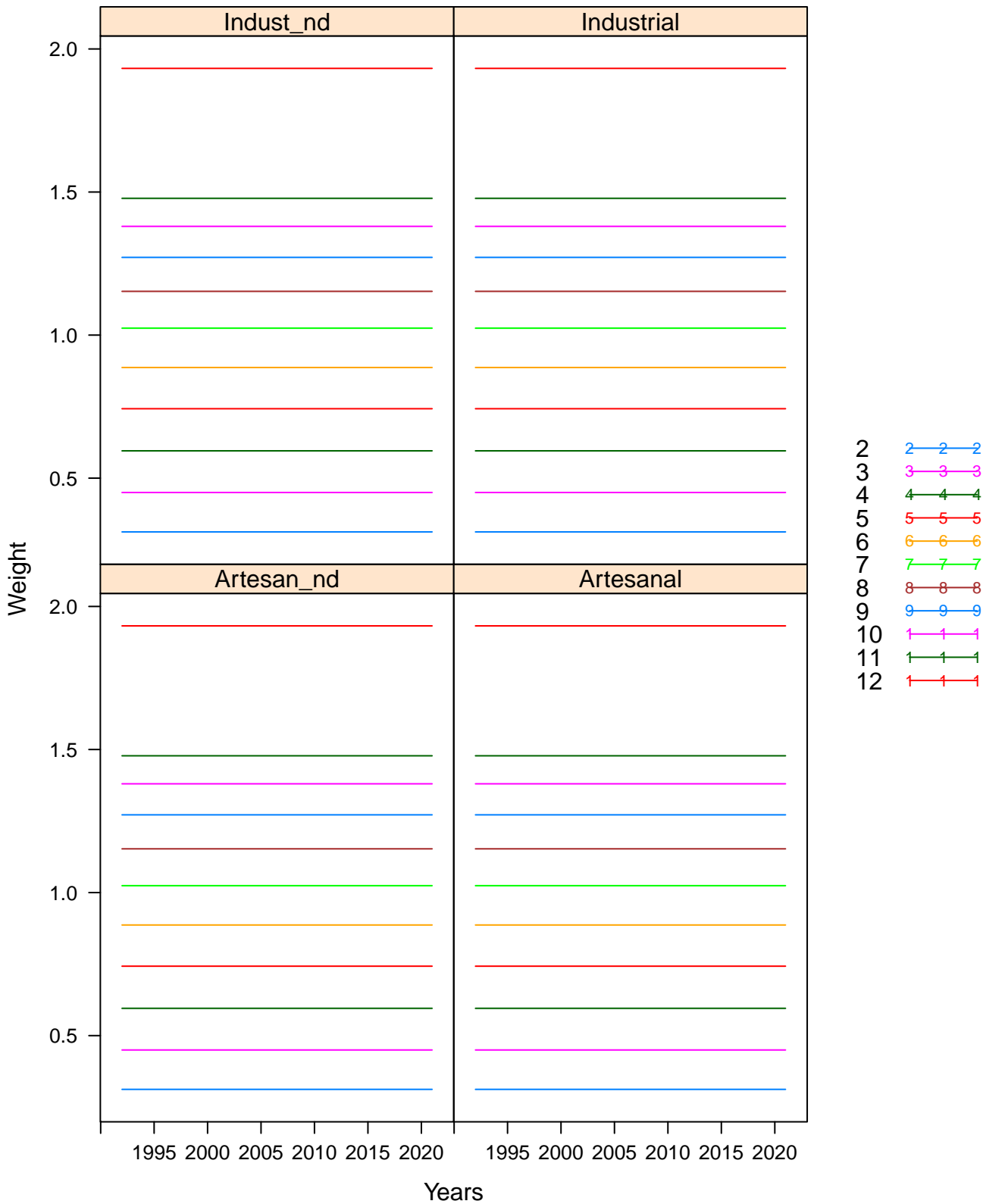
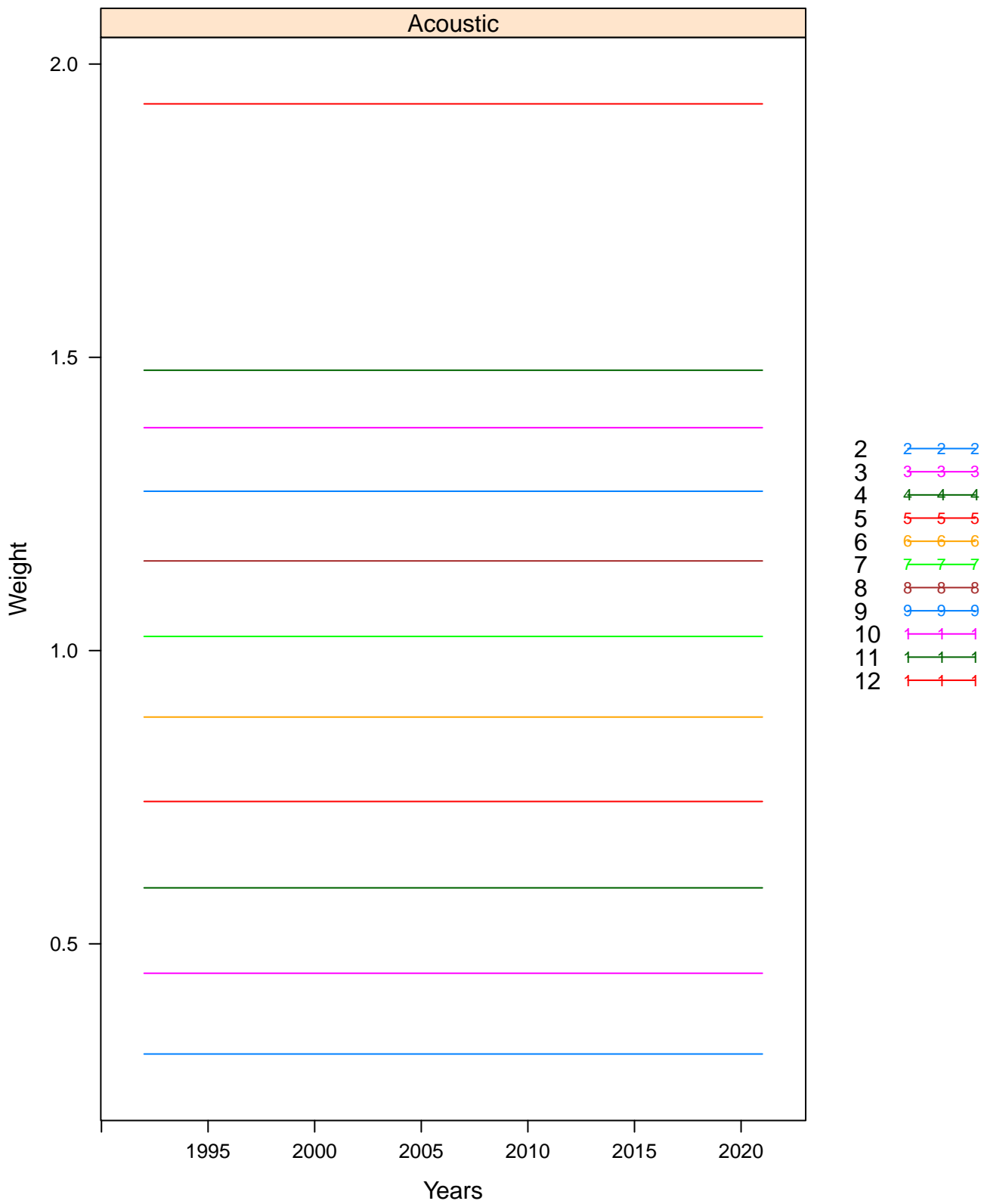


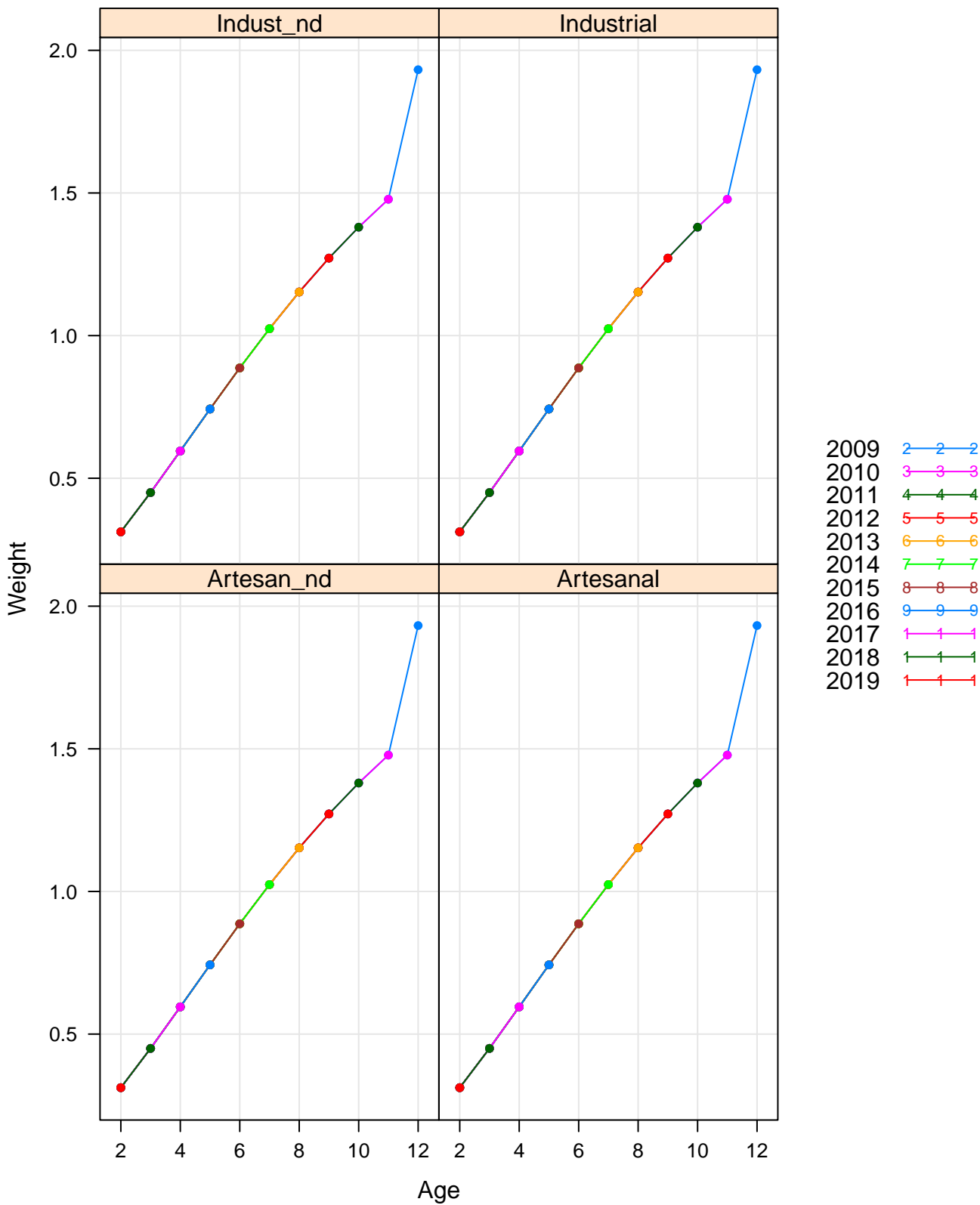
# Weight at age in the fishery



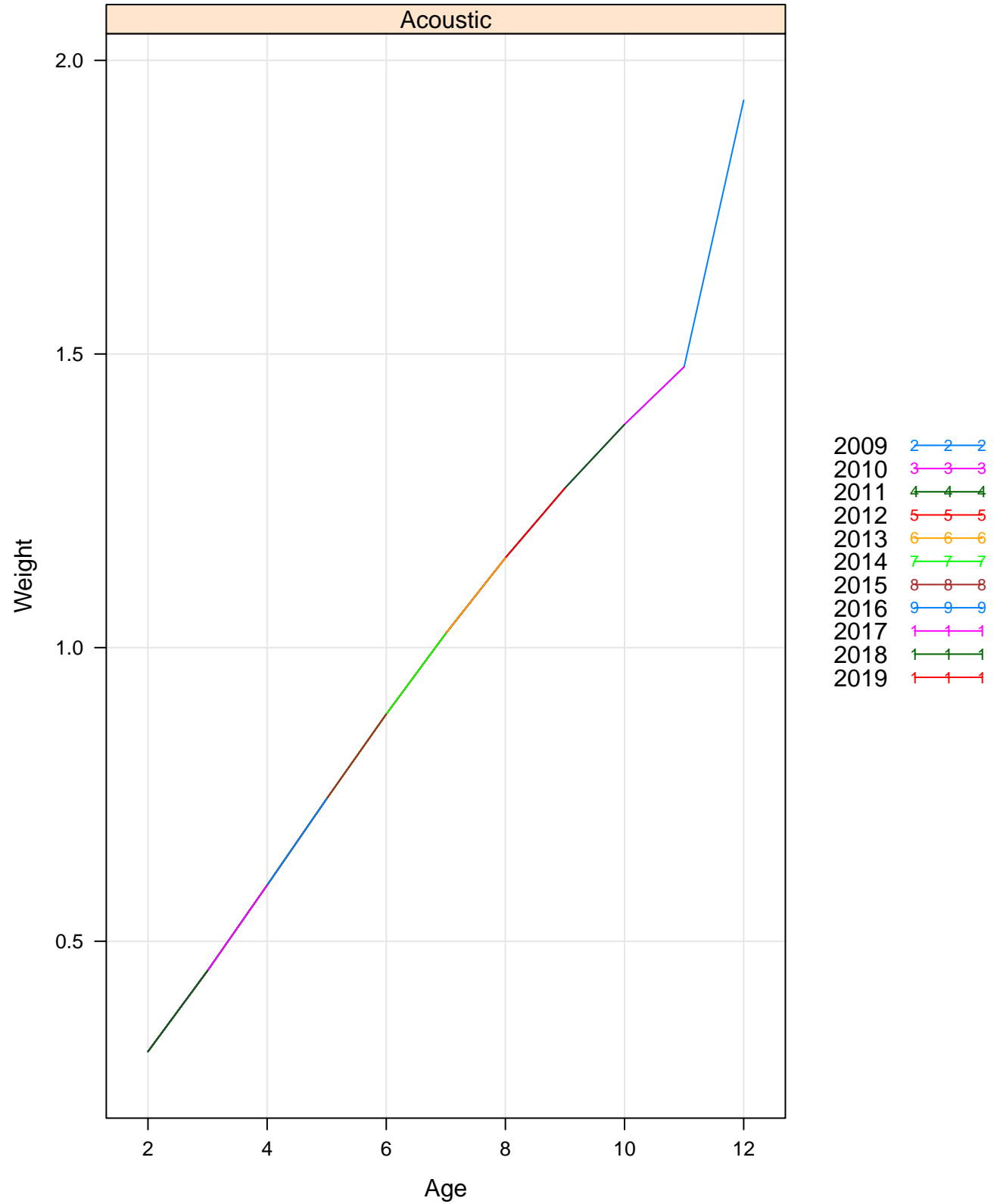
# Weight at age in the survey



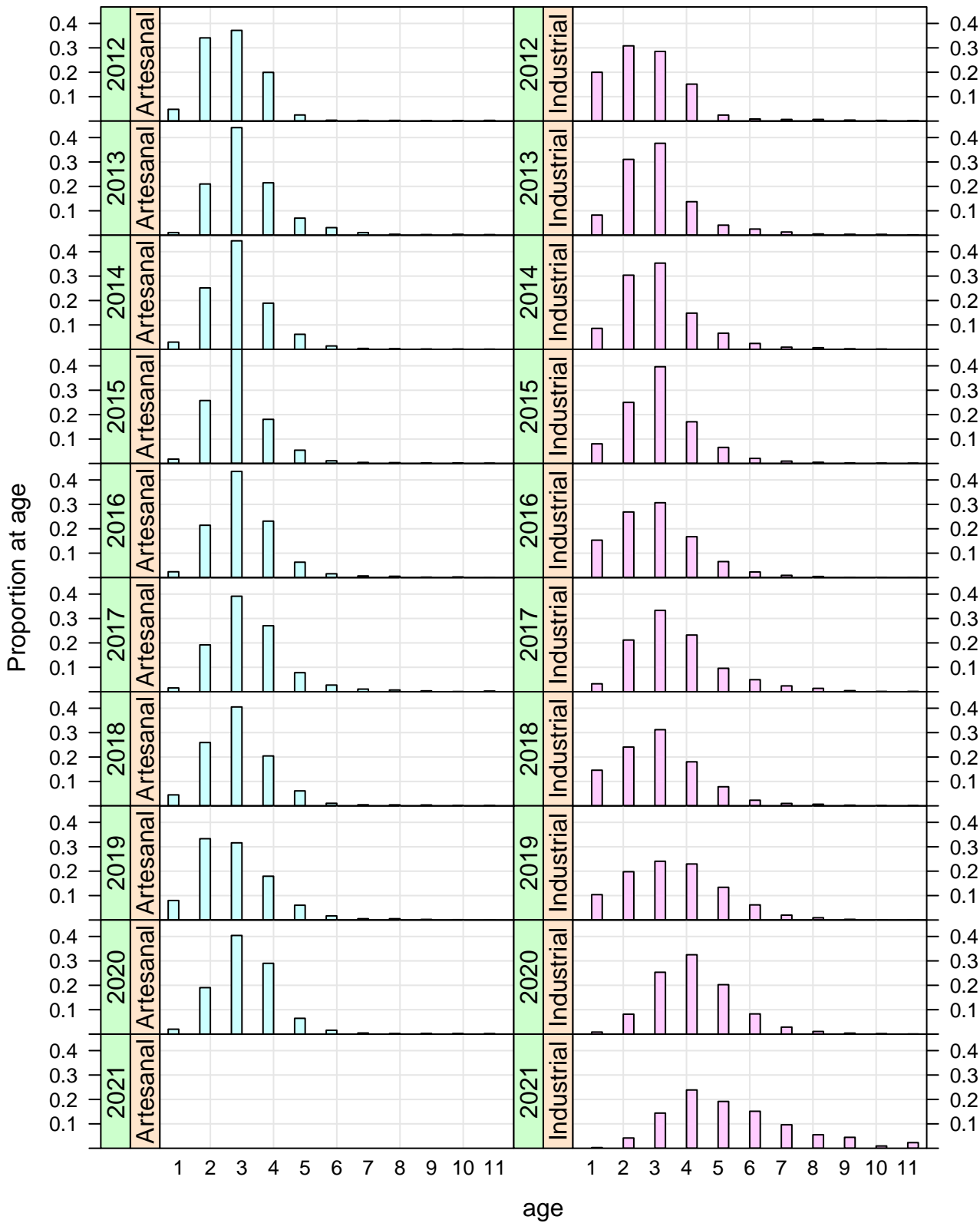
## Weight at age by cohort in the fleet



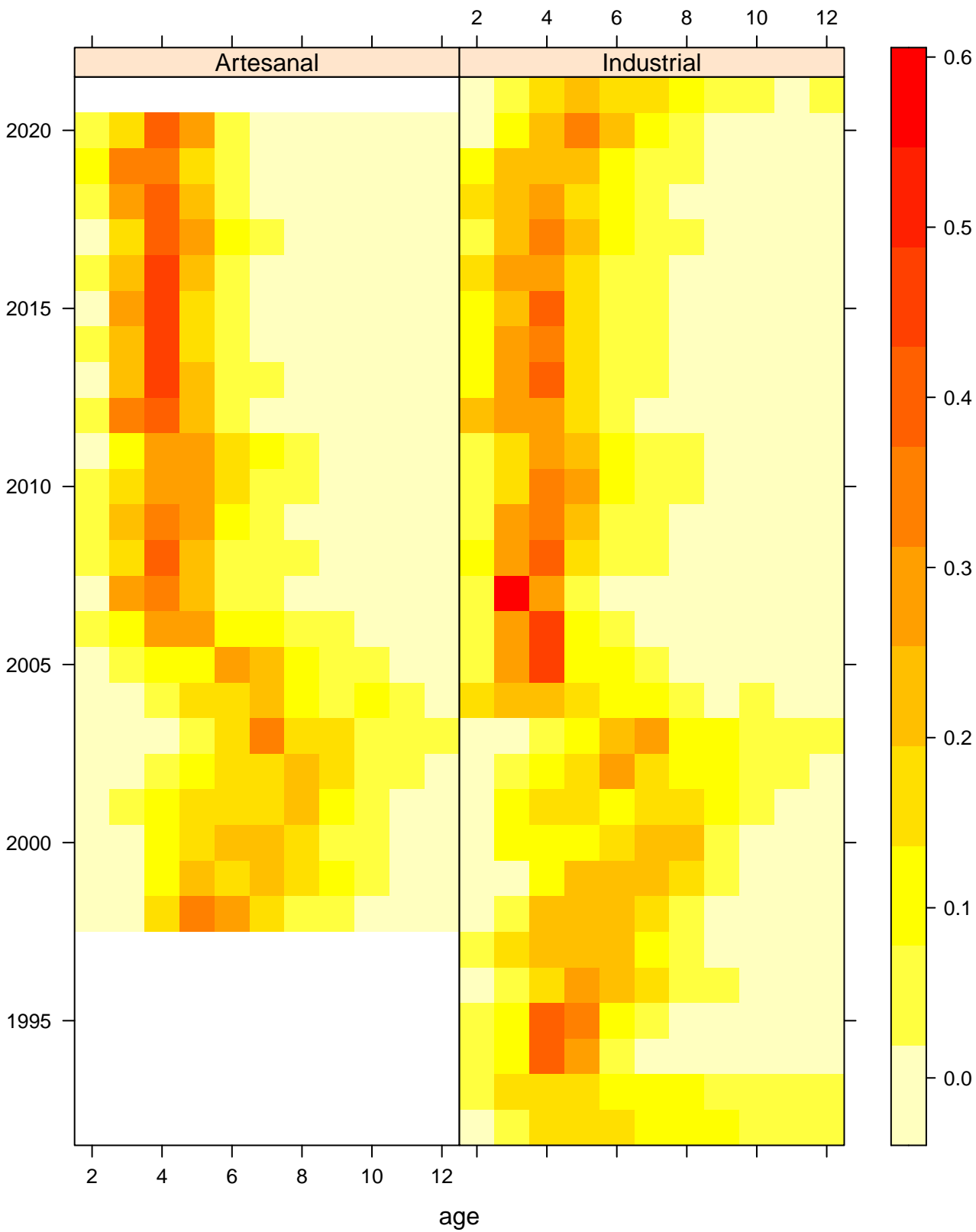
Weight at age by cohort in the survey



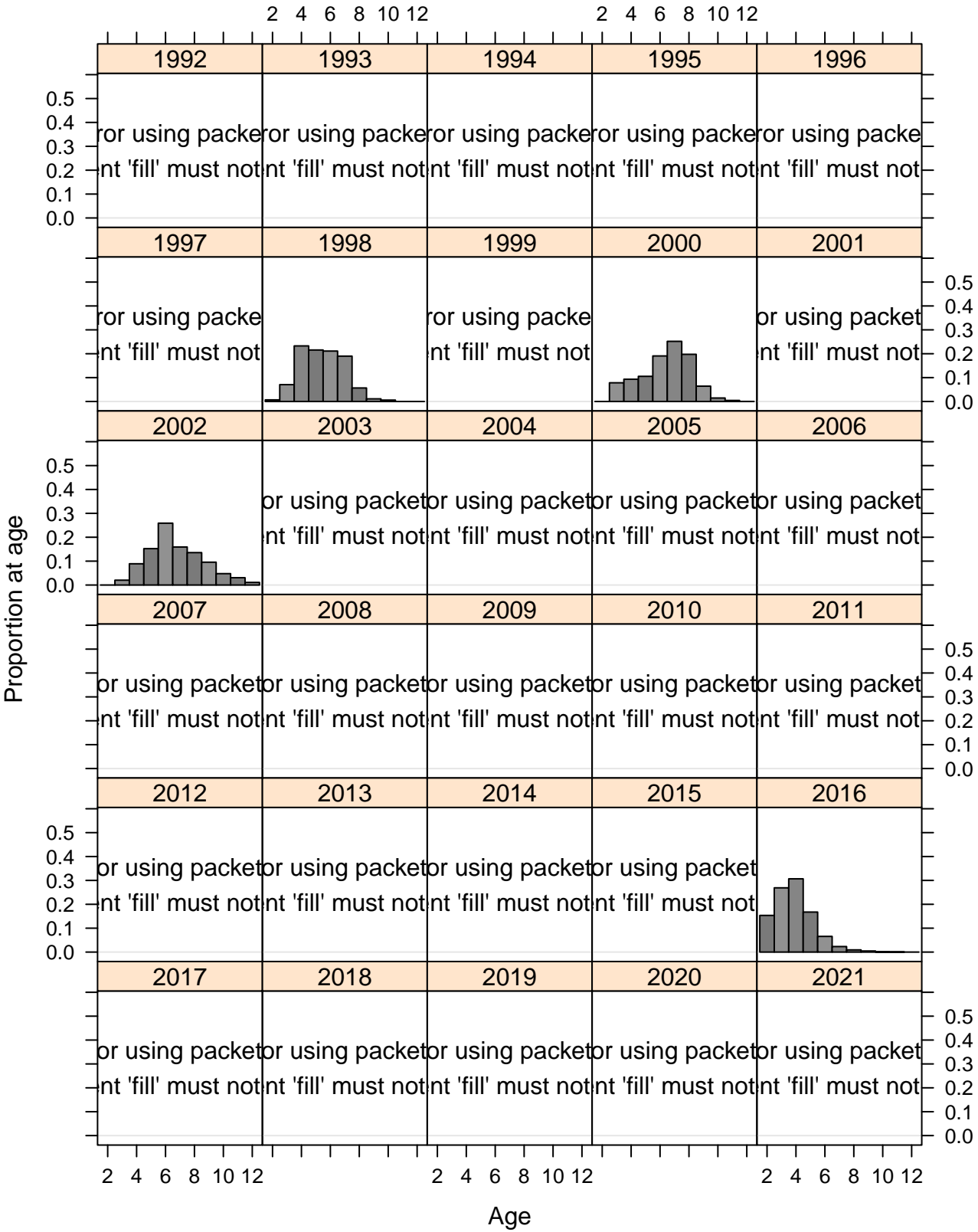
# Age composition in fleets



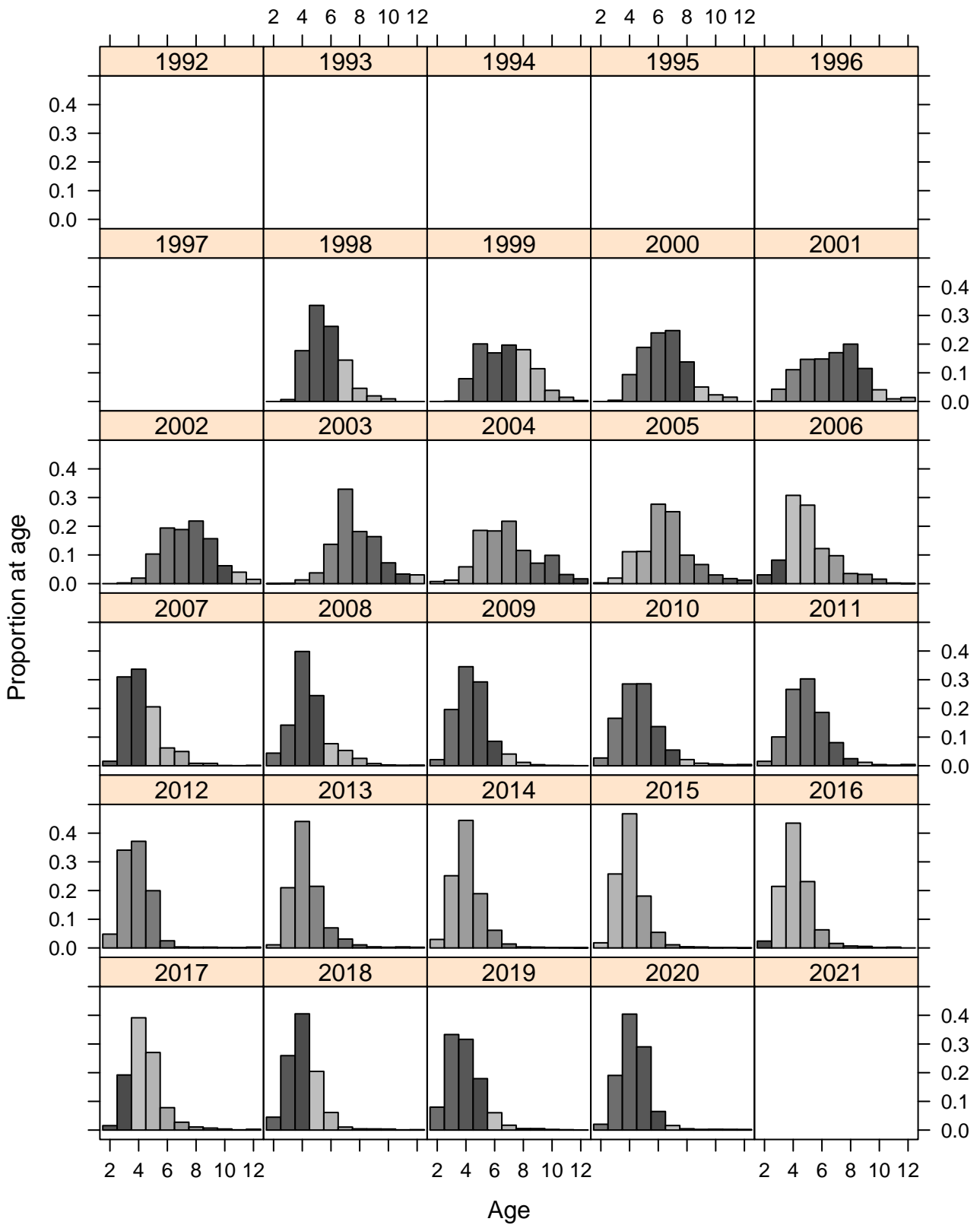
## Age composition in fleets



Age composition in fleets Industrial

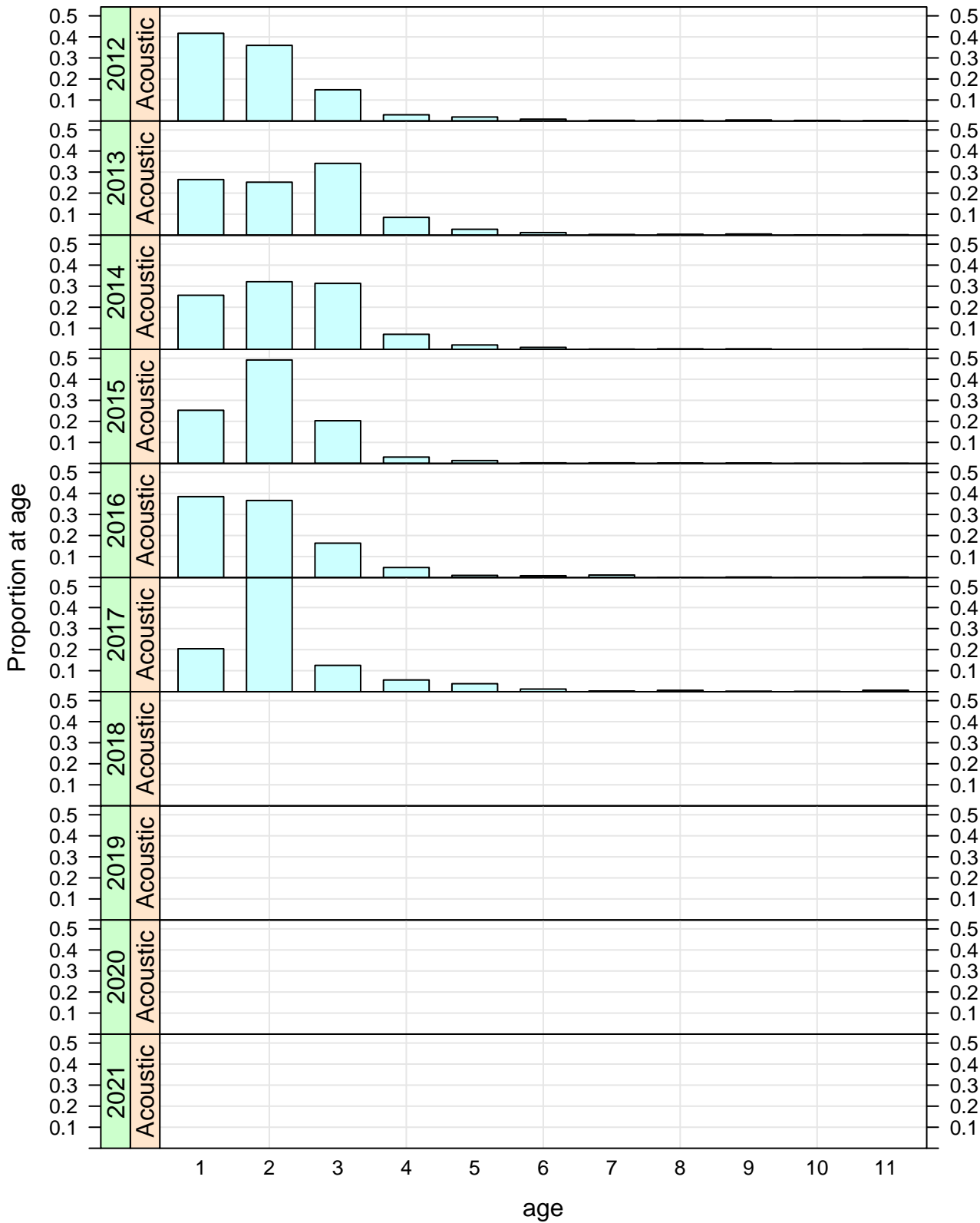


## Age composition in fleets Artesanal

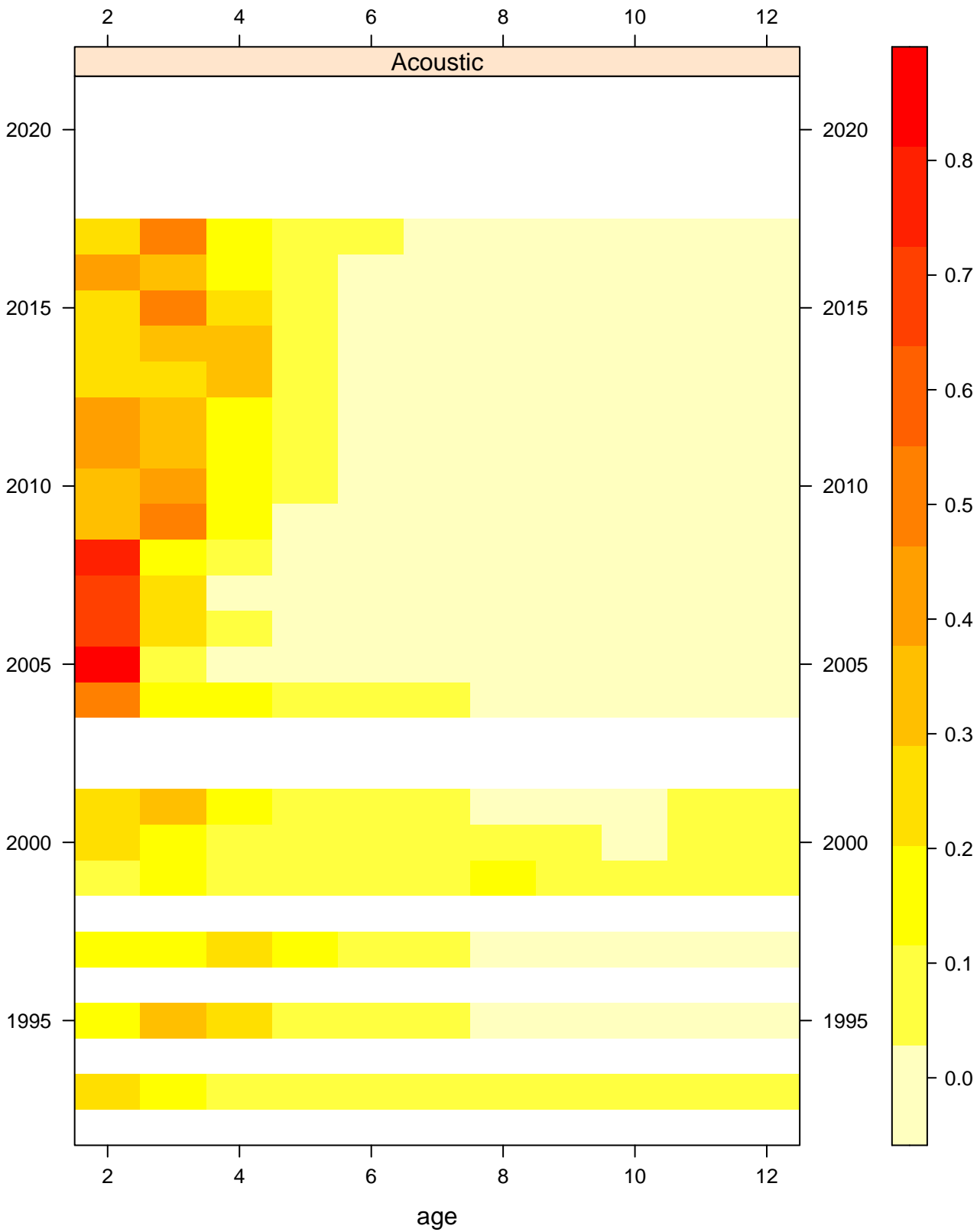




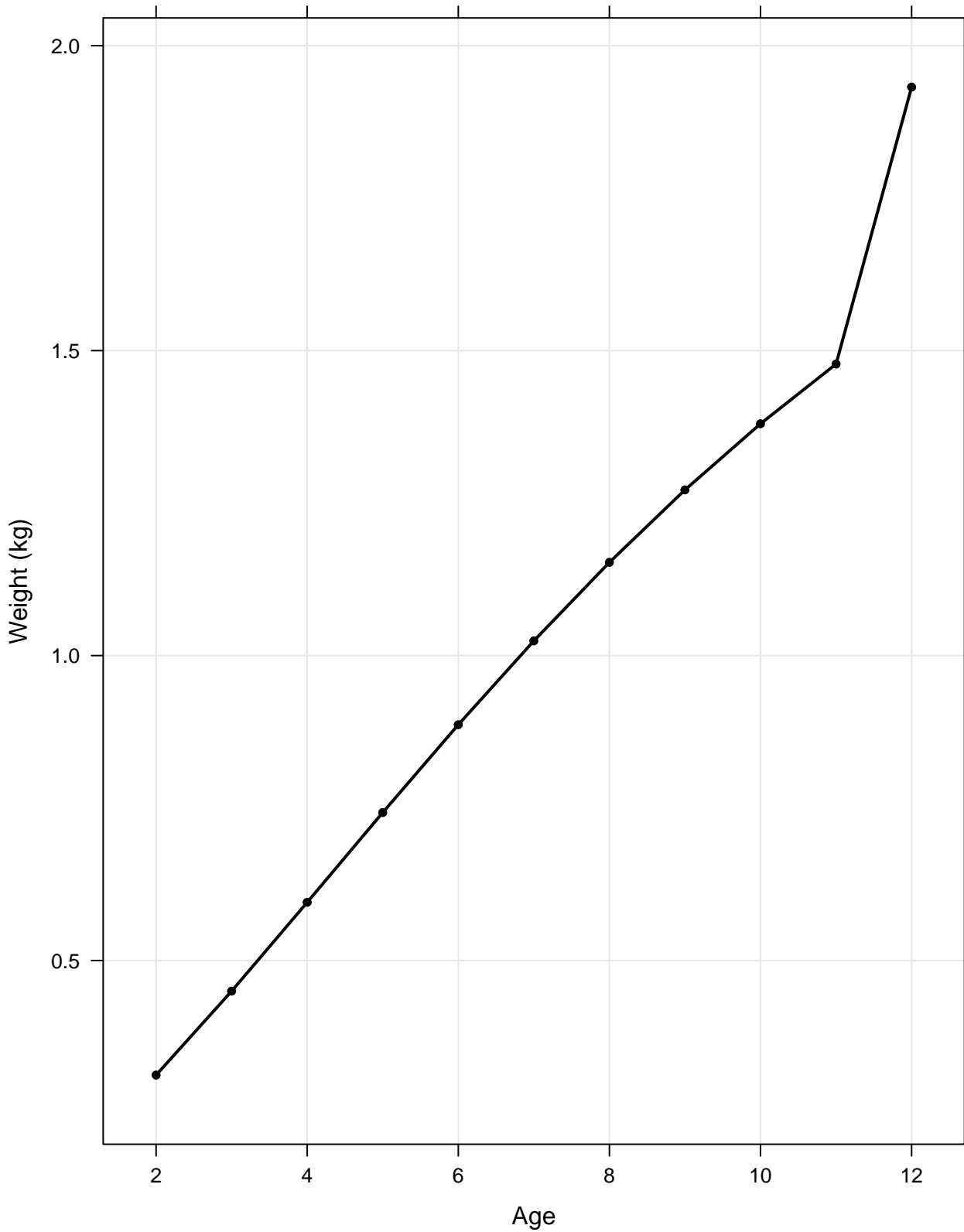
## Age composition in surveys



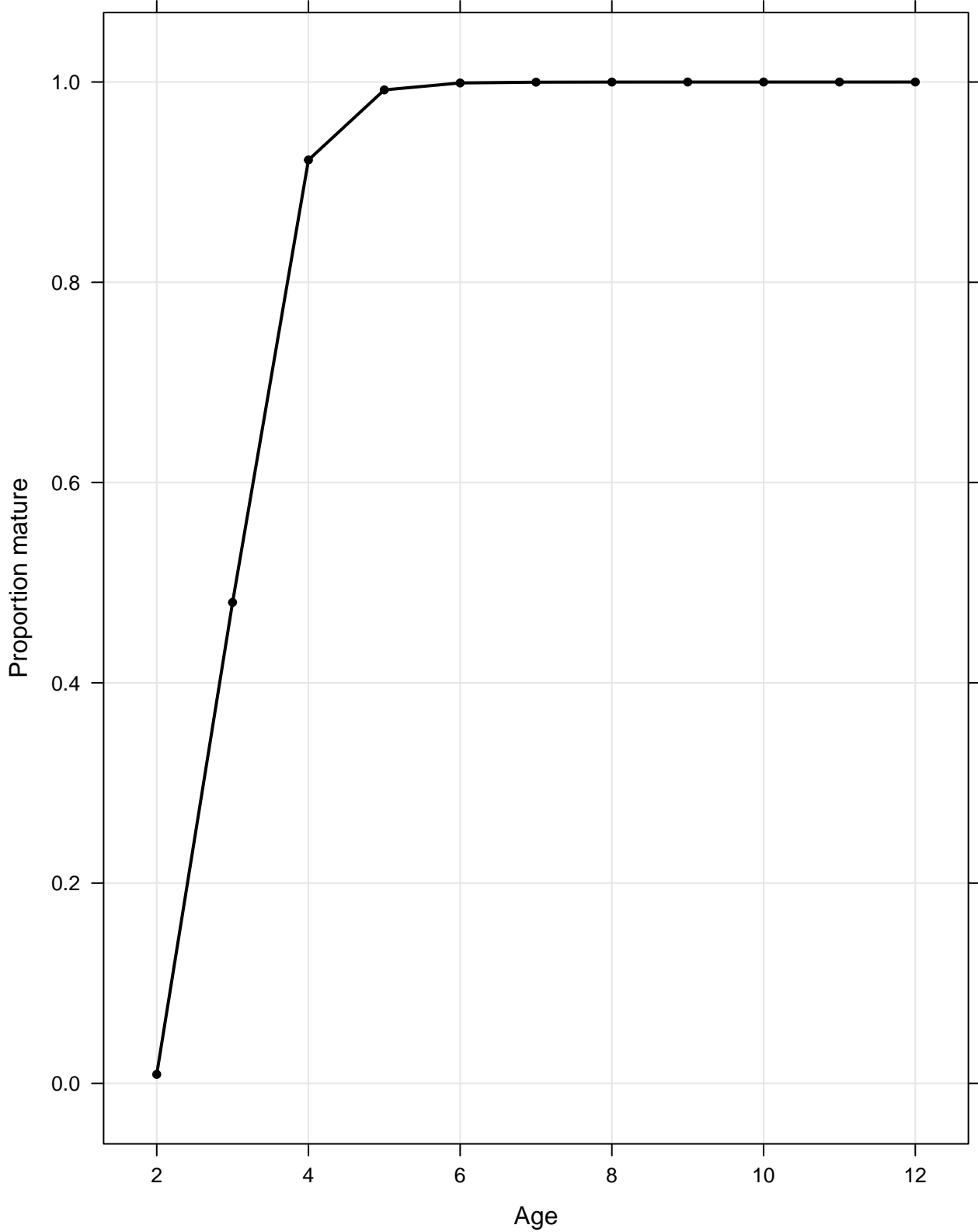
# Age composition in surveys



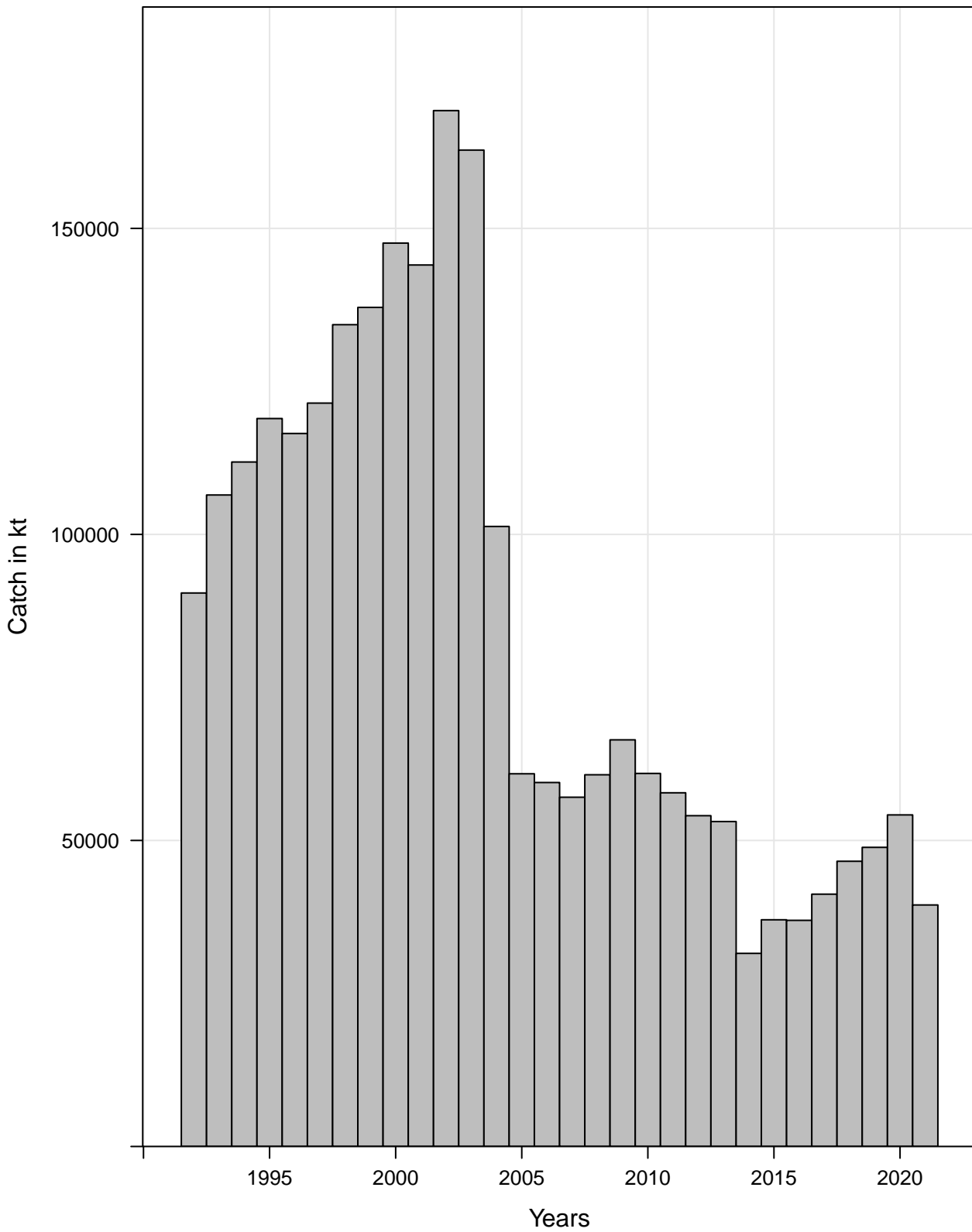
Weight in the stock



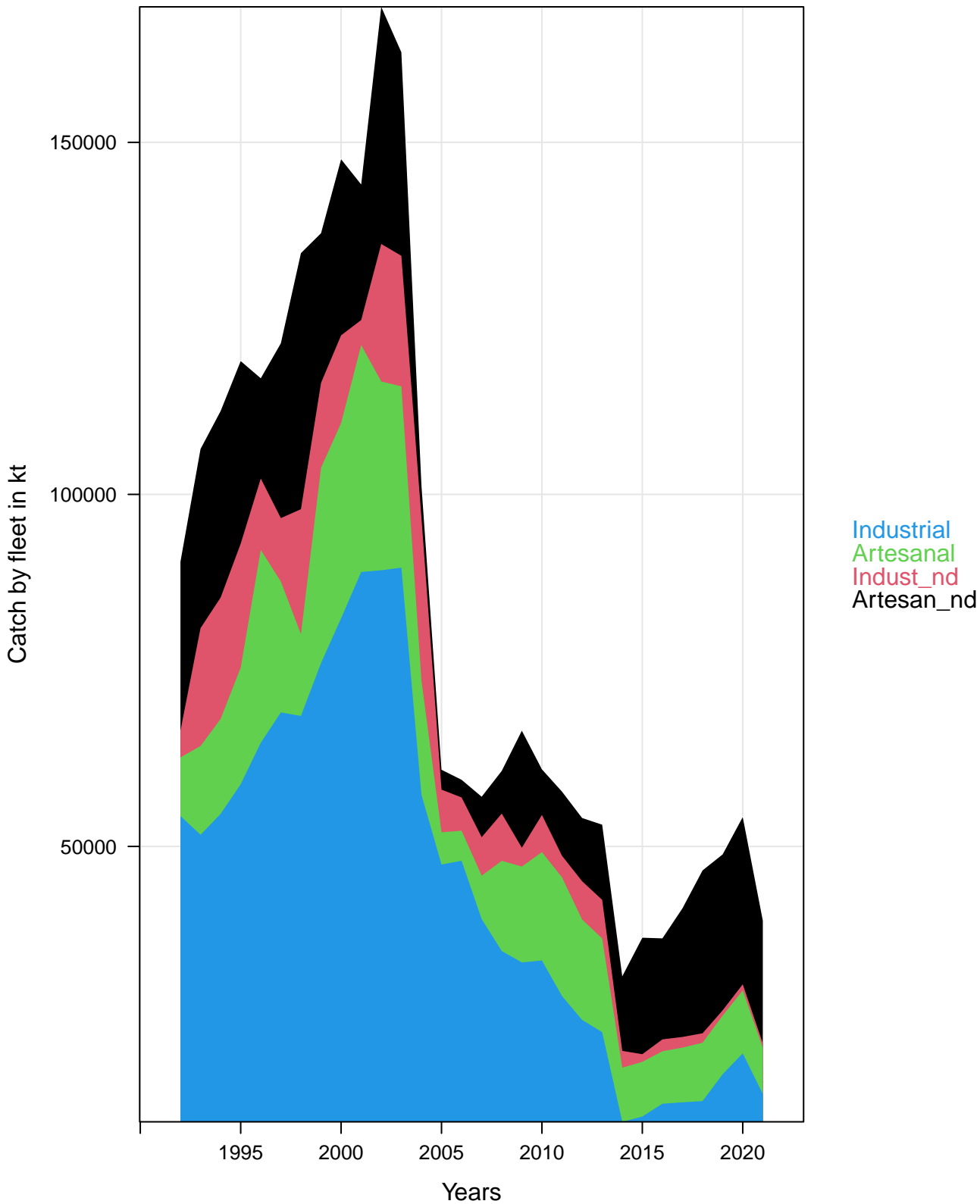
**Maturity in the stock**



**Total catch**

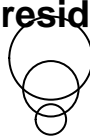


Total catch by fleet

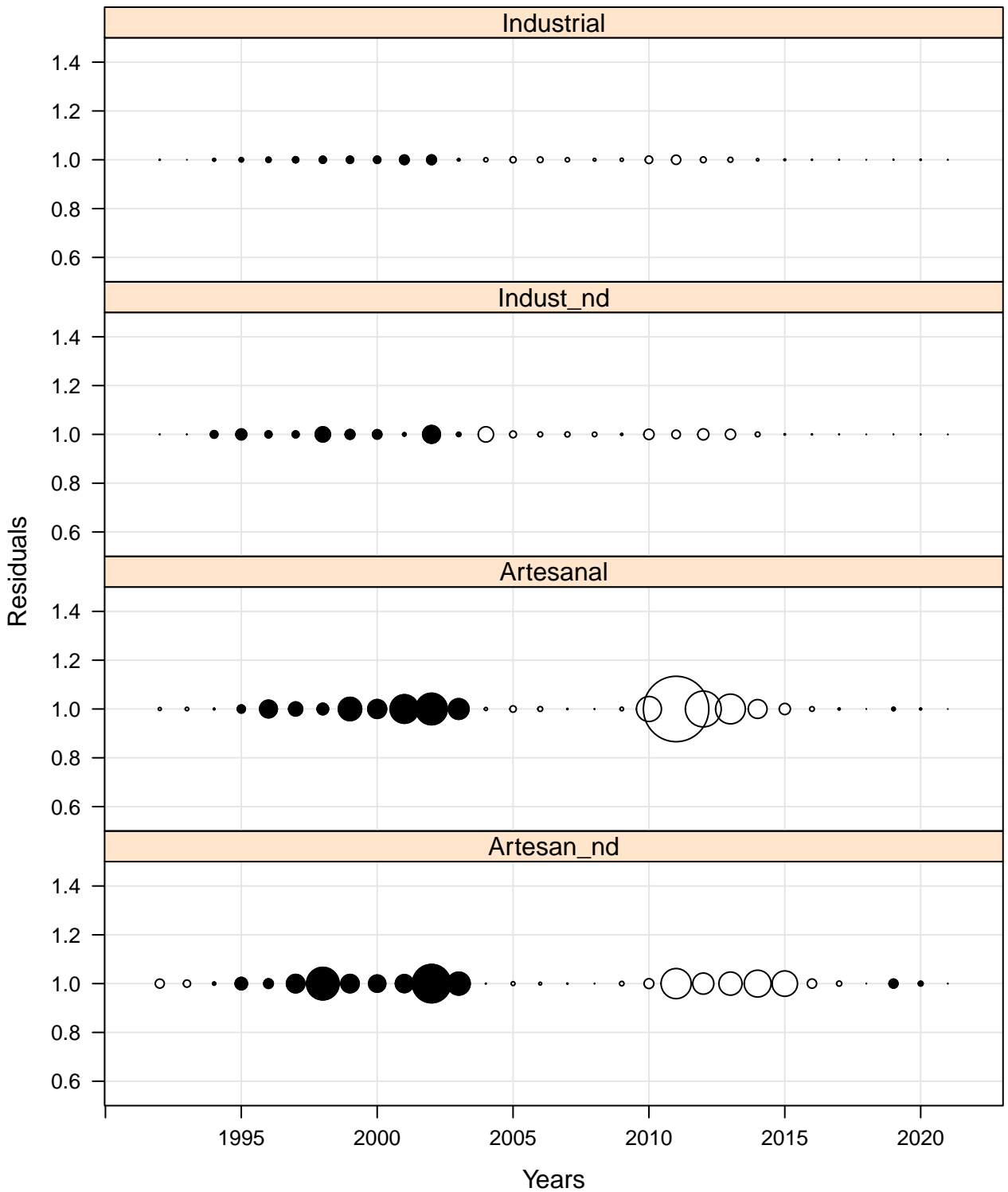


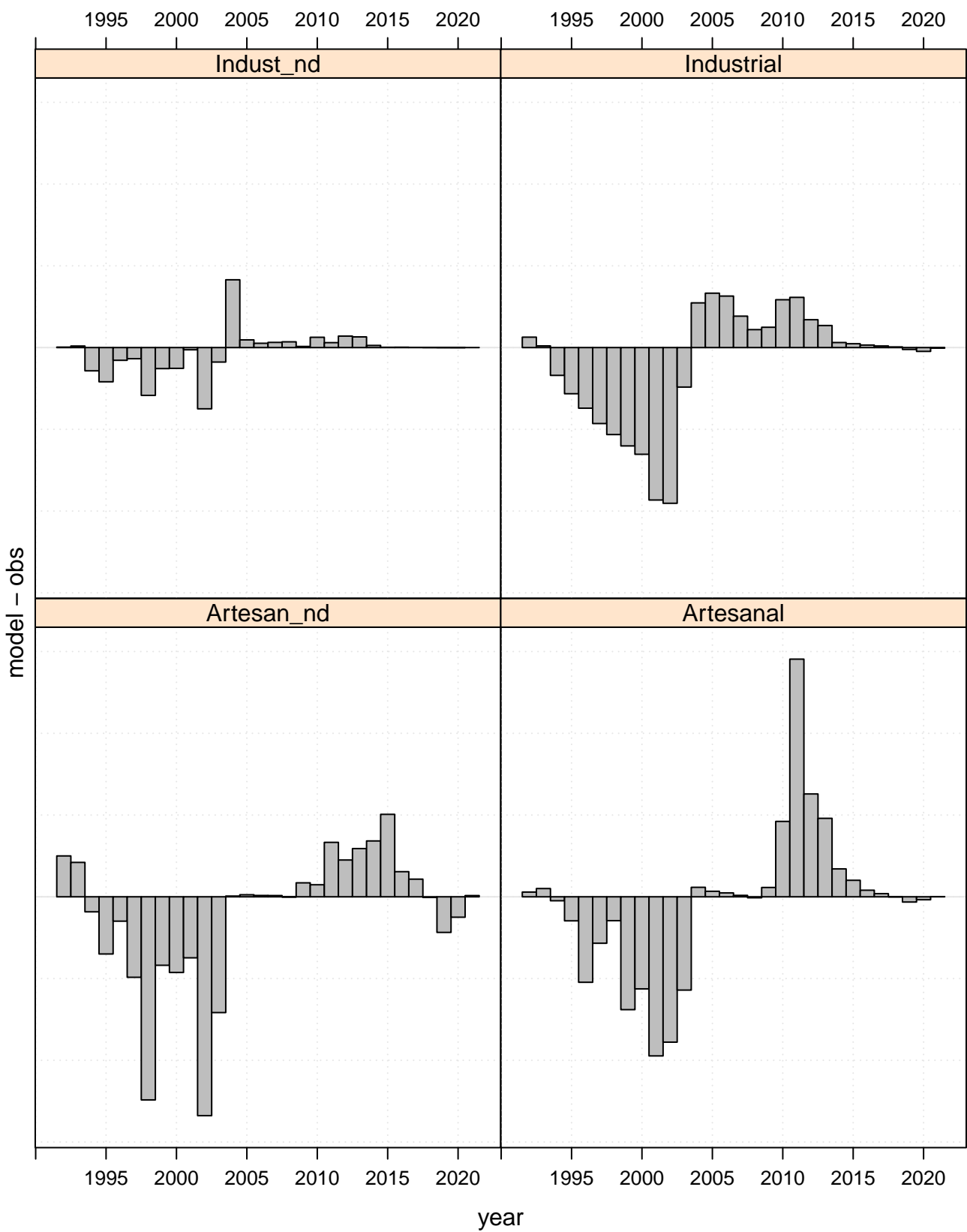
# Catch residuals by fleet

-0.3  
-0.2  
-0.11



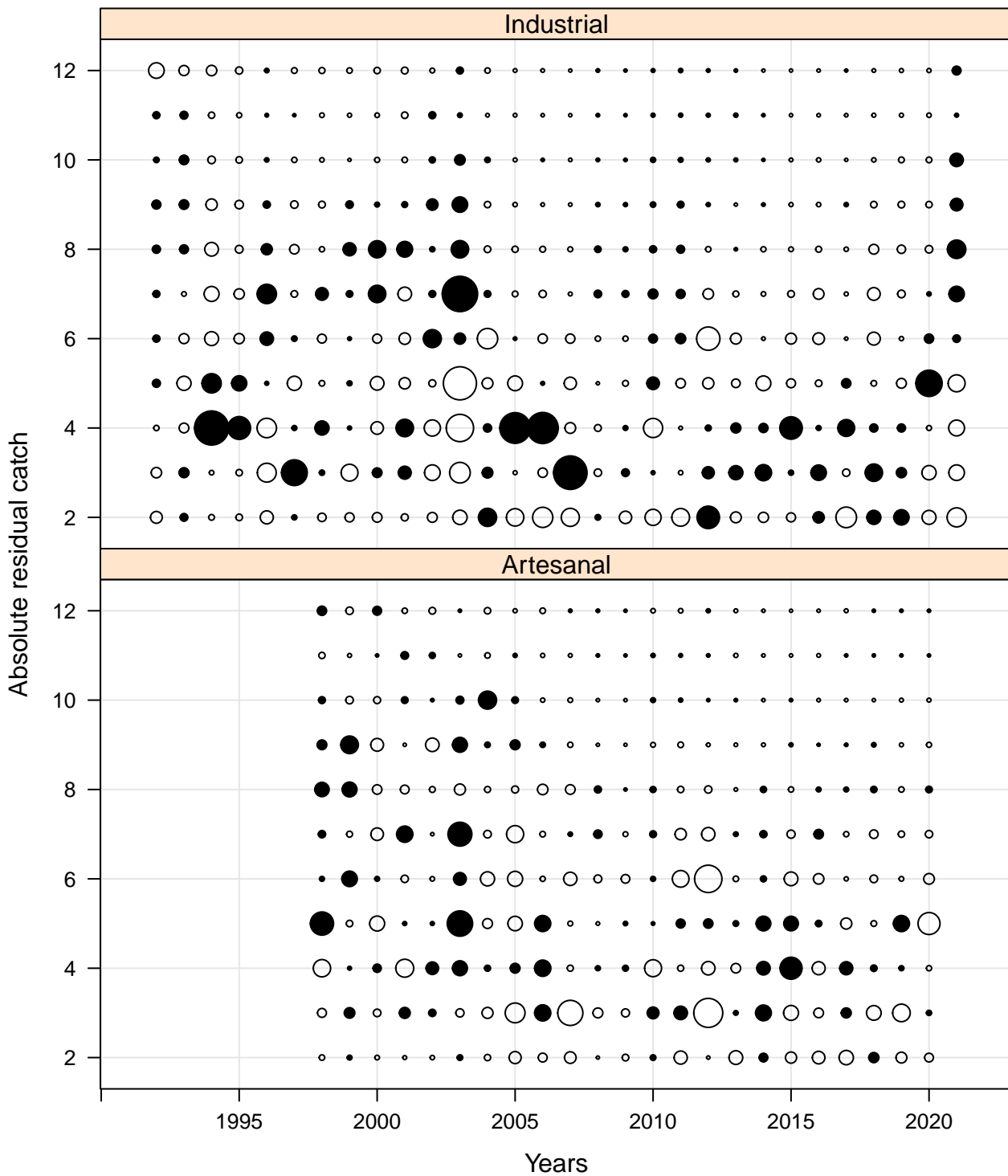
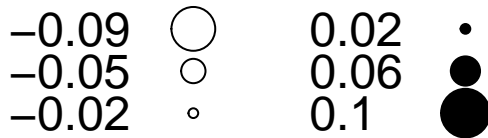
-0.01  
0.08  
0.17





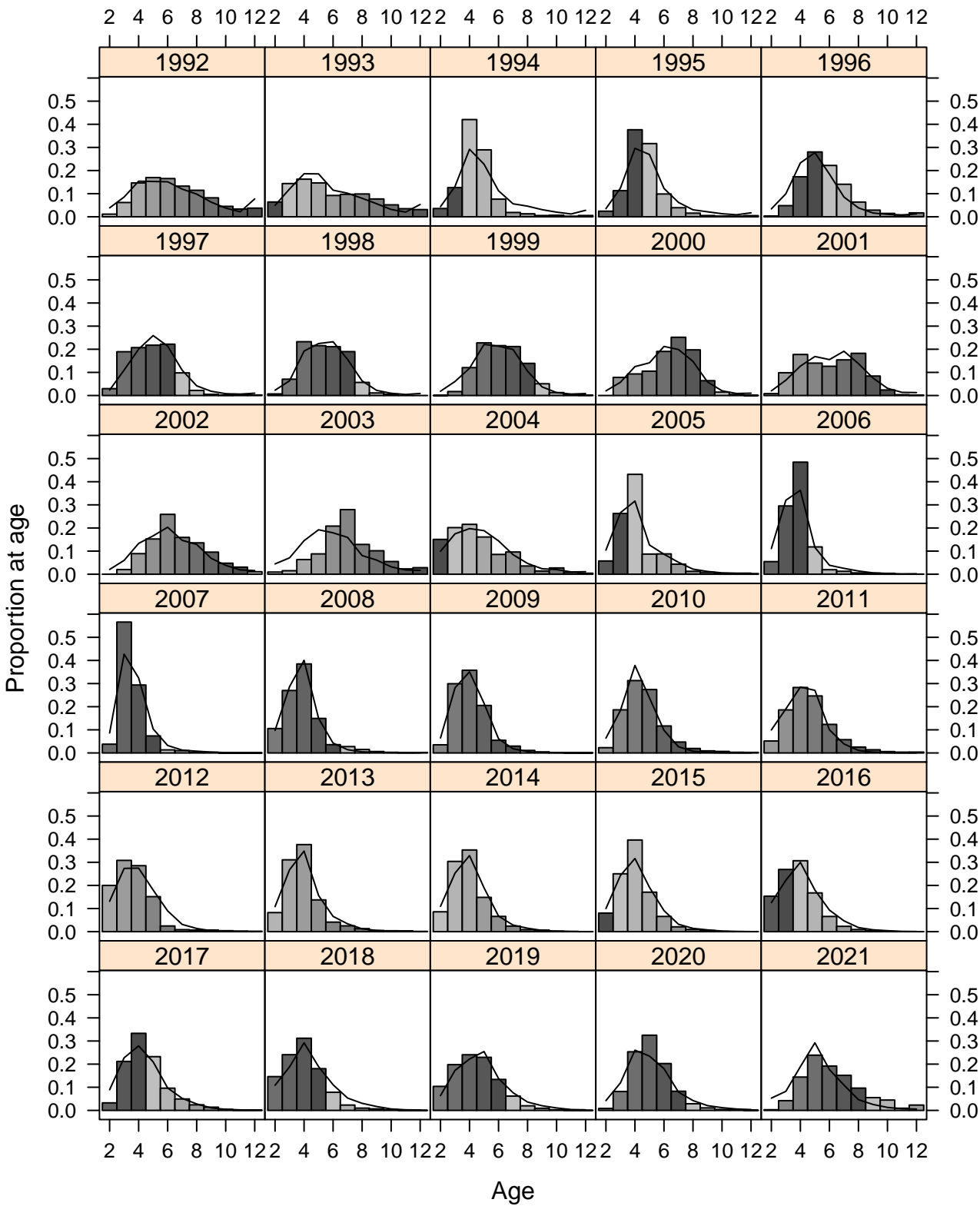


# Absolute residual catch by fleet



# Age fits Industrial

Observed  Predicted 



# Age fits Artesanal

Observed



Predicted •

2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12

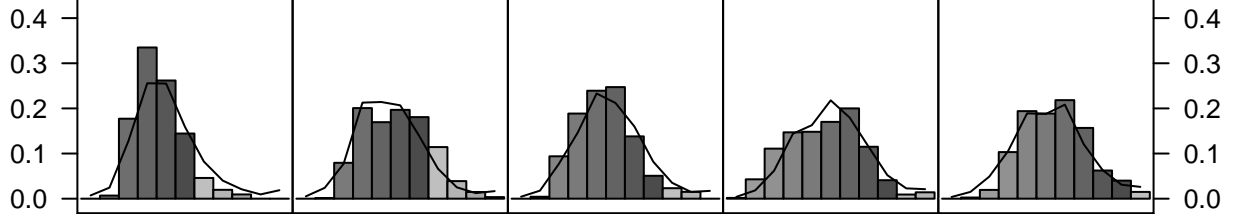
1998

1999

2000

2001

2002



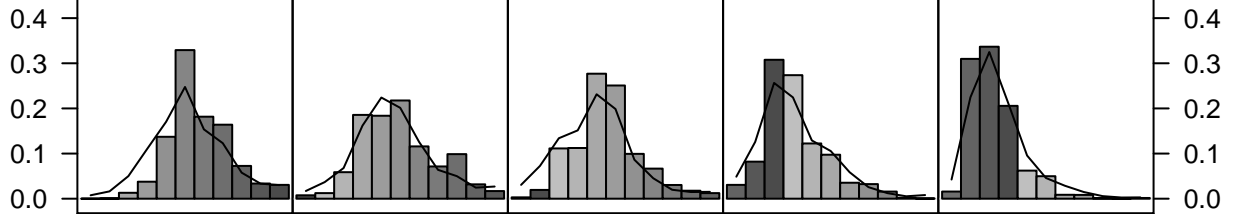
2003

2004

2005

2006

2007



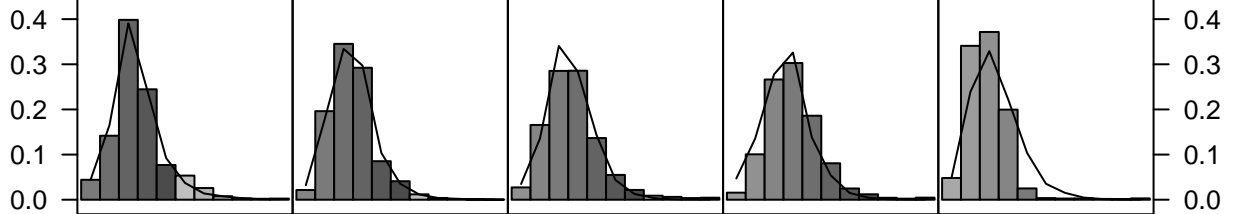
2008

2009

2010

2011

2012



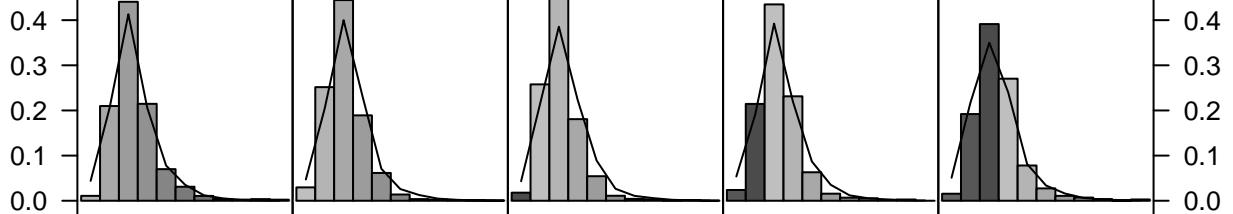
2013

2014

2015

2016

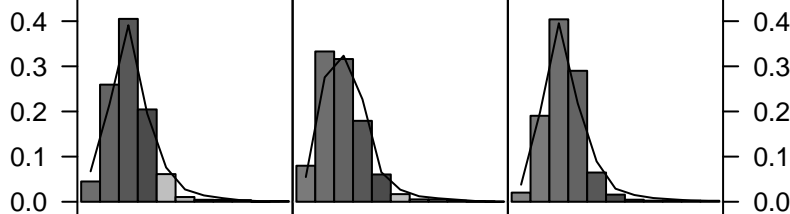
2017



2018

2019

2020



2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12

Age

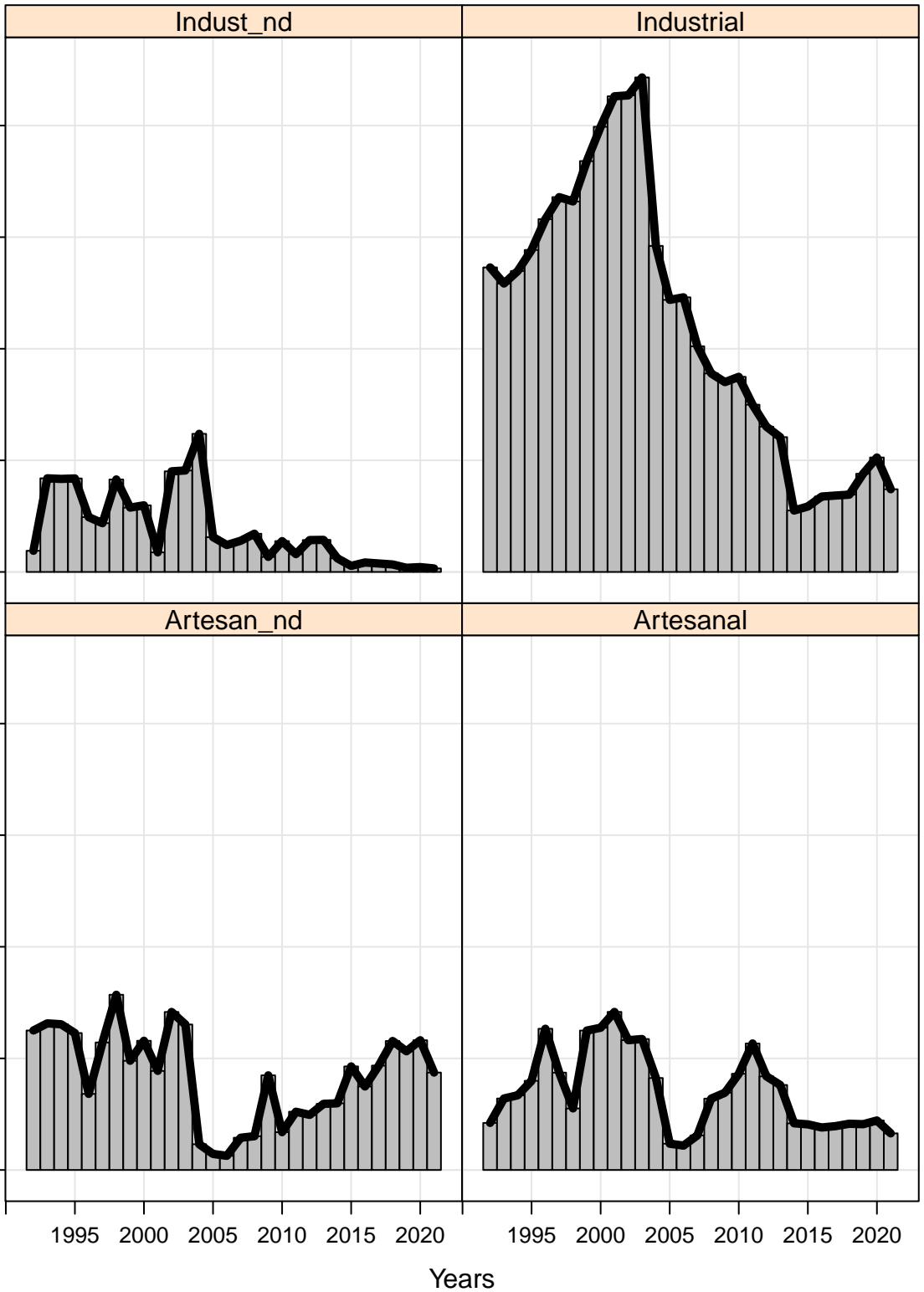
Proportion at age

**Predicted and observed catches by fleet**

Observed



Predicted



Predicted and observed indices

Observed      Predicted

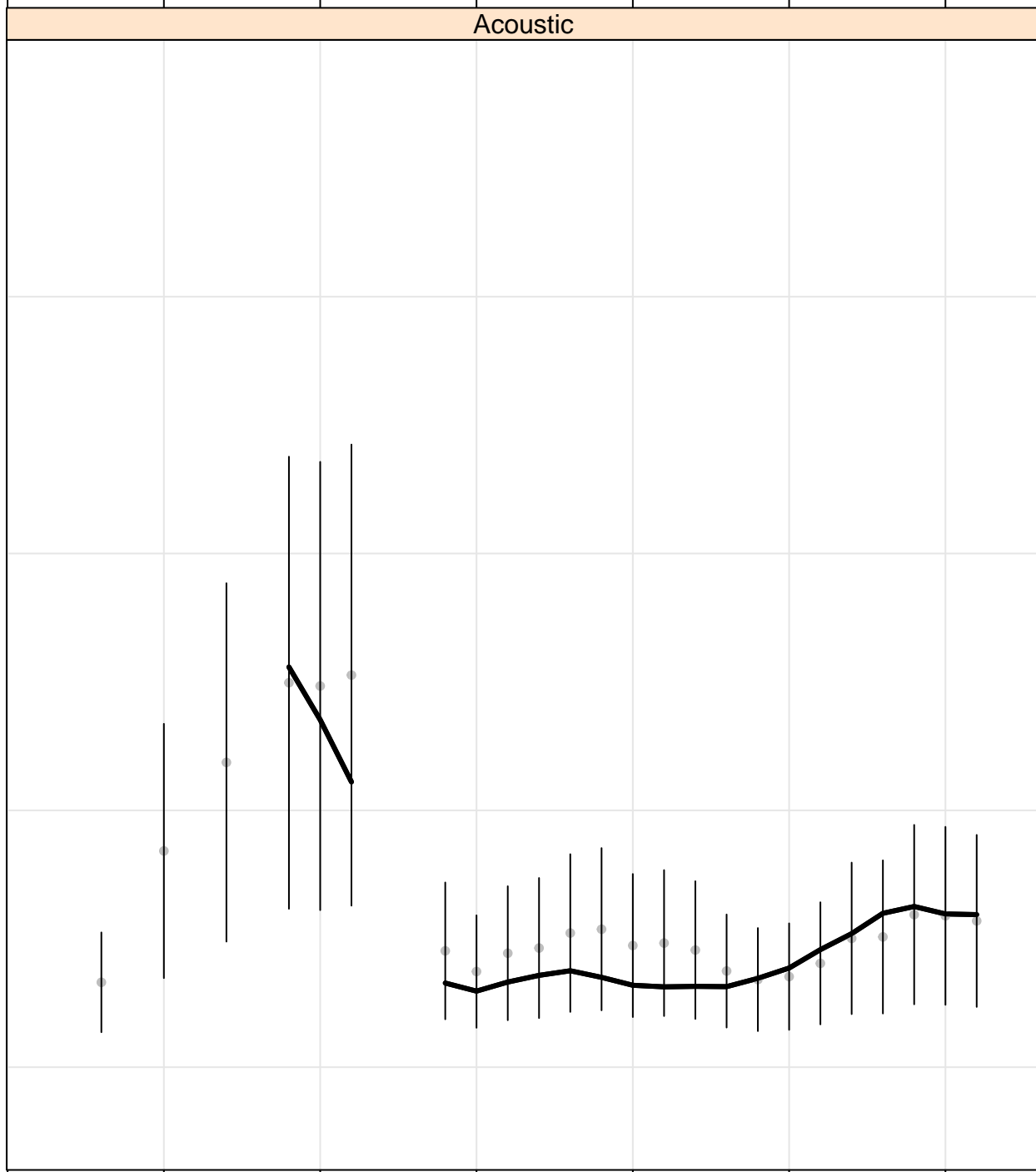
1995      2000      2005      2010      2015      2020

Acoustic

Normalized index value

1995      2000      2005      2010      2015      2020

Years

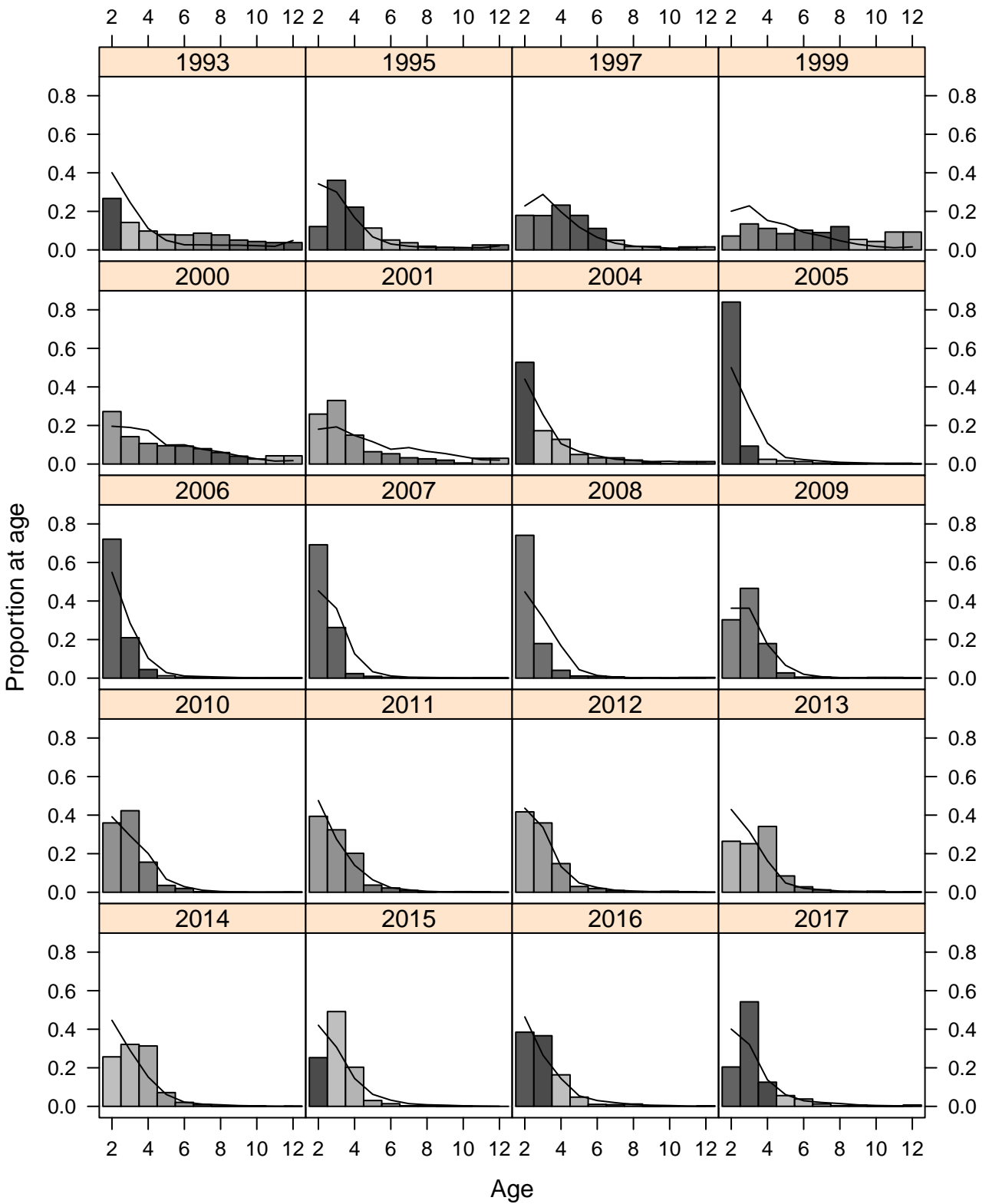


# Age fits Acoustic

Observed



Predicted ●



# Standardized survey residuals

-5.97

-4.48

-2.99



-1.5

-0.01

1.48



Log residuals

Acoustic

1995

2000

2005

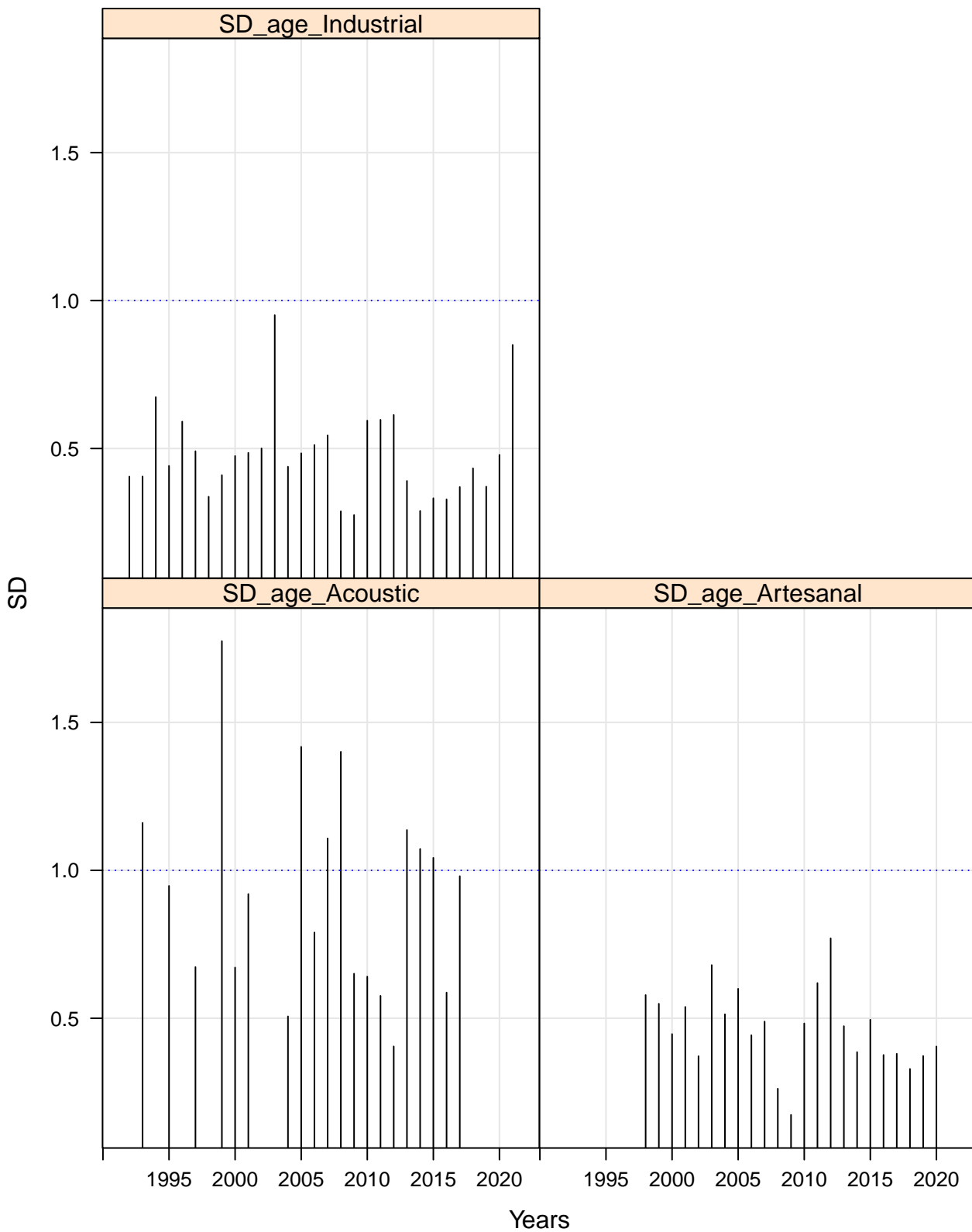
2010

2015

2020

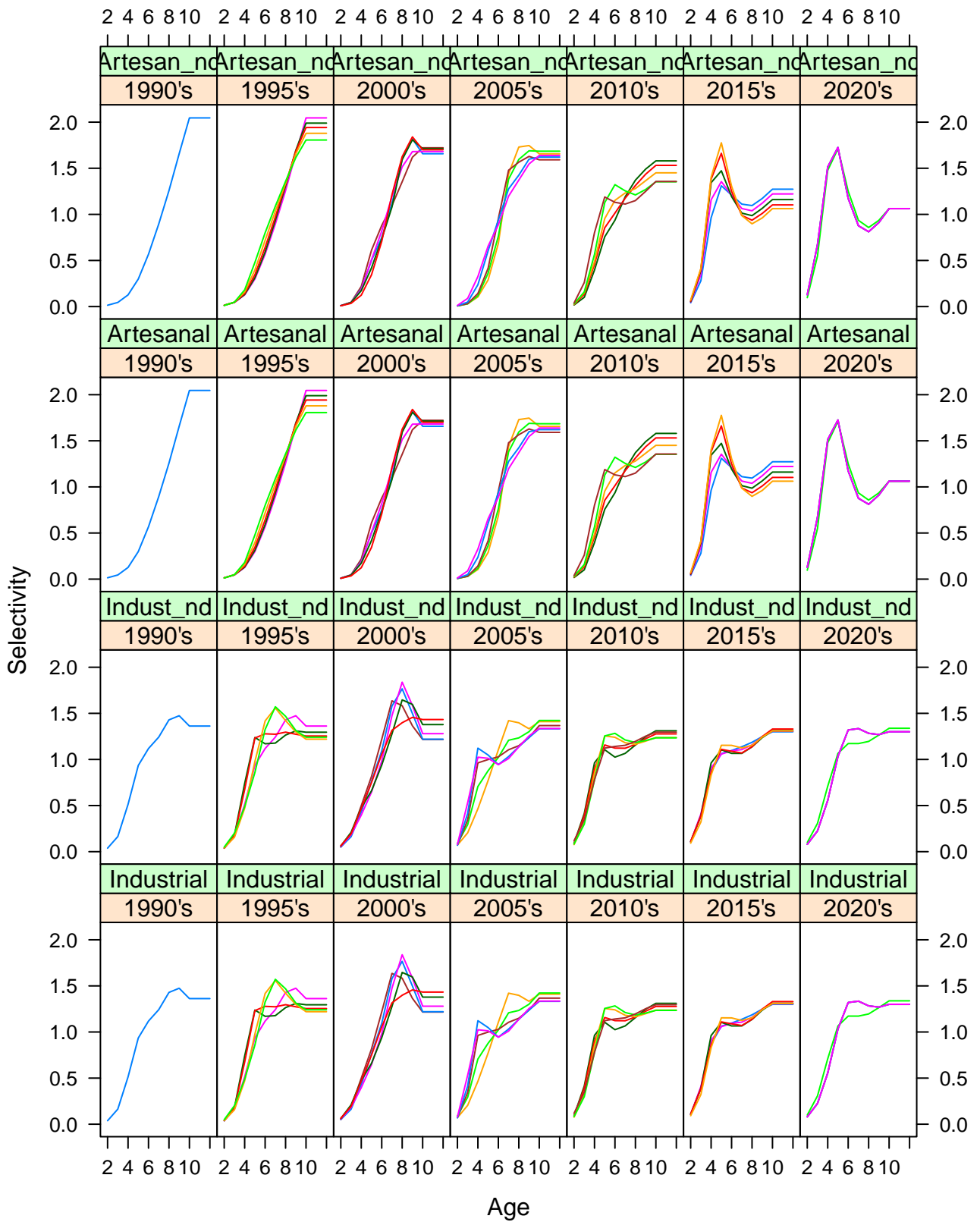
Years

# SD per input series



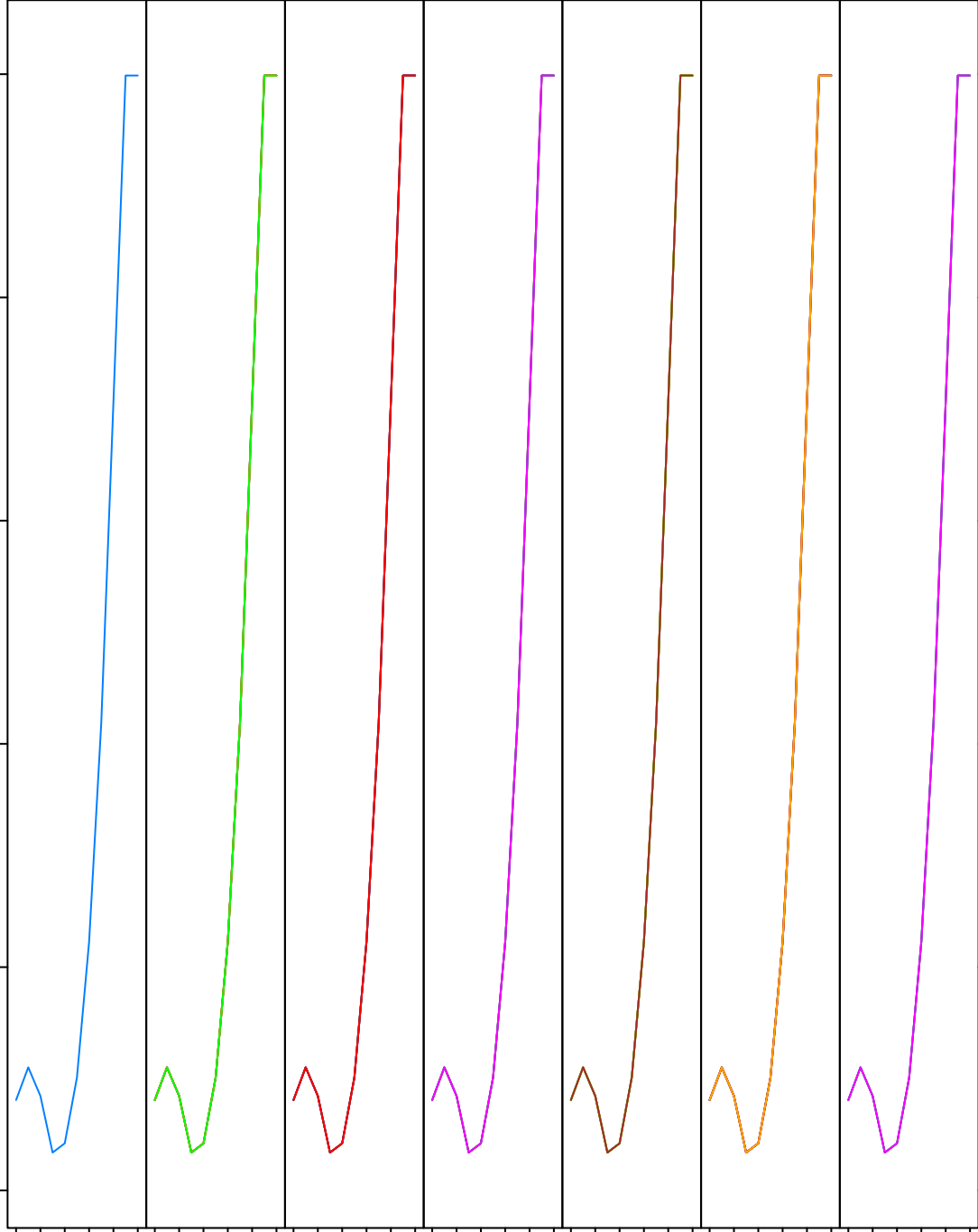


# Selectivity of the Fishery by Pentad



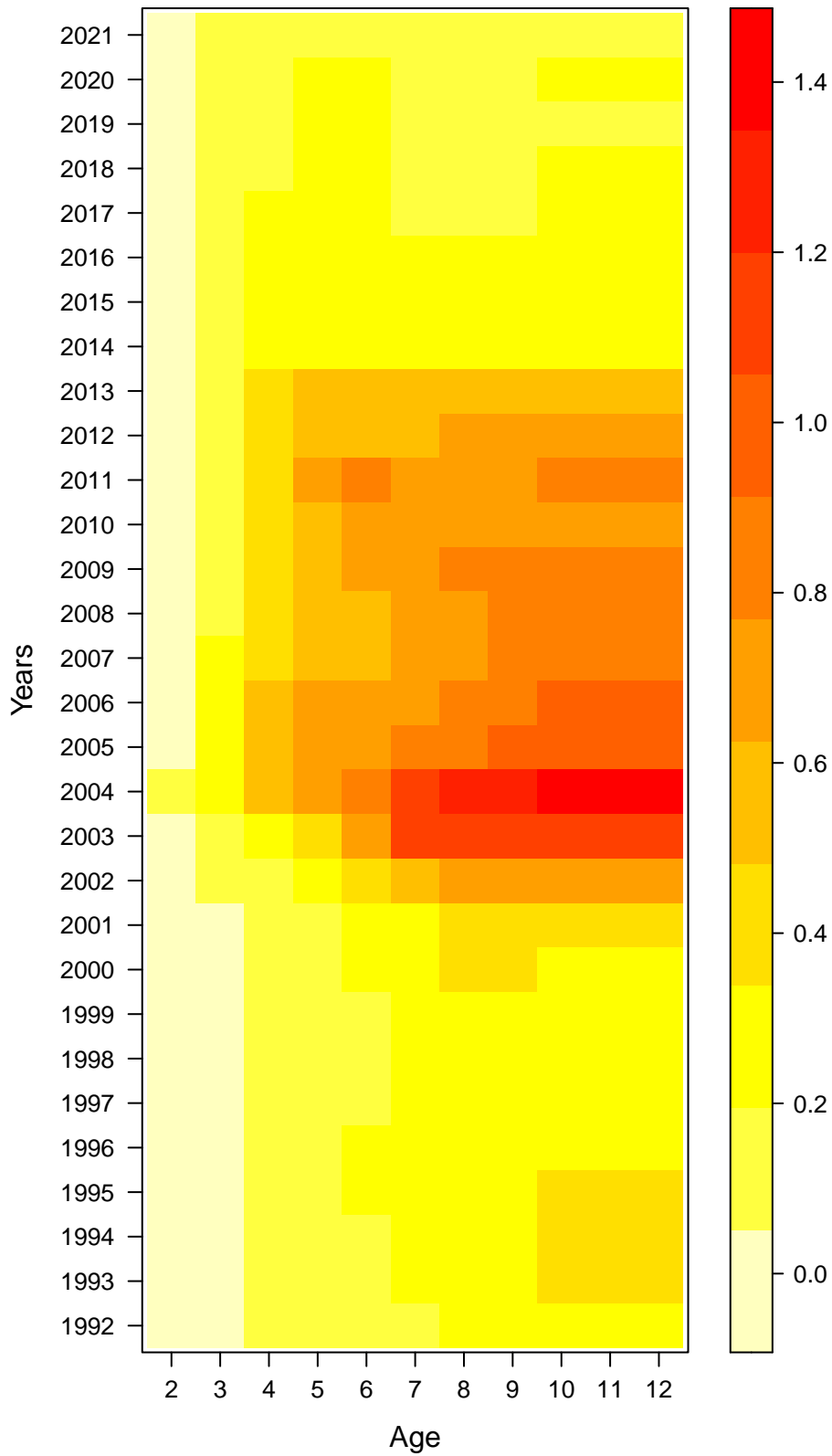
# Selectivity of the survey by Pentad

|          |   |   |   |    |          |   |   |   |    |          |   |   |   |    |          |   |   |   |    |          |   |   |   |    |          |   |   |   |    |          |   |   |   |    |
|----------|---|---|---|----|----------|---|---|---|----|----------|---|---|---|----|----------|---|---|---|----|----------|---|---|---|----|----------|---|---|---|----|----------|---|---|---|----|
| 2        | 4 | 6 | 8 | 10 | 2        | 4 | 6 | 8 | 10 | 2        | 4 | 6 | 8 | 10 | 2        | 4 | 6 | 8 | 10 | 2        | 4 | 6 | 8 | 10 | 2        | 4 | 6 | 8 | 10 | 2        | 4 | 6 | 8 | 10 |
| Acoustic |   |   |   |    | Acoustic |   |   |   |    | Acoustic |   |   |   |    | Acoustic |   |   |   |    | Acoustic |   |   |   |    | Acoustic |   |   |   |    | Acoustic |   |   |   |    |
| 1990's   |   |   |   |    | 1995's   |   |   |   |    | 2000's   |   |   |   |    | 2005's   |   |   |   |    | 2010's   |   |   |   |    | 2015's   |   |   |   |    | 2020's   |   |   |   |    |

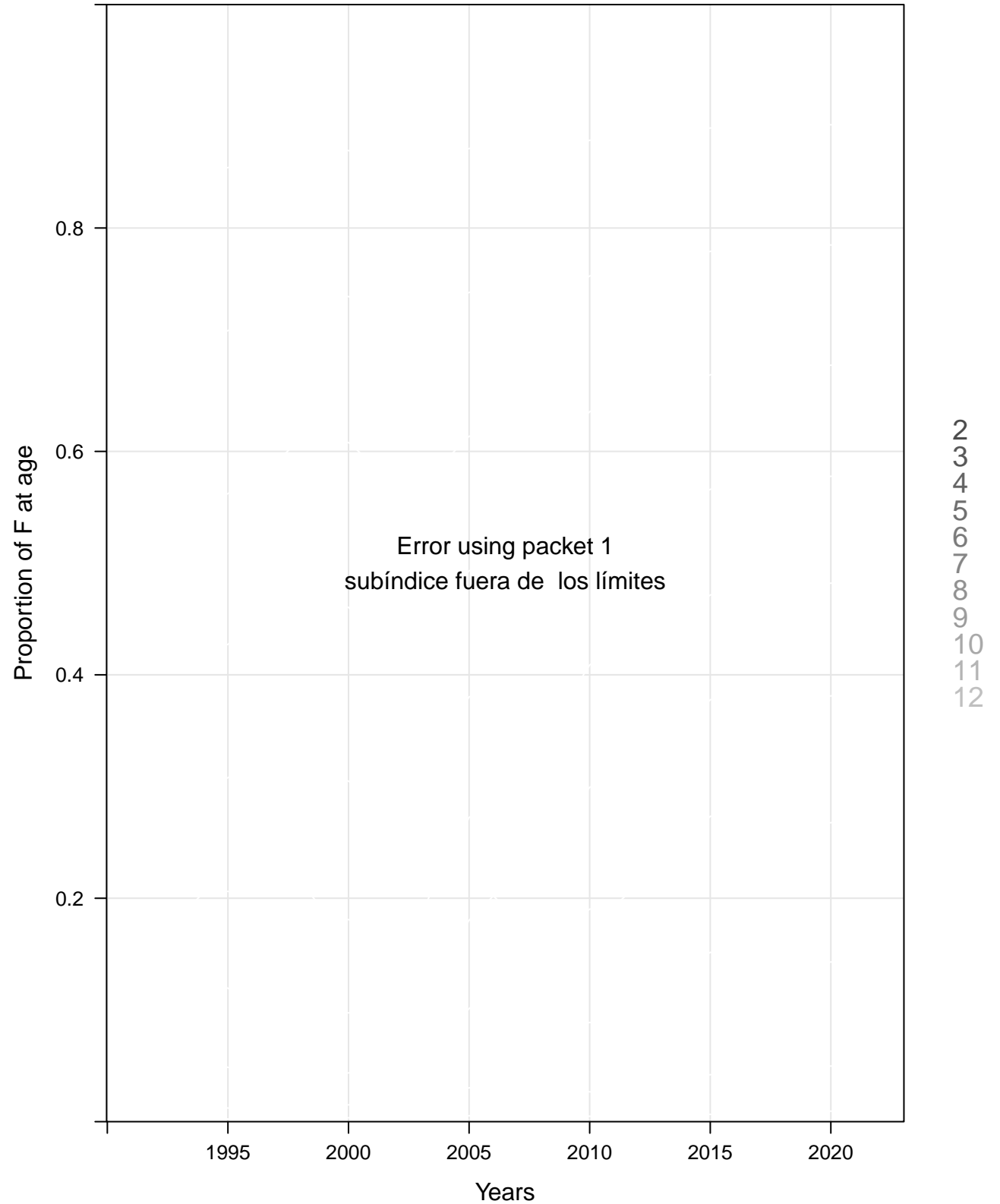


Age

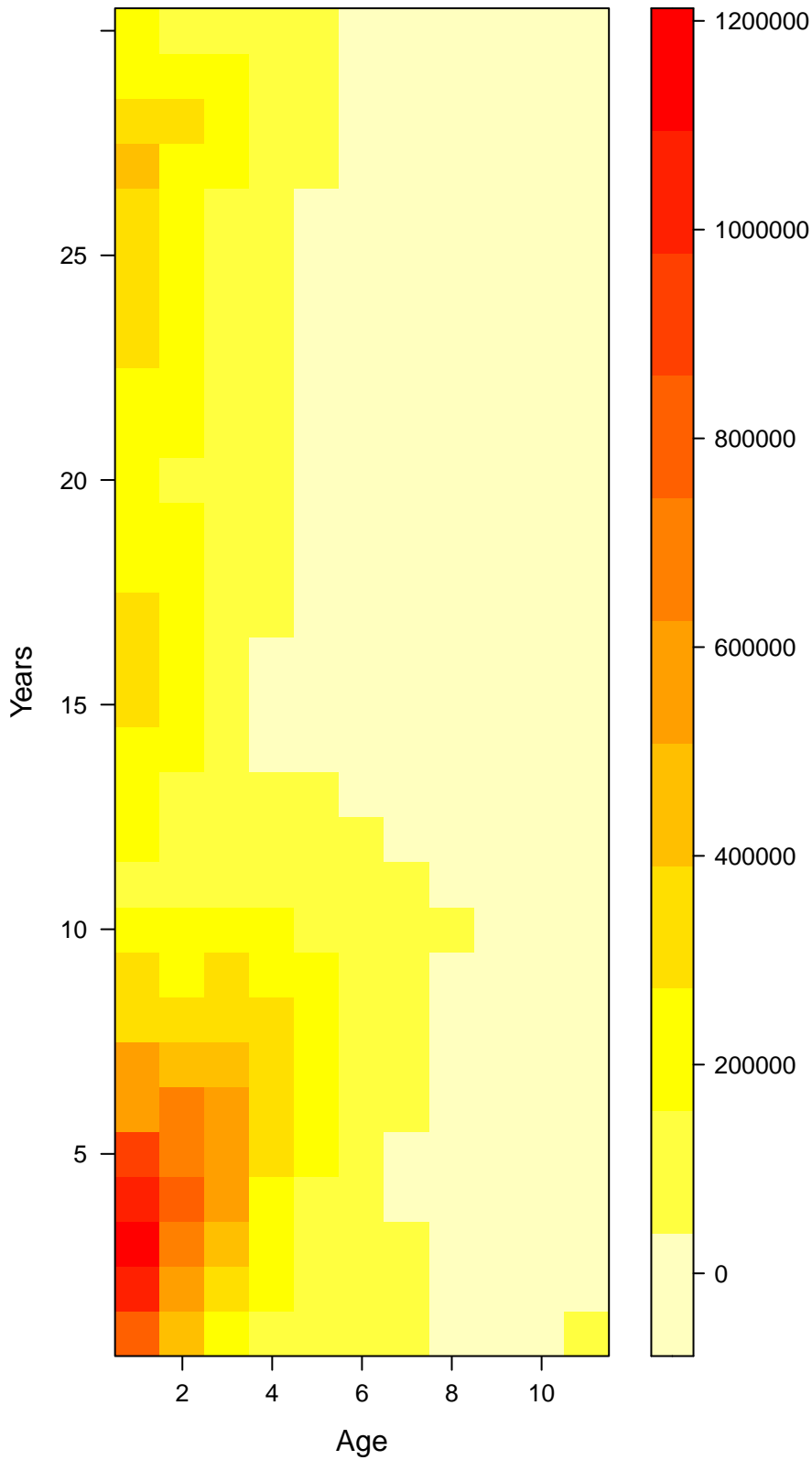
## F at age



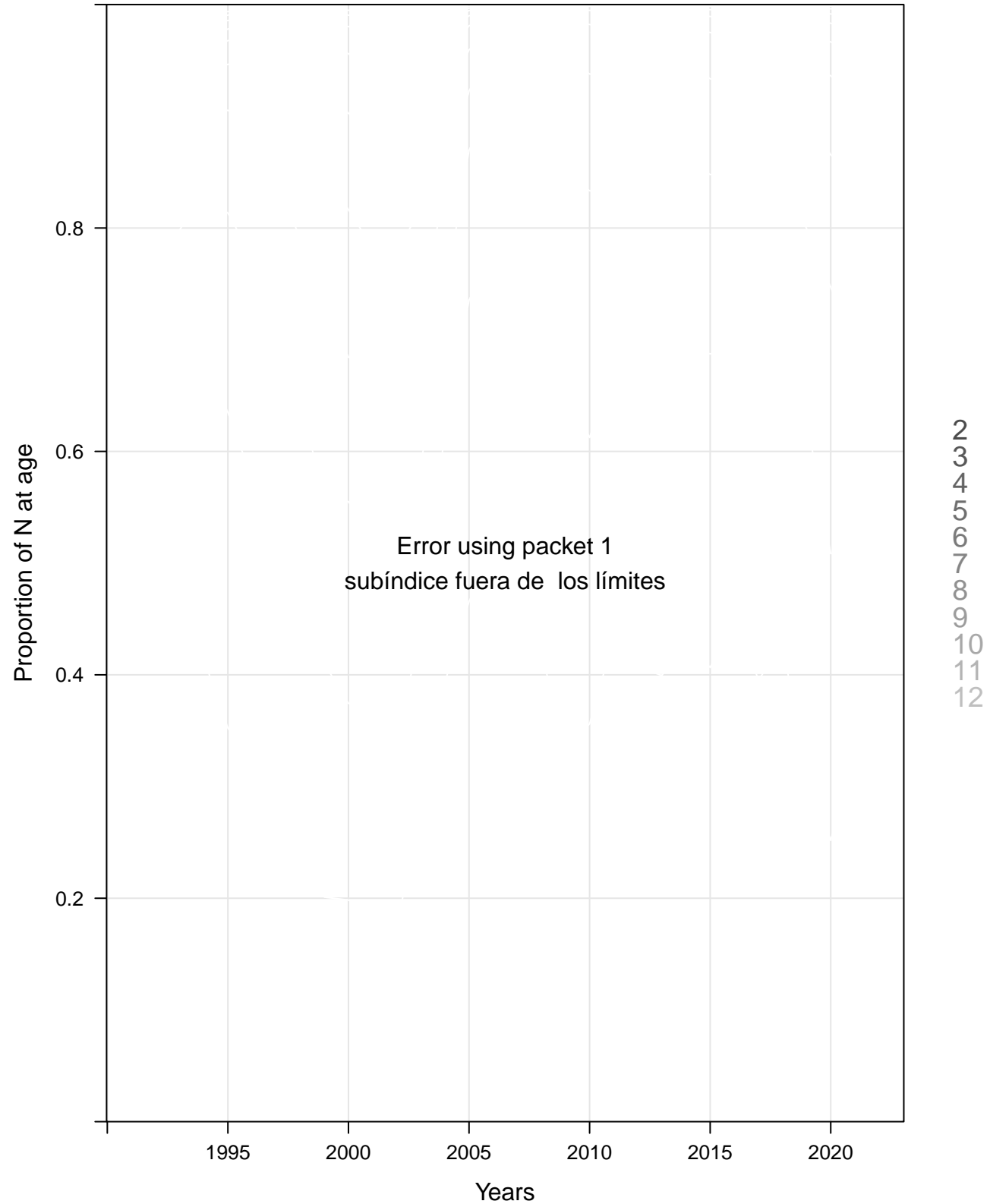
F proportion at age



**N at age**



Proportion at age

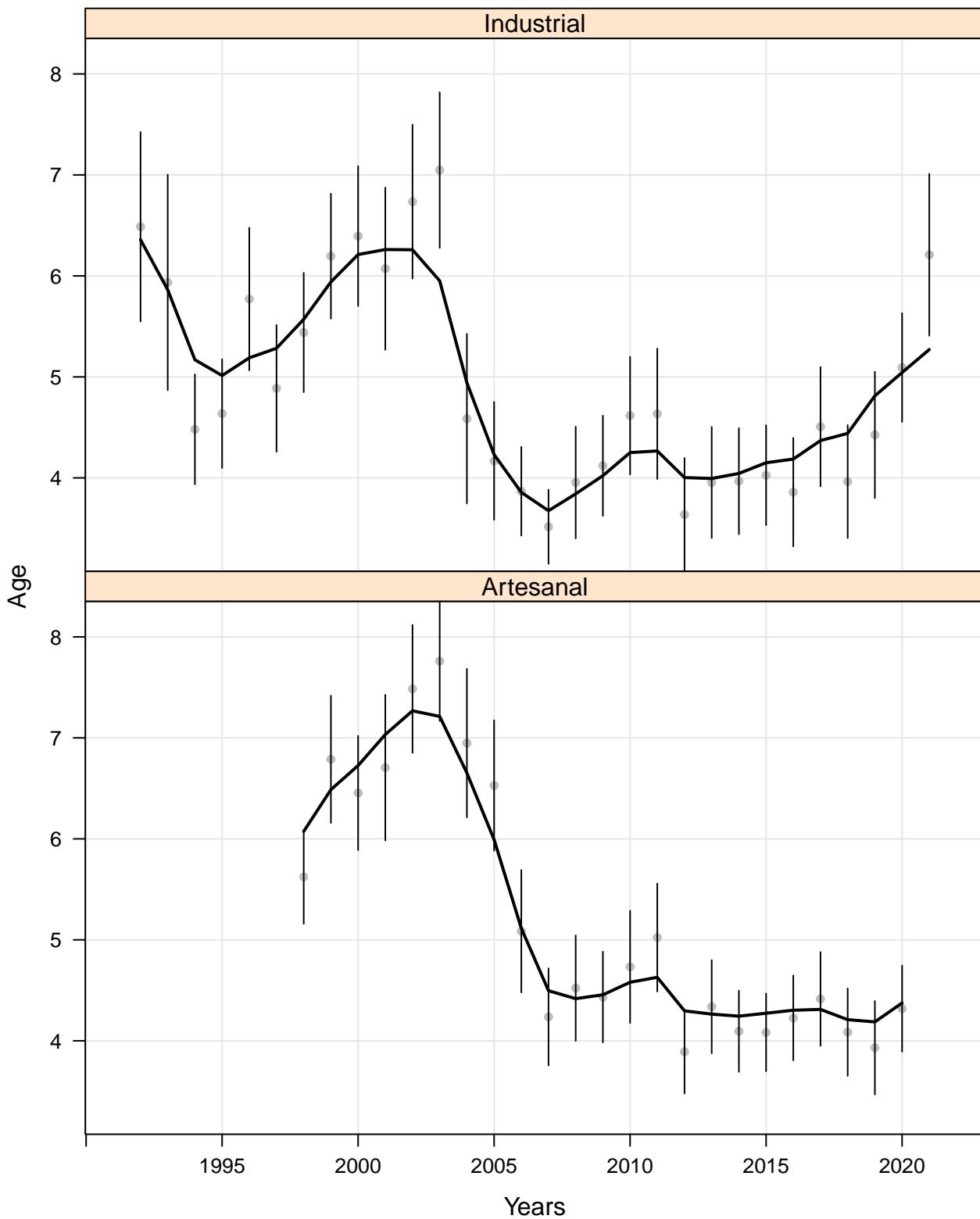


# Fishery mean age

Observed



Modelled

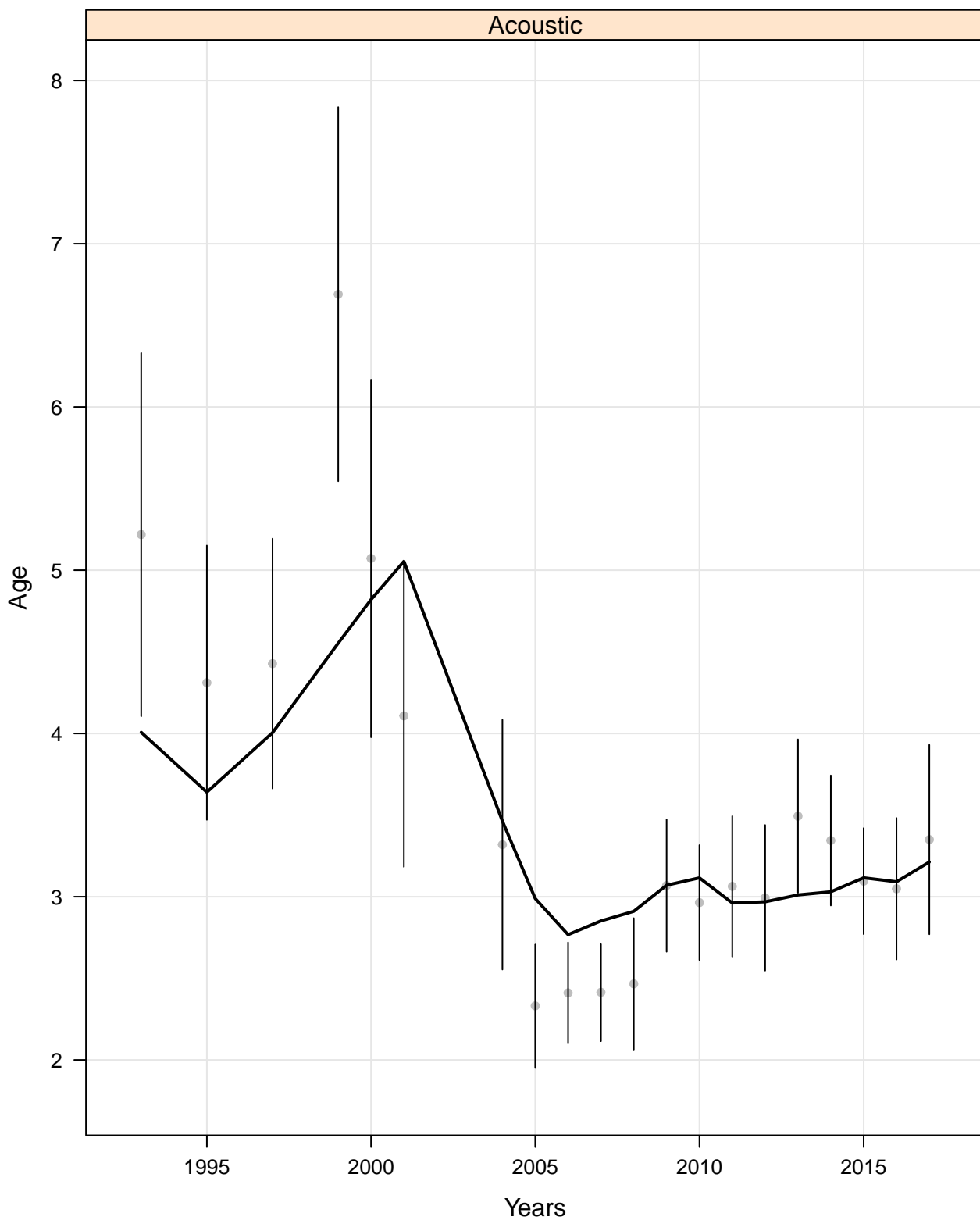


# Survey mean age

Observed

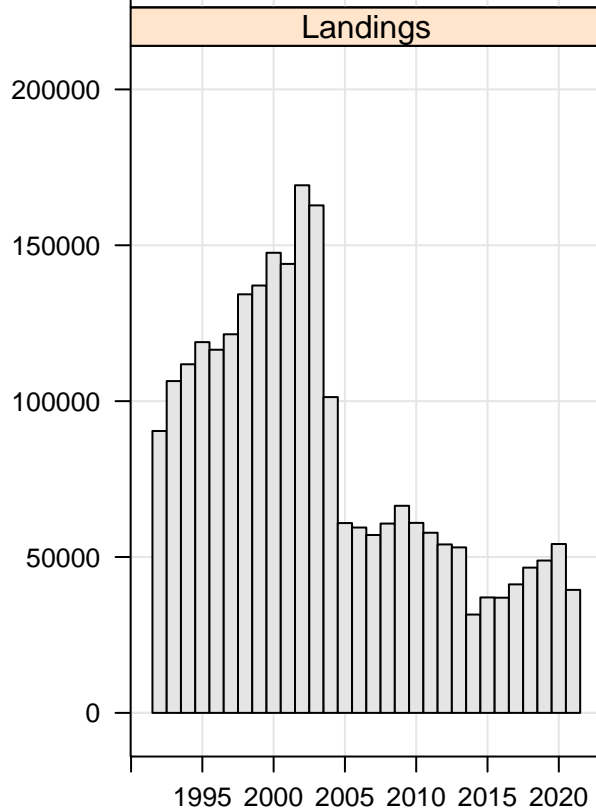
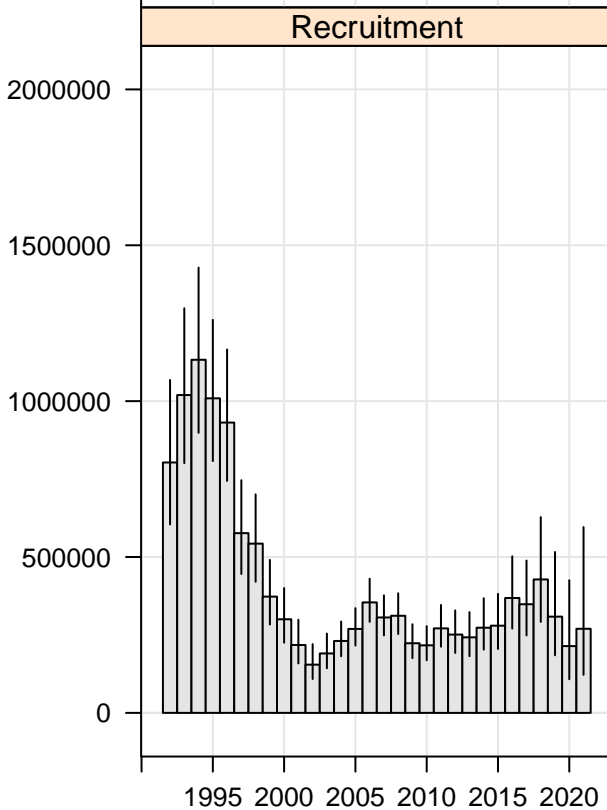
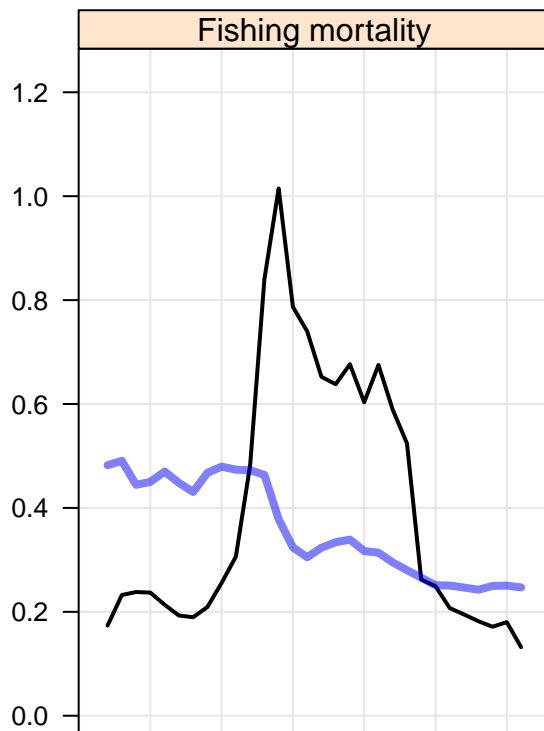
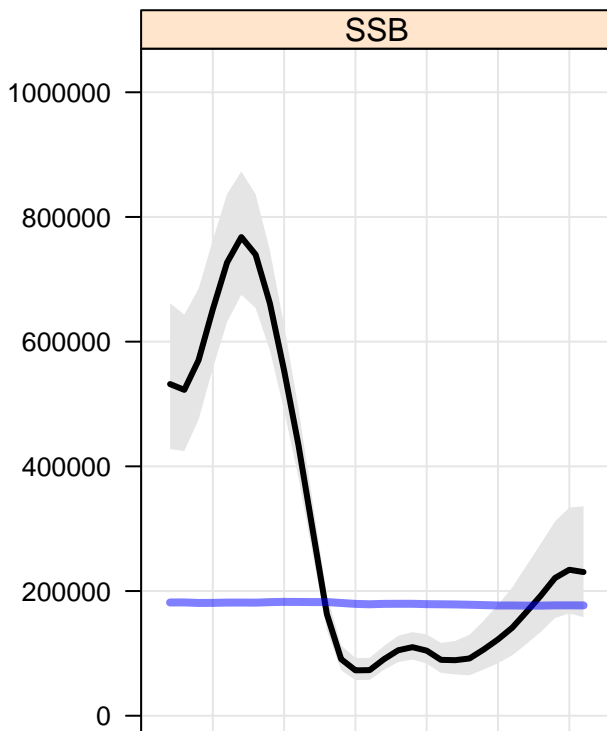


Modelled





data



year

data

Total biomass

1500000

1000000

500000

Fishing mortality

1.0

0.8

0.6

0.4

0.2

Recruitment

1500000

1000000

500000

Unfished biomass

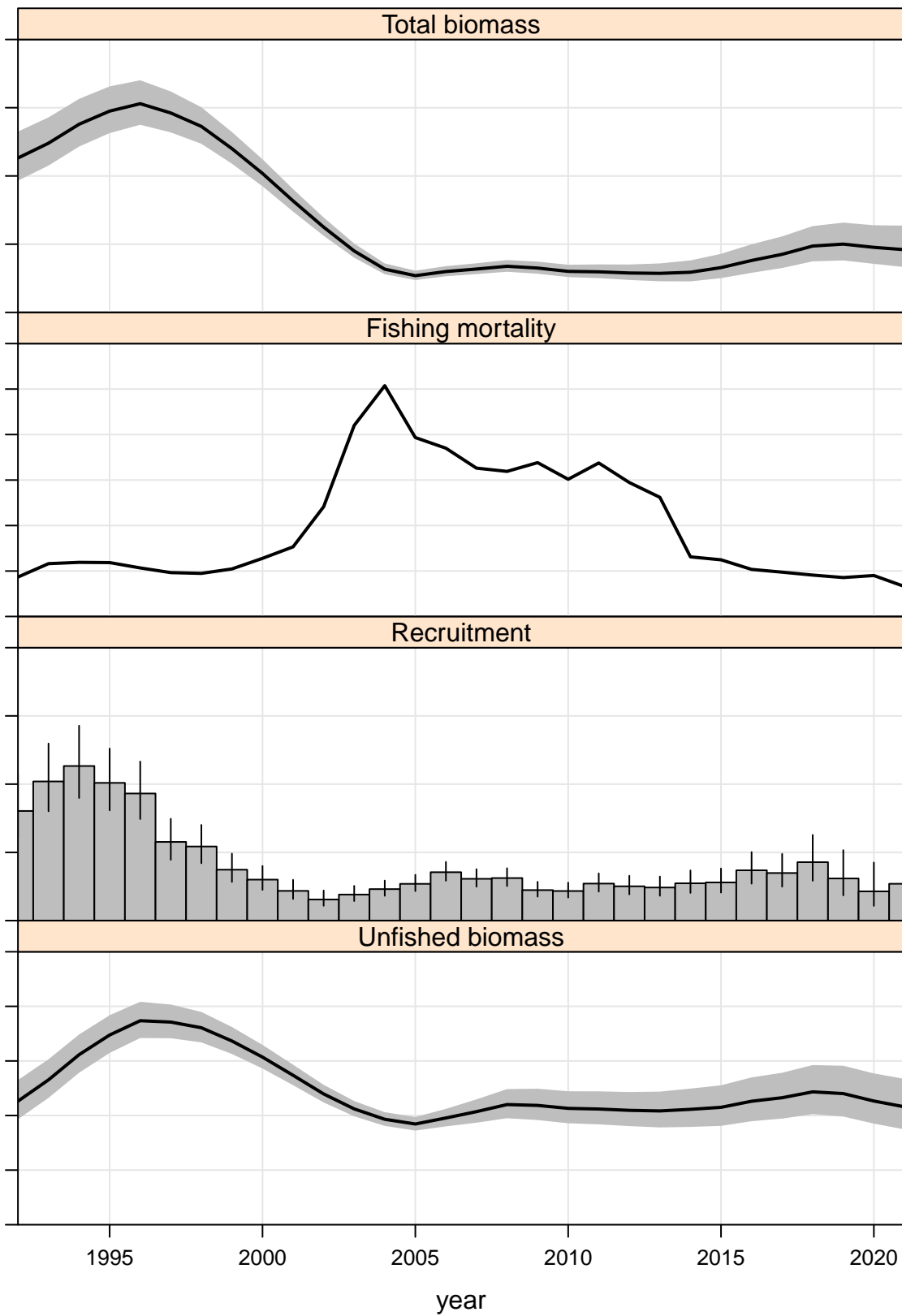
2000000

1500000

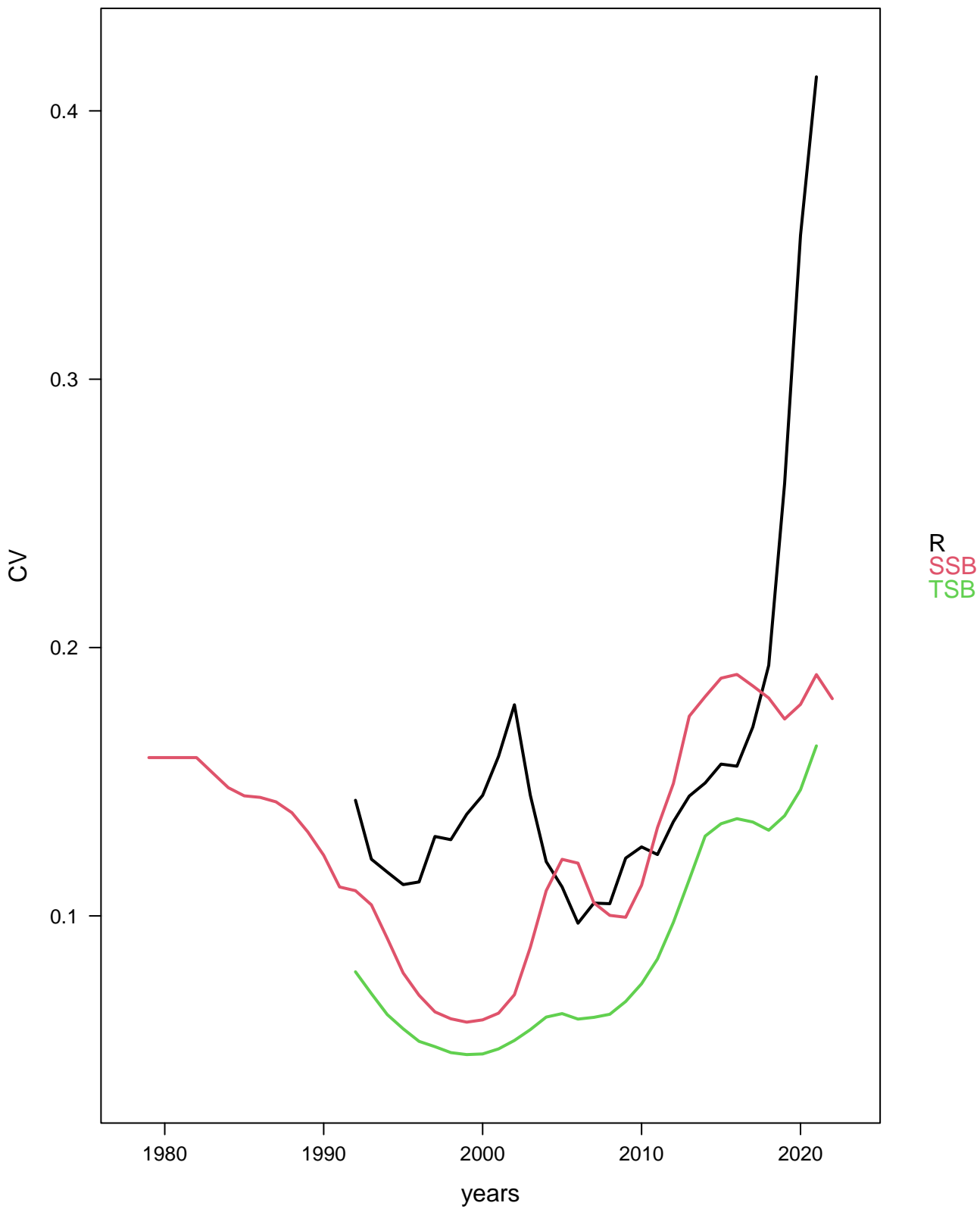
1000000

500000

year



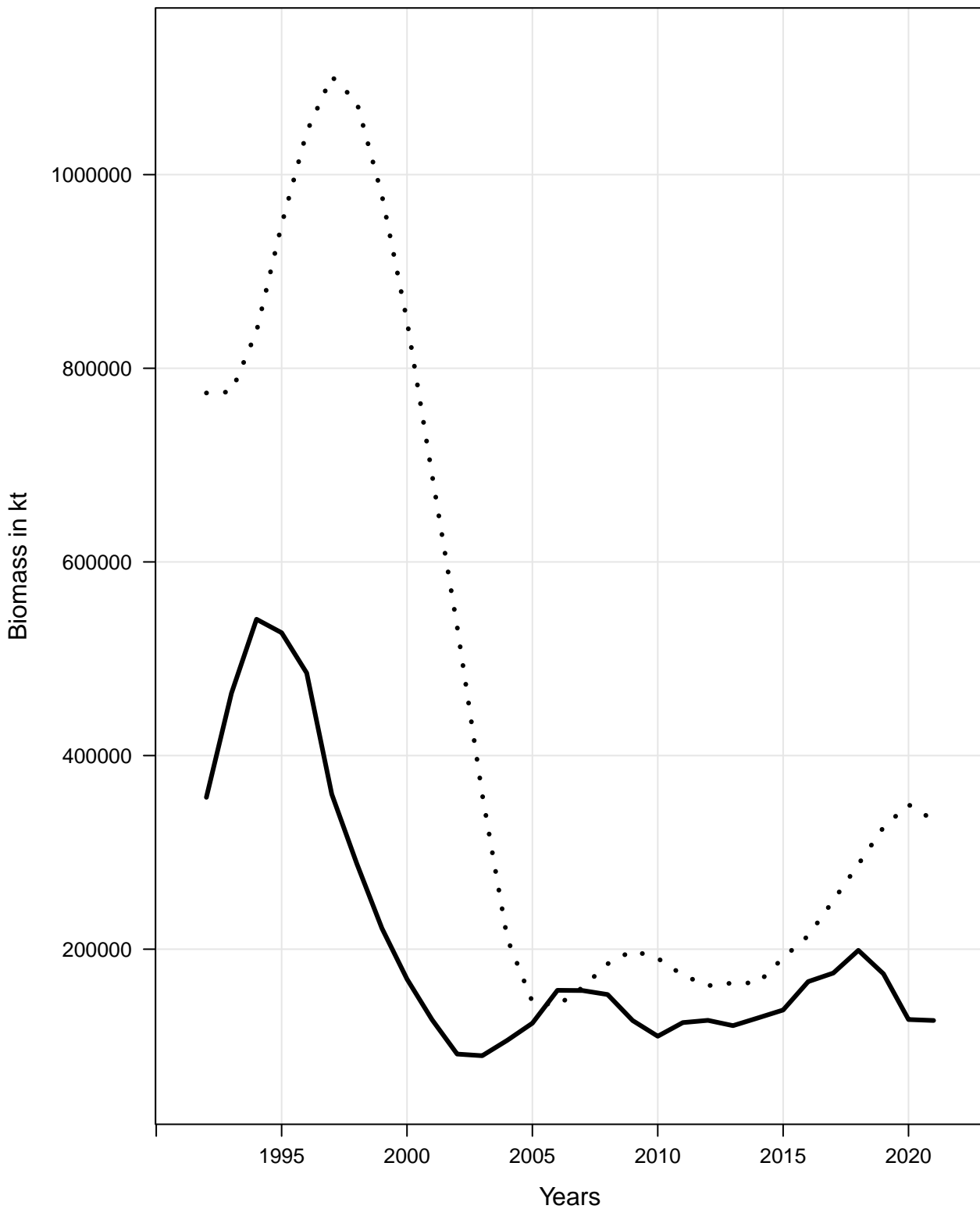
# Uncertainty of key parameters



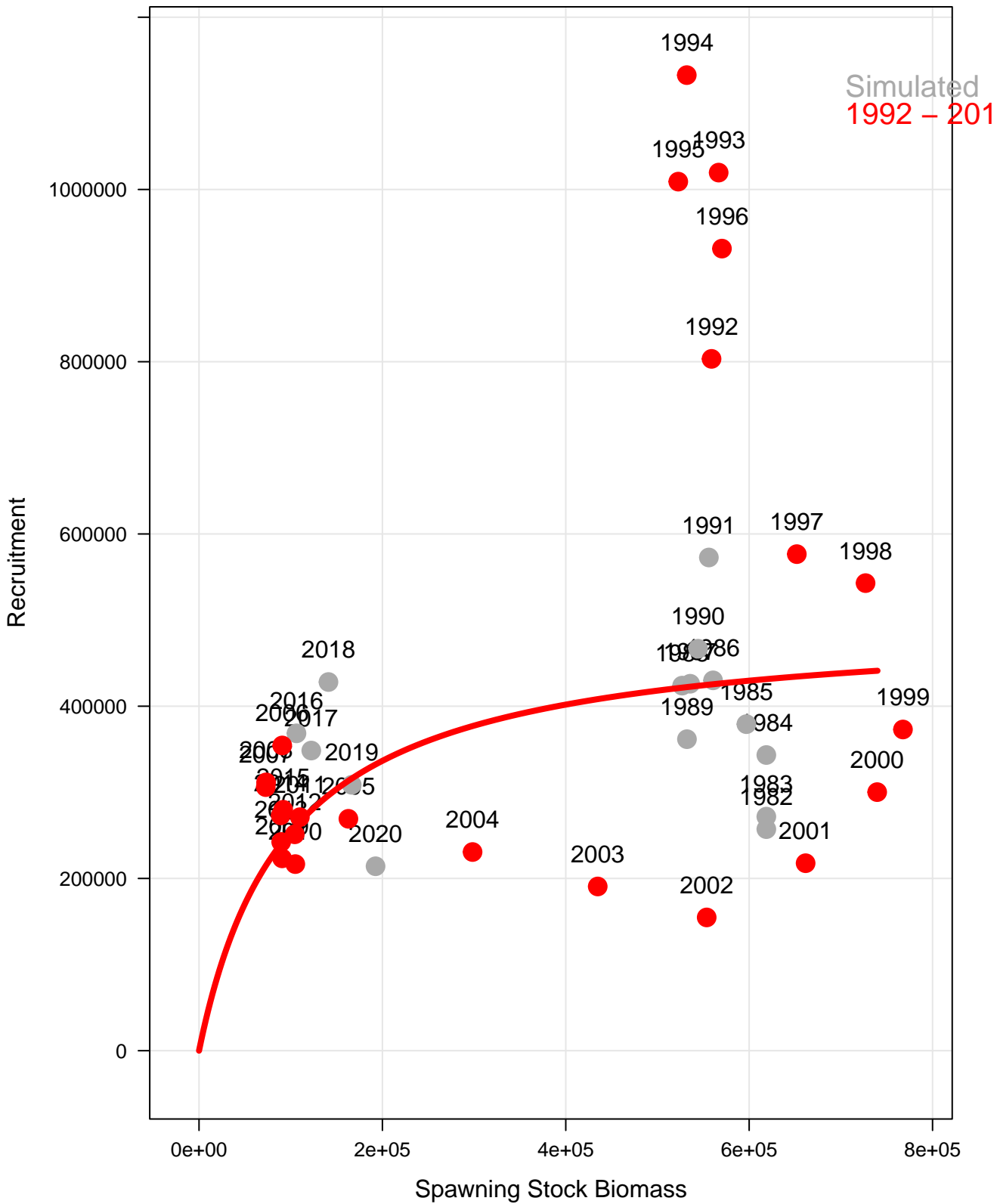
# Mature – Immature fish

Mature . . . .

Immature —

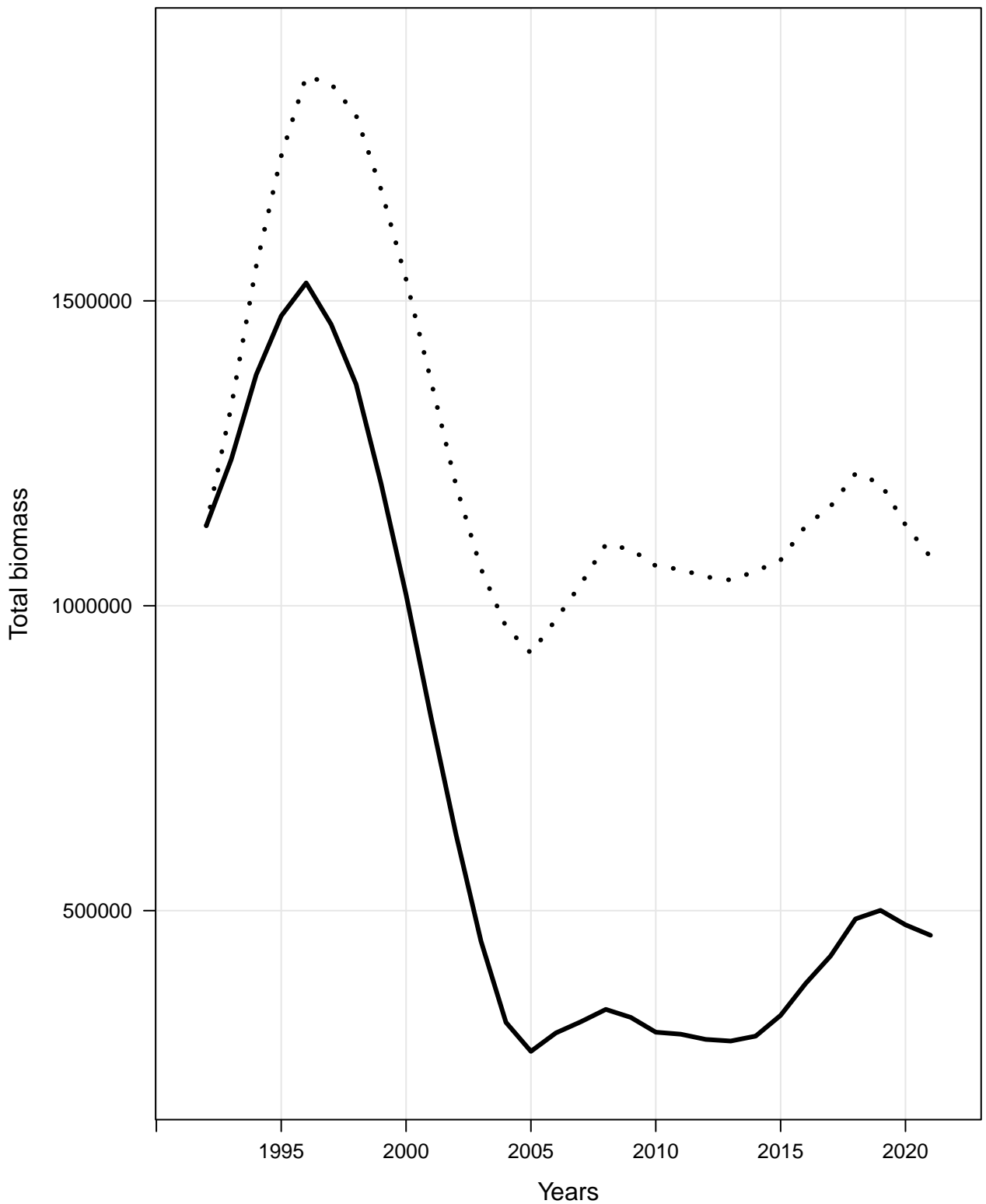


# Stock Recruitment



# Comparing fished with unfished biomass

Fished — Unfished .....



# SSB prediction

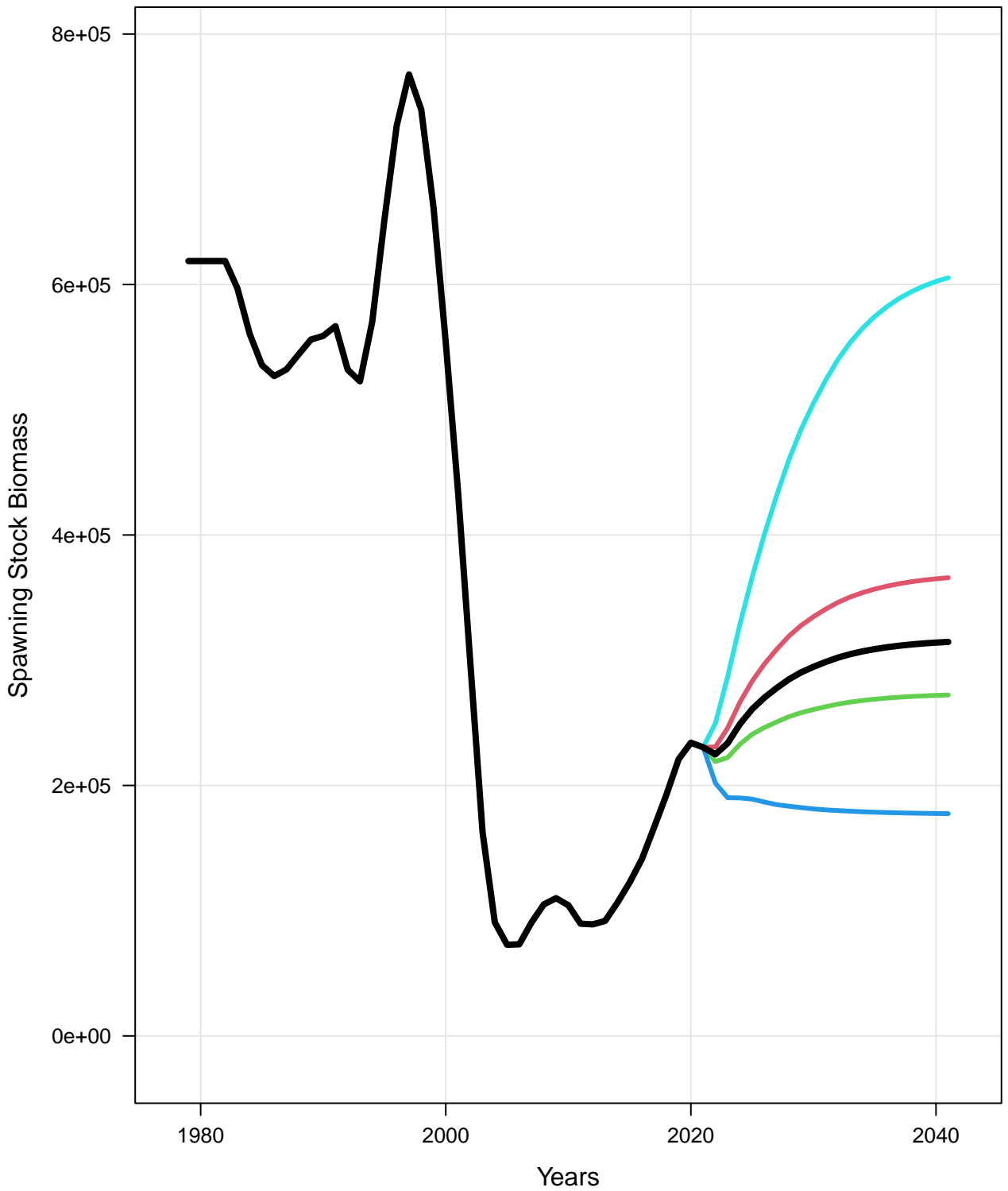
F2021 SQ

F2021 0.75x

F2021 1.25x

FMSY

F2021 0x



# Catch prediction

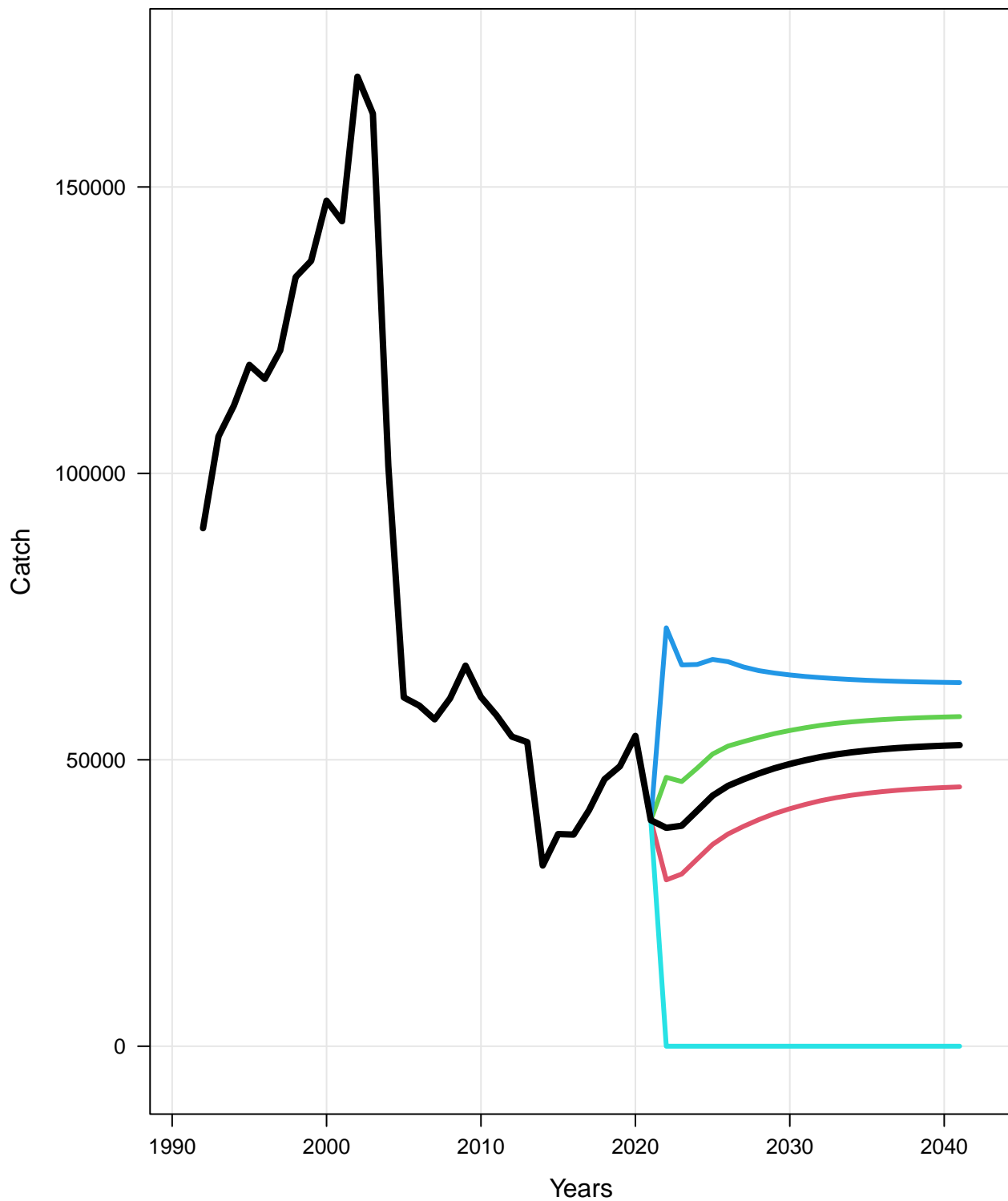
F2021 SQ

F2021 0.75x

F2021 1.25x

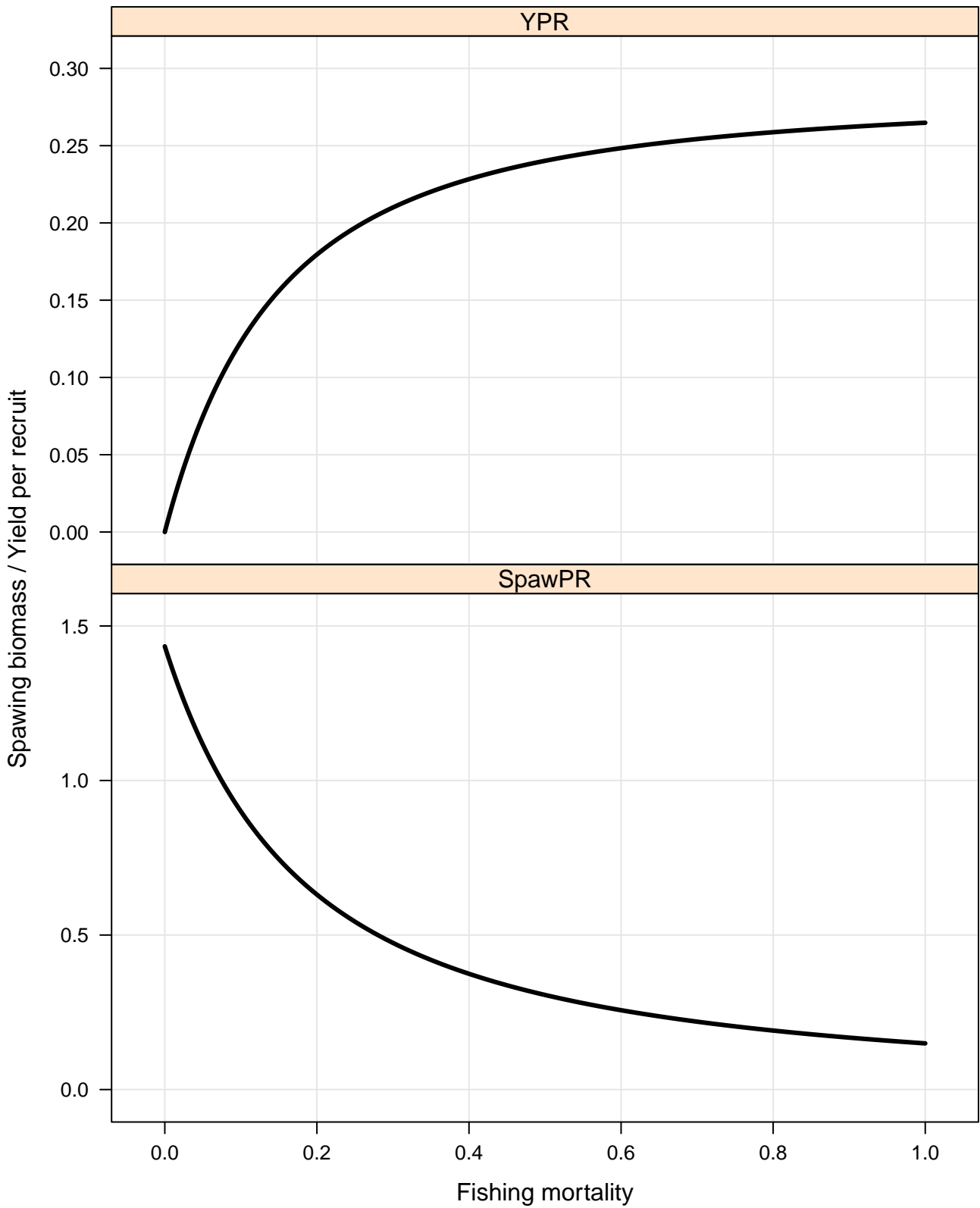
FMSY

F2021 0x

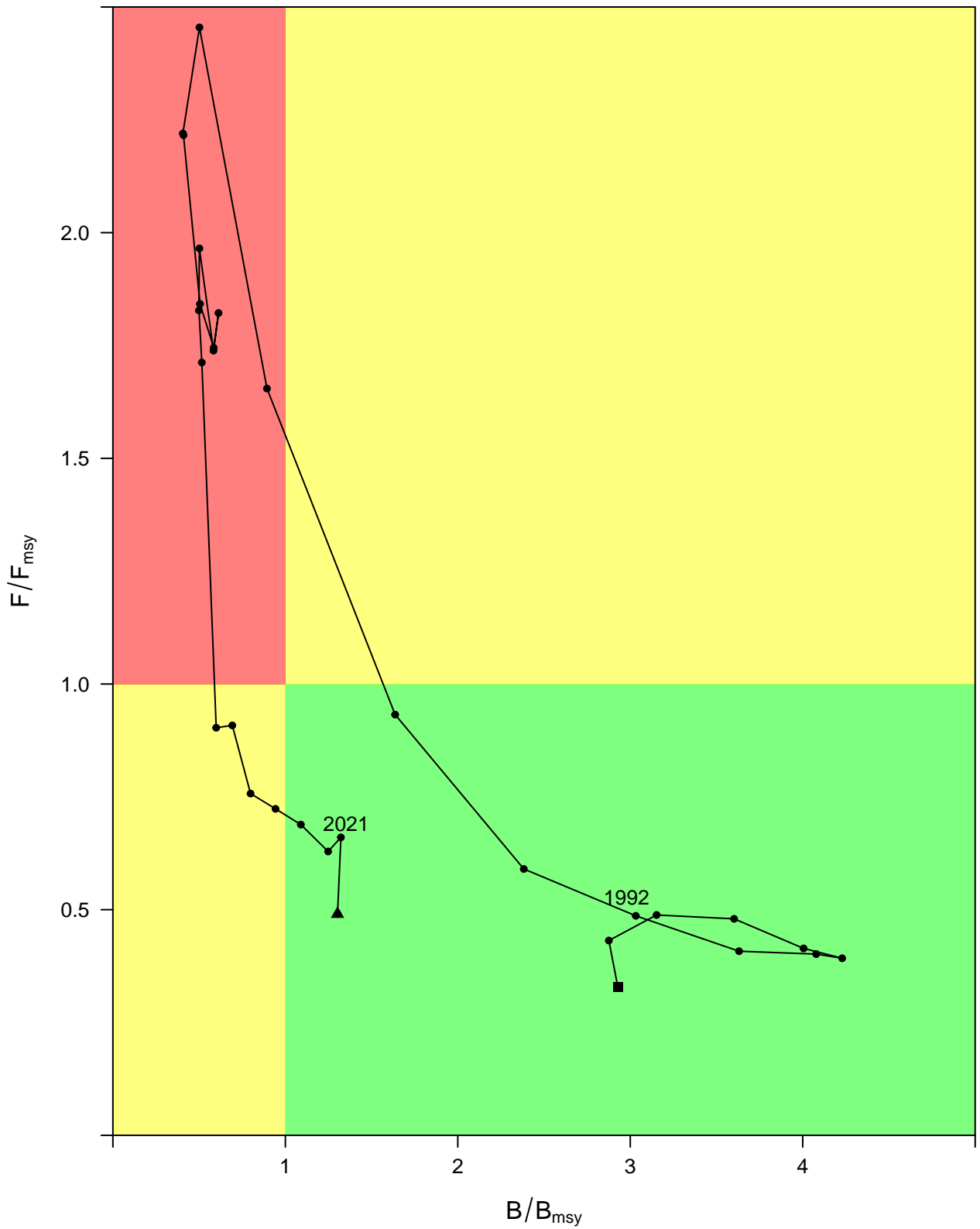


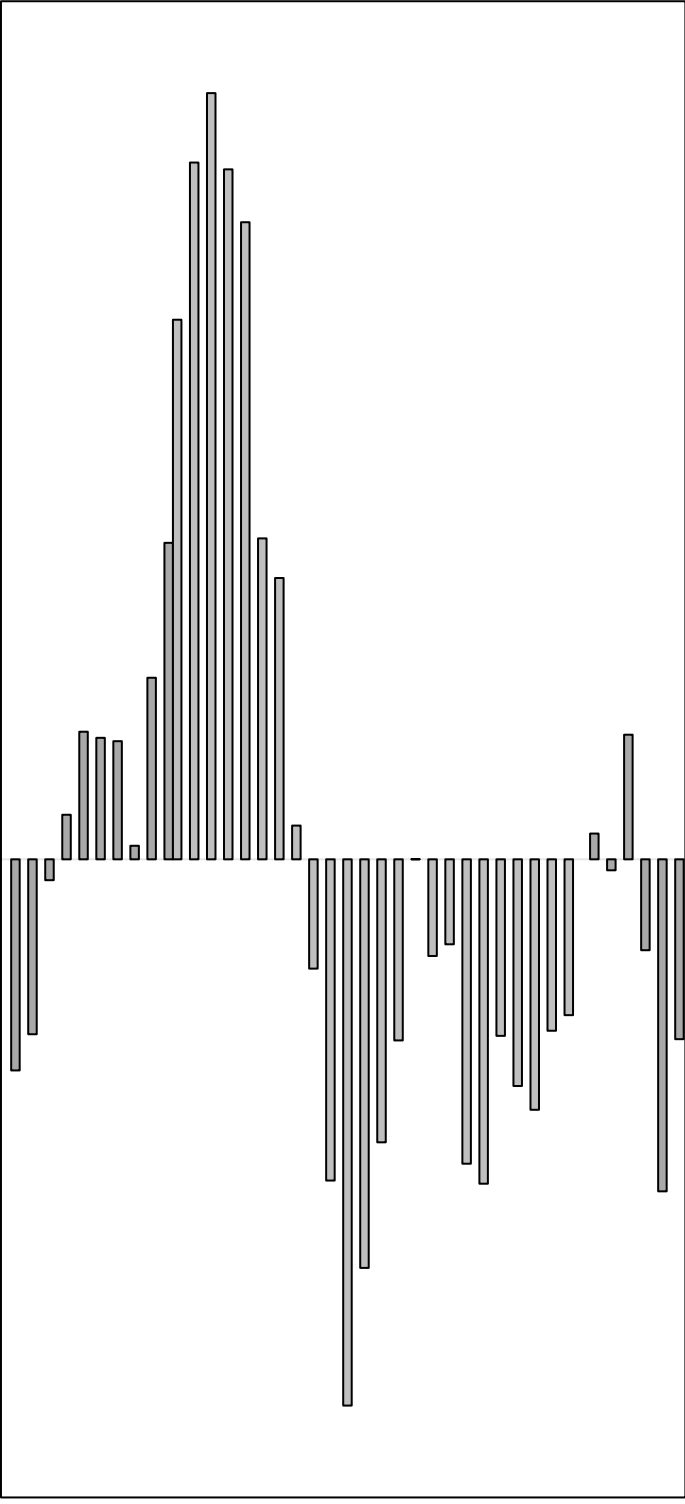


# Yield and spawning stock biomass per recruit



Kobe plot





Simulated  
1992 - 2015



