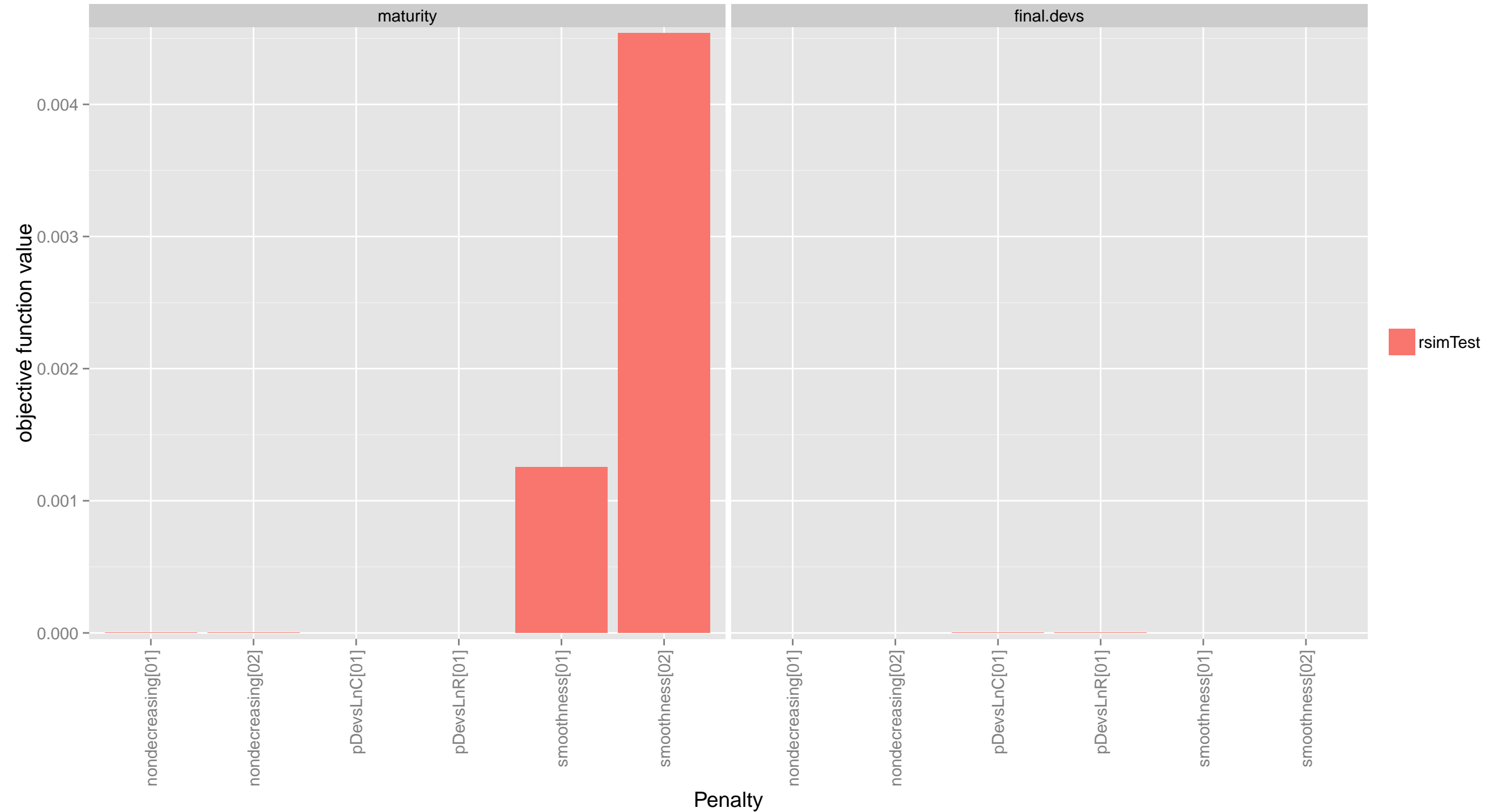


# Penalties

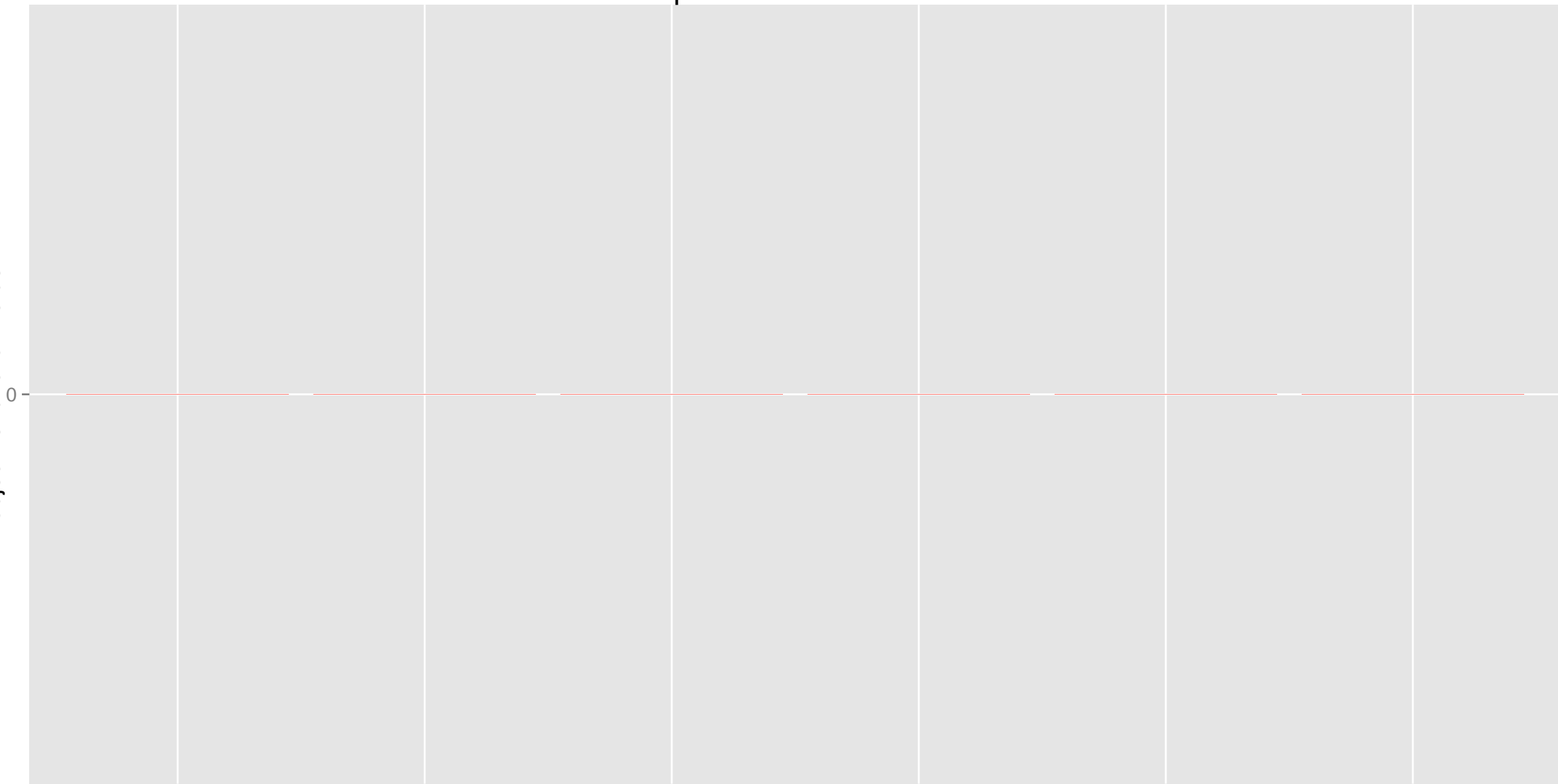
maturity

final.devs



priors: recruitment

objective function value



pDevsLnR[01]

pLgtRX[01]

pLnR[01]

pLnRa[01]

pLnRb[01]

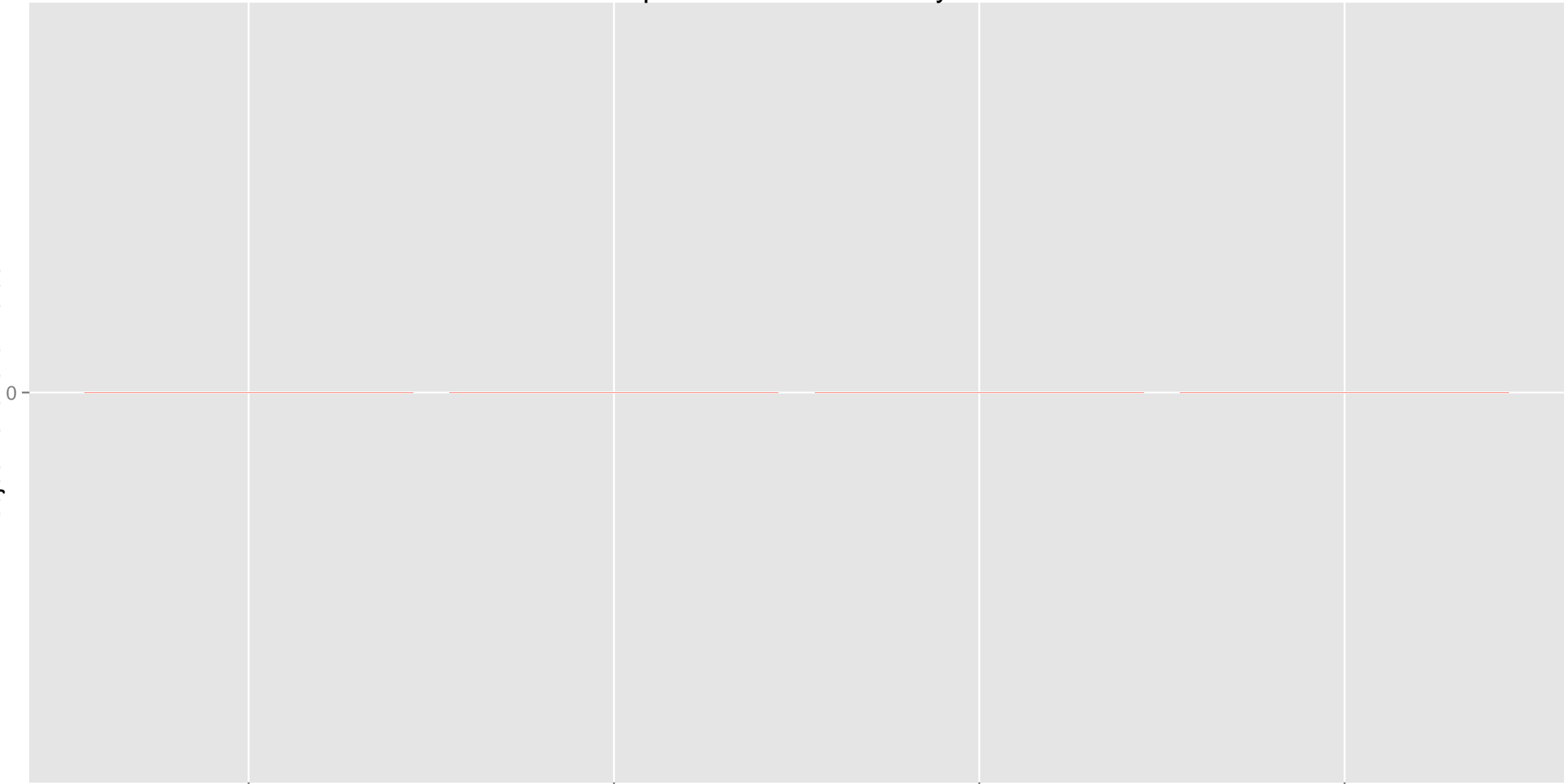
pLnRCV[01]

Parameter

rsimTest

priors: natural mortality

objective function value



0

pLnDMM[01]

pLnDMX[01]

pLnDMXX[01]

pLnM[01]

Parameter

rsimTest

priors: growth

objective function value



0

pLnGrA[01]

pLnGrA[02]

pLnGrB[01]

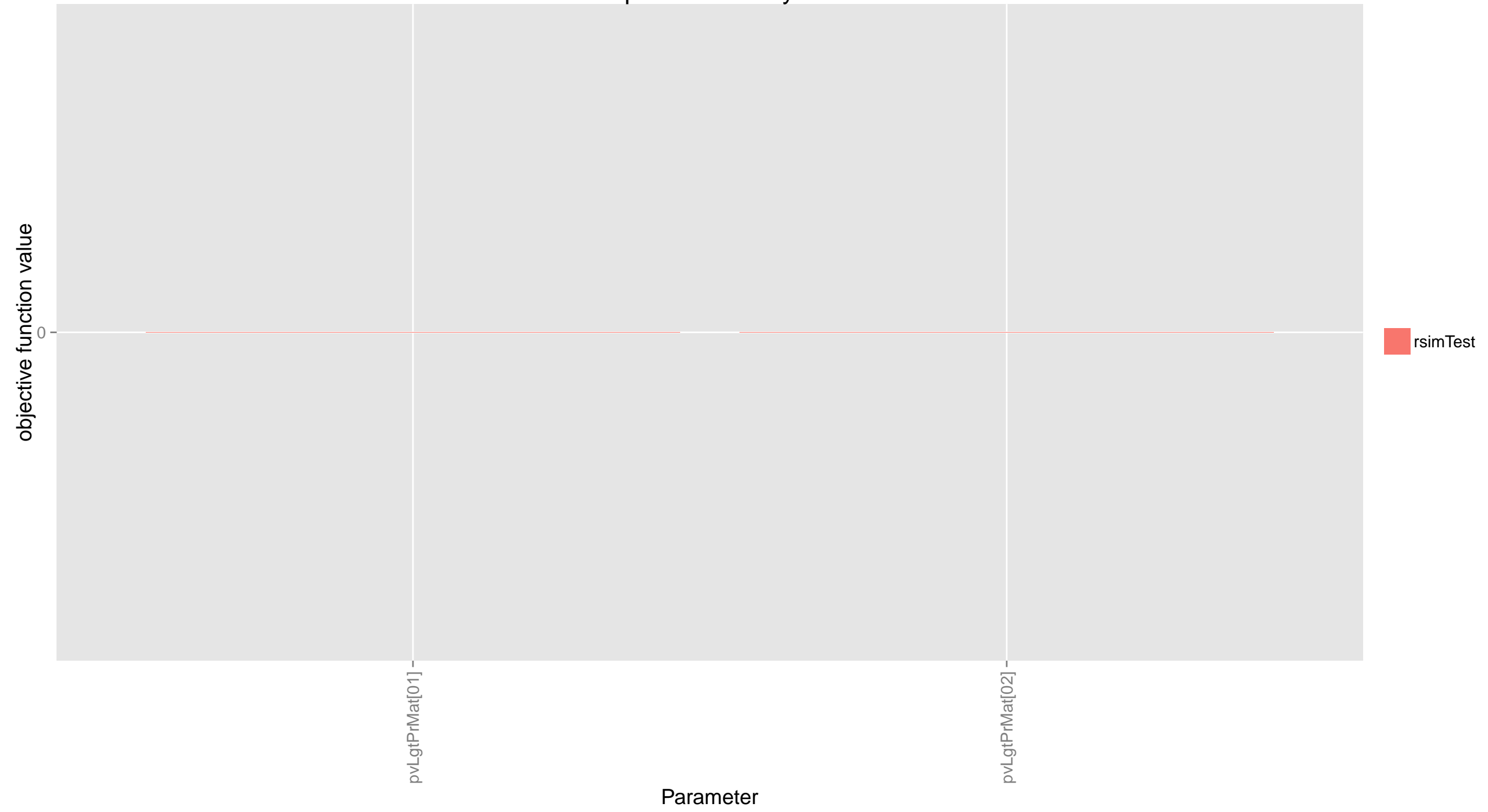
pLnGrB[02]

pLnGrBeta[01]

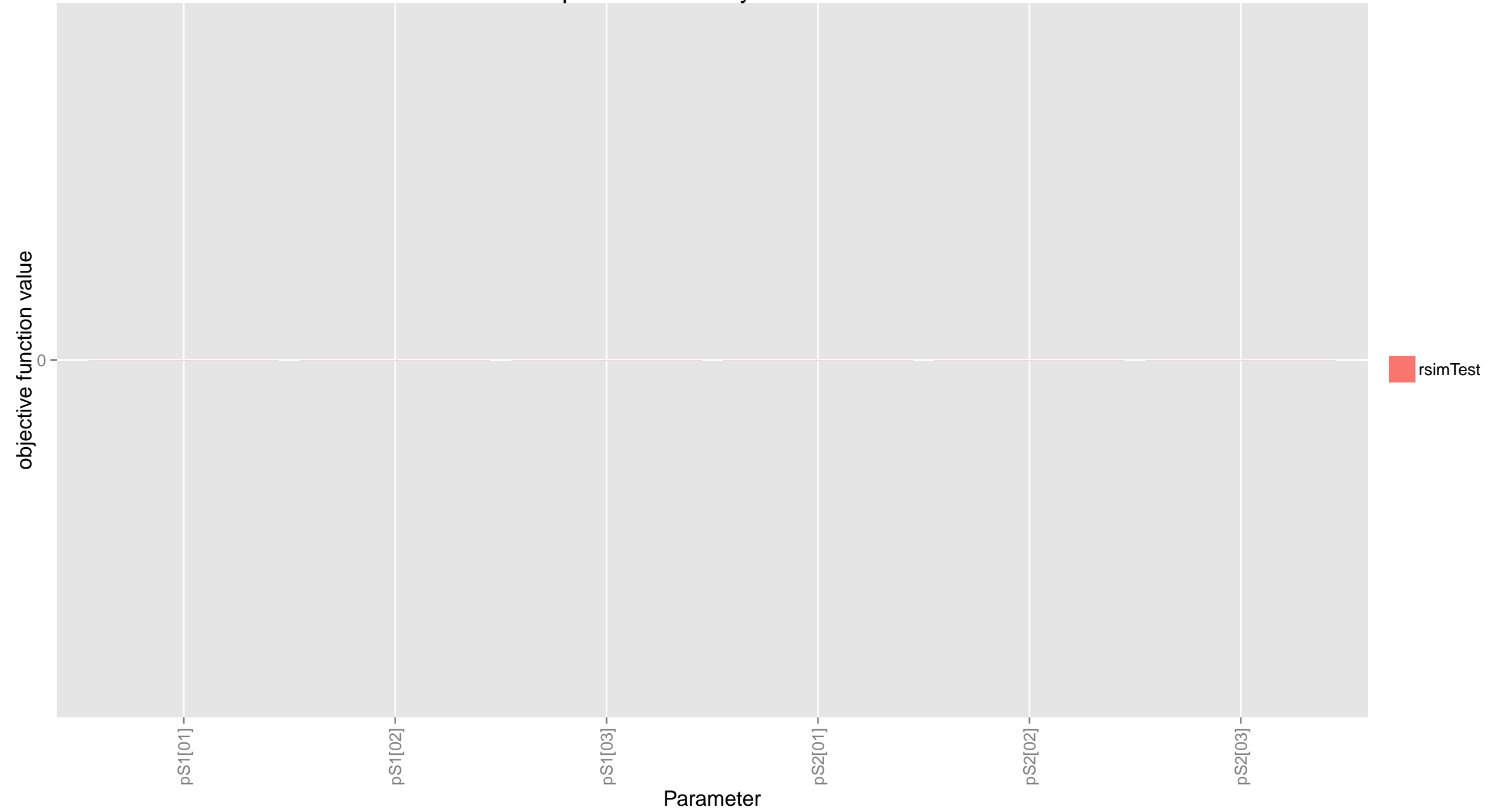
Parameter

rsimTest

priors: maturity

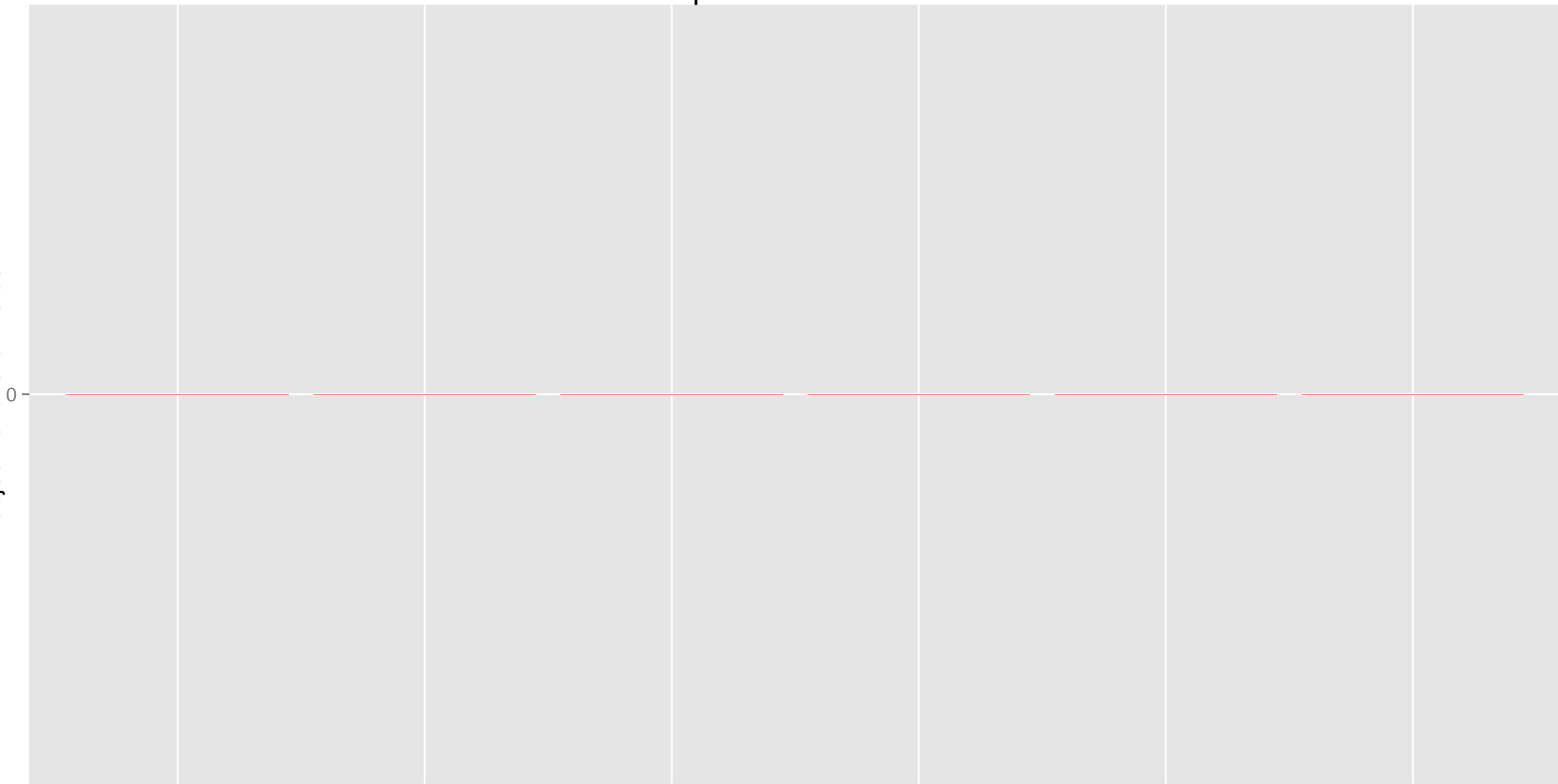


# priors: selectivity functions



priors: fisheries

objective function value



pDevsLnC[01]

pLnC[01]

pLnDCM[01]

pLnDCT[01]

pLnDCX[01]

pLnDCXM[01]

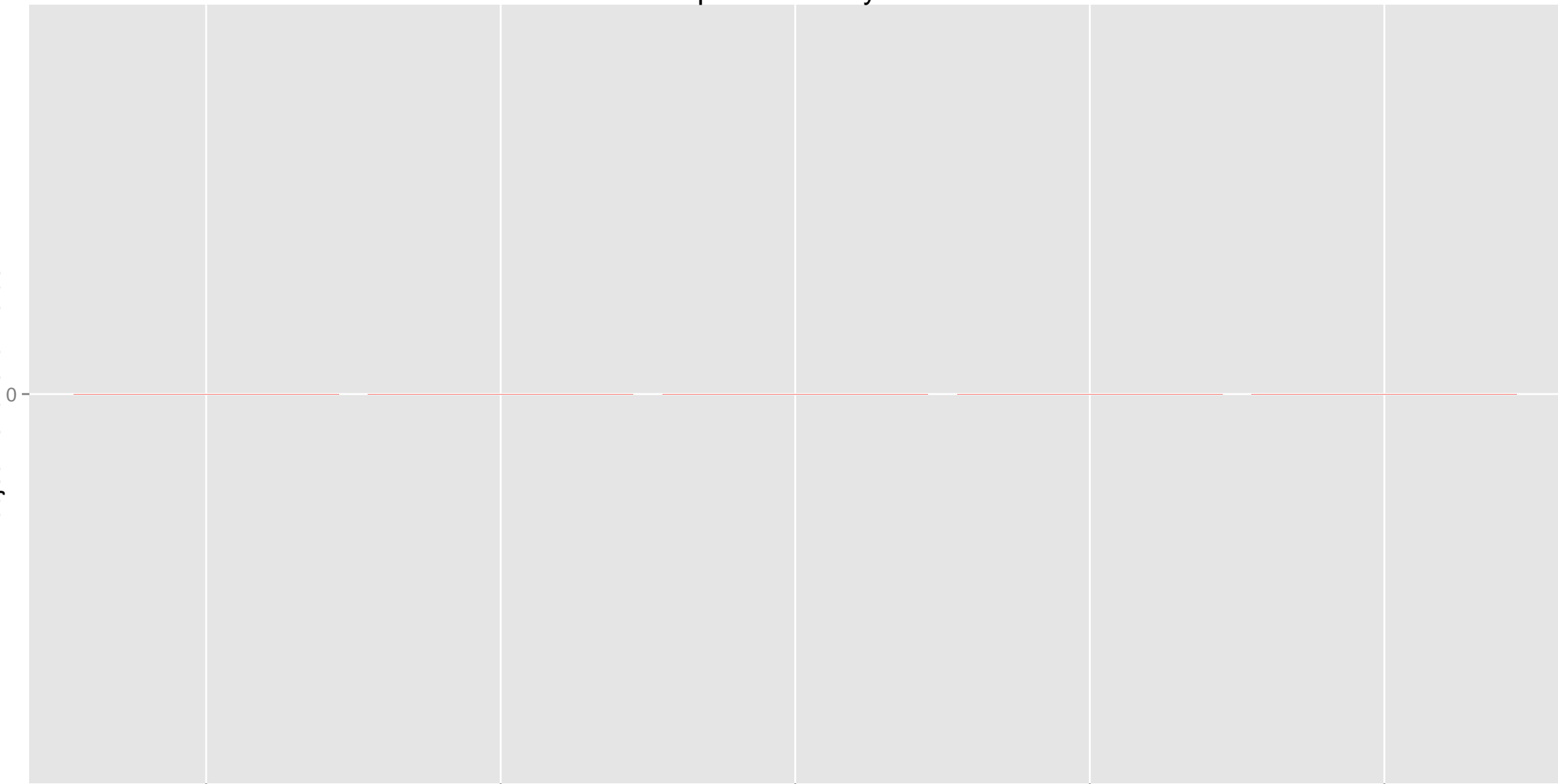
Parameter

rsimTest



priors: surveys

objective function value



pLnDQM[01]

pLnDQT[01]

pLnDQX[01]

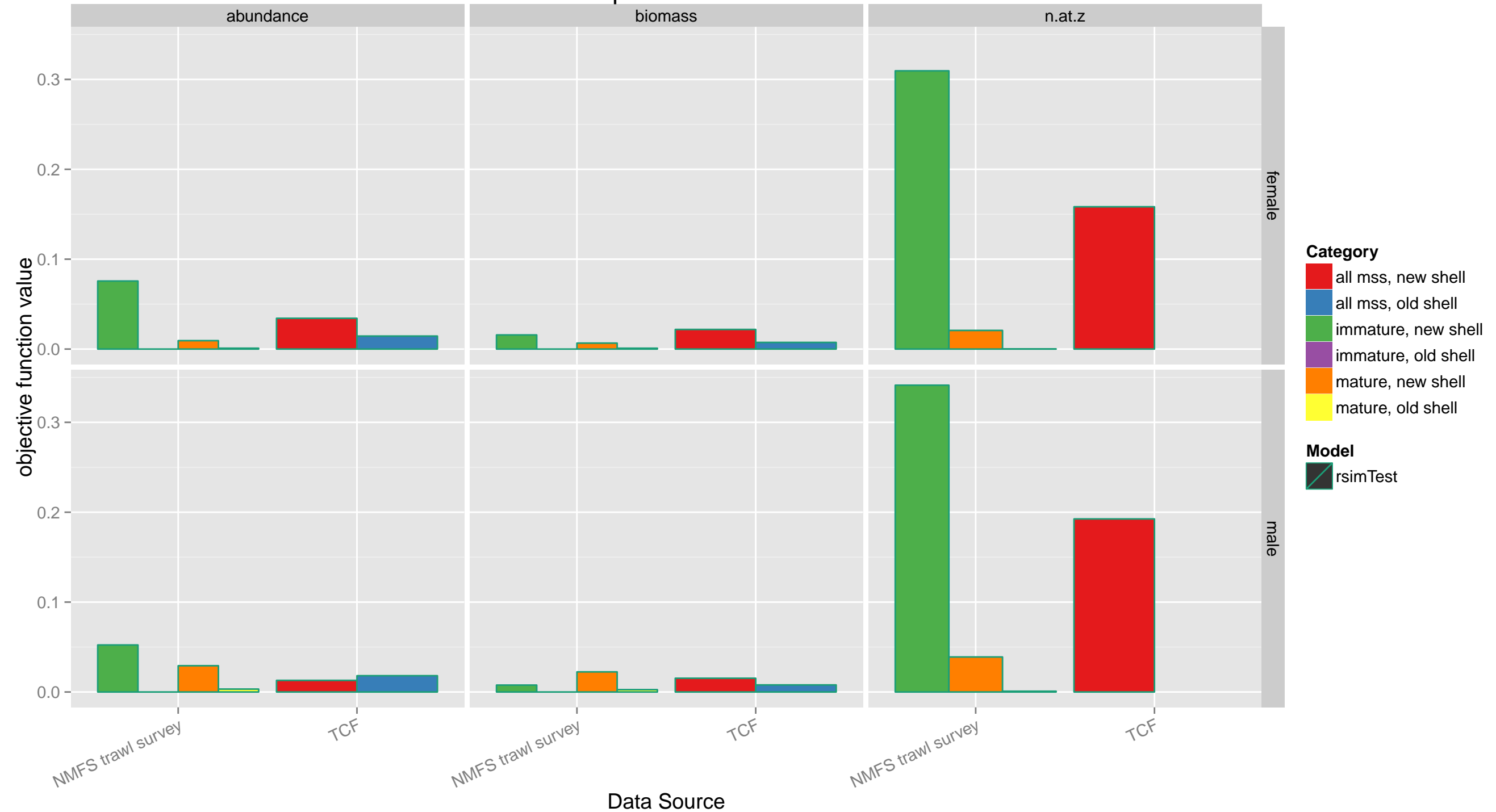
pLnDQXM[01]

pLnQ[01]

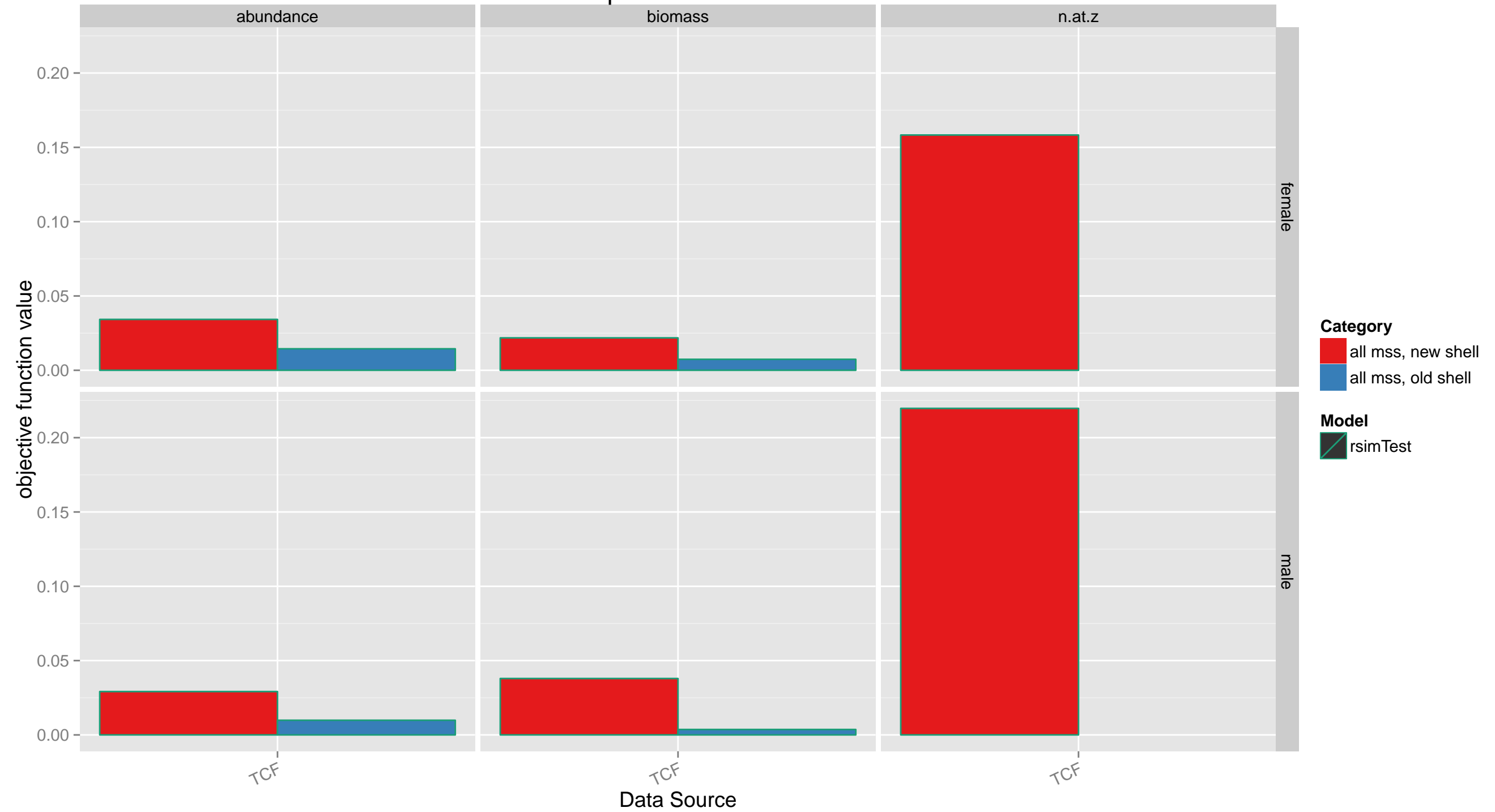
Parameter

rsimTest

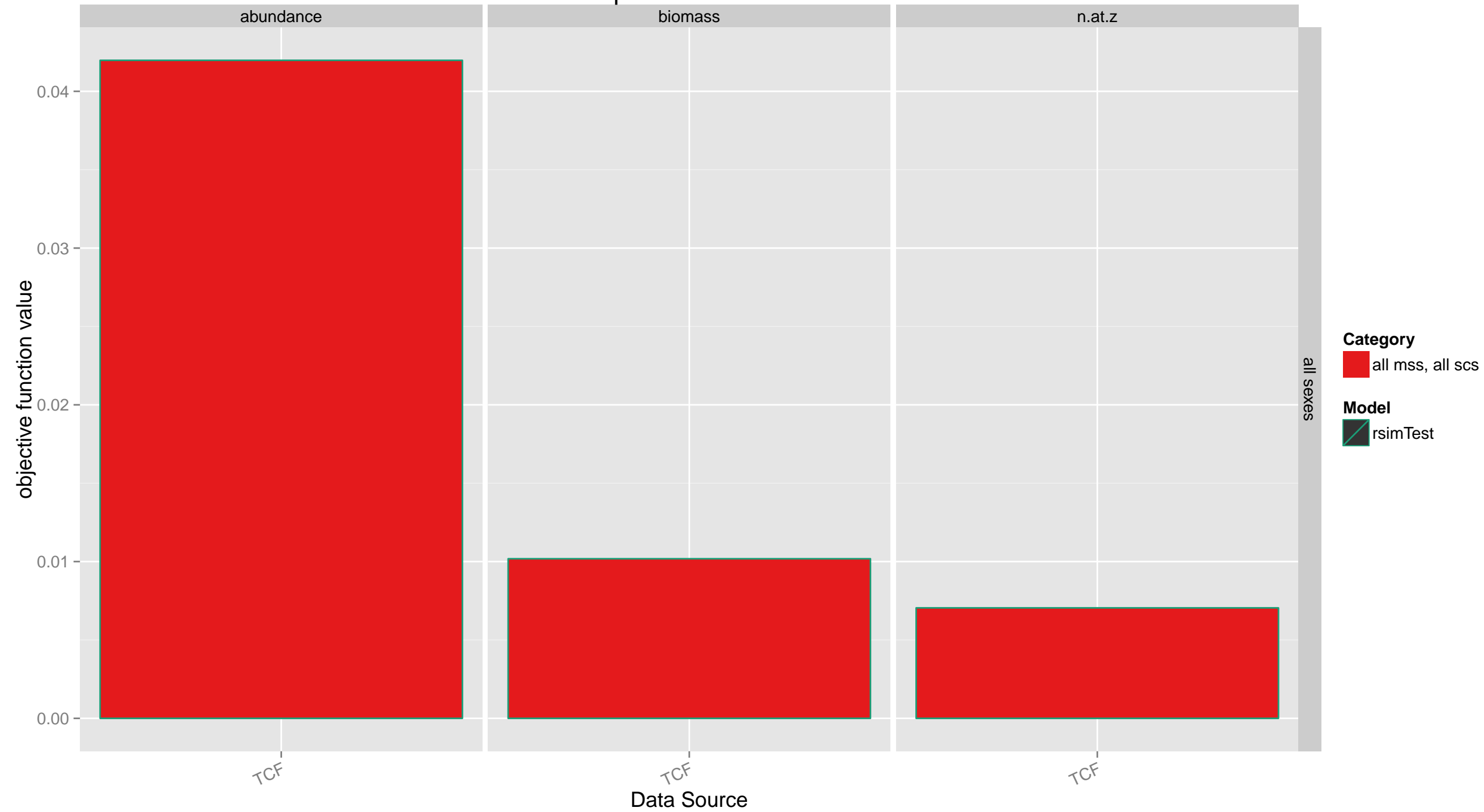
# Data Components: total catch



# Data Components: discard catch

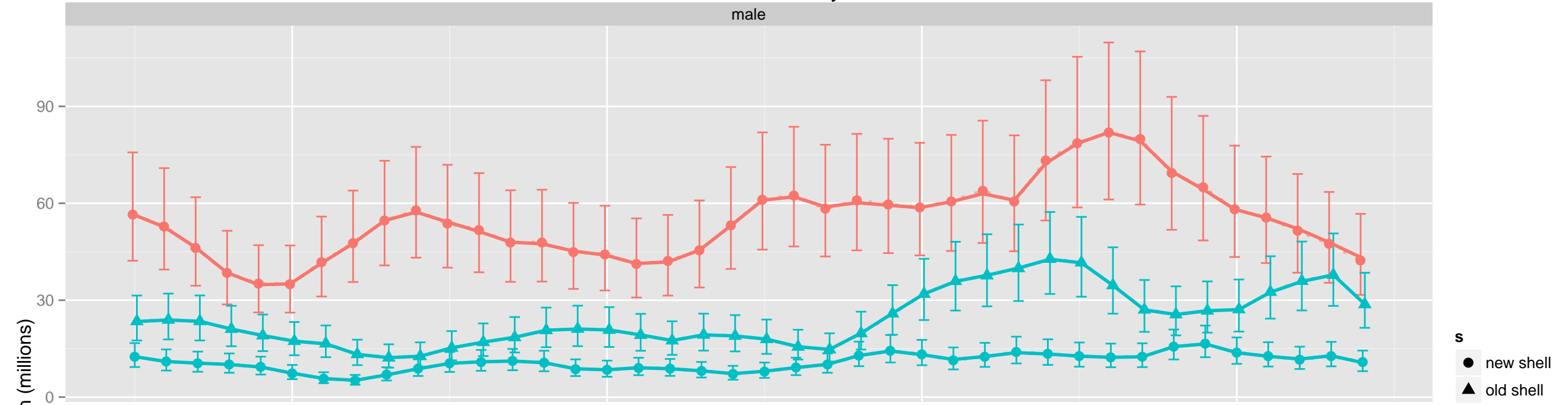


# Data Components: retained catch

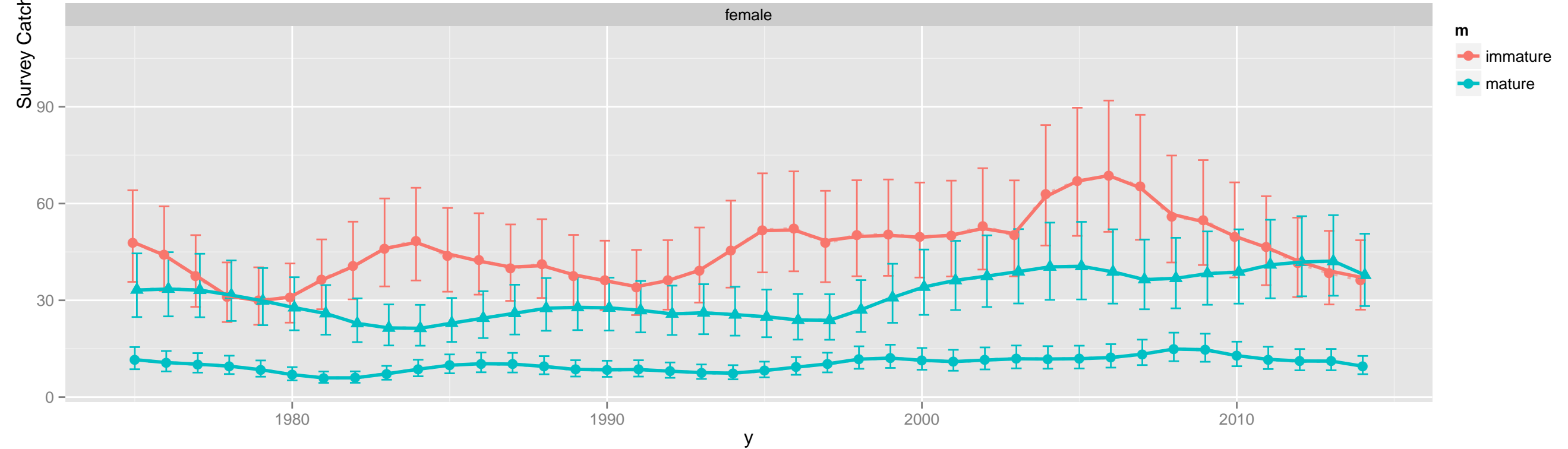


# NMFS trawl survey

male

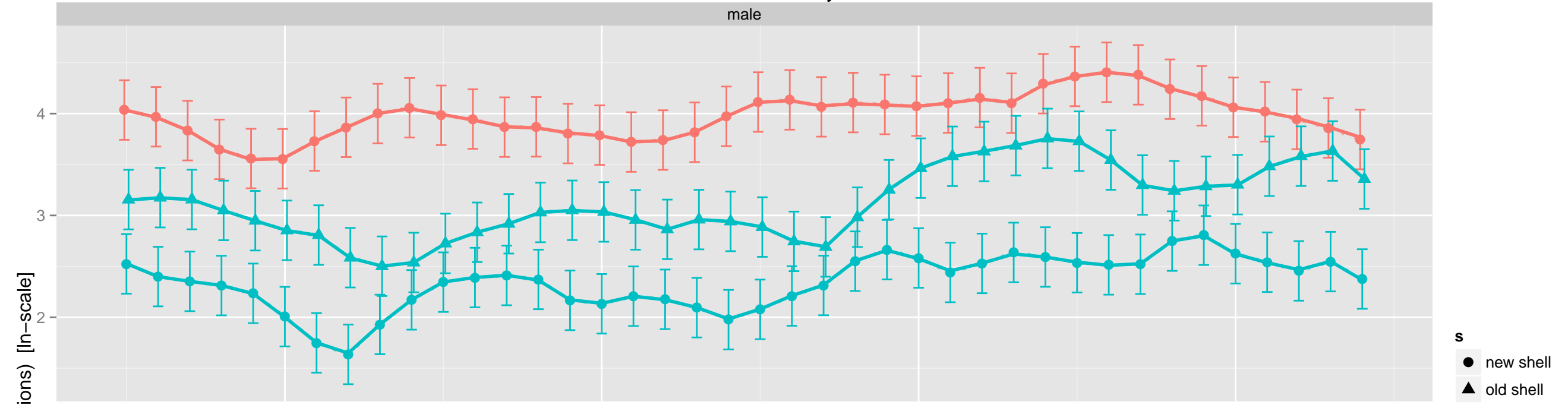


female

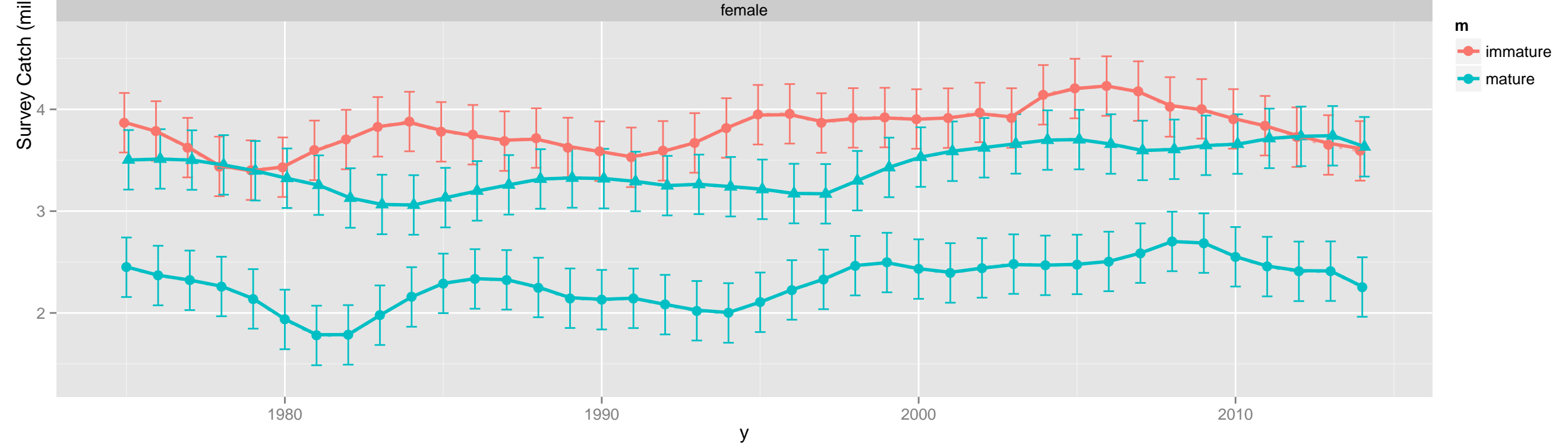


# NMFS trawl survey

male

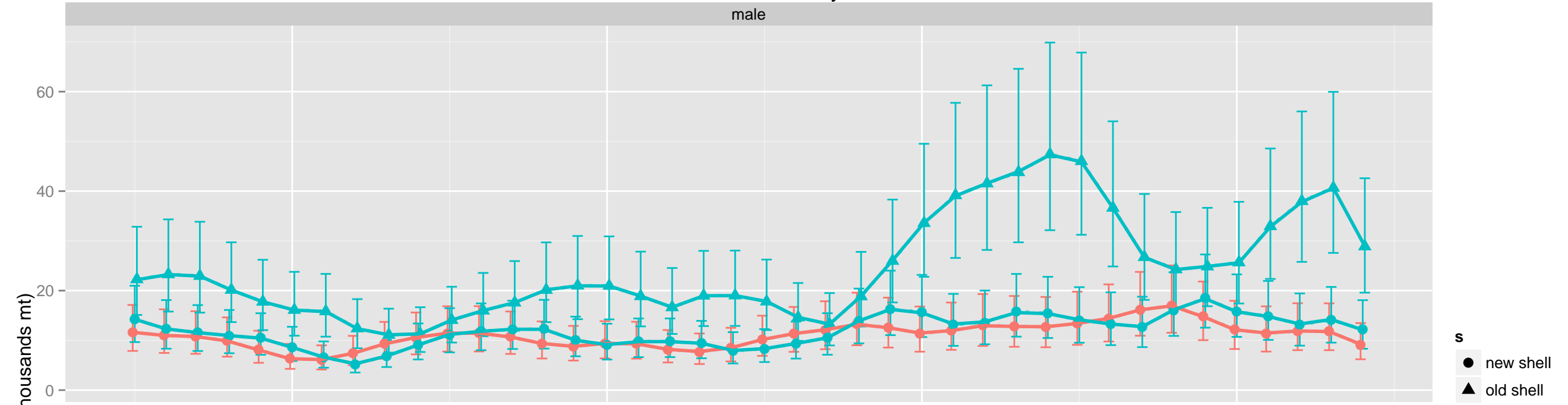


female

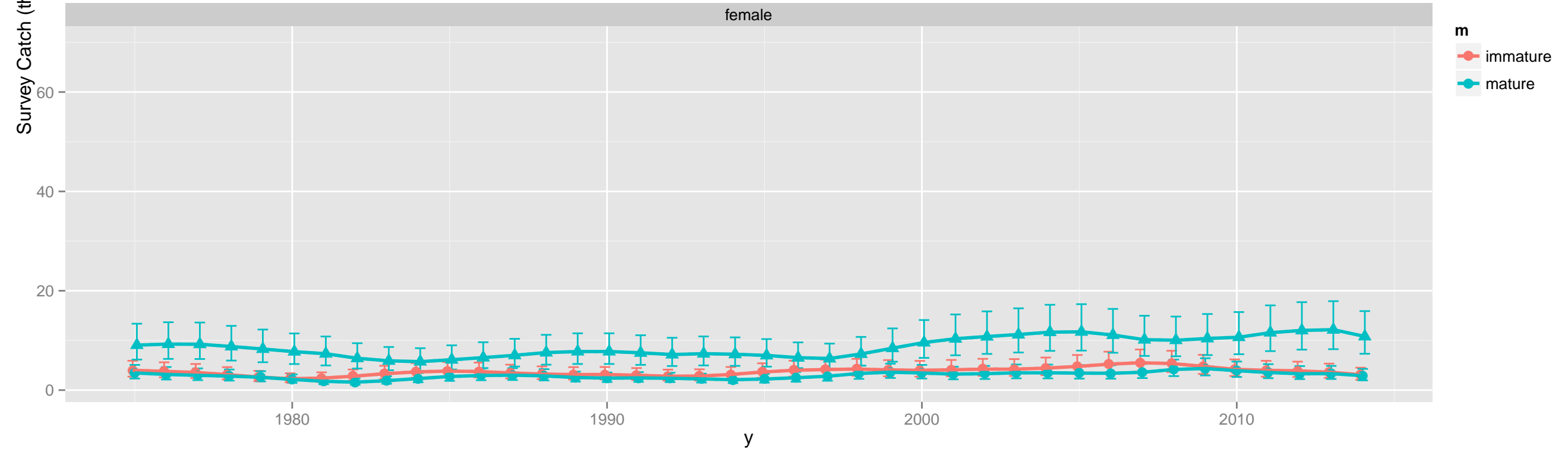


# NMFS trawl survey

male

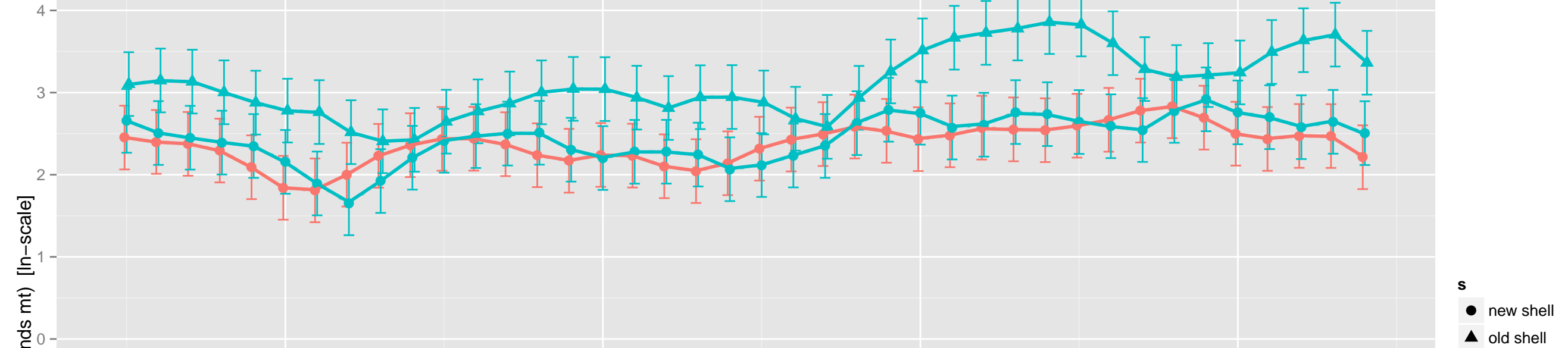


female

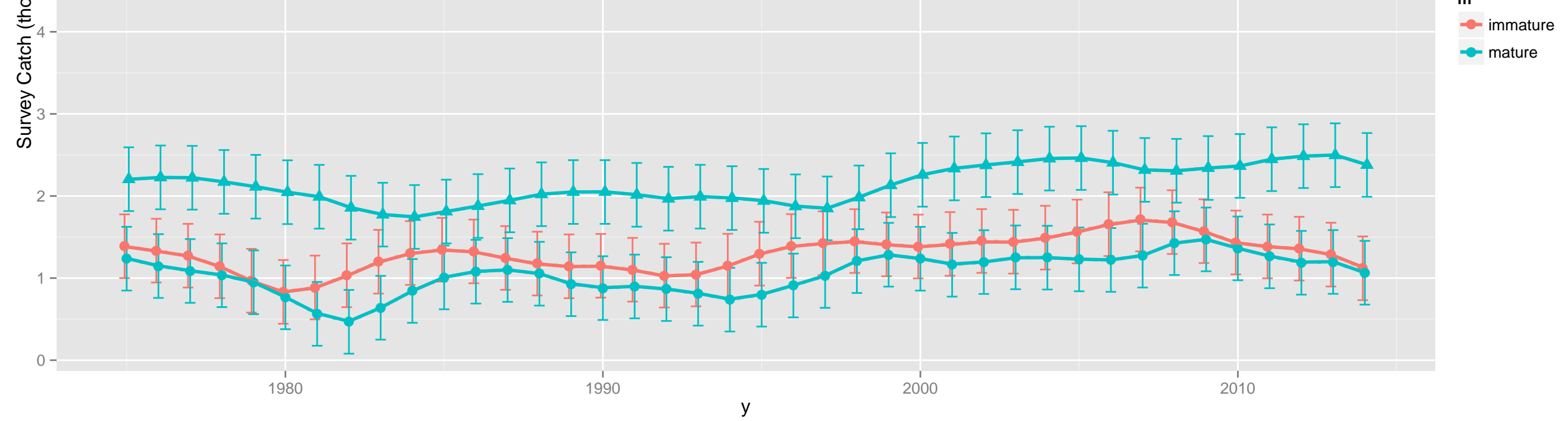


# NMFS trawl survey

male

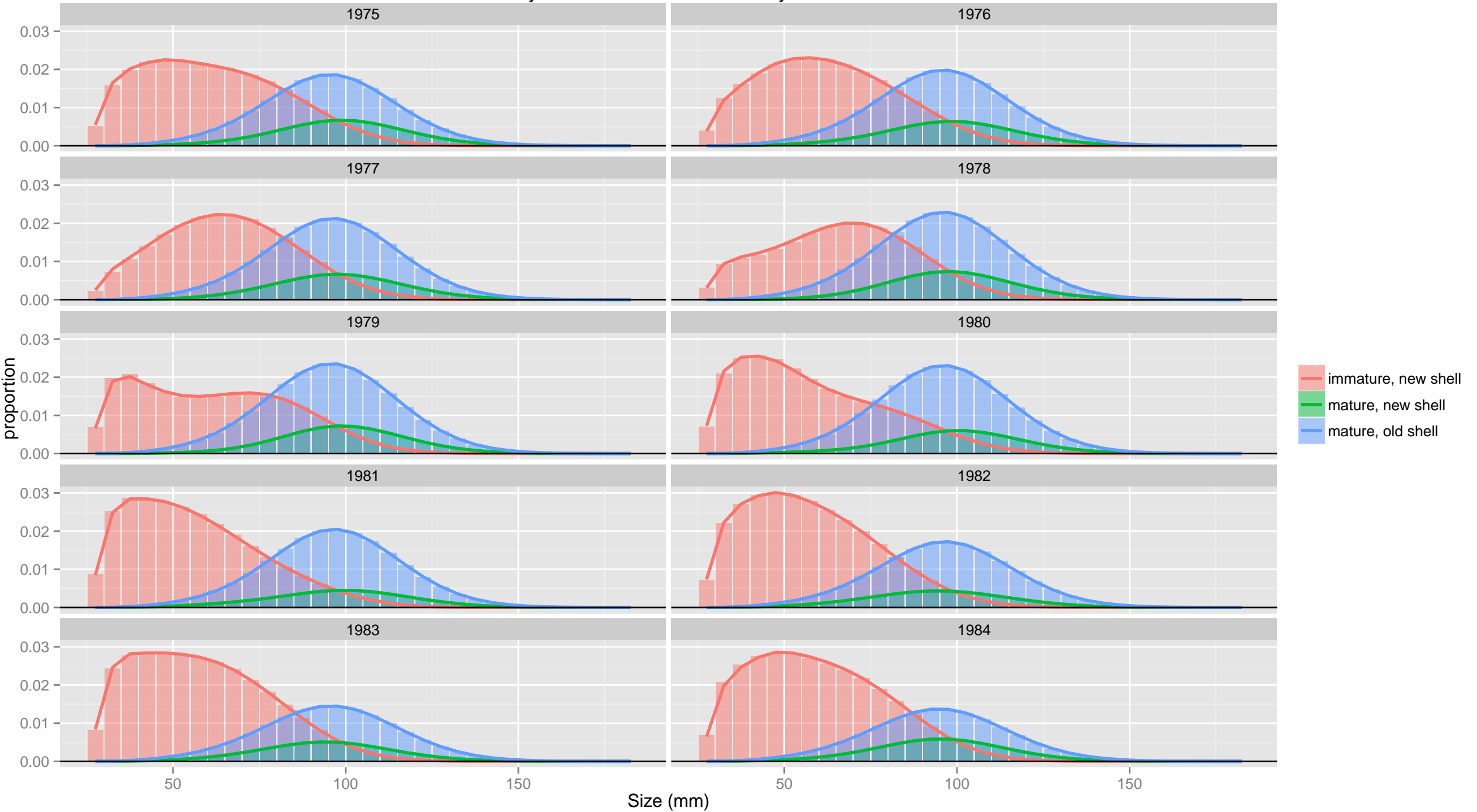


female

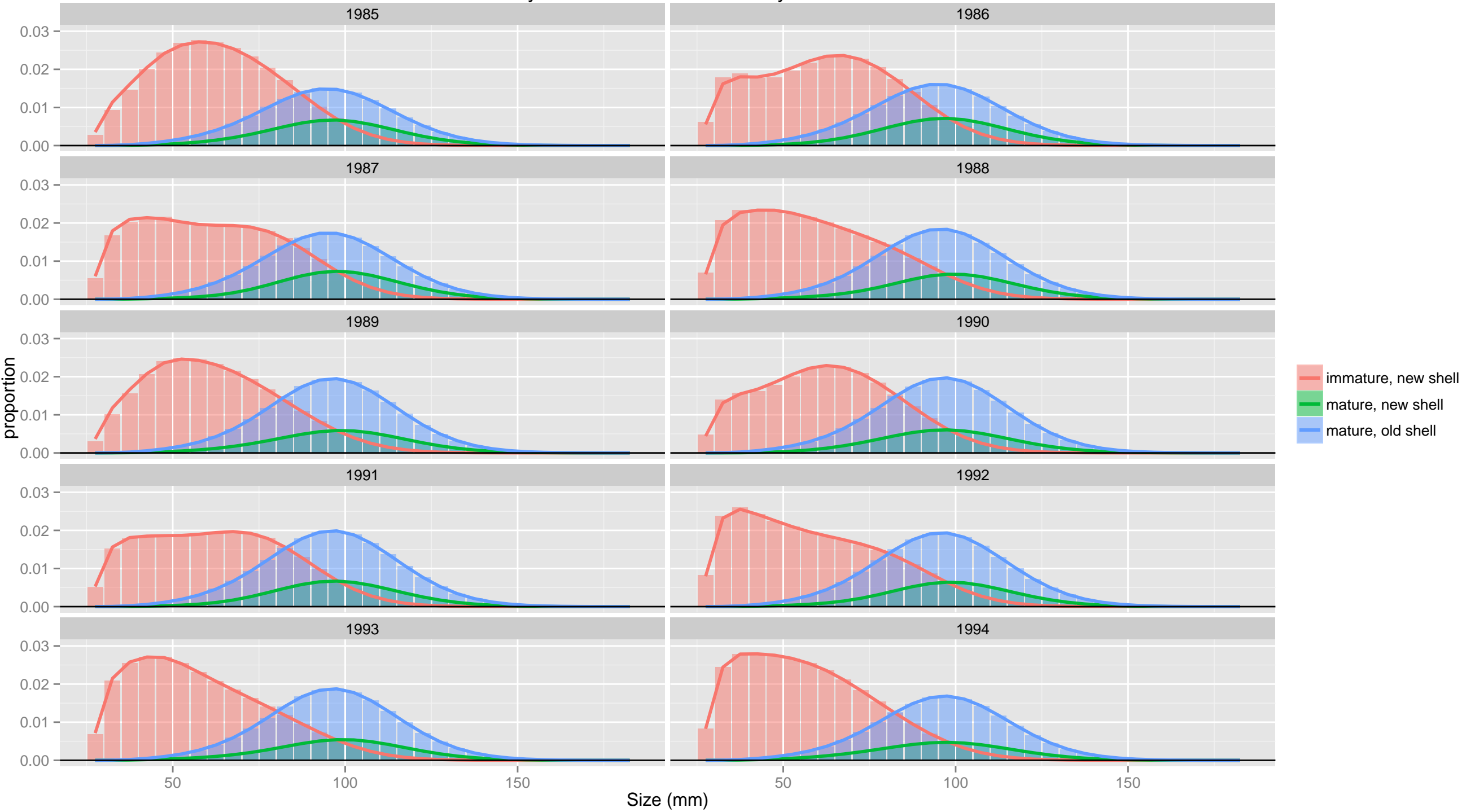




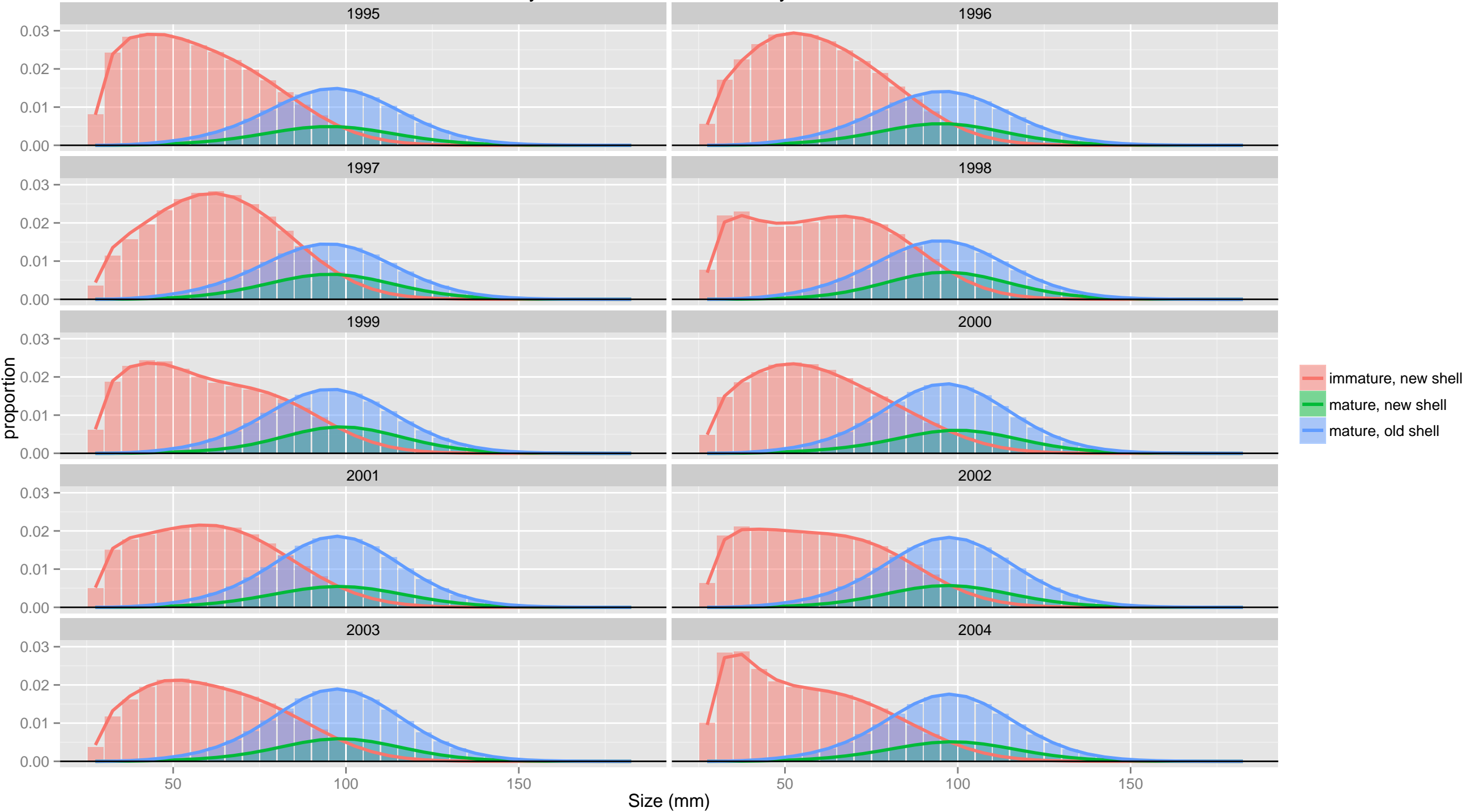
# Survey Catch: NMFS trawl survey: female



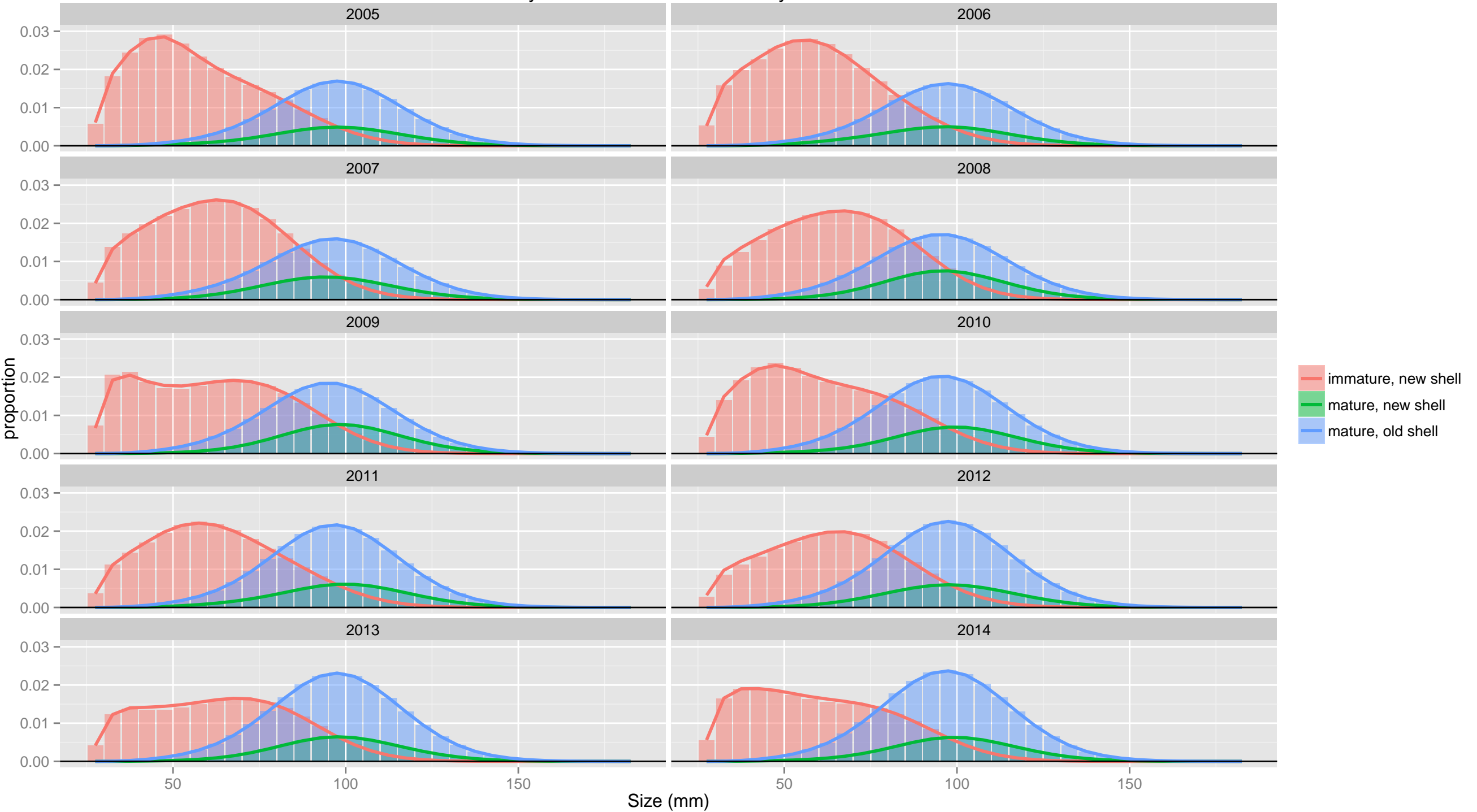
# Survey Catch: NMFS trawl survey: female



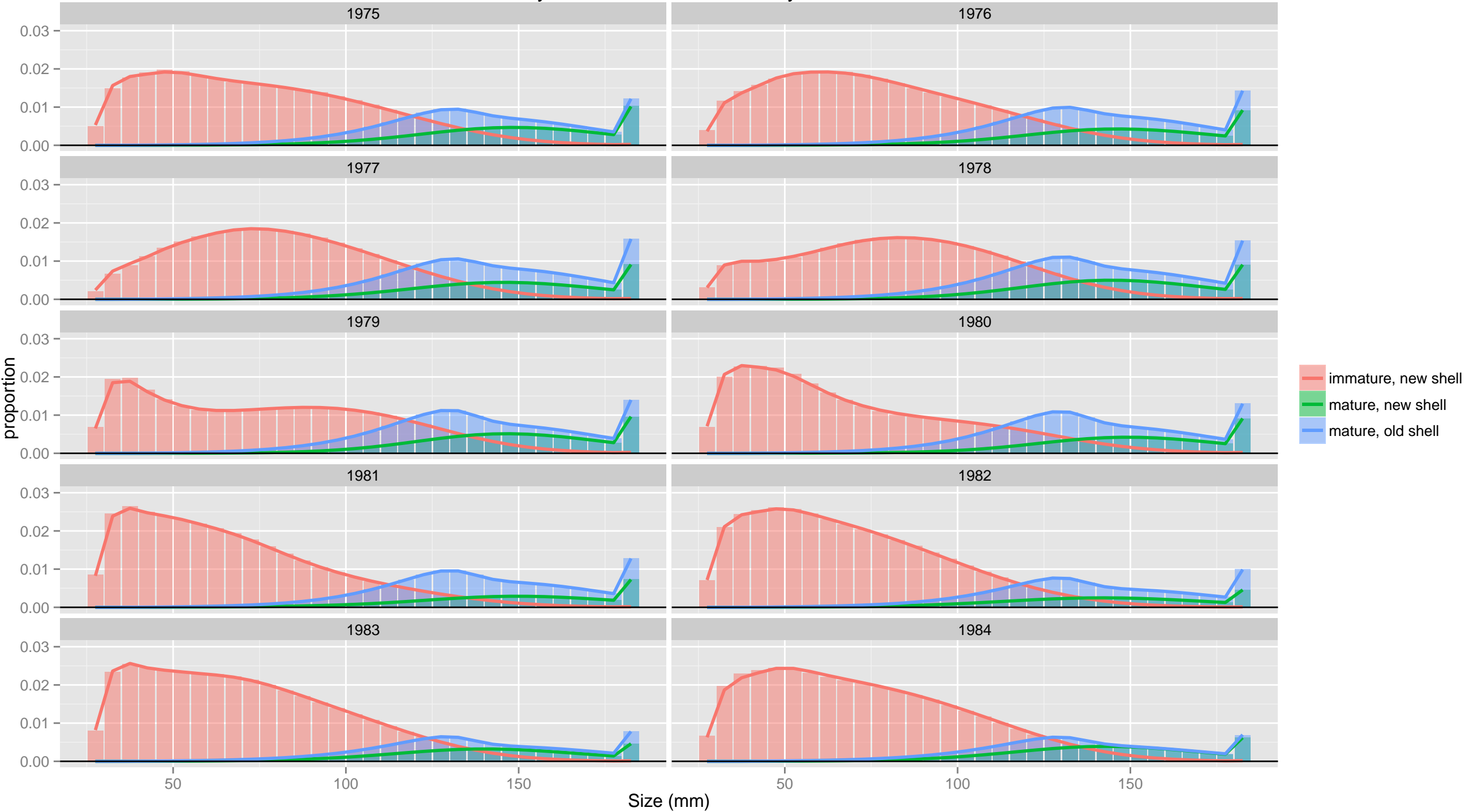
# Survey Catch: NMFS trawl survey: female



# Survey Catch: NMFS trawl survey: female



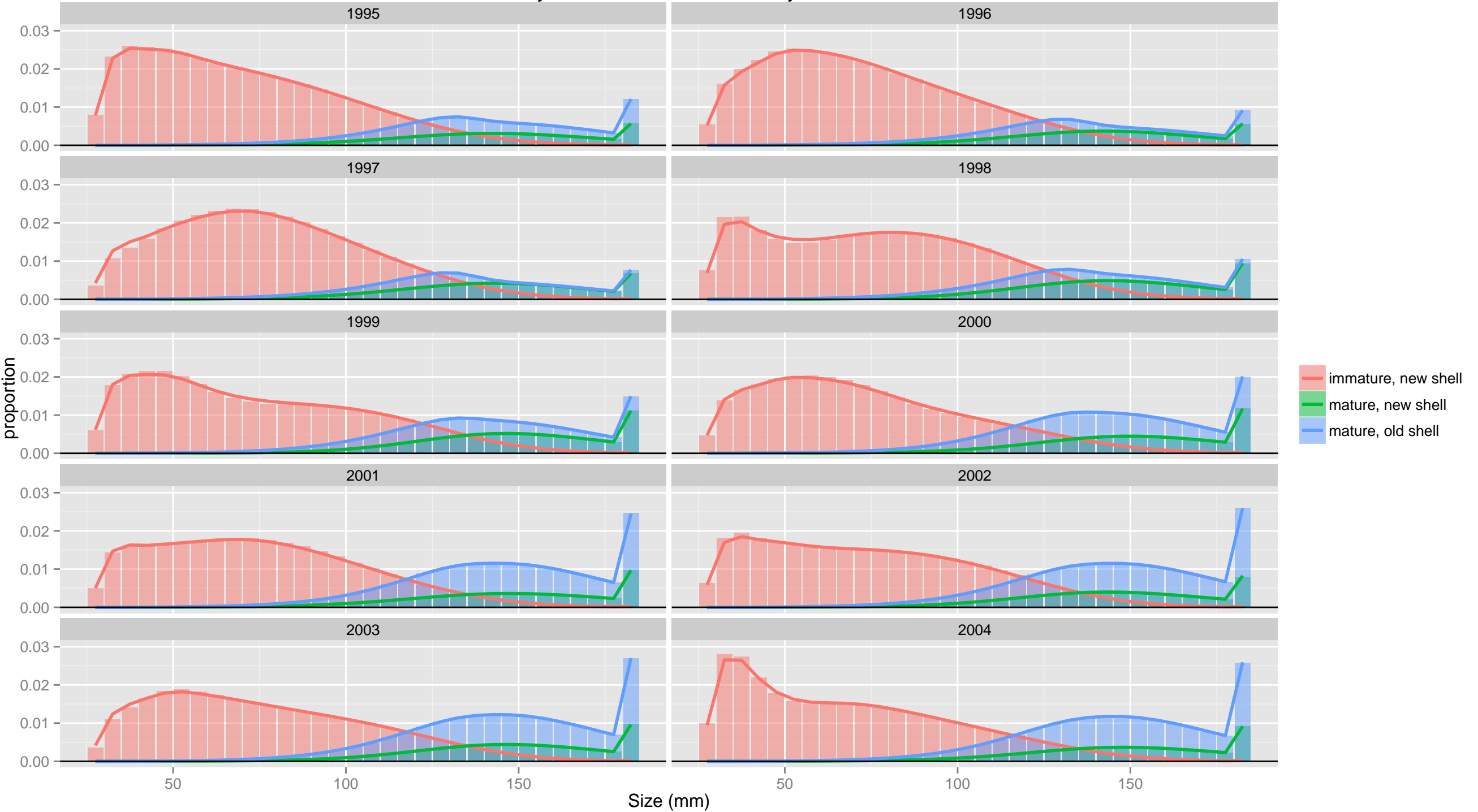
# Survey Catch: NMFS trawl survey: male



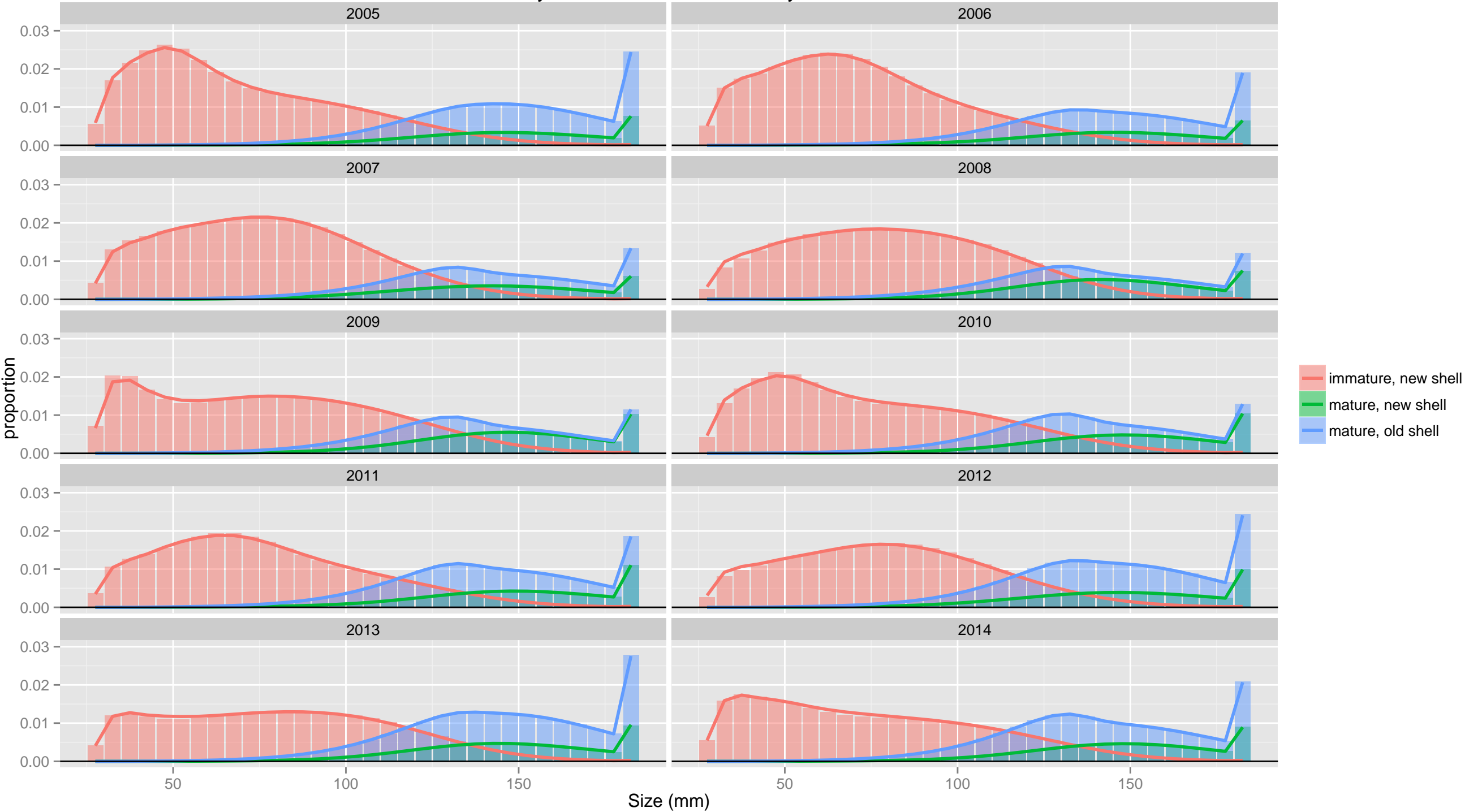
# Survey Catch: NMFS trawl survey: male



# Survey Catch: NMFS trawl survey: male

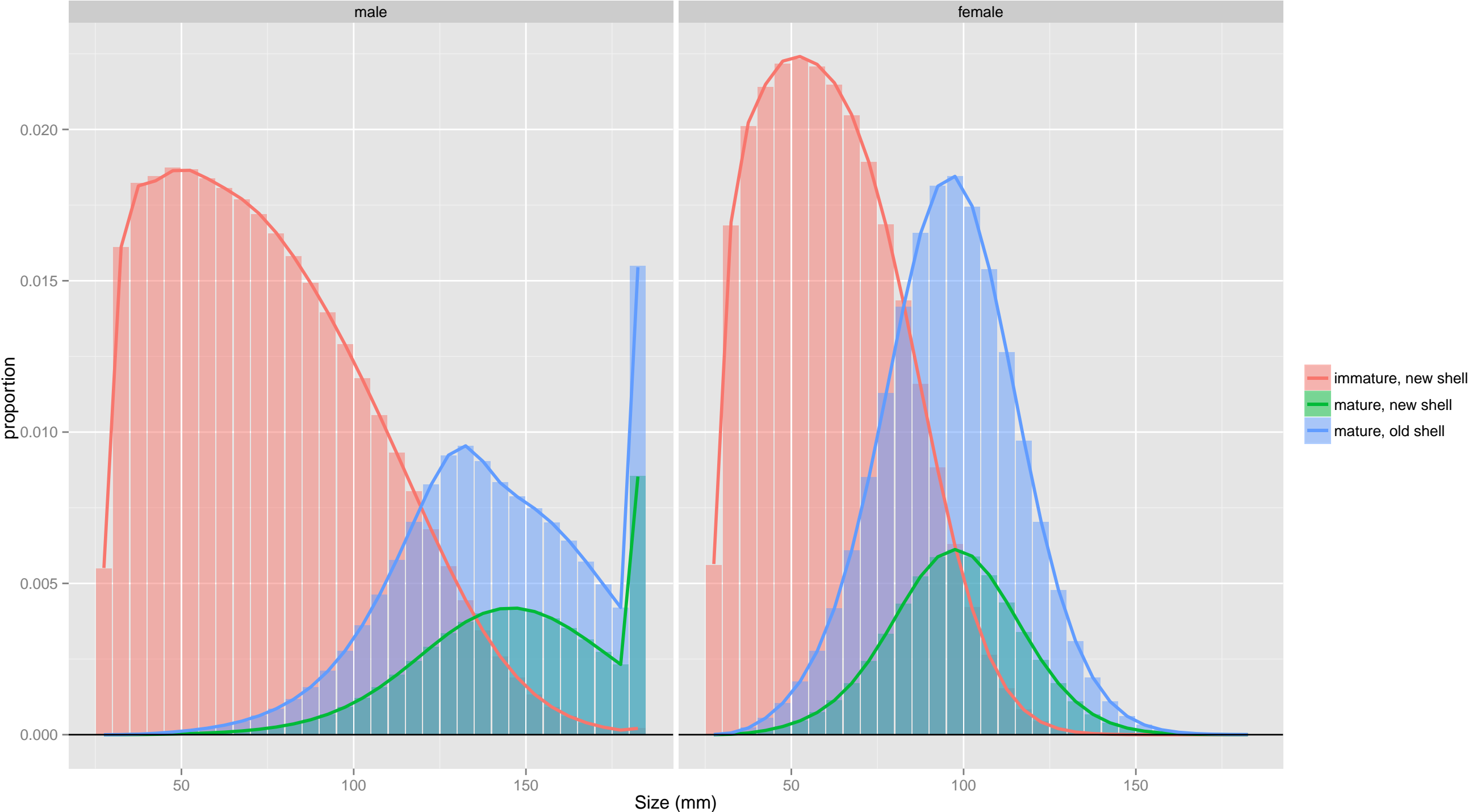


# Survey Catch: NMFS trawl survey: male



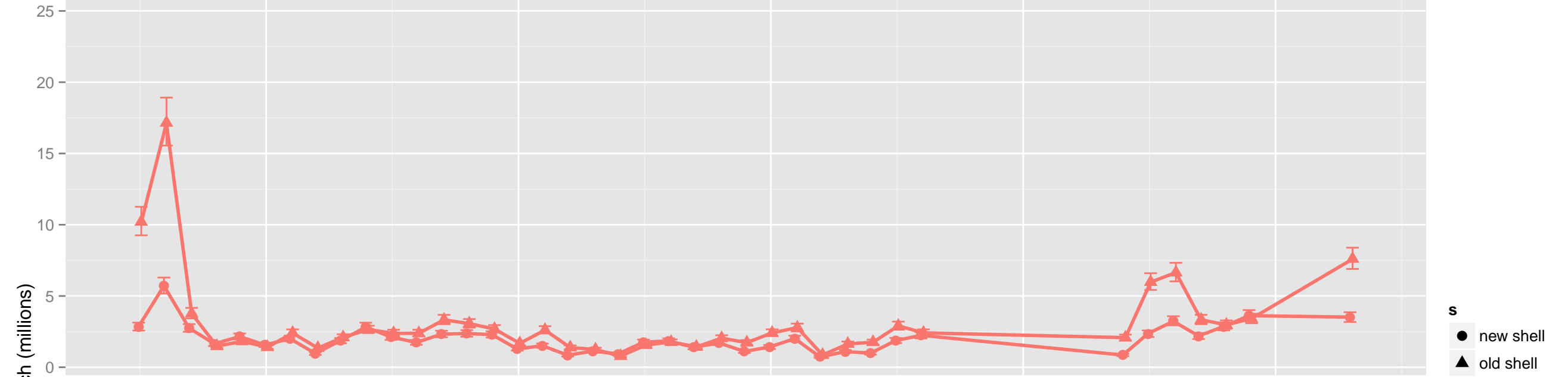


# Survey Catch: NMFS trawl survey

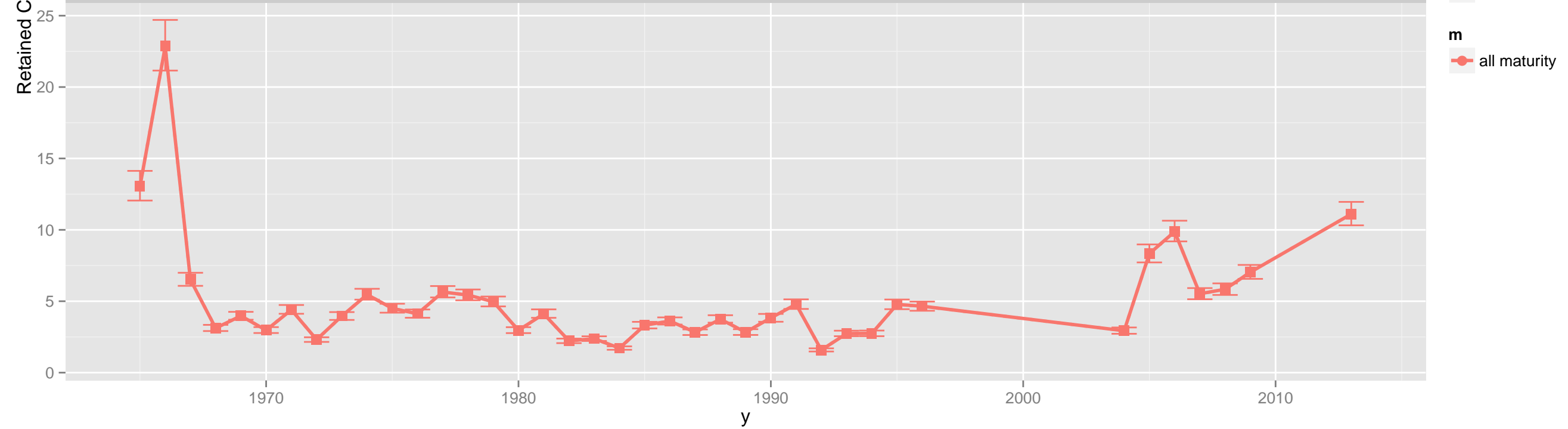


# TCF

male

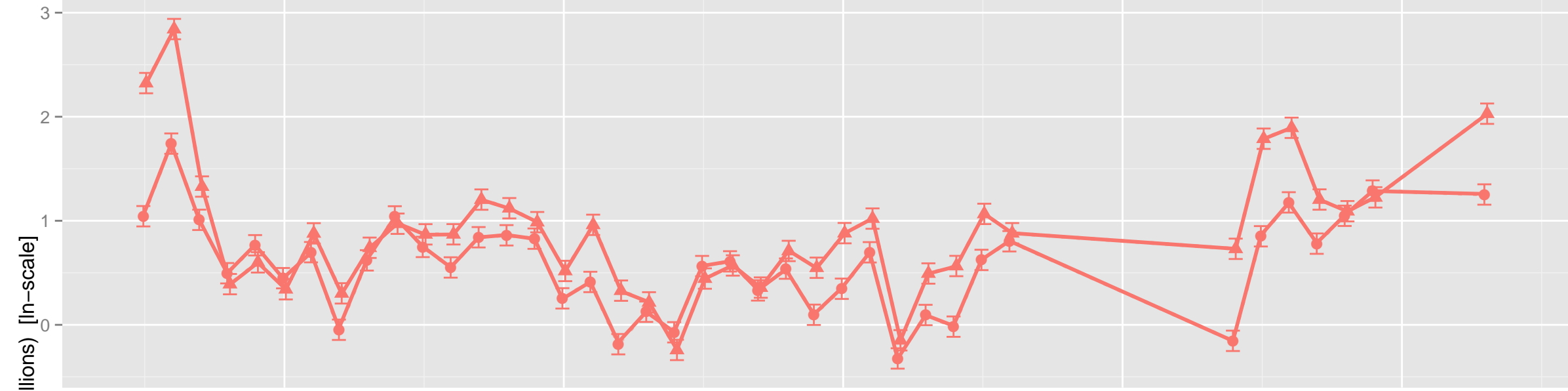


all sex

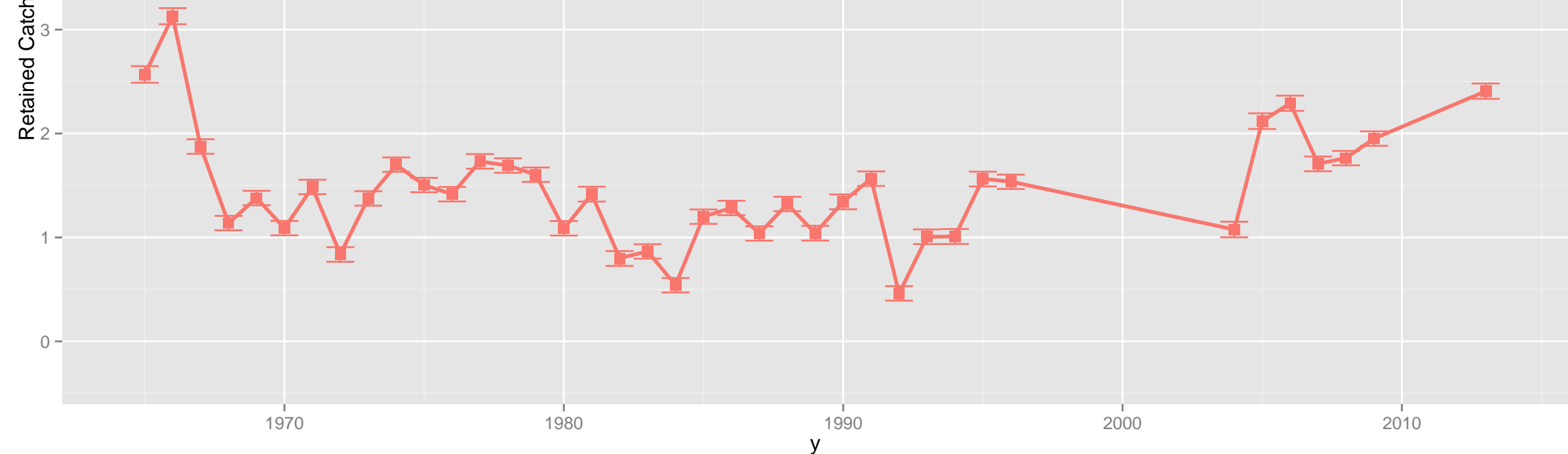


# TCF

male

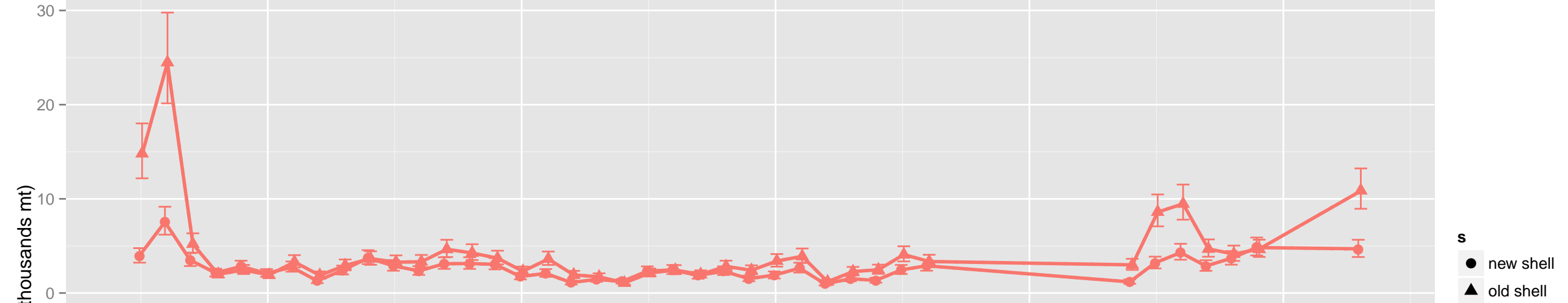


all sex

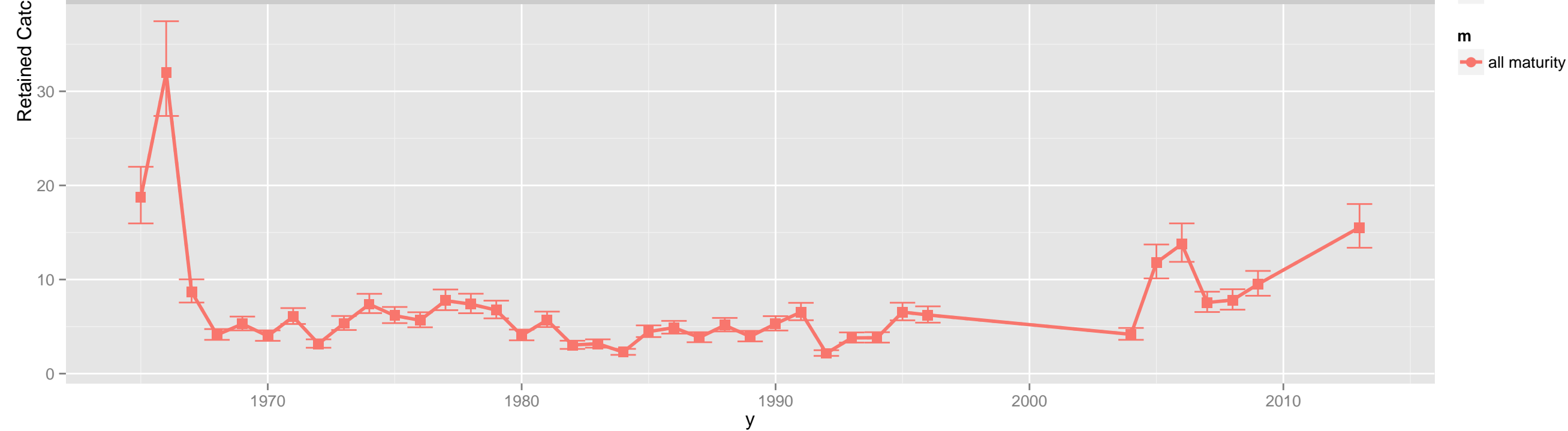


# TCF

male

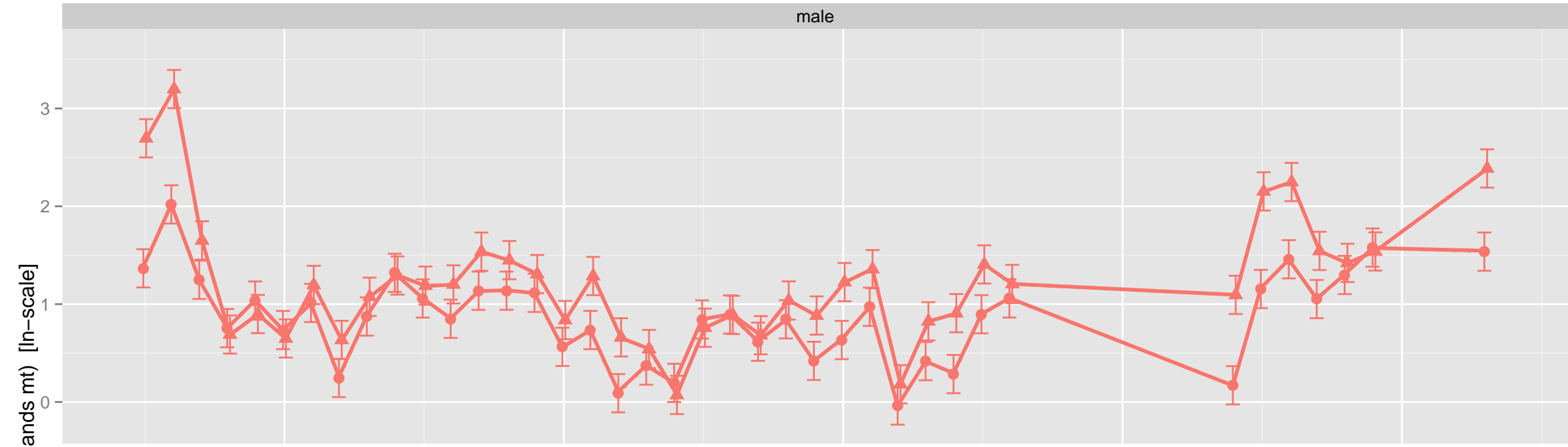


all sex

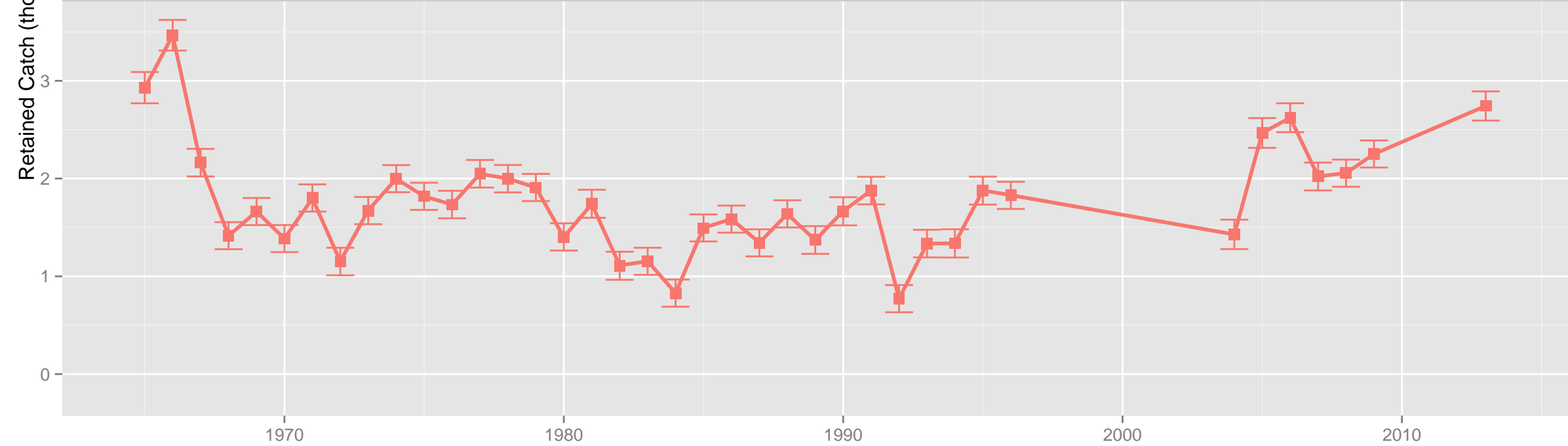


# TCF

male



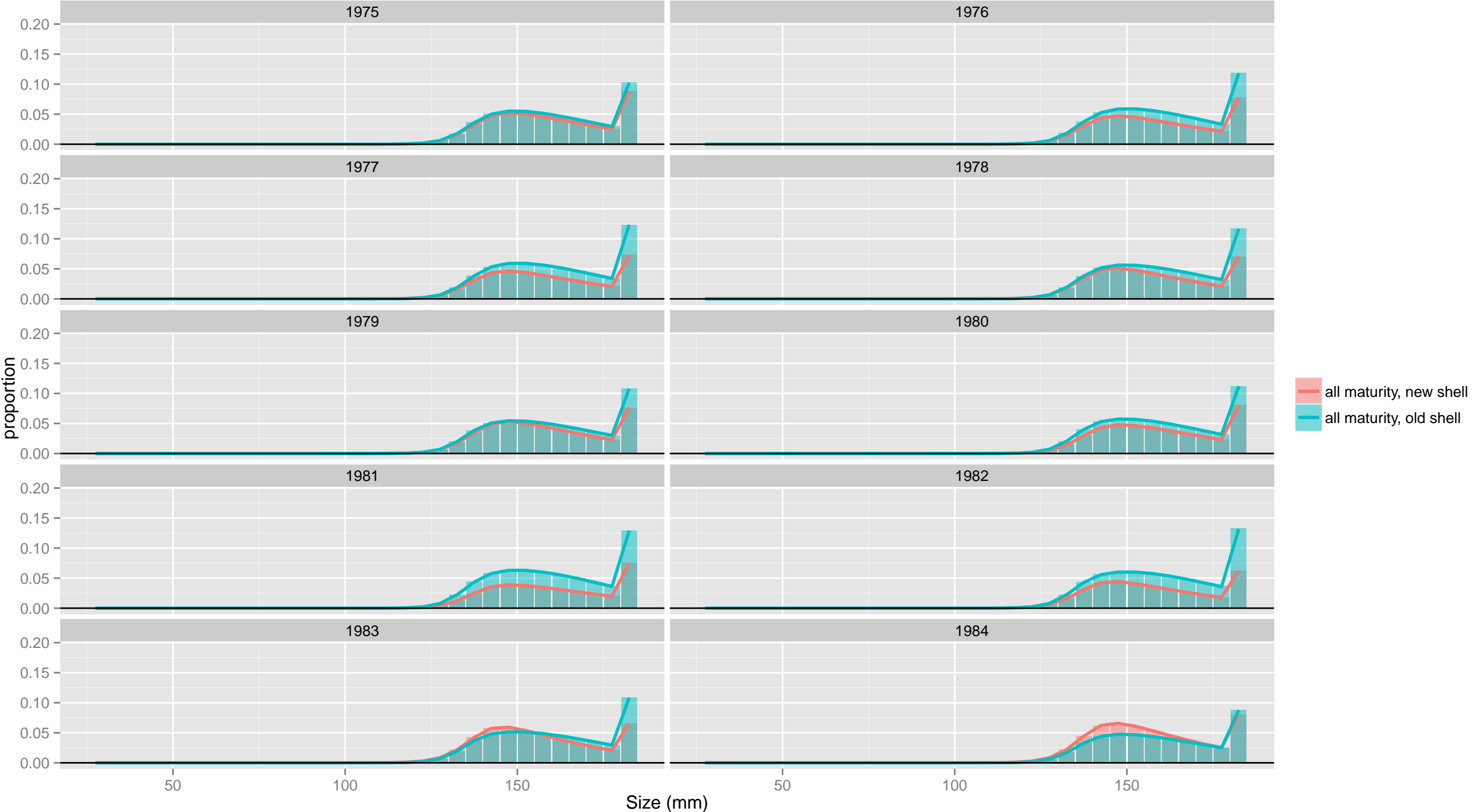
all sex



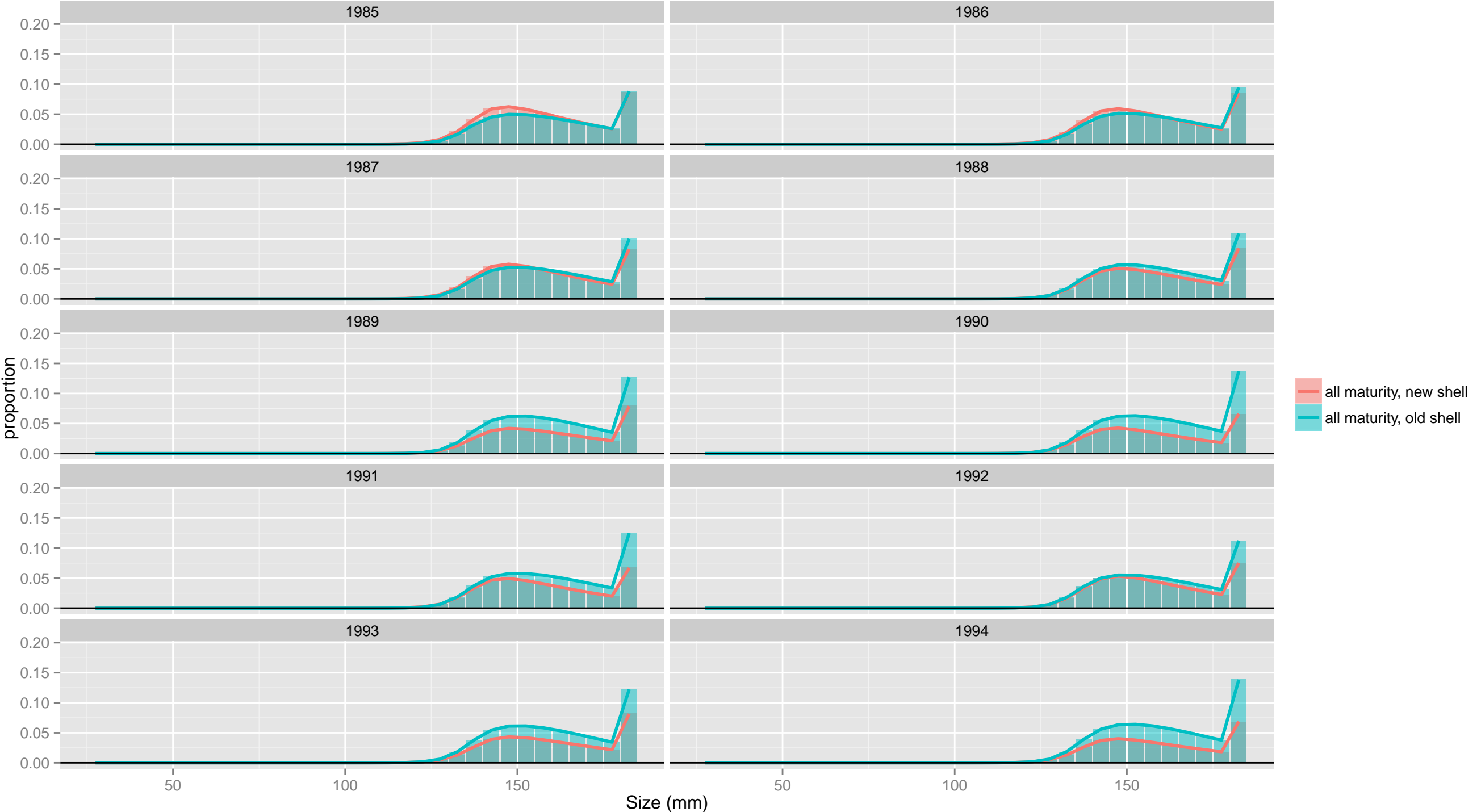
# Retained Catch: TCF: male



# Retained Catch: TCF: male

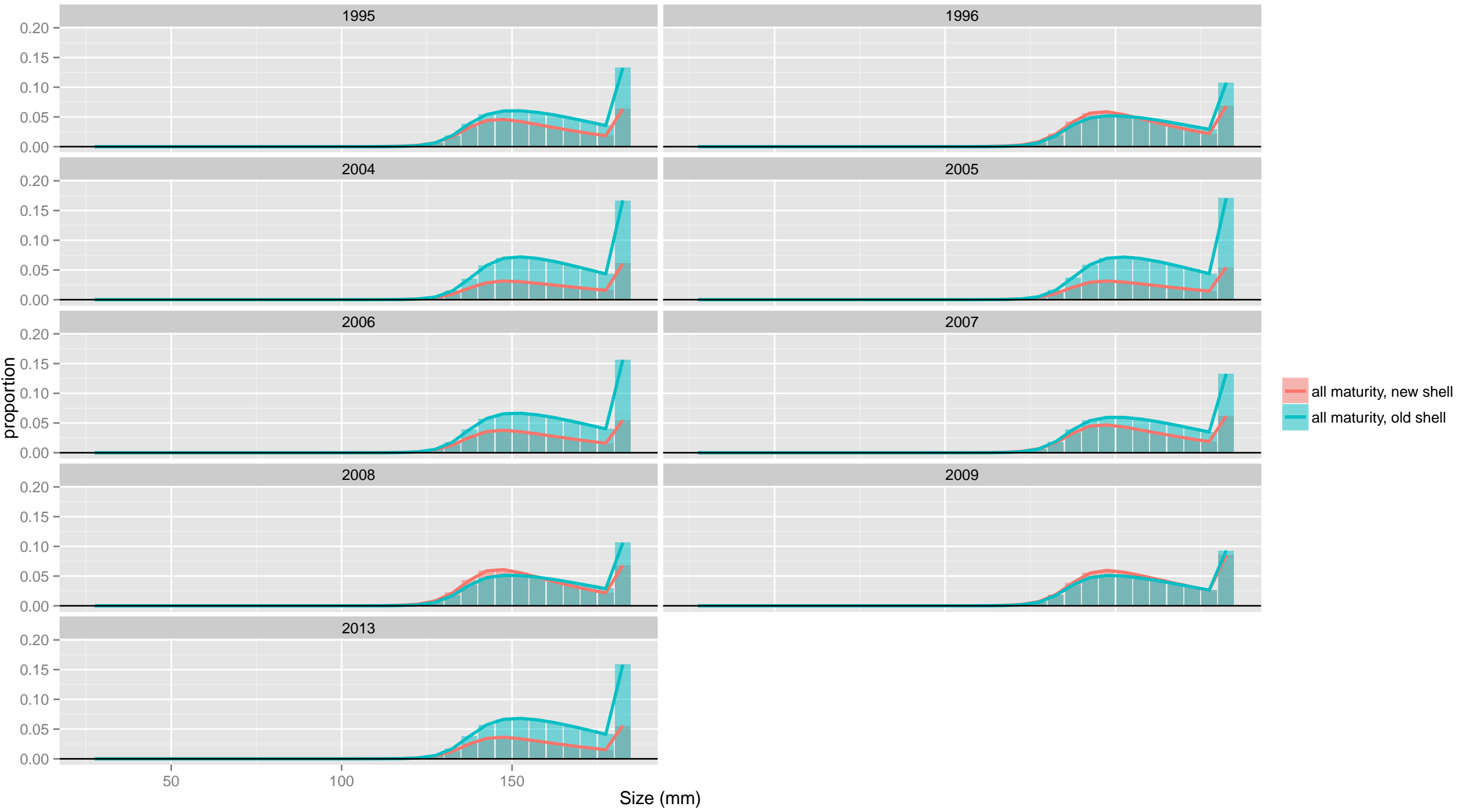


# Retained Catch: TCF: male



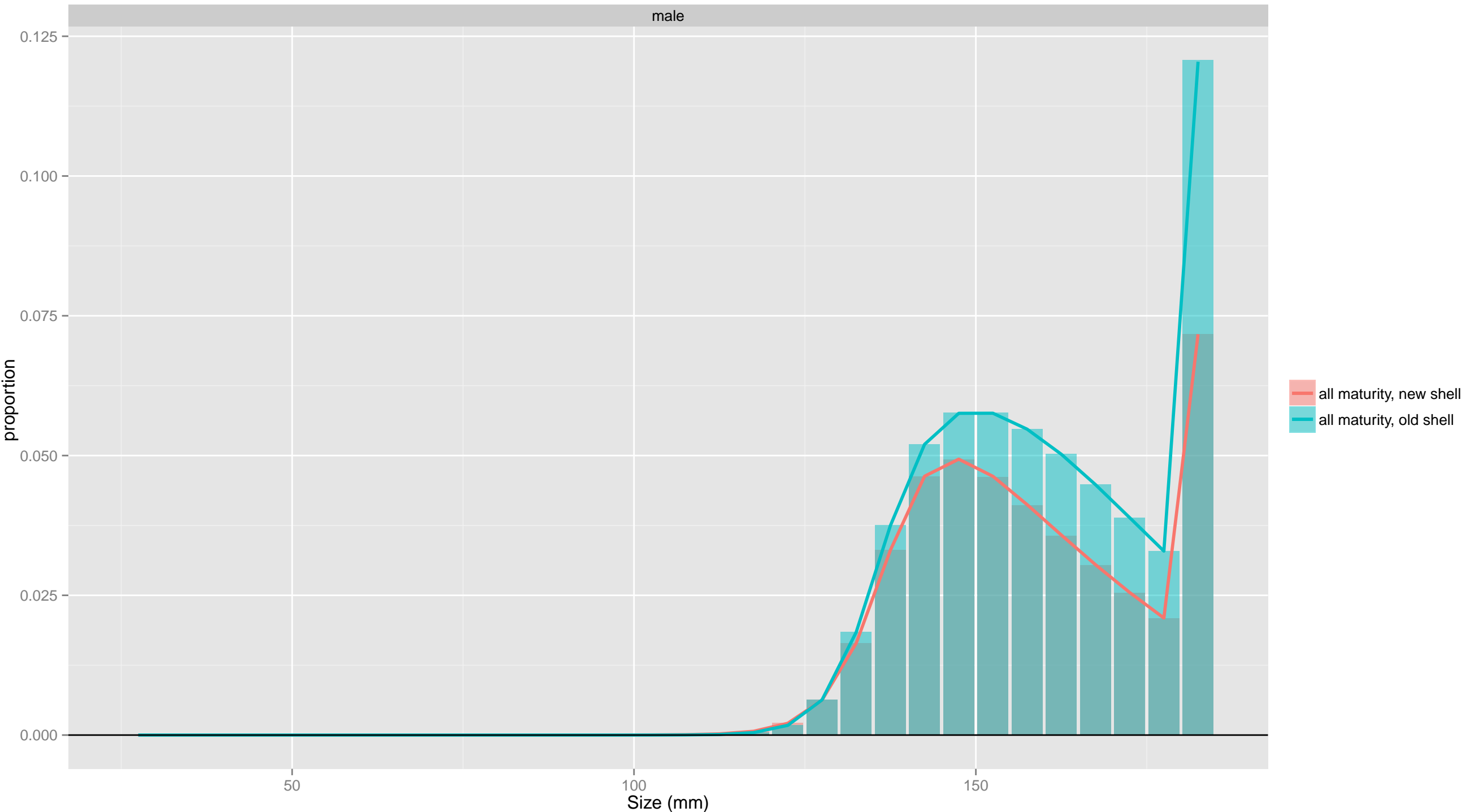


# Retained Catch: TCF: male



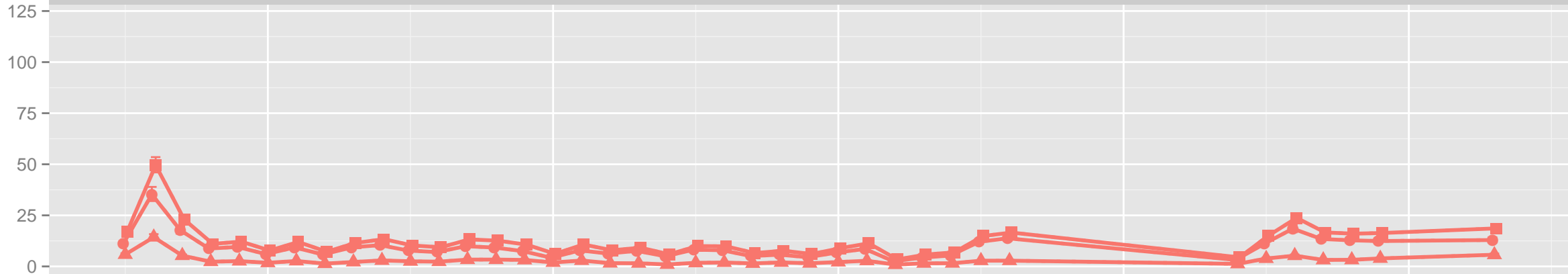
# Retained Catch: TCF

male

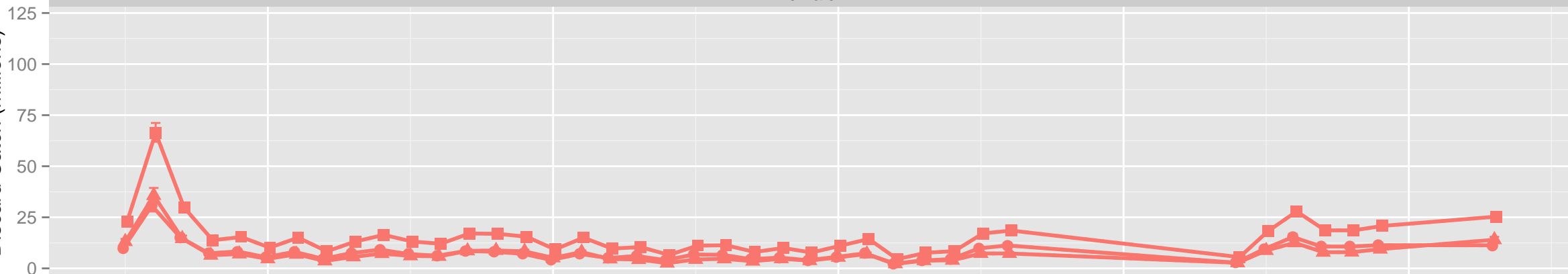


# TCF

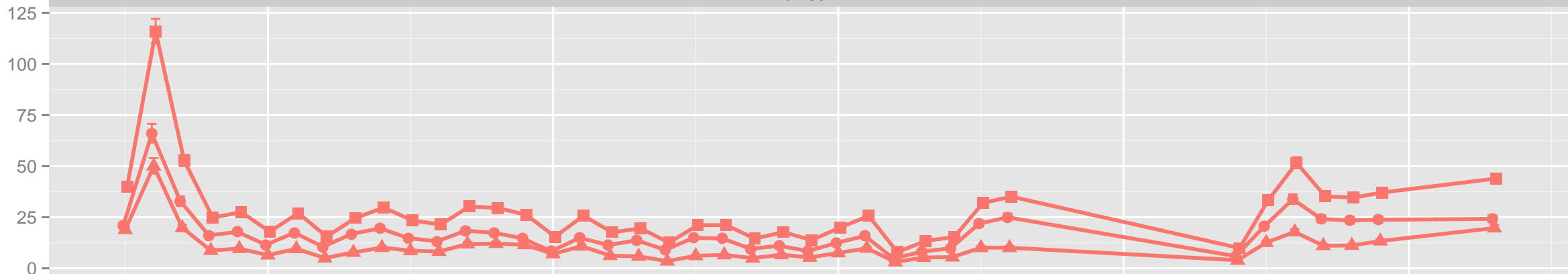
male



female



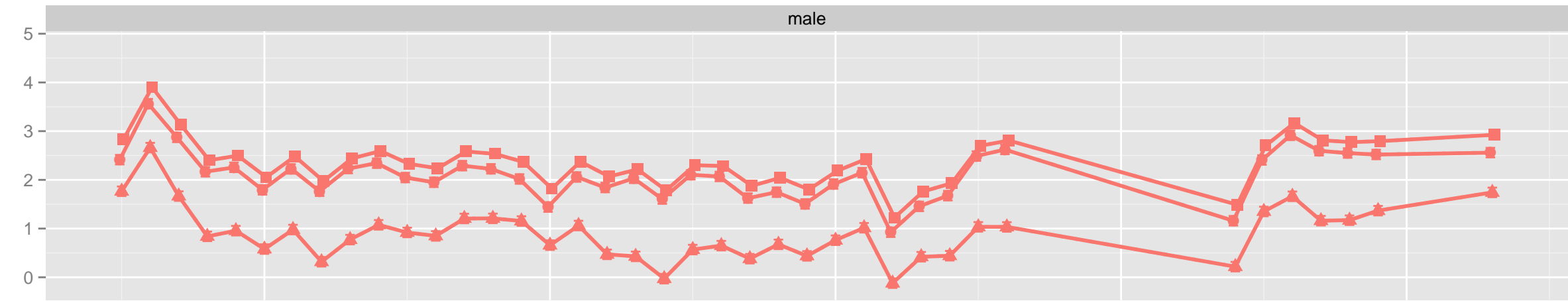
all sex



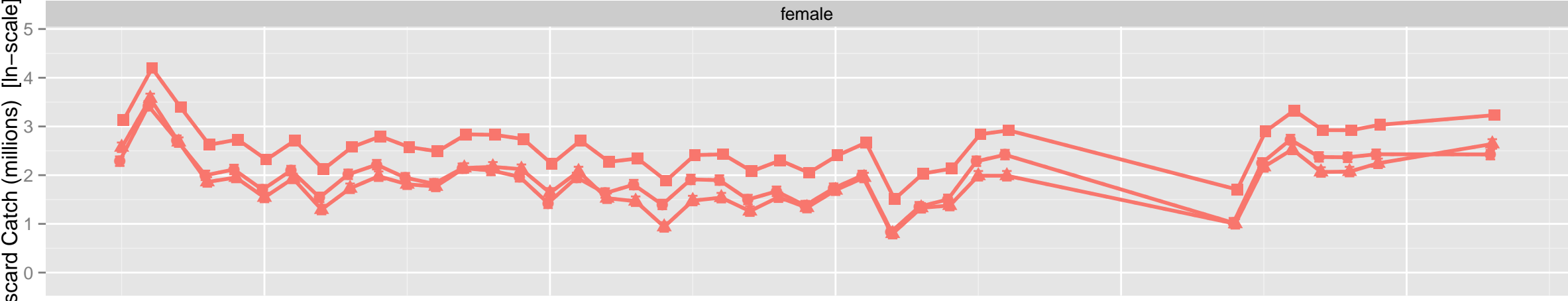
y

# TCF

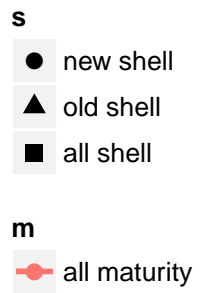
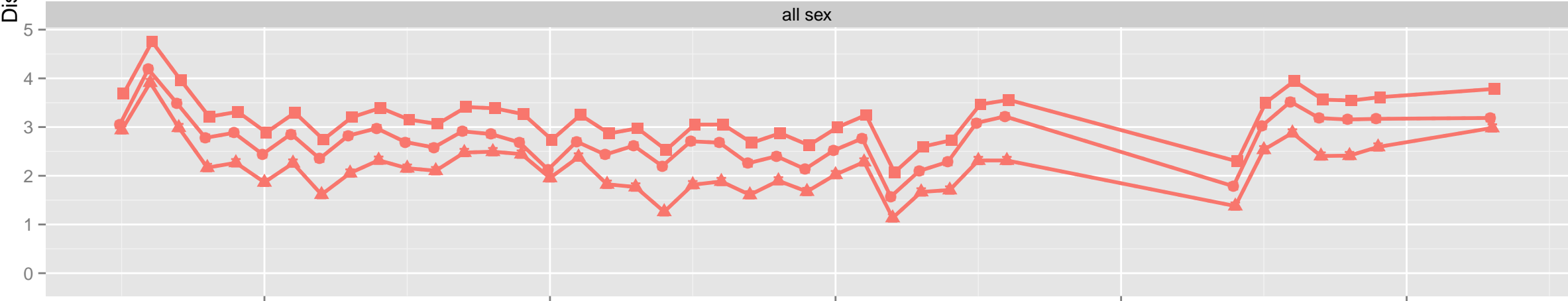
male



female



all sex



# TCF

male

30

20

10

0

female

30

20

10

0

all sex

30

20

10

0

1970

1980

1990

2000

2010

y

s

- new shell
- ▲ old shell
- all shell

m

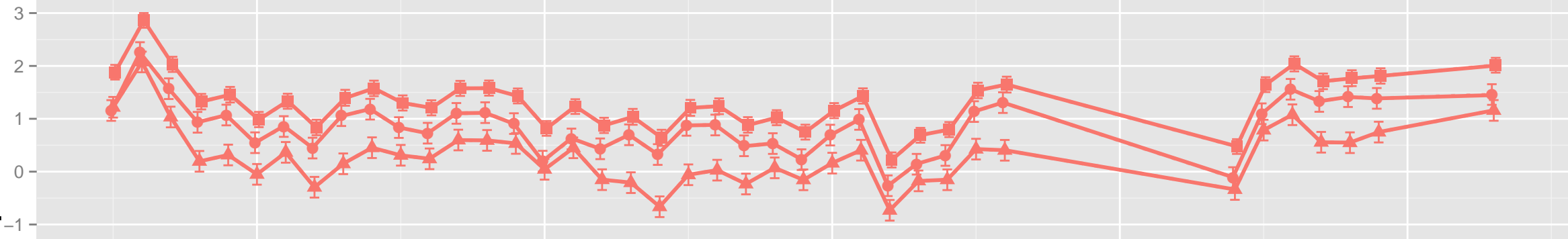
- all maturity

Discard Catch (thousands mt)

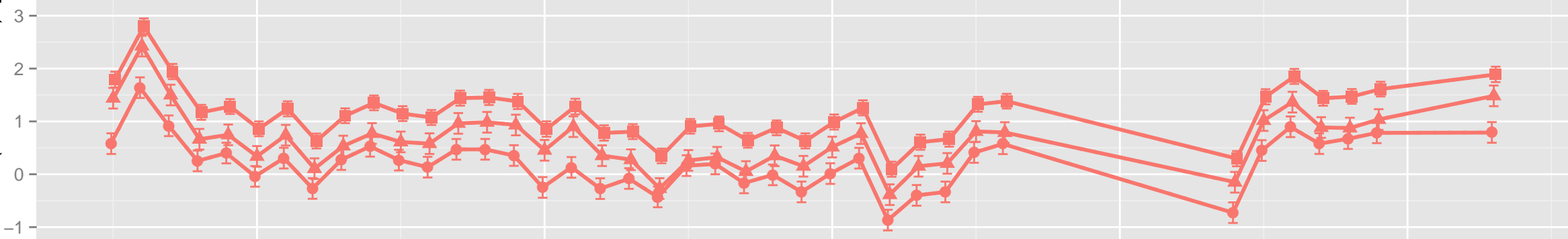


# TCF

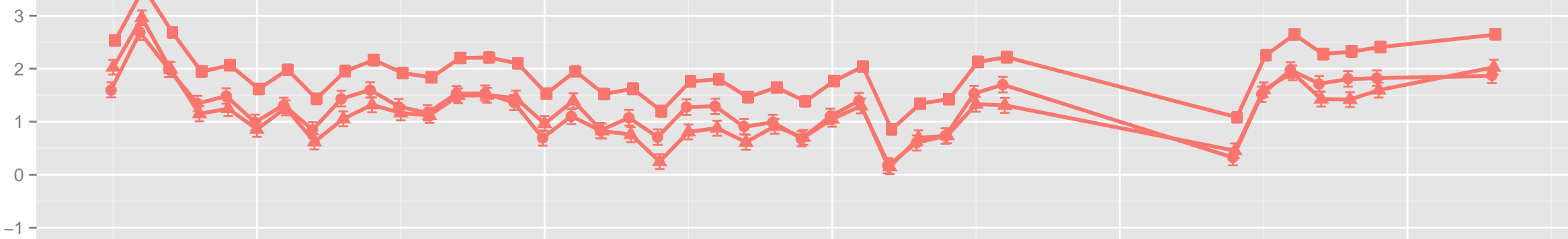
male



female



all sex



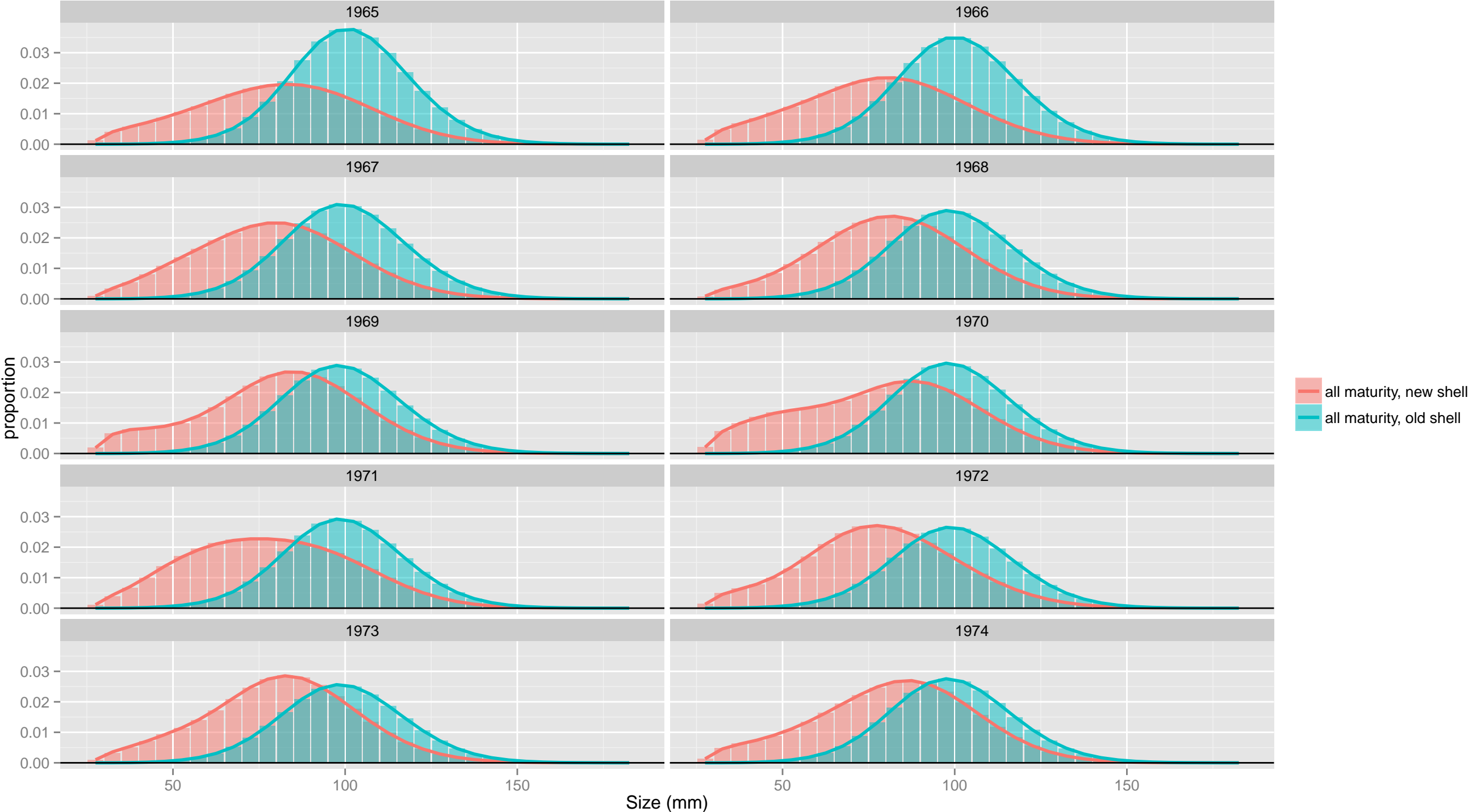
s

- new shell
- ▲ old shell
- all shell

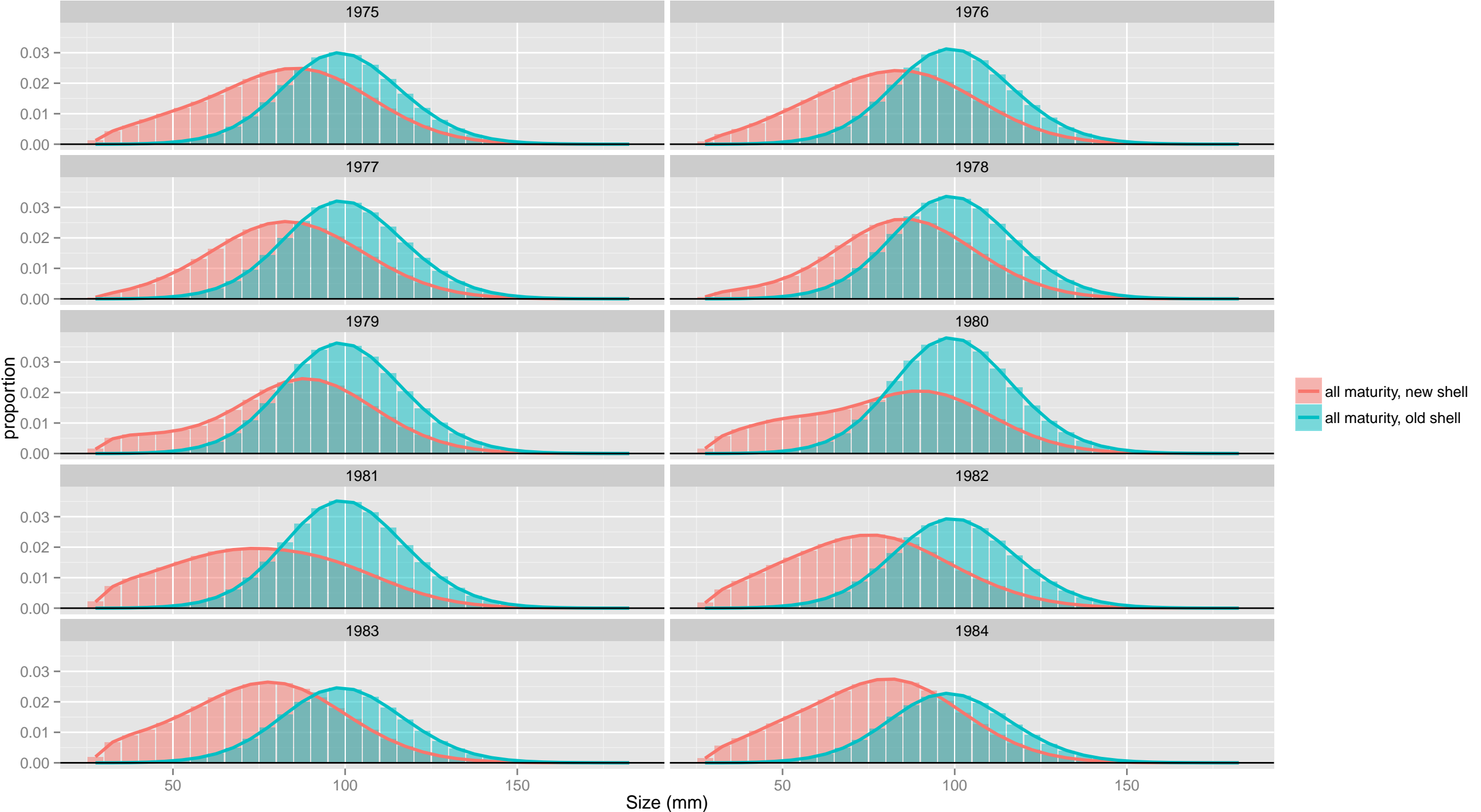
m

- all maturity

# Discard Catch: TCF: female

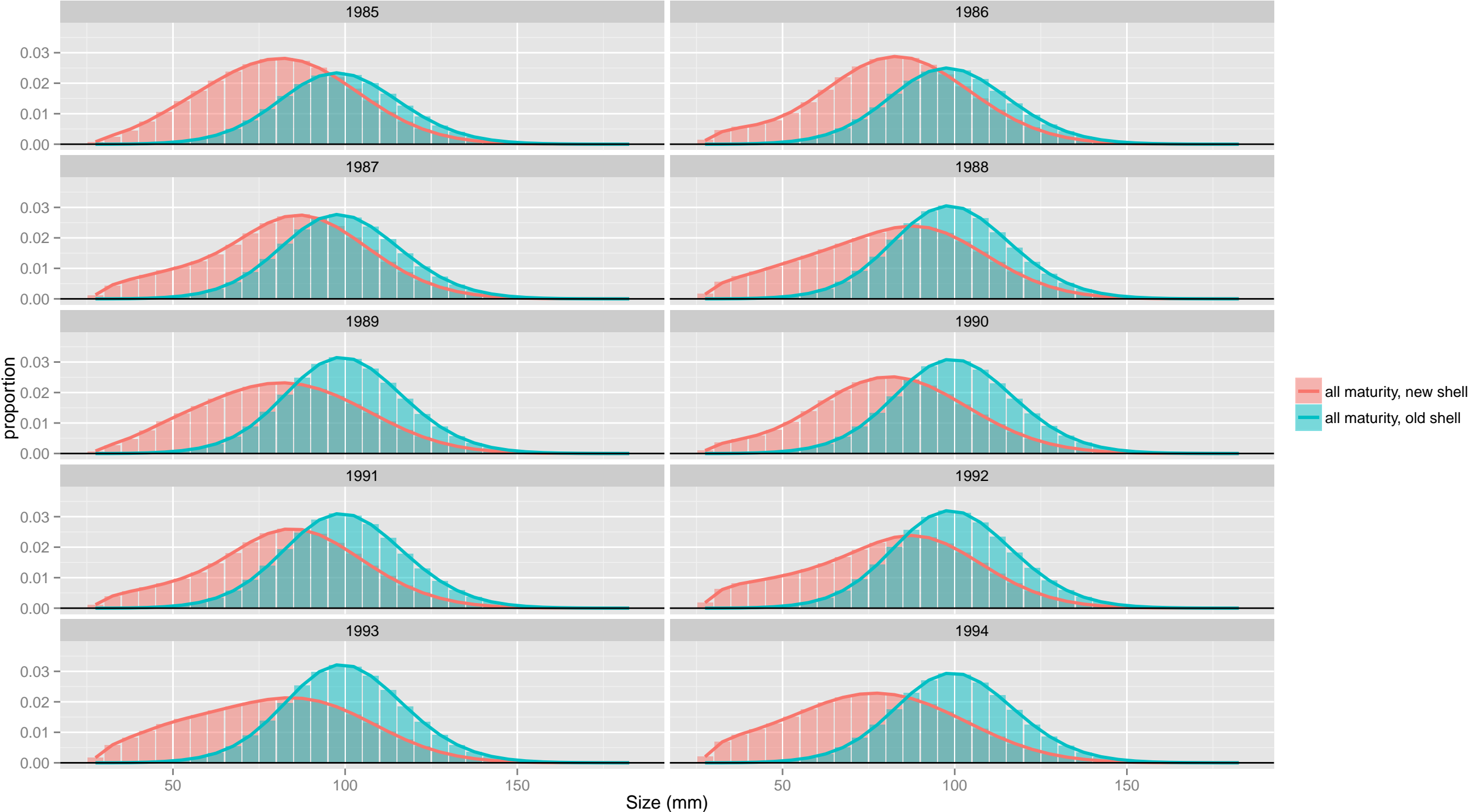


# Discard Catch: TCF: female

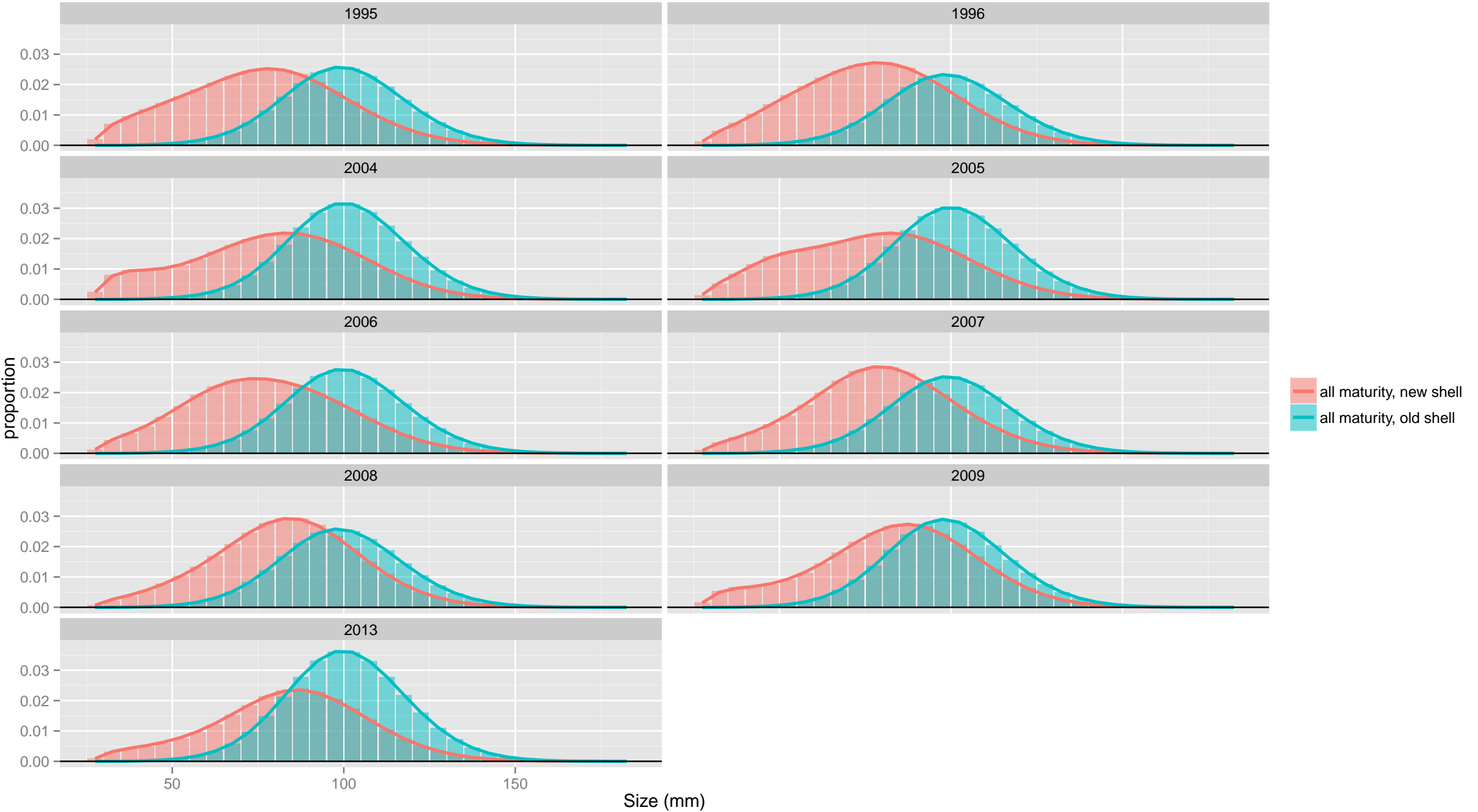




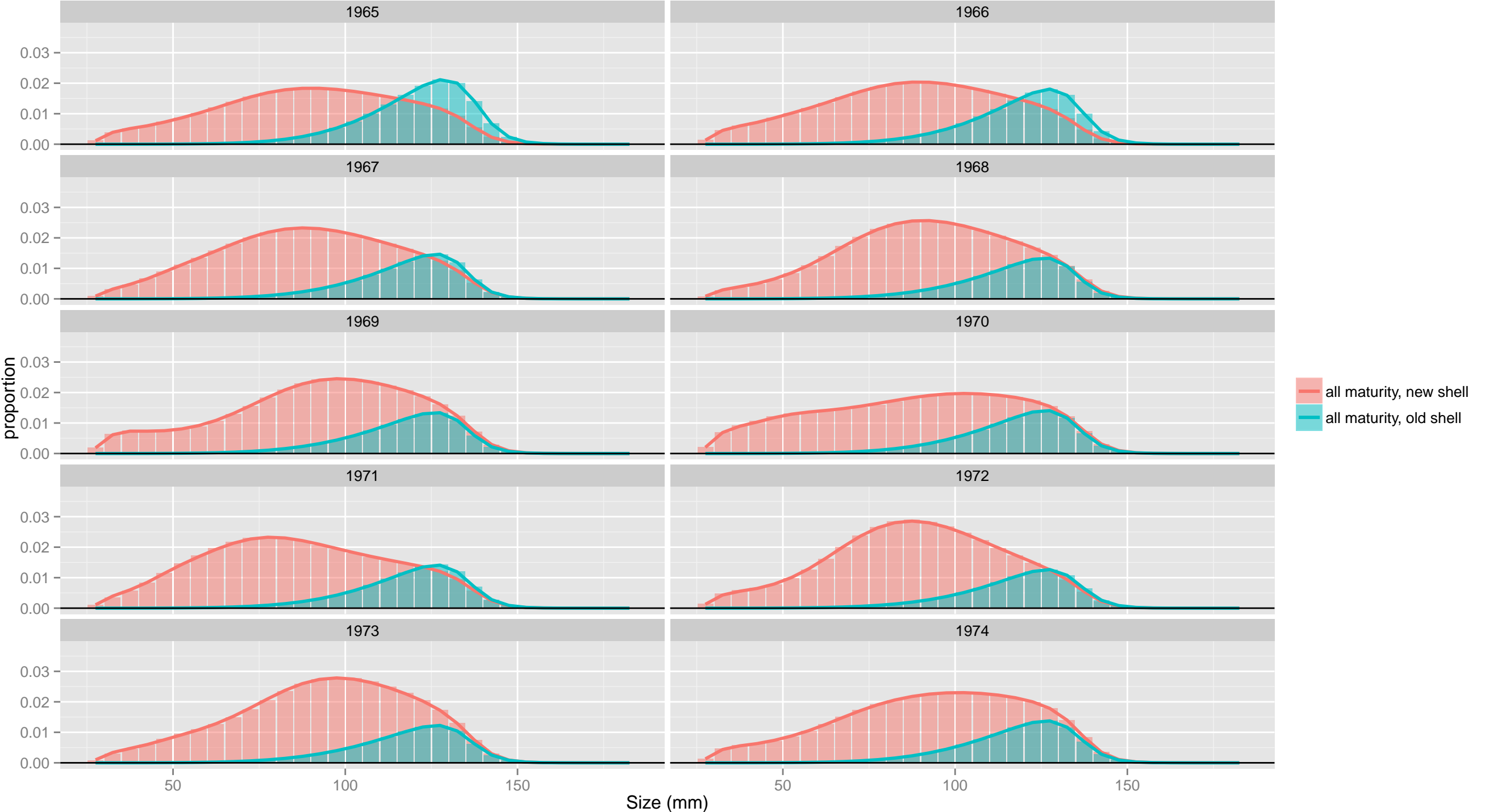
# Discard Catch: TCF: female



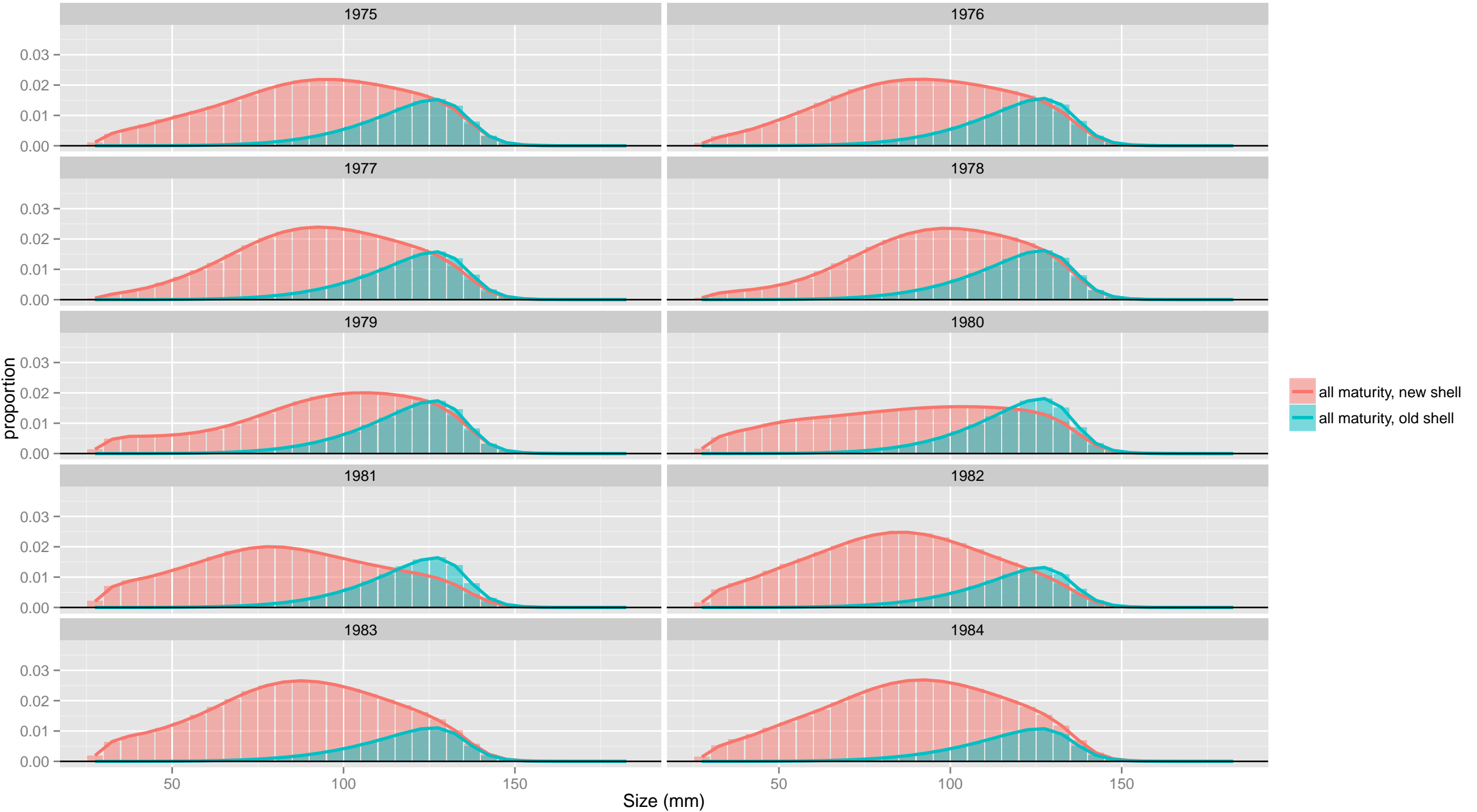
# Discard Catch: TCF: female



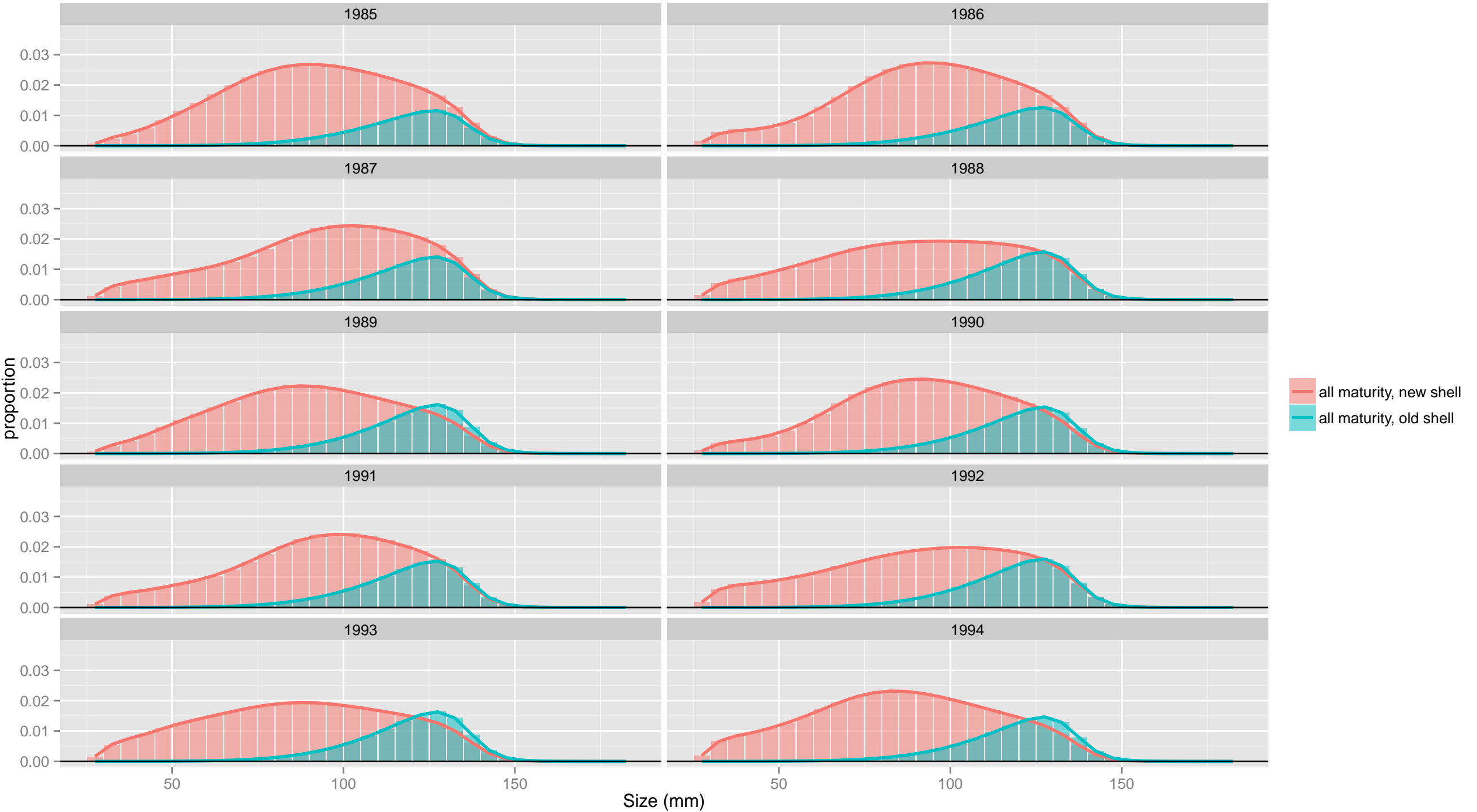
Discard Catch: TCF: male



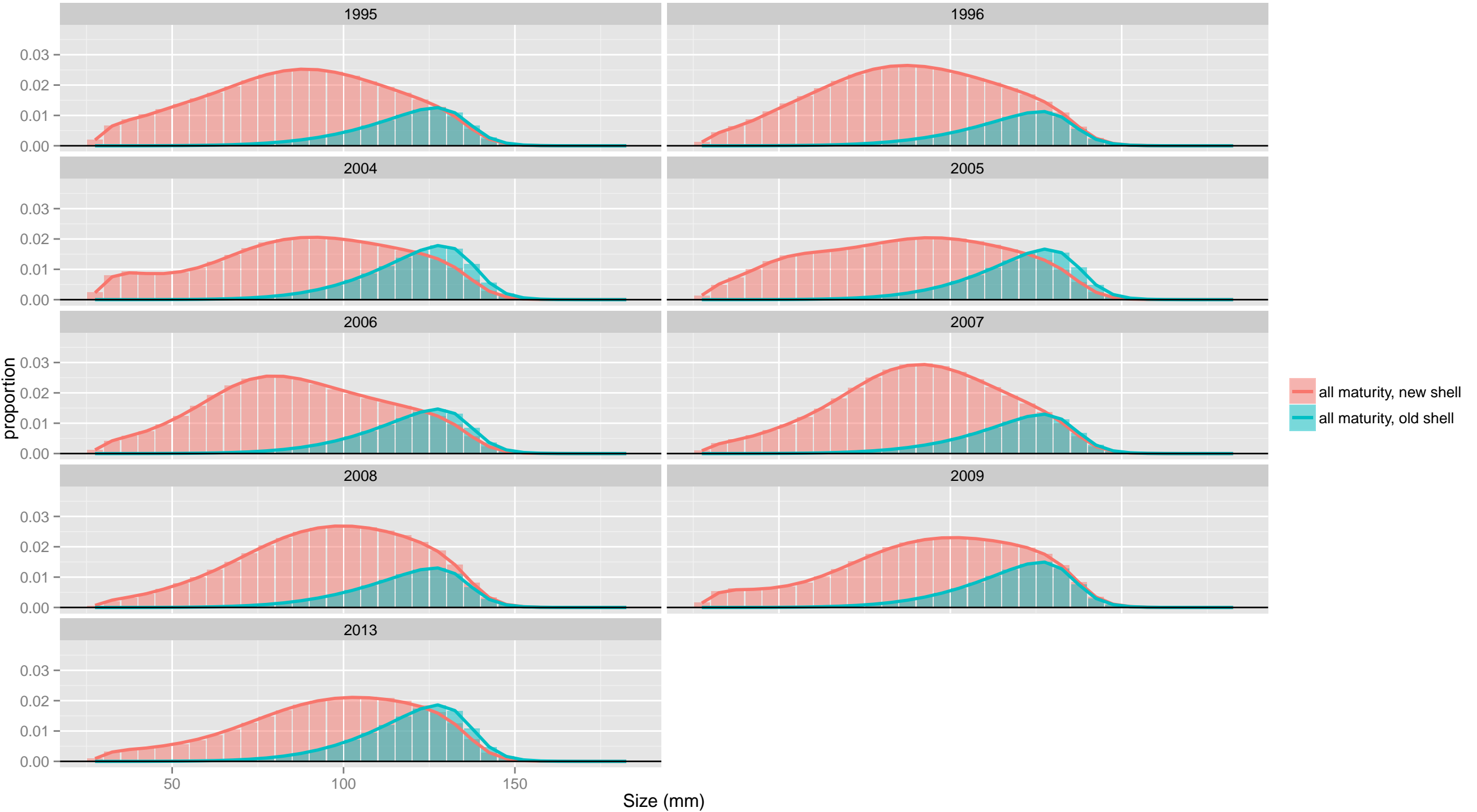
Discard Catch: TCF: male



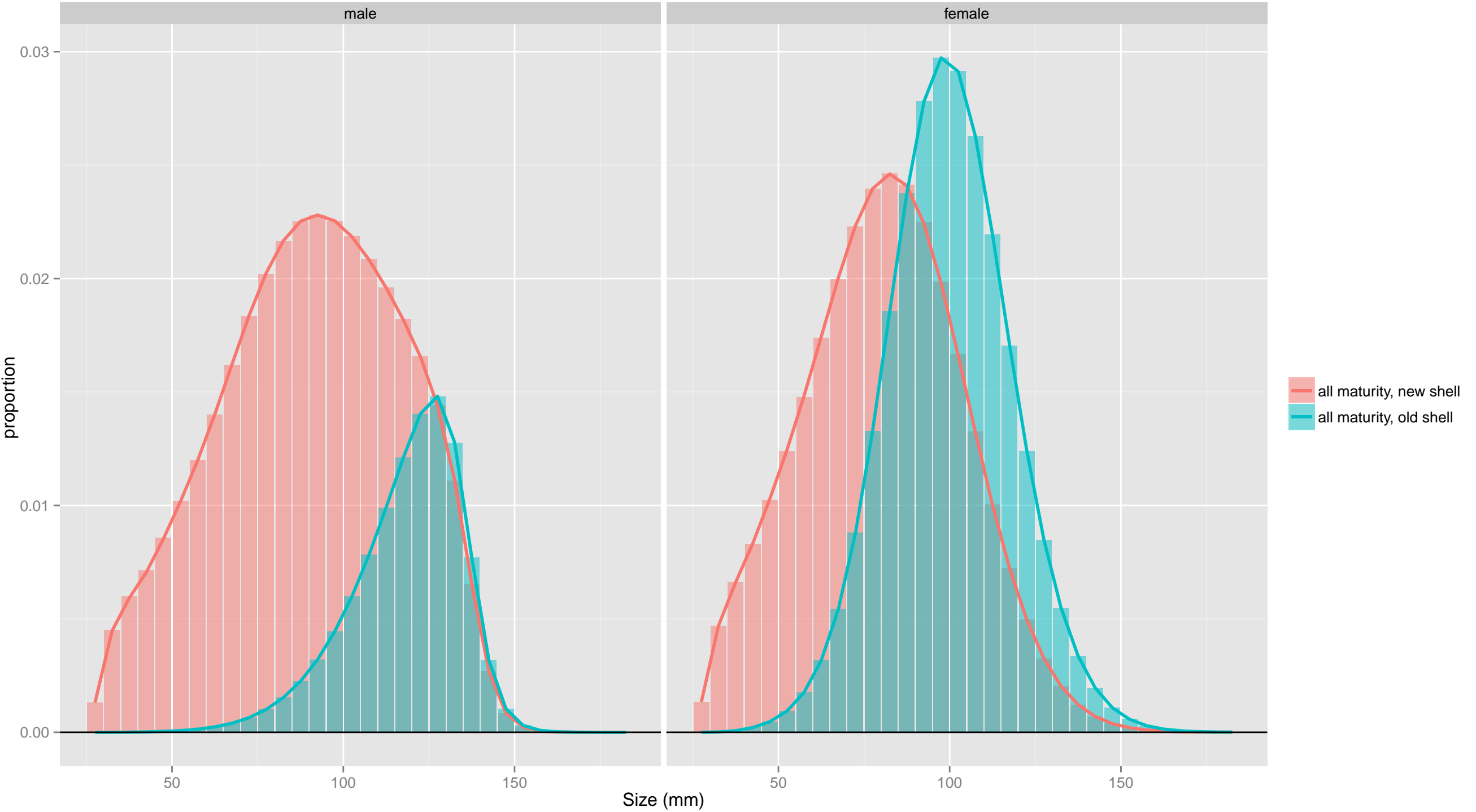
Discard Catch: TCF: male



Discard Catch: TCF: male

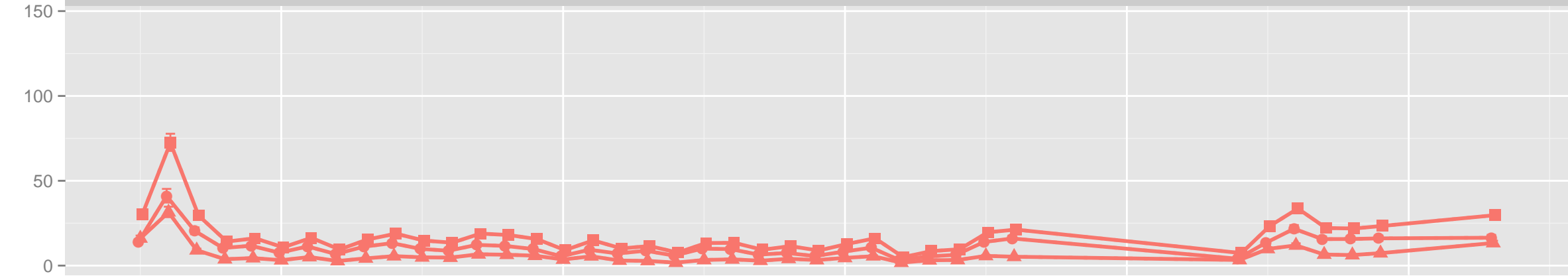


# Discard Catch: TCF

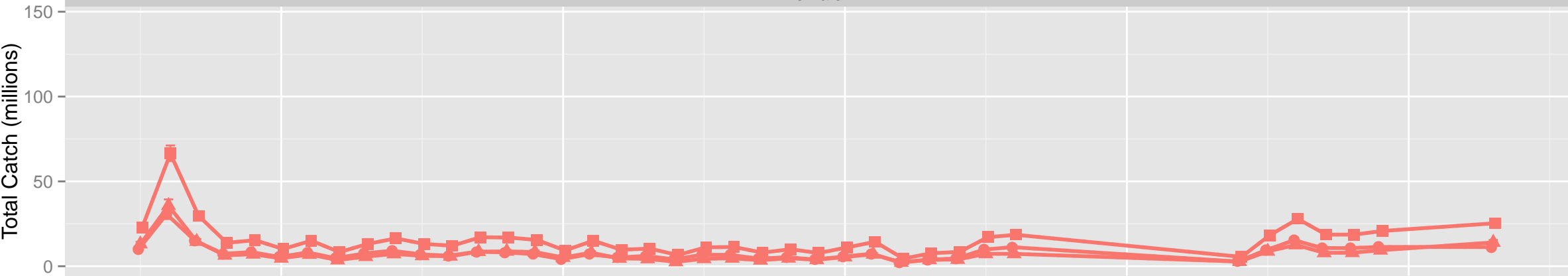


# TCF

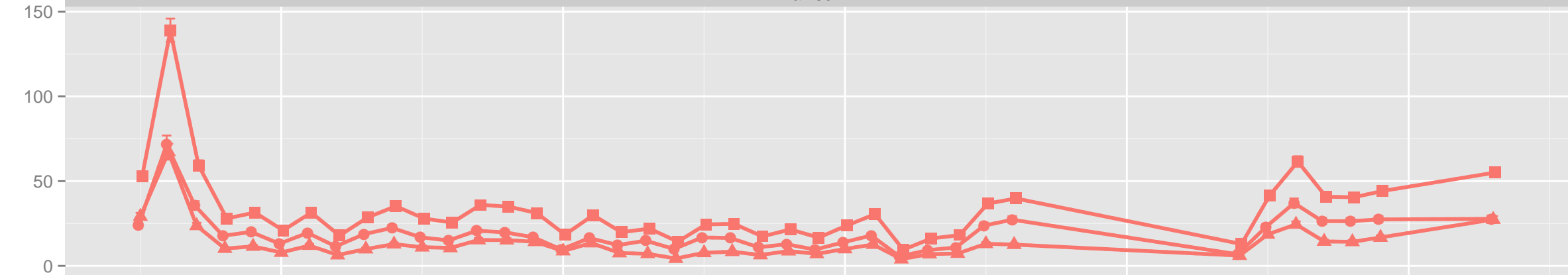
male



female



all sex



s

- new shell
- ▲ old shell
- all shell

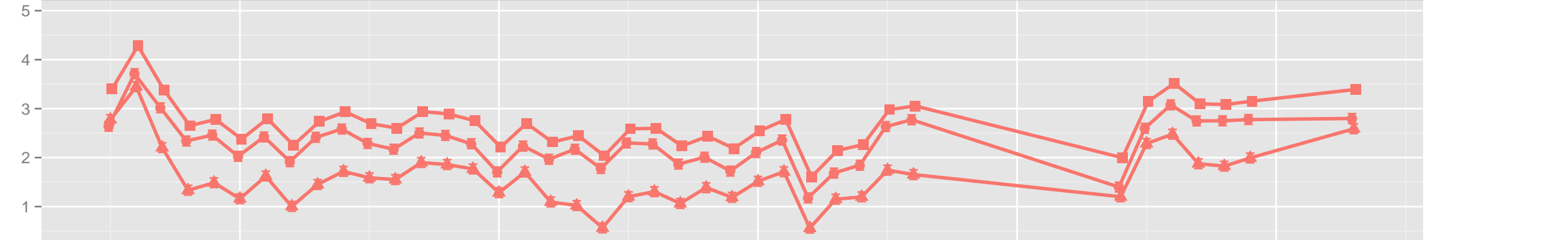
m

- all maturity

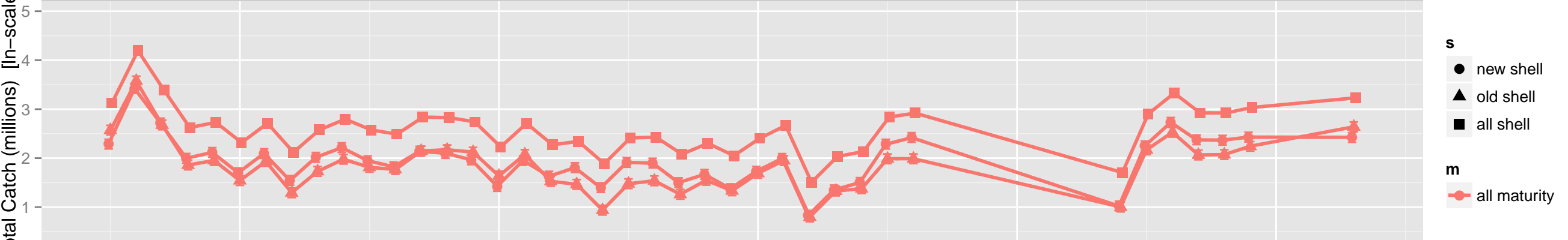


# TCF

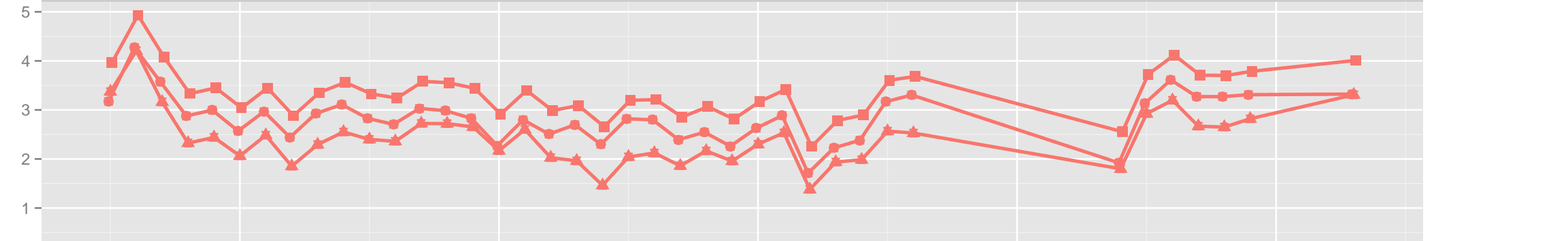
male



female



all sex



# TCF

male

60  
40  
20  
0

female

60  
40  
20  
0

all sex

60  
40  
20  
0

1970 1980 1990 2000 2010

y

s

- new shell
- ▲ old shell
- all shell

m

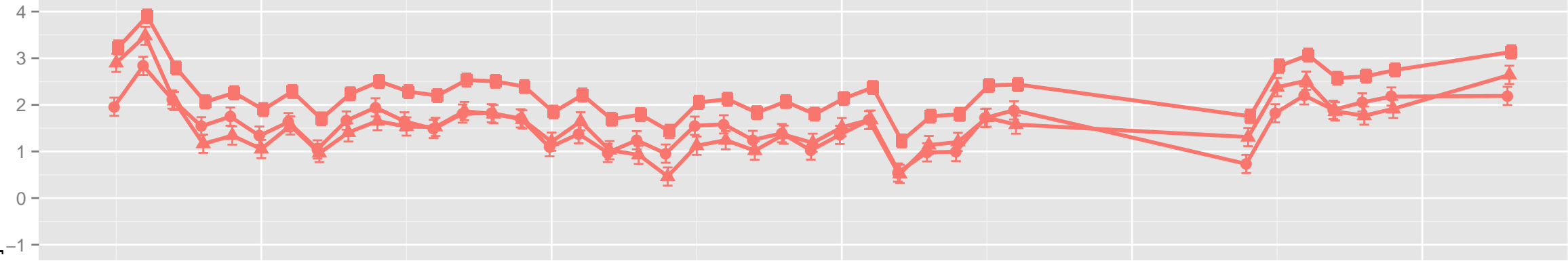
- all maturity

Total Catch (thousands mt)

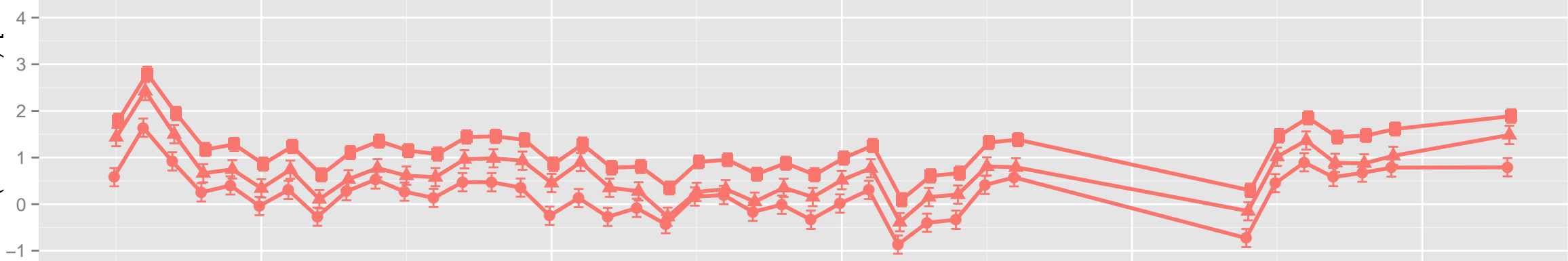


# TCF

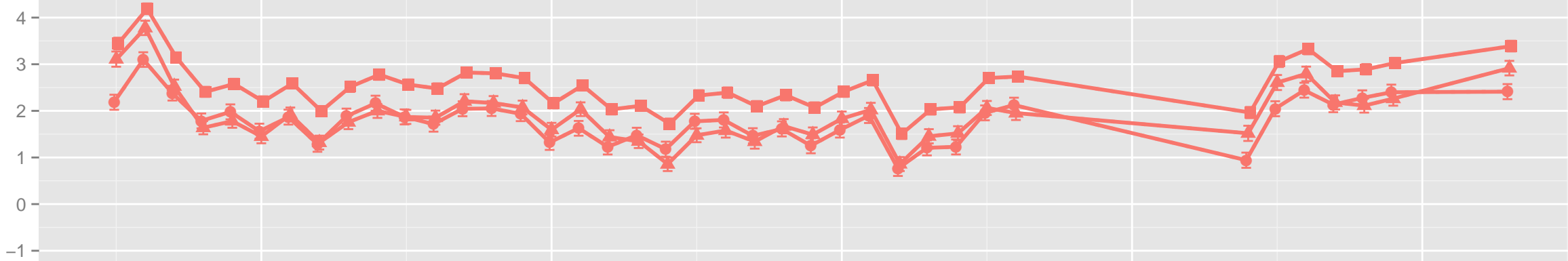
male



female



all sex



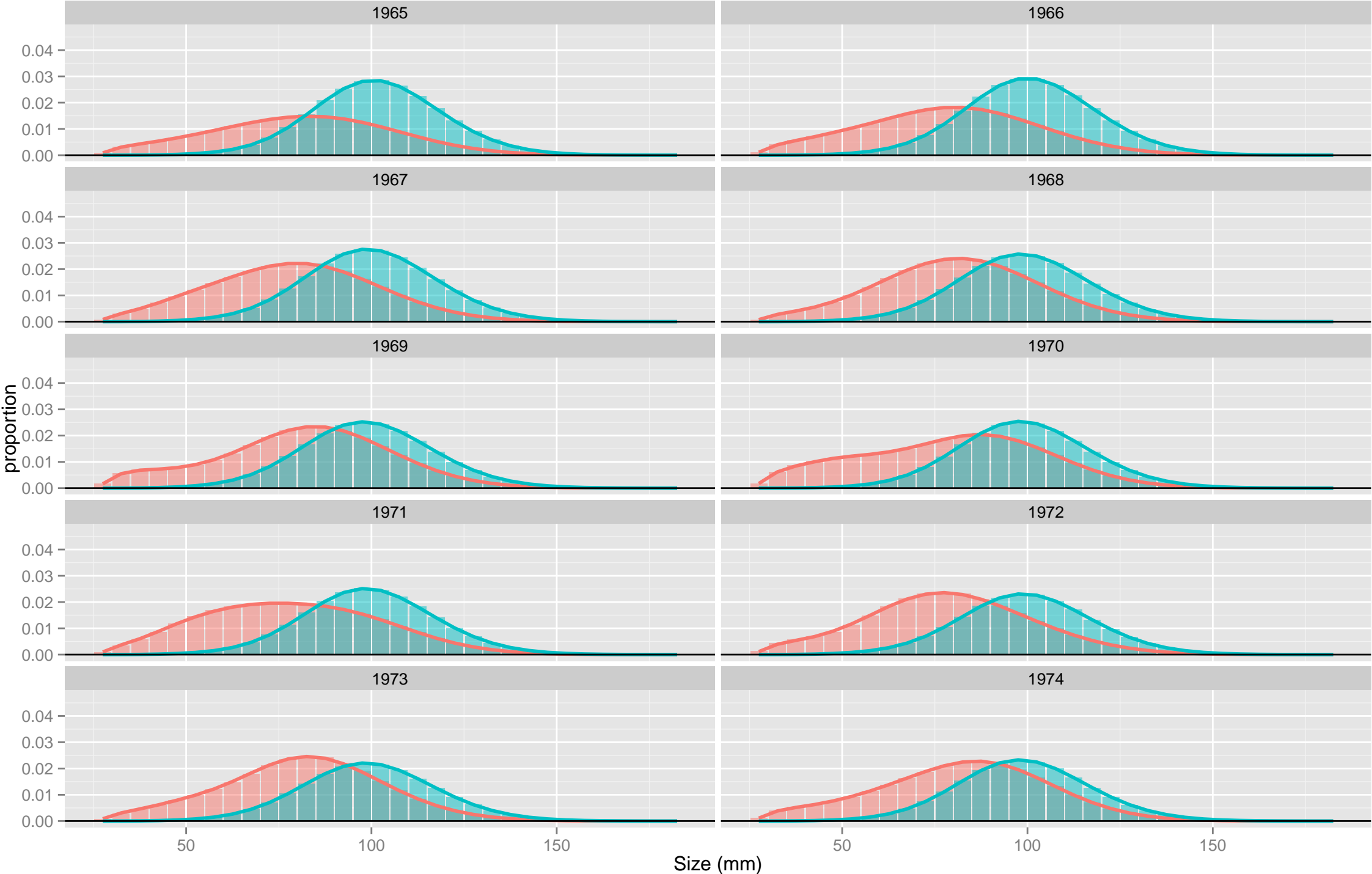
- s**
- new shell
  - ▲ old shell
  - all shell
- m**
- all maturity

Total Catch (thousands mt) [ln-scale]

1970 1980 1990 2000 2010

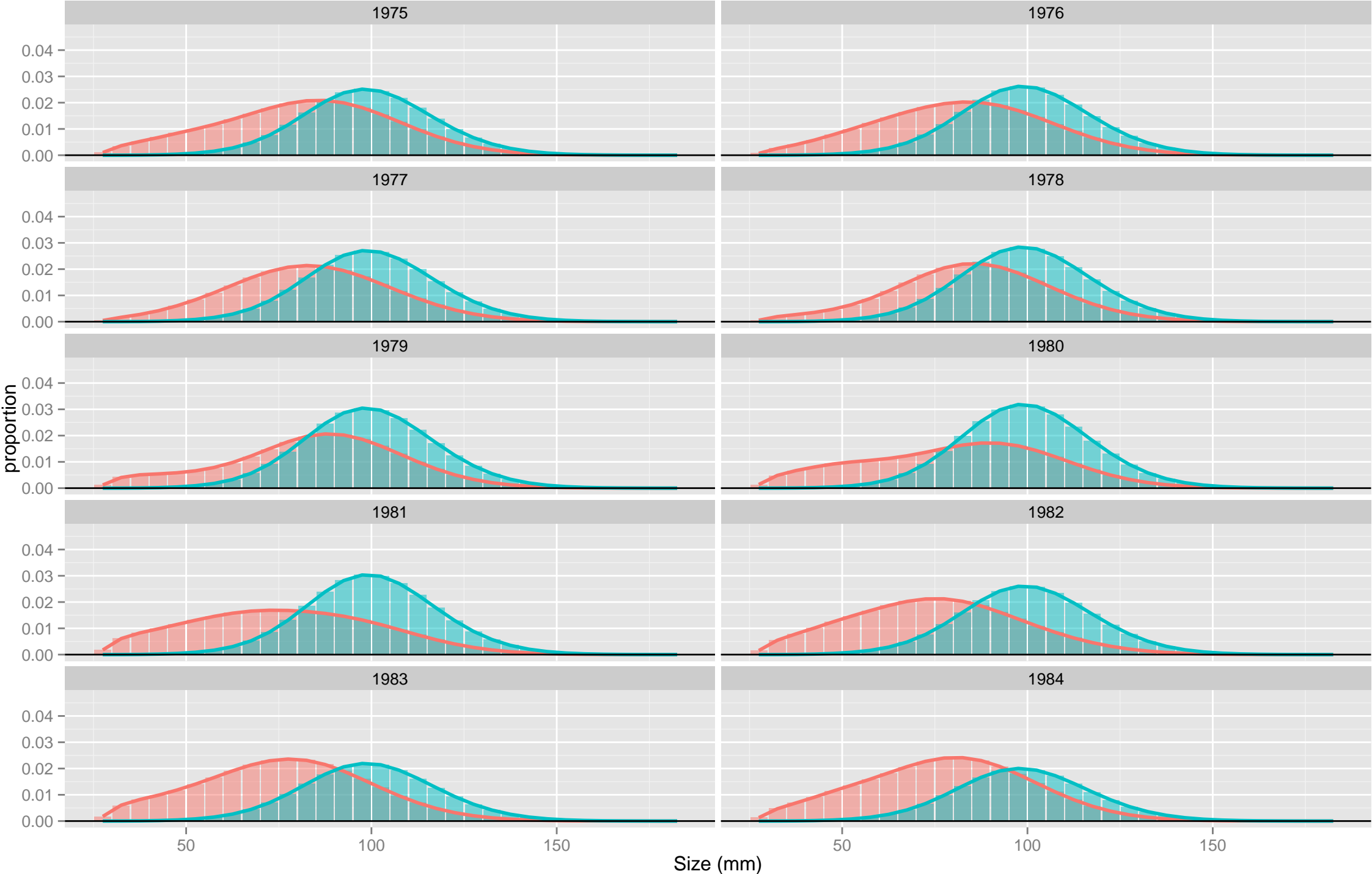
y

Total Catch: TCF: female



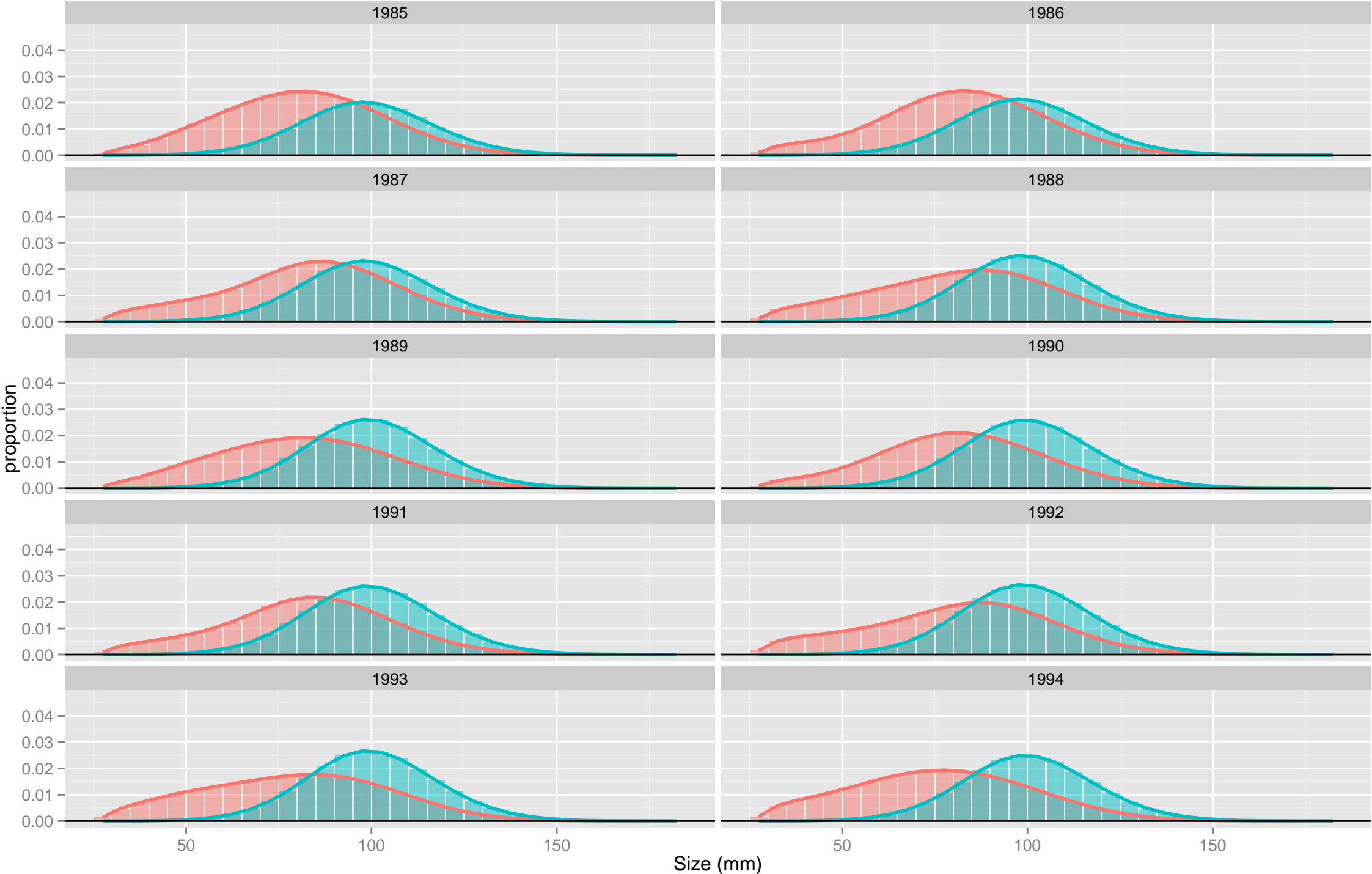
all maturity, new shell  
all maturity, old shell

Total Catch: TCF: female



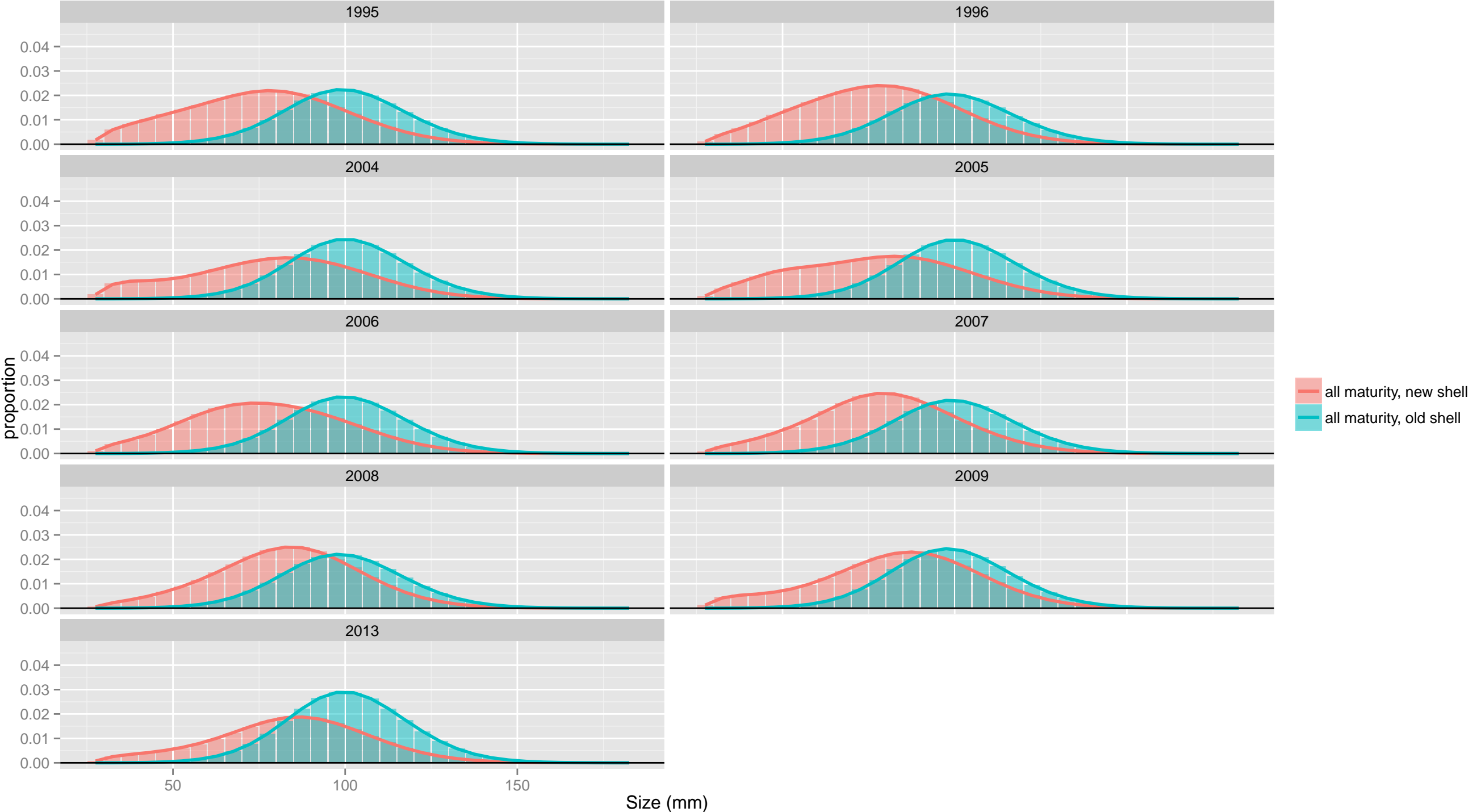
all maturity, new shell  
all maturity, old shell

Total Catch: TCF: female

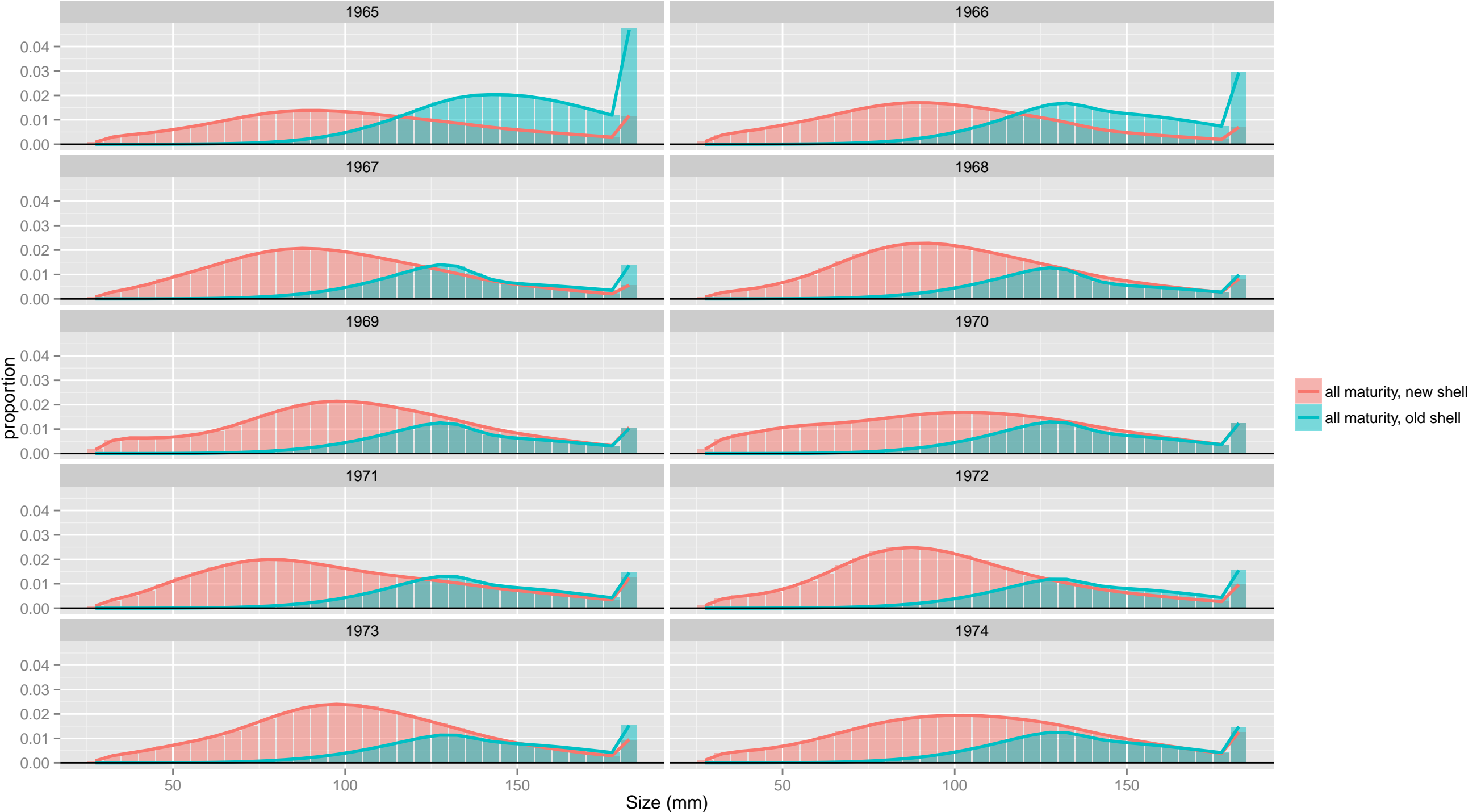


- all maturity, new shell
- all maturity, old shell

Total Catch: TCF: female



# Total Catch: TCF: male

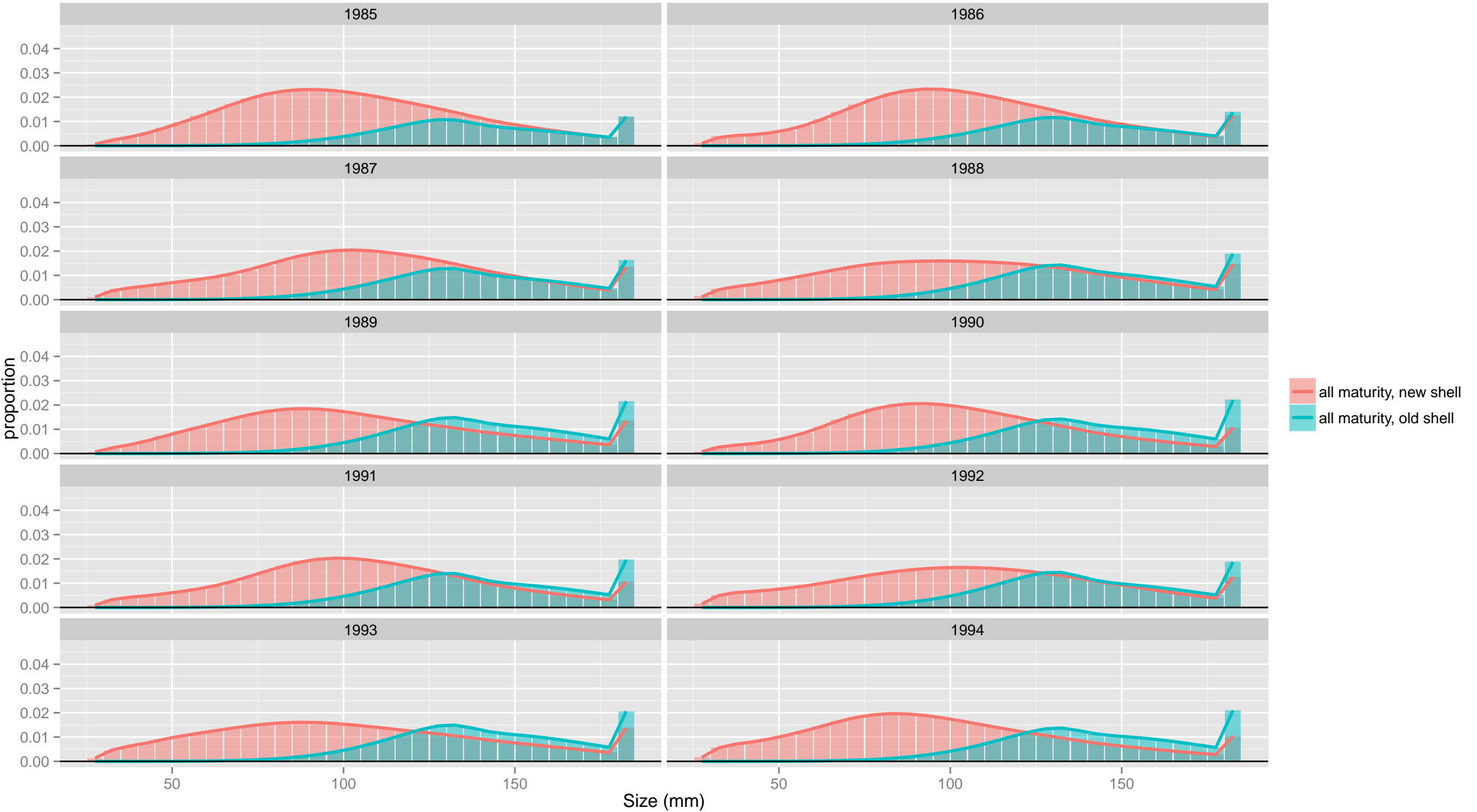




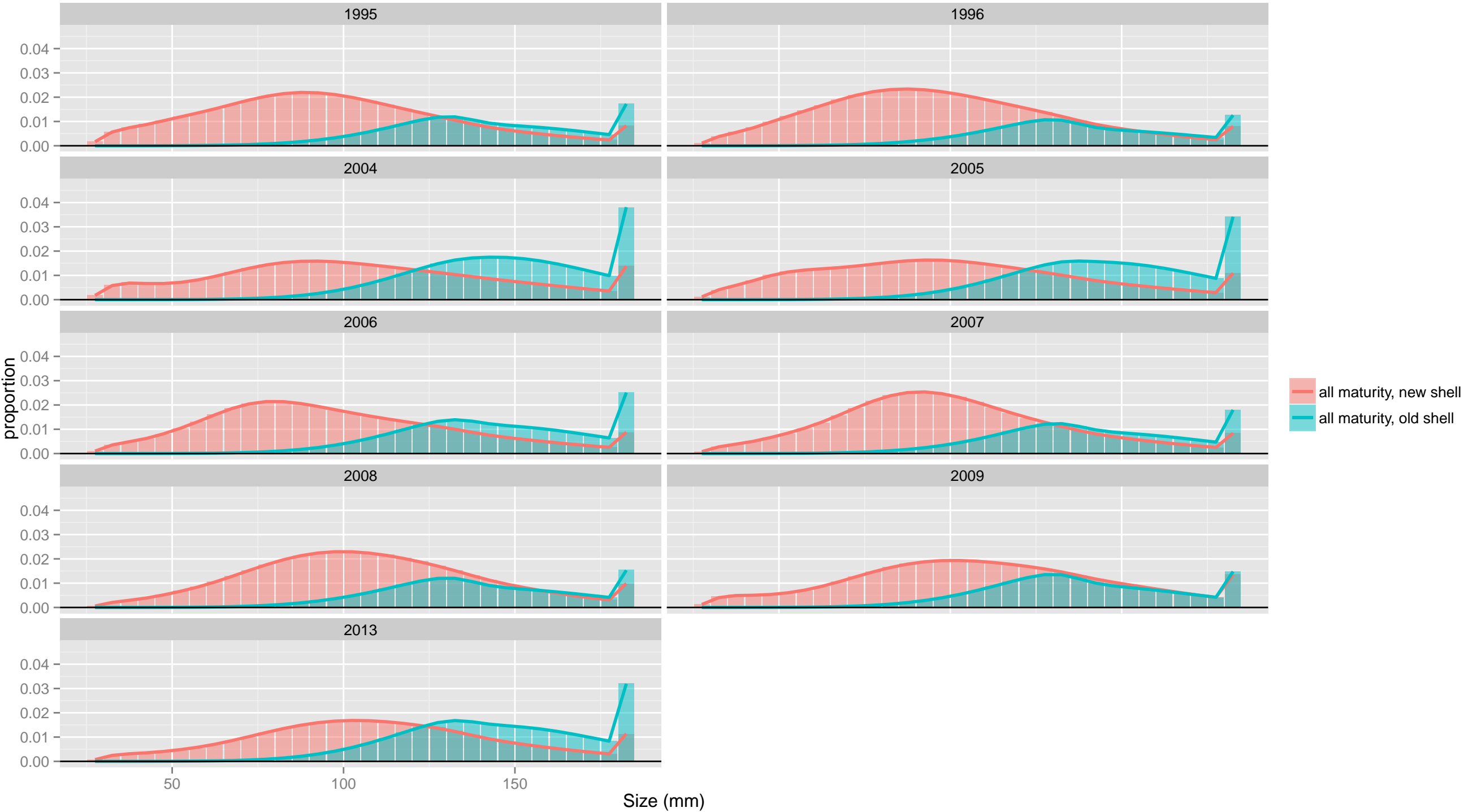
Total Catch: TCF: male



Total Catch: TCF: male



Total Catch: TCF: male



# Total Catch: TCF

male

female

0.025  
0.020  
0.015  
0.010  
0.005  
0.000

50

100

150

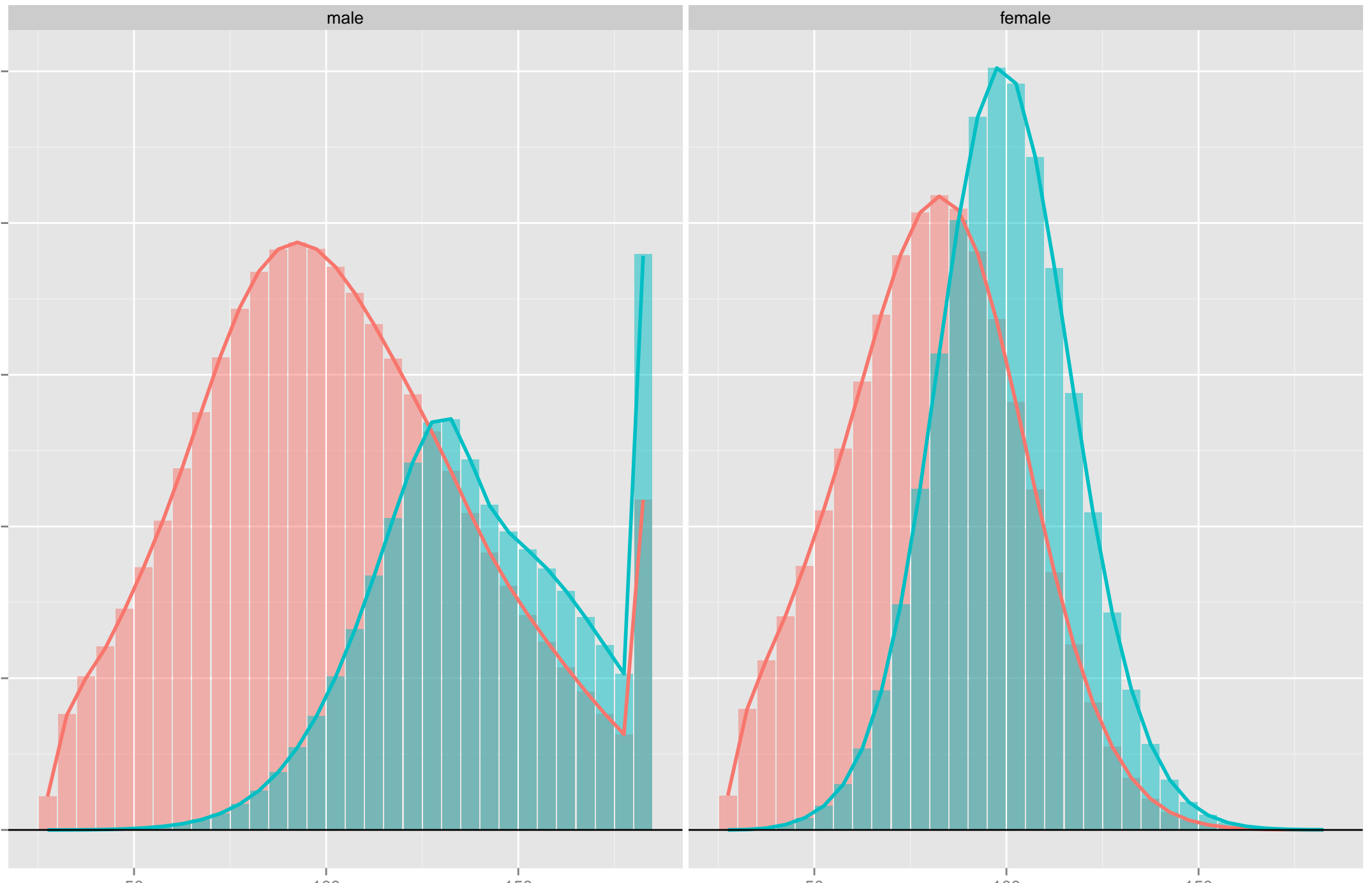
Size (mm)

50

100

150

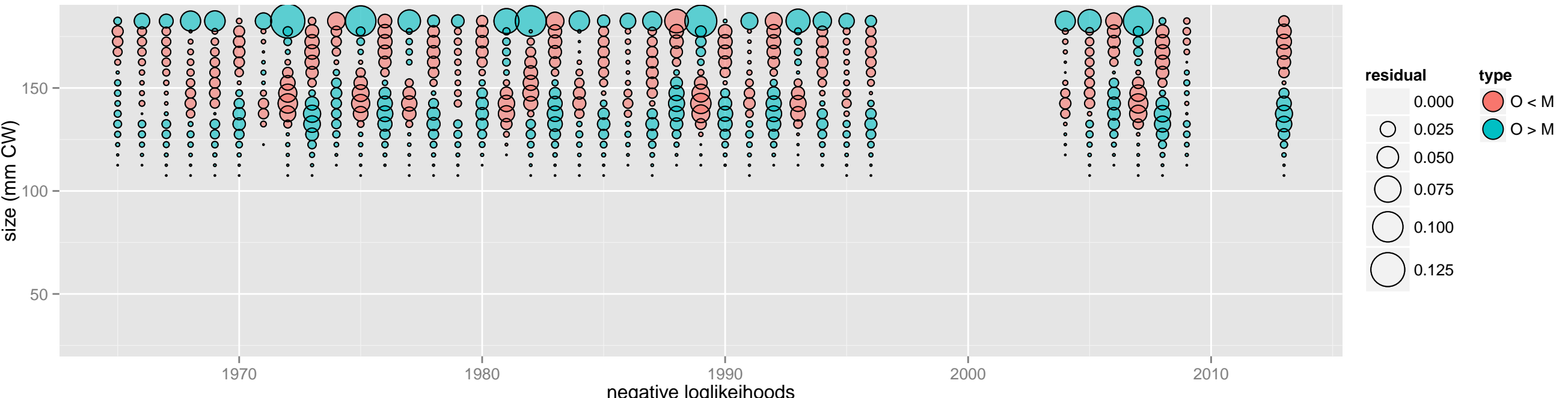
- all maturity, new shell
- all maturity, old shell



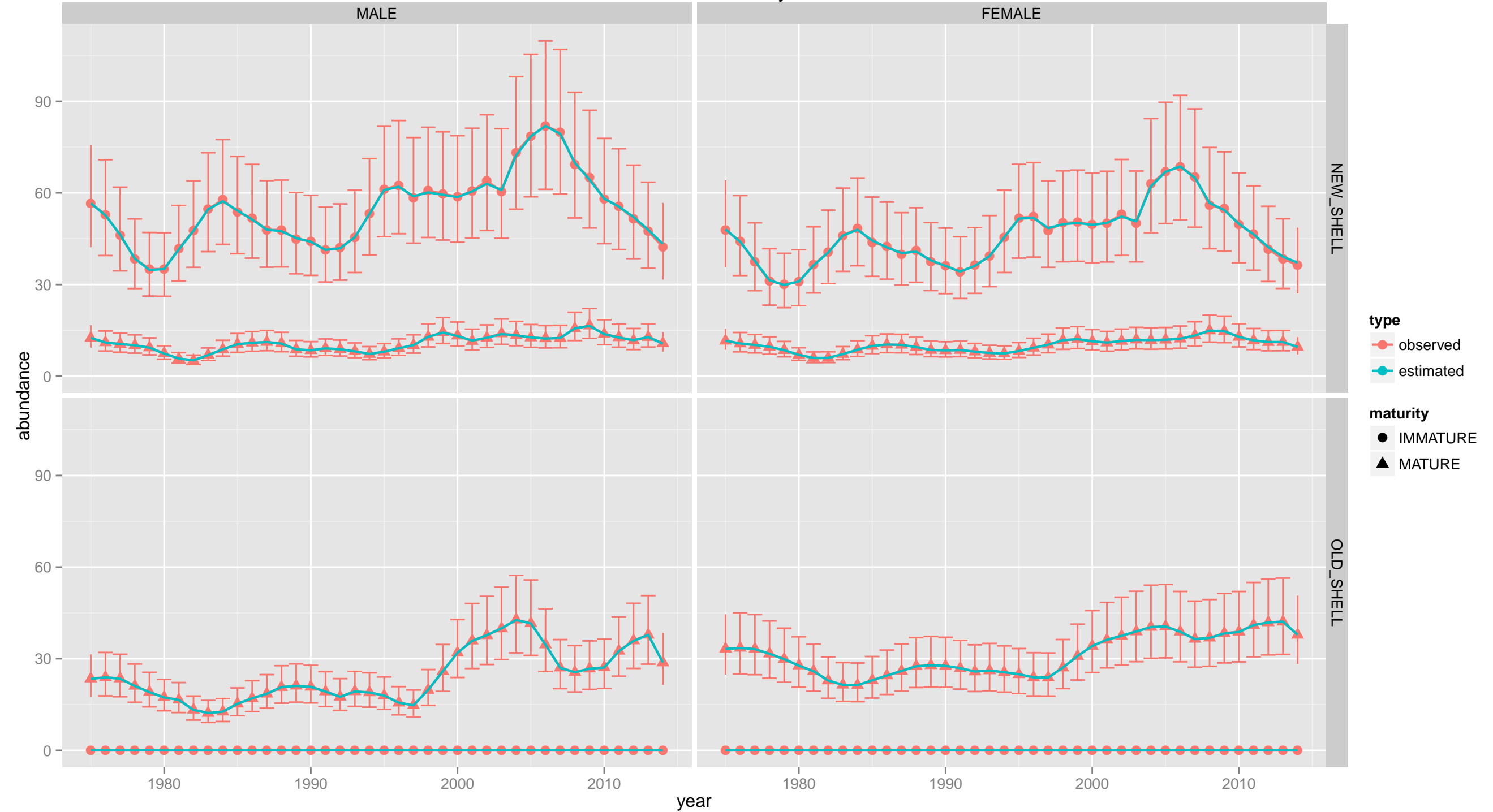
TCF: retained catch:



negative loglikelihoods



# NMFS\_trawl\_survey



# NMFS\_trawl\_survey

MALE

FEMALE

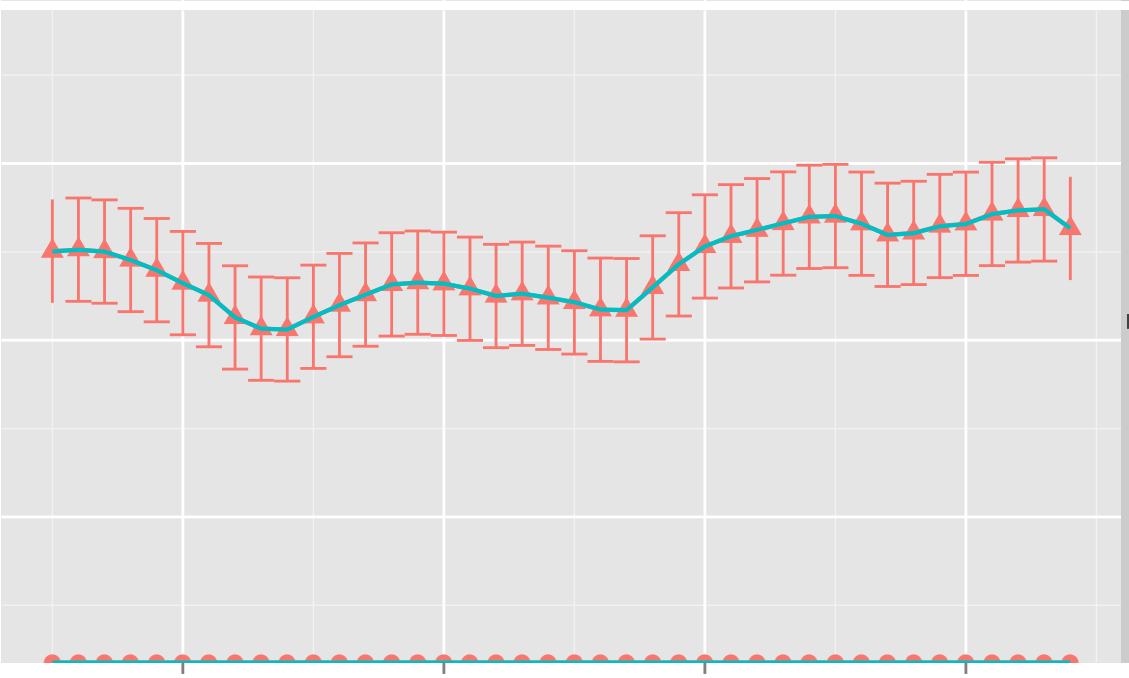
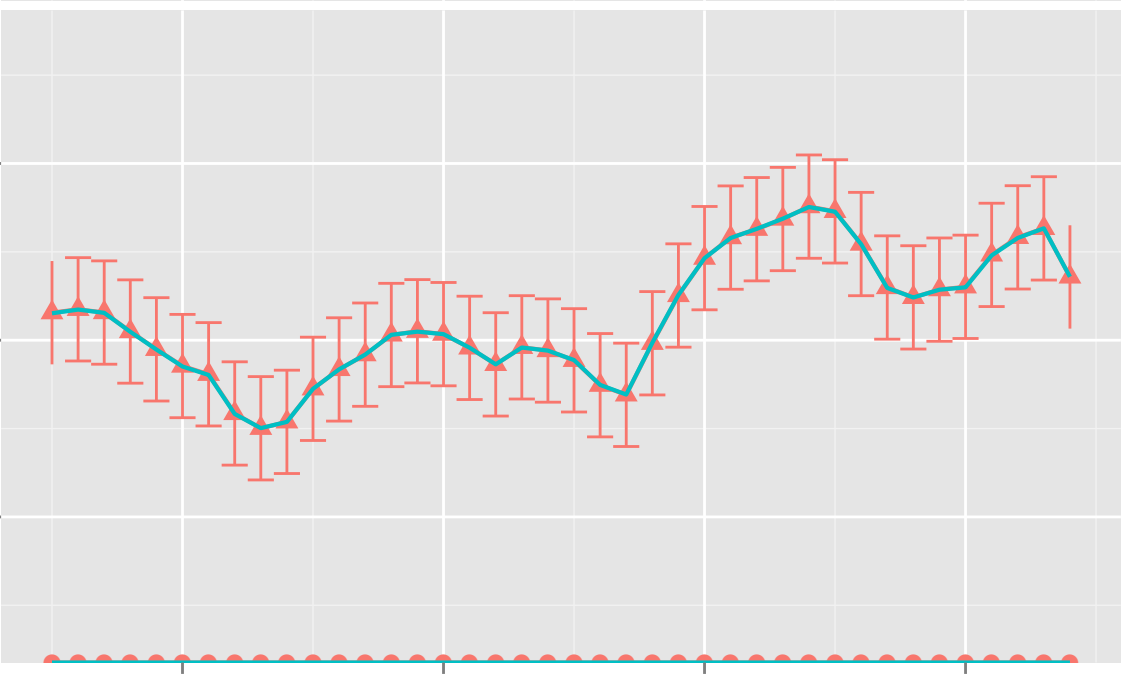
NEW\_SHELL

OLD\_SHELL

abundance [ln-scale]

year

- maturity**
- IMMATURE
  - ▲ MATURE
- type**
- observed
  - estimated



# NMFS\_trawl\_survey

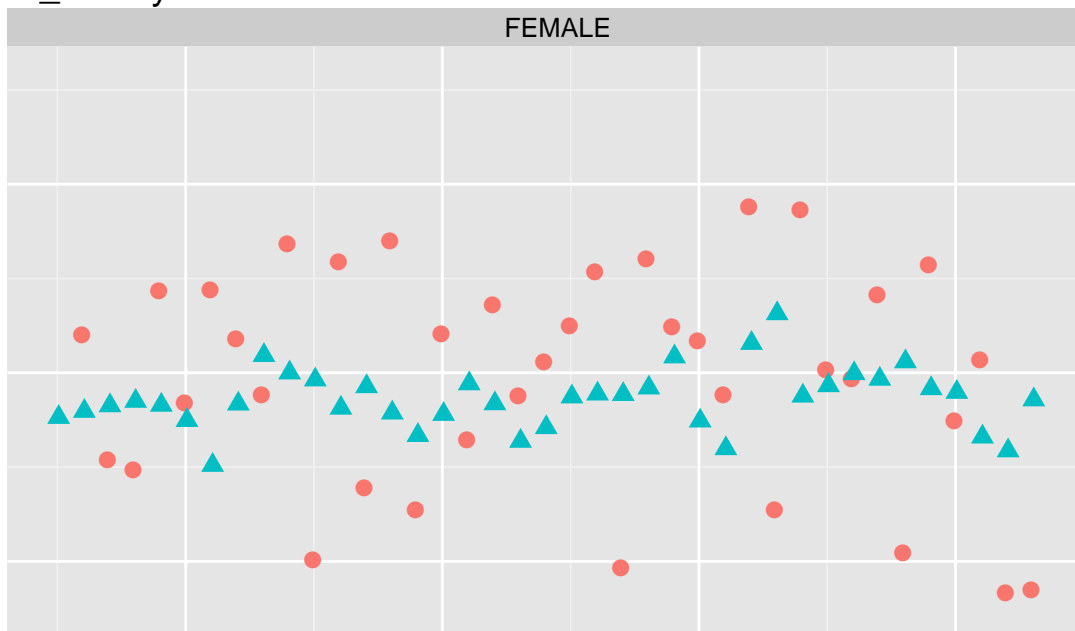
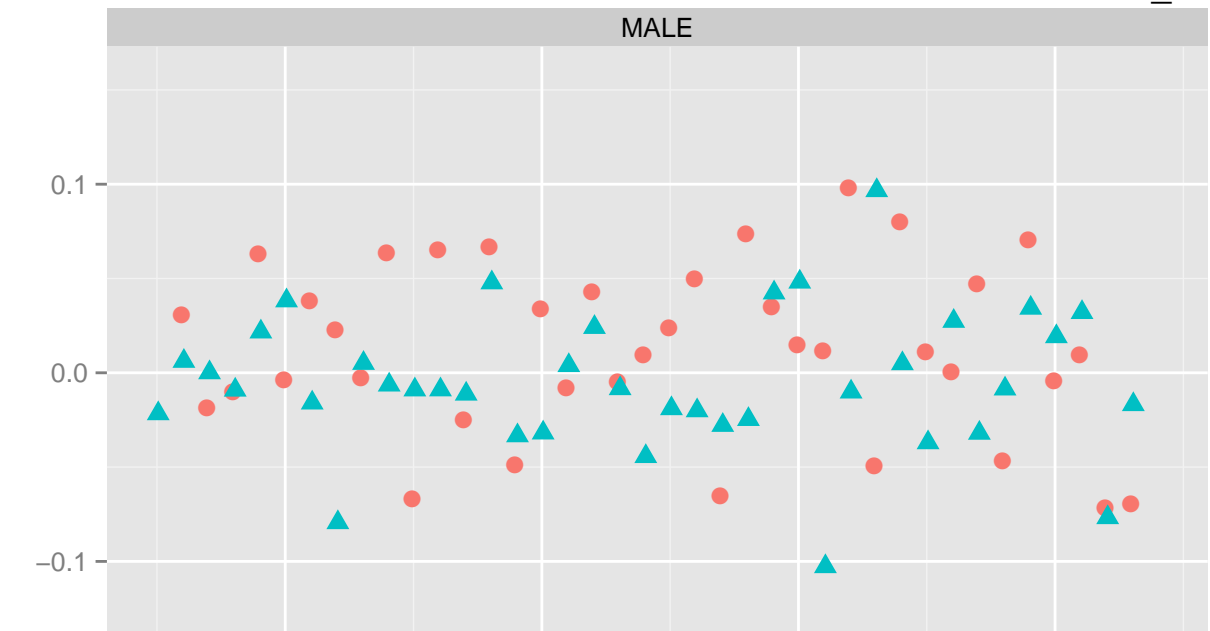
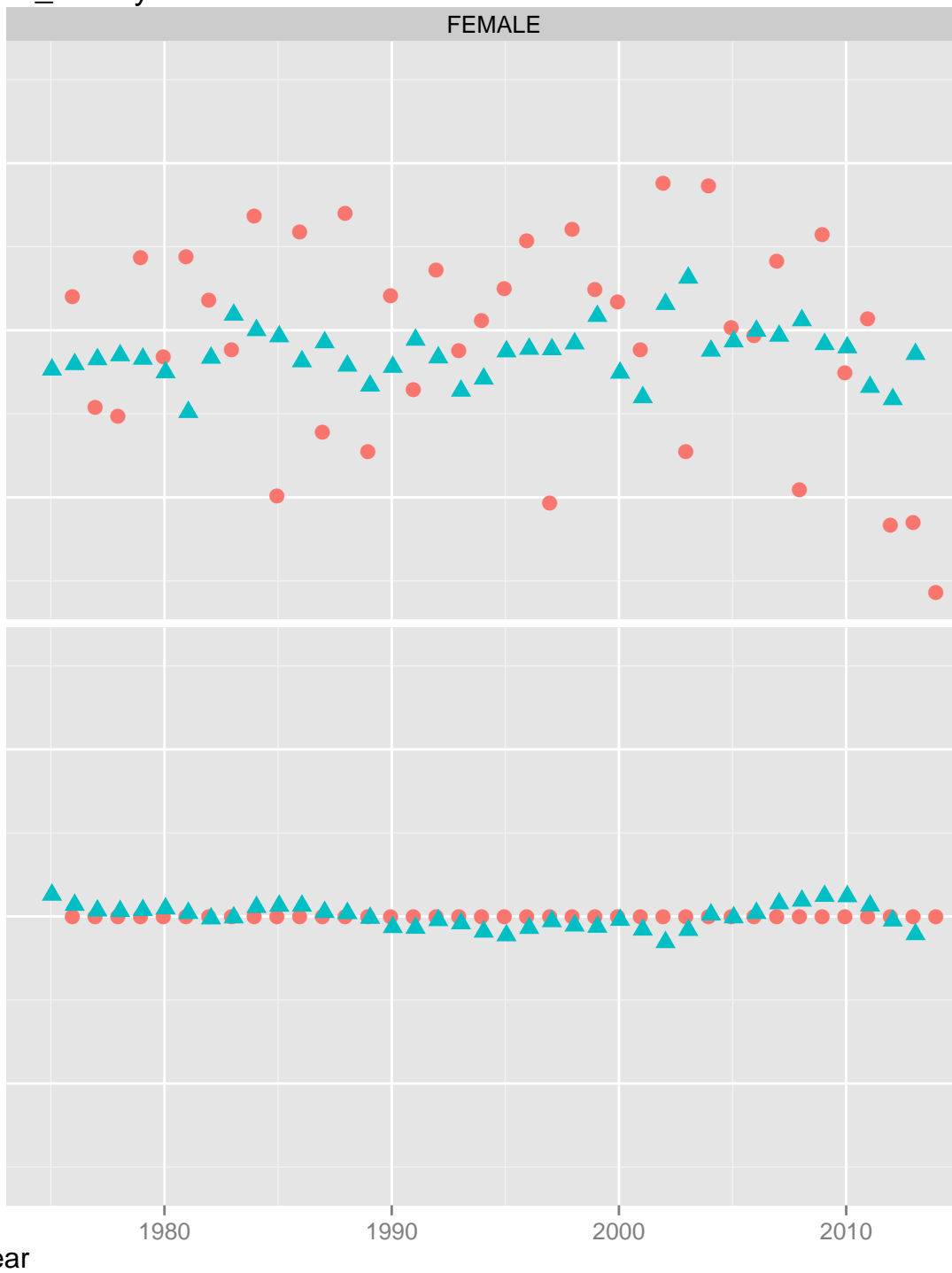
MALE

FEMALE

NEW\_SHELL

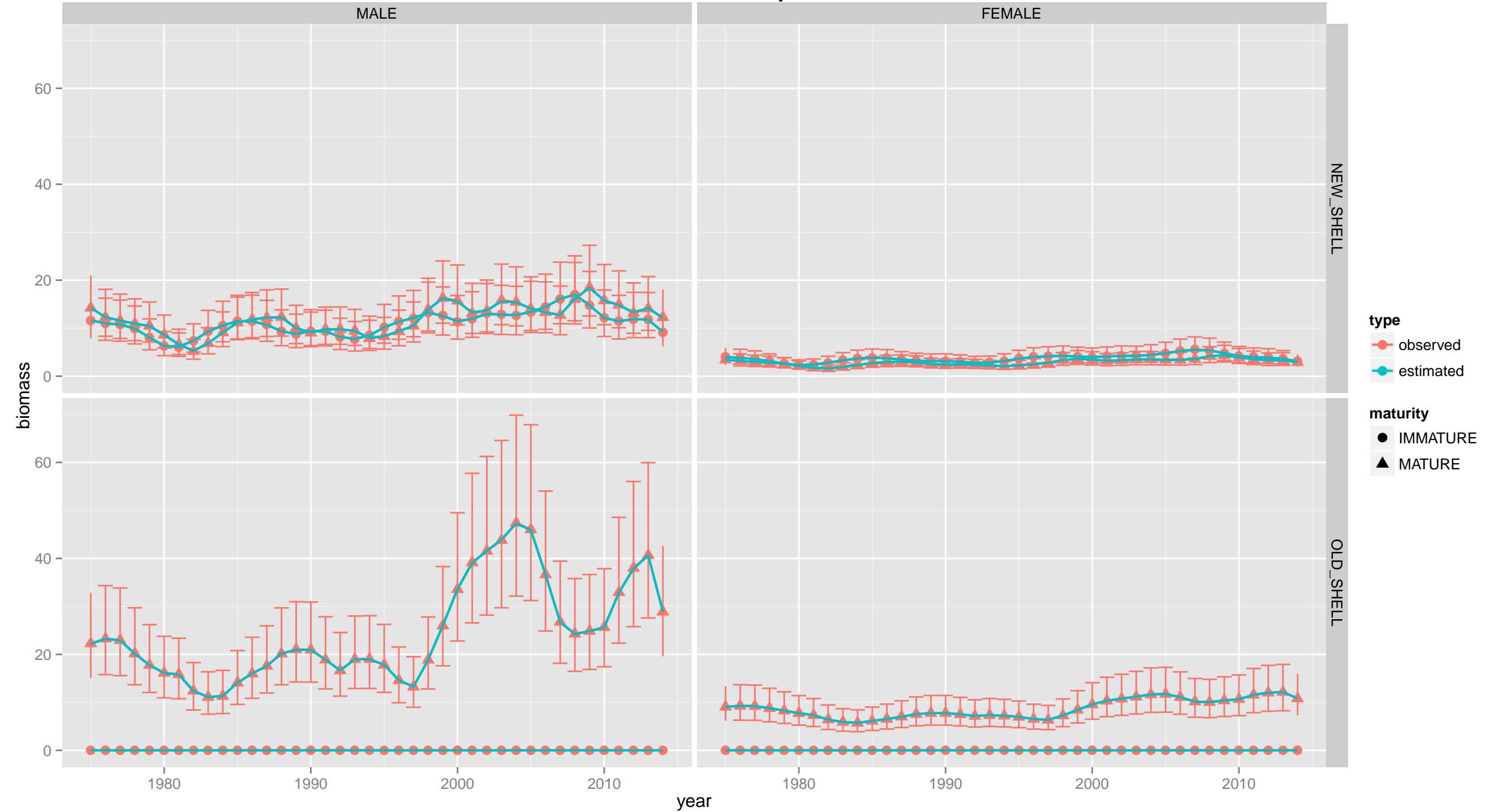
OLD\_SHELL

maturity  
● IMMATURE  
▲ MATURE





# NMFS\_trawl\_survey



# NMFS\_trawl\_survey

MALE

FEMALE

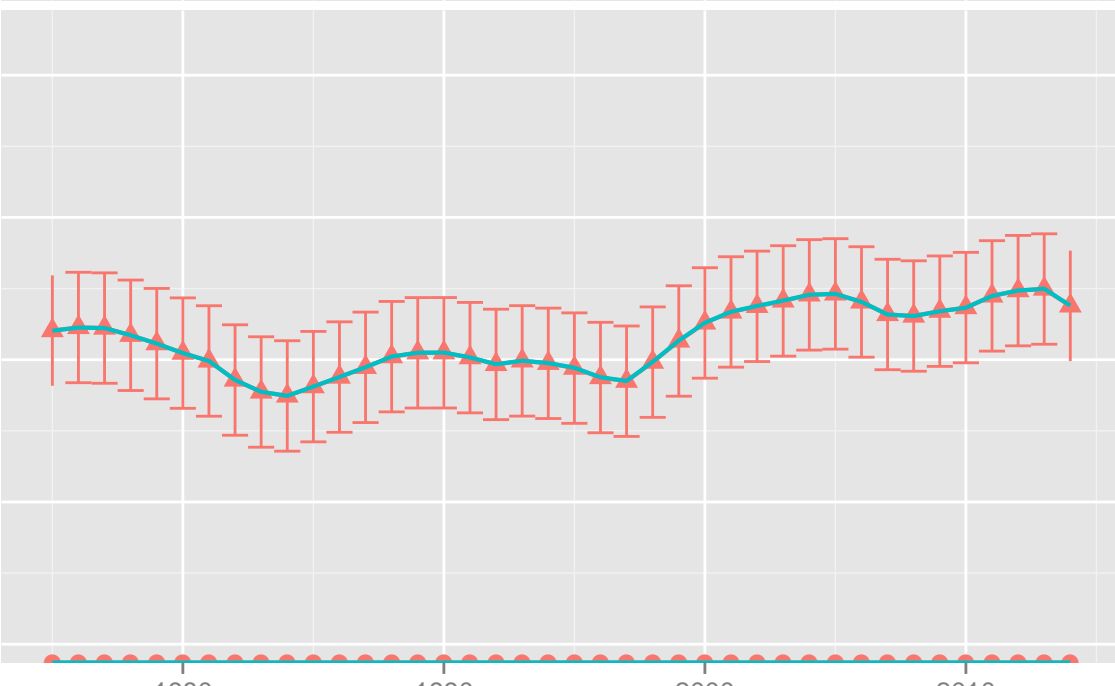
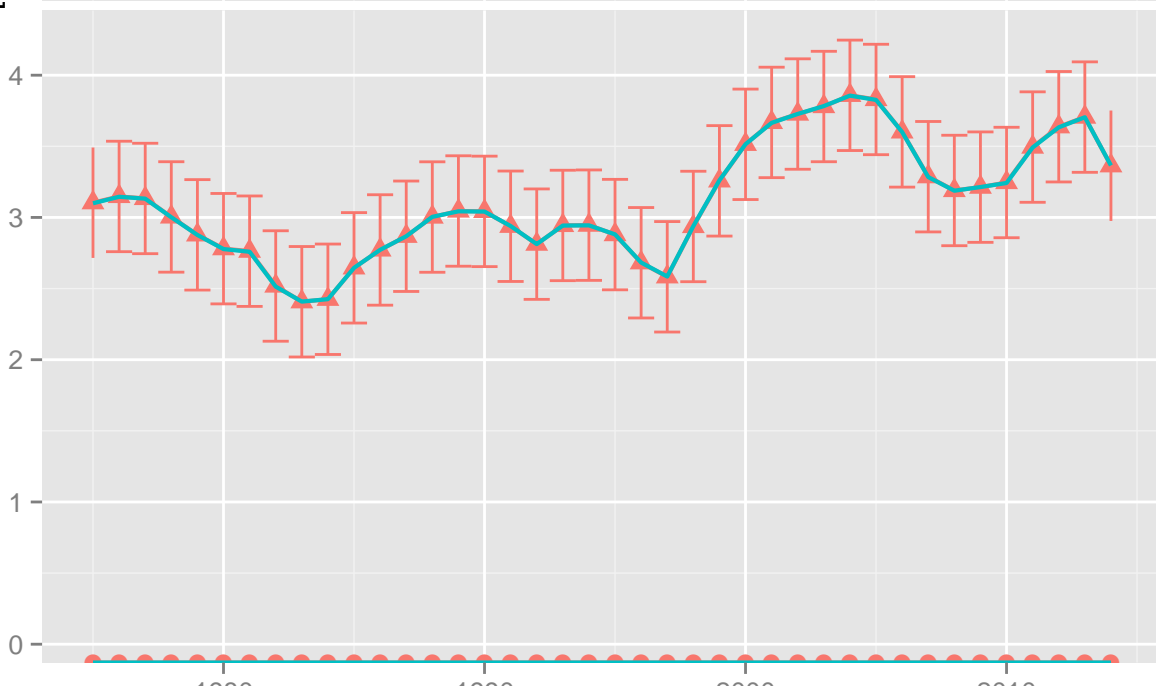
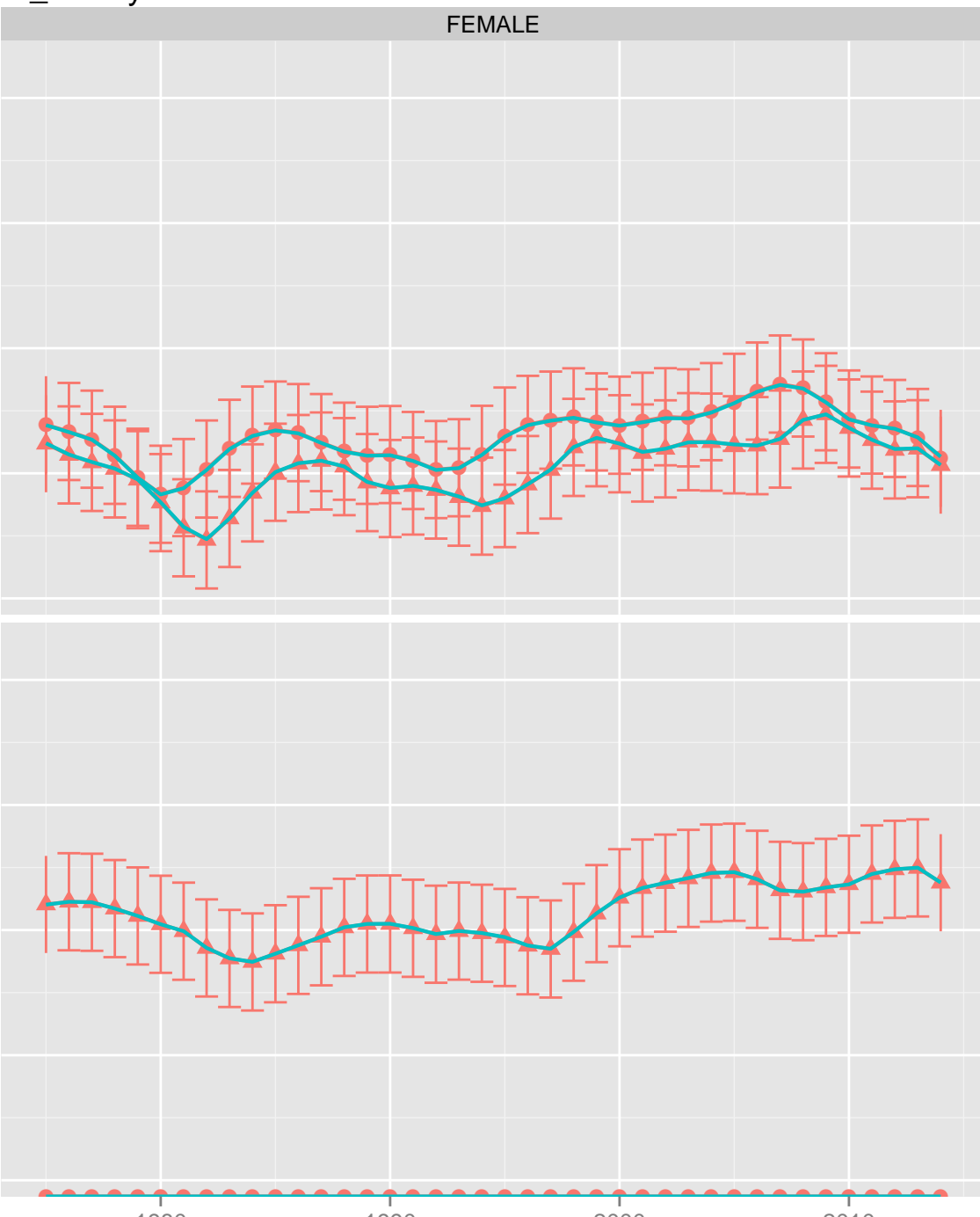
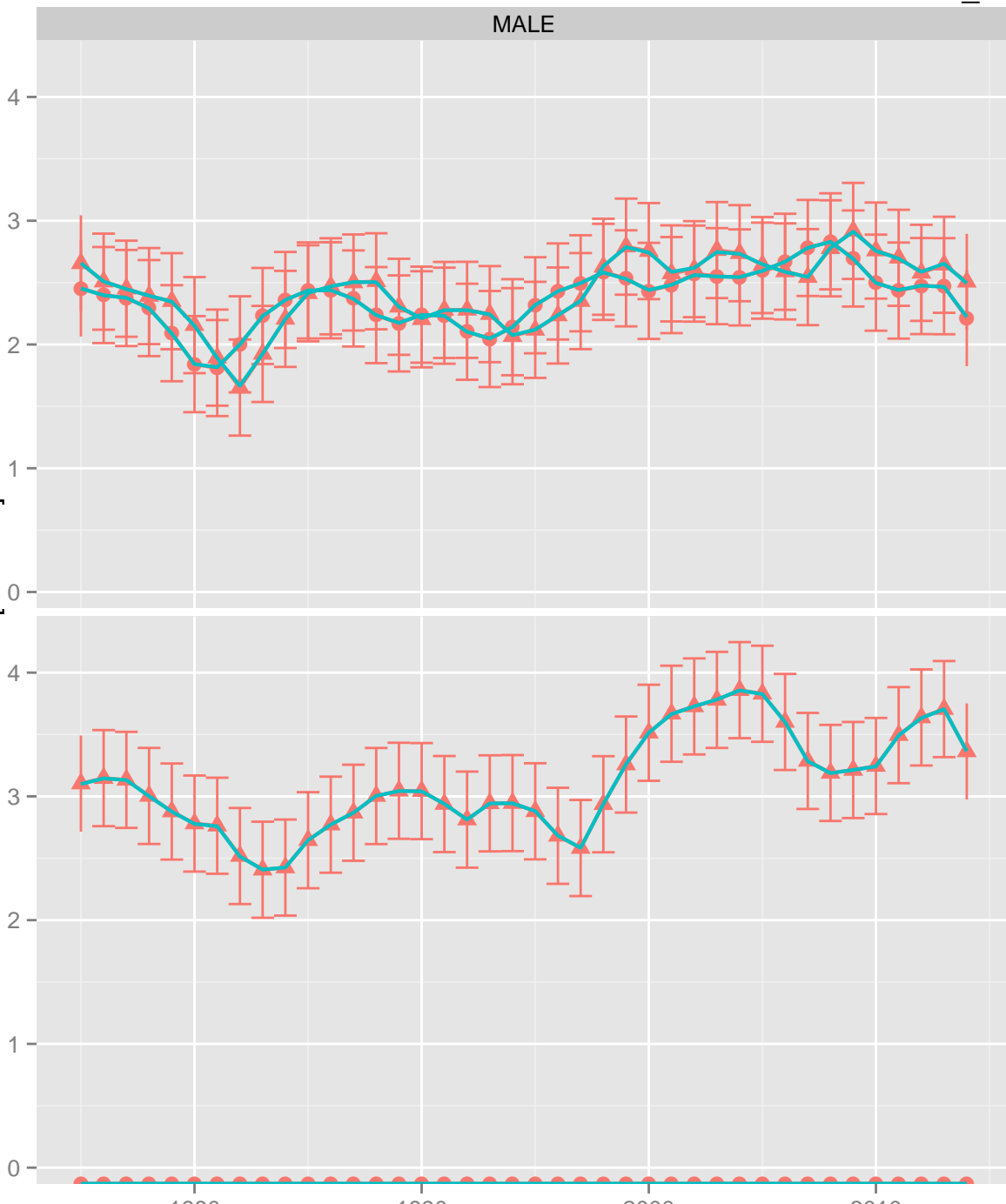
NEW\_SHELL

OLD\_SHELL

biomass [ln-scale]

year

- maturity**
- IMMATURE
  - ▲ MATURE
- type**
- observed
  - estimated



# NMFS\_trawl\_survey

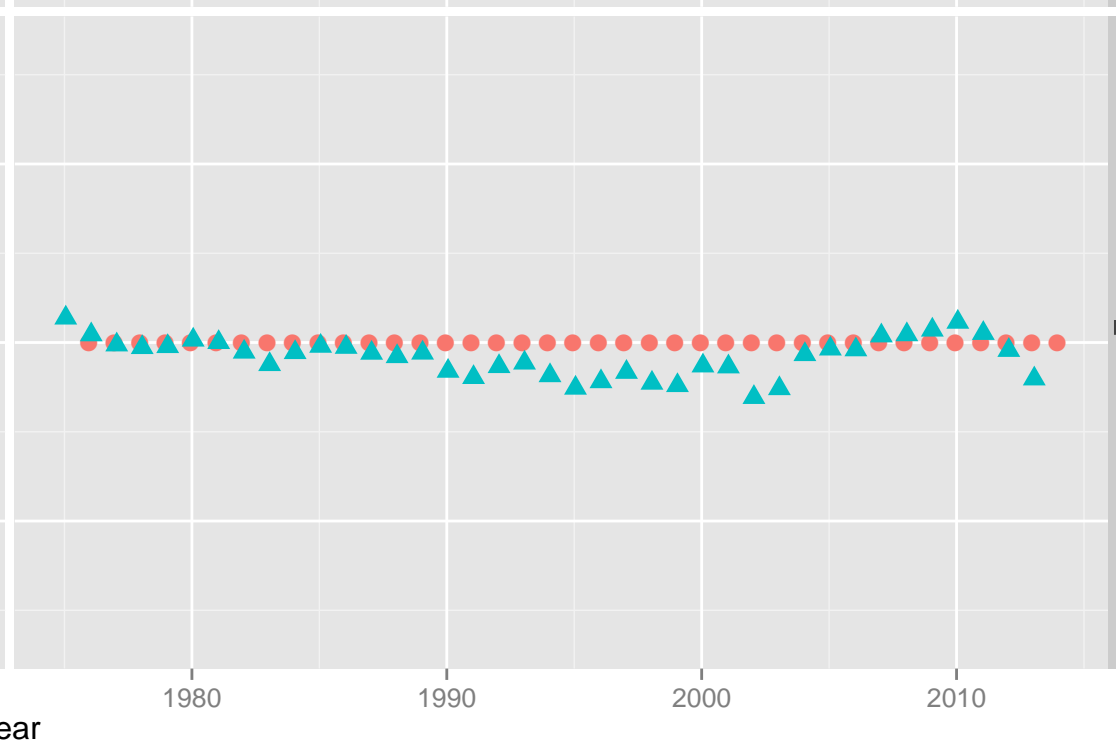
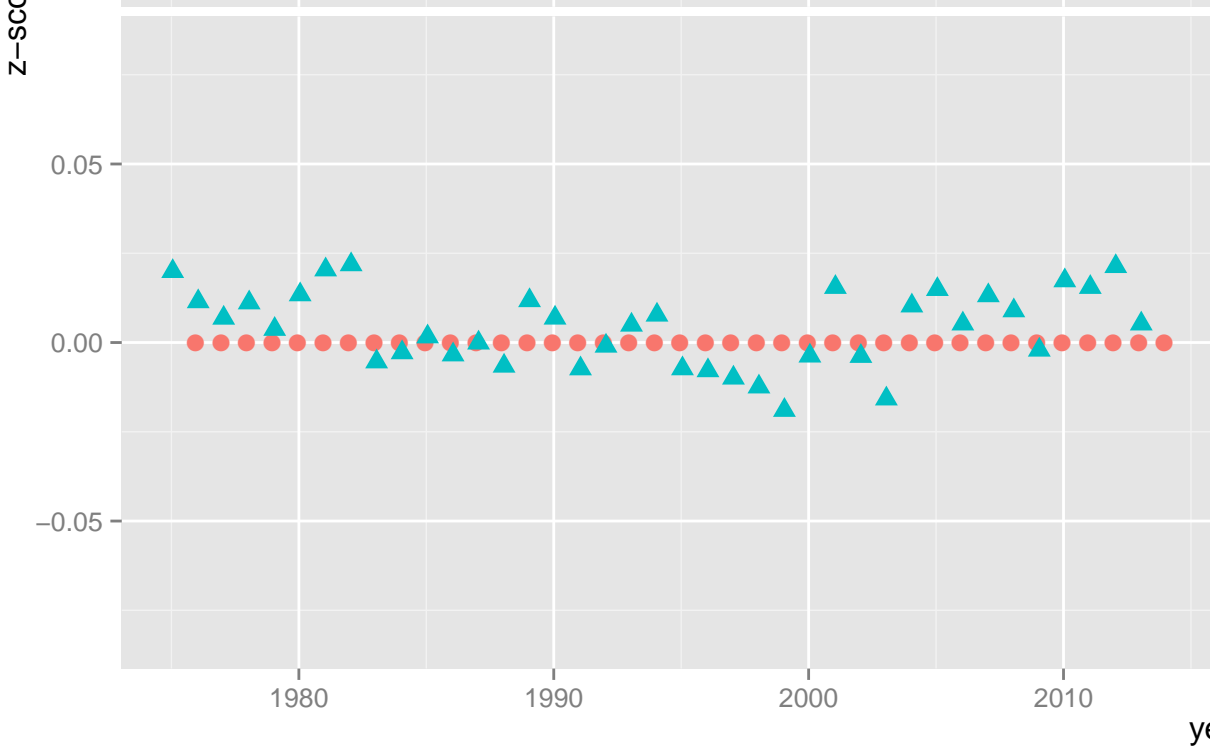
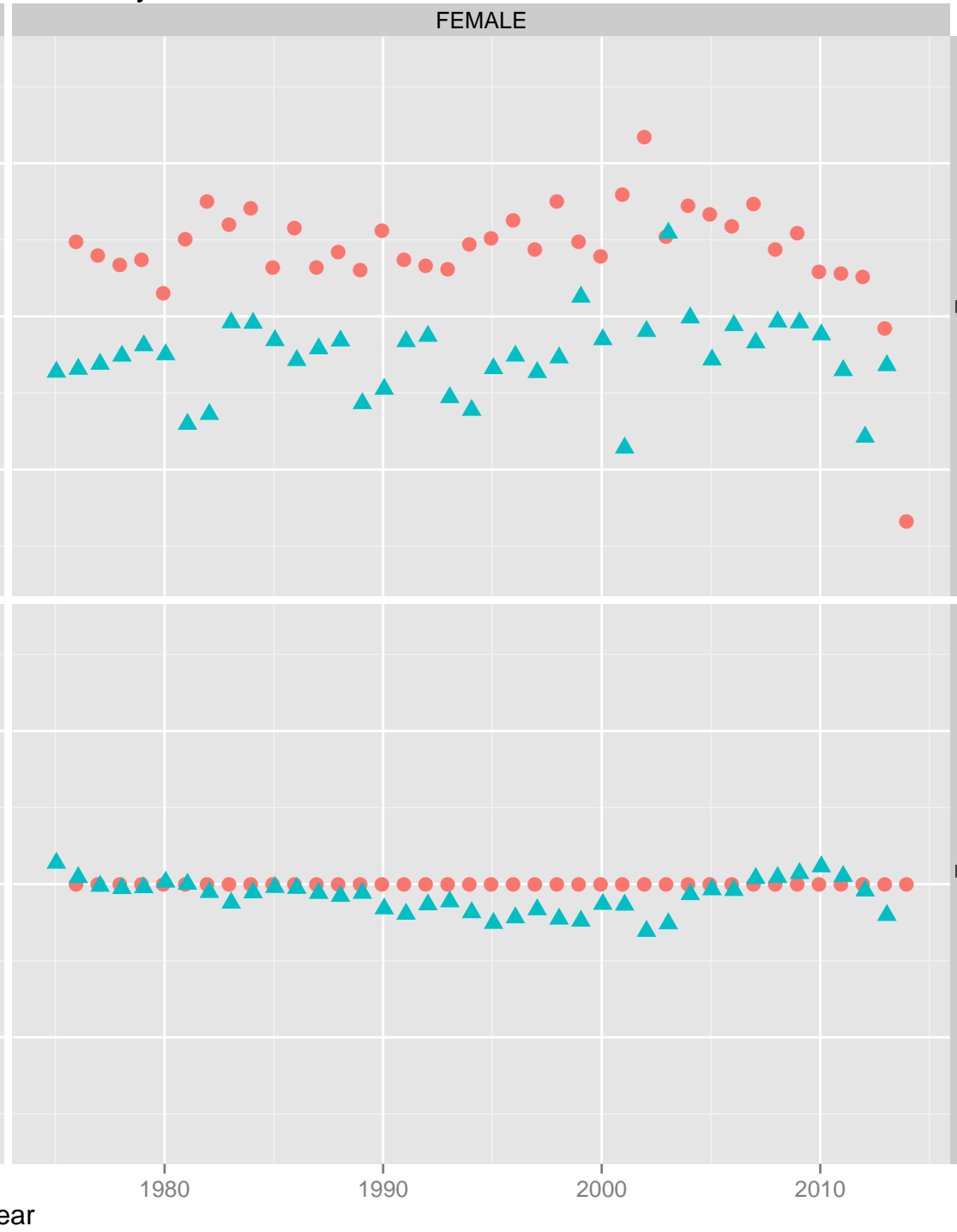
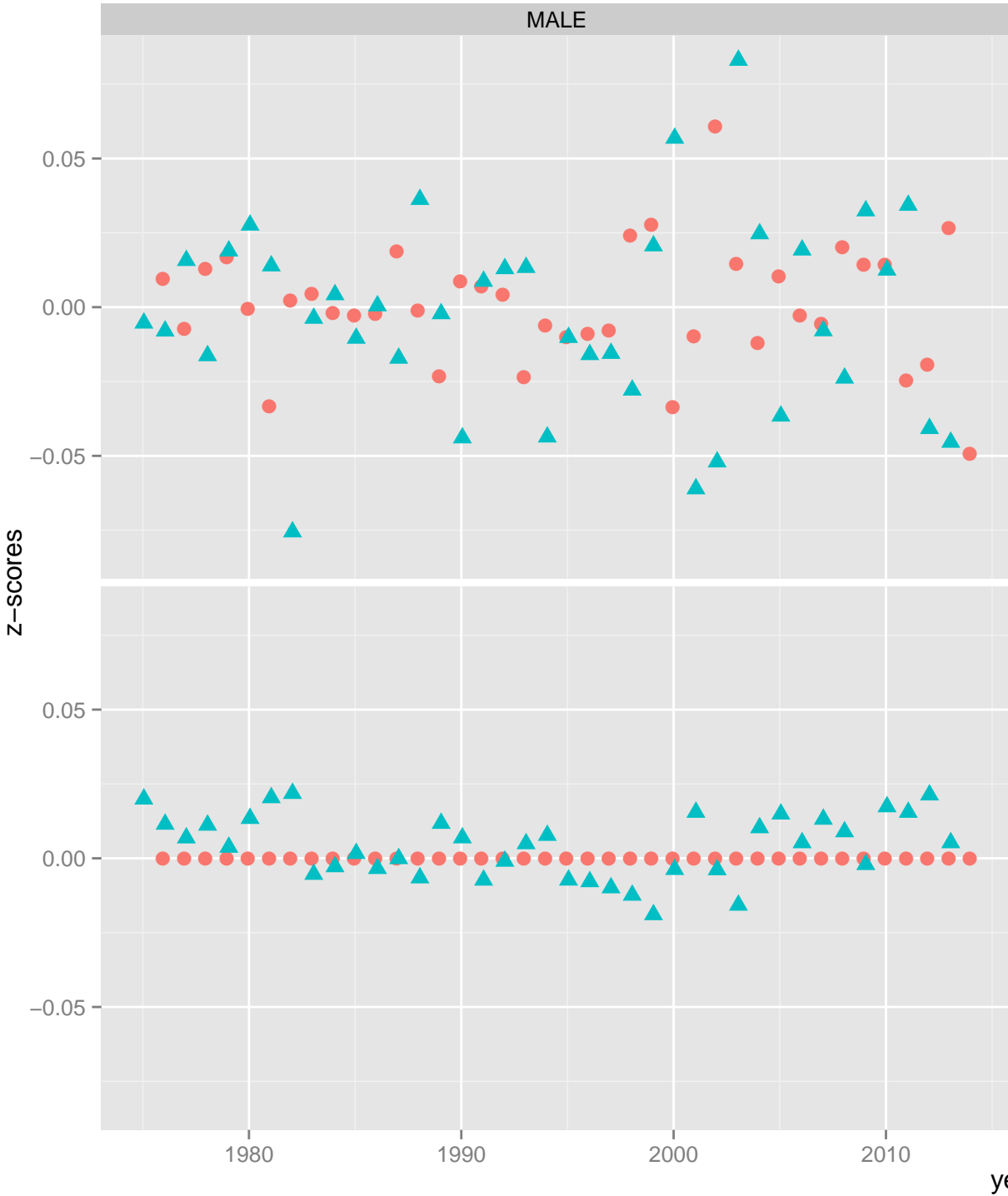
MALE

FEMALE

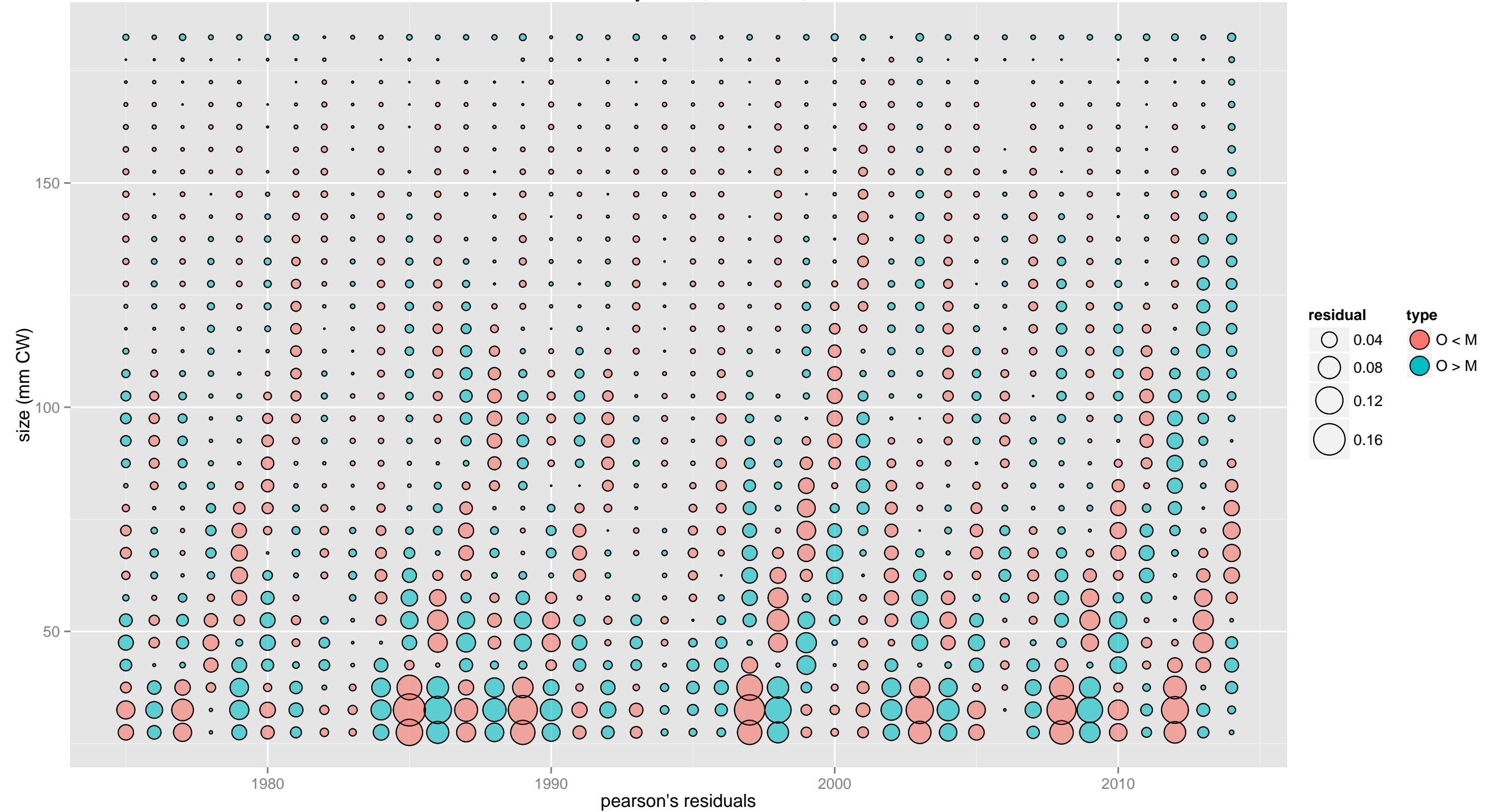
NEW\_SHELL

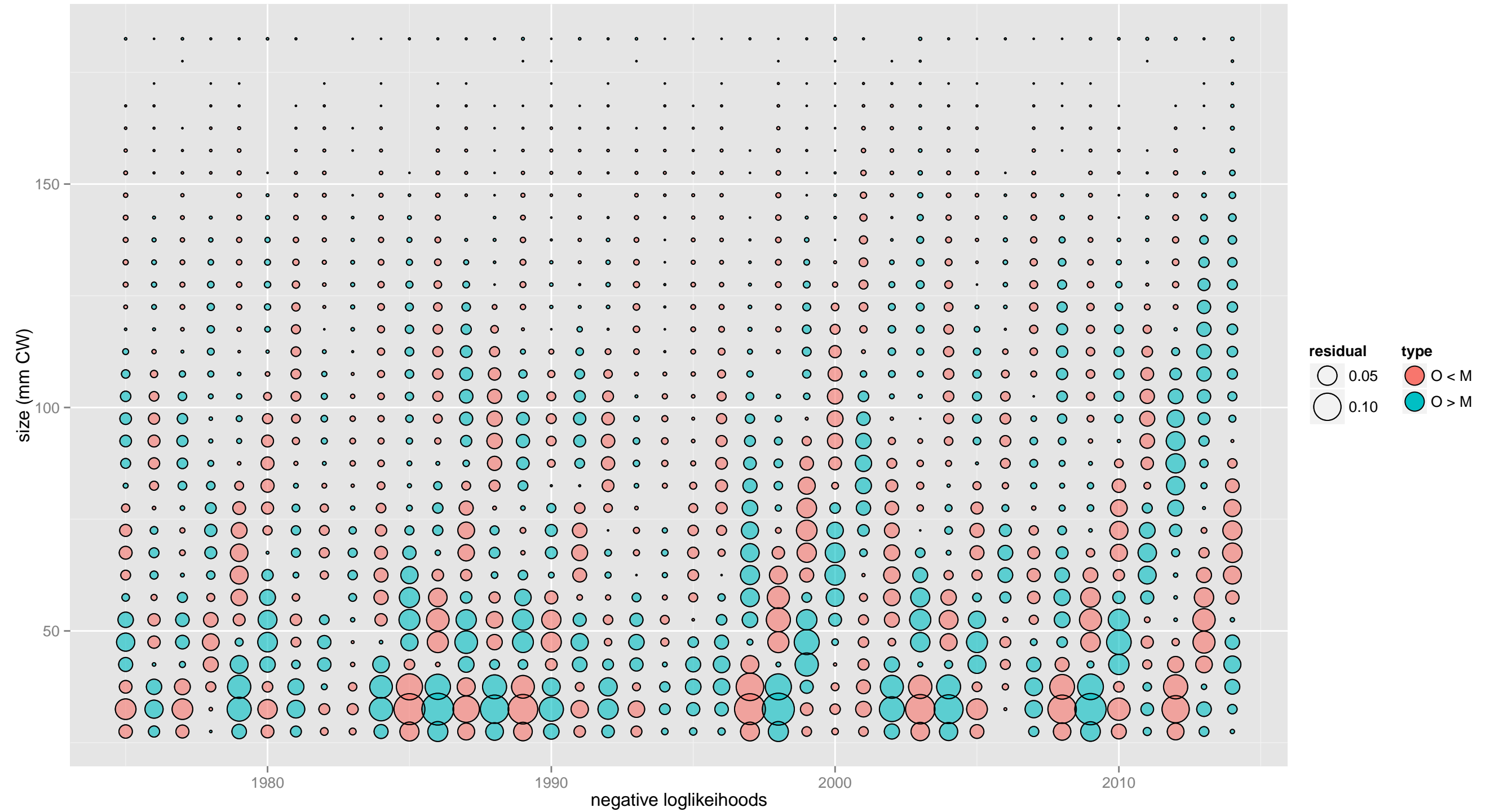
OLD\_SHELL

maturity  
● IMMATURE  
▲ MATURE

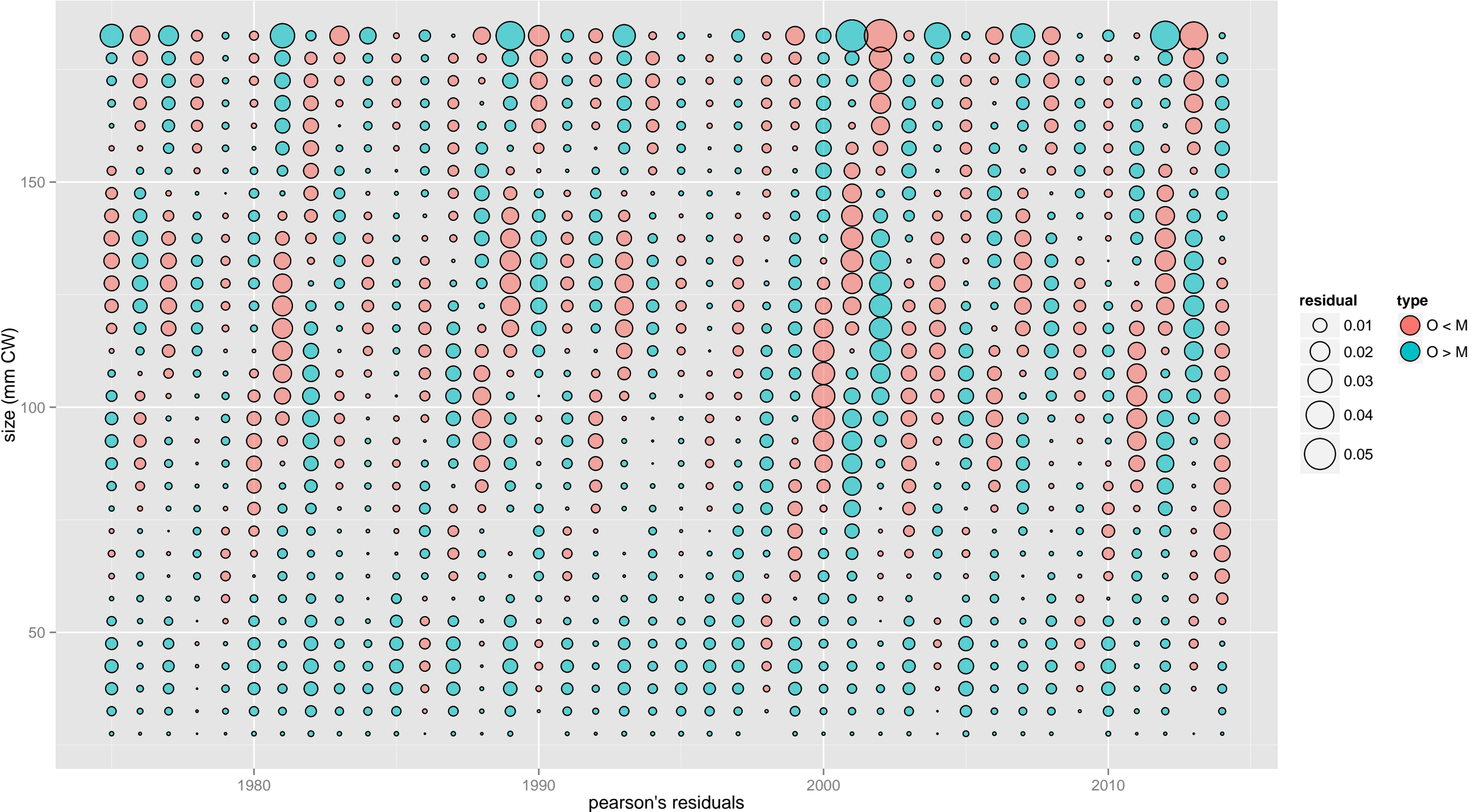


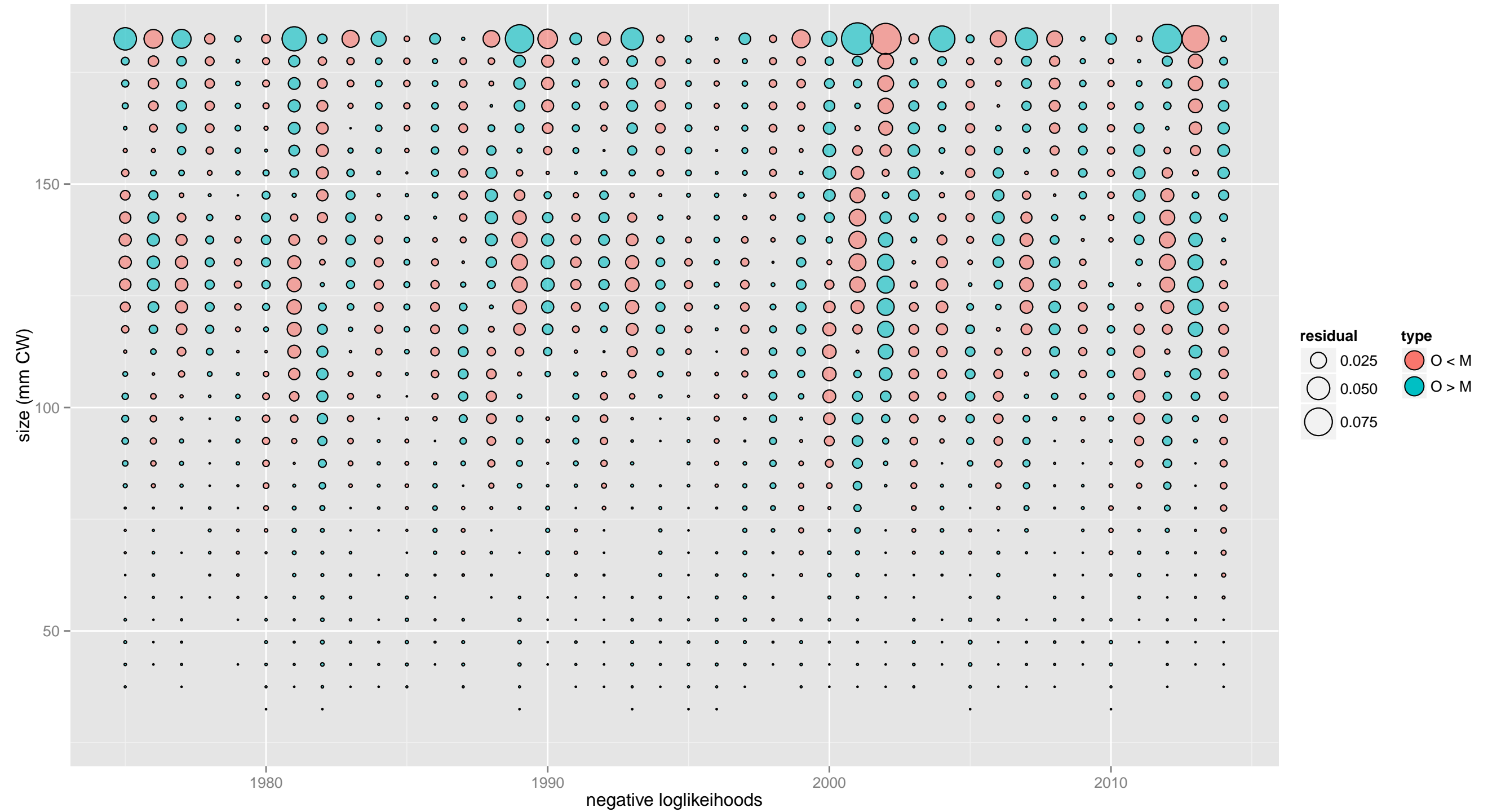
NMFS\_trawl\_survey: male, immature, new shell





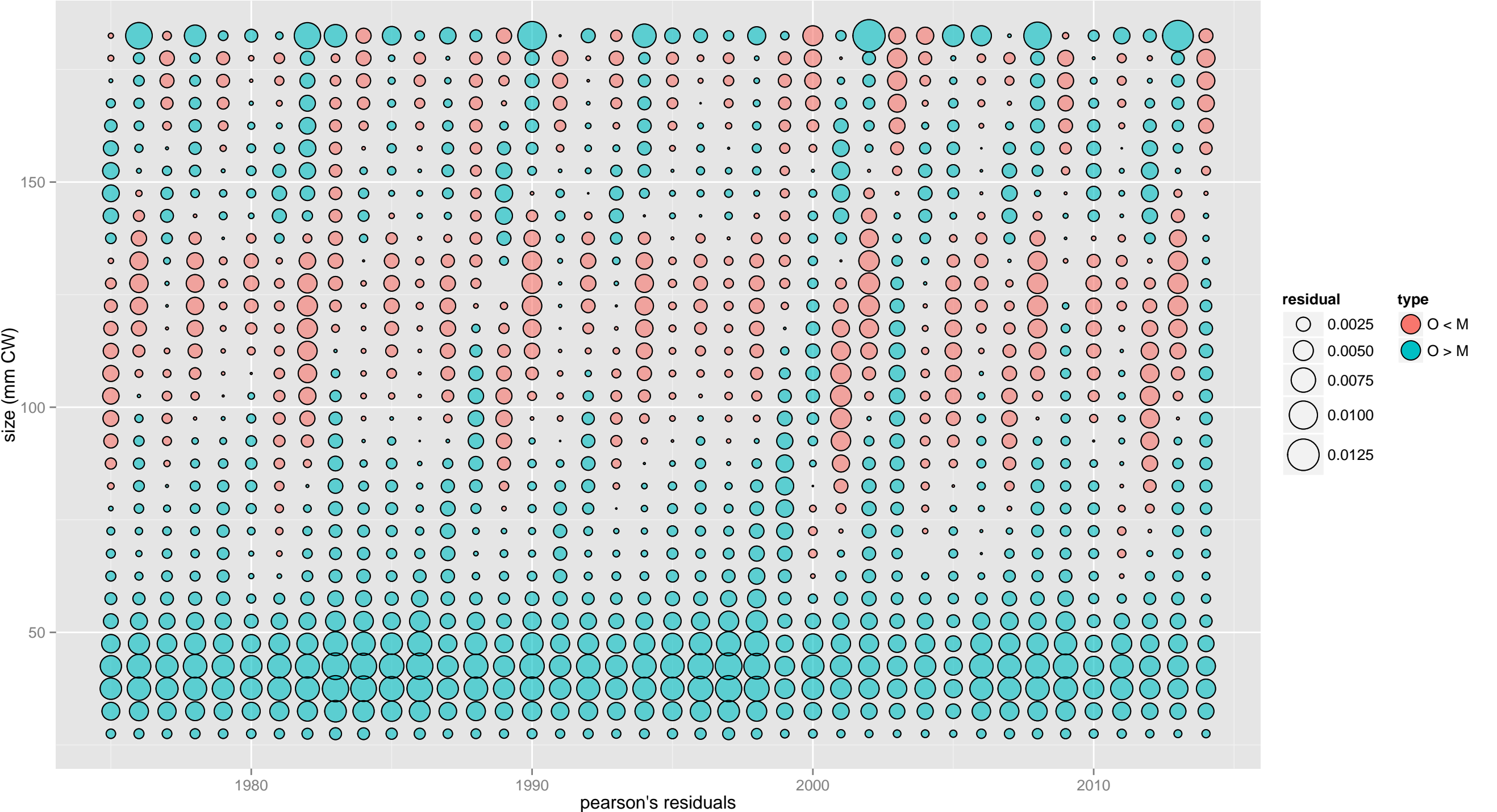
NMFS\_trawl\_survey: male, mature, new shell



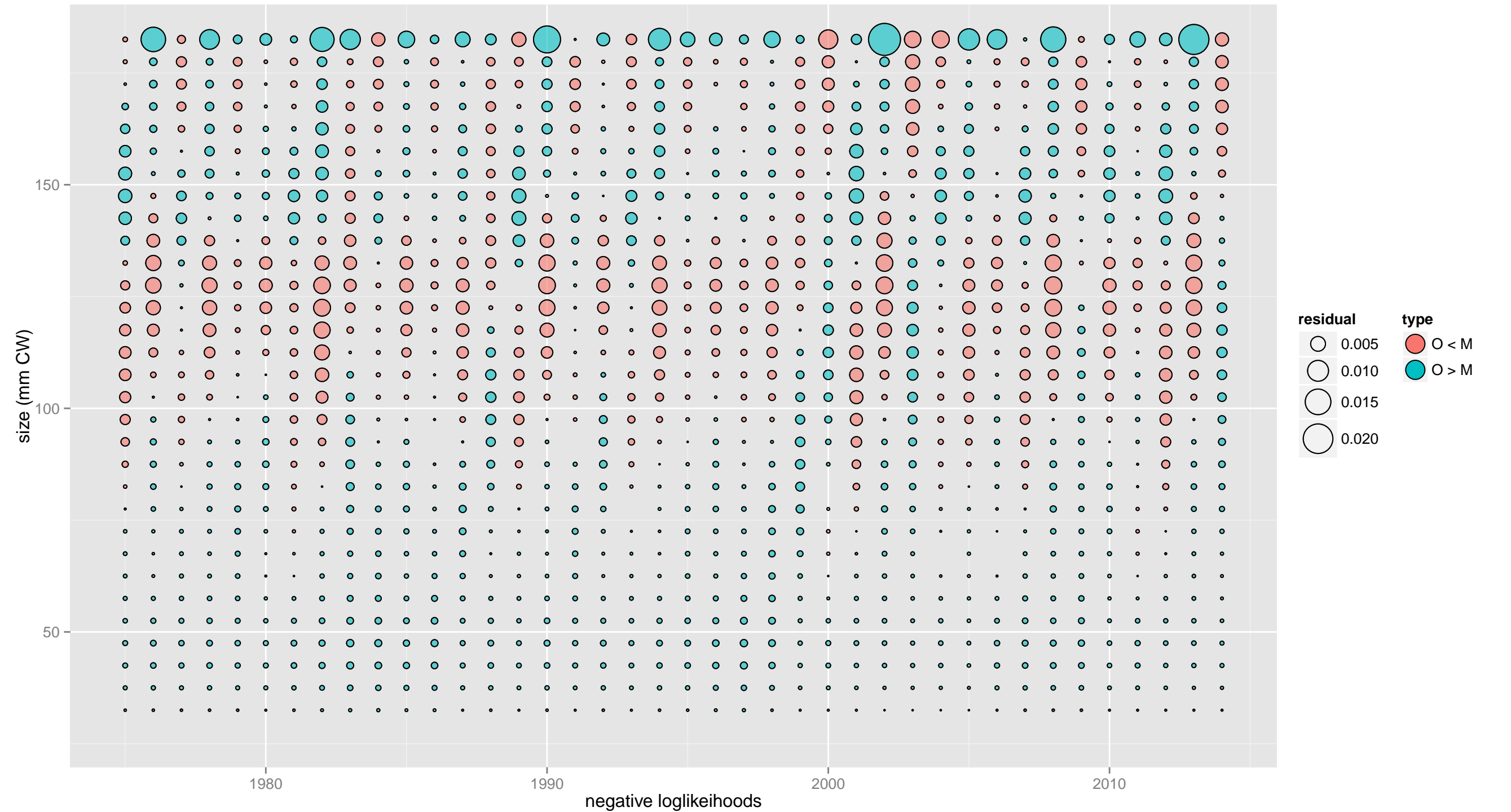




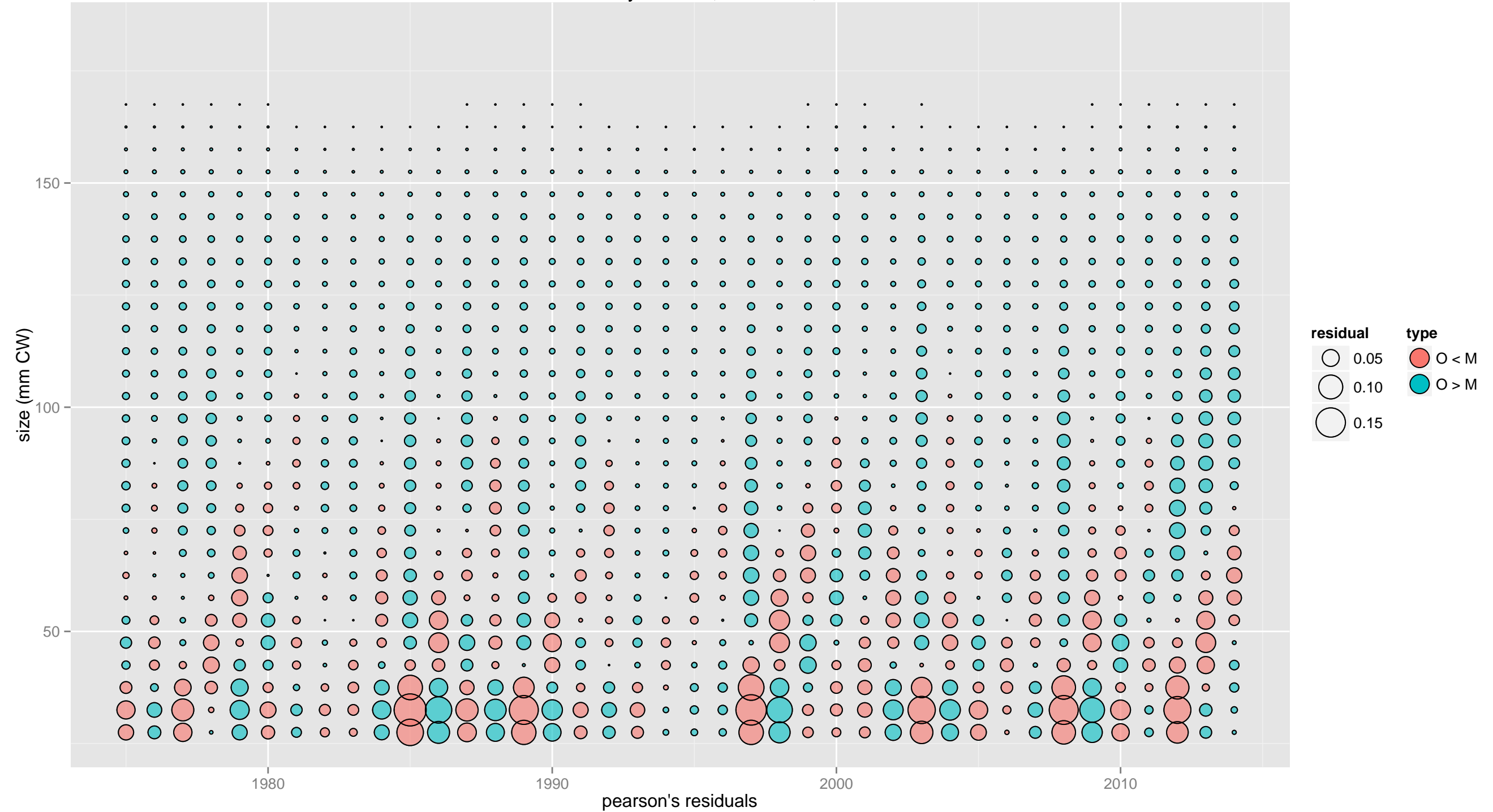
NMFS\_trawl\_survey: male, mature, old shell

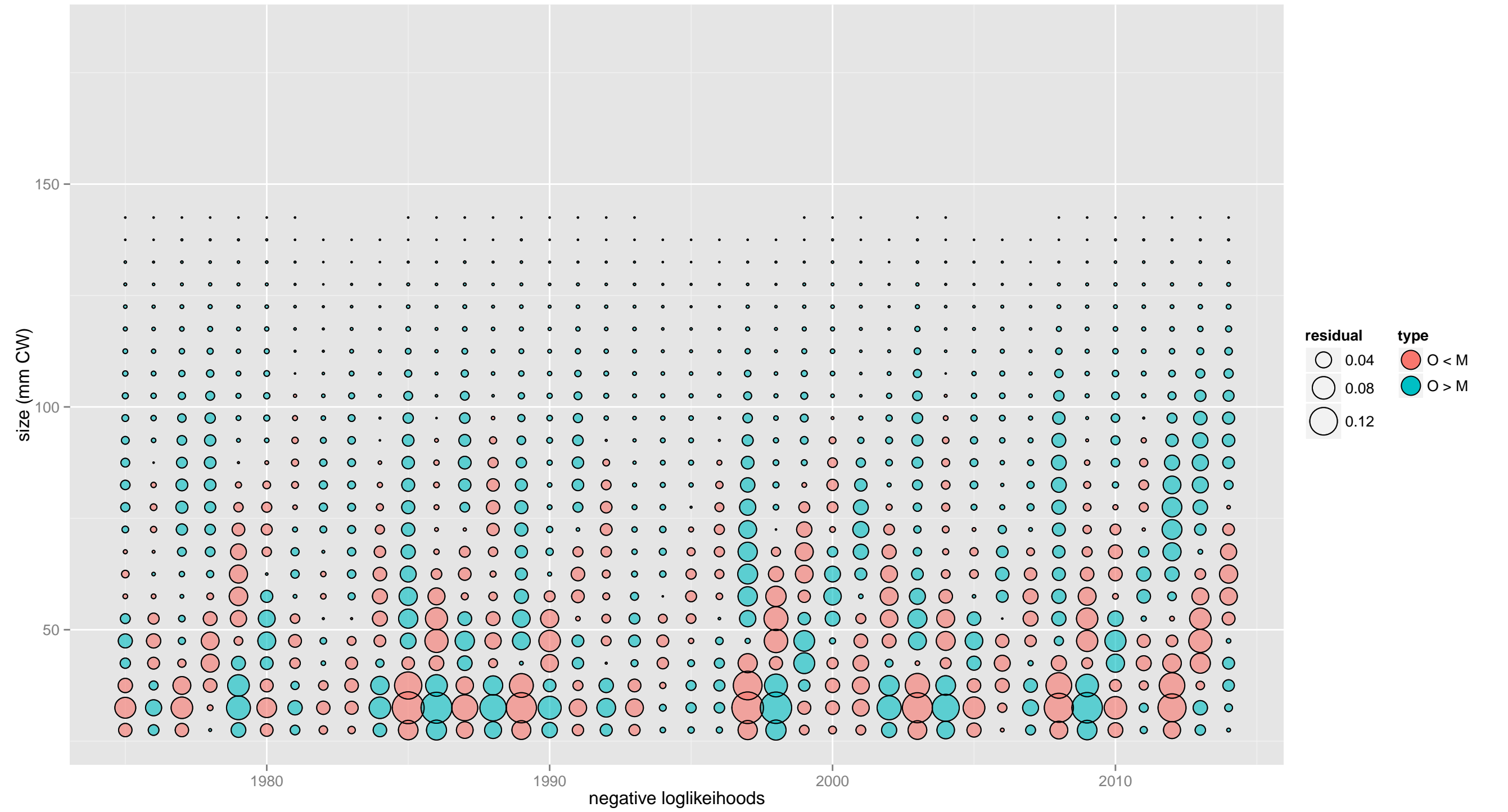




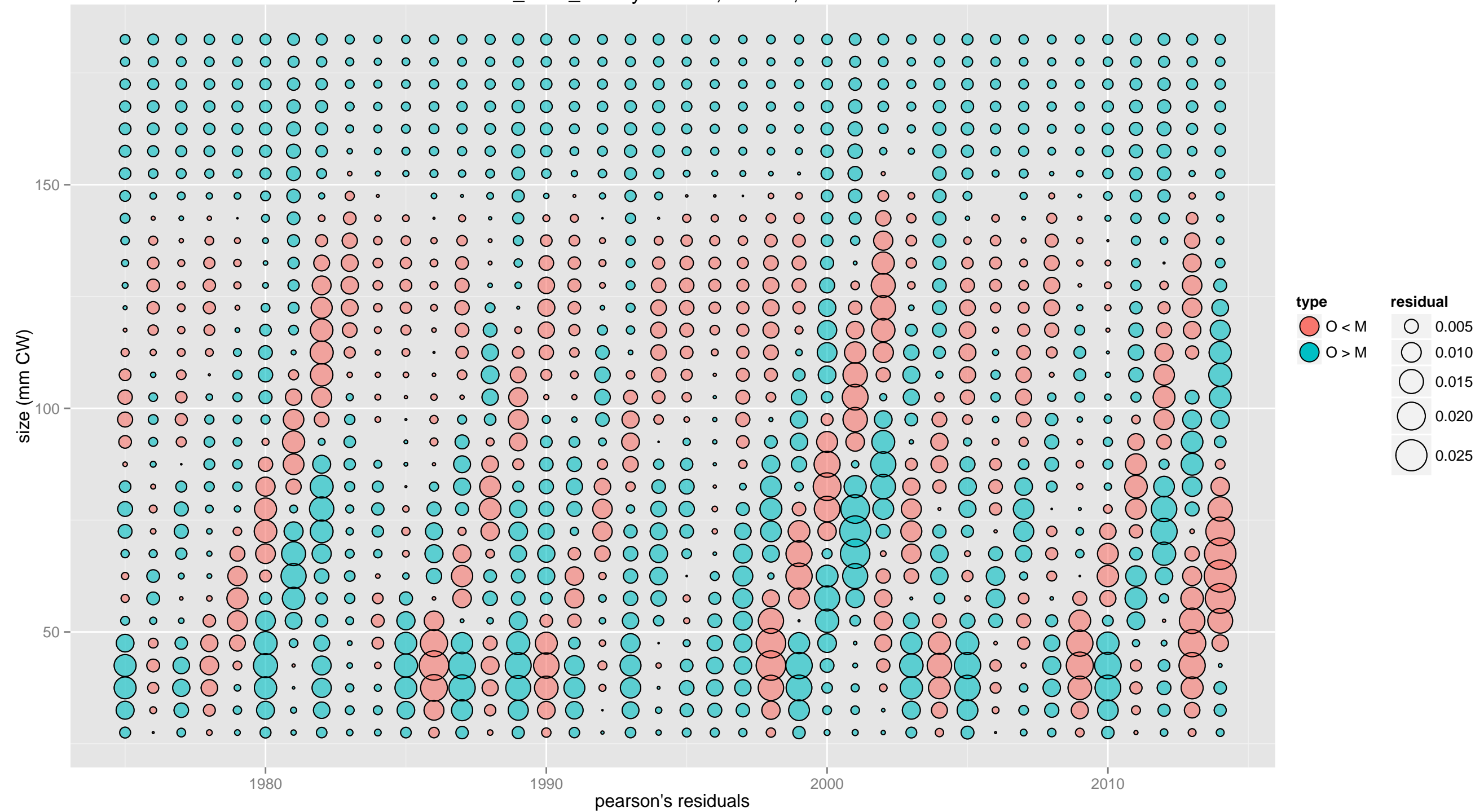


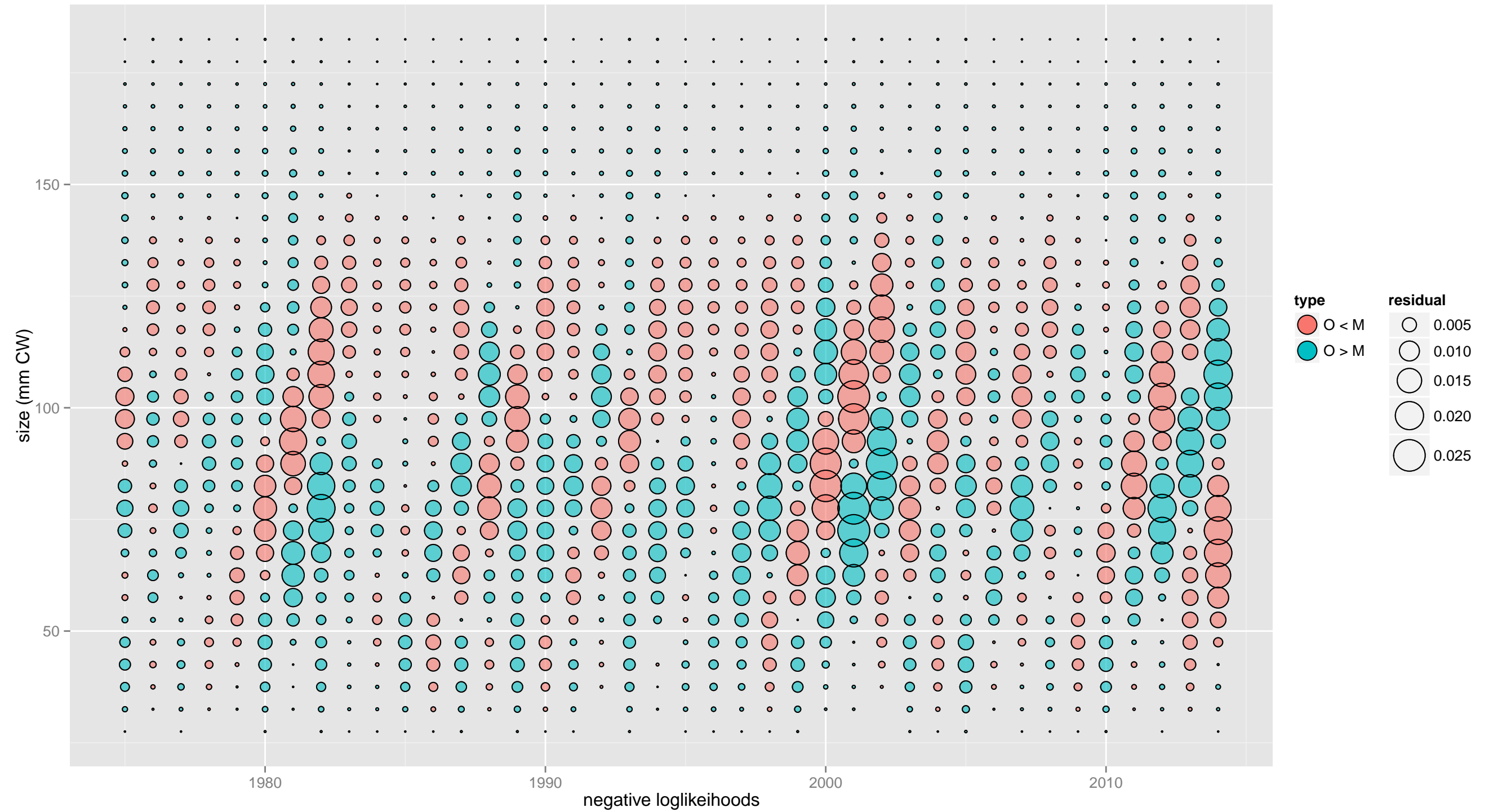
NMFS\_trawl\_survey: female, immature, new shell





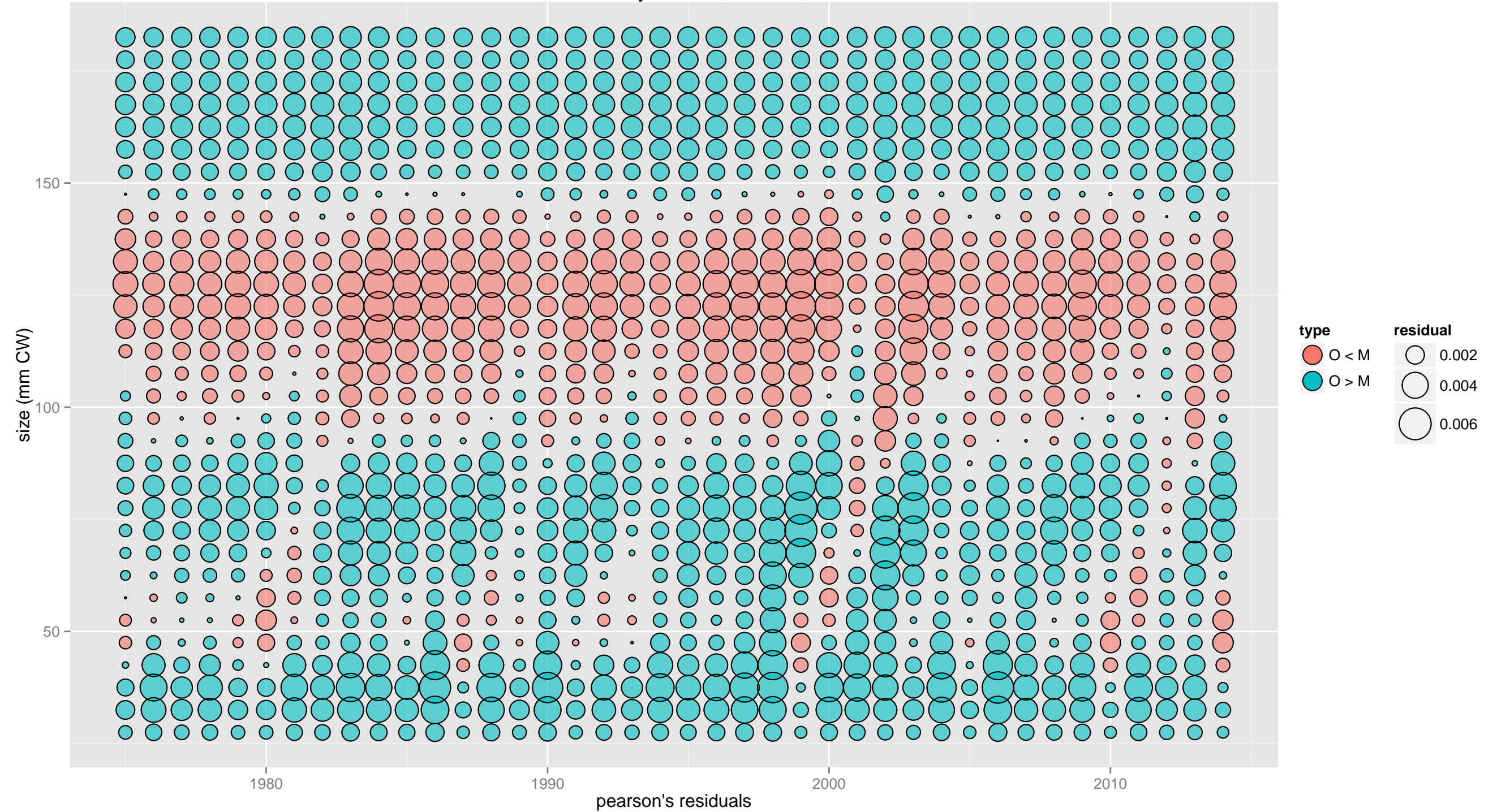
NMFS\_trawl\_survey: female, mature, new shell

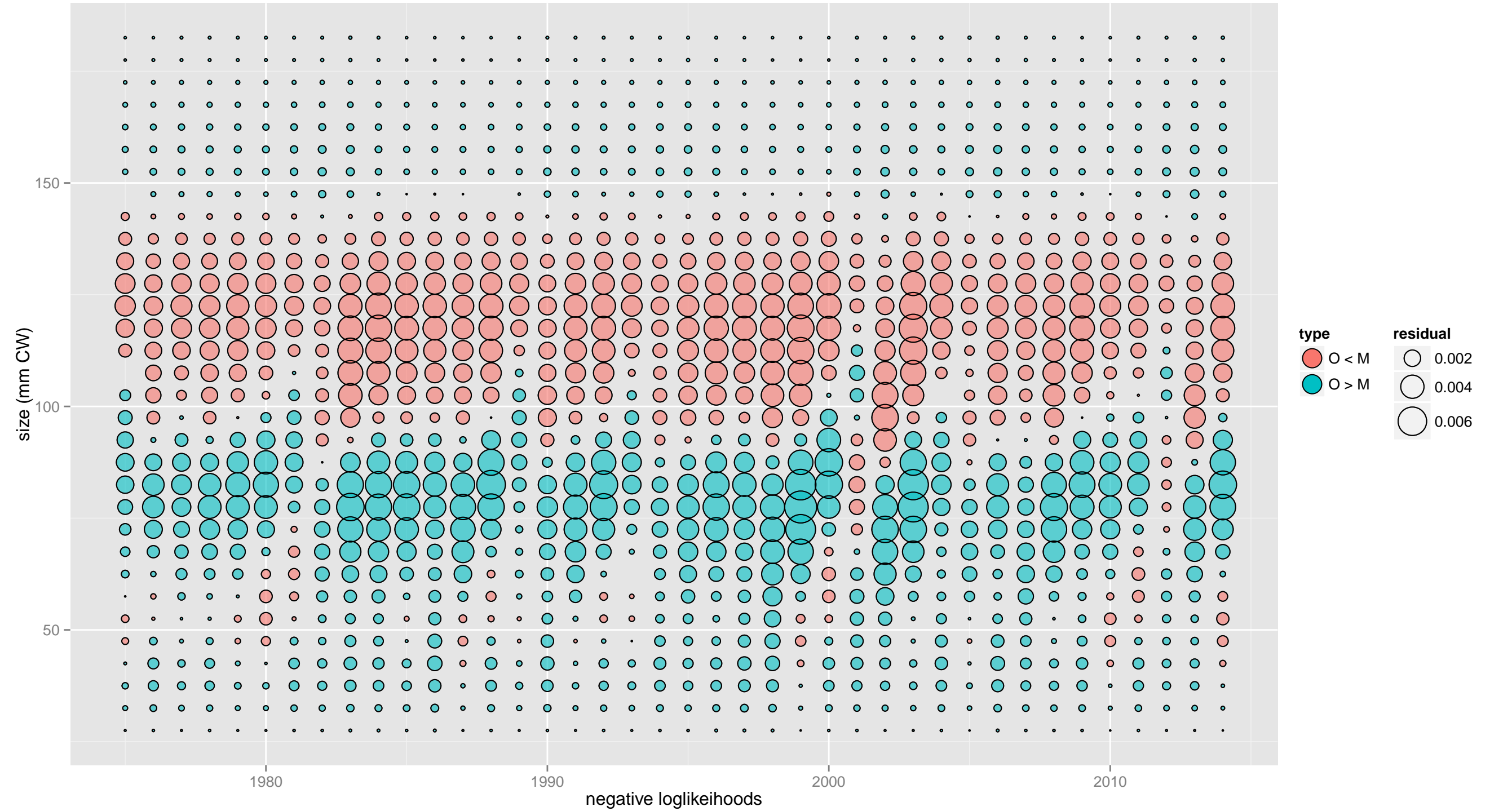




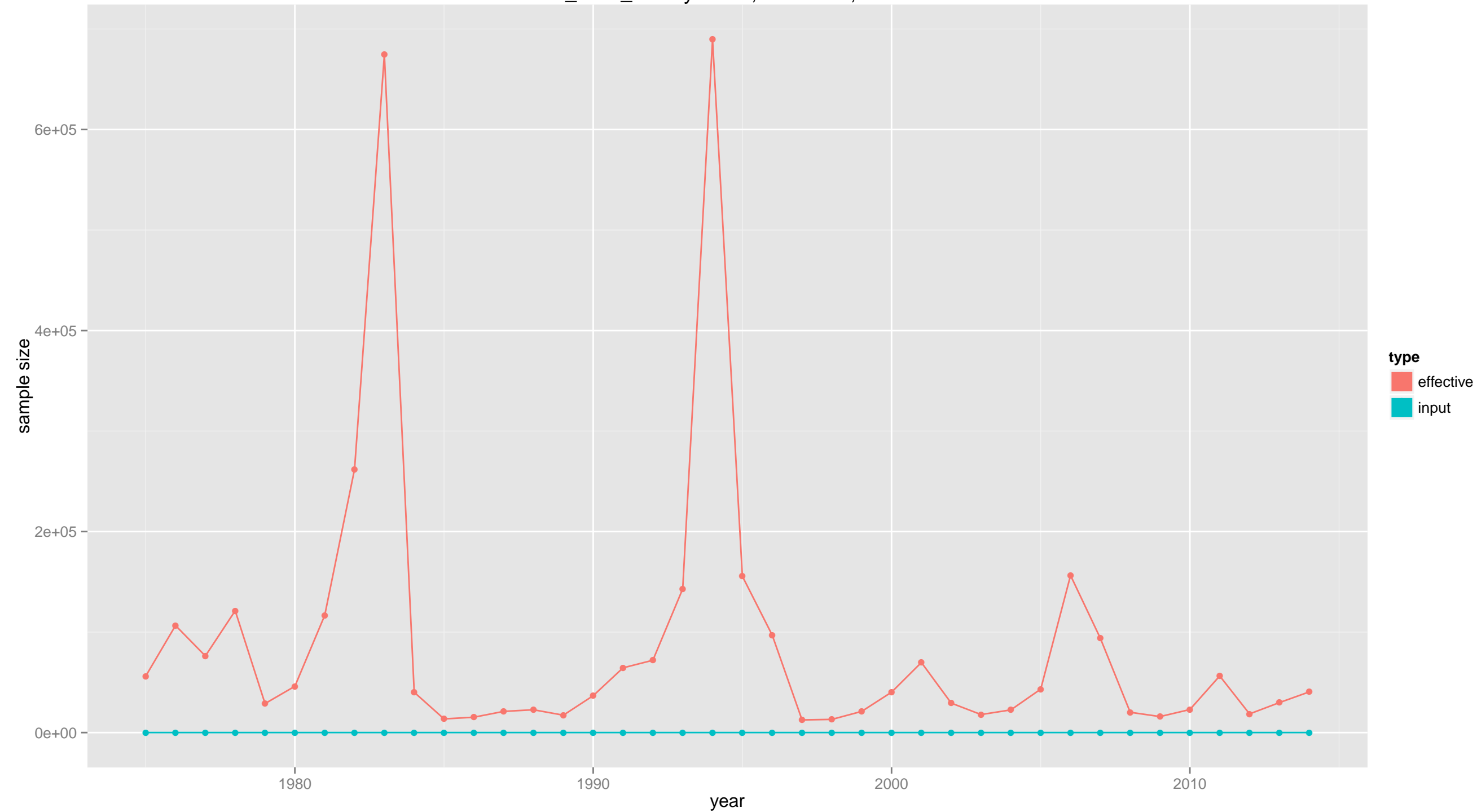


NMFS\_trawl\_survey: female, mature, old shell



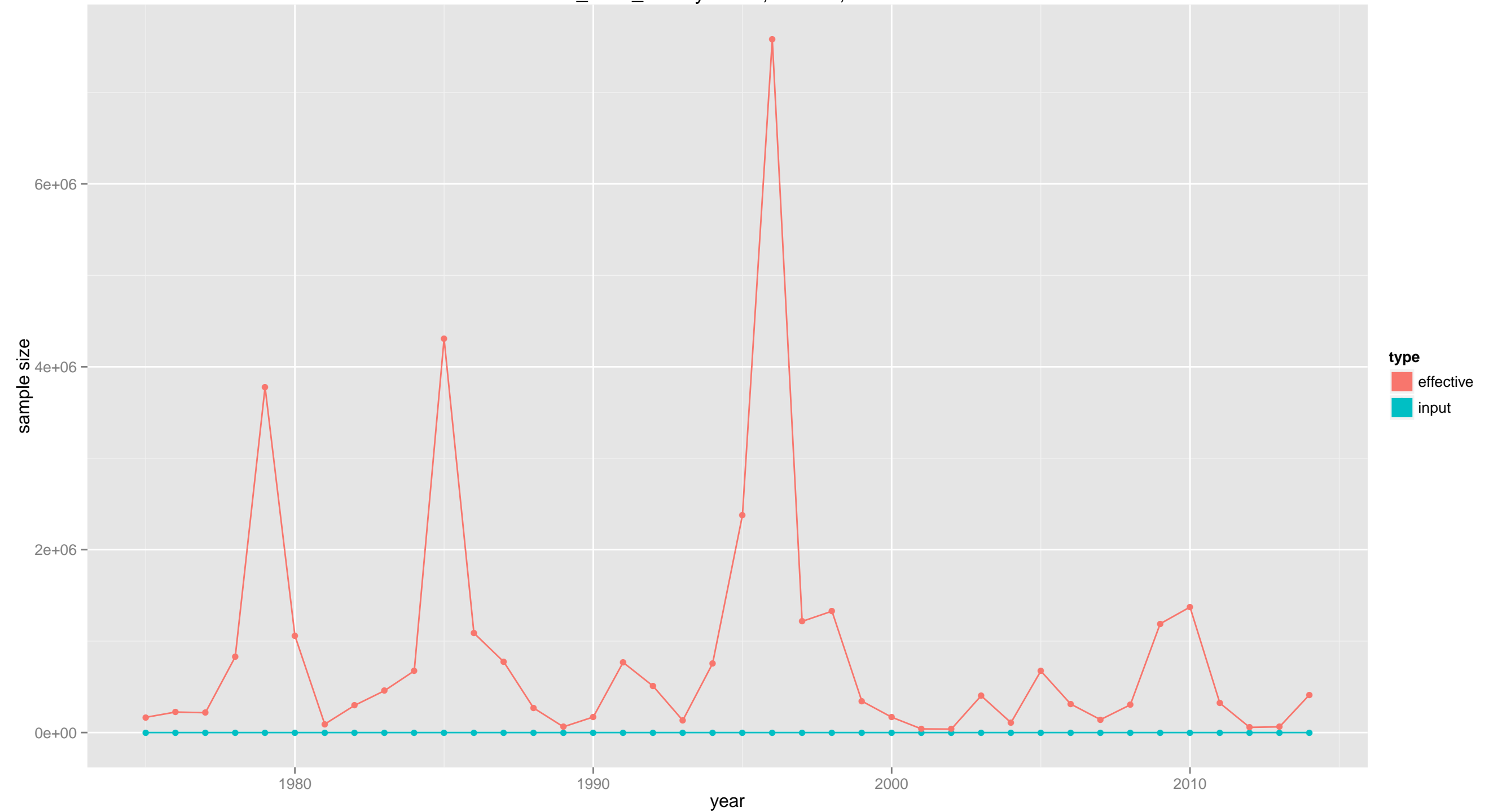


NMFS\_trawl\_survey: male, immature, new shell

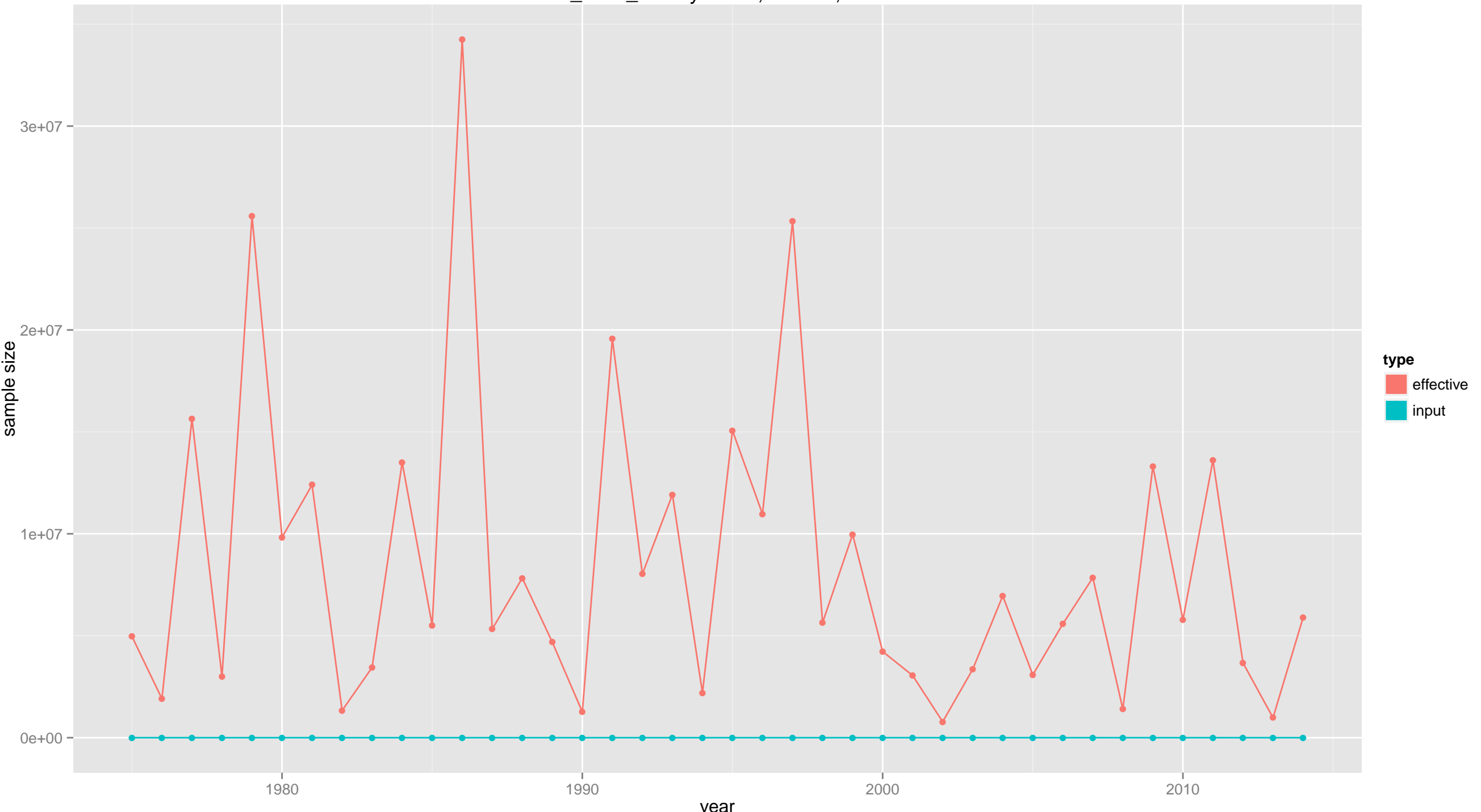




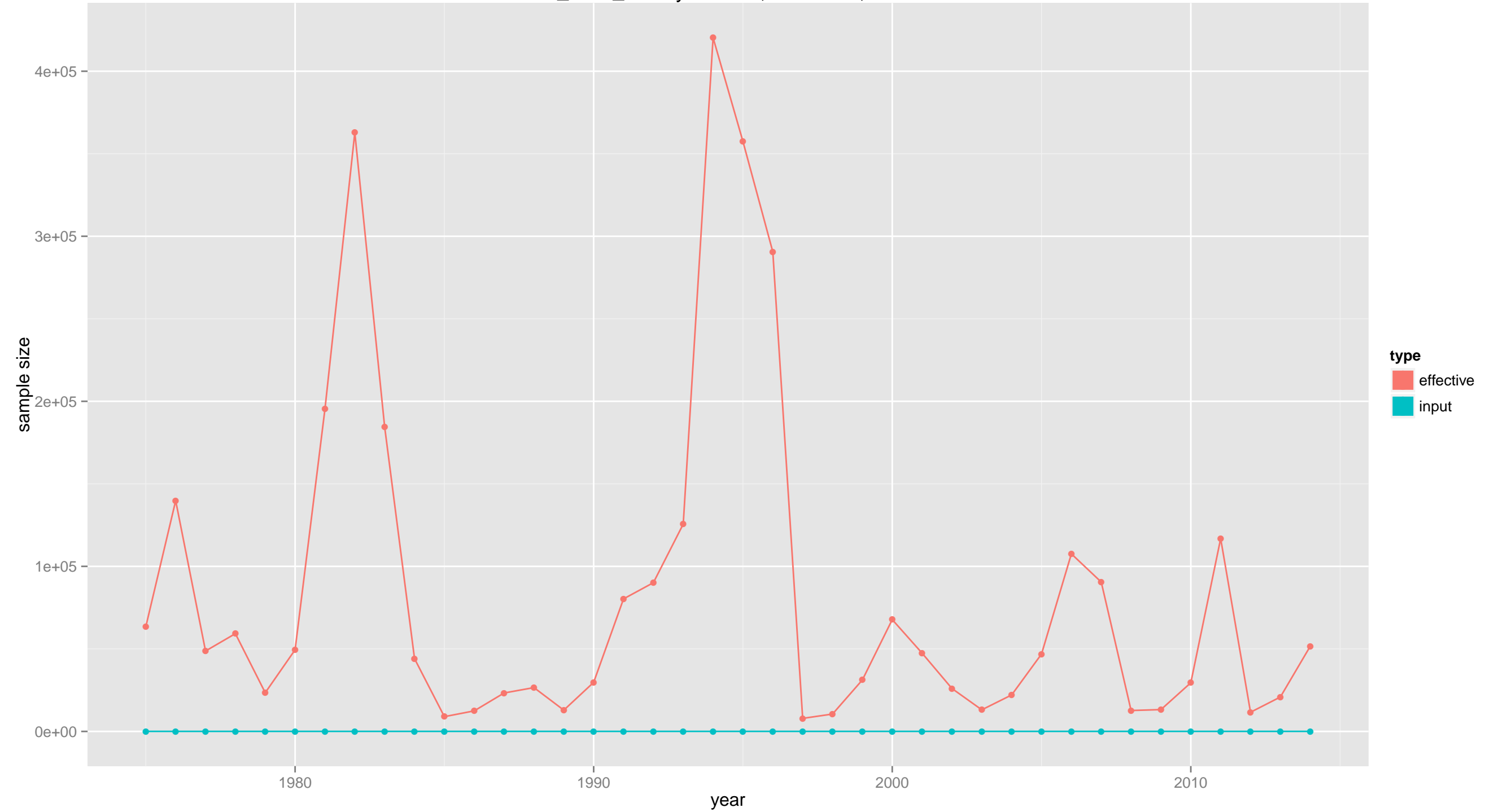
NMFS\_trawl\_survey: male, mature, new shell



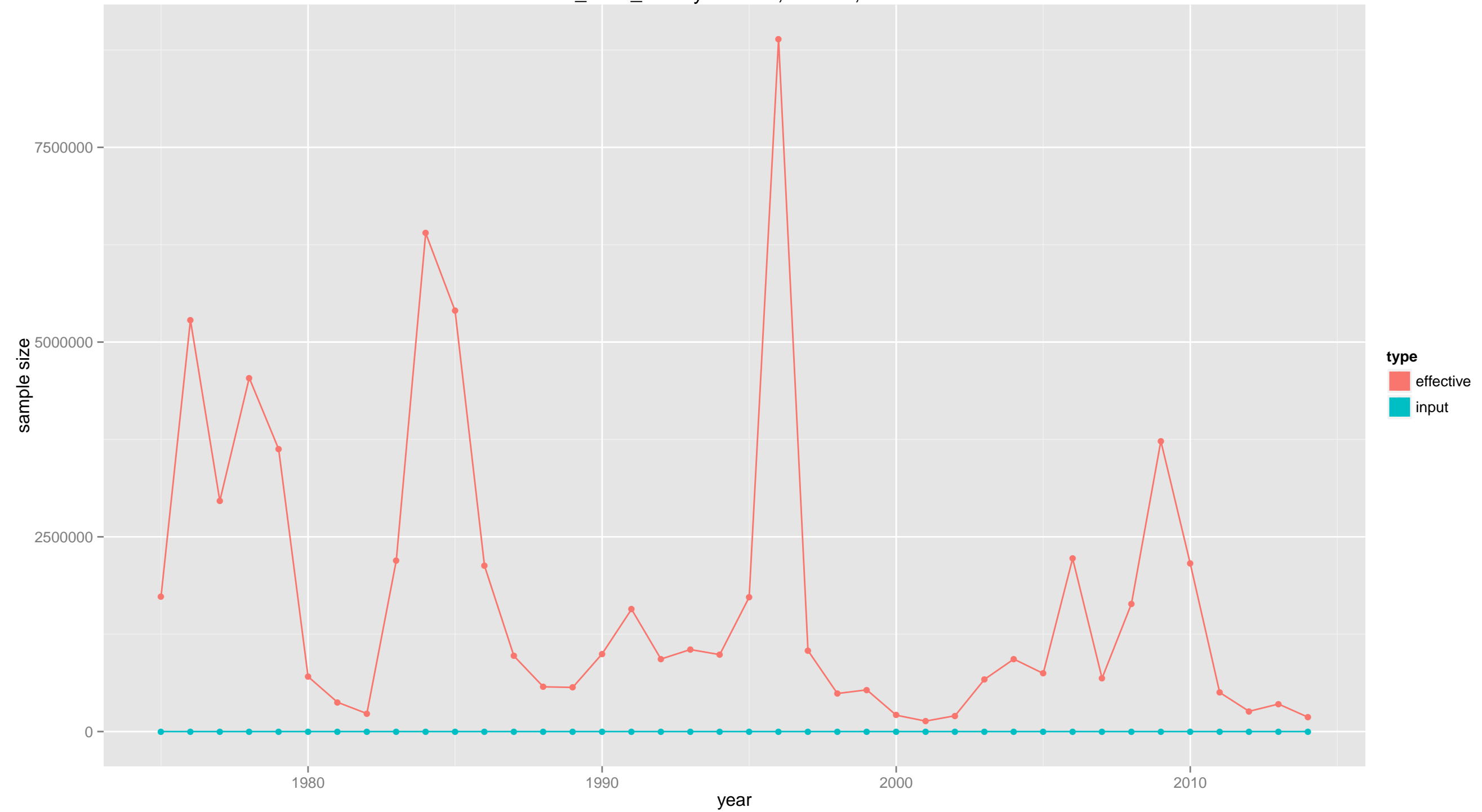
NMFS\_trawl\_survey: male, mature, old shell



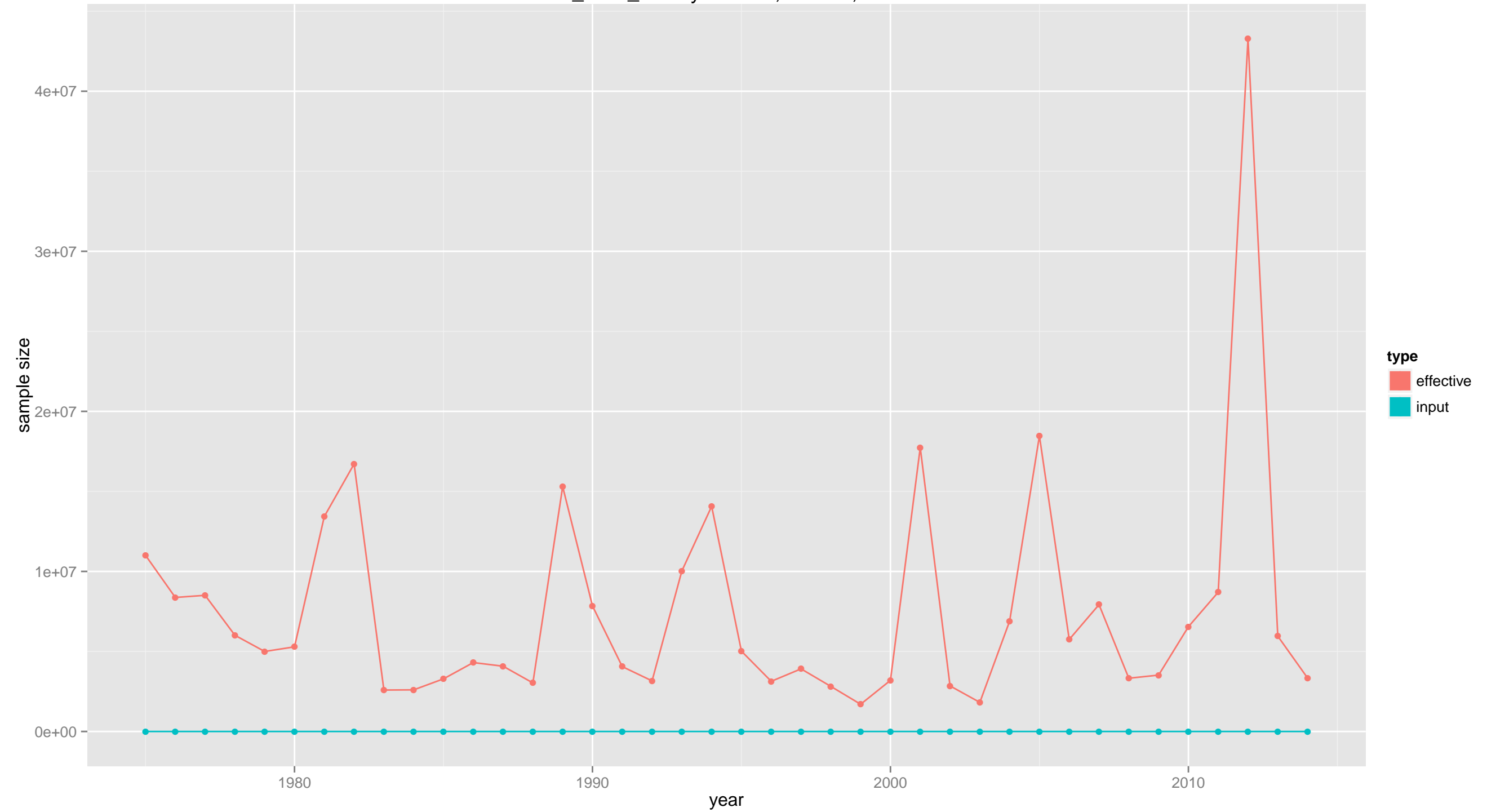
NMFS\_trawl\_survey: female, immature, new shell



NMFS\_trawl\_survey: female, mature, new shell



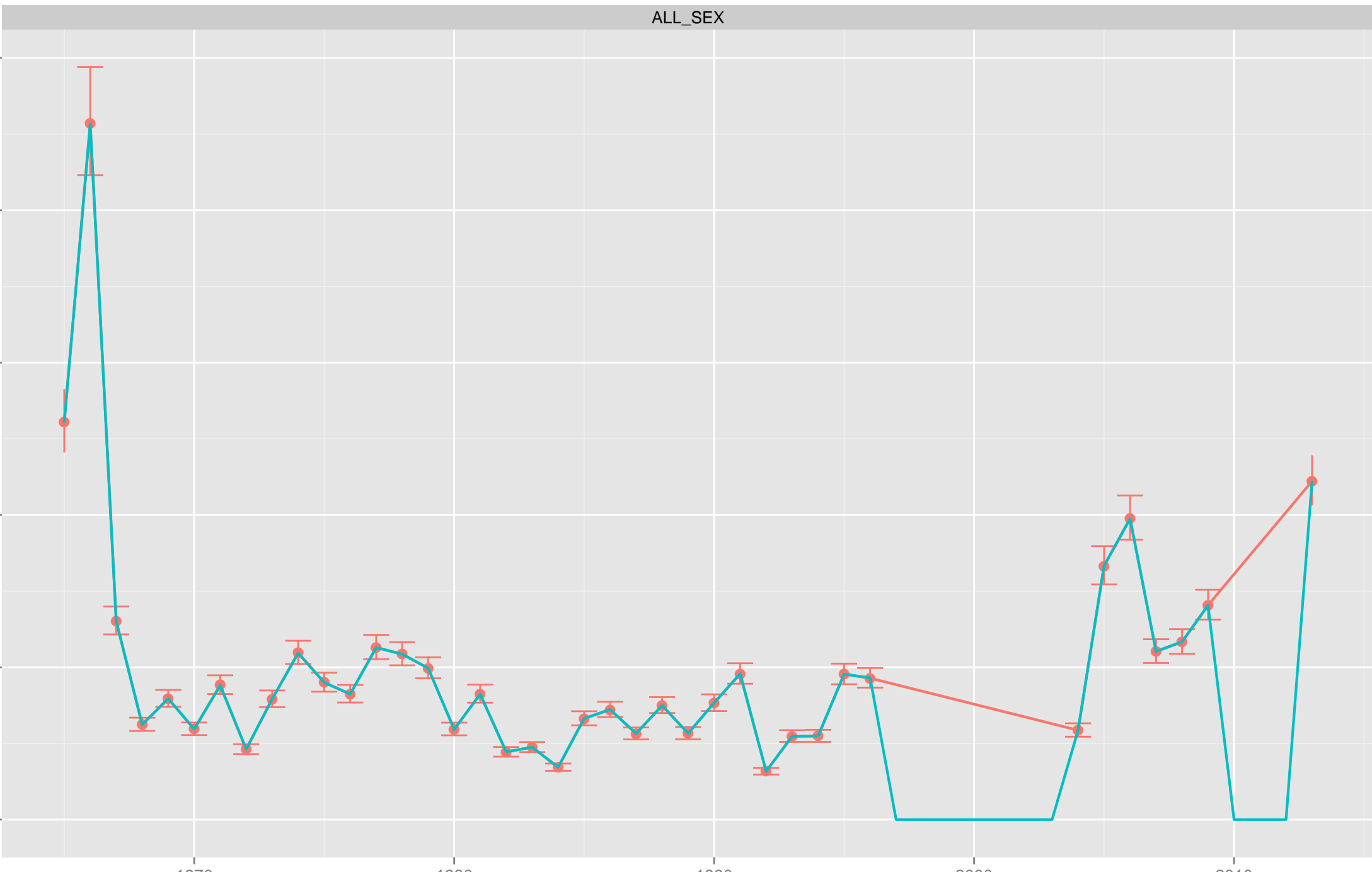
NMFS\_trawl\_survey: female, mature, old shell



# TCF: retained catch abundance

ALL\_SEX

abundance



- type**
  - observed
  - estimated
- maturity**
  - ALL\_MATURITY

ALL\_SHELL

year

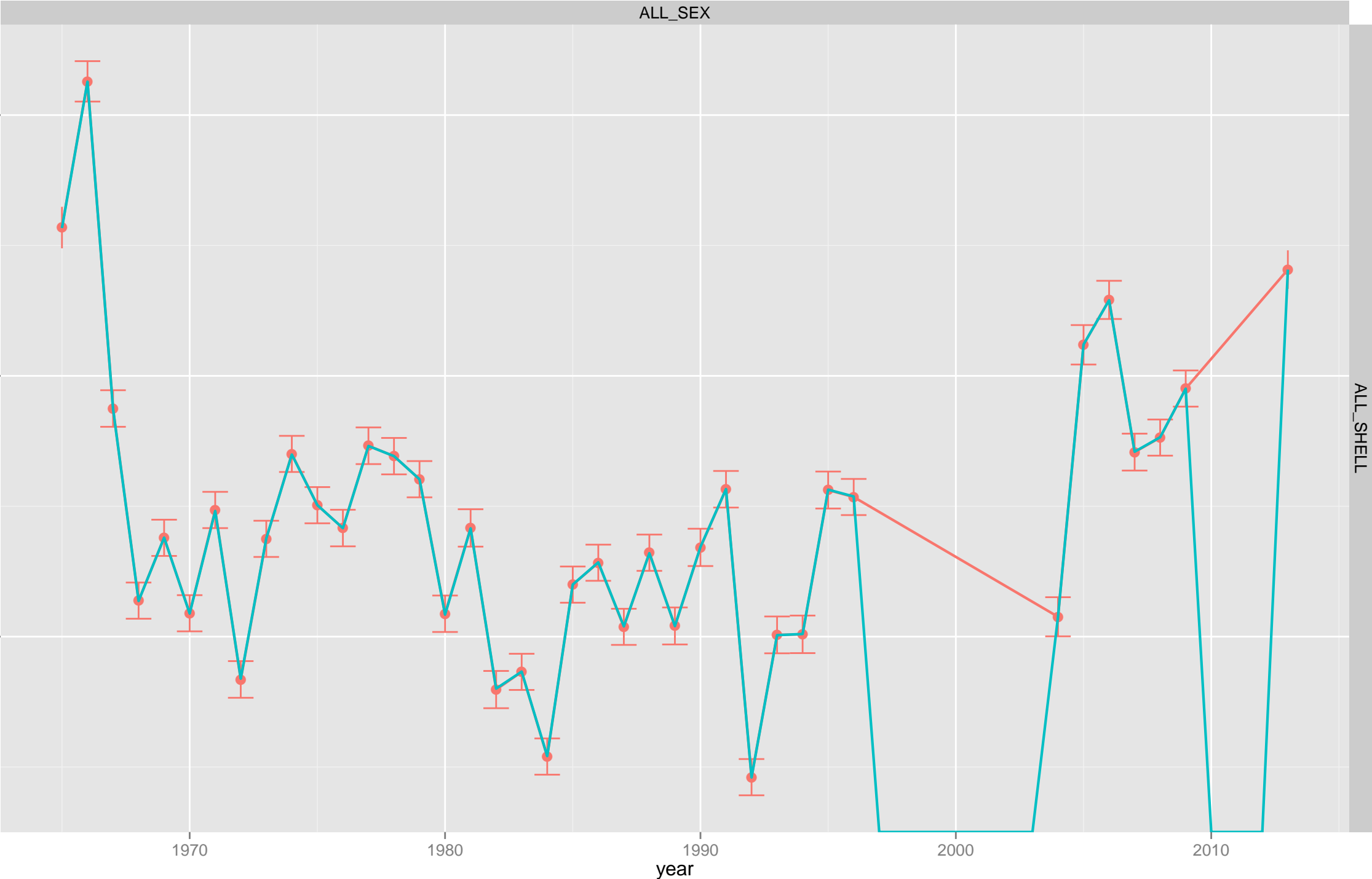
# TCF: retained catch abundance

ALL\_SEX

abundance [ln-scale]

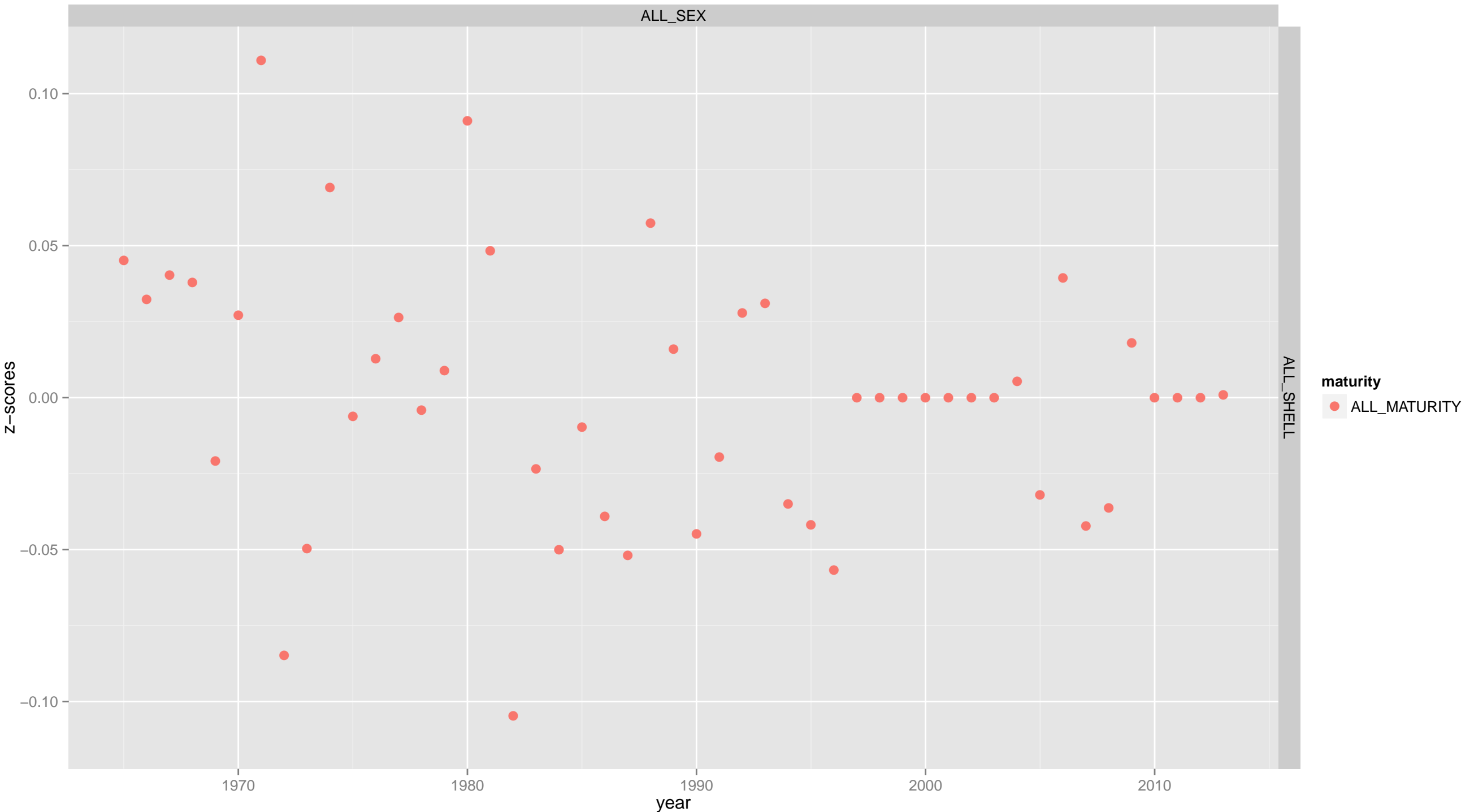
ALL\_SHELL

- maturity**
  - ALL\_MATURITY
- type**
  - observed
  - estimated



# TCF: retained catch abundance

ALL\_SEX





# TCF: retained catch biomass

ALL\_SEX

biomass

ALL\_SHELL

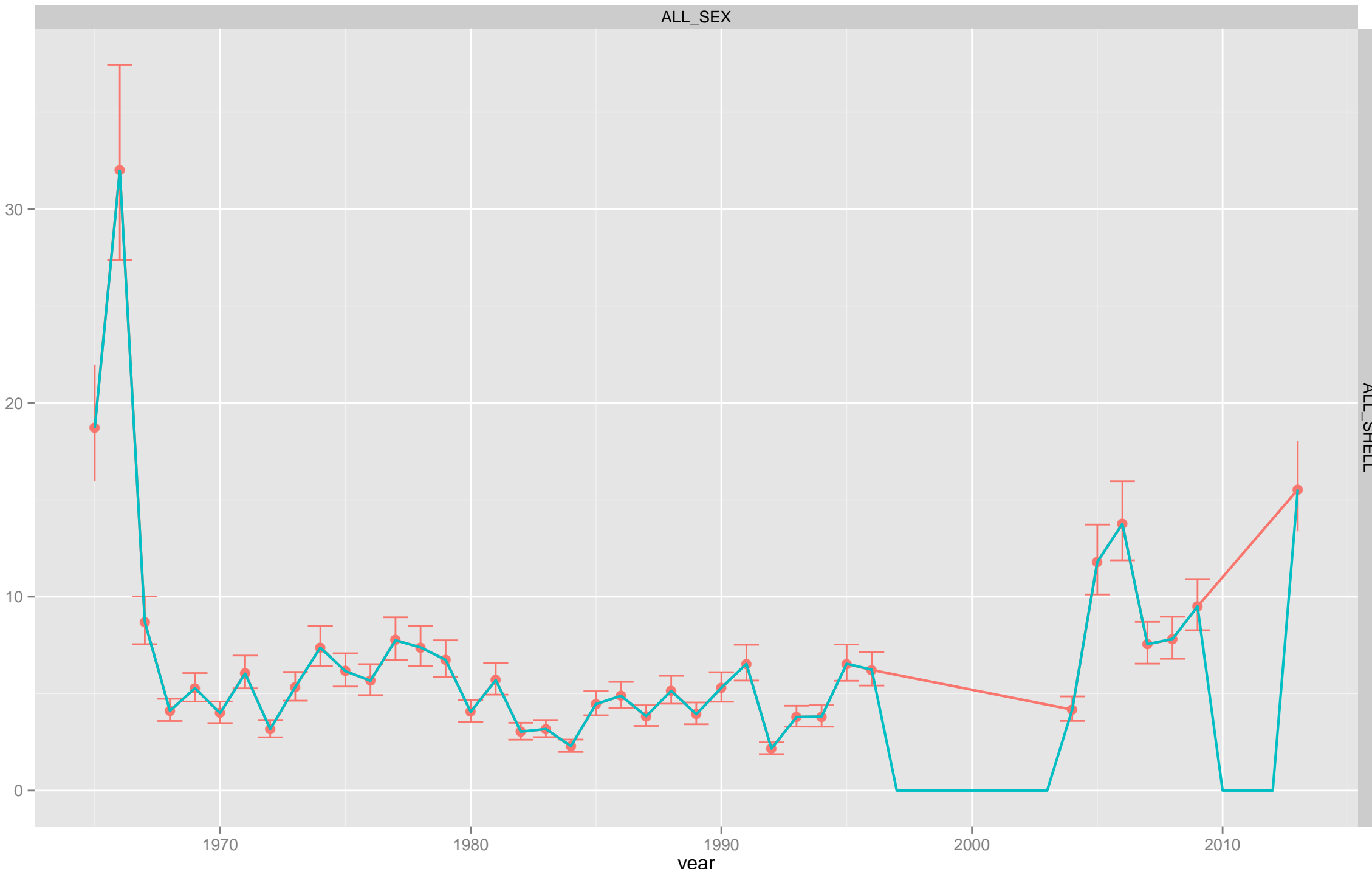
type

observed

estimated

maturity

ALL\_MATURITY



# TCF: retained catch biomass

ALL\_SEX

biomass [ln-scale]

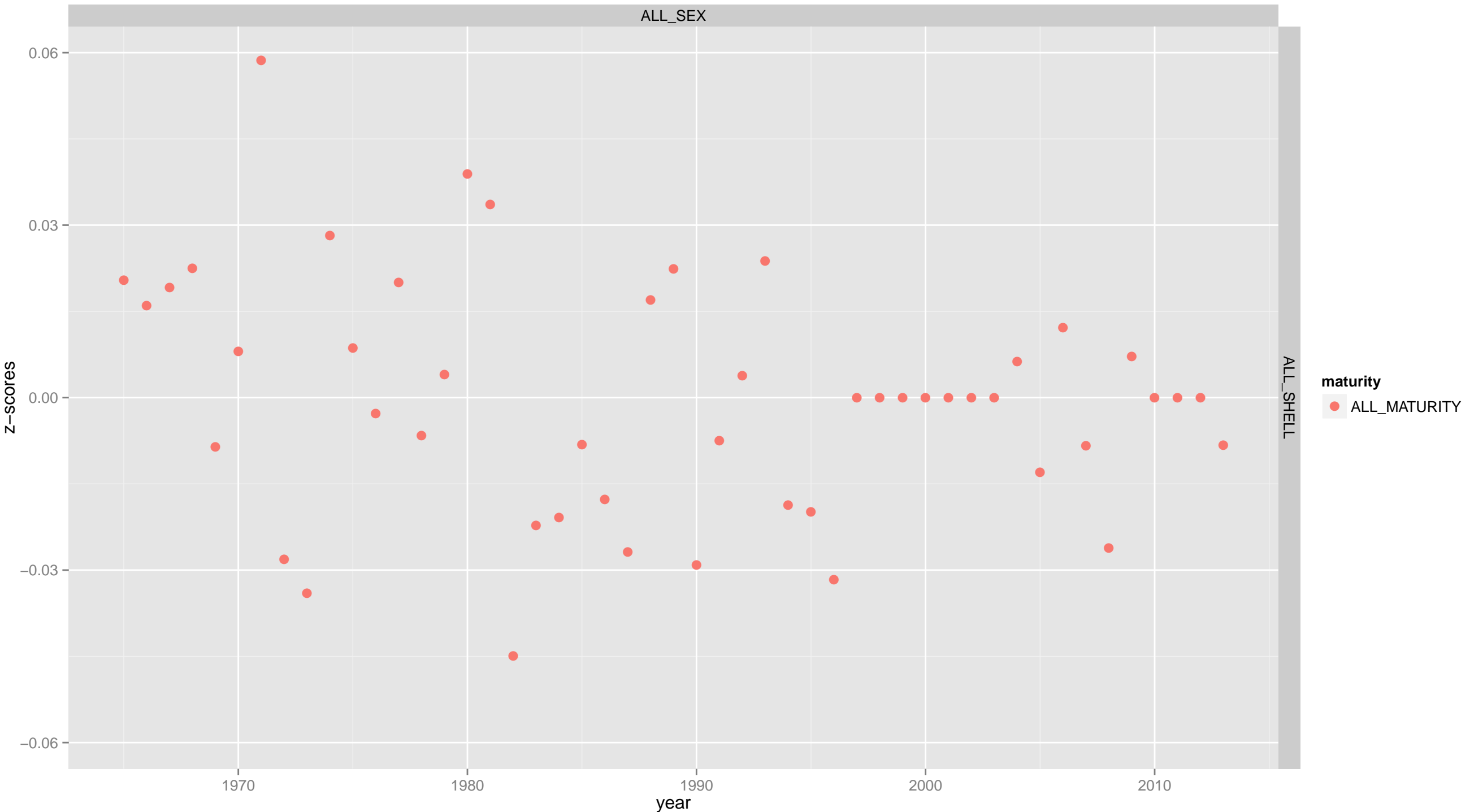
ALL\_SHELL

- maturity**
  - ALL\_MATURITY
- type**
  - observed
  - estimated



# TCF: retained catch biomass

ALL\_SEX

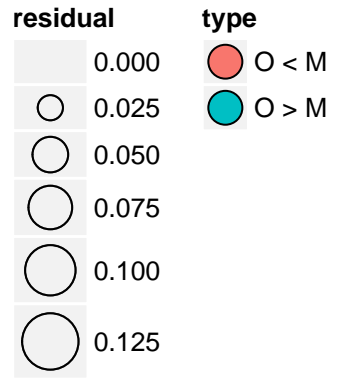


maturity  
ALL\_MATURITY

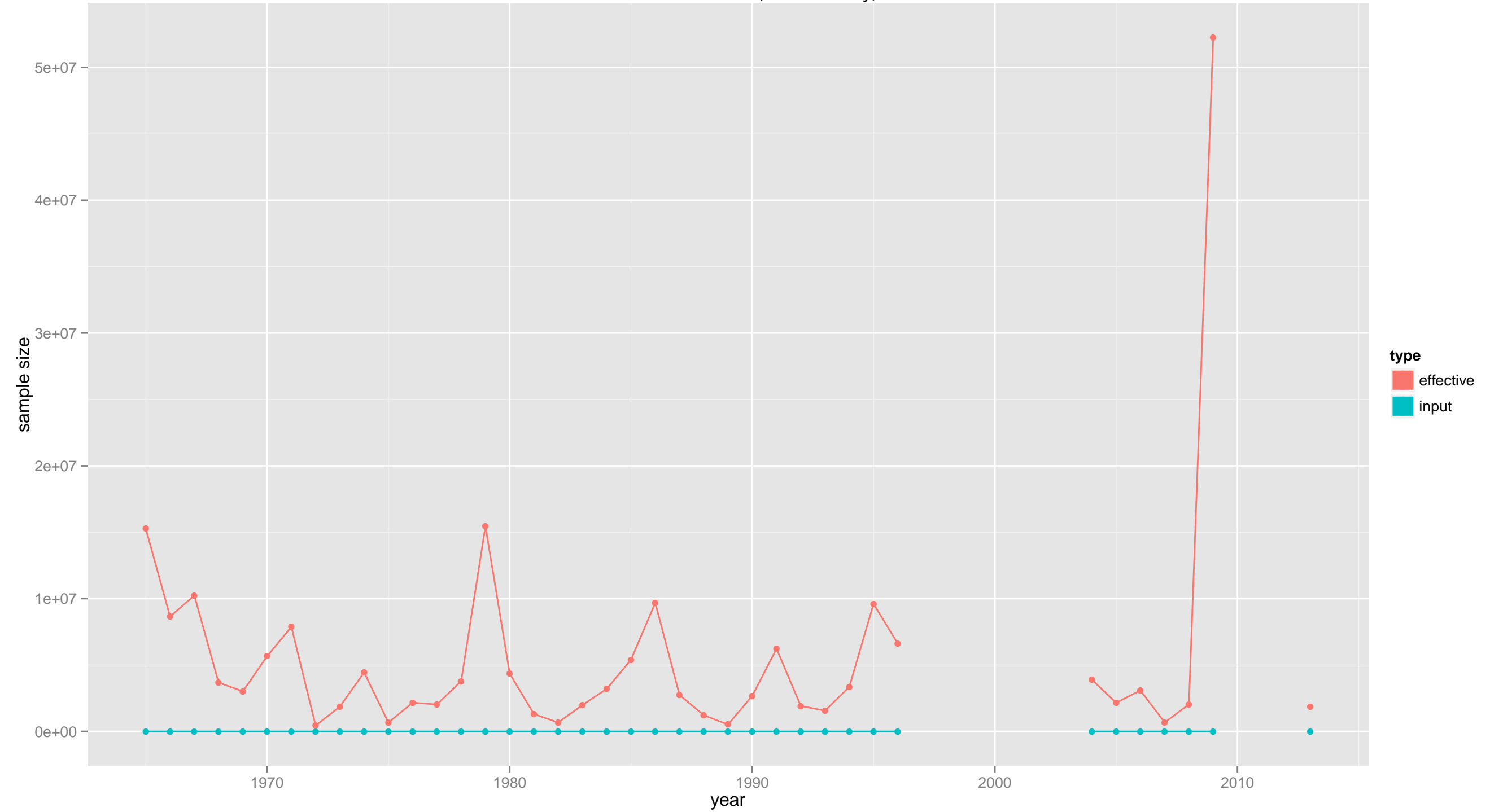
ALL\_SHELL

TCF: retained catch:

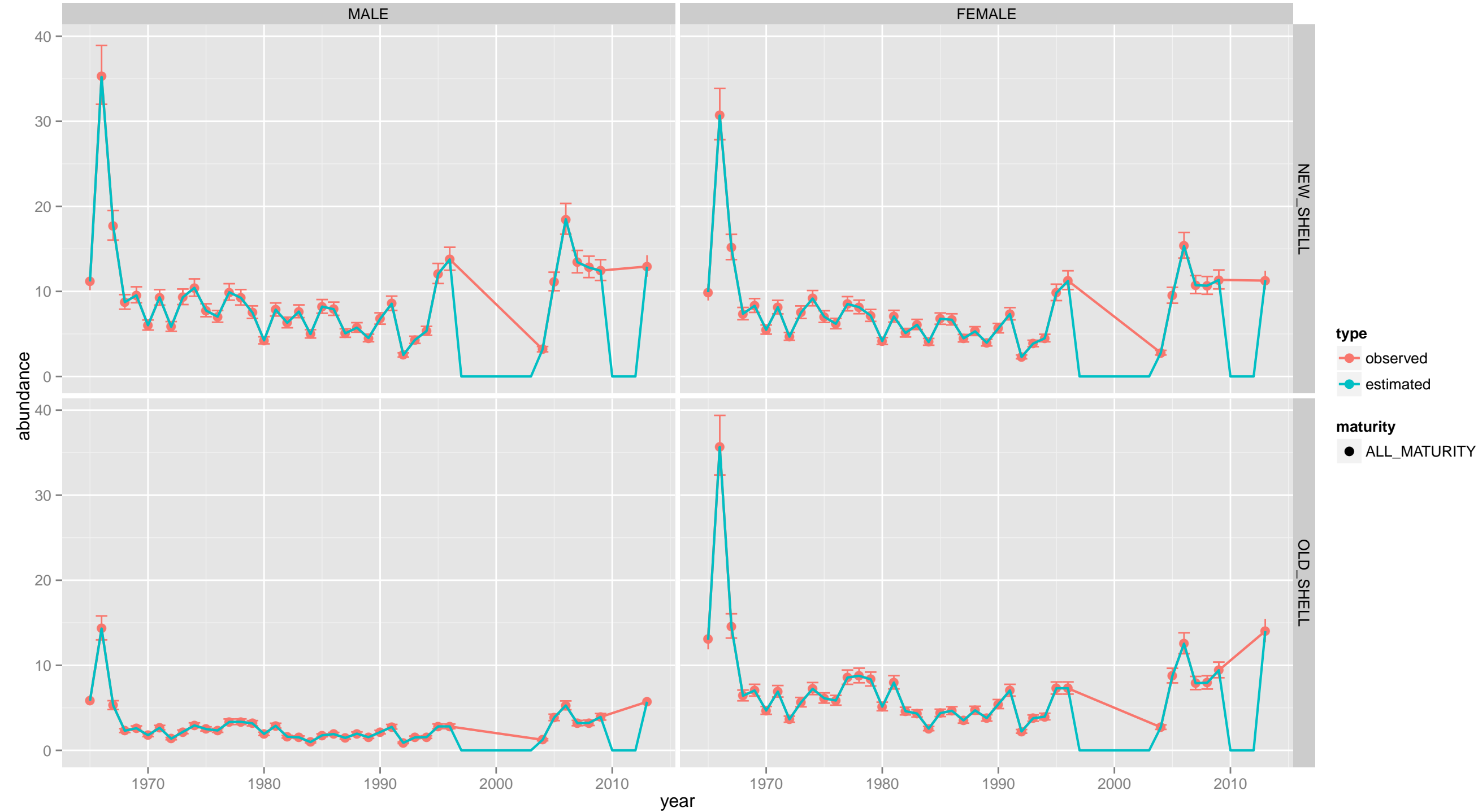




TCF: retained catch: all sex, all maturity, all shell



# TCF: discard catch abundance



# TCF: discard catch abundance





# TCF: discard catch abundance



# TCF: discard catch biomass

MALE

FEMALE

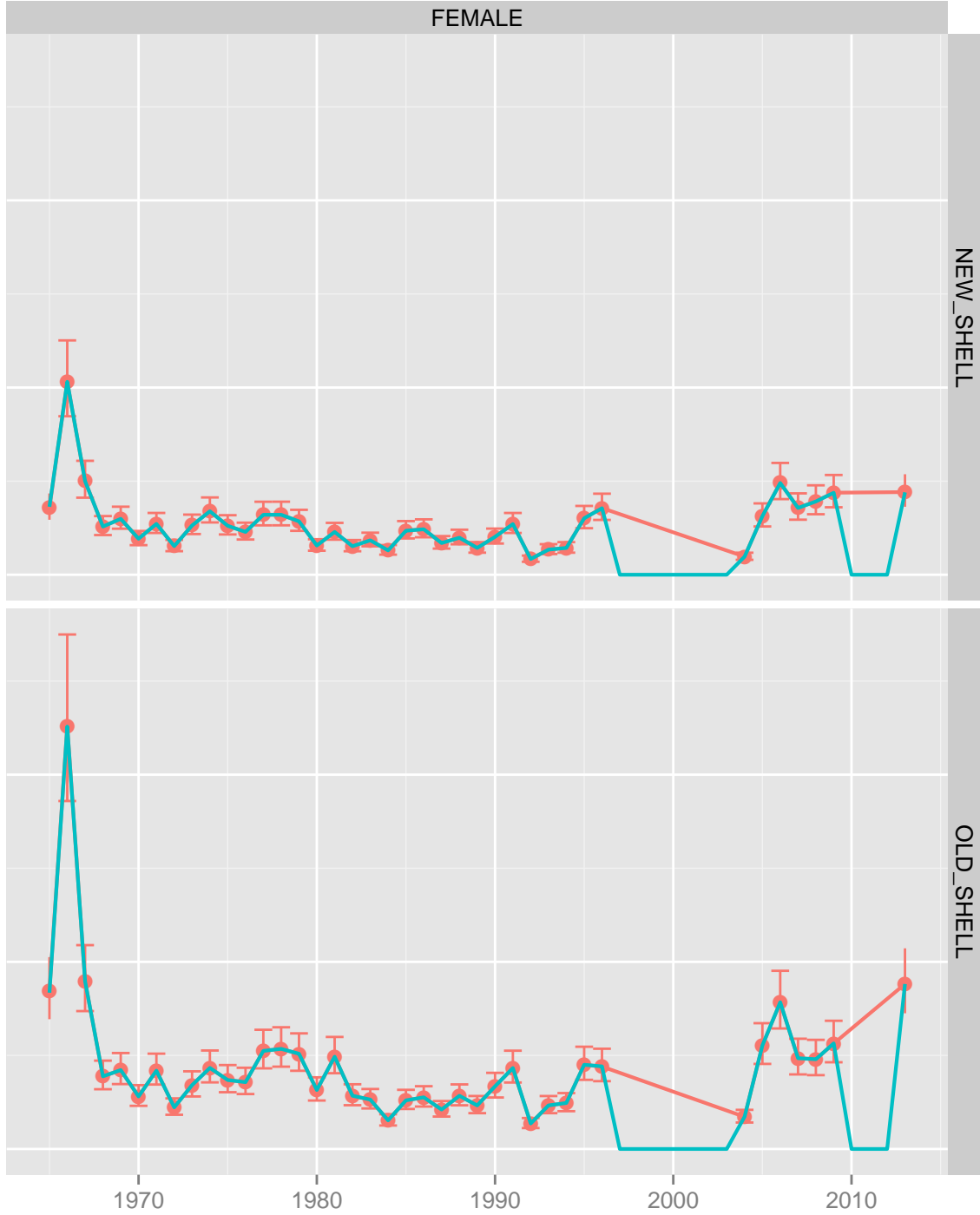
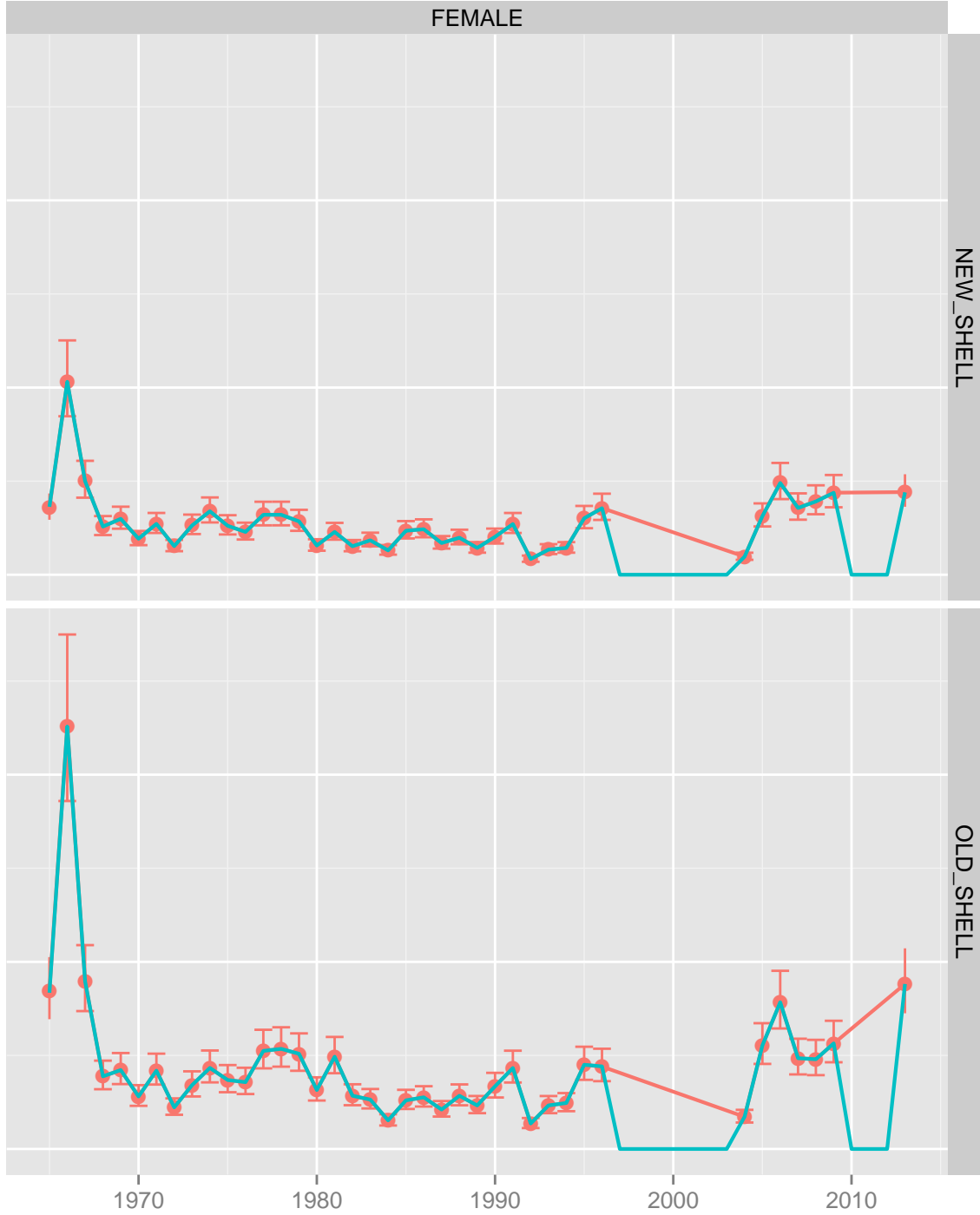
NEW\_SHELL

OLD\_SHELL

biomass

year

- type**
- observed
  - estimated
- maturity**
- ALL\_MATURITY



# TCF: discard catch biomass

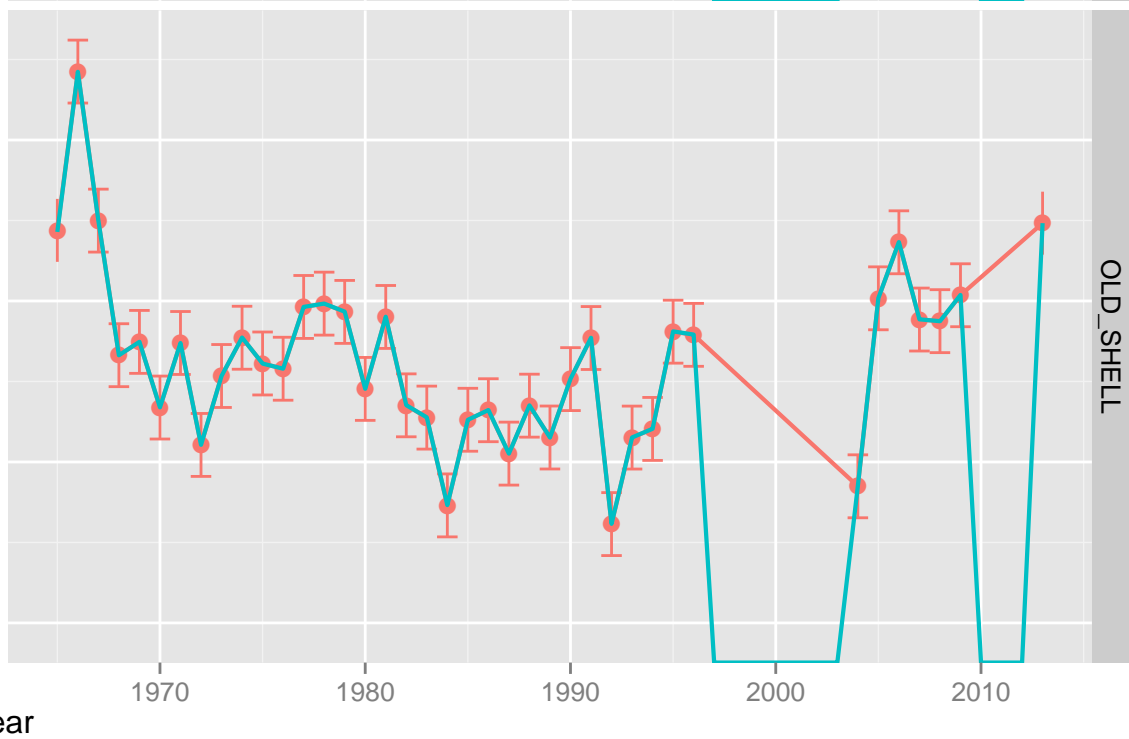
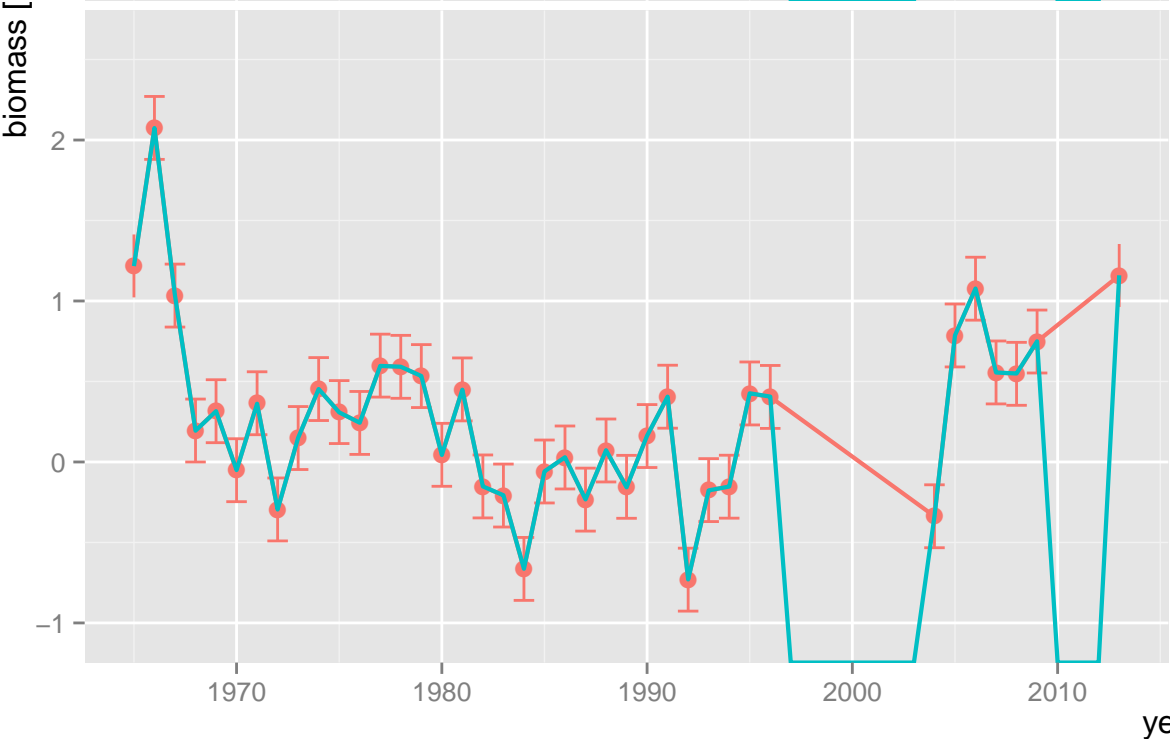
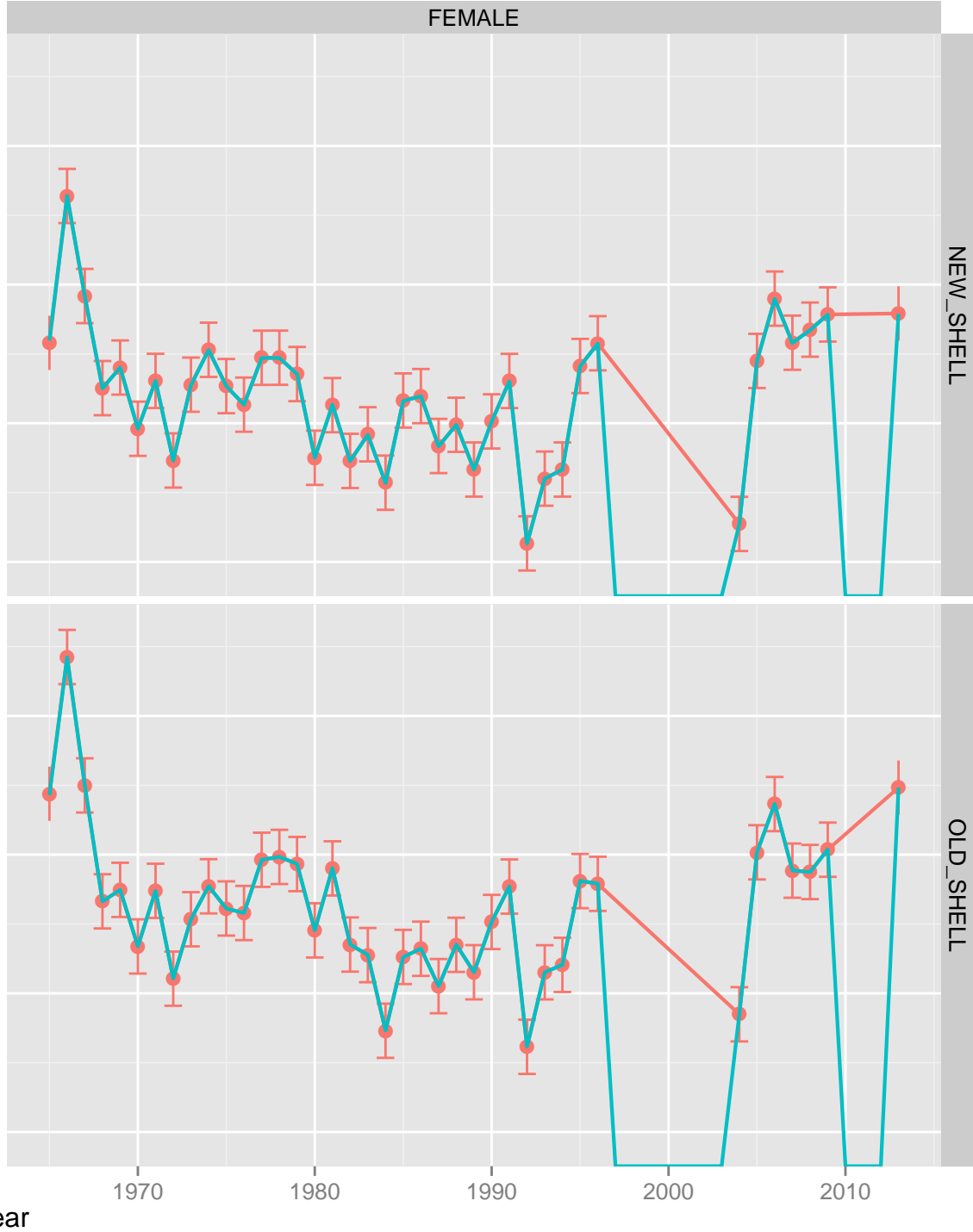
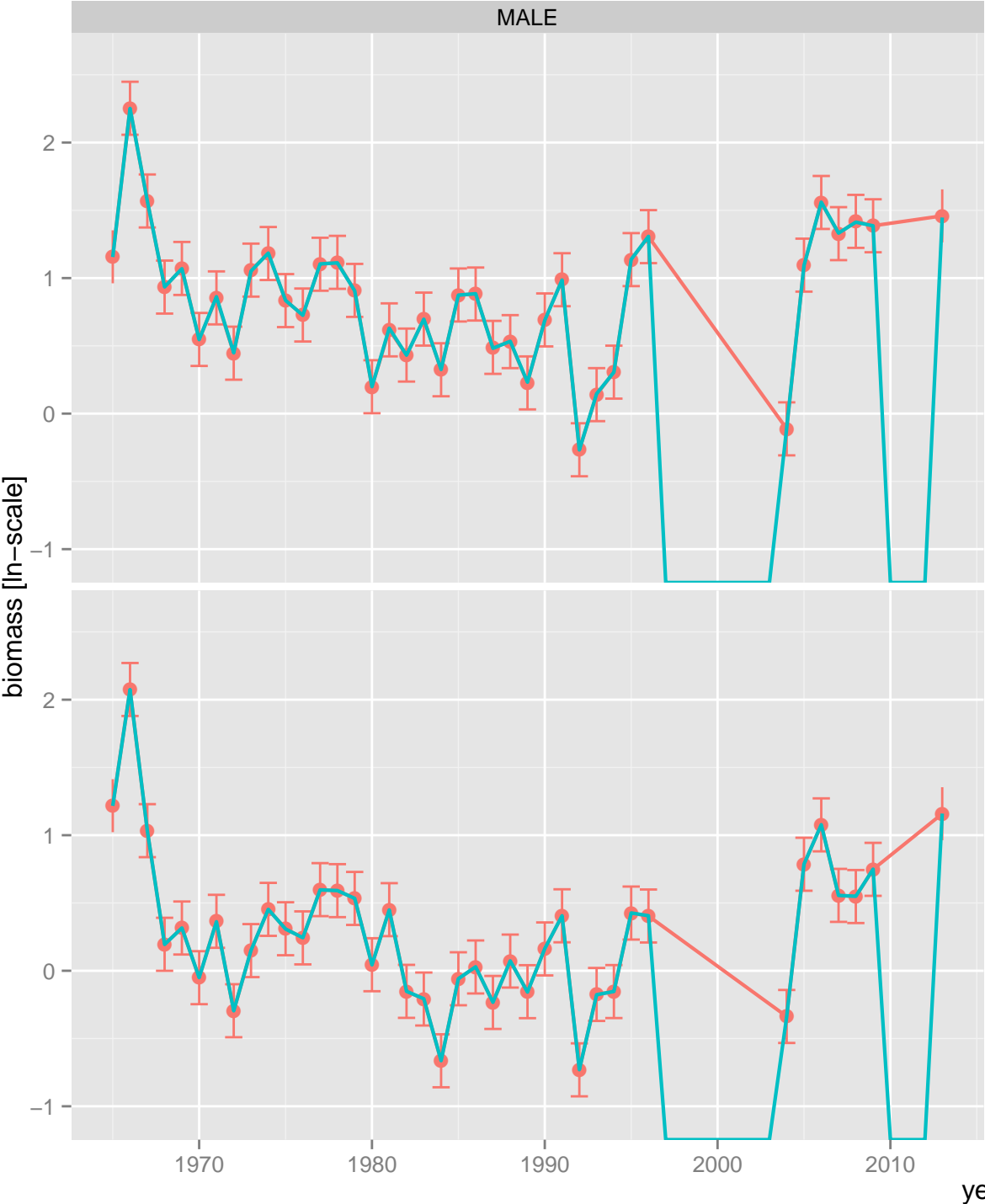
MALE

FEMALE

NEW\_SHELL

OLD\_SHELL

- maturity**
- ALL\_MATURITY
- type**
- observed
  - estimated



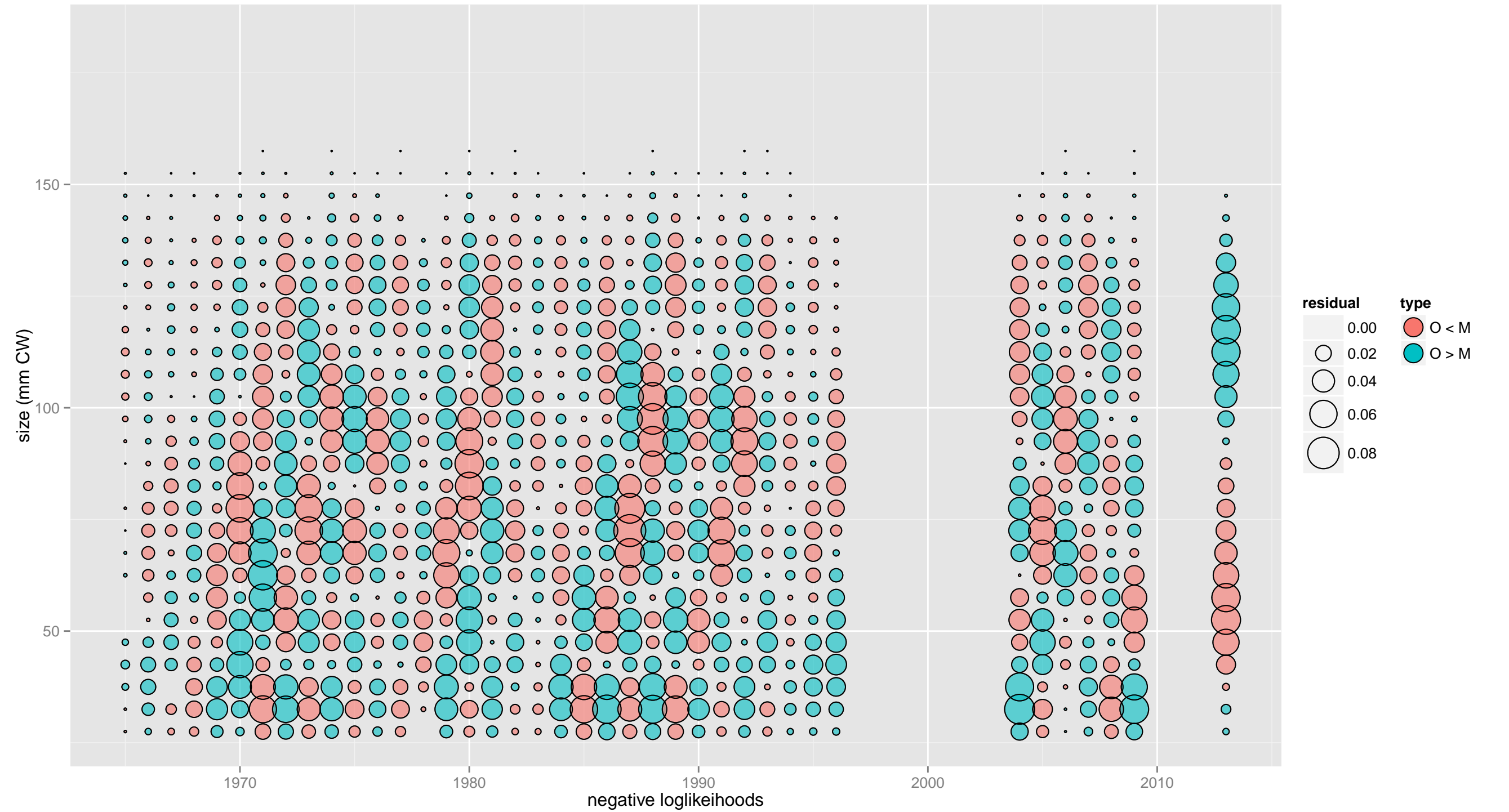
year

TCF: discard catch biomass

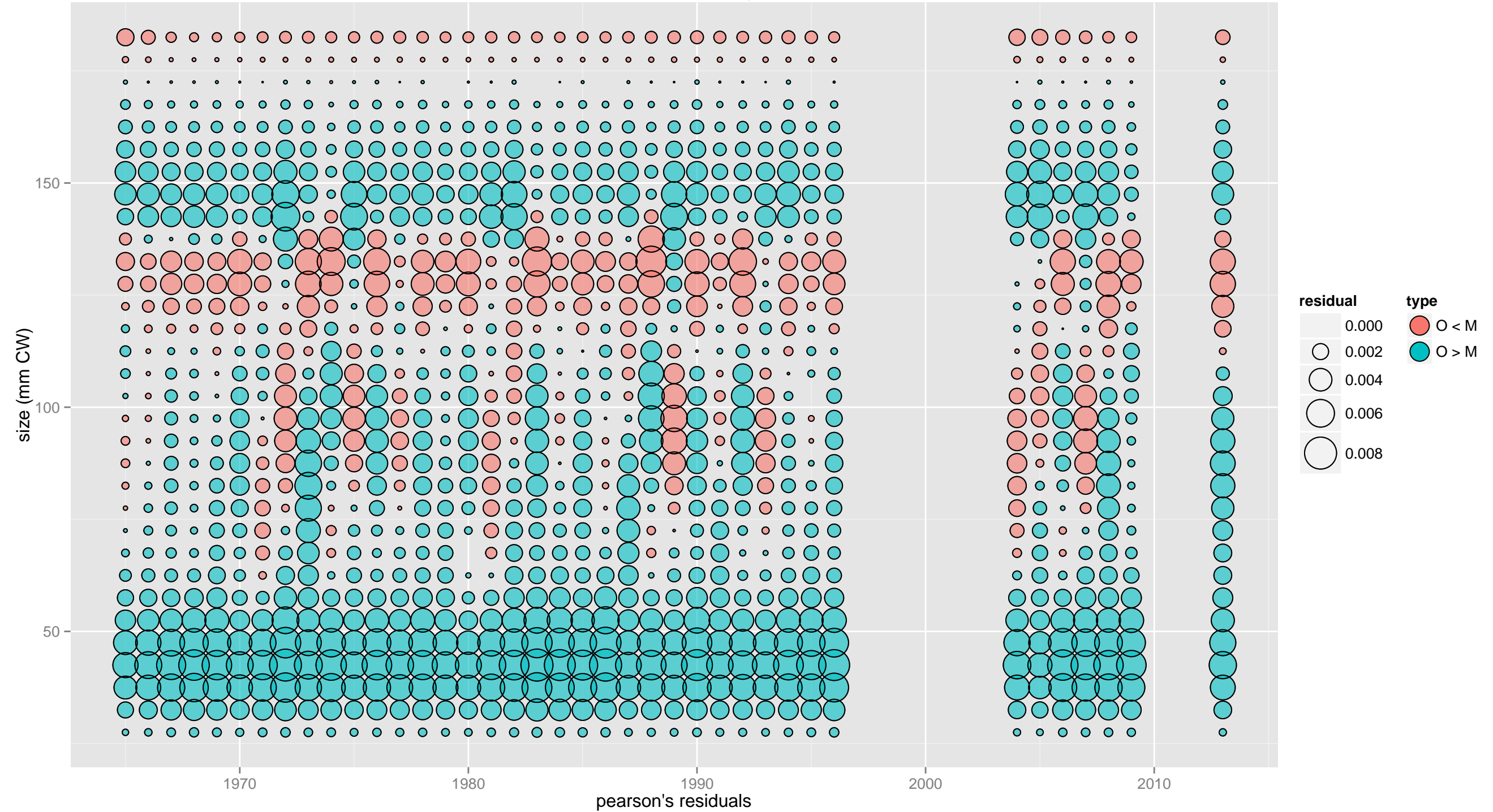


TCF: discard catch: male, new shell

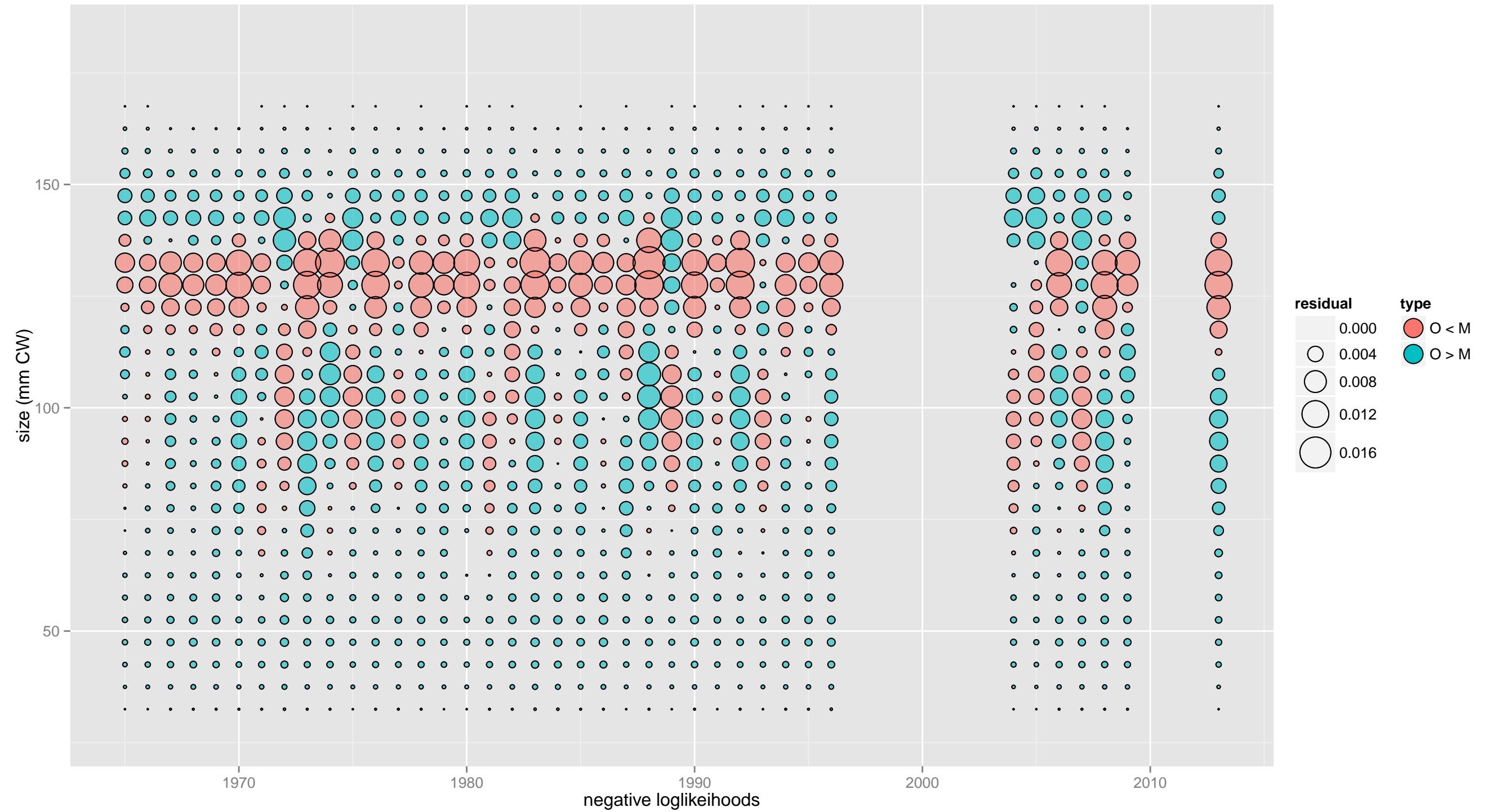




TCF: discard catch: male, old shell



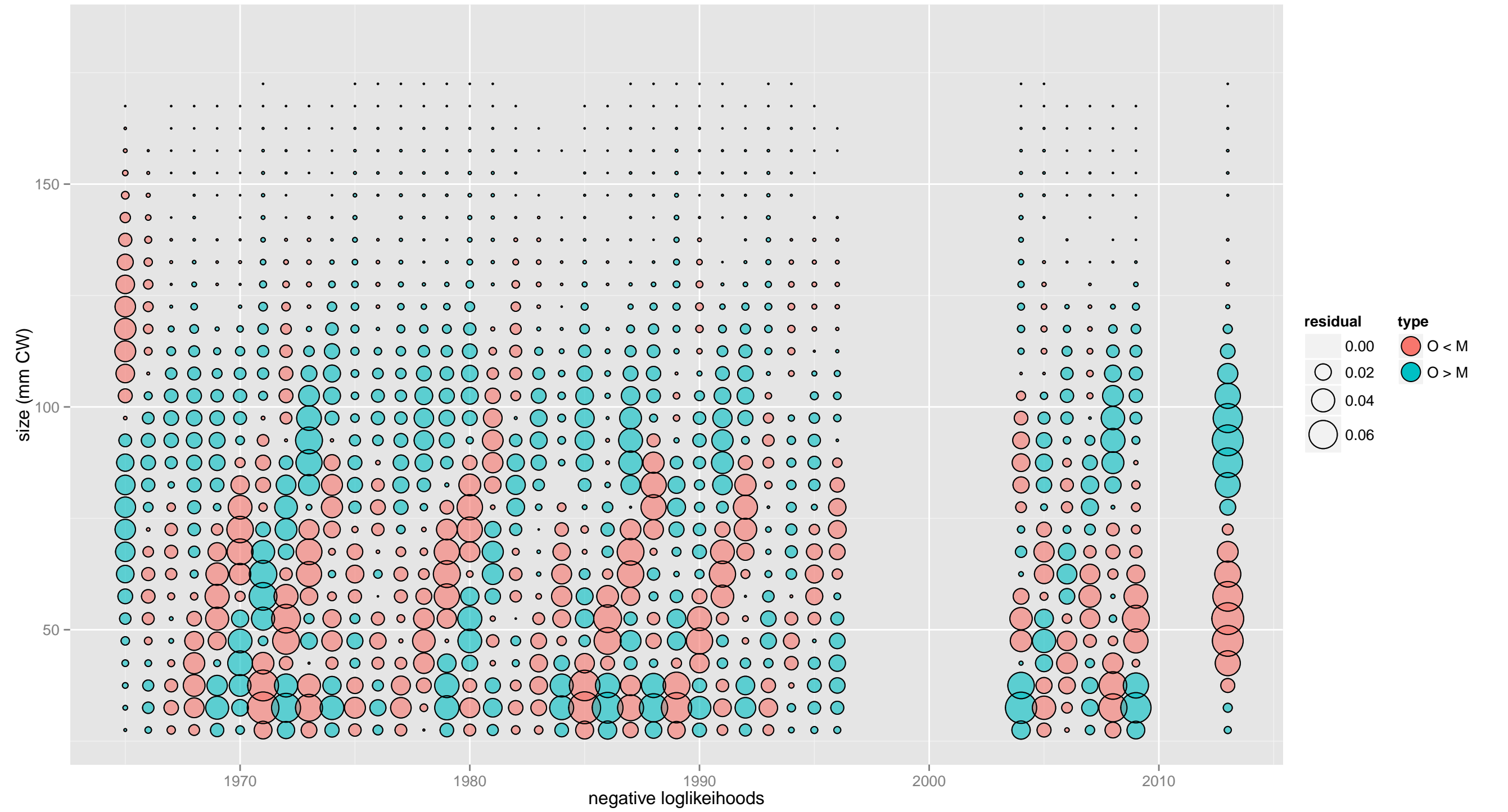






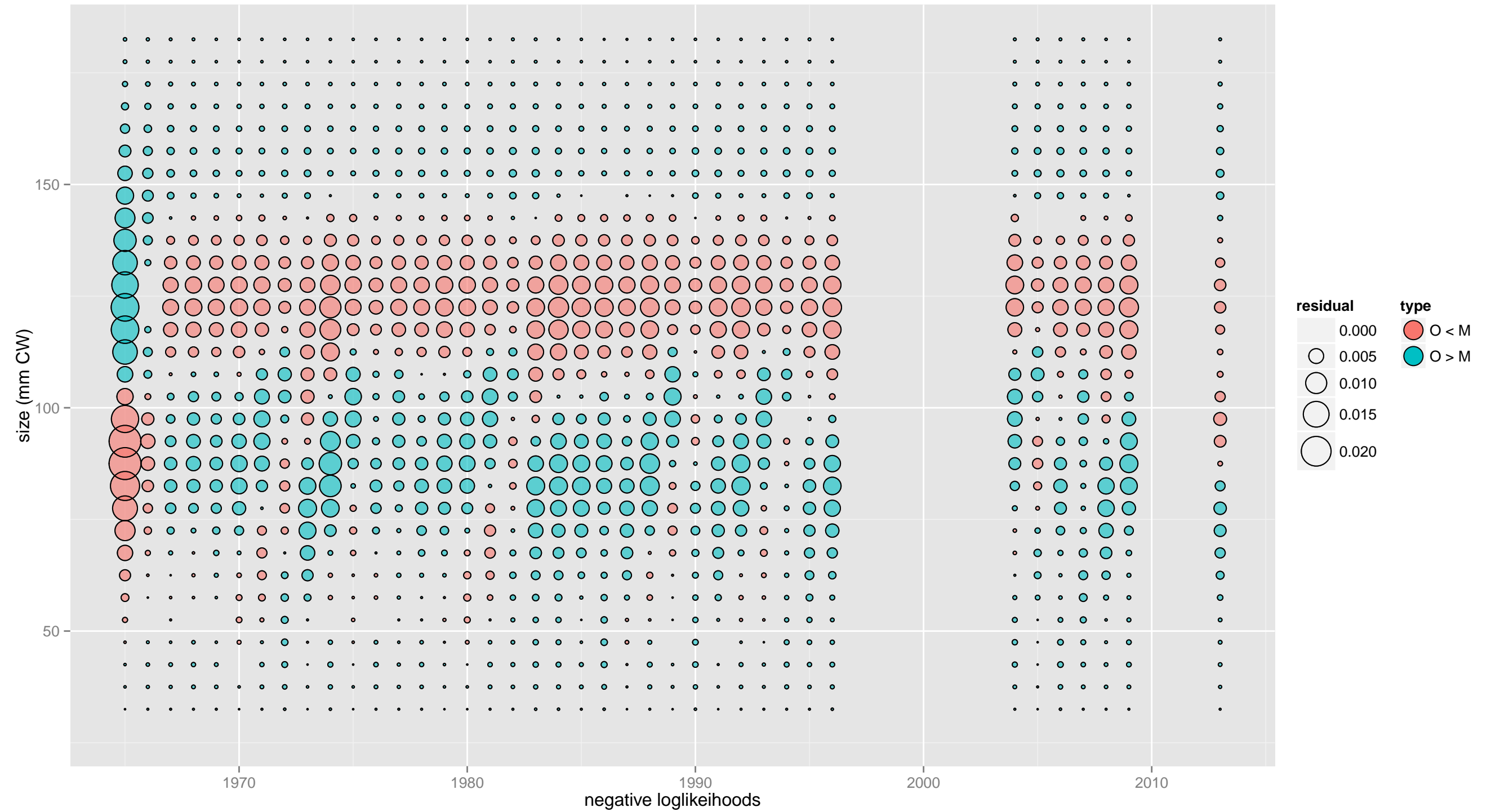
TCF: discard catch: female, new shell



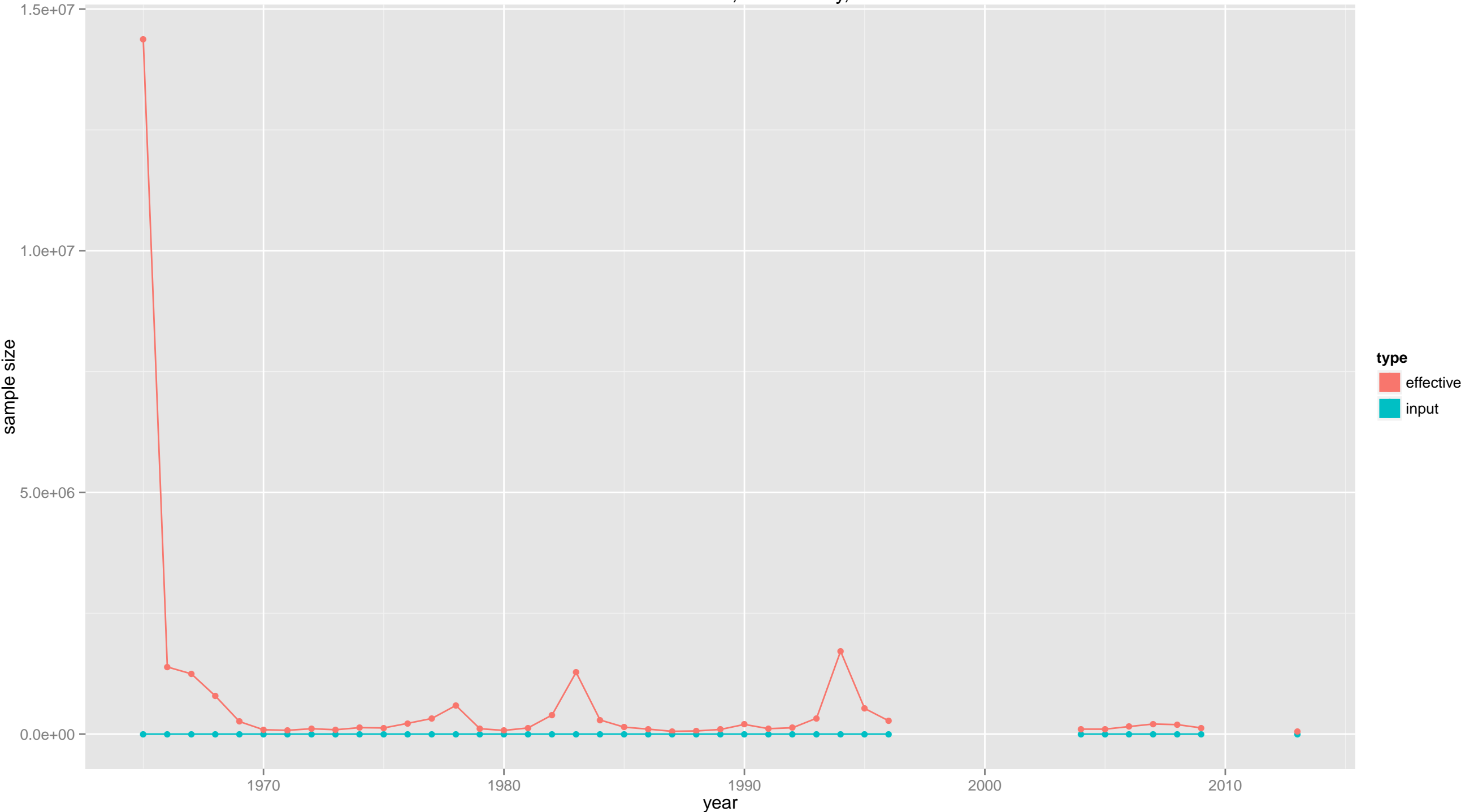


TCF: discard catch: female, old shell





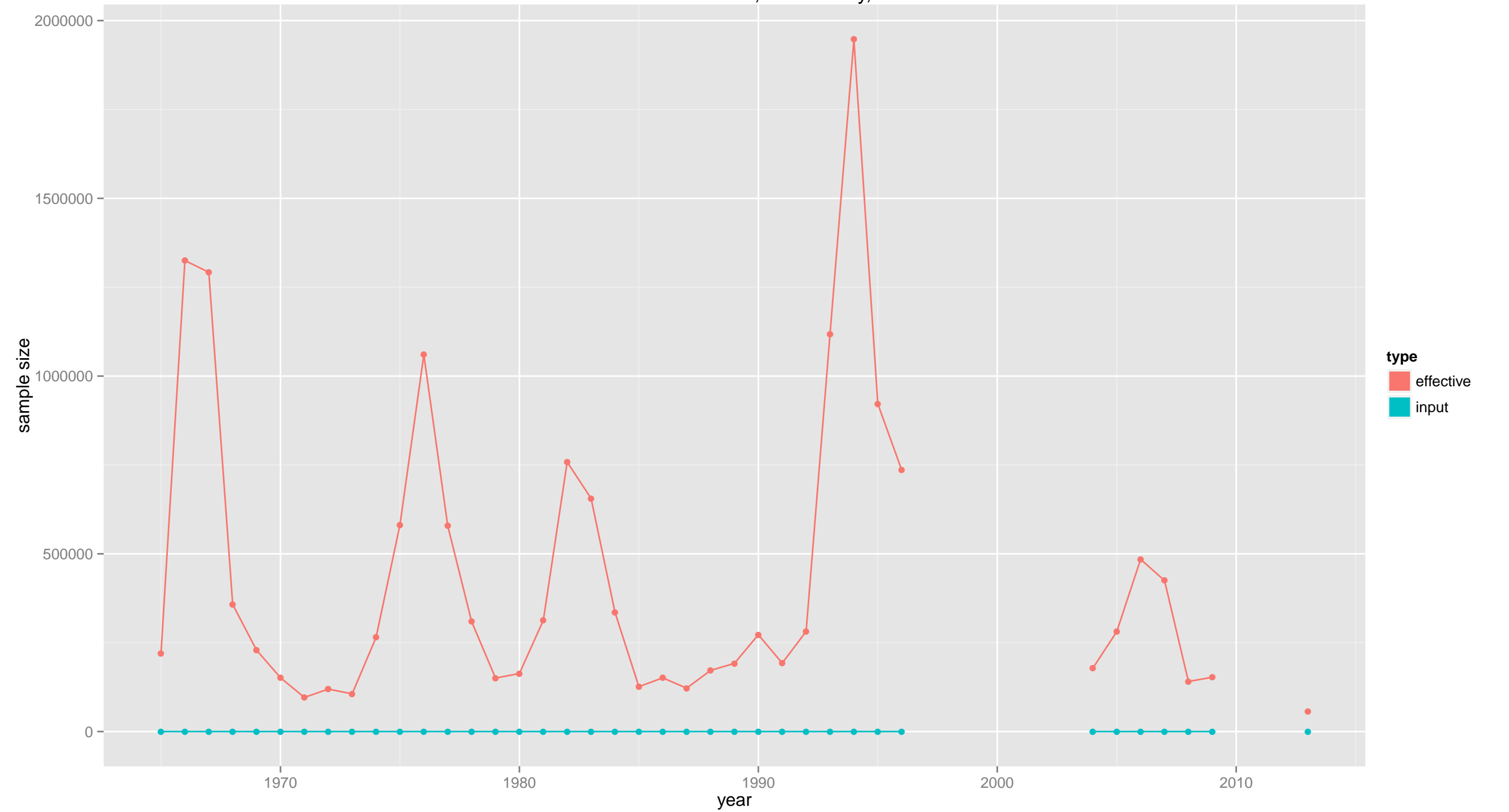
TCF: discard catch: male, all maturity, new shell



TCF: discard catch: male, all maturity, old shell



TCF: discard catch: female, all maturity, new shell



TCF: discard catch: female, all maturity, old shell





TCF: total catch abundance



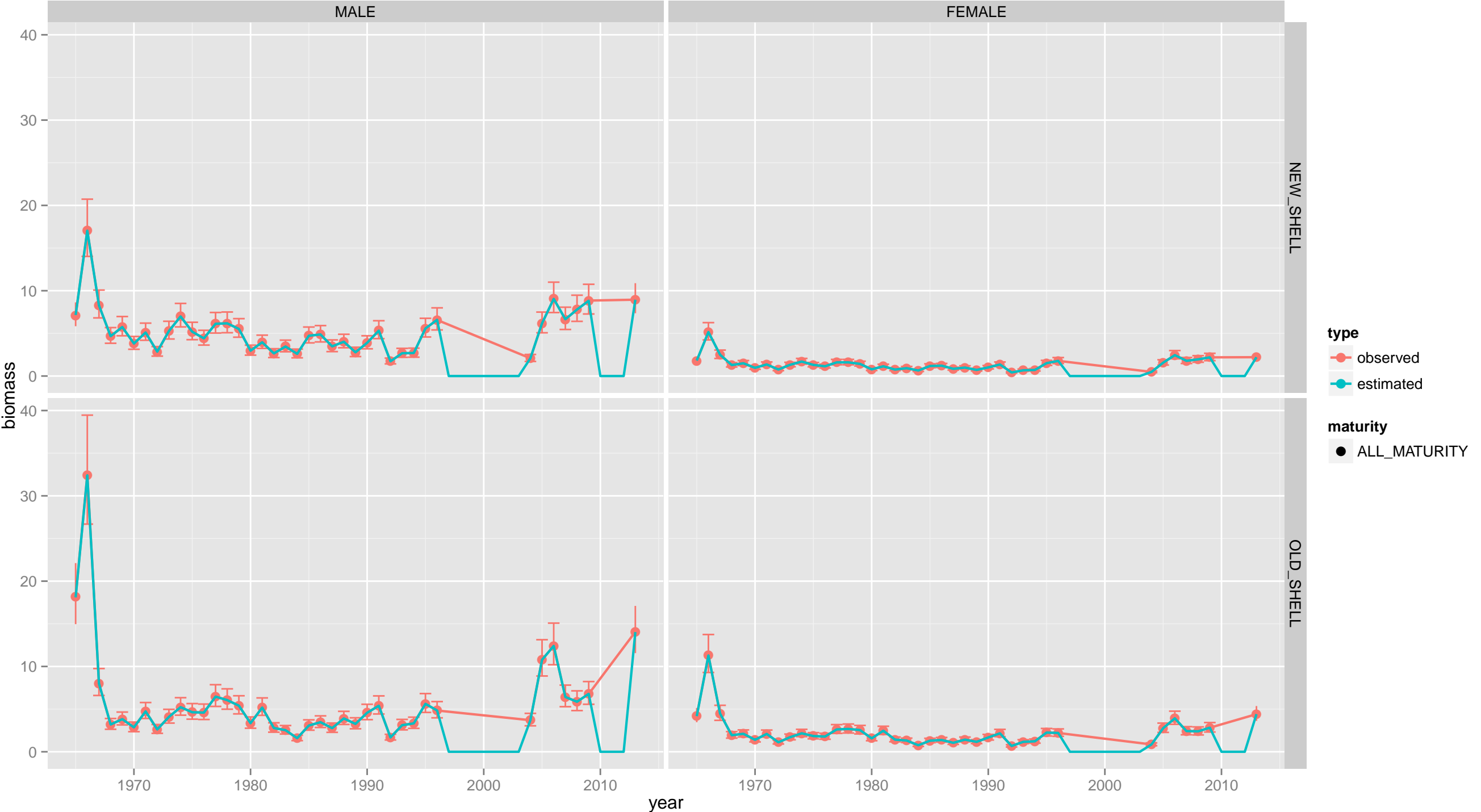
# TCF: total catch abundance



TCF: total catch abundance



# TCF: total catch biomass



# TCF: total catch biomass

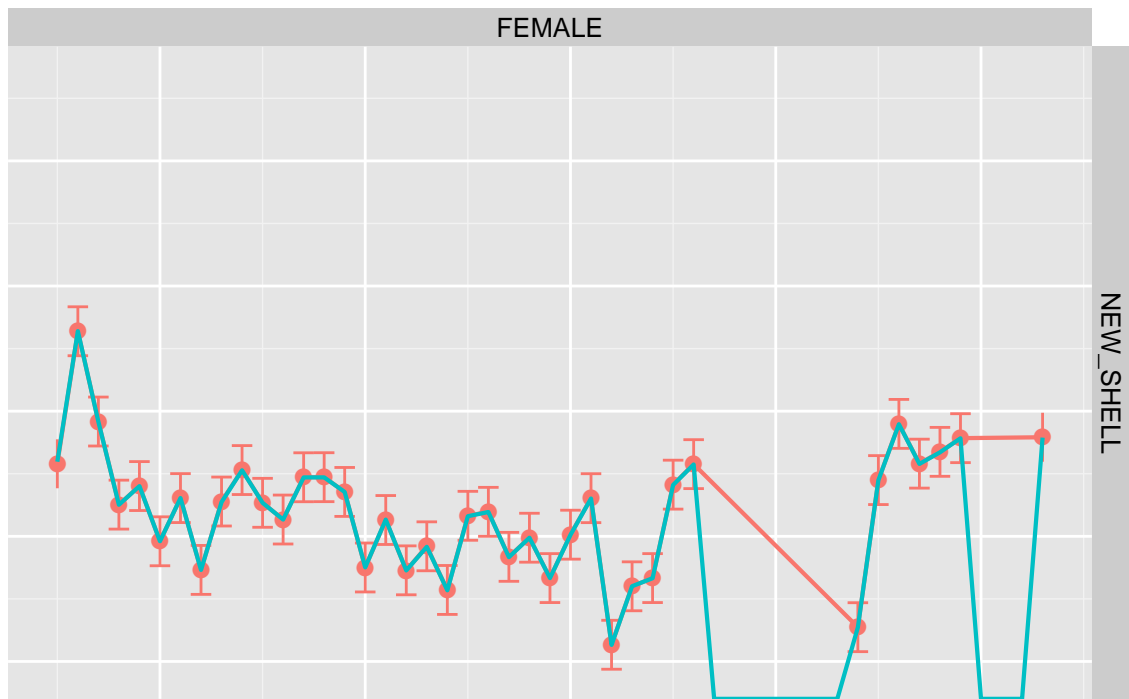
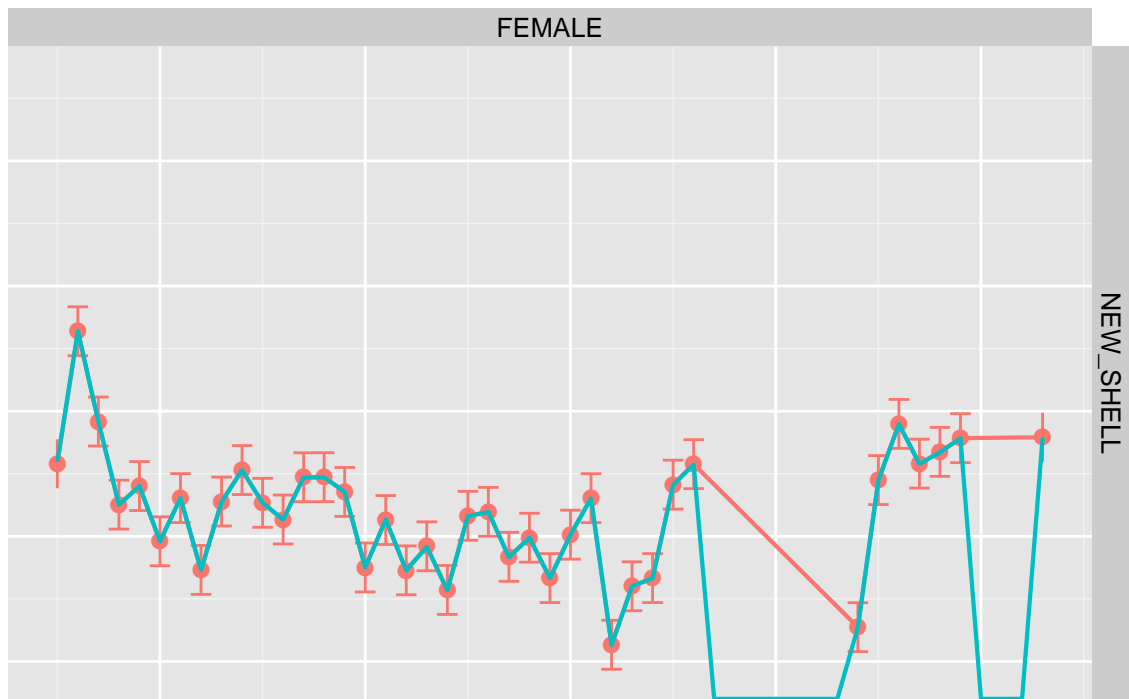
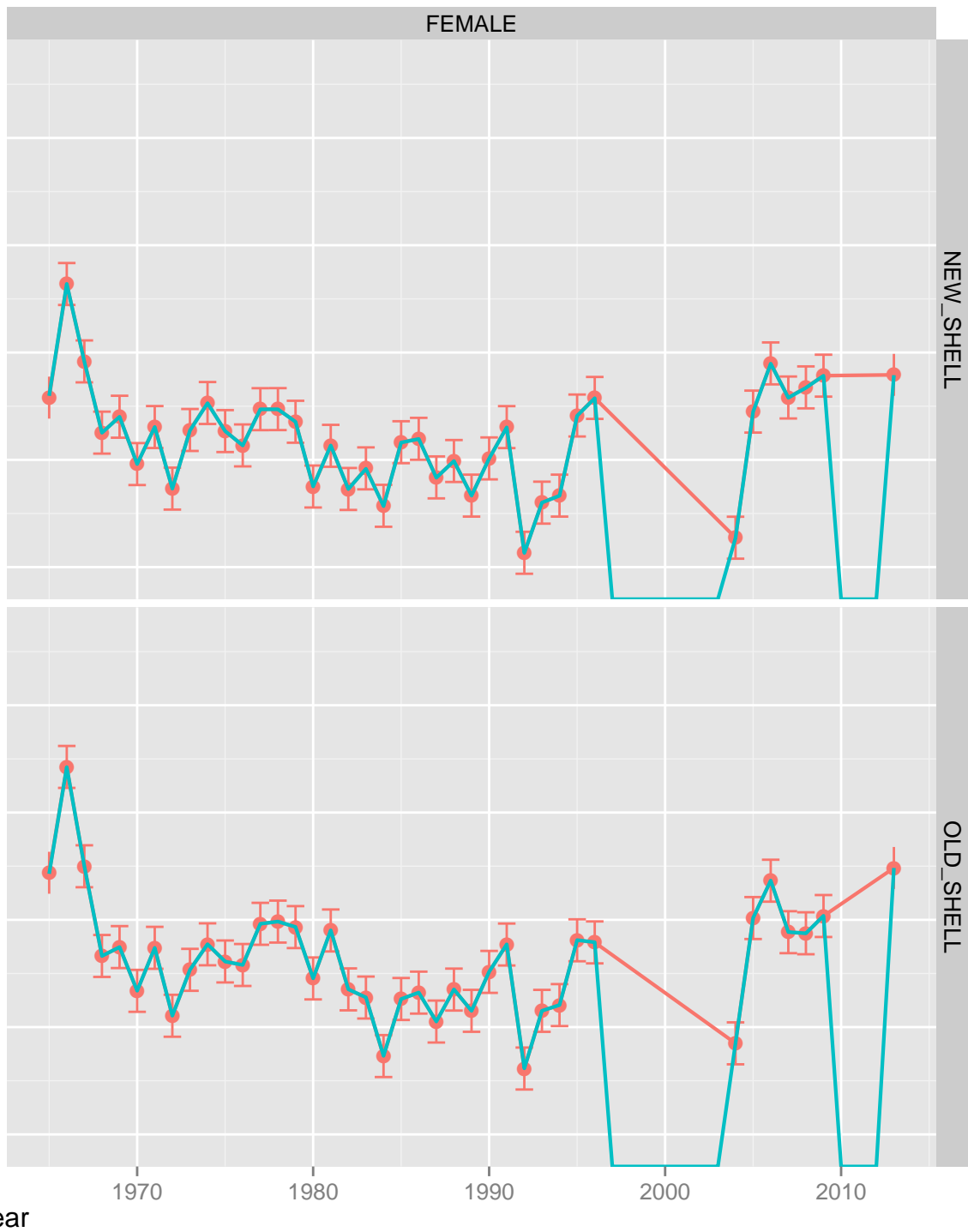
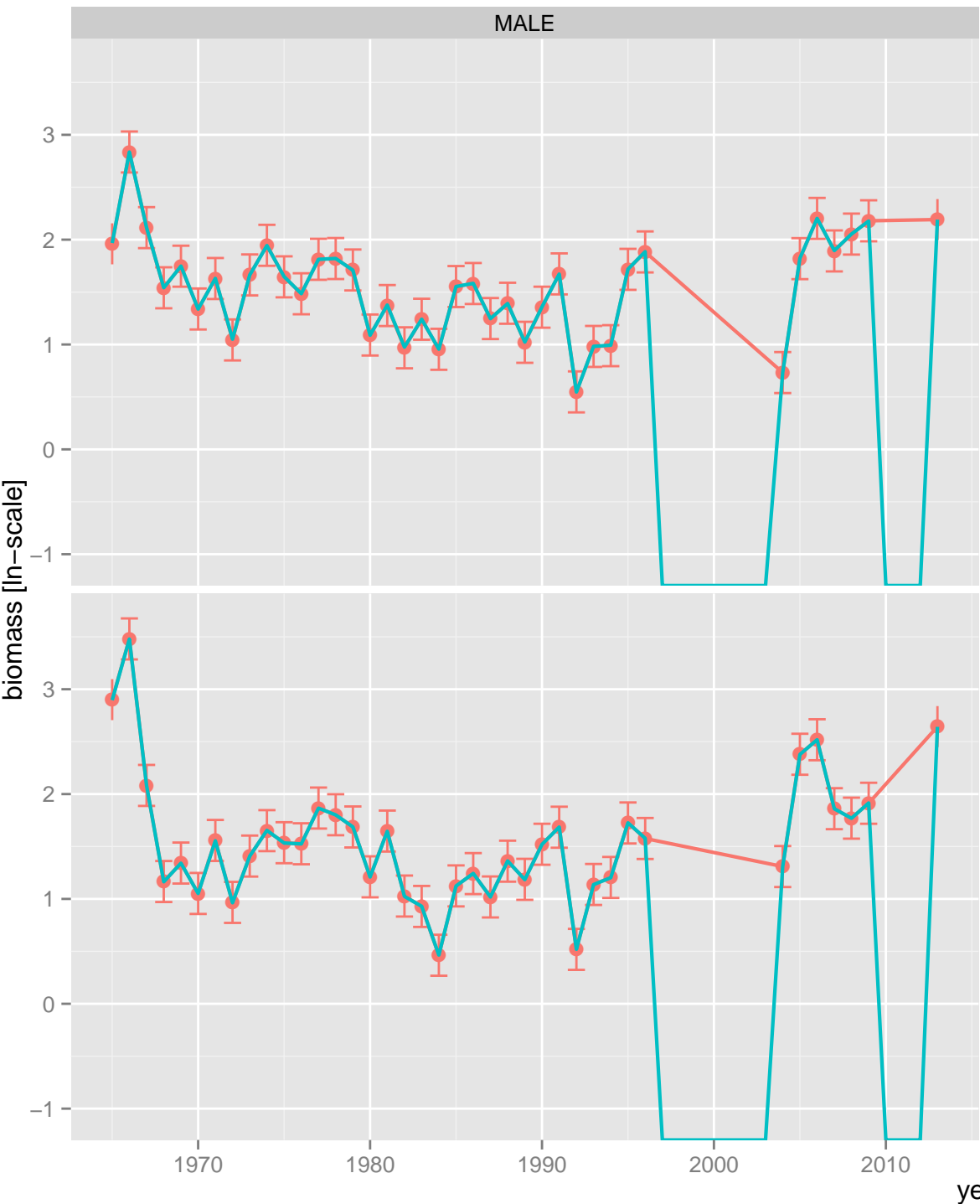
MALE

FEMALE

NEW\_SHELL

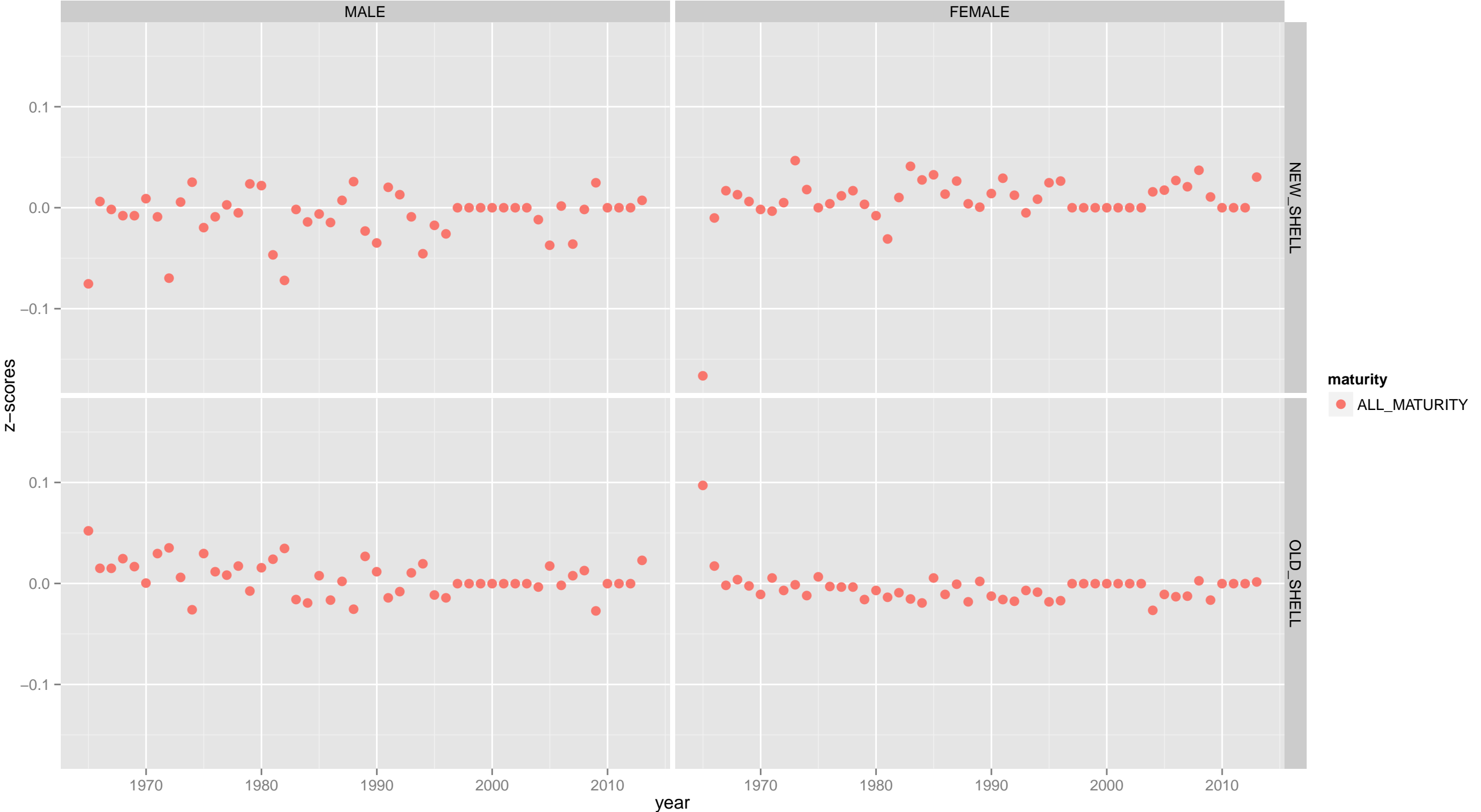
OLD\_SHELL

- maturity**
- ALL\_MATURITY
- type**
- observed
  - estimated



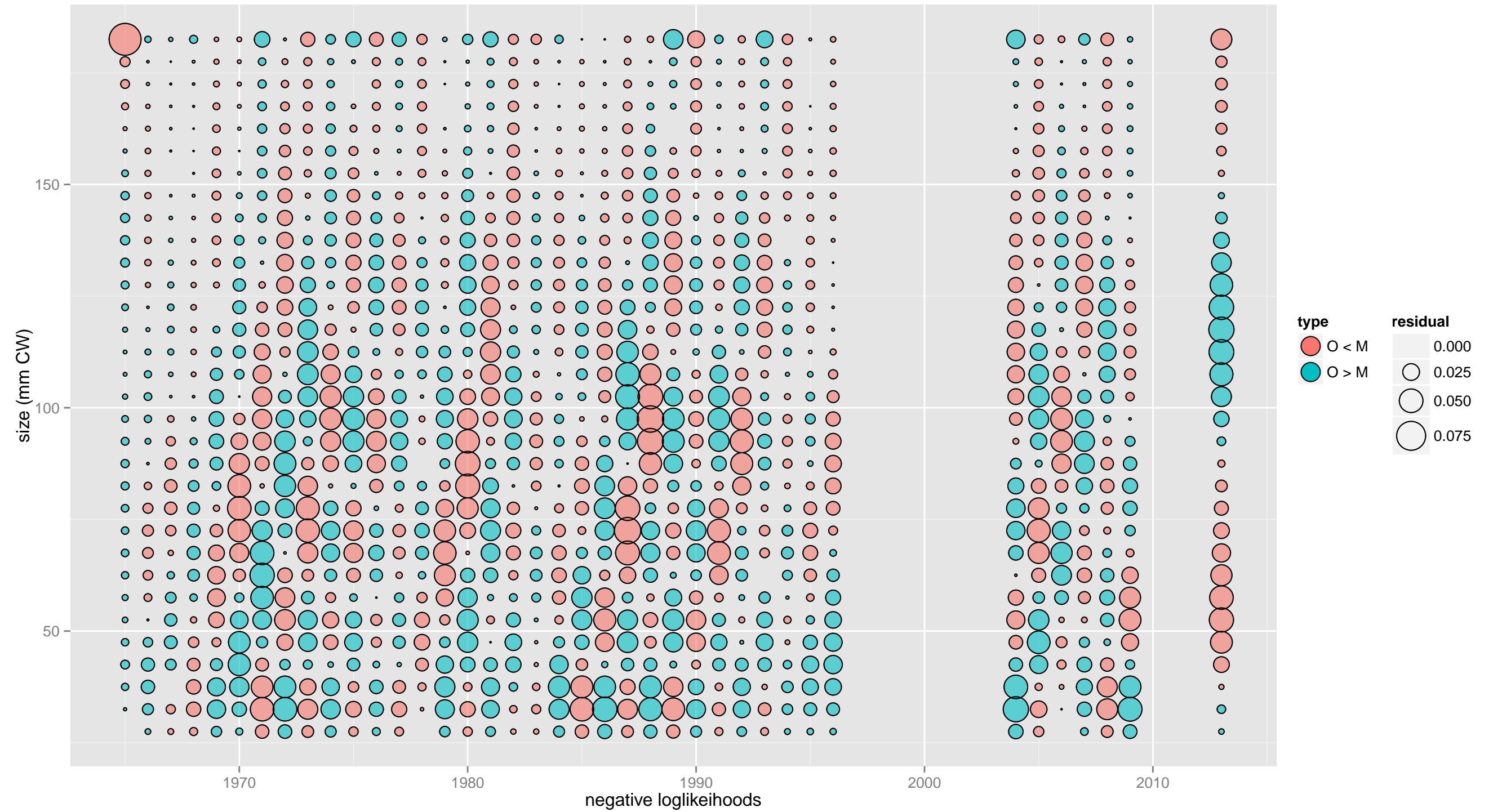
year

TCF: total catch biomass



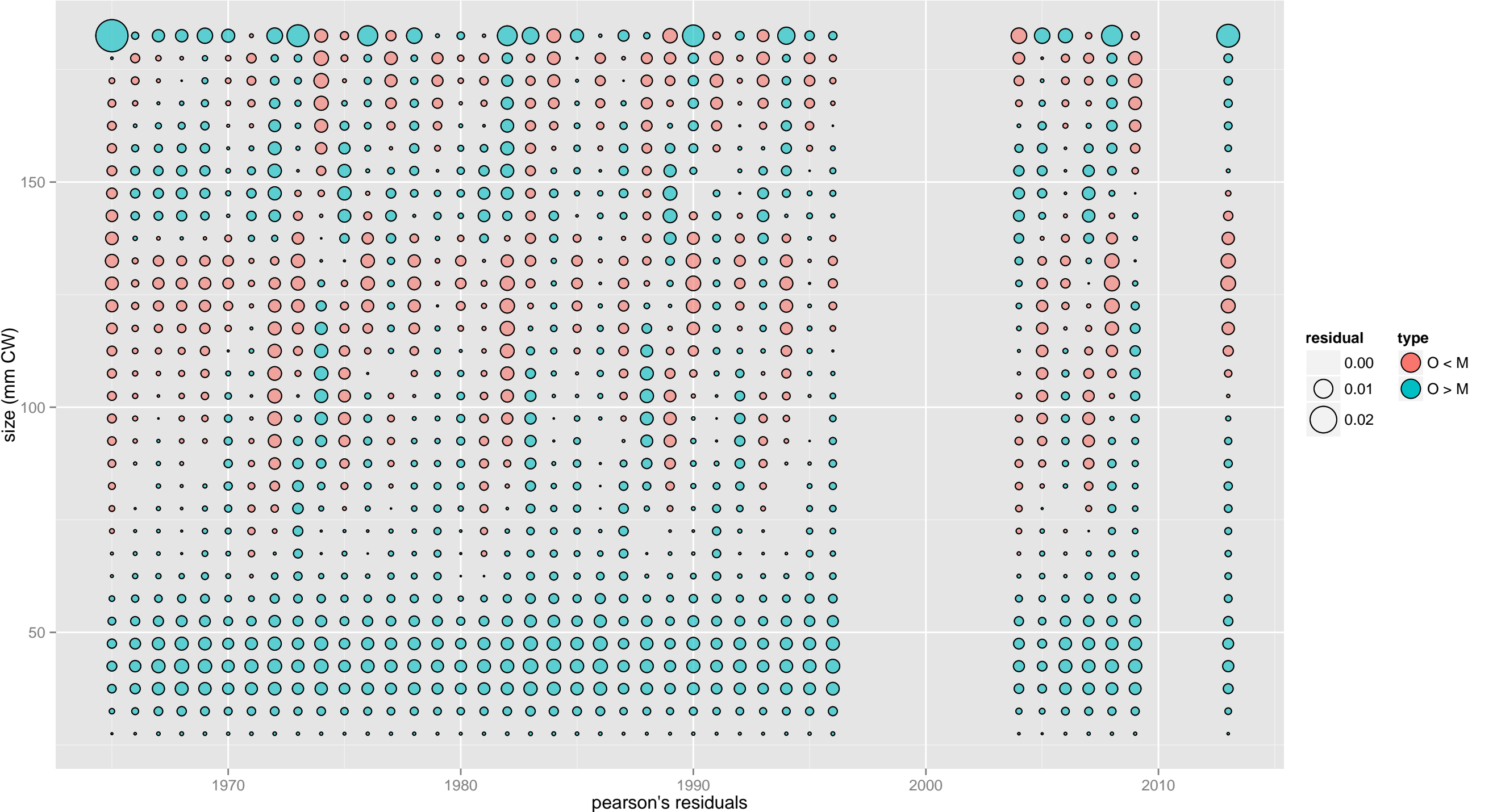
TCF: total catch: male, new shell

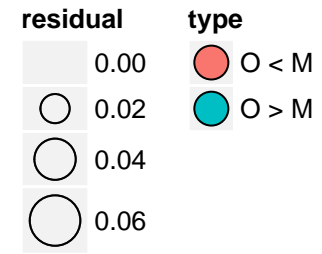






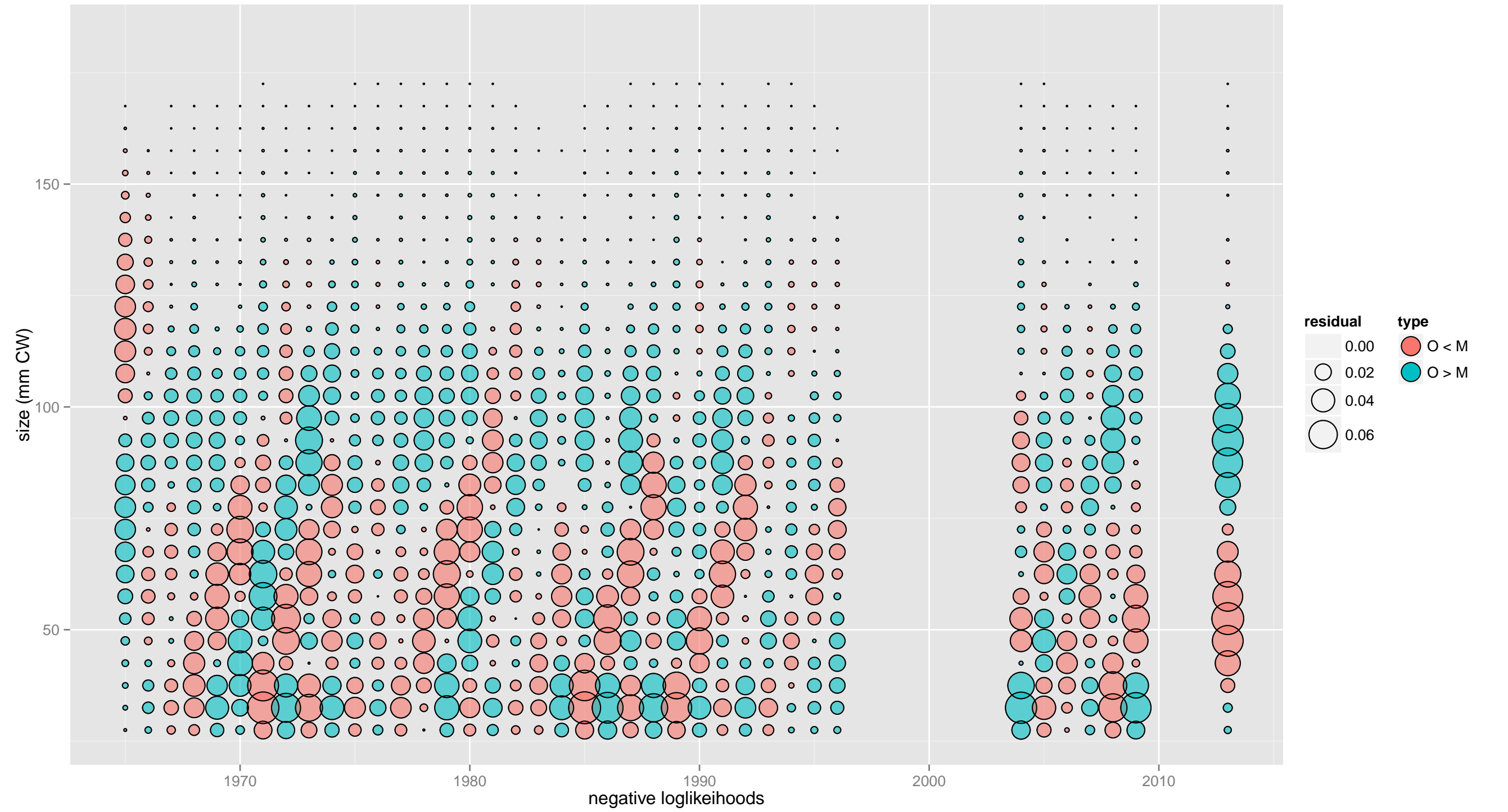
TCF: total catch: male, old shell



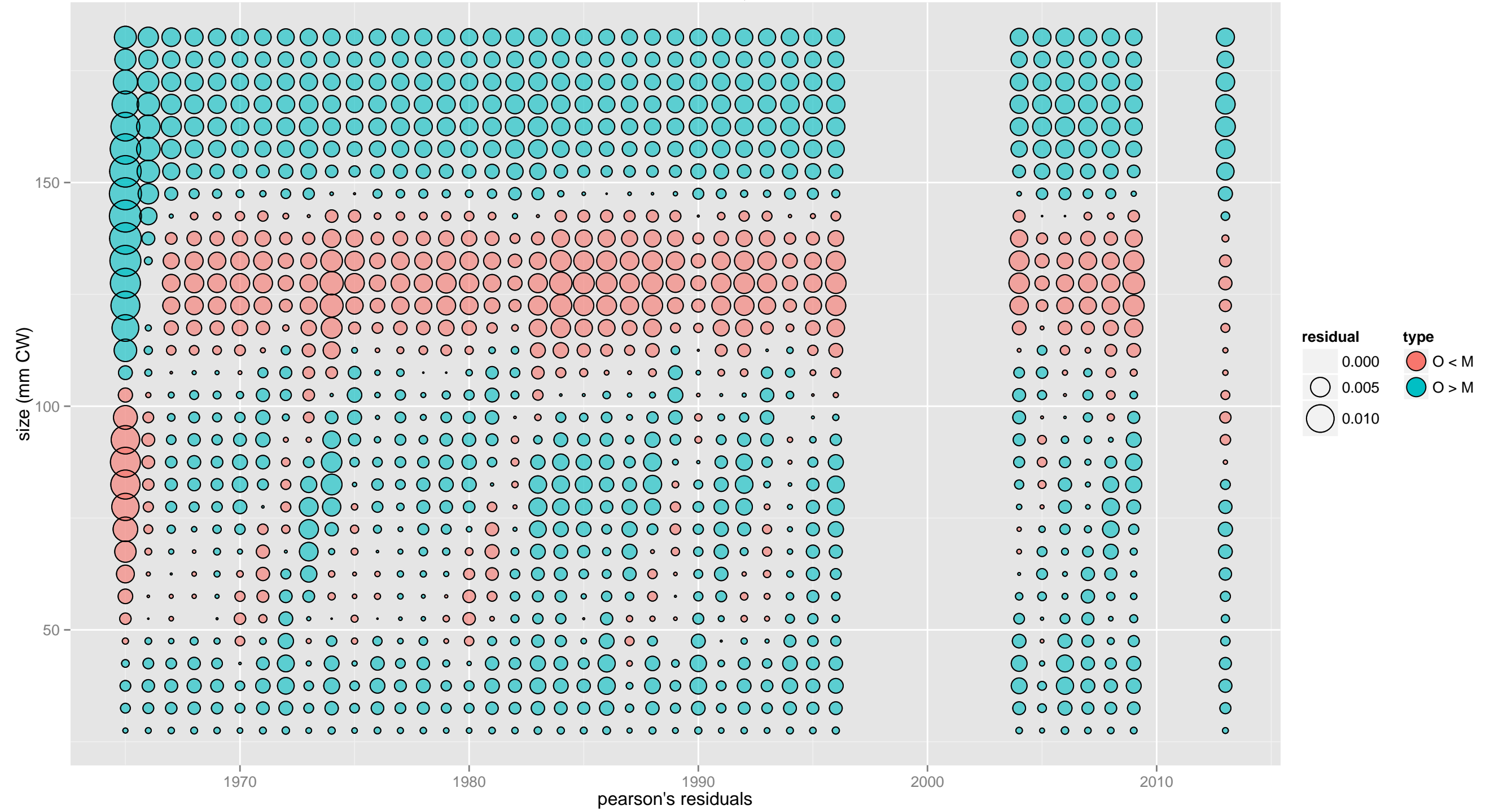


TCF: total catch: female, new shell

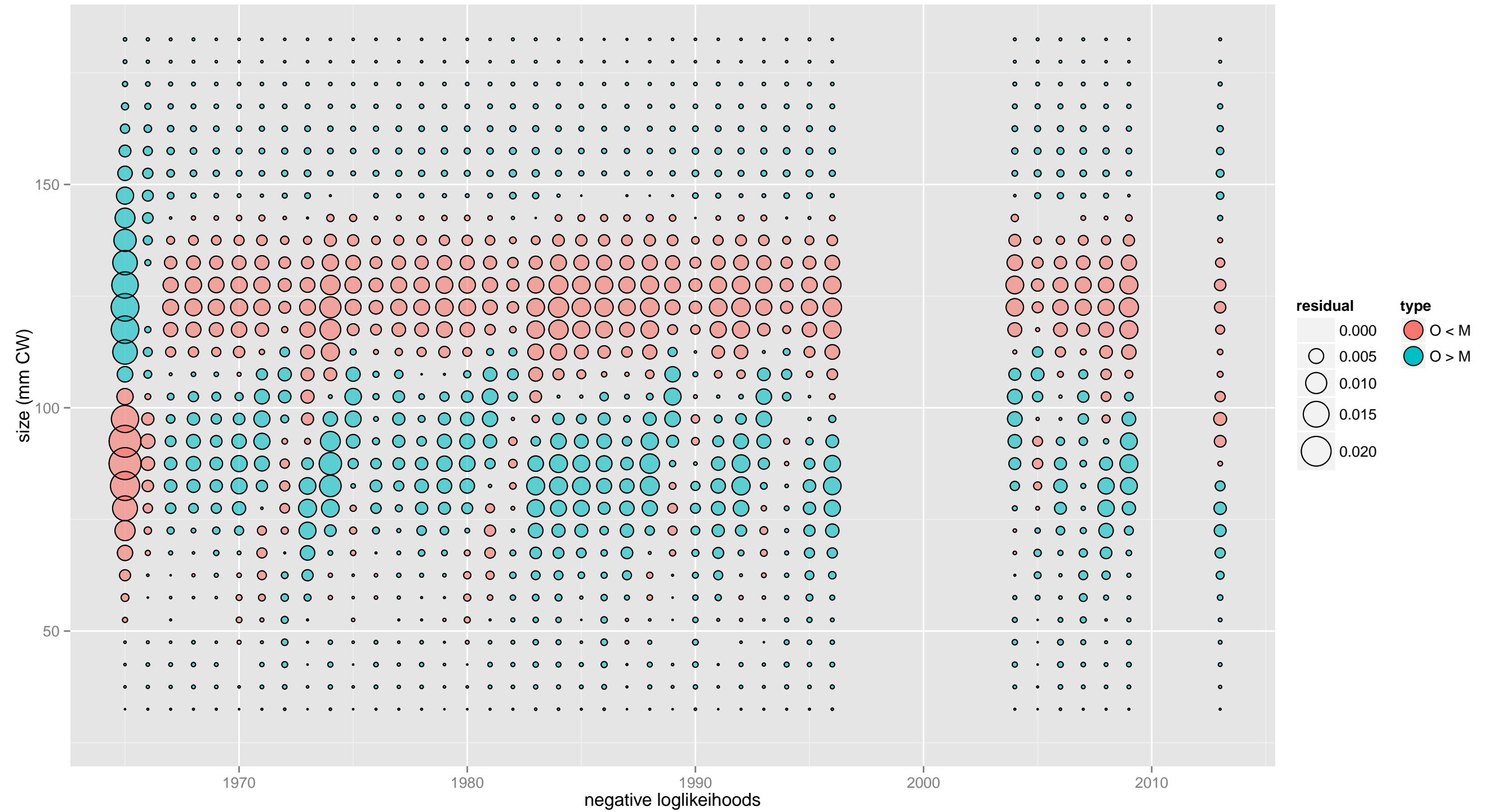




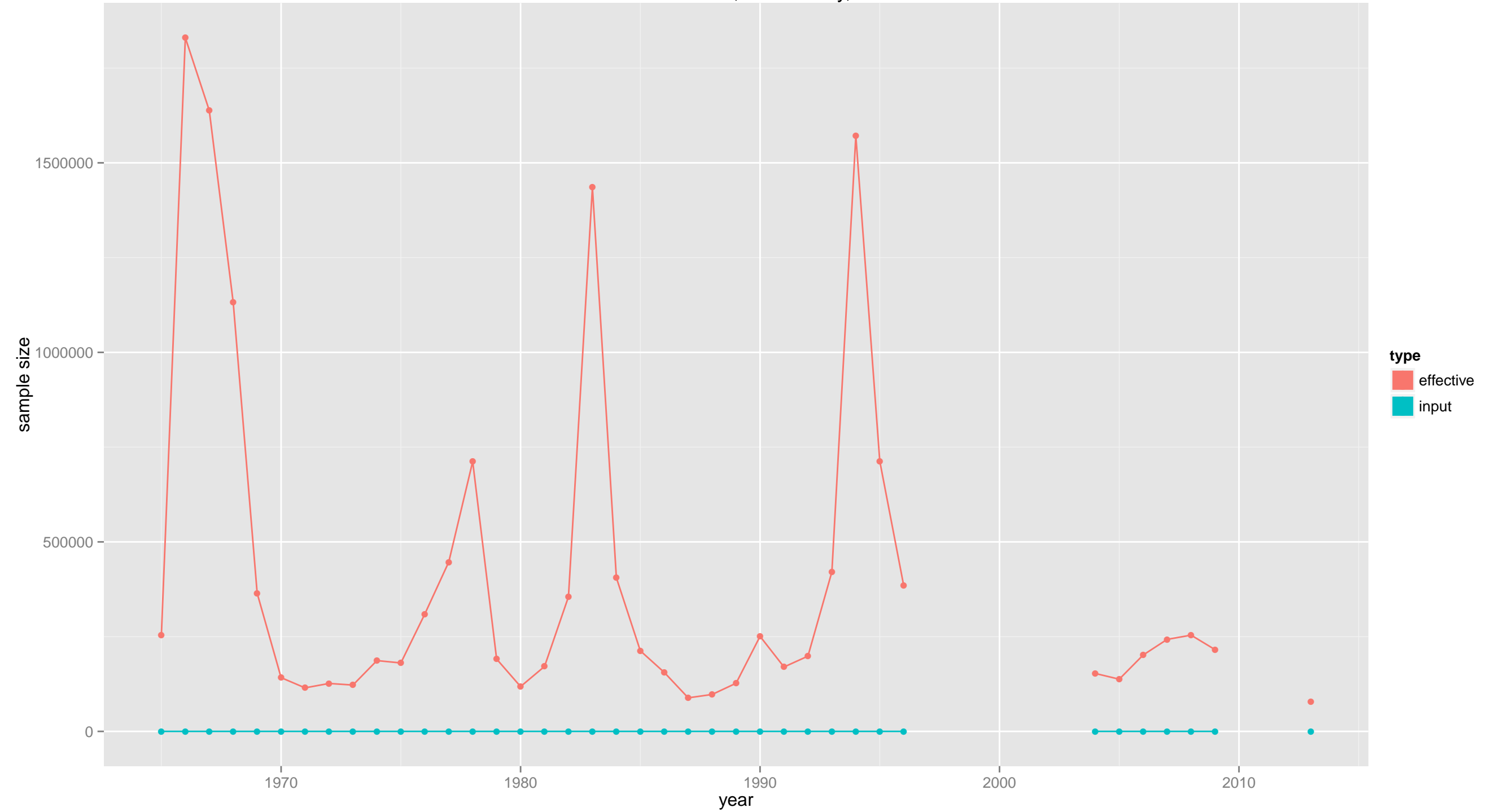
TCF: total catch: female, old shell



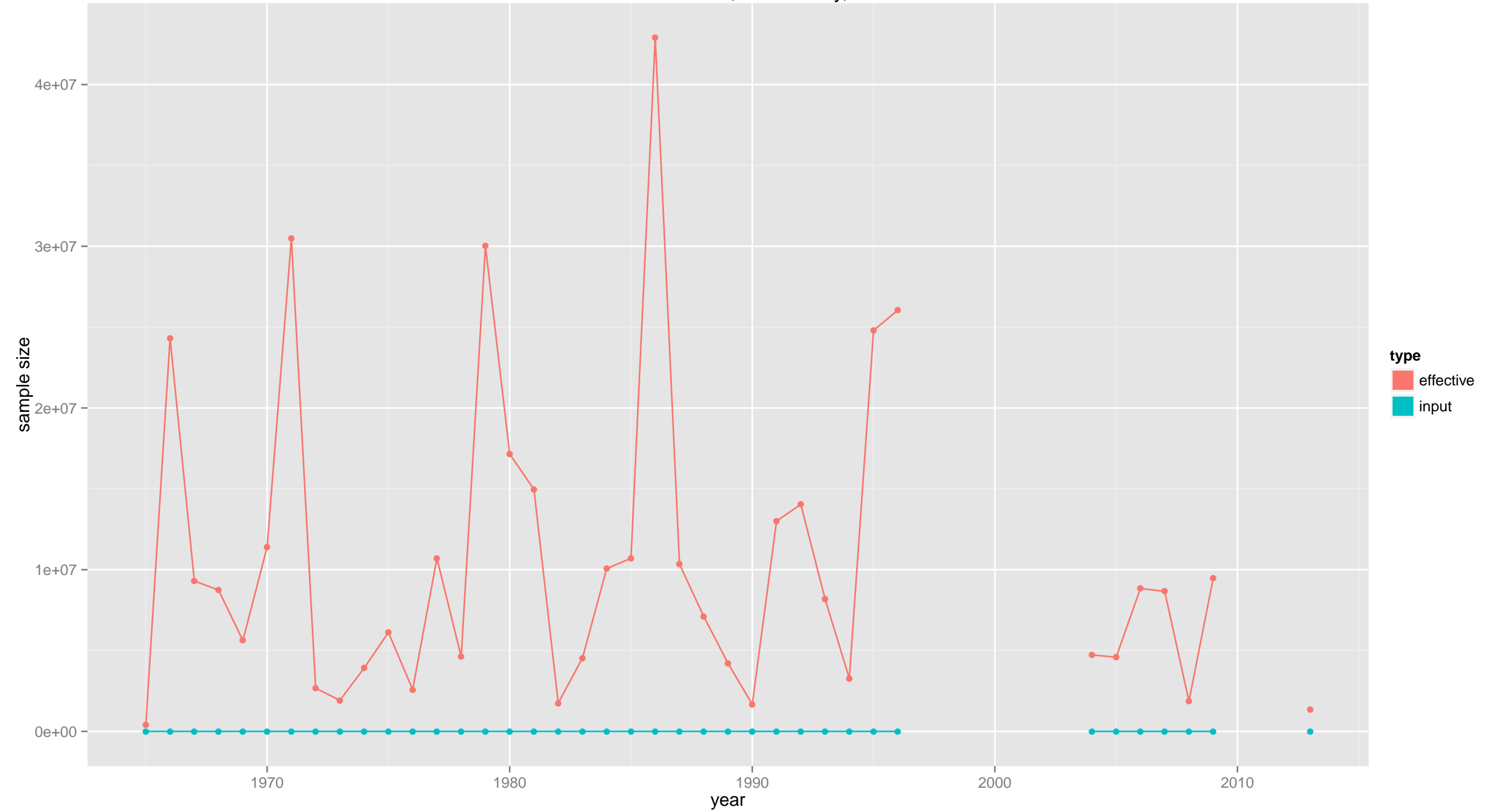




TCF: total catch: male, all maturity, new shell

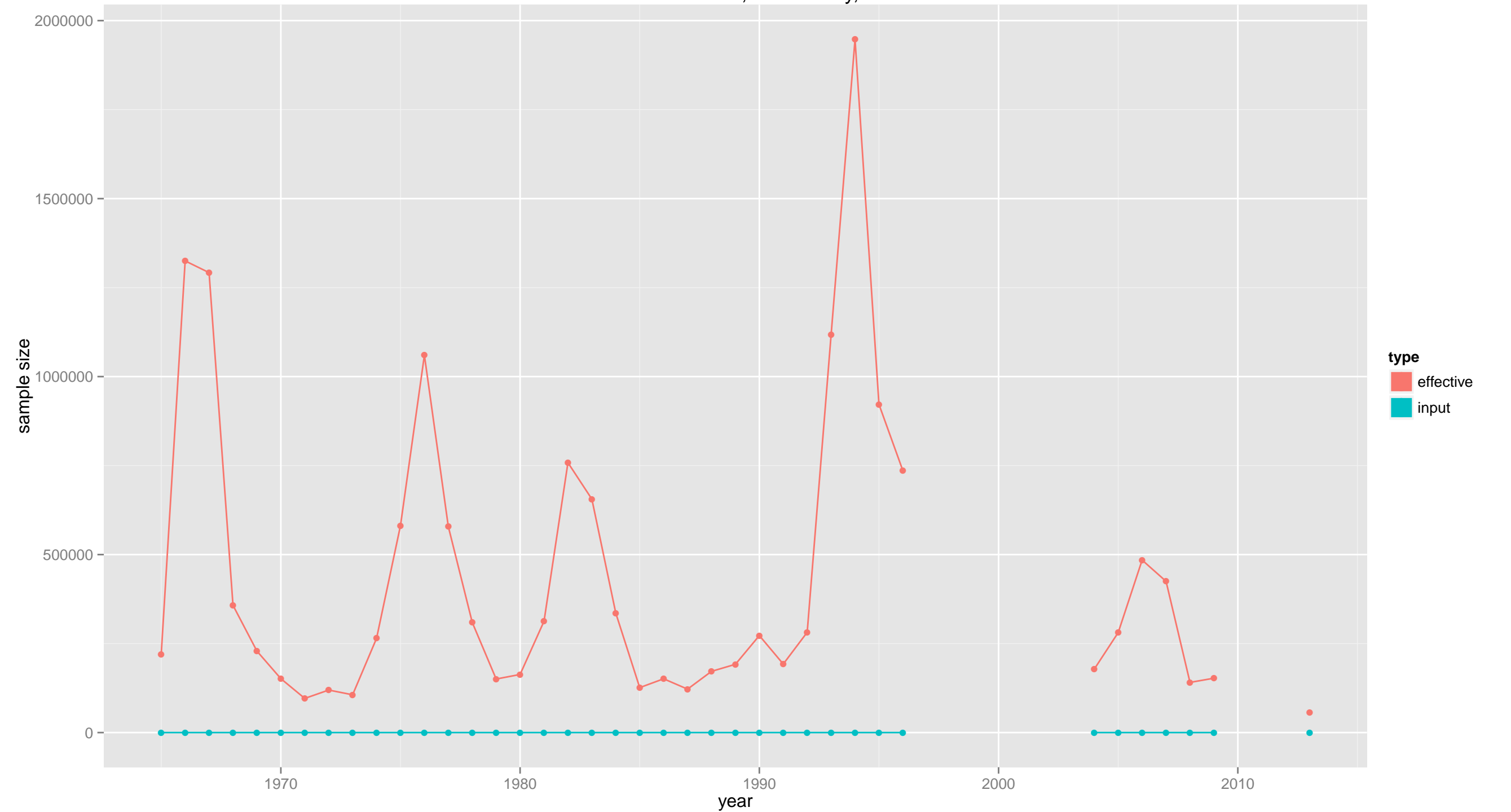


TCF: total catch: male, all maturity, old shell

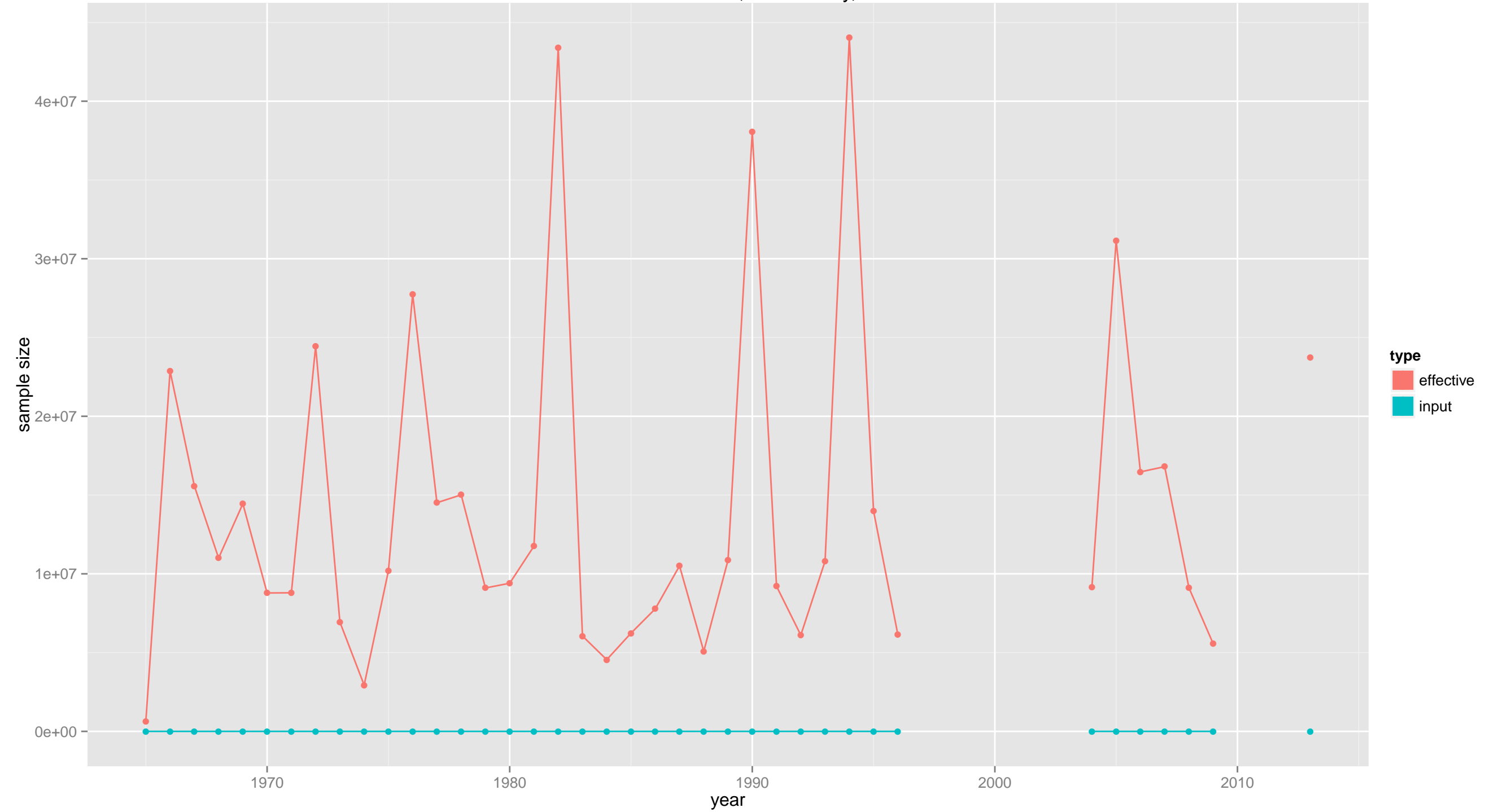


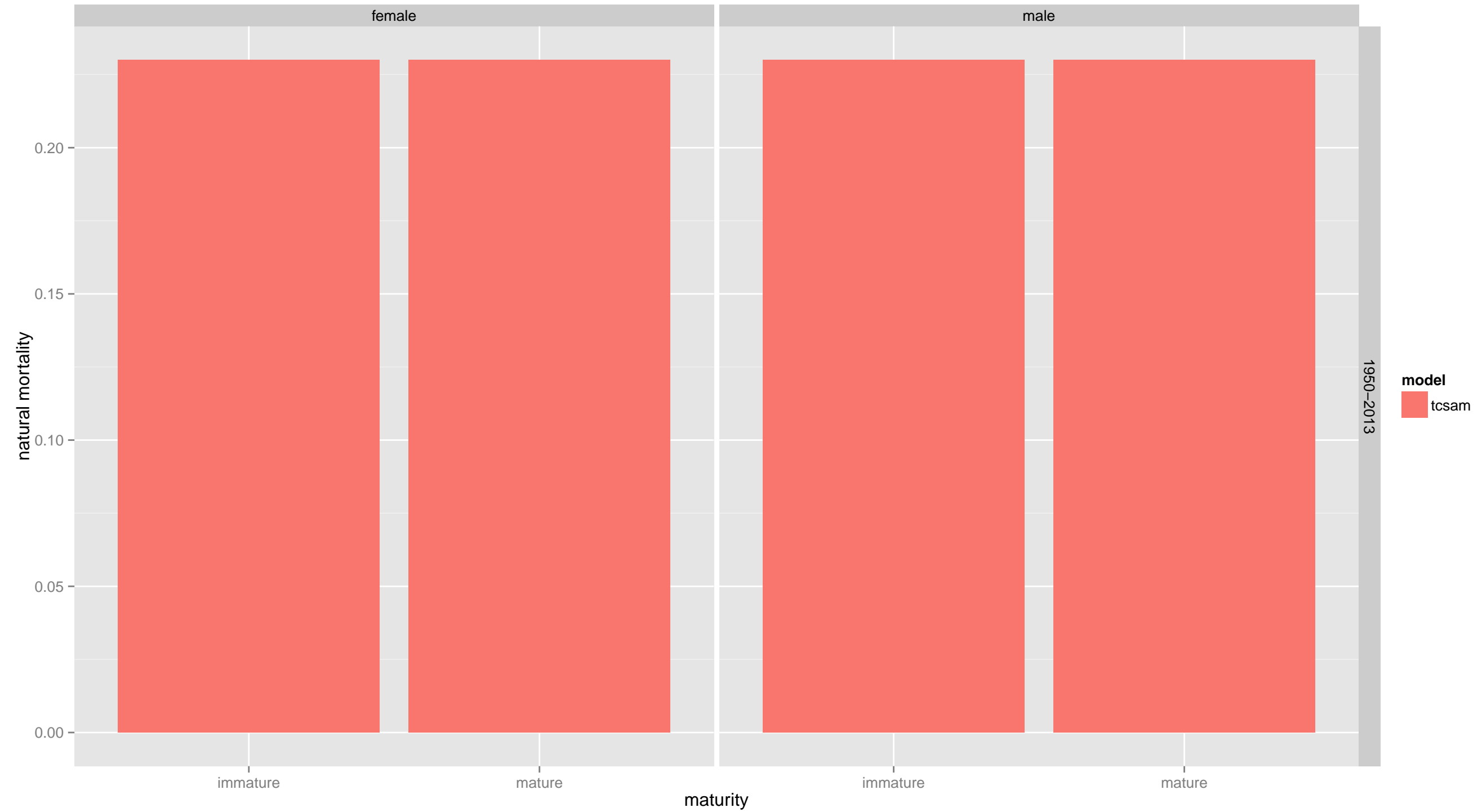


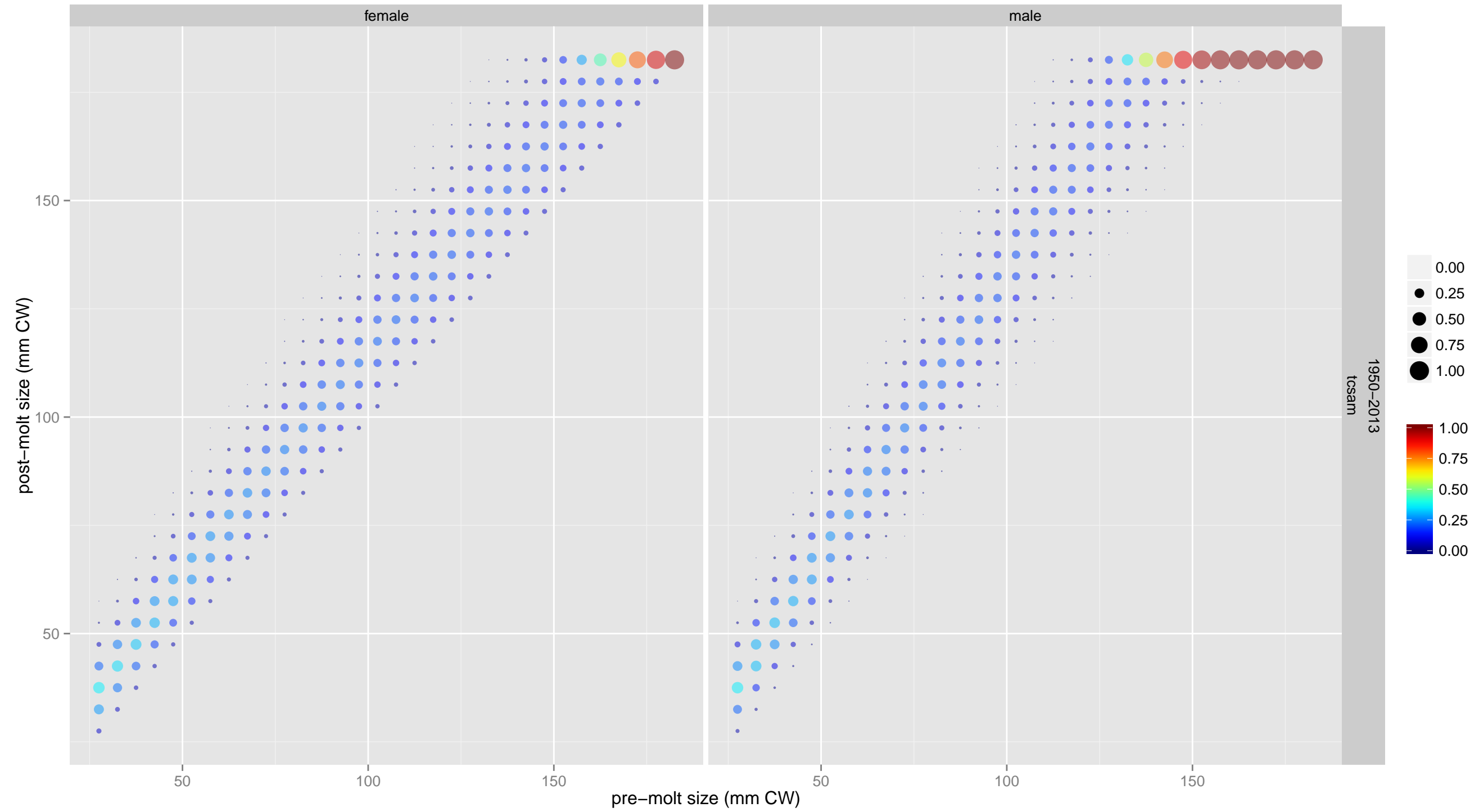
TCF: total catch: female, all maturity, new shell

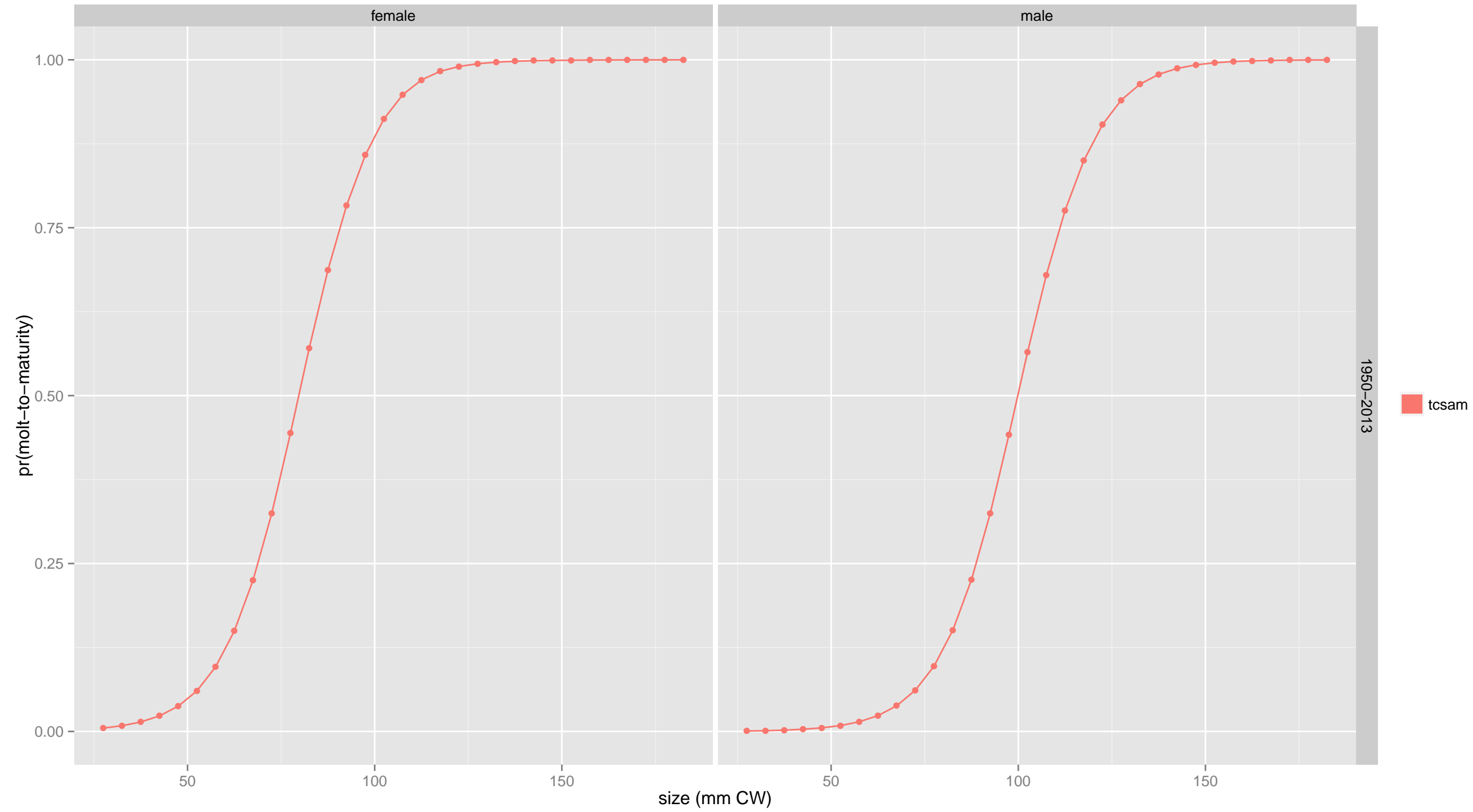


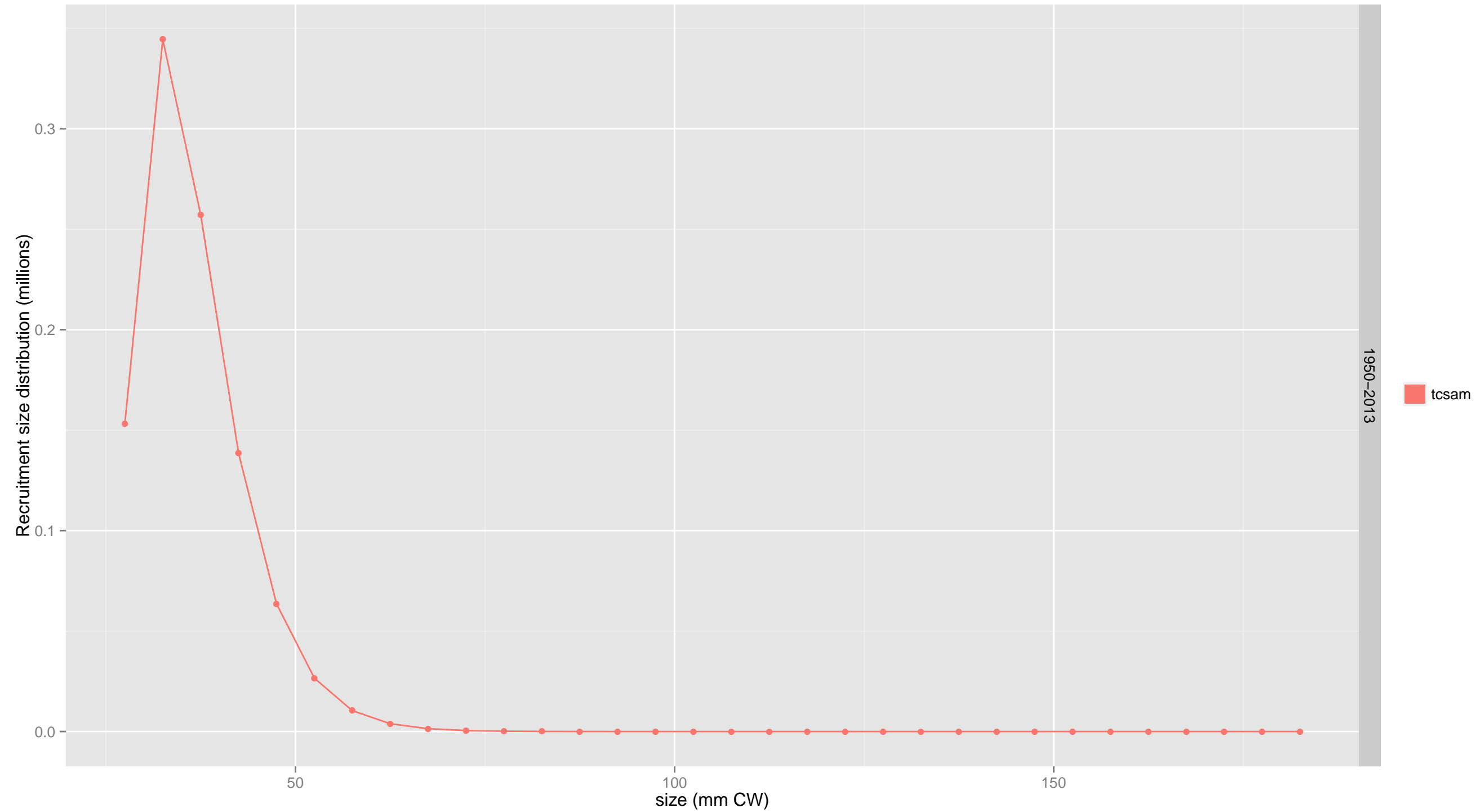
TCF: total catch: female, all maturity, old shell



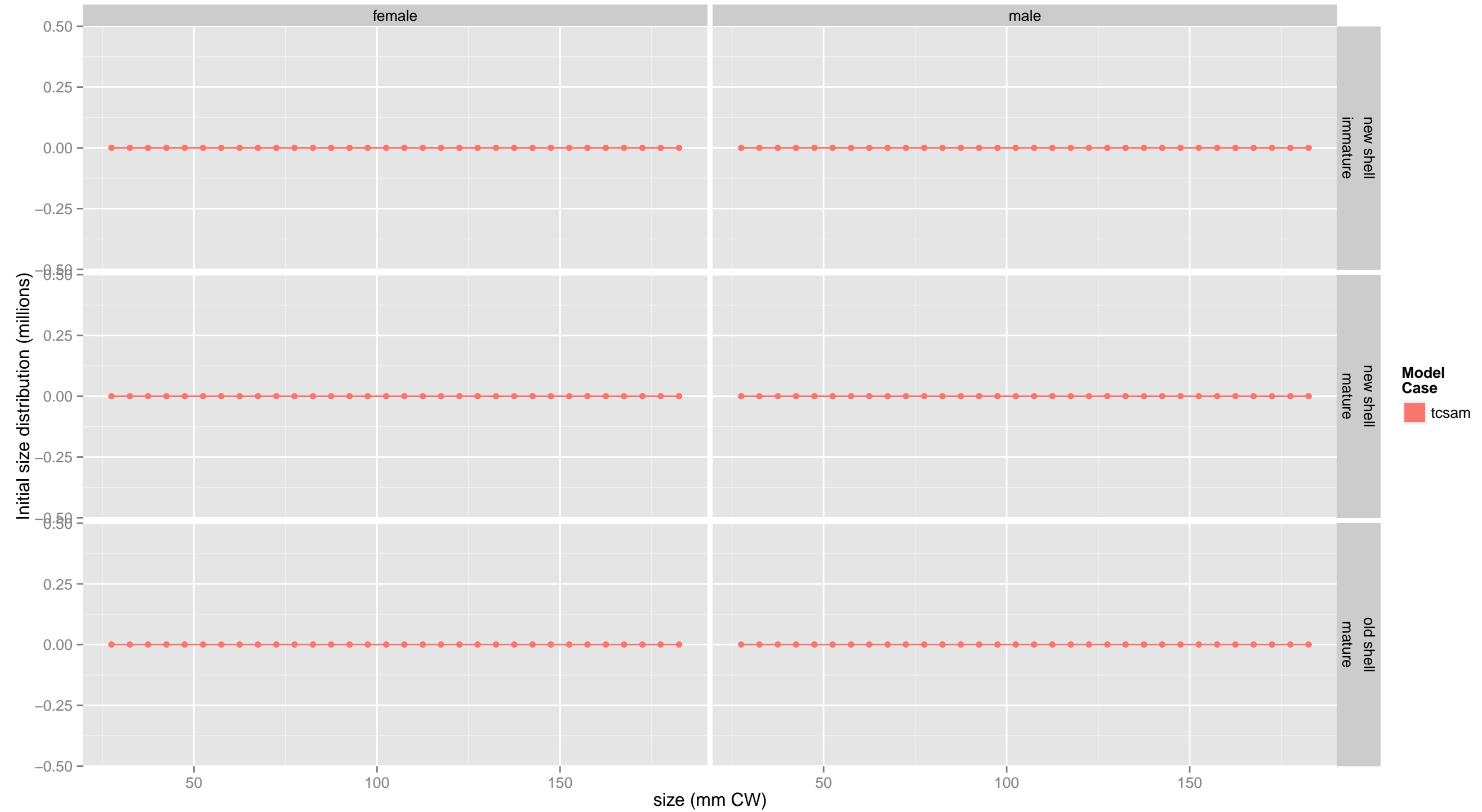




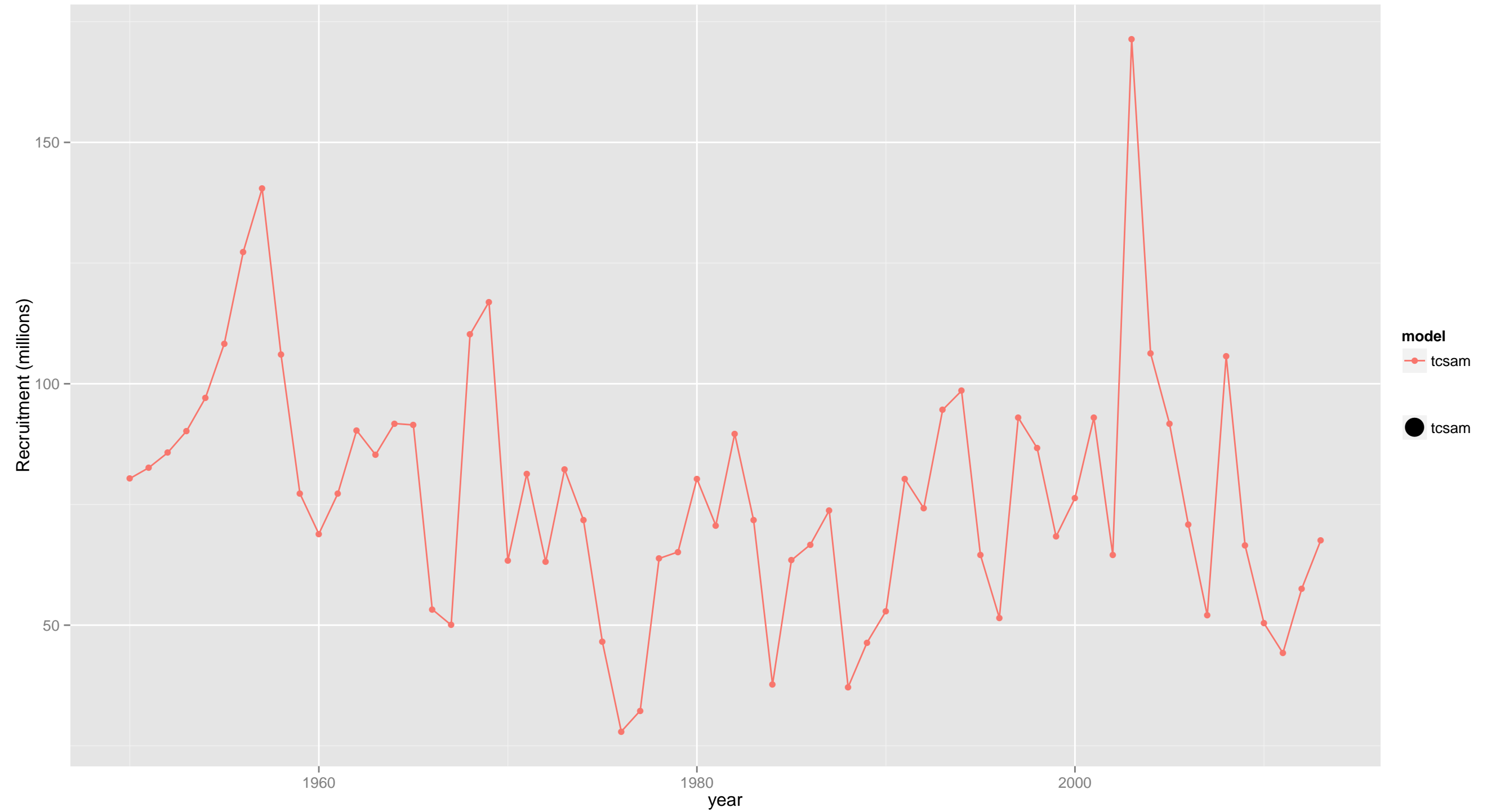










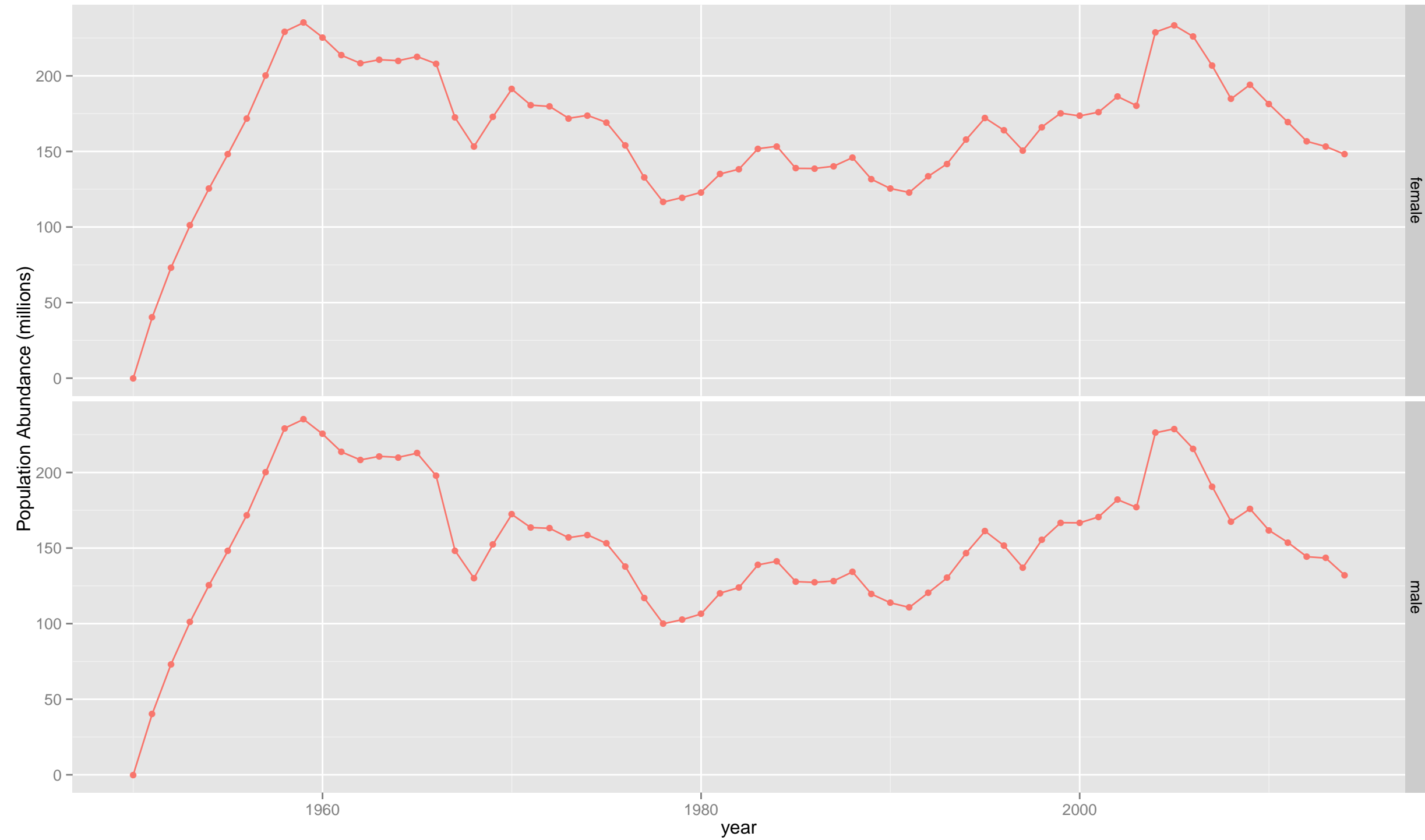


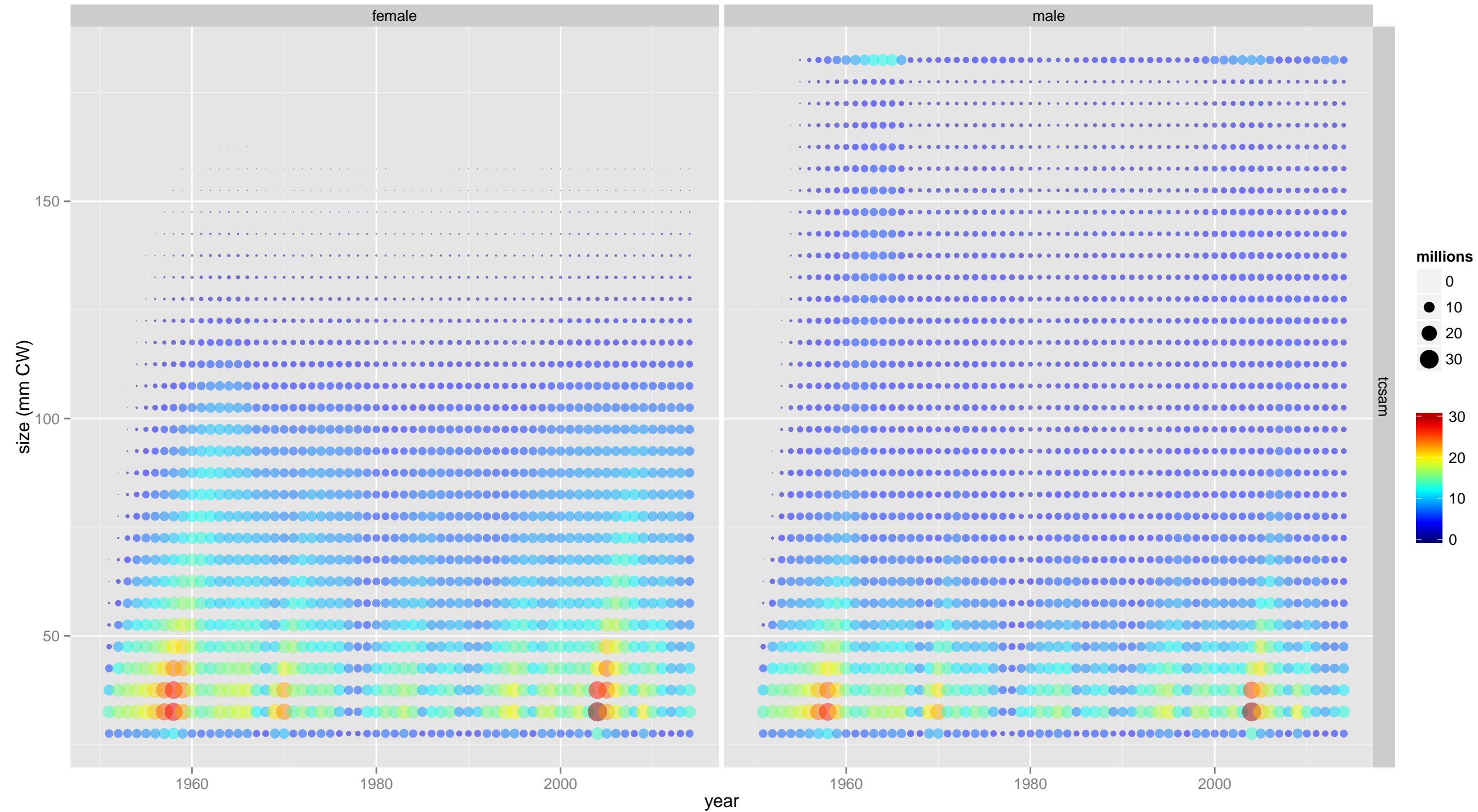




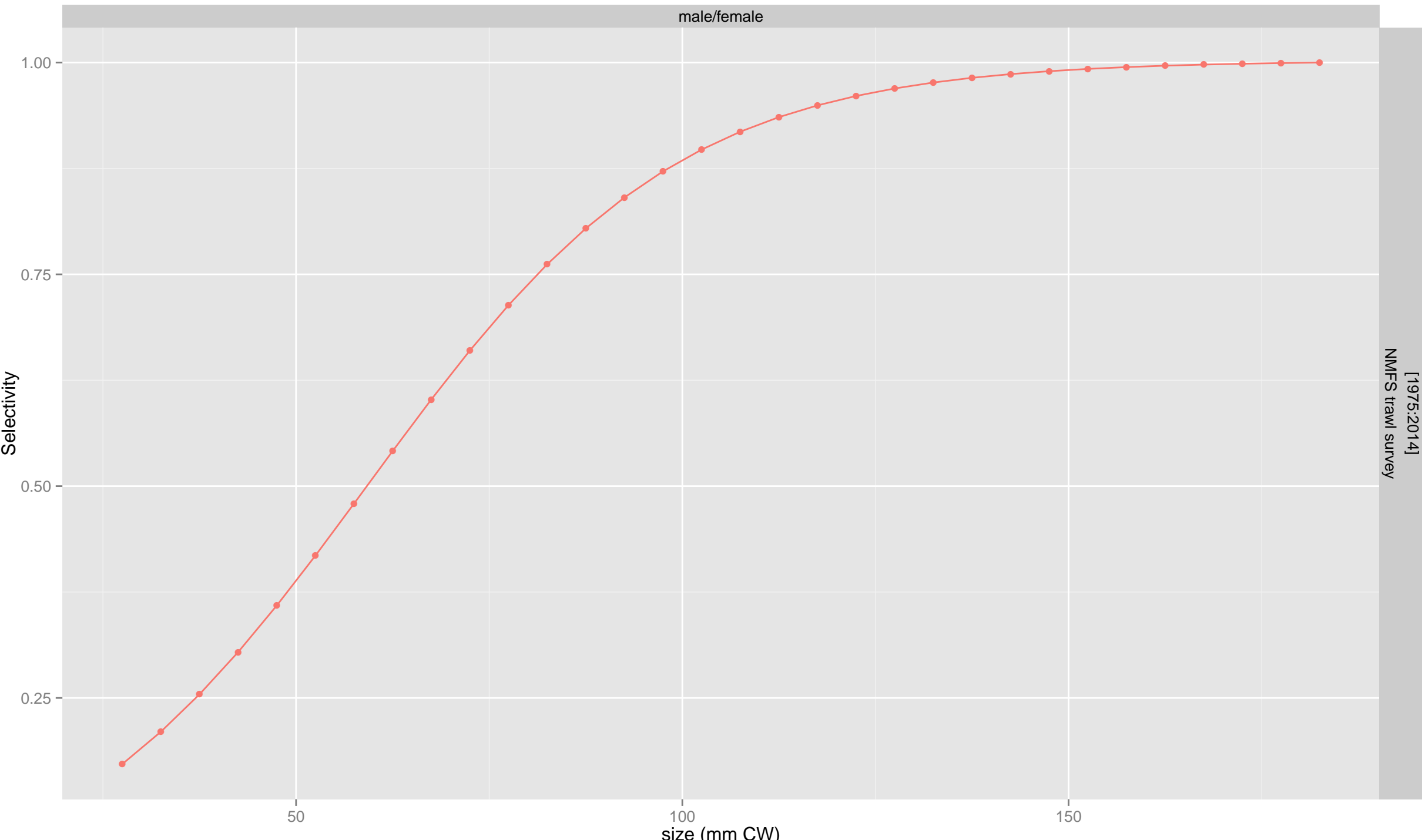


tcsam





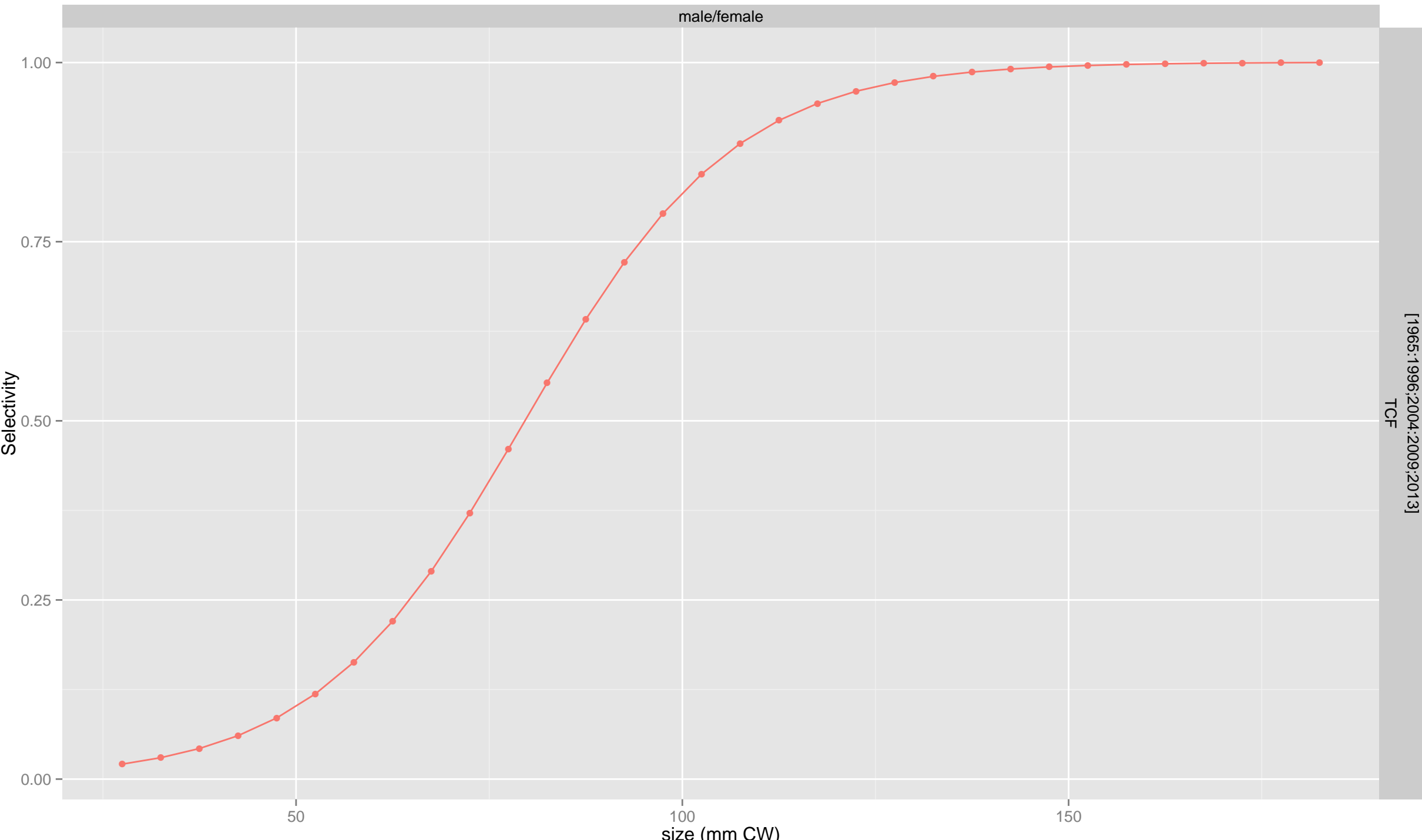
male/female



[1975:2014]  
NMFS trawl survey

**model**  
tcsam  
tcsam

male/female

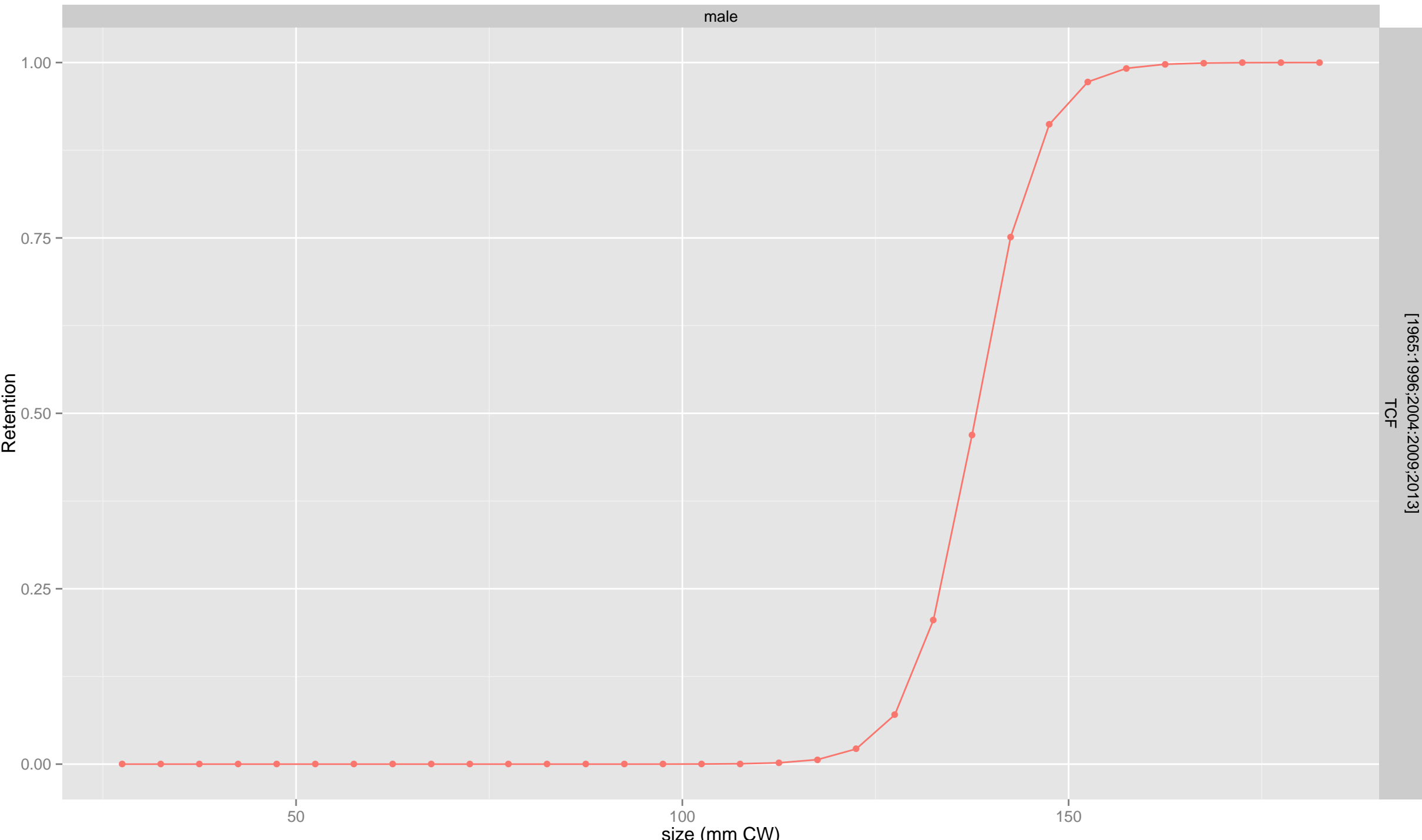


**model**  
—●— tcsam  
● tcsam

[1965:1996;2004:2009;2013]  
TCF



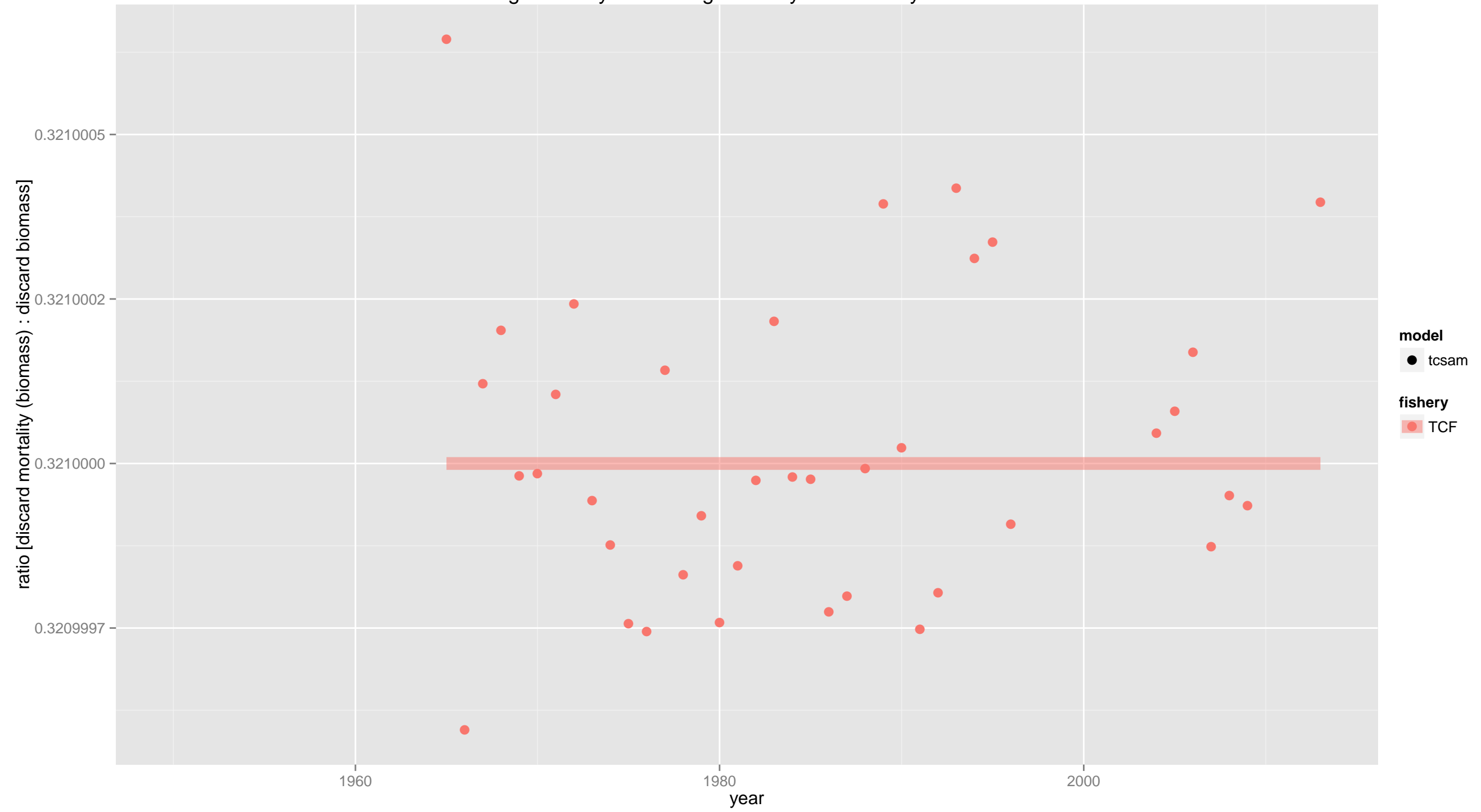
male



model  
tcsam  
tcsam

[1965:1996;2004:2009;2013]  
TCF

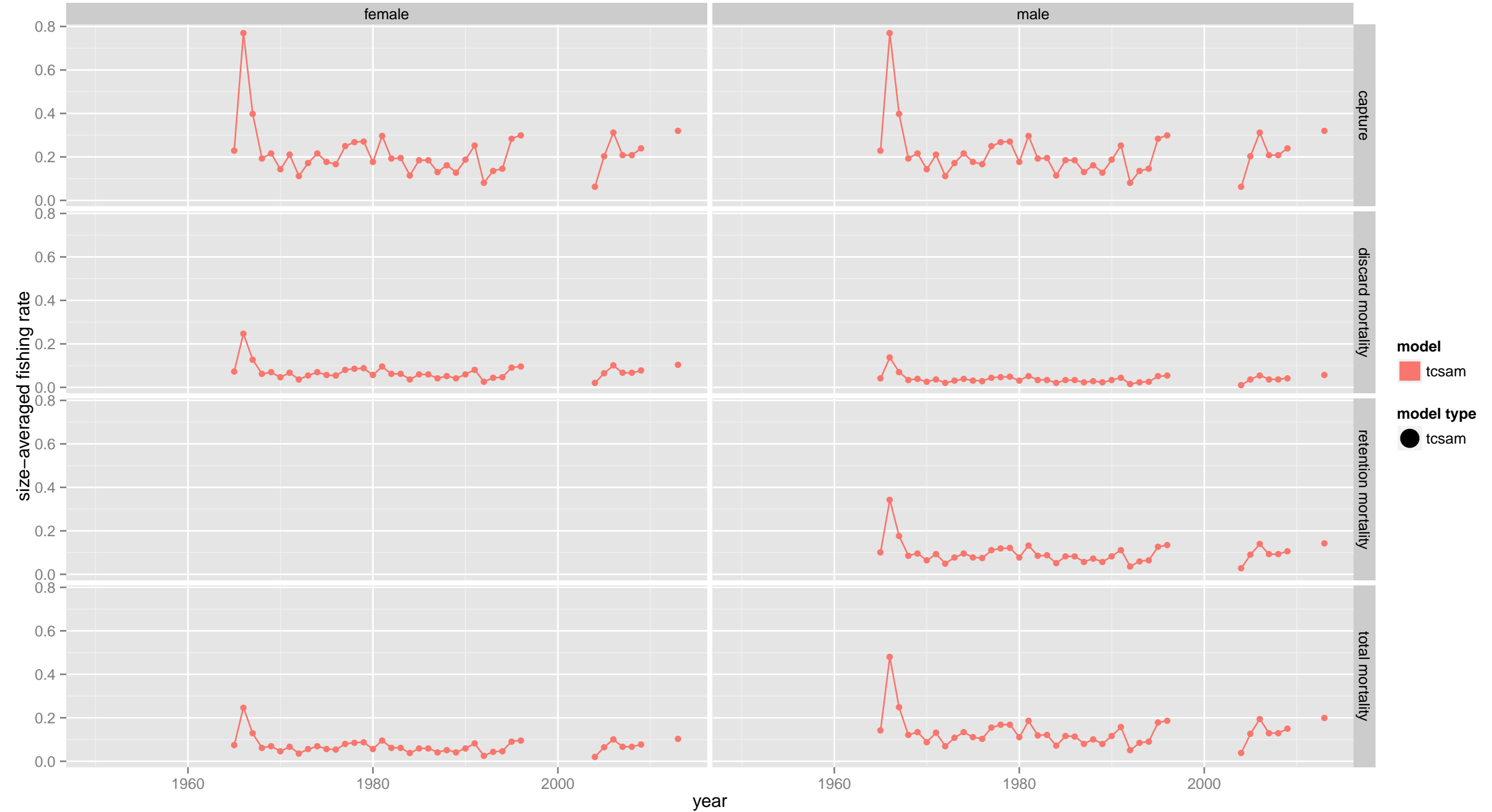
gmacs-style Handling Mortality Consistency Check



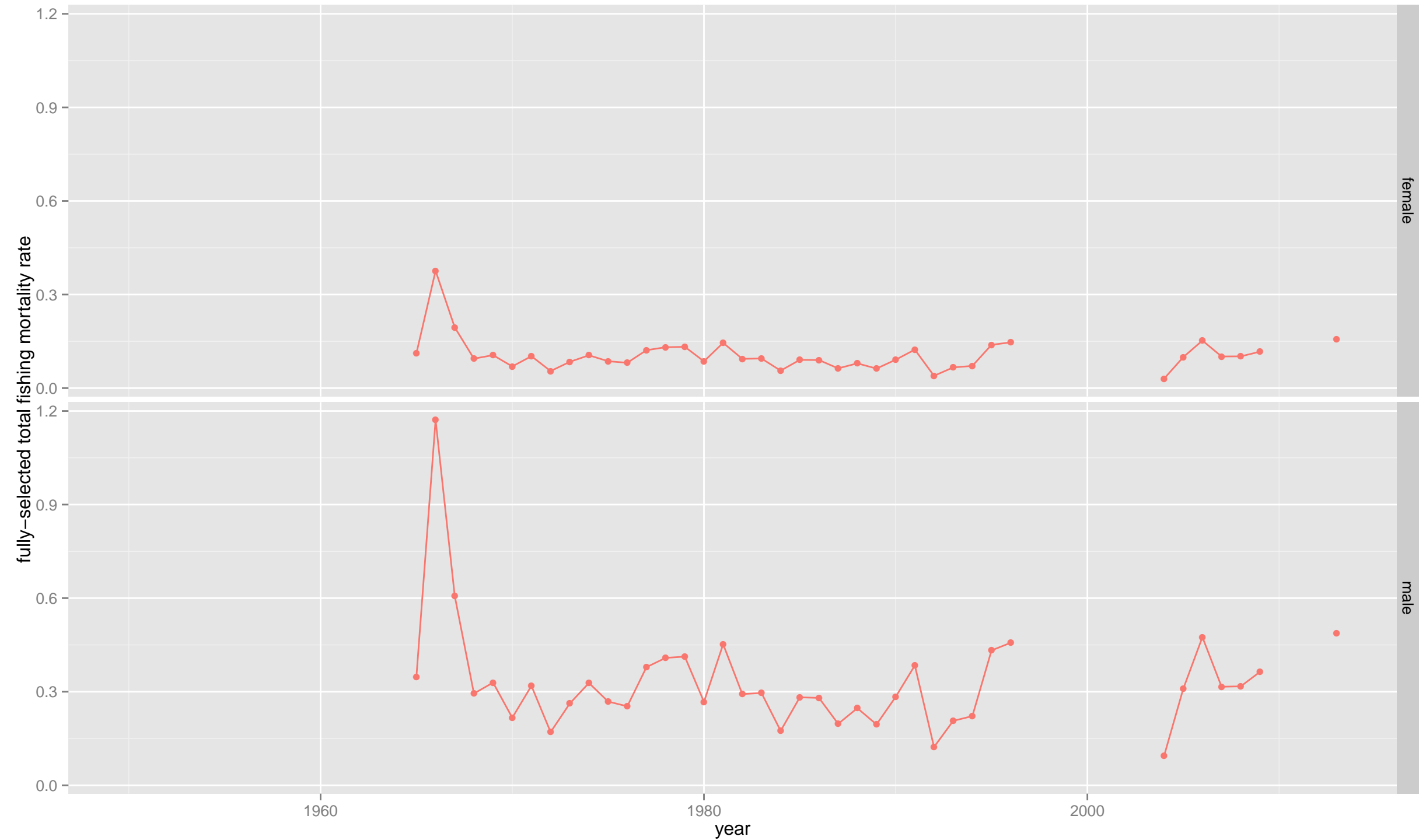
# TCF



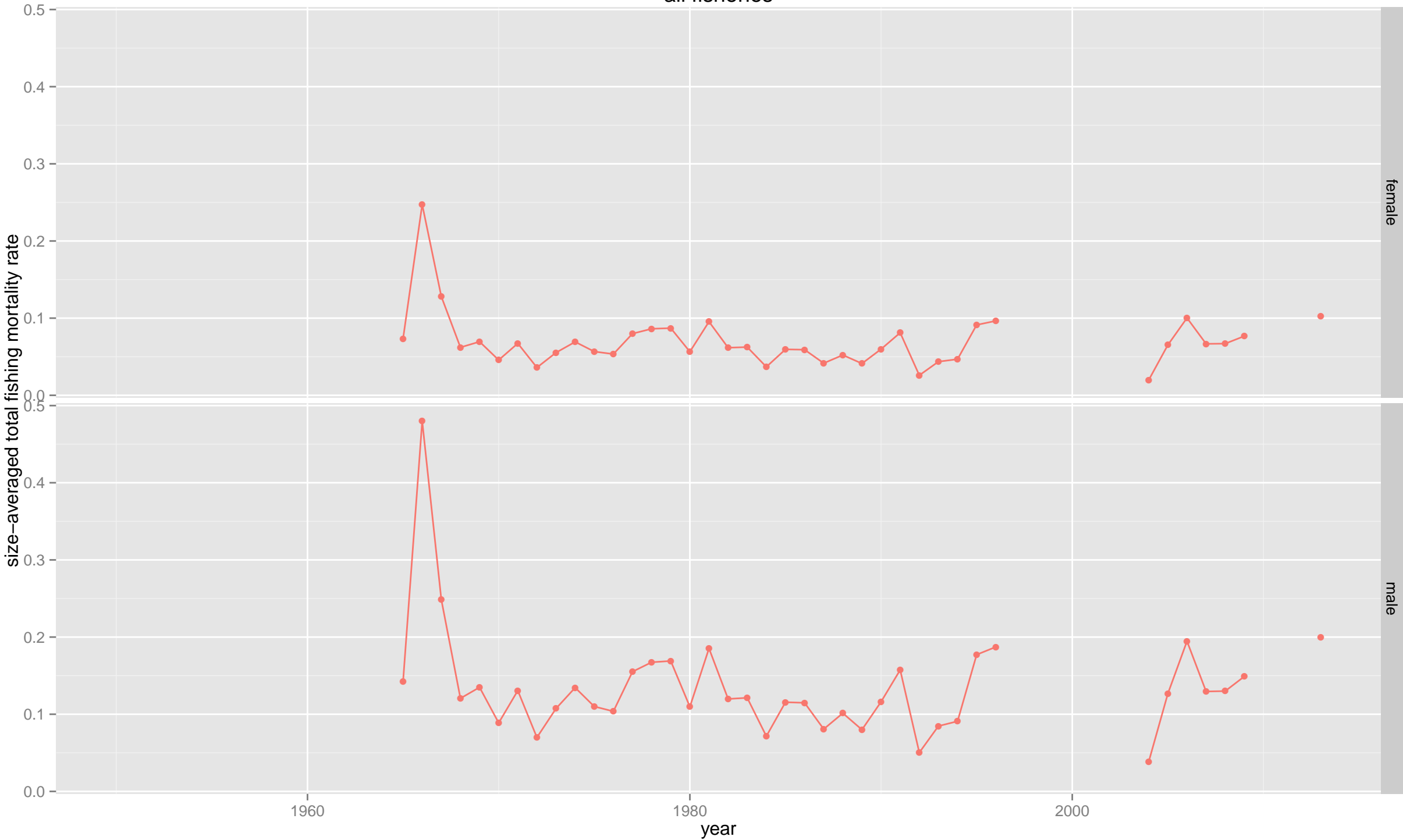
# TCF



# all fisheries



all fisheries



# TCF

female

male

captured

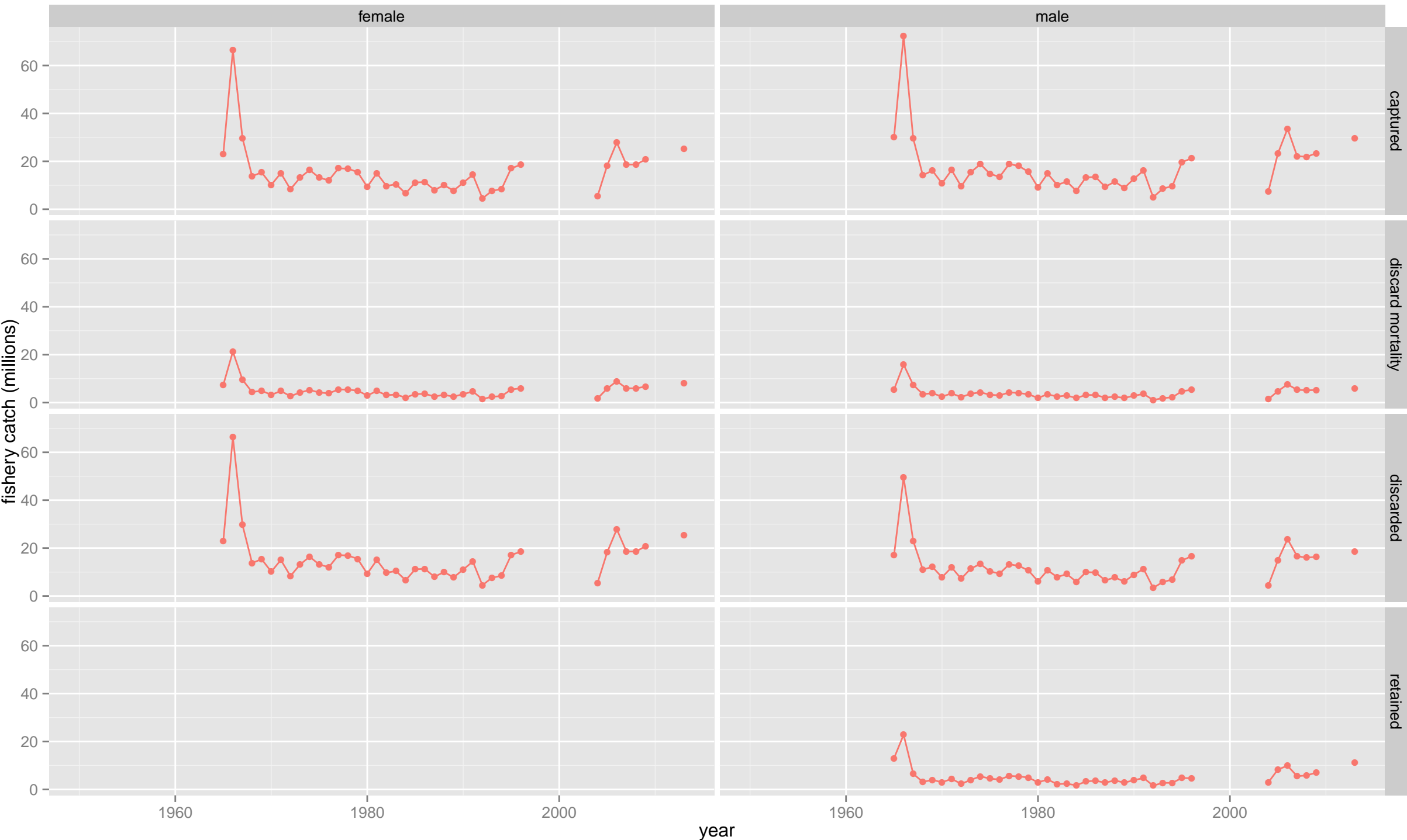
discard mortality

discarded

retained

**model**  
—●— tcsam

**model type**  
■ tcsam



# TCF

female

male

captured

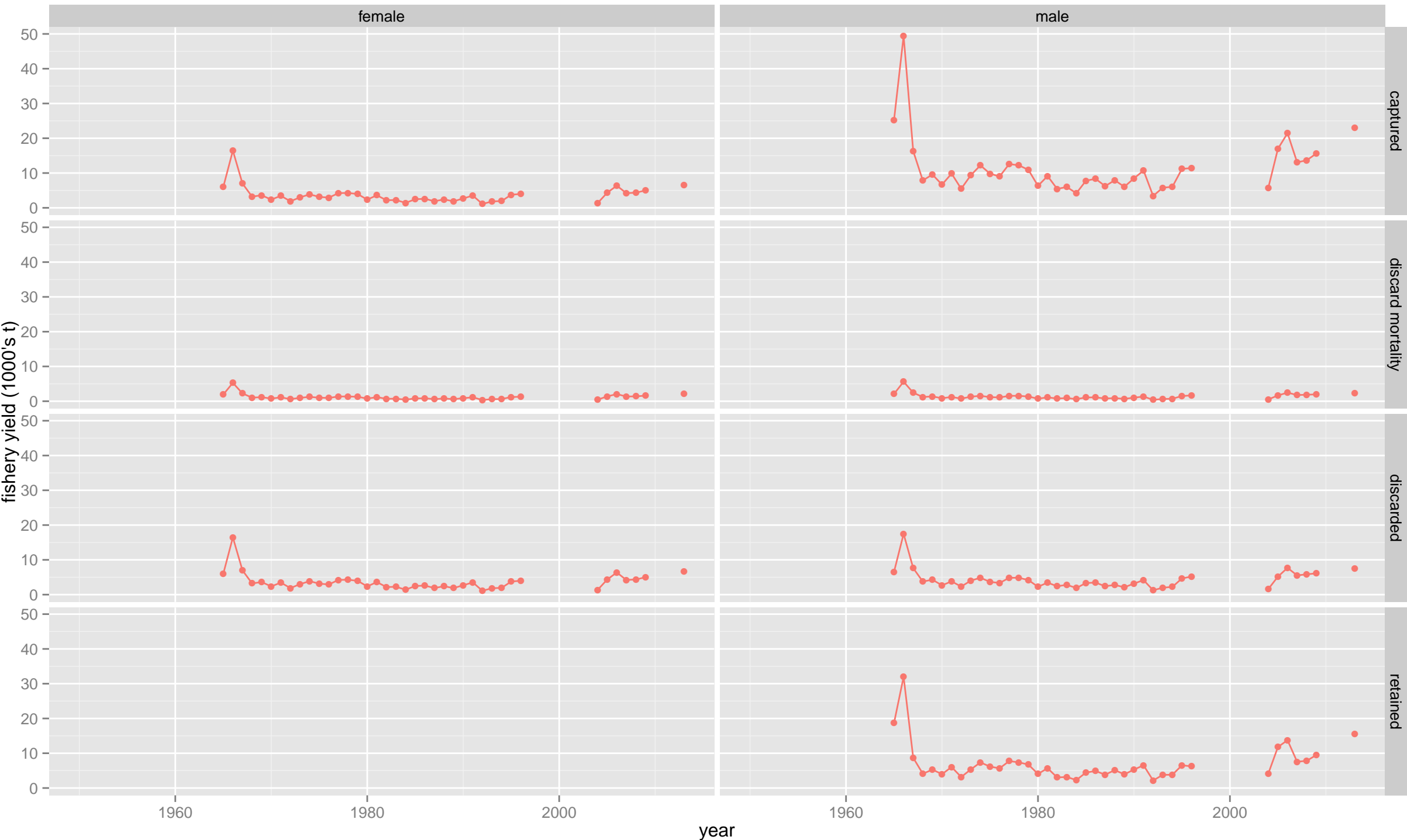
discard mortality

discarded

retained

**model**  
—●— tcsam

**model type**  
■ tcsam





# TCF



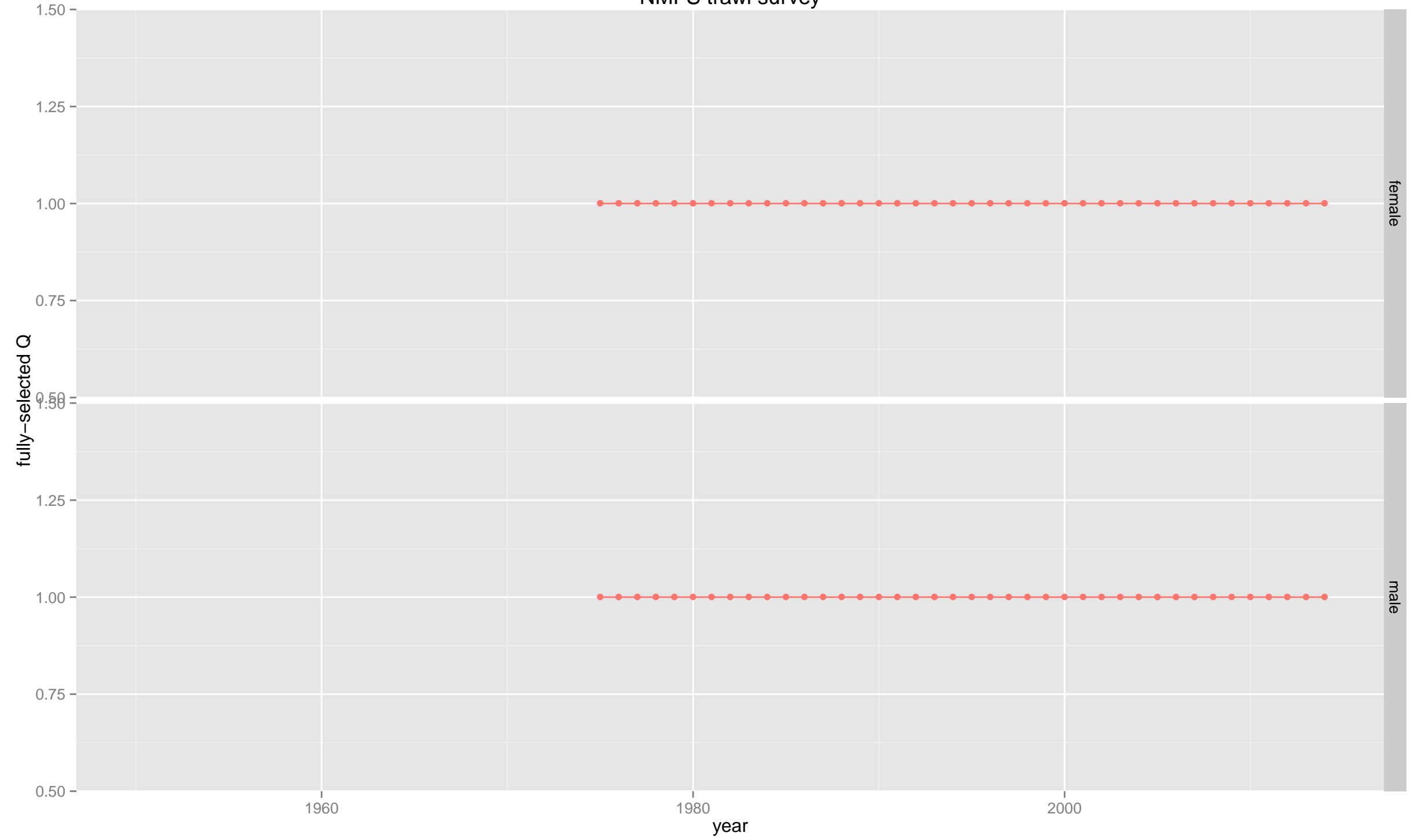
**model**  
—●— tcsam

**model type**  
■ tcsam

female

male

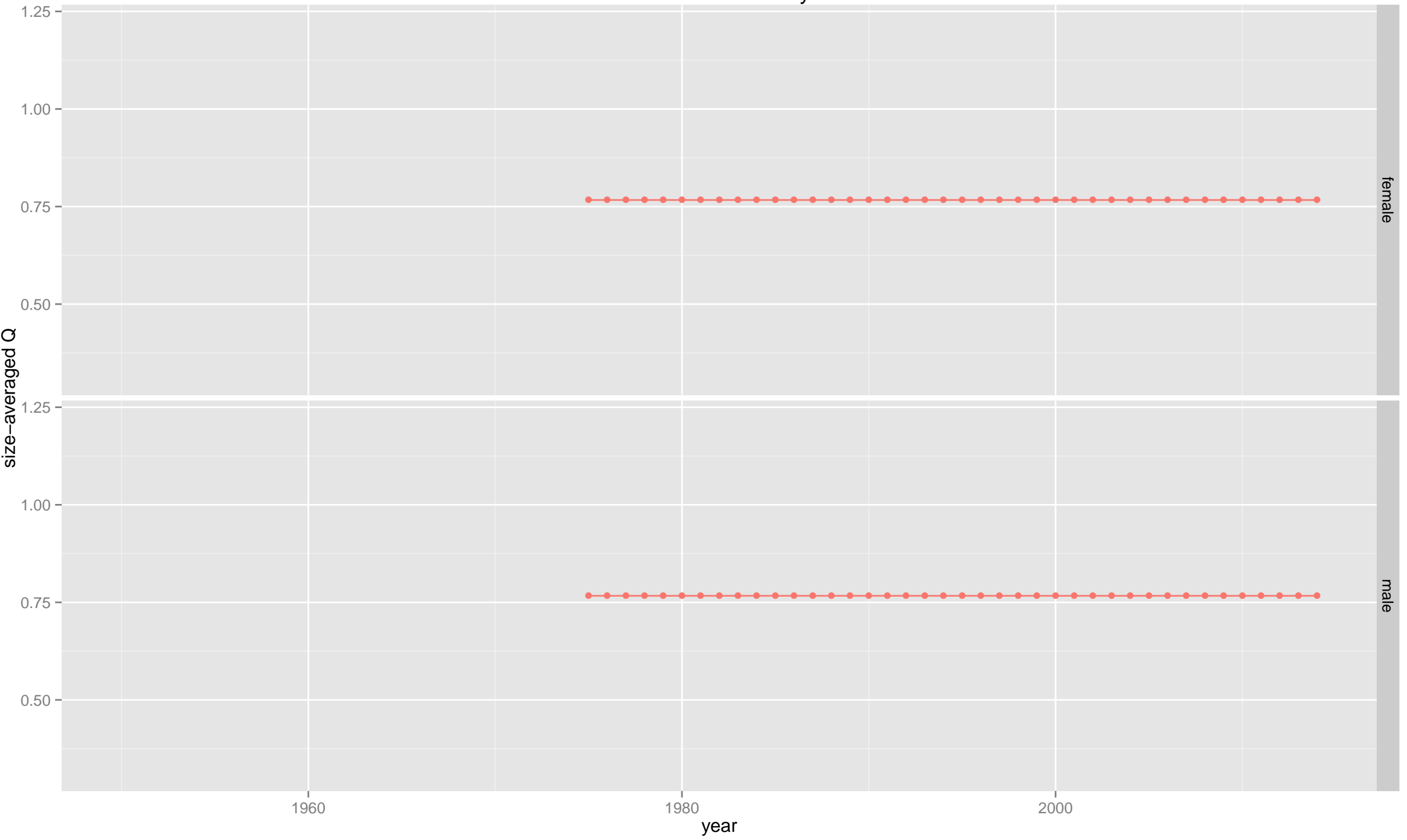
# NMFS trawl survey



**model**  
—● tcsam

**model type**  
● tcsam

# NMFS trawl survey



# NMFS trawl survey



# NMFS trawl survey

