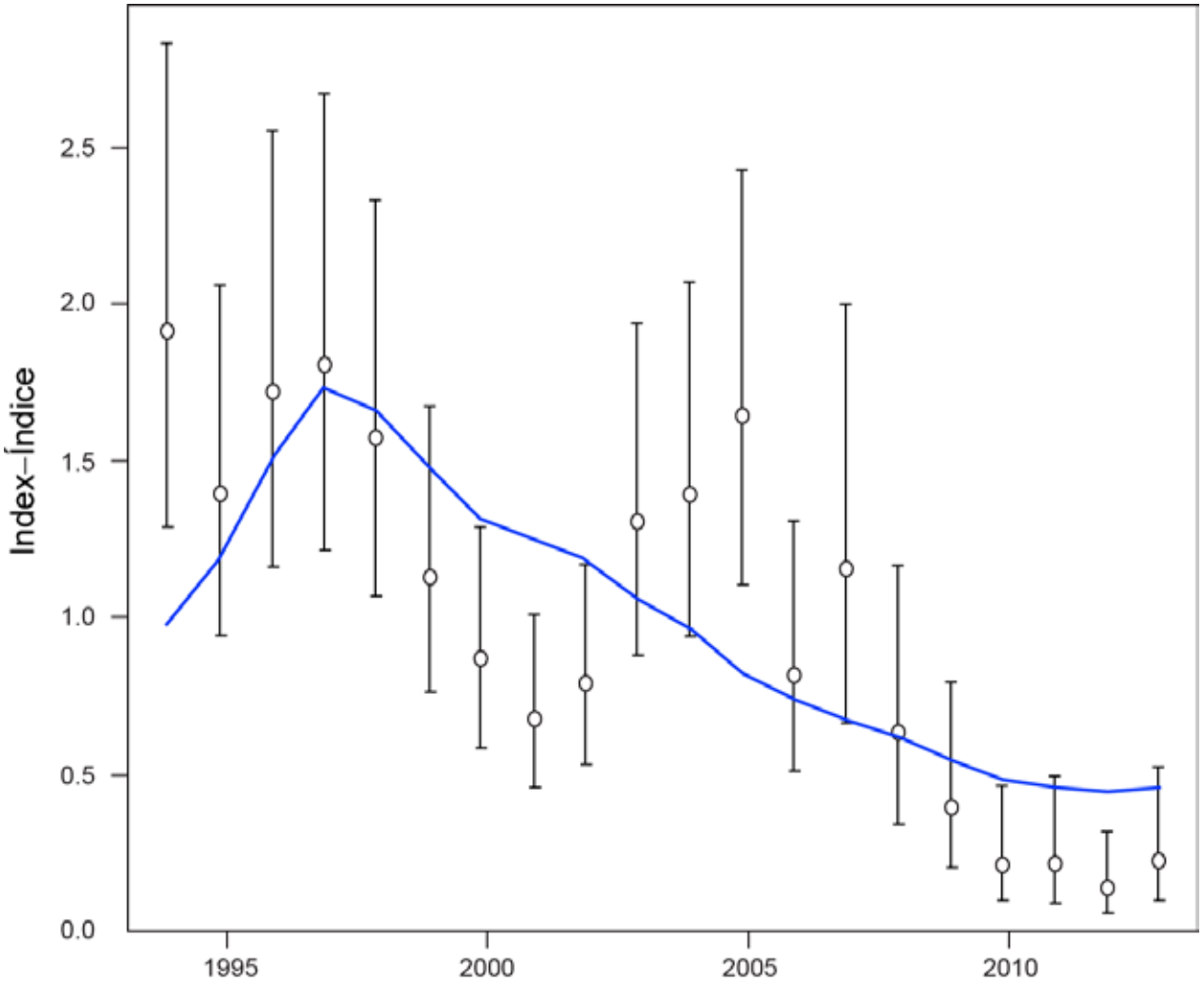


Scaled JPN longline index

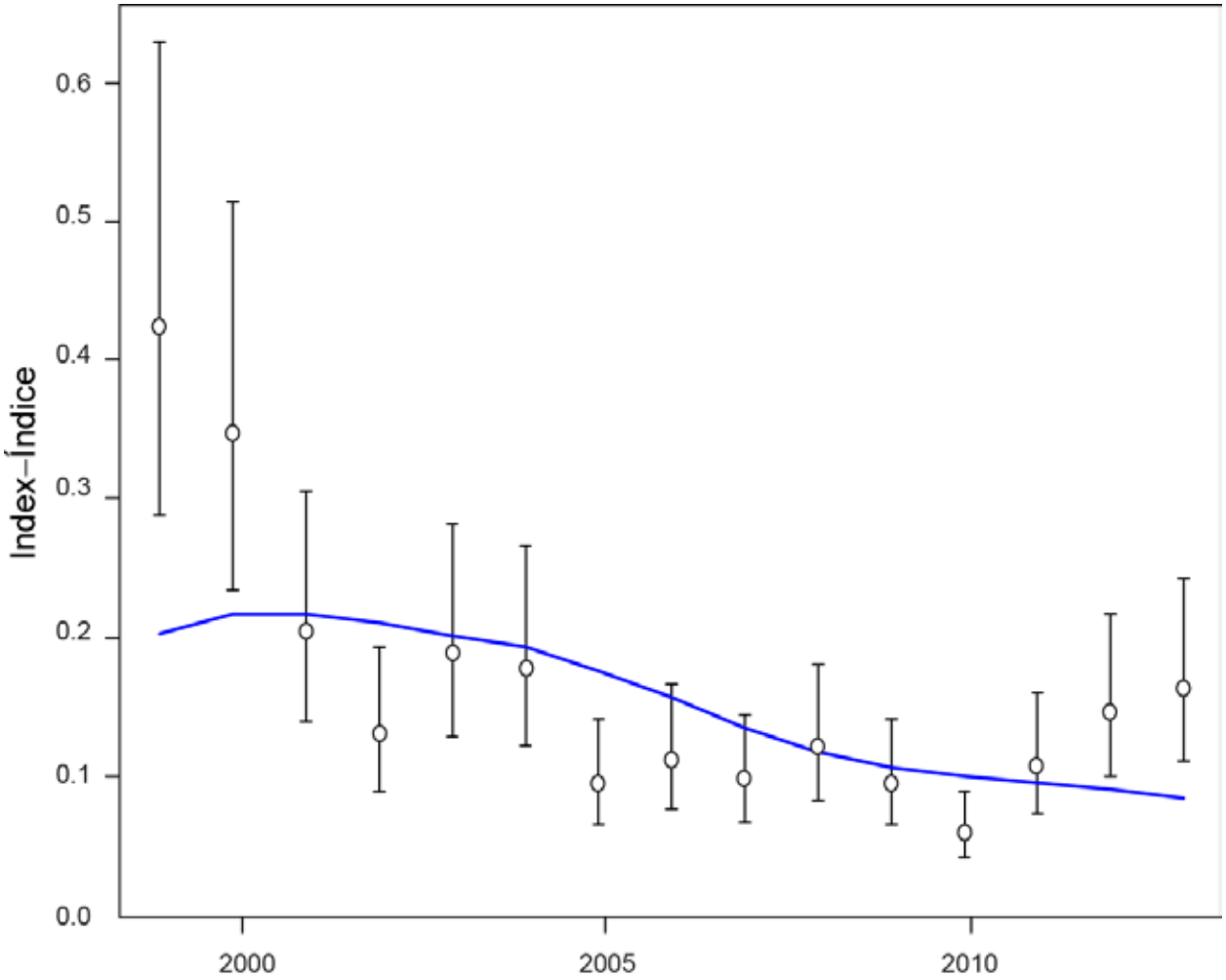


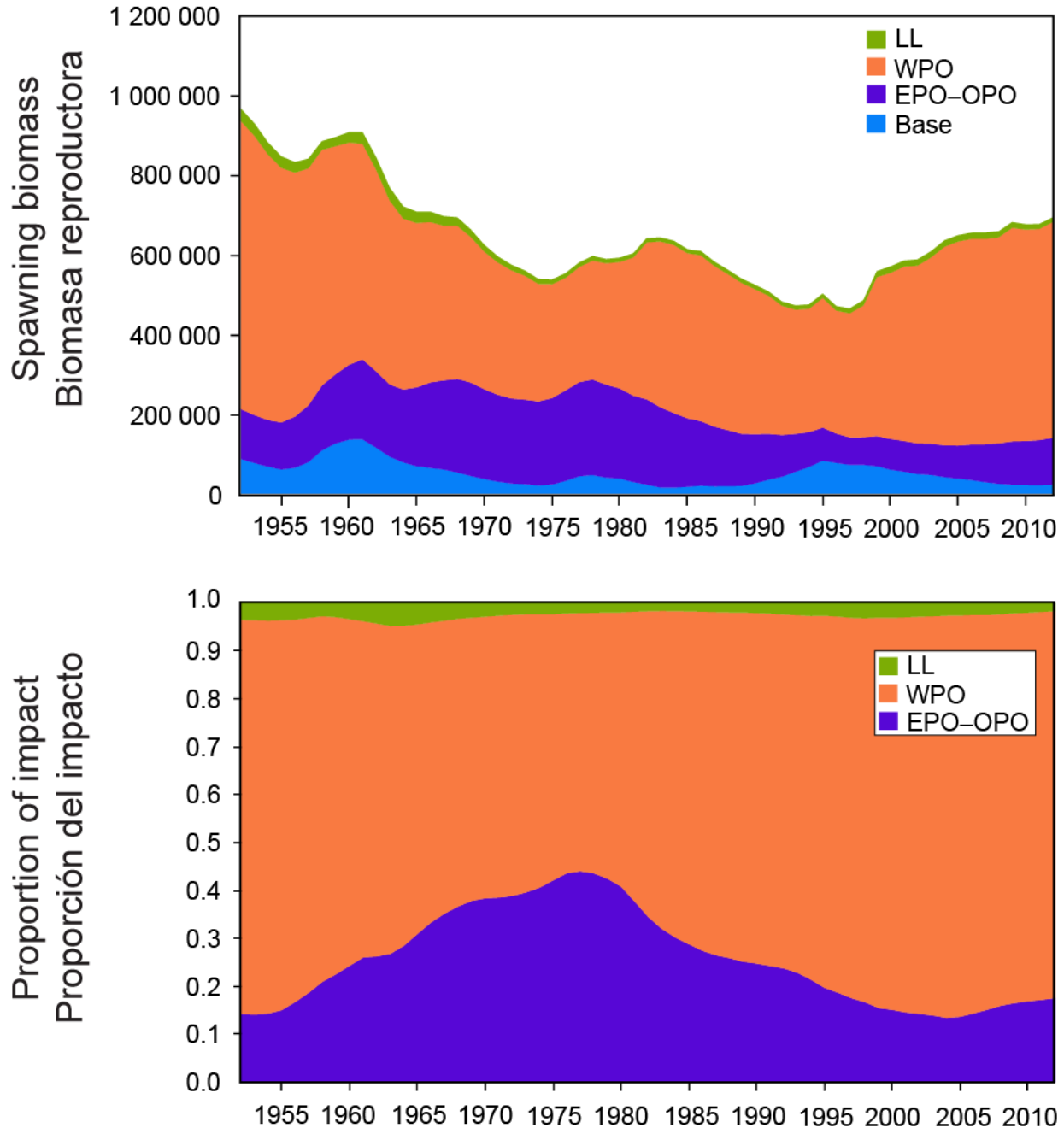
Urgent need for management

Assessment fit to JPN LL index

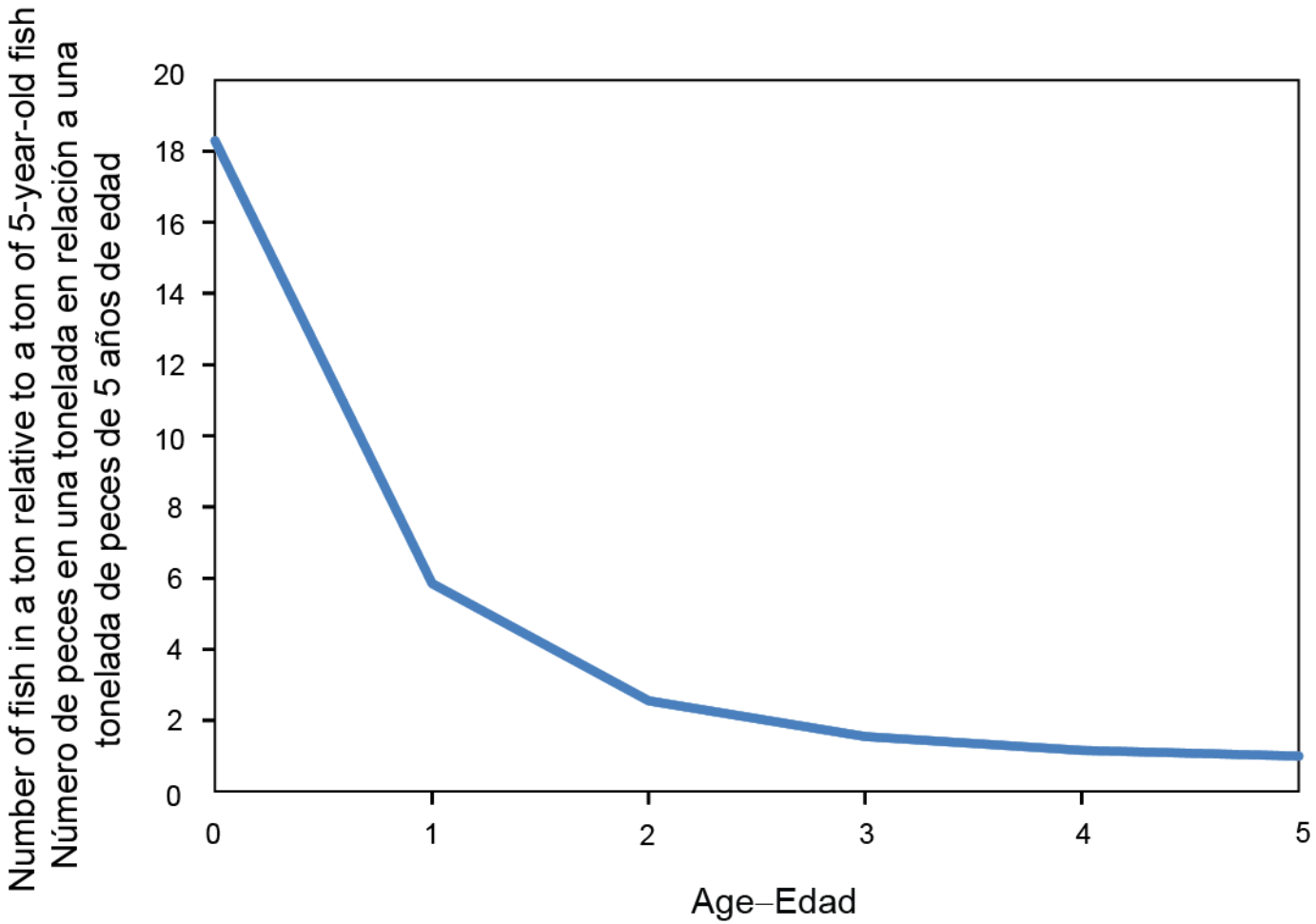


Assessment fit to TWN LL index

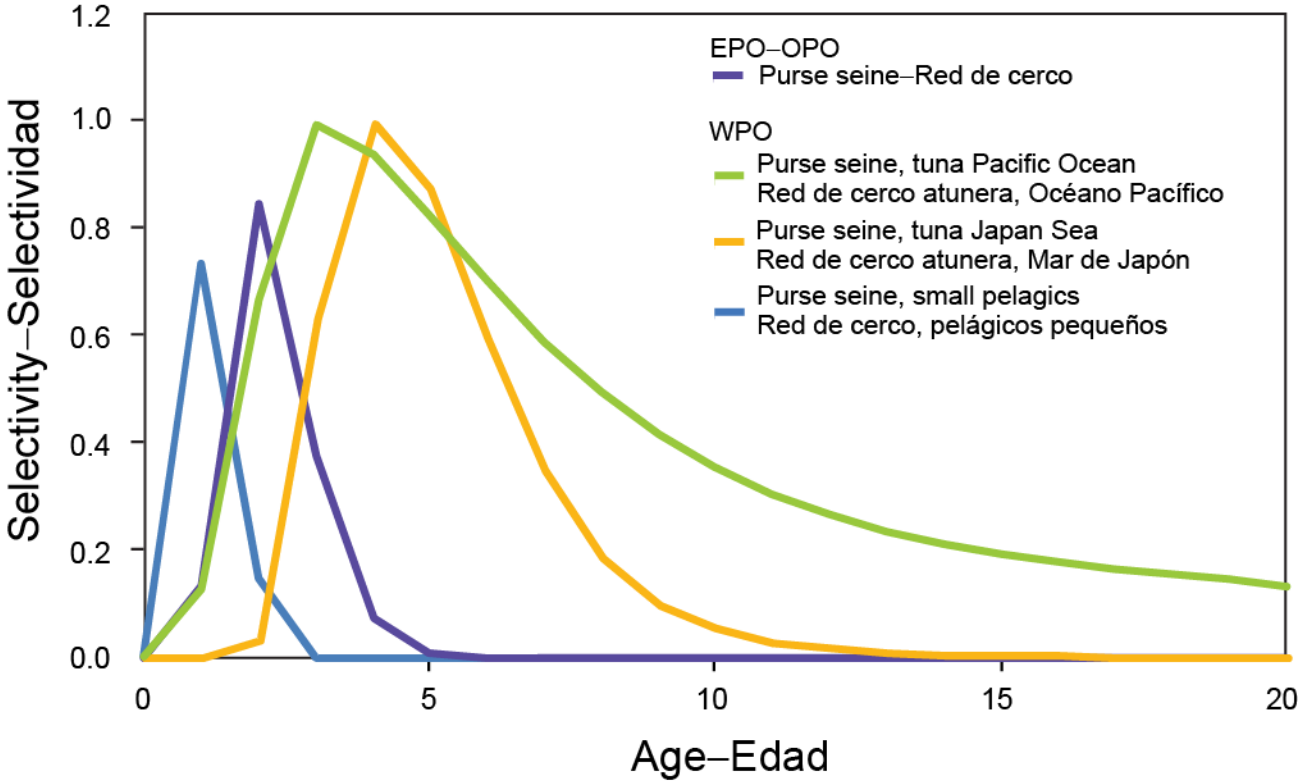



Spawning biomass
Biomasa reproductora
1 200 000
1 000 000
800 000
600 000
400 000
200 000
0
LL
WPO
EPO–OPO
Base
1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010
Proportion of impact
Proporción del impacto
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
LL
WPO
EPO–OPO
1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010

Age-specific impact on spawning biomass



Fishery selectivities

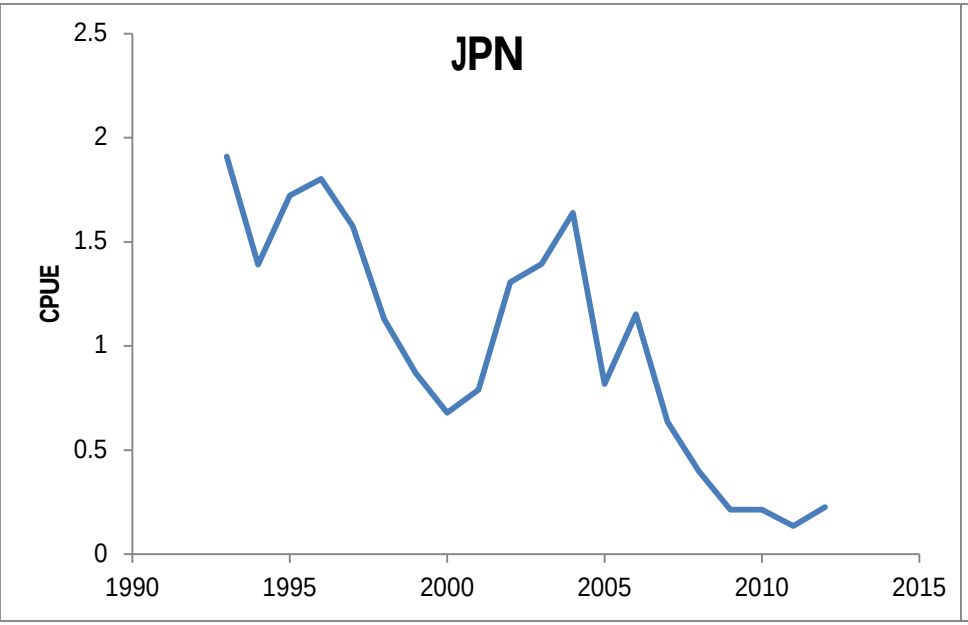


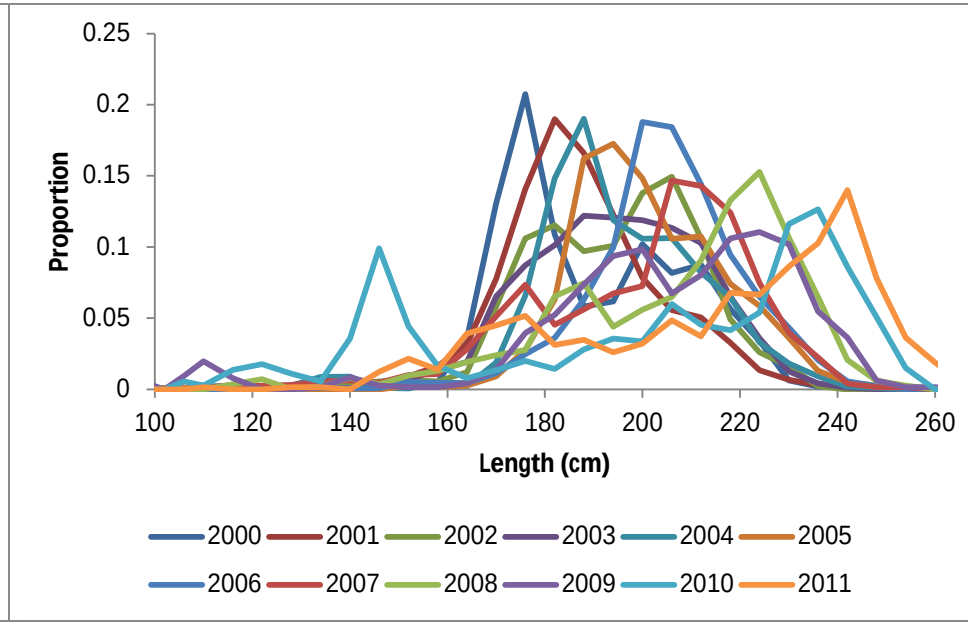
Conclusions

- The Pacific bluefin stock is at very low levels
- Tthe spawning population is mostly comprised of a single cohort that is coming to the end of its life.
- The most recent recruitments appear to have fallen below the historical average.
- Future projections predict that the population will not increase if future recruitment falls below the historical mean unless catches of juveniles are reduced by 25-50%.
- Similar cuts are needed to ensure a high probability of reaching 10% of the unexploited biomass in 10 years, even with recruitment at the historical average.
- Substantial and immediate cuts in fishing mortality of juveniles are most likely required to ensure the viability of the Pacific bluefin fisheries.
- The greatest benefit can be obtained by restricting the other fisheries, which target juveniles.
- Longline fleets should not be allowed to increase their catches, to avoid losing the benefits from the reduction in the catch of juveniles.
- The extremely low levels of current spawning biomass may require protecting the limited spawner population until cuts in juvenile *F* allow more bluefin to become spawners.

The End

Japan length and CPUE consistent





Taiwan length and CPUE consistent?