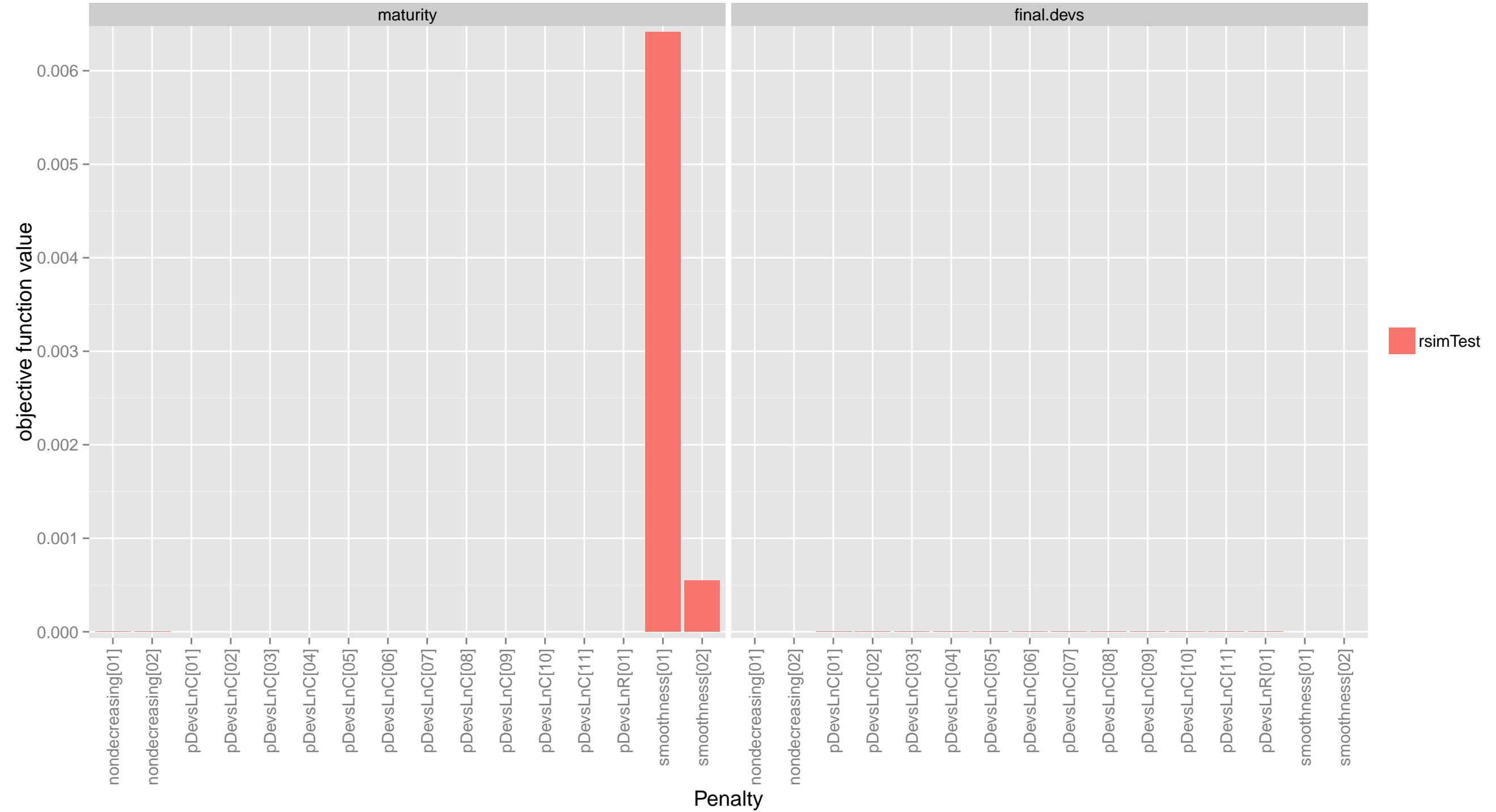
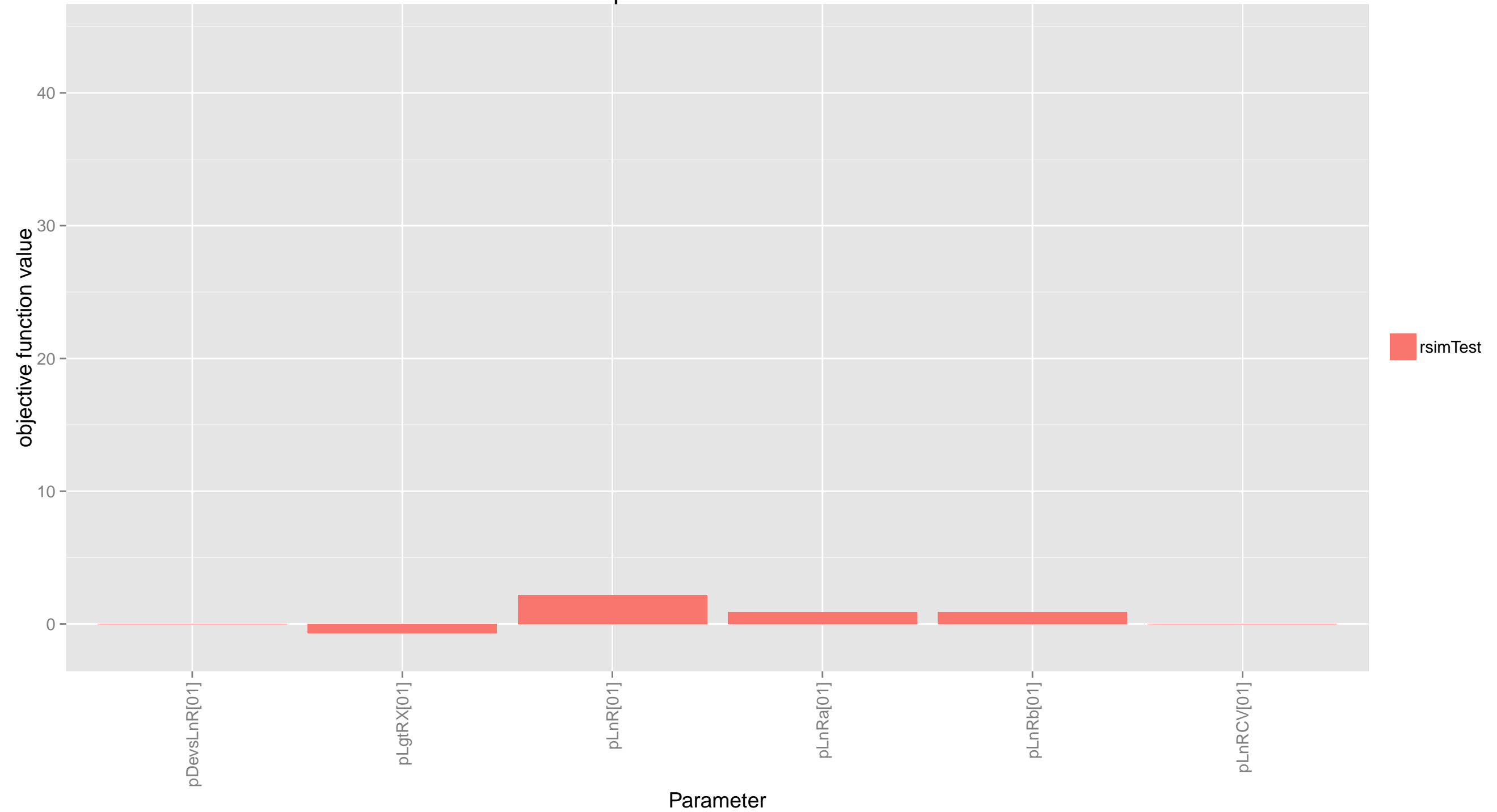


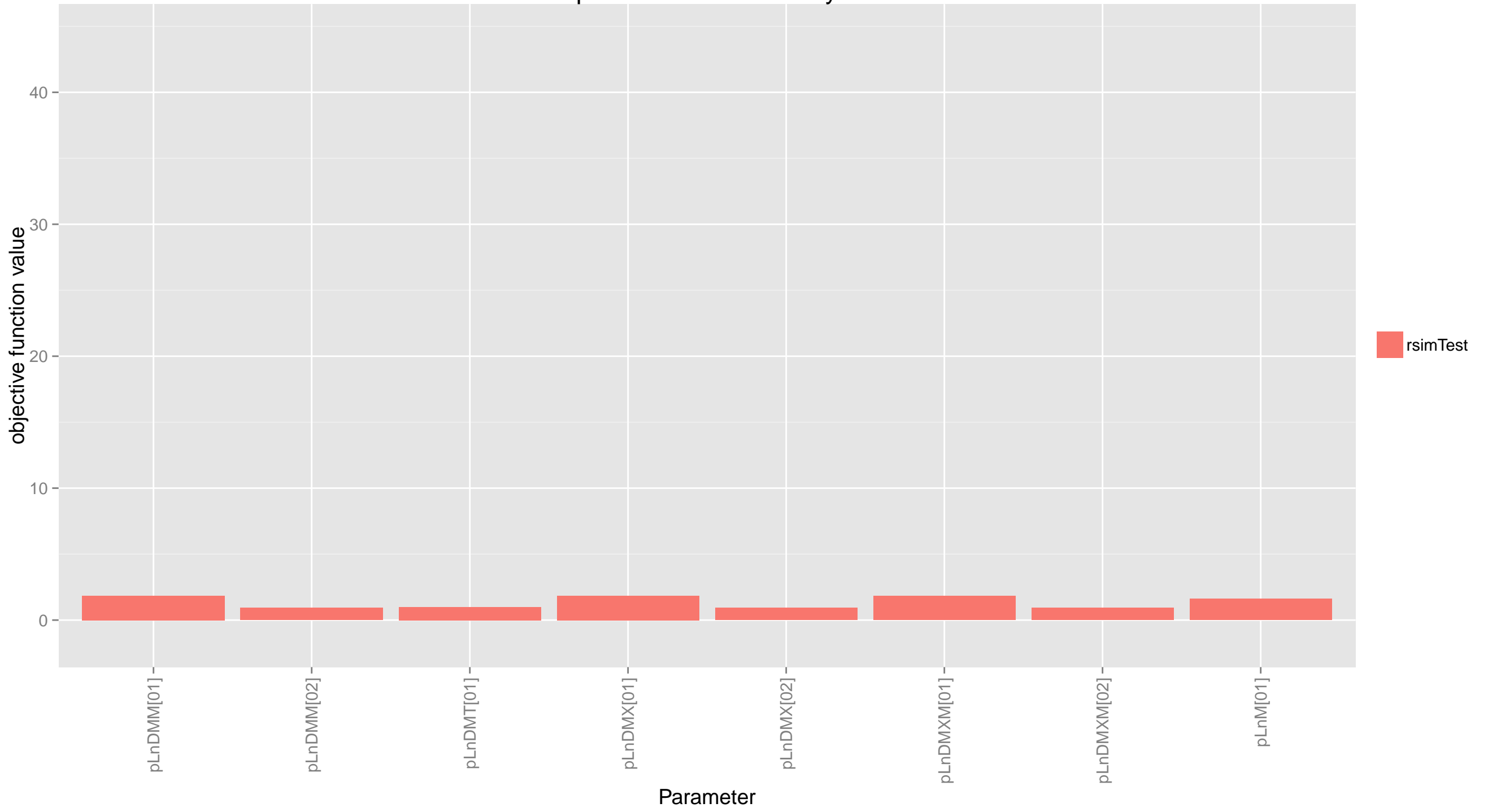
Penalties



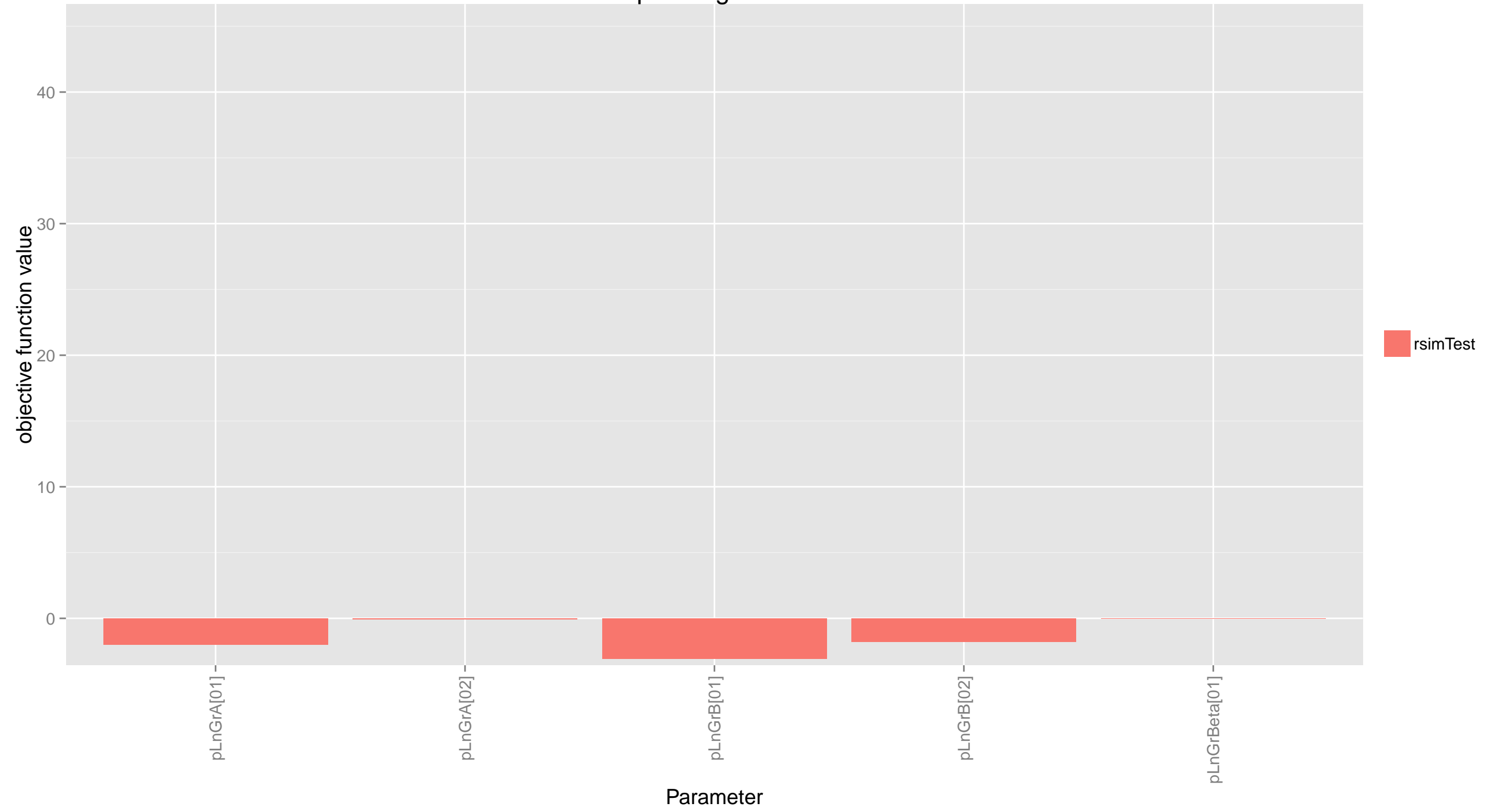
priors: recruitment



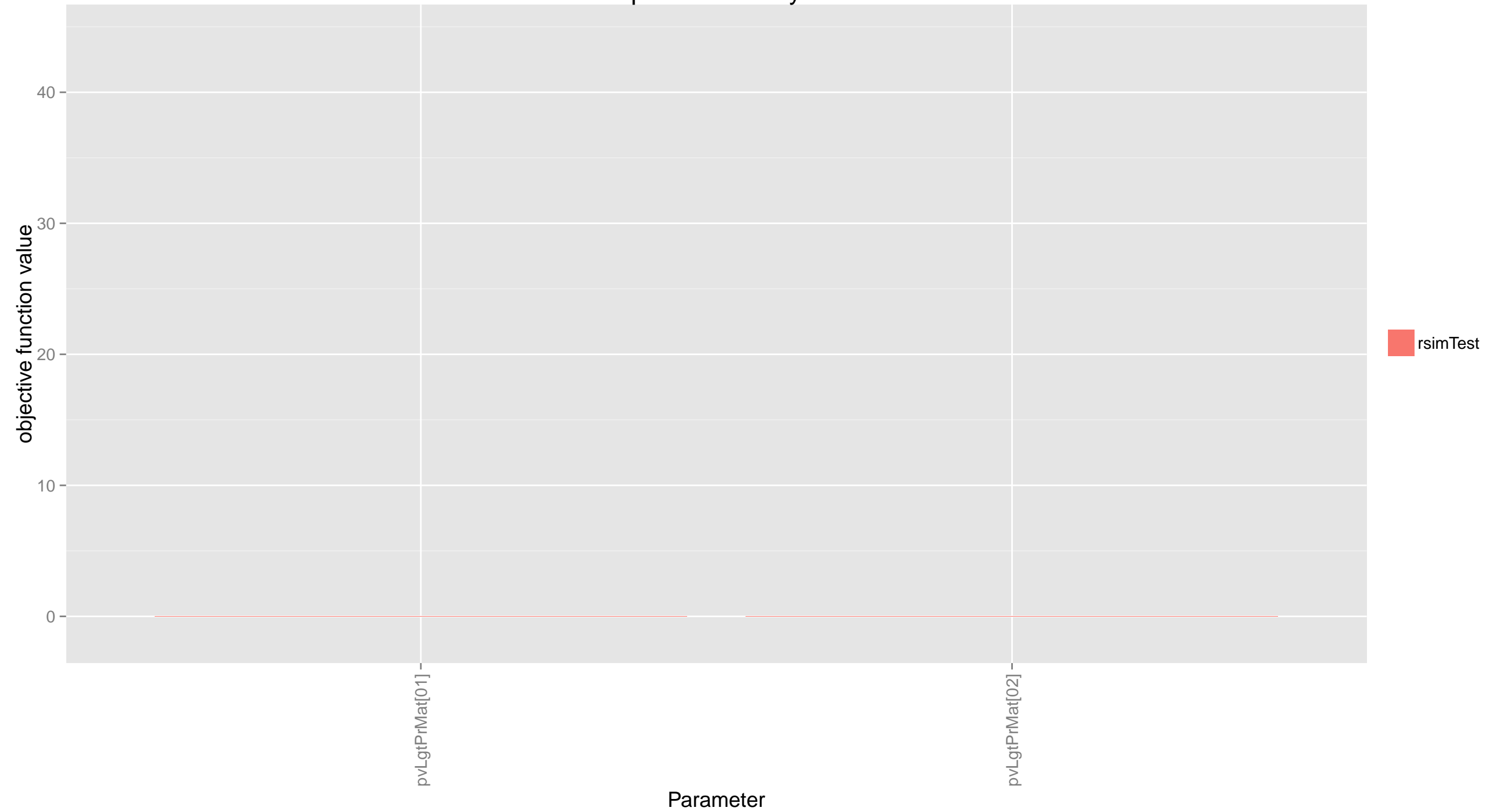
priors: natural mortality



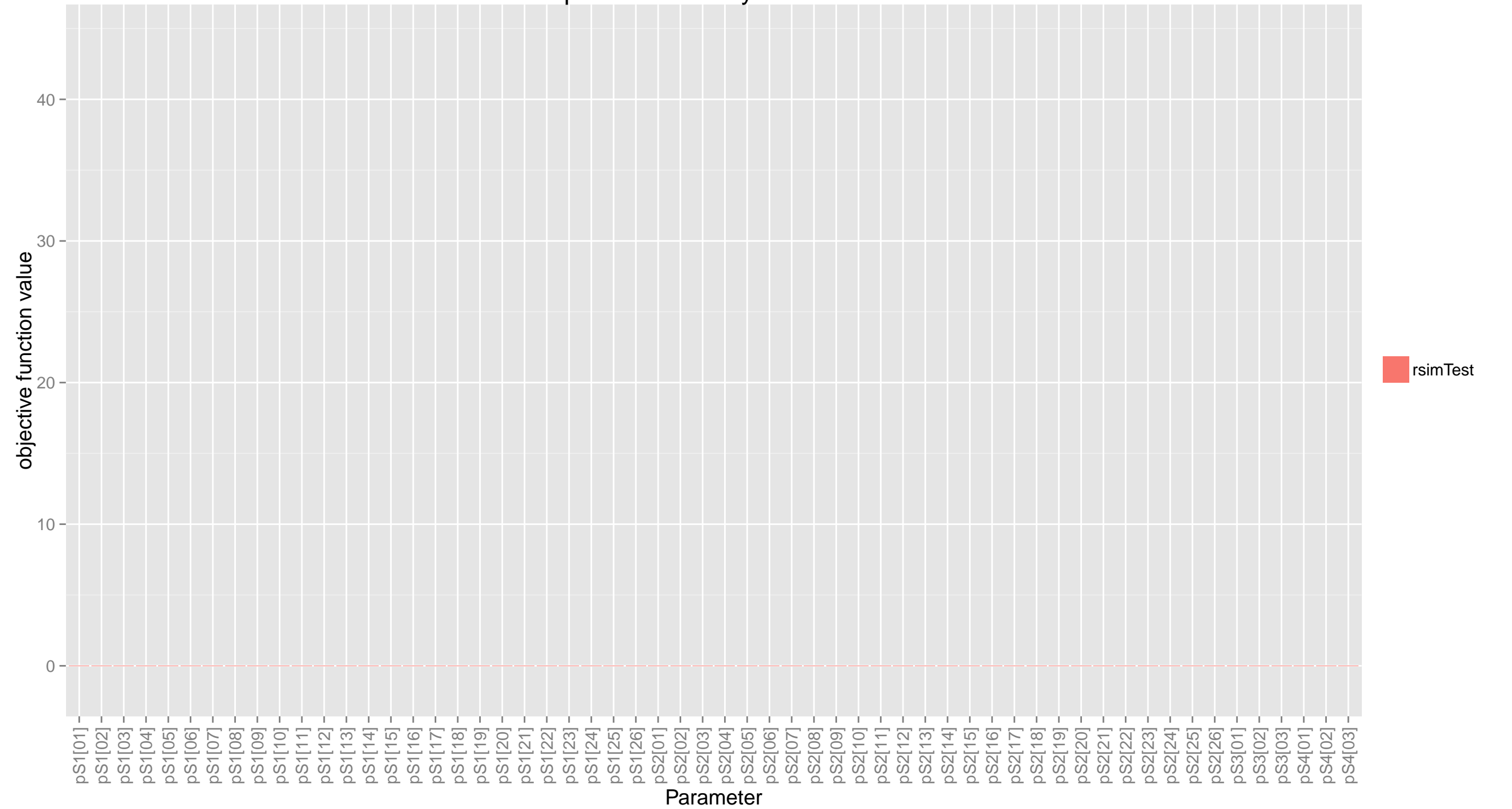
priors: growth



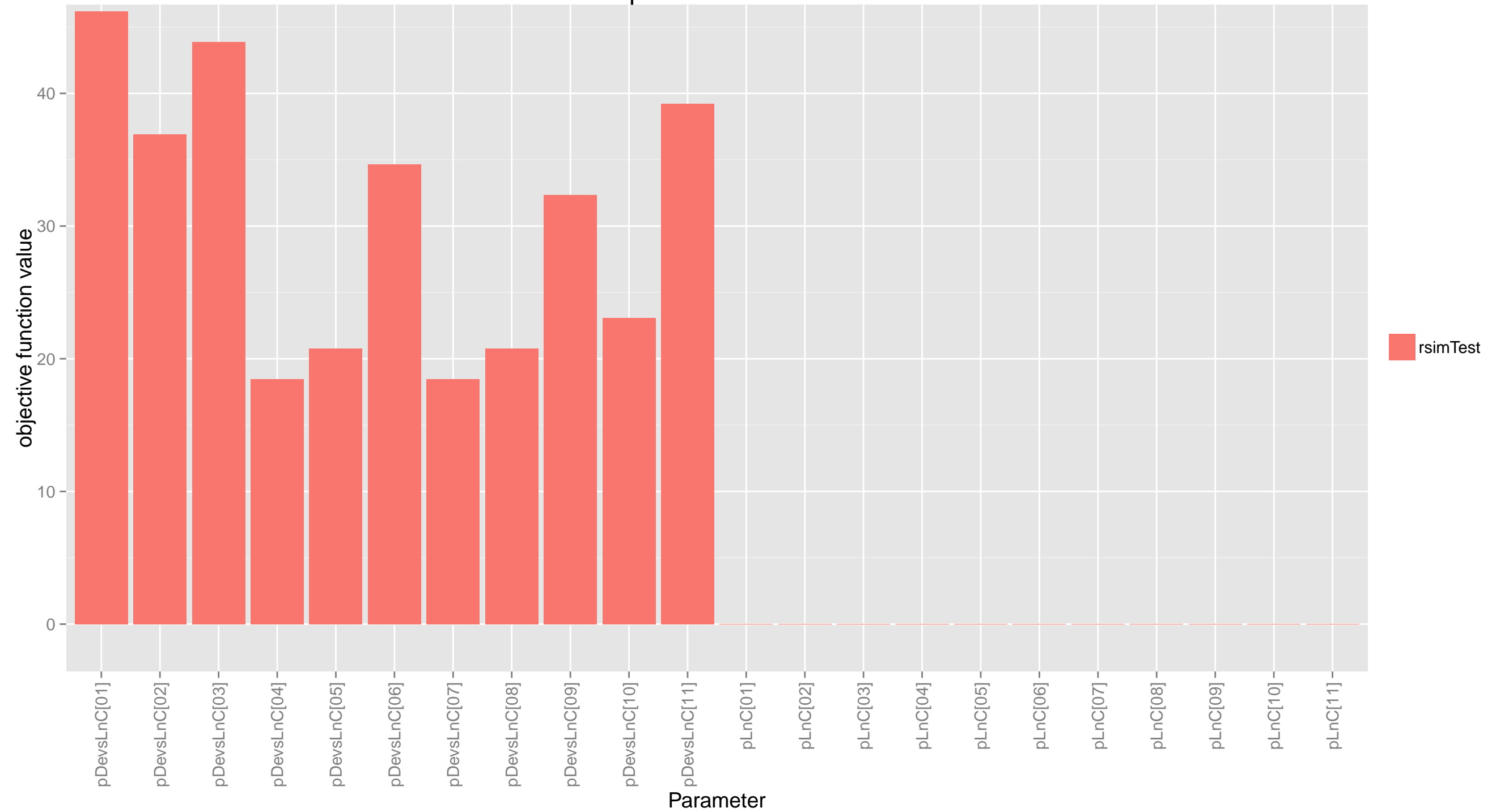
priors: maturity



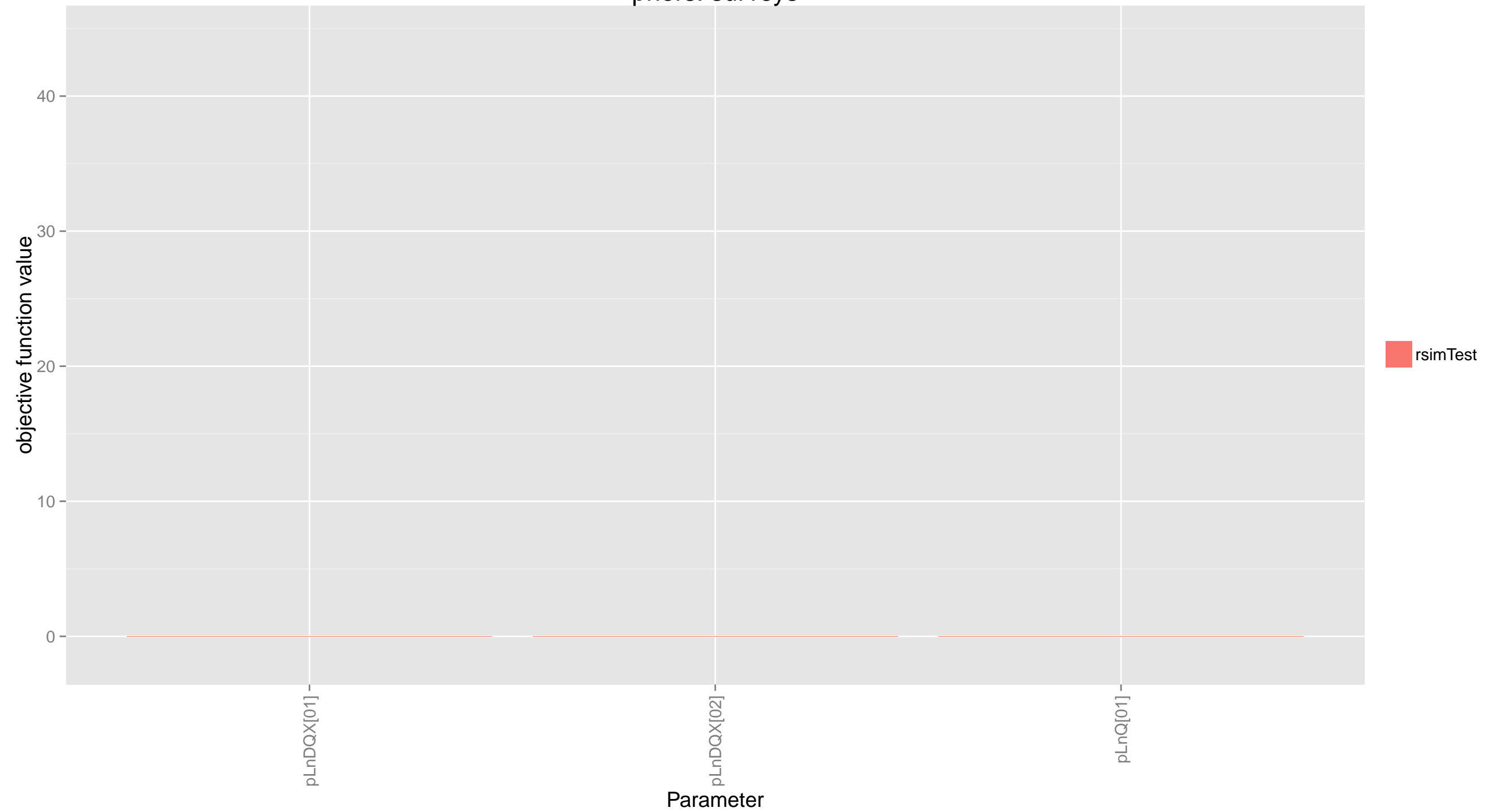
priors: selectivity functions



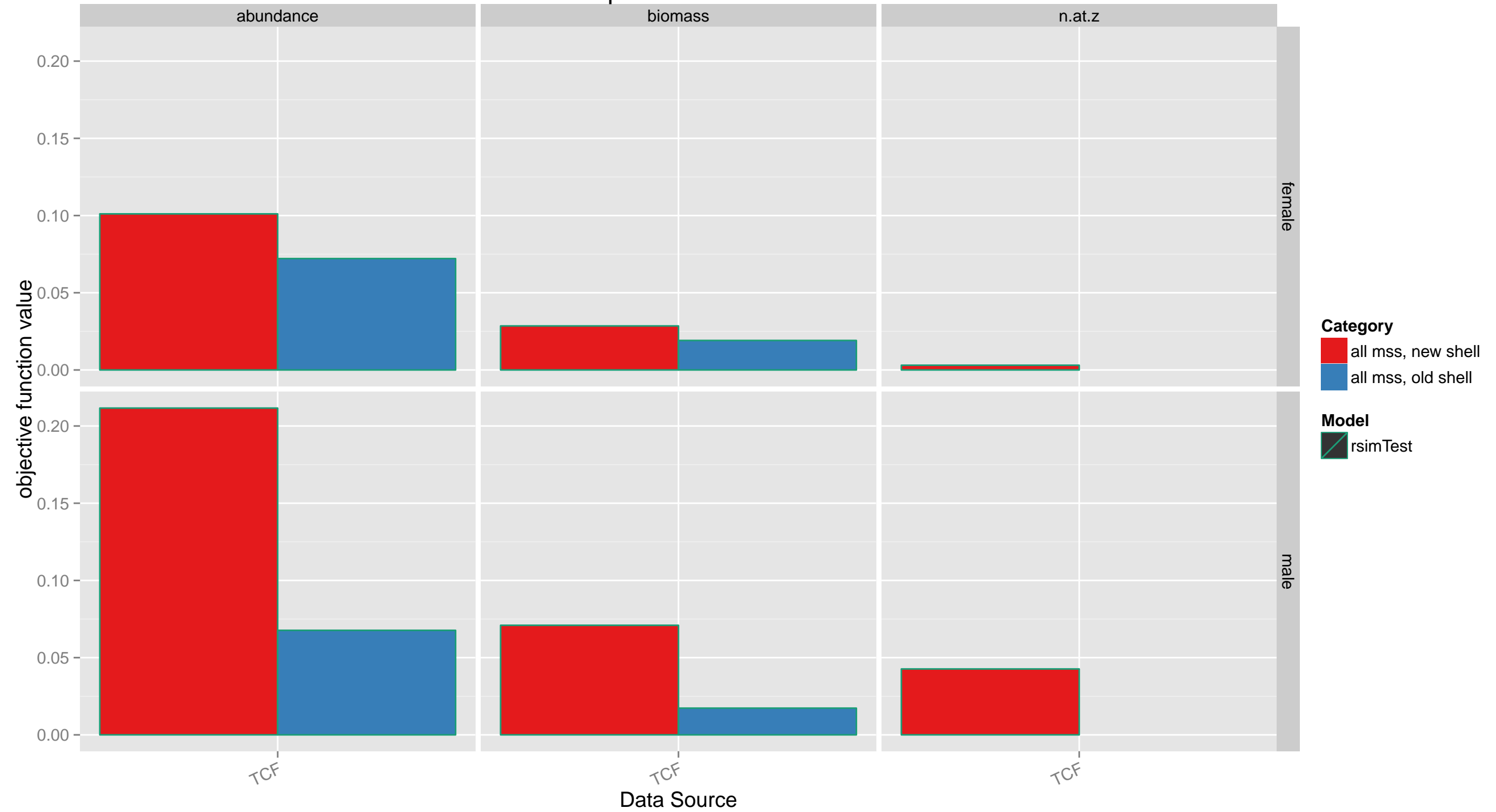
priors: fisheries



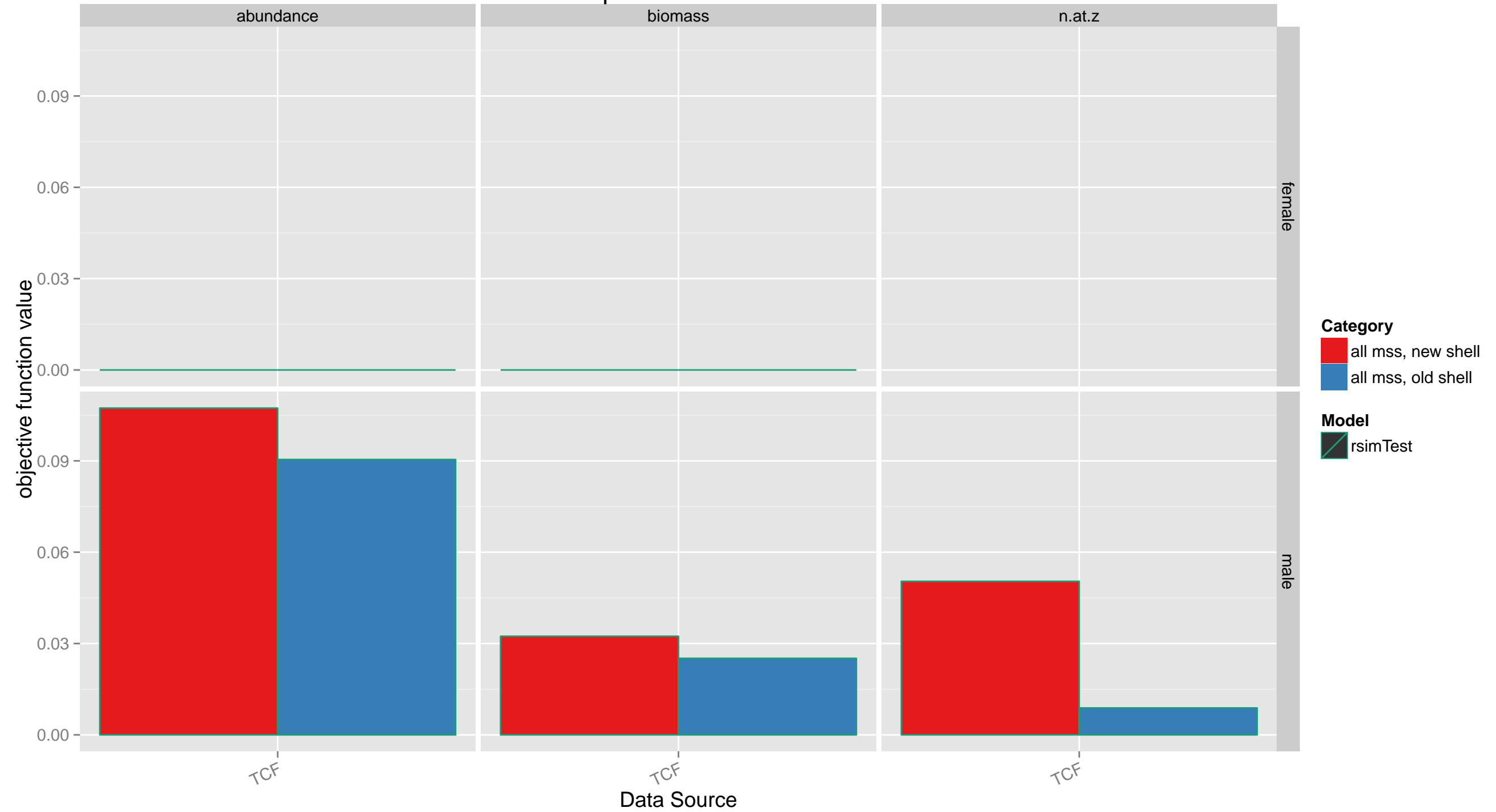
priors: surveys



Data Components: discard catch

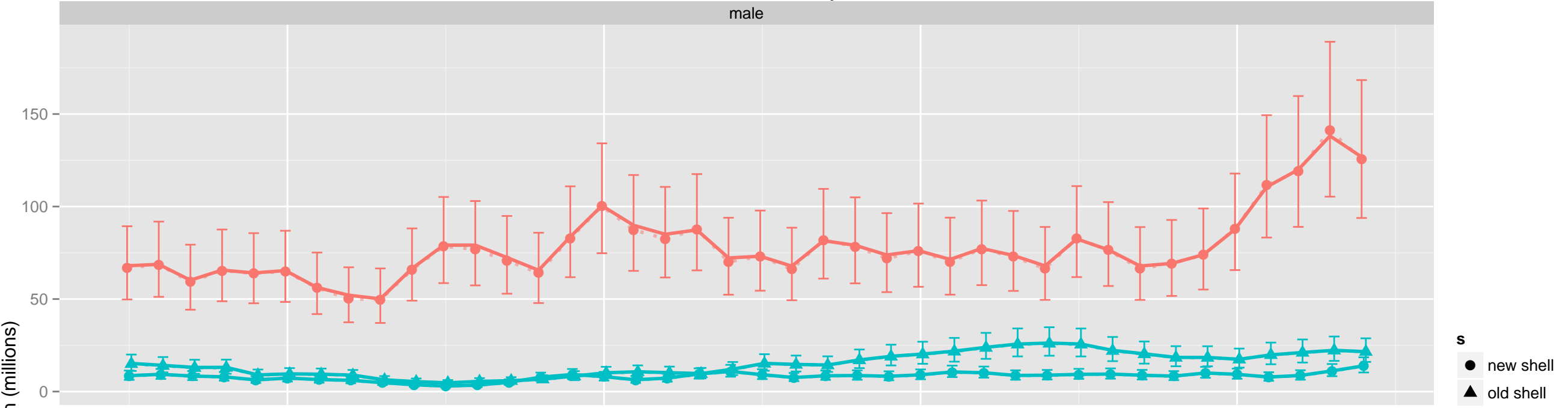


Data Components: retained catch



NMFS trawl survey

male

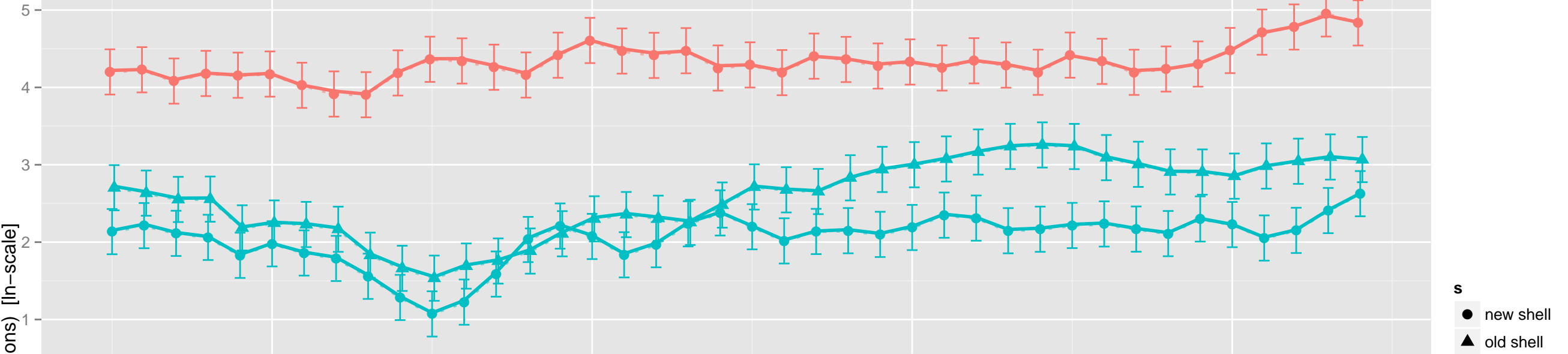


female

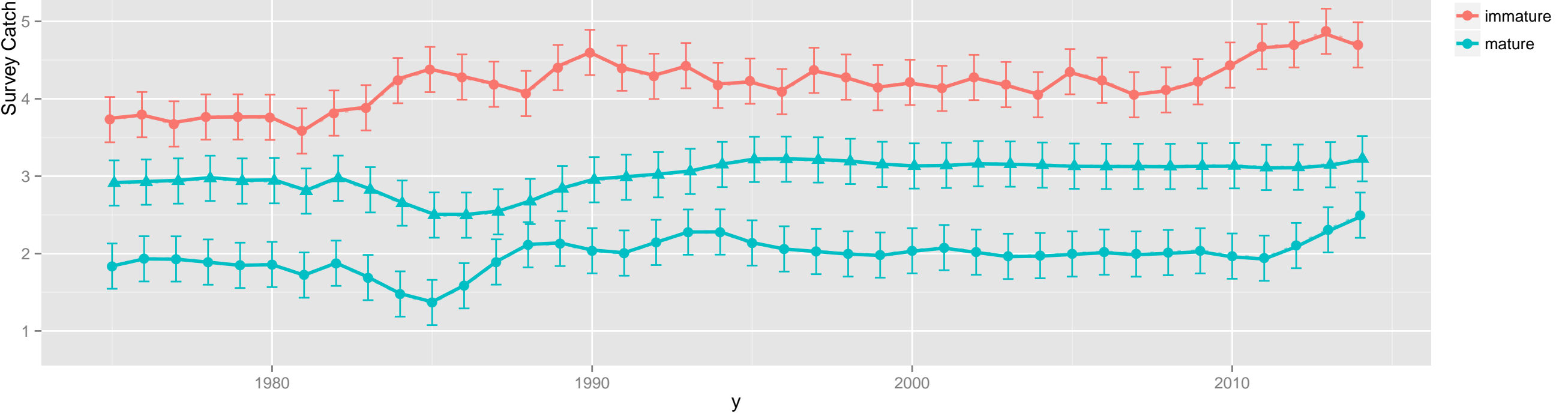


NMFS trawl survey

male

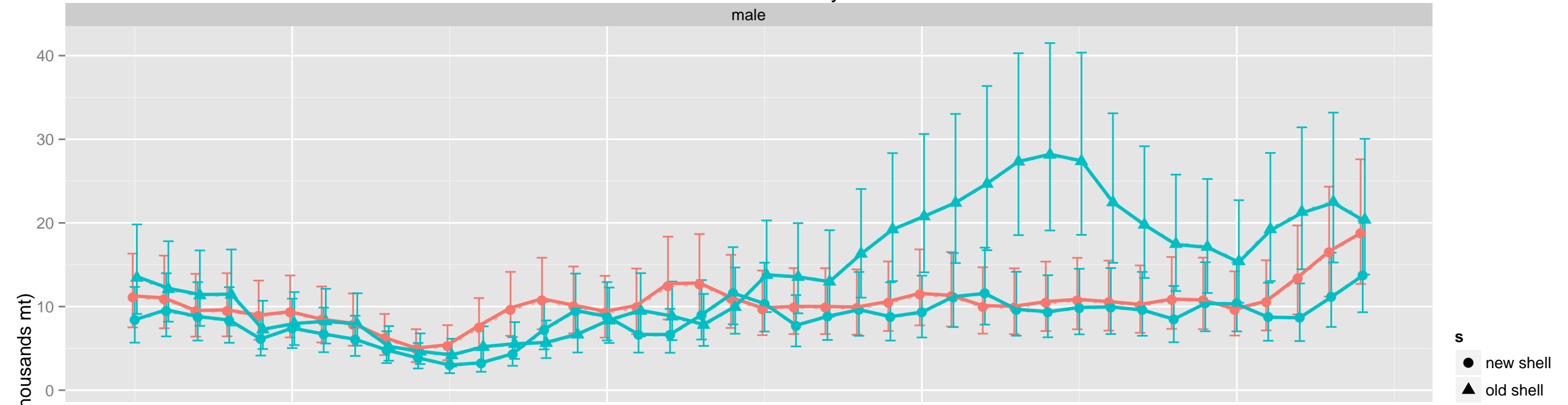


female

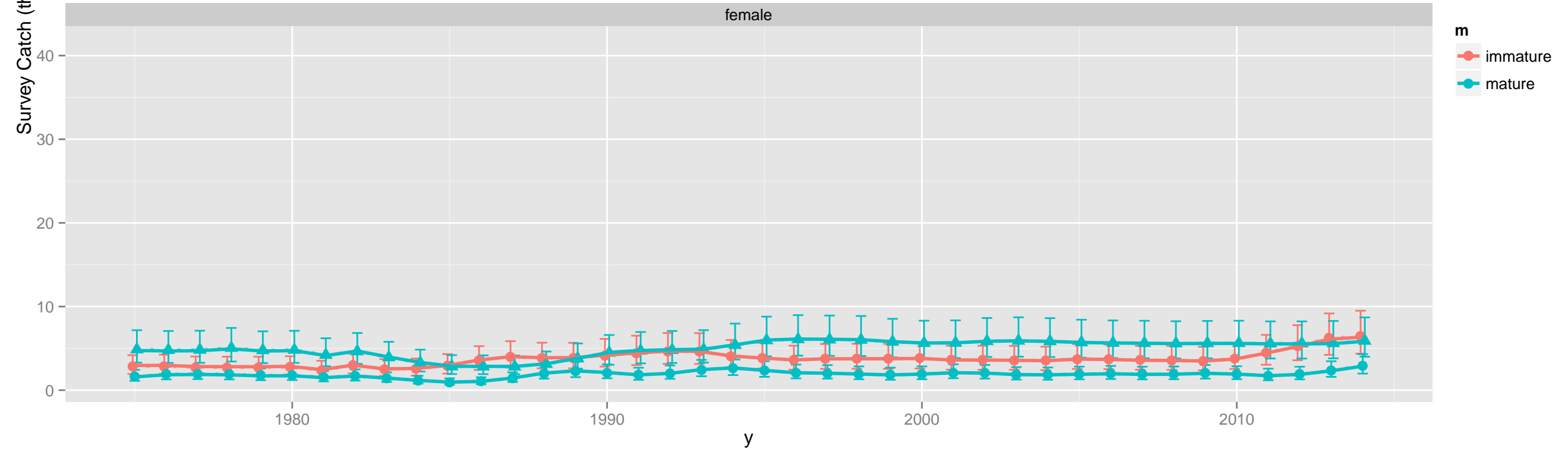


NMFS trawl survey

male

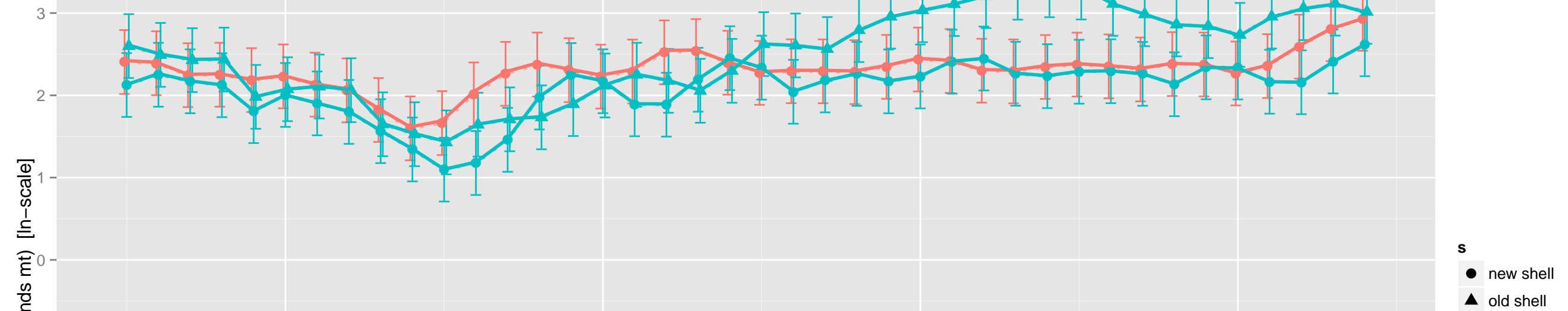


female

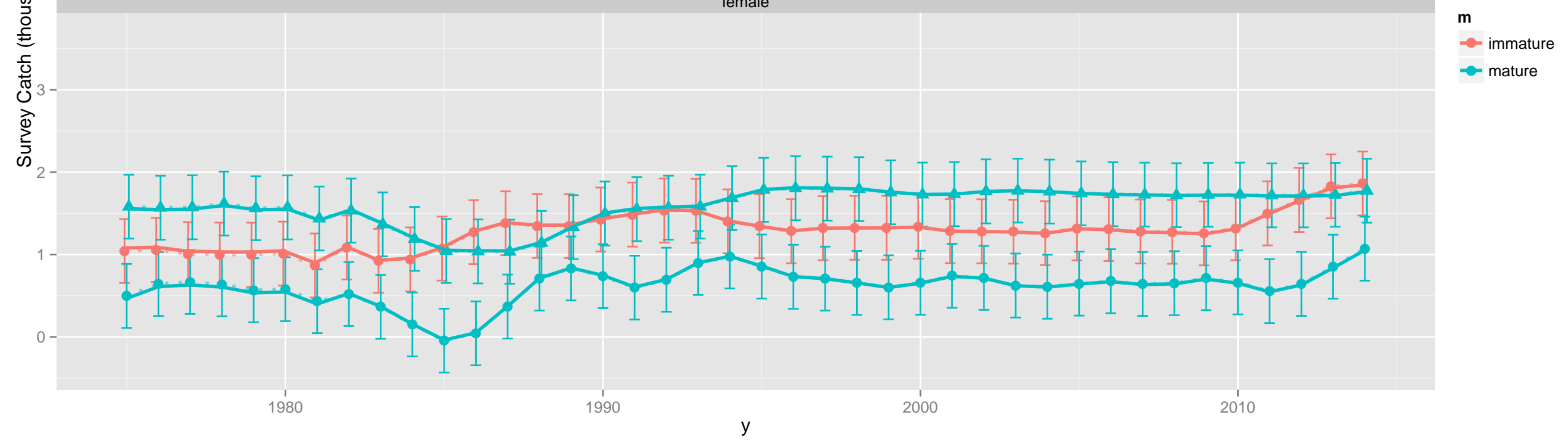


NMFS trawl survey

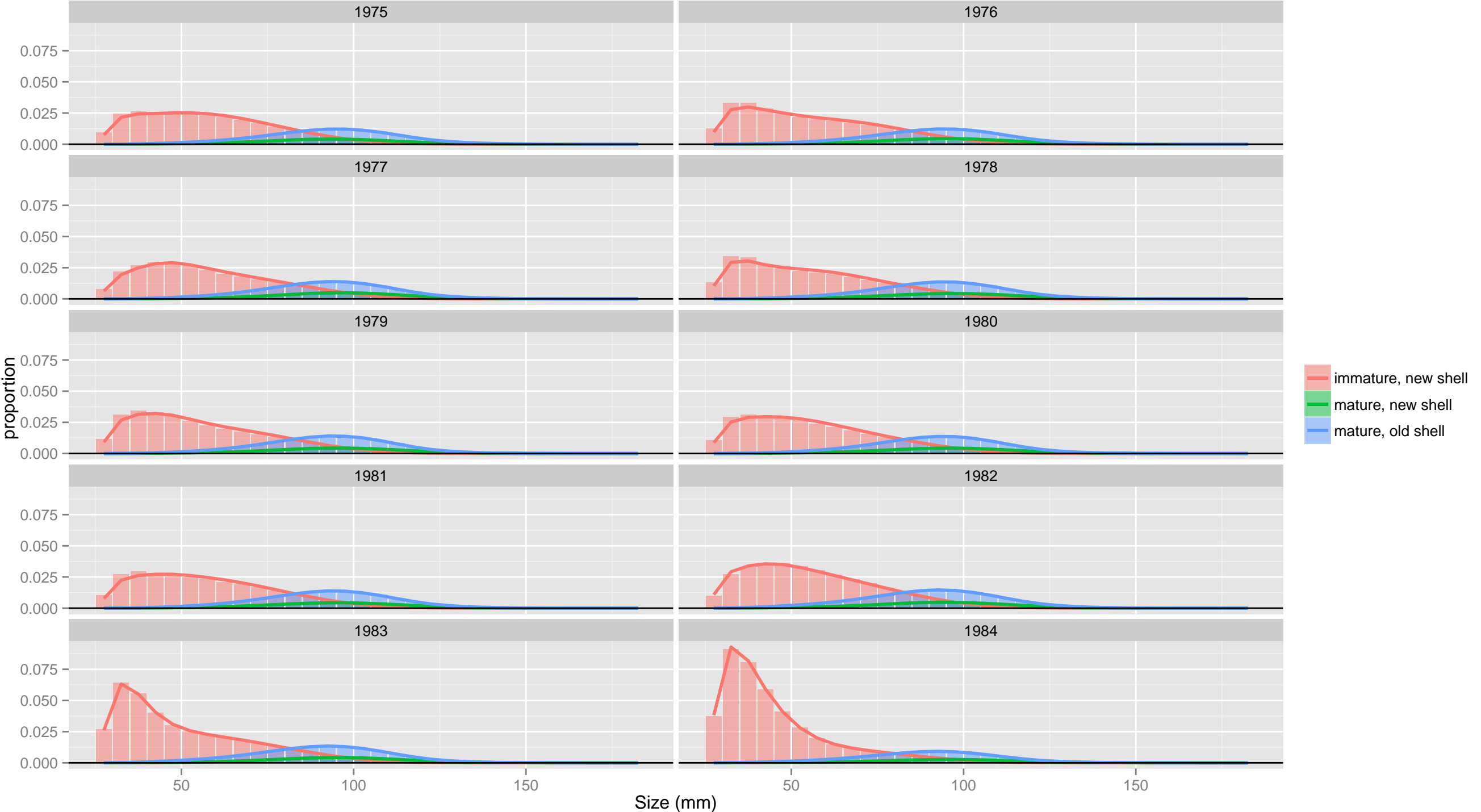
male



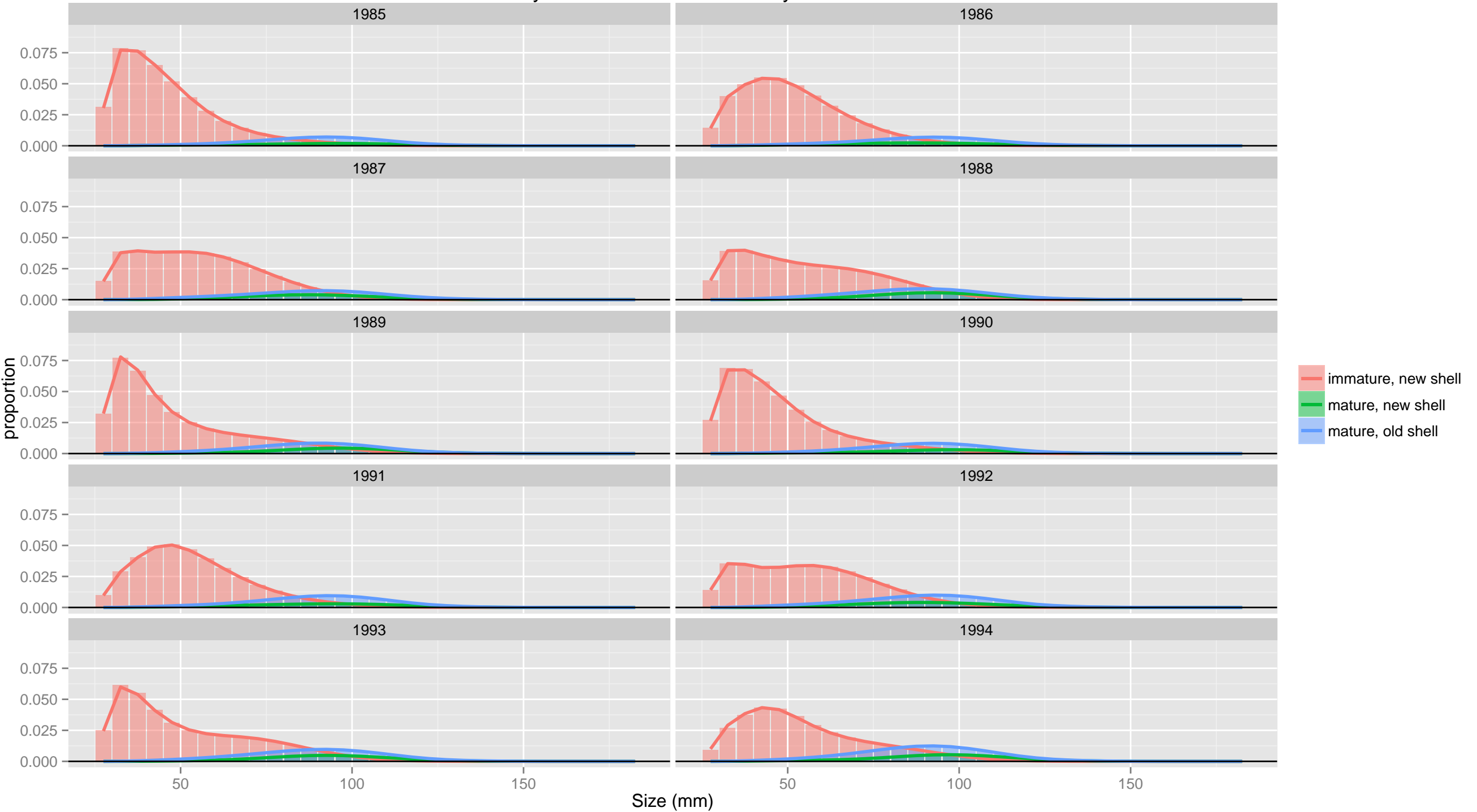
female



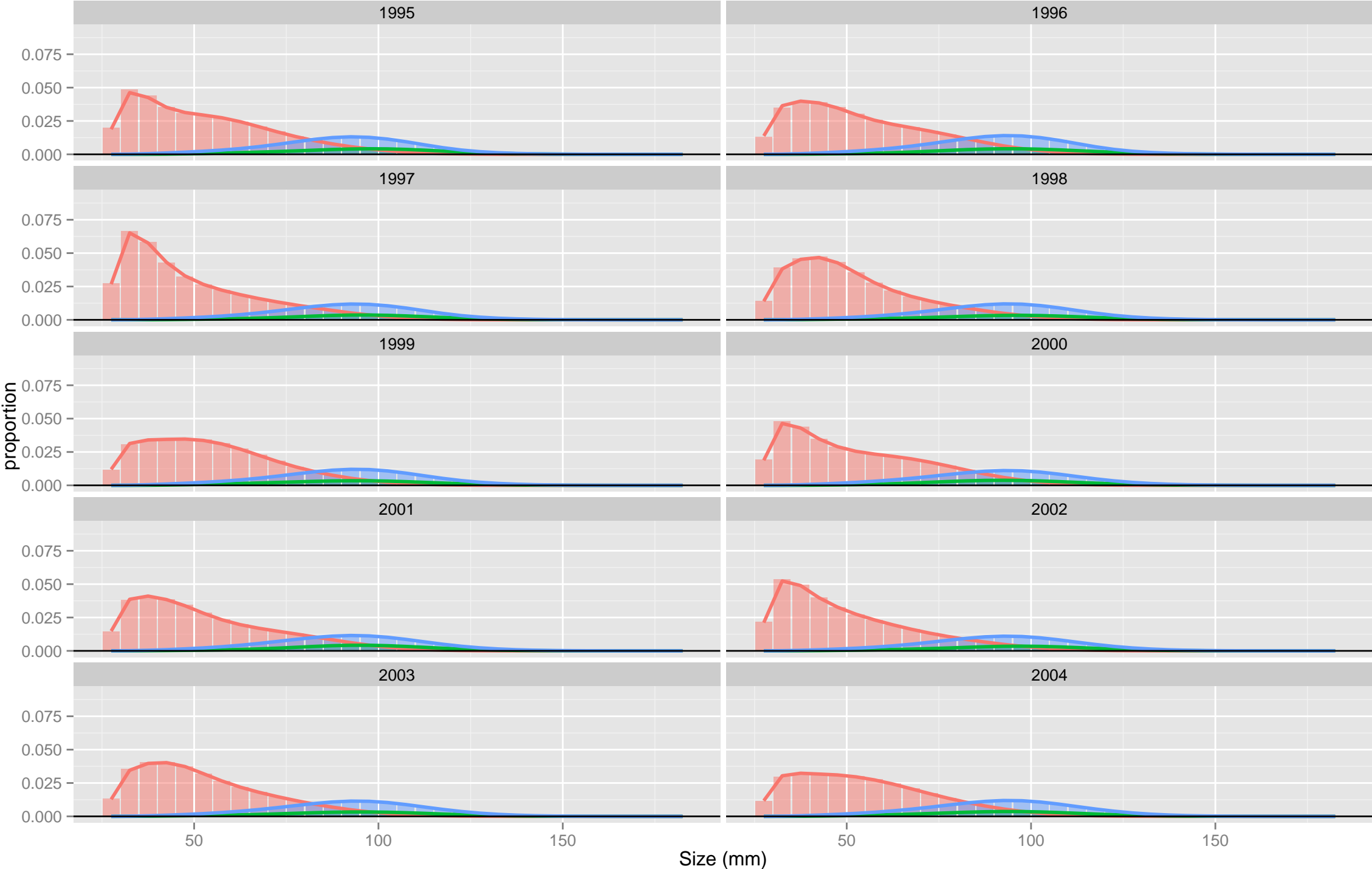
Survey Catch: NMFS trawl survey: female



Survey Catch: NMFS trawl survey: female

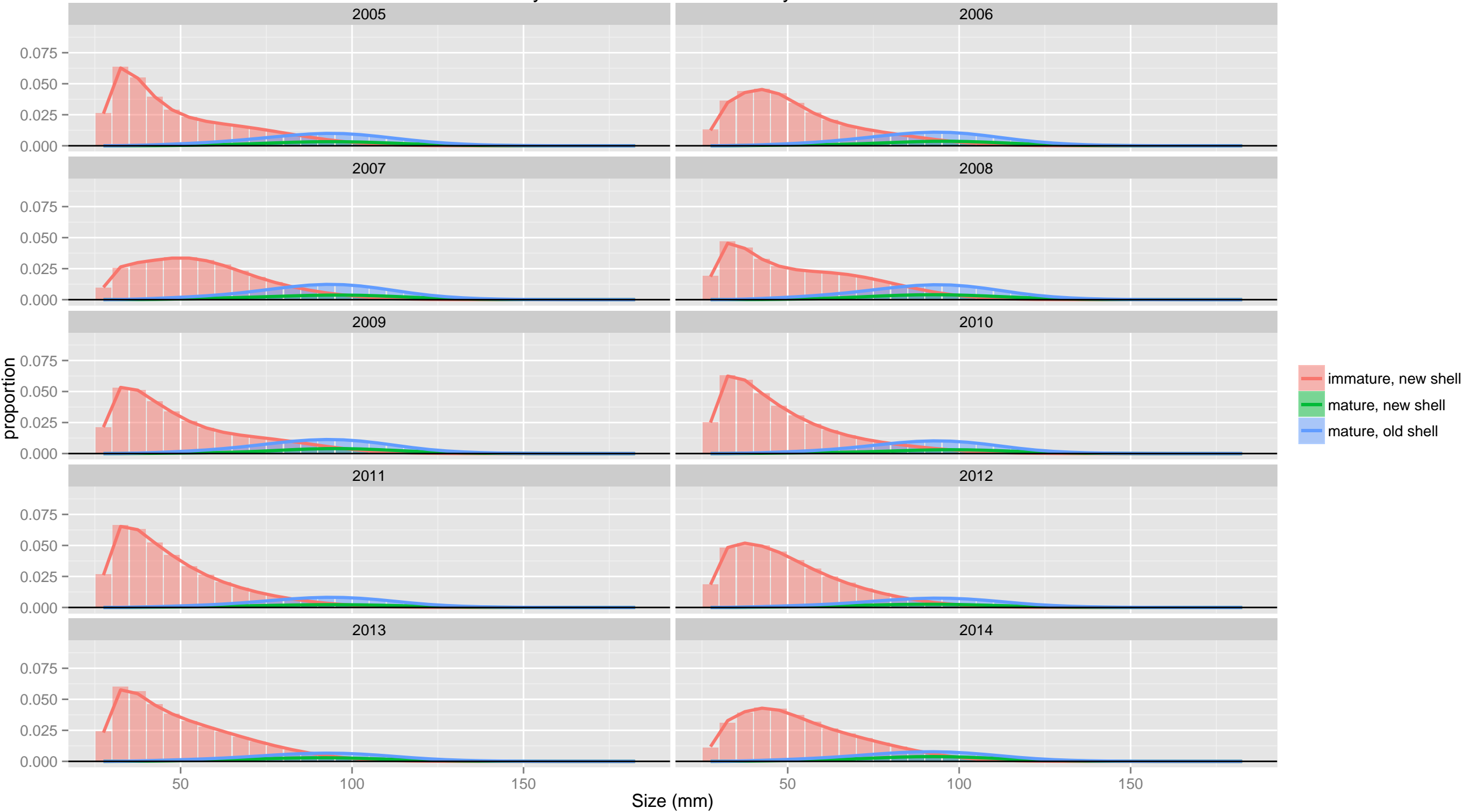


Survey Catch: NMFS trawl survey: female

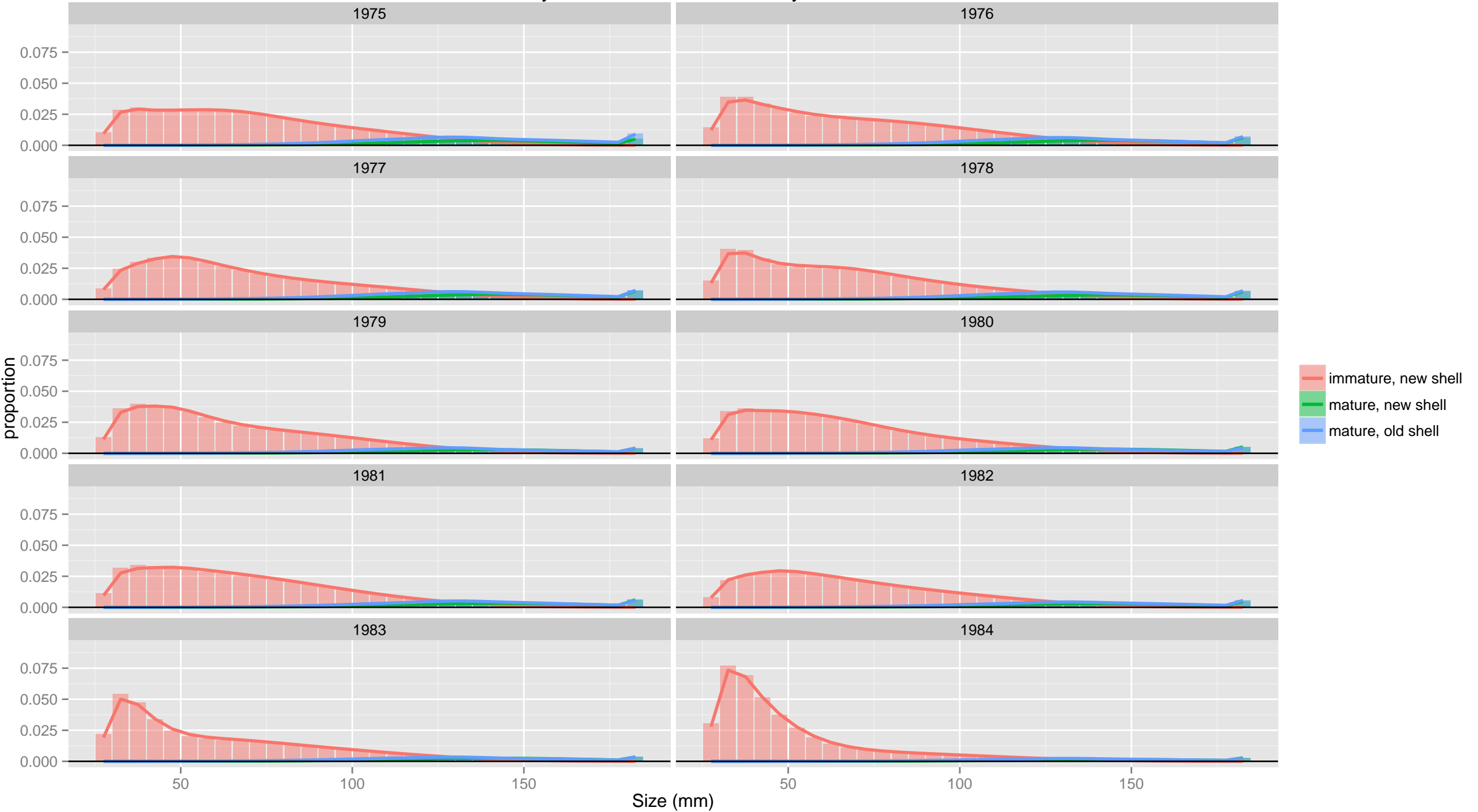


- immature, new shell
- mature, new shell
- mature, old shell

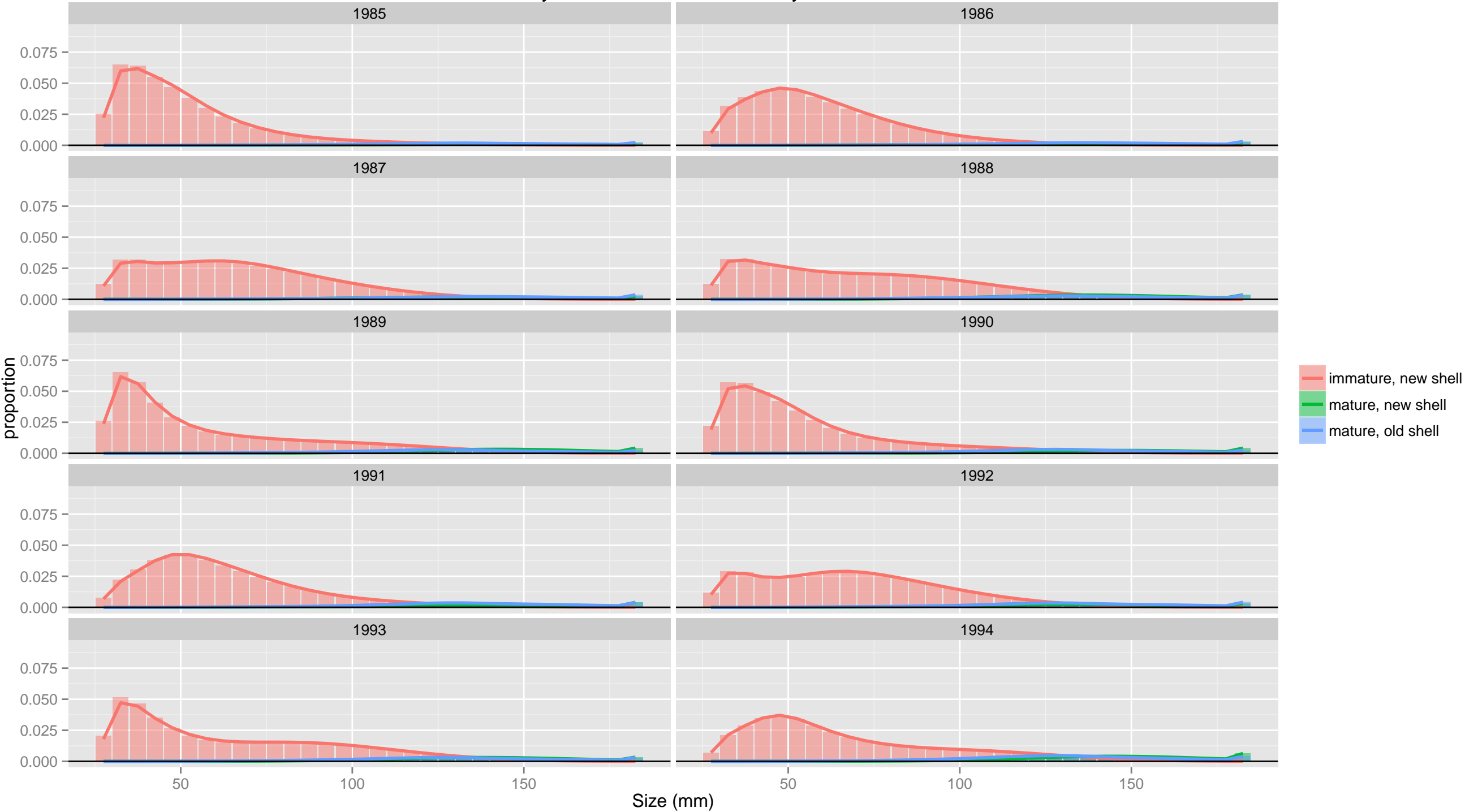
Survey Catch: NMFS trawl survey: female



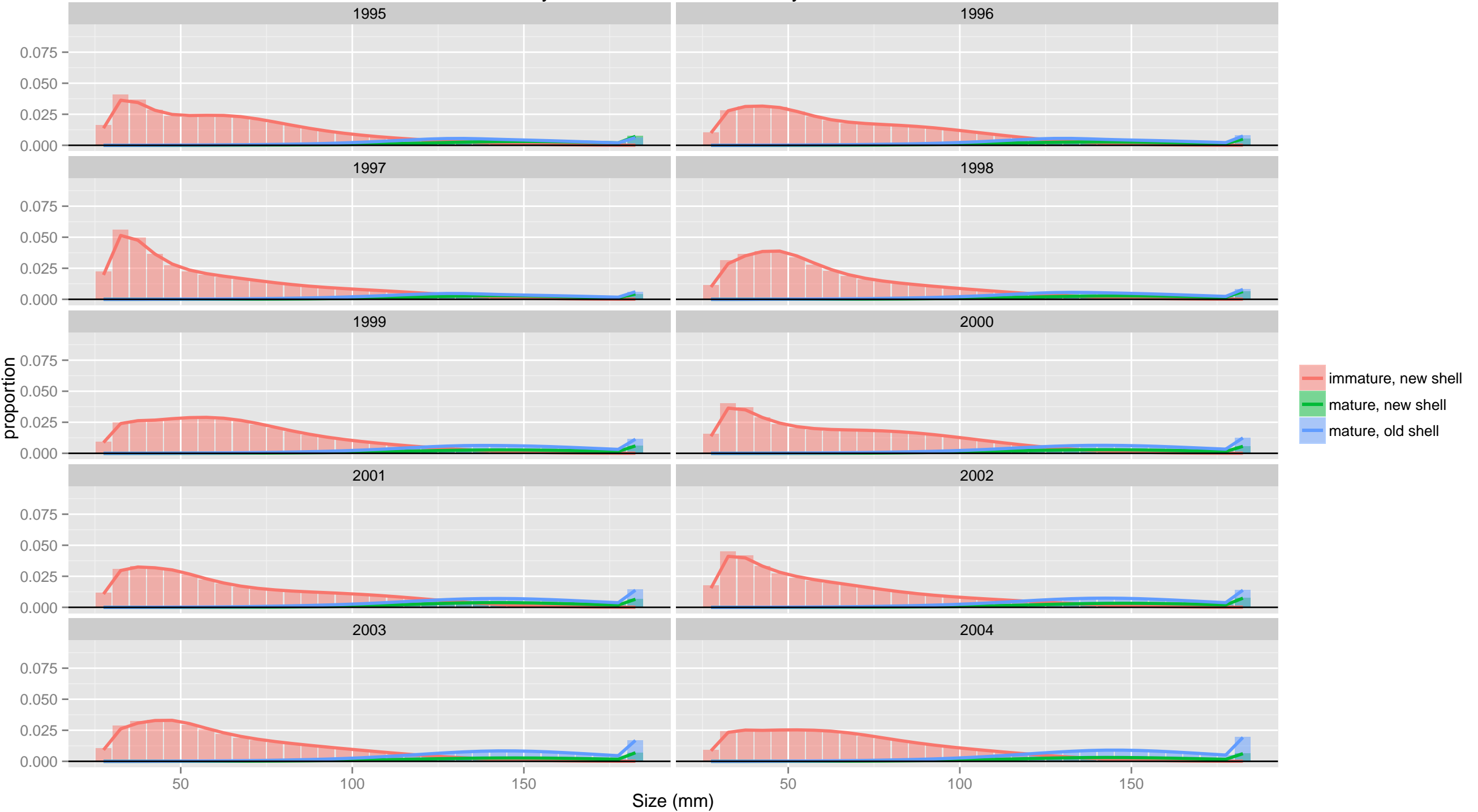
Survey Catch: NMFS trawl survey: male



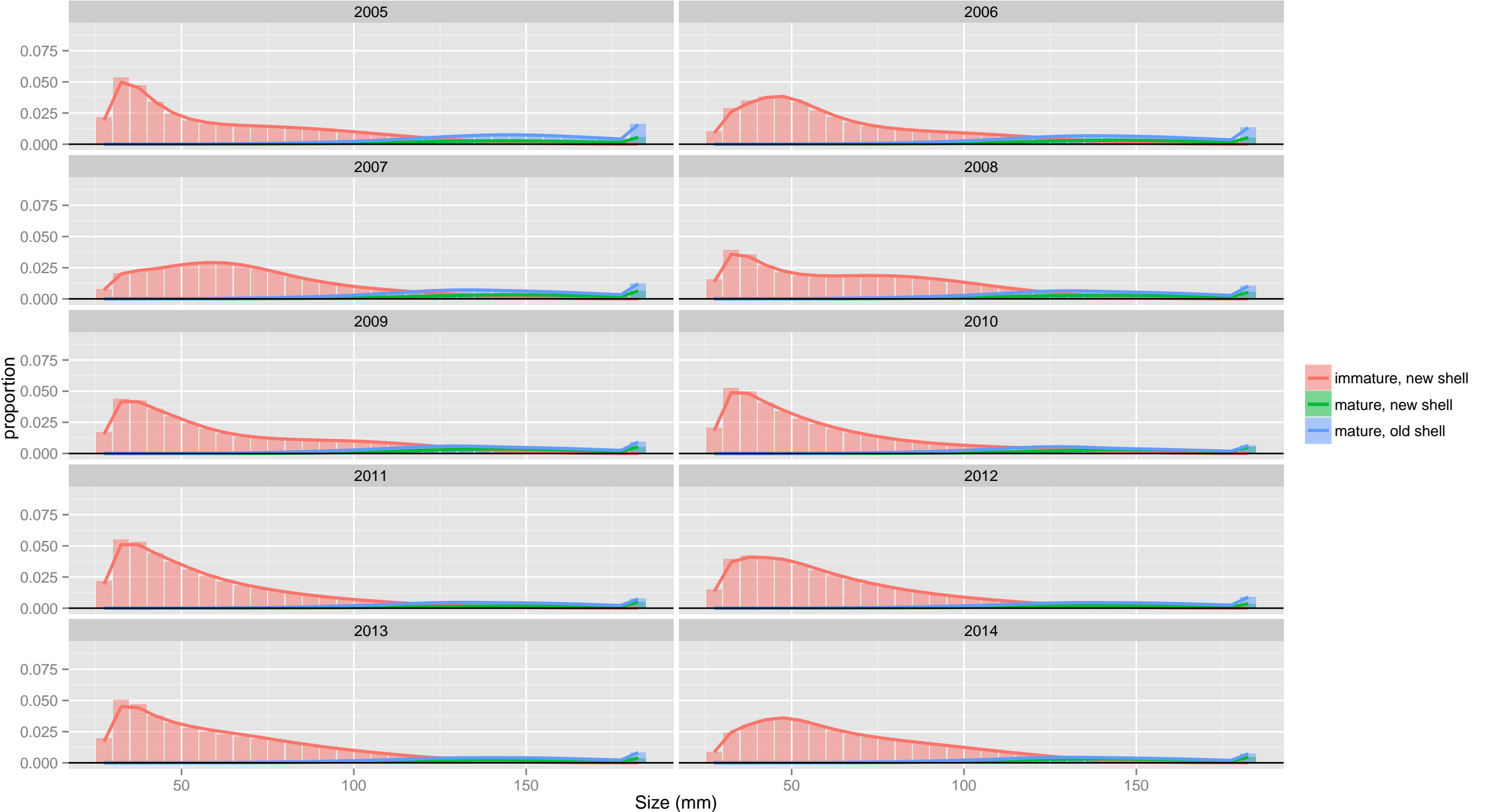
Survey Catch: NMFS trawl survey: male



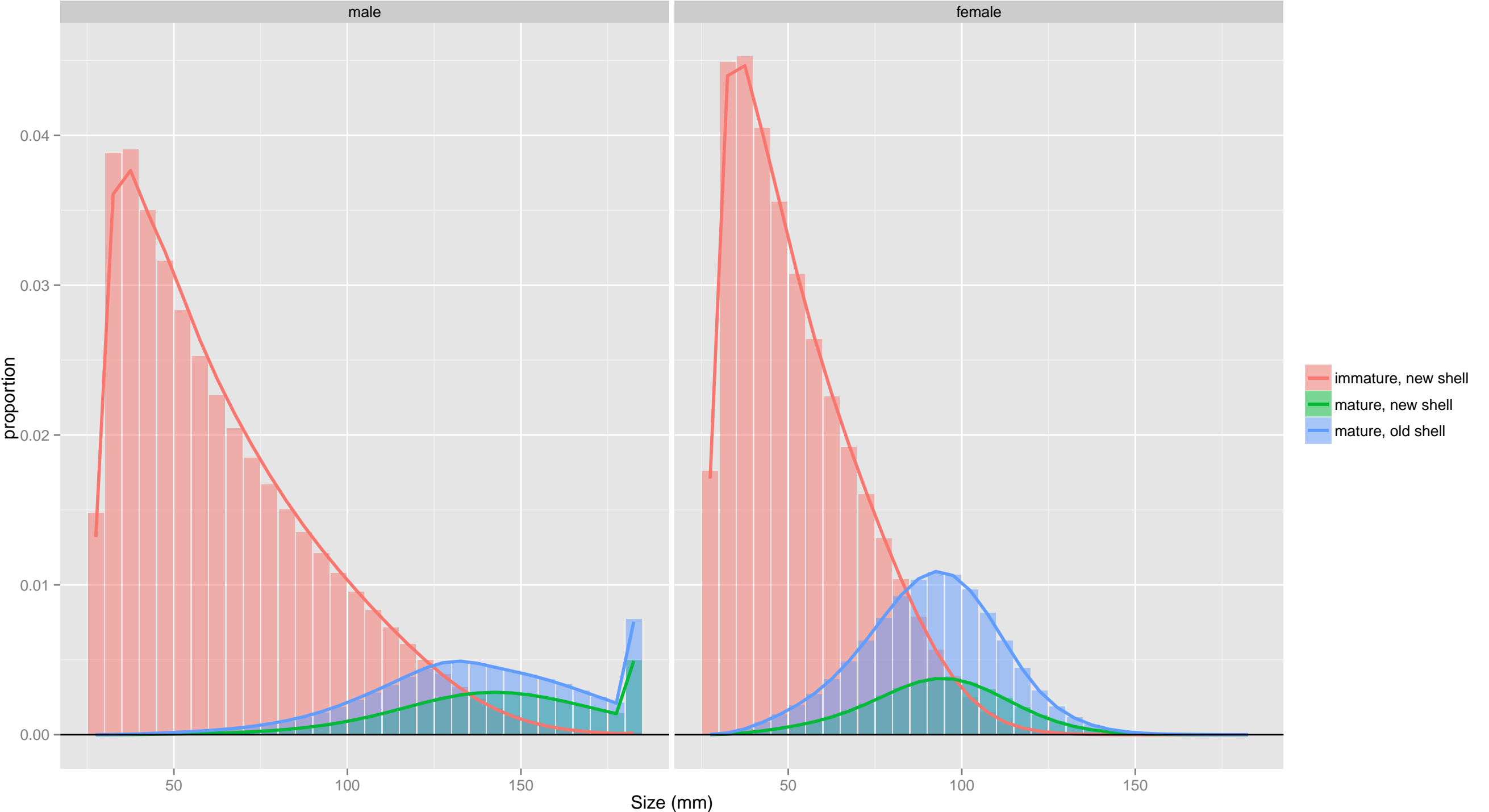
Survey Catch: NMFS trawl survey: male



Survey Catch: NMFS trawl survey: male

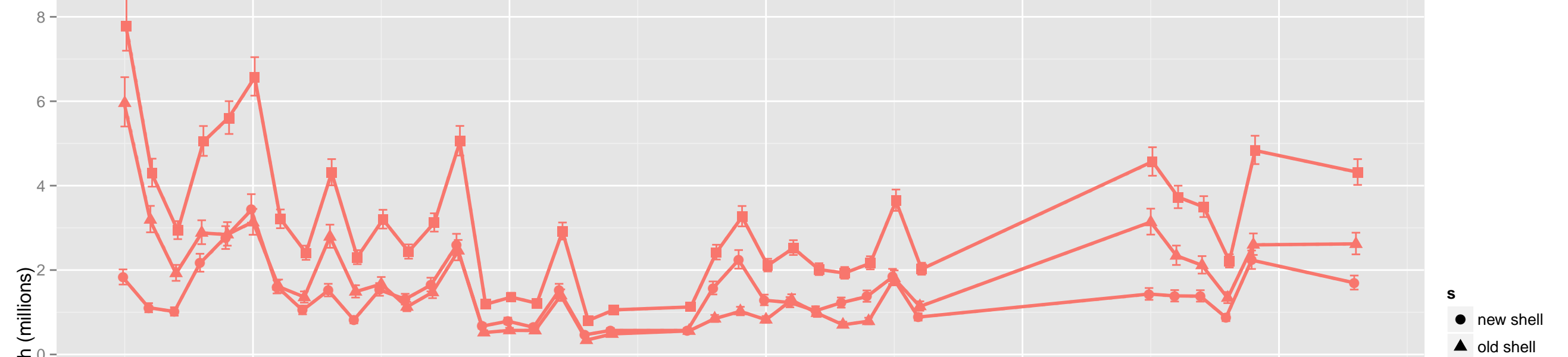


Survey Catch: NMFS trawl survey

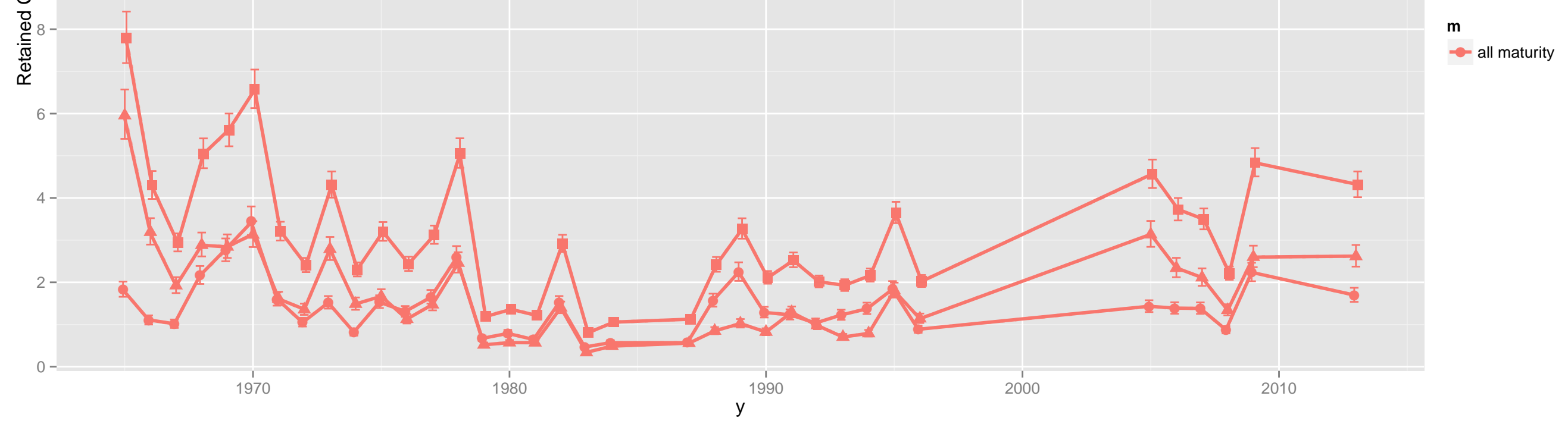


TCF

male

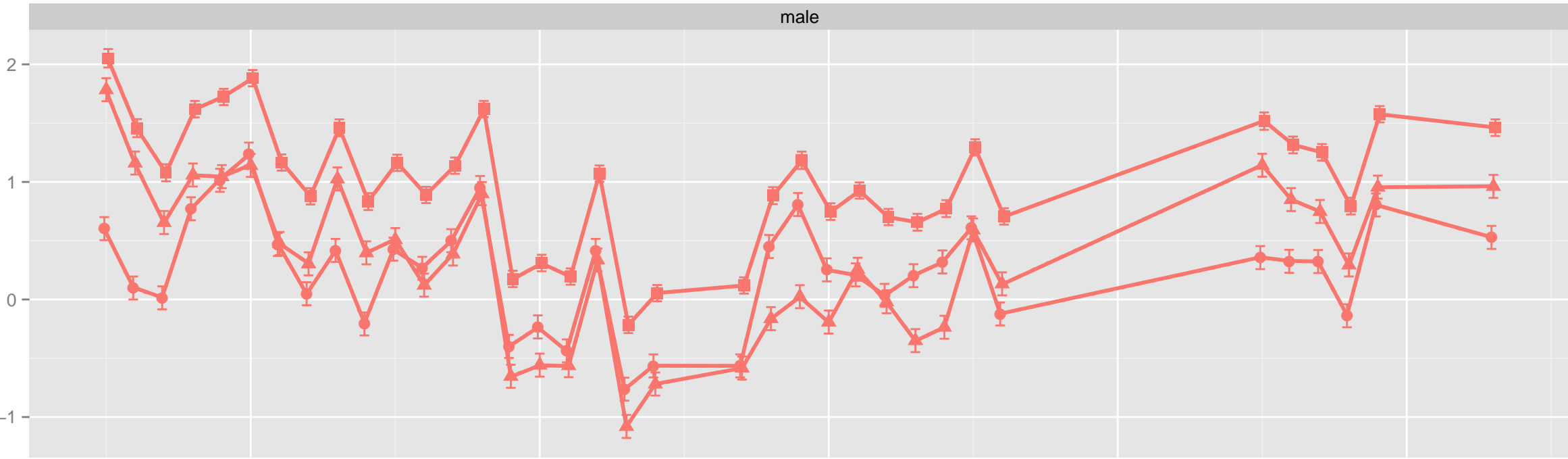


all sex

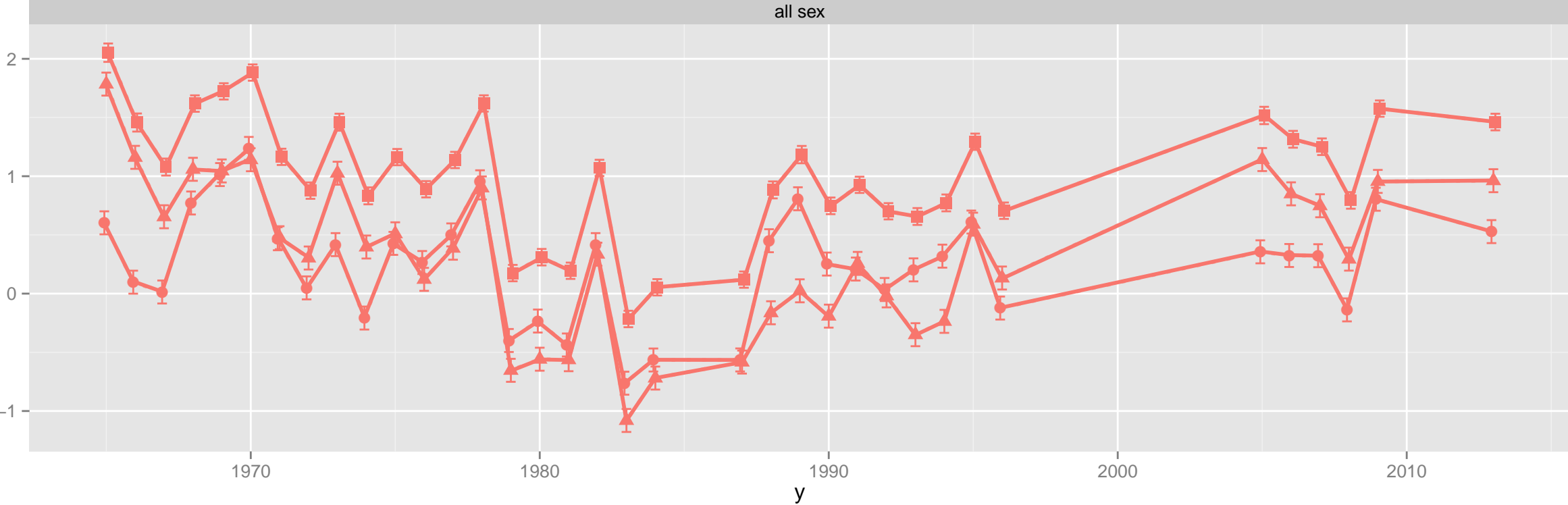


TCF

male

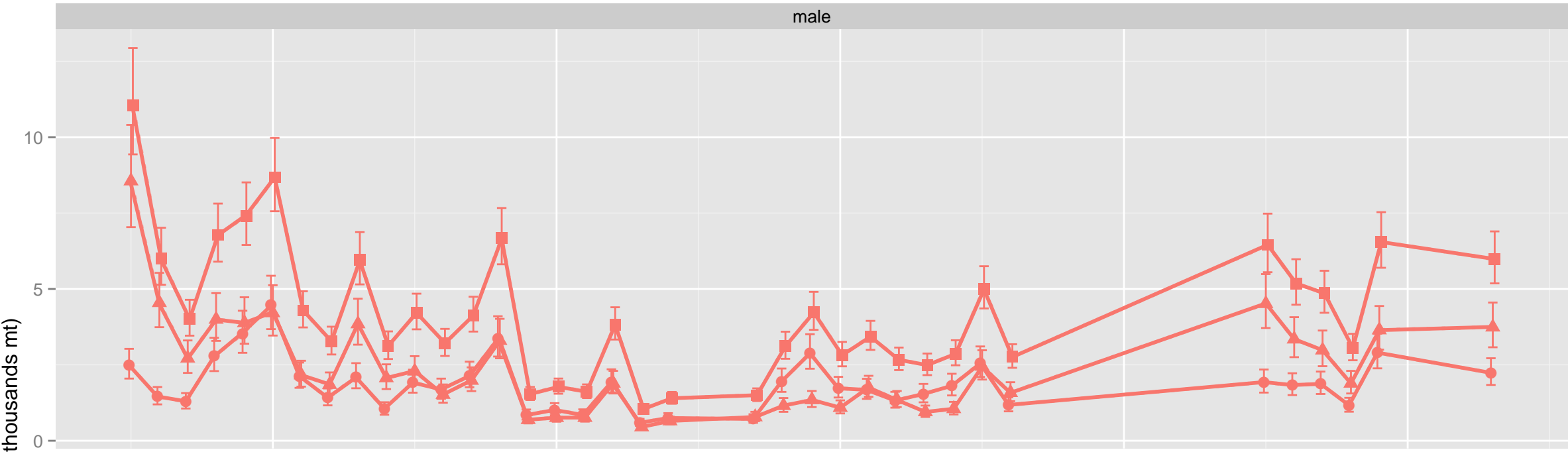


all sex

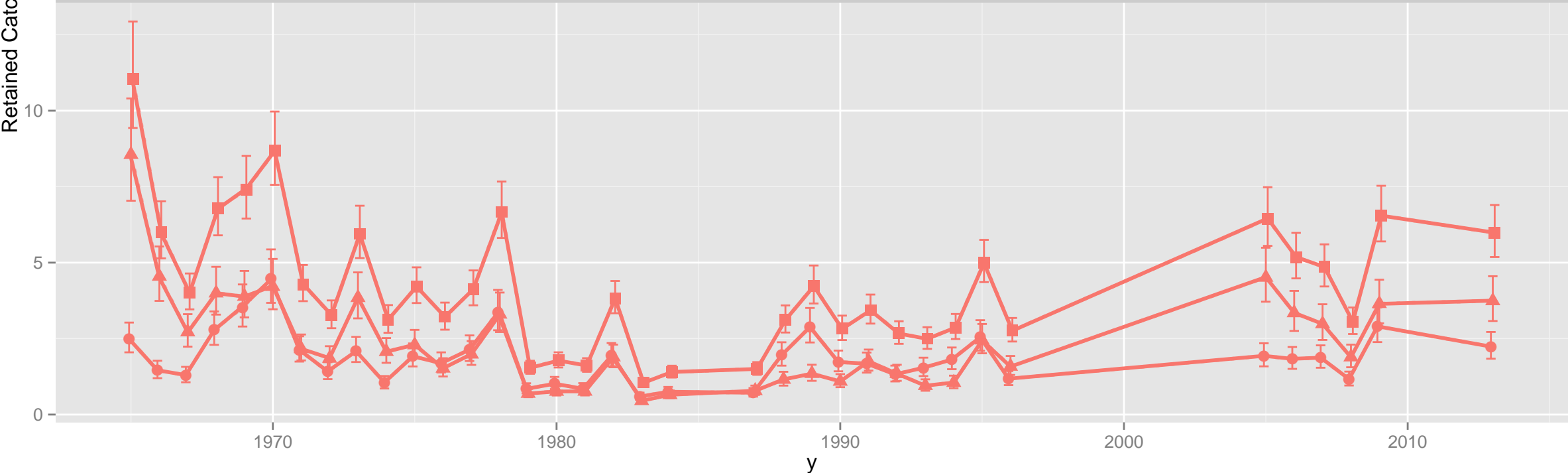


TCF

male

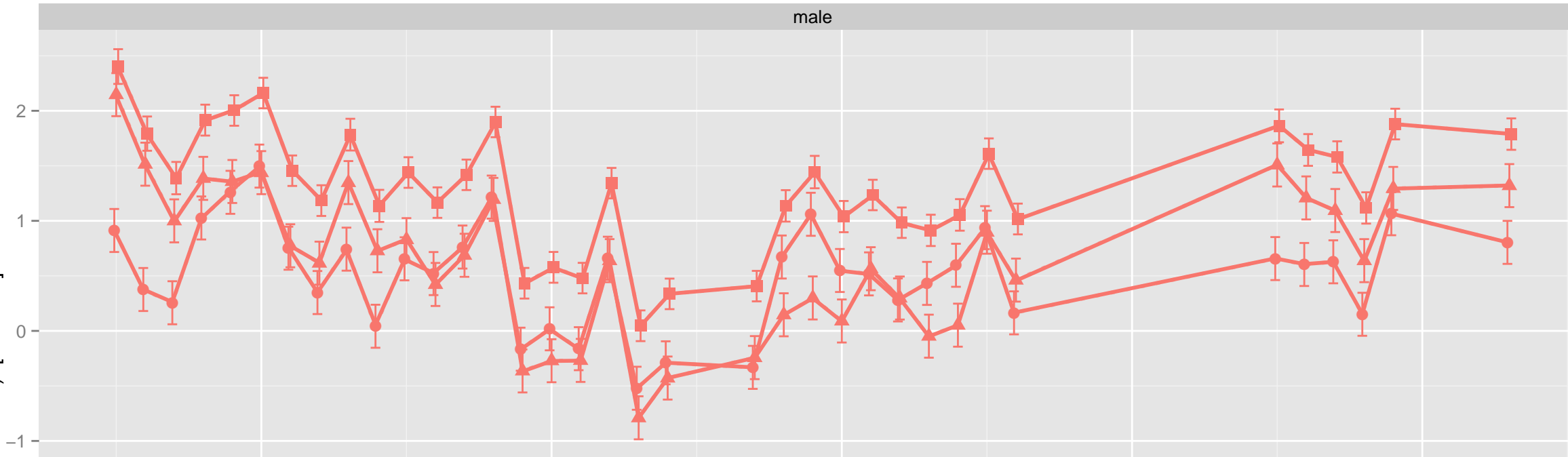


all sex

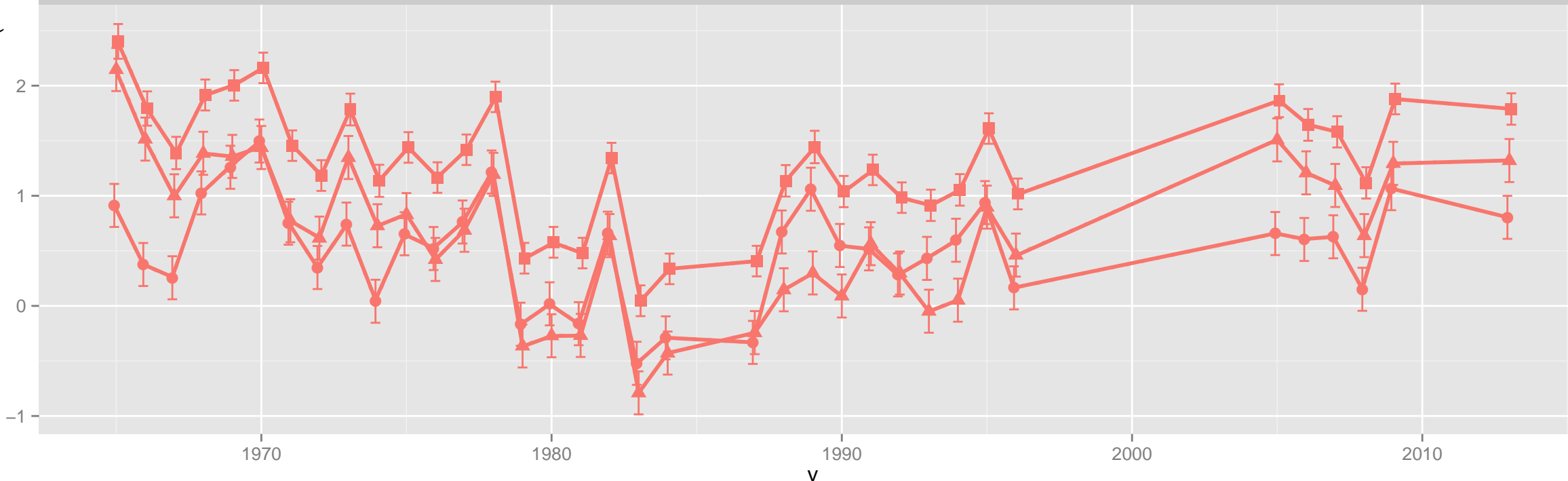


TCF

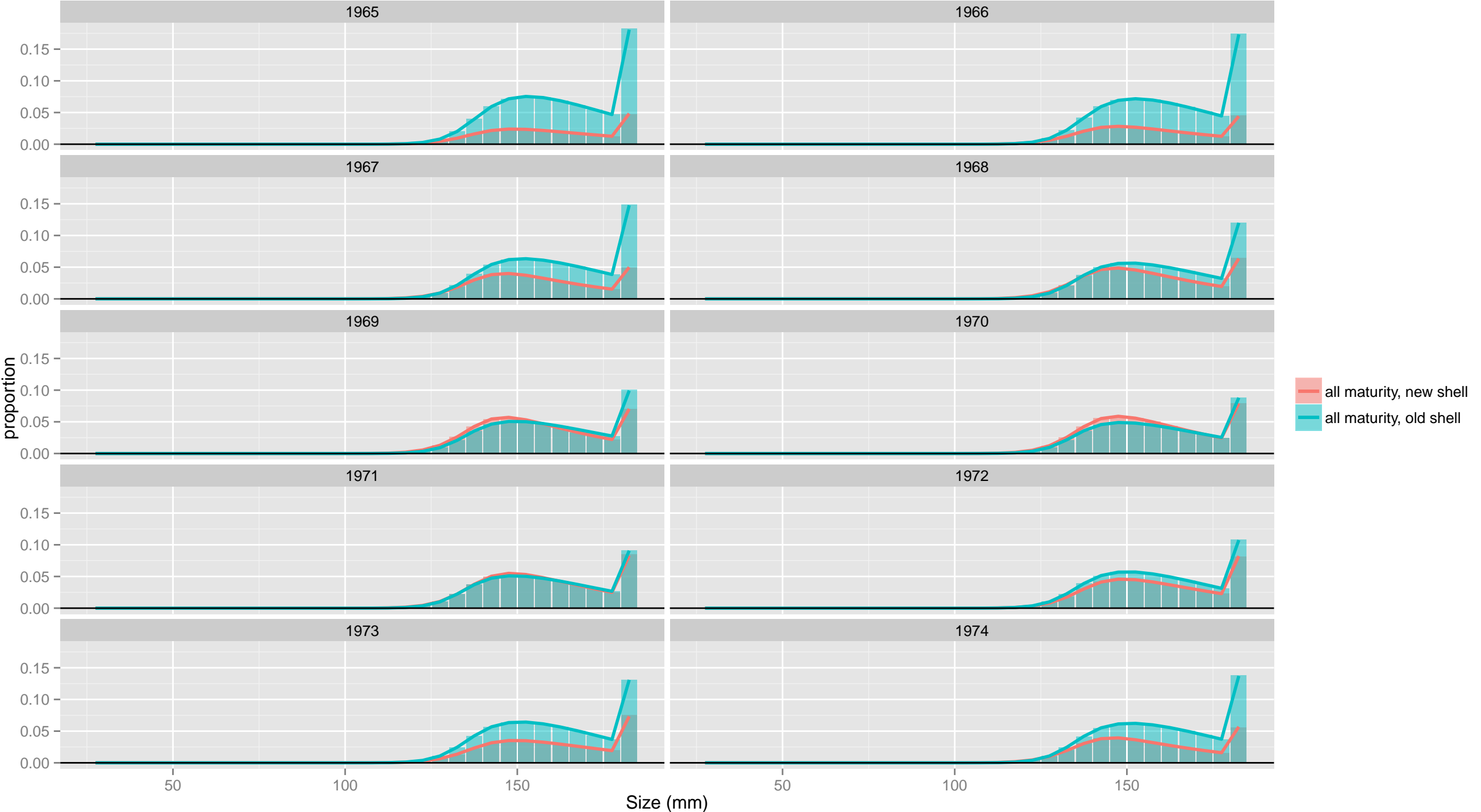
male



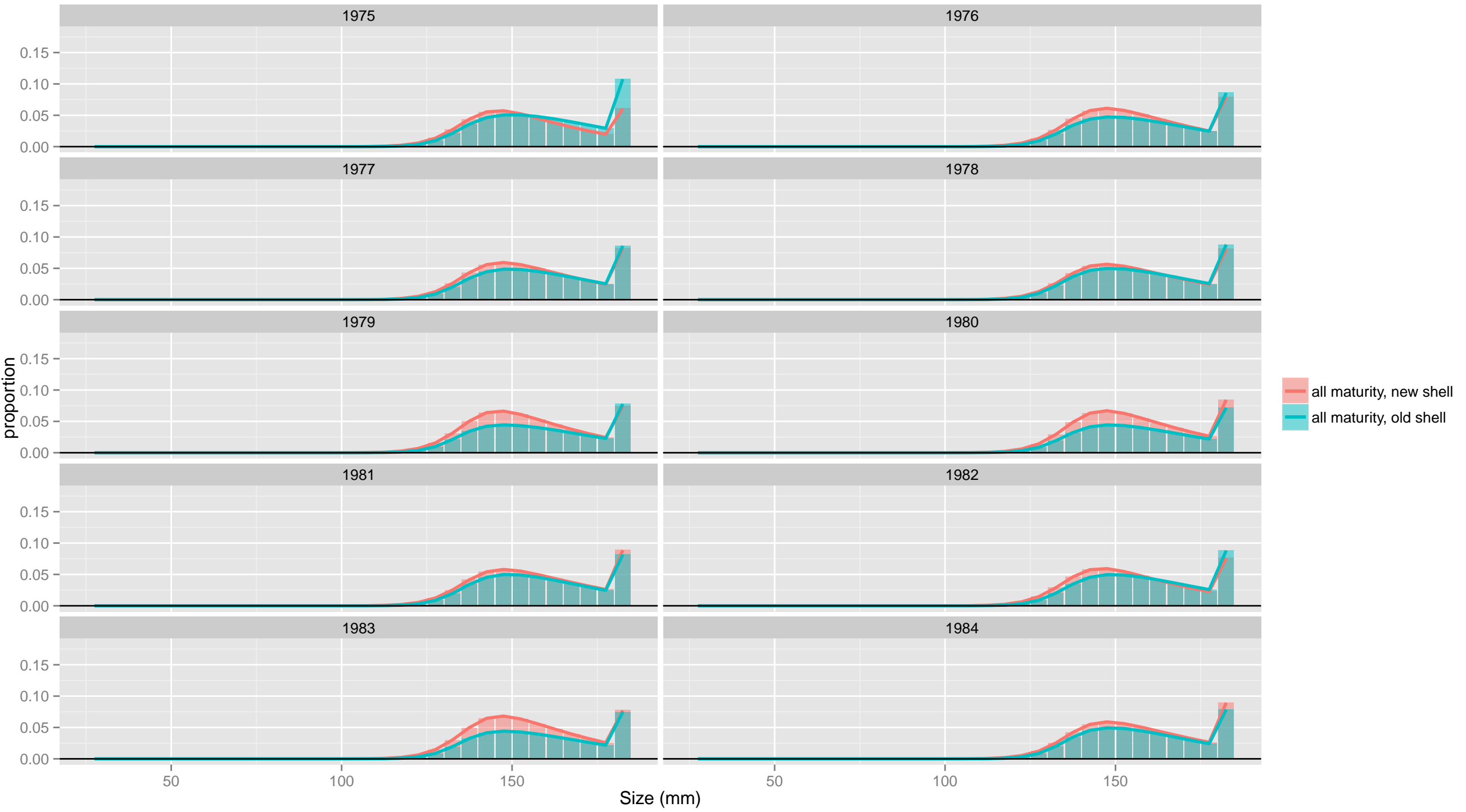
all sex



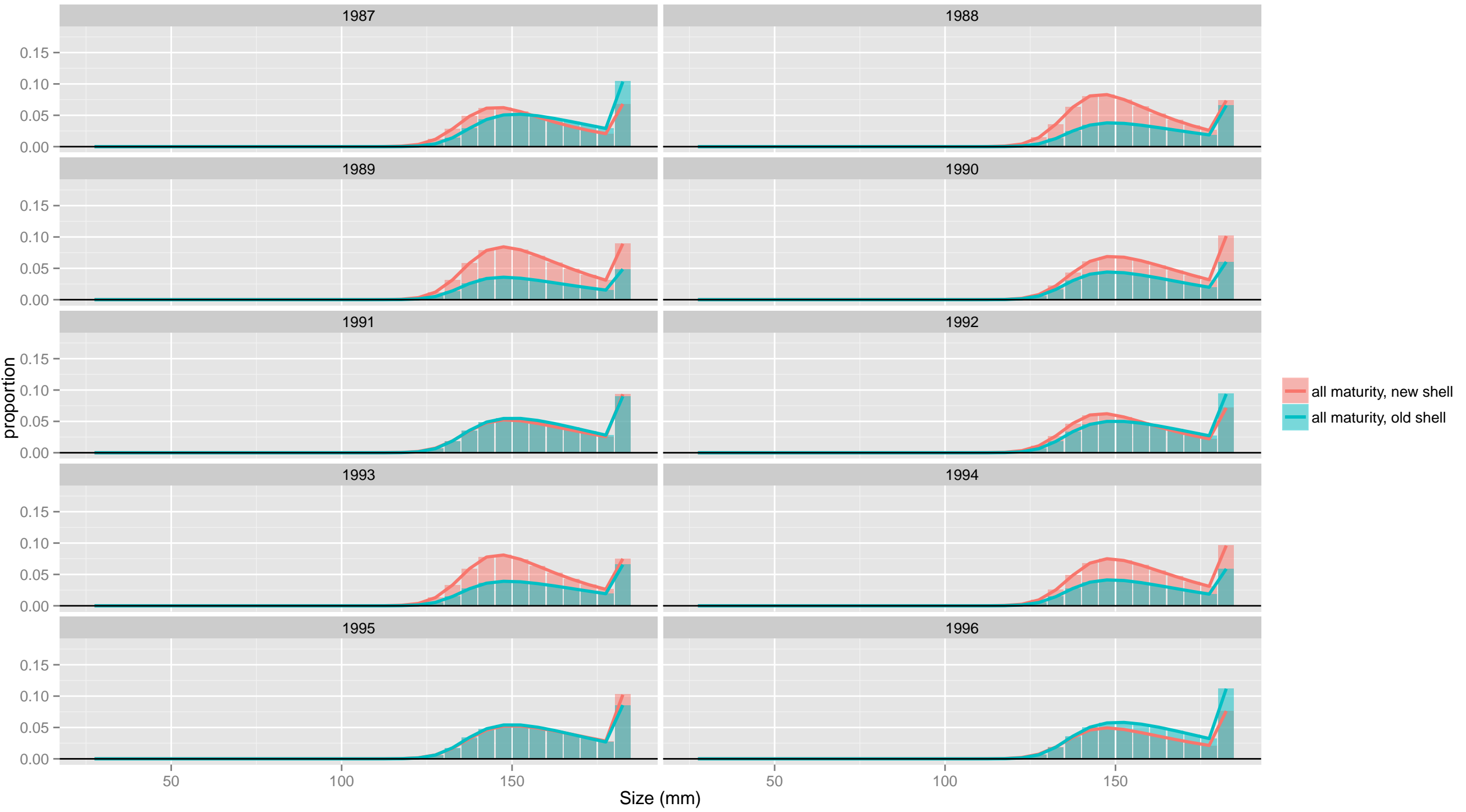
Retained Catch: TCF: male



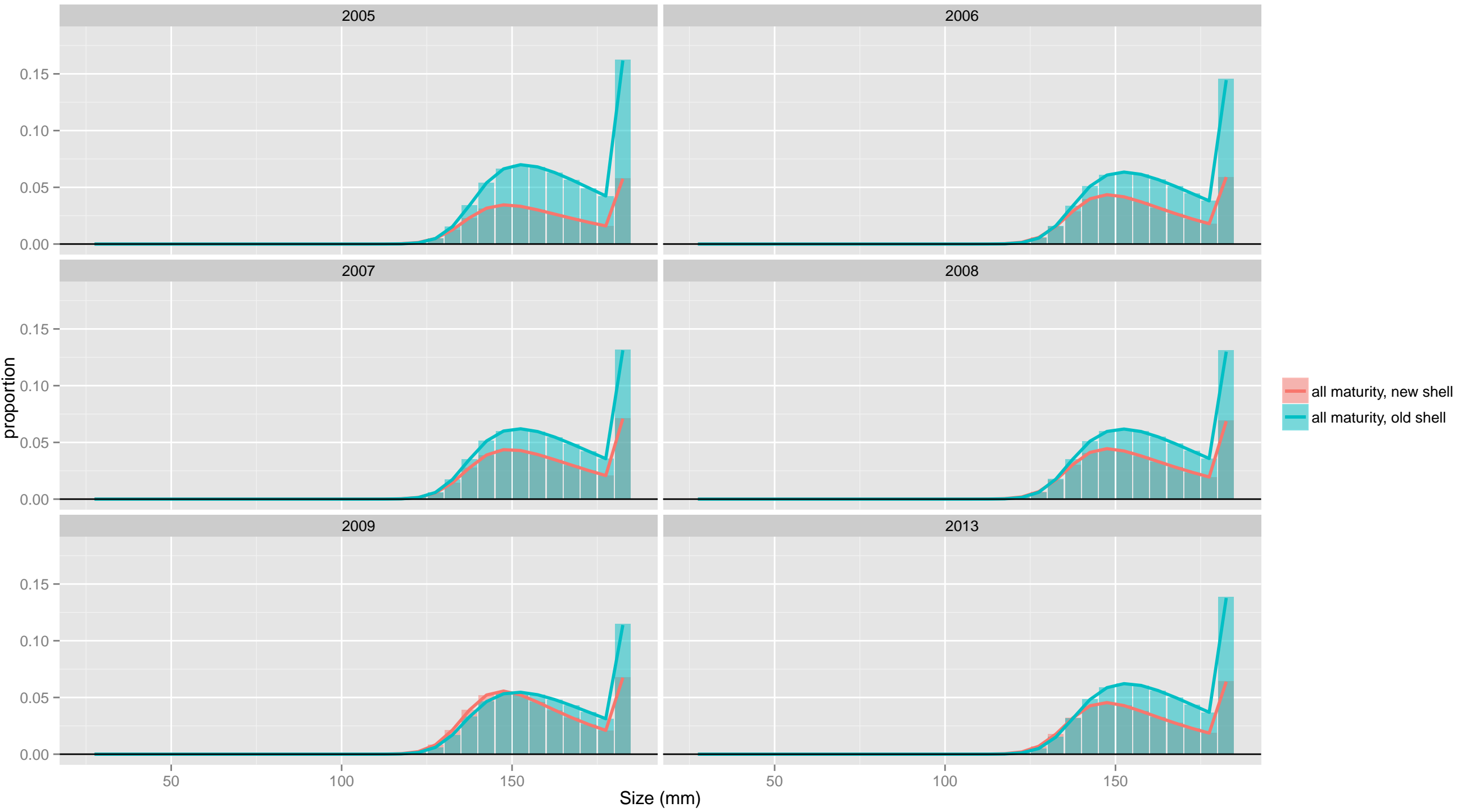
Retained Catch: TCF: male



Retained Catch: TCF: male

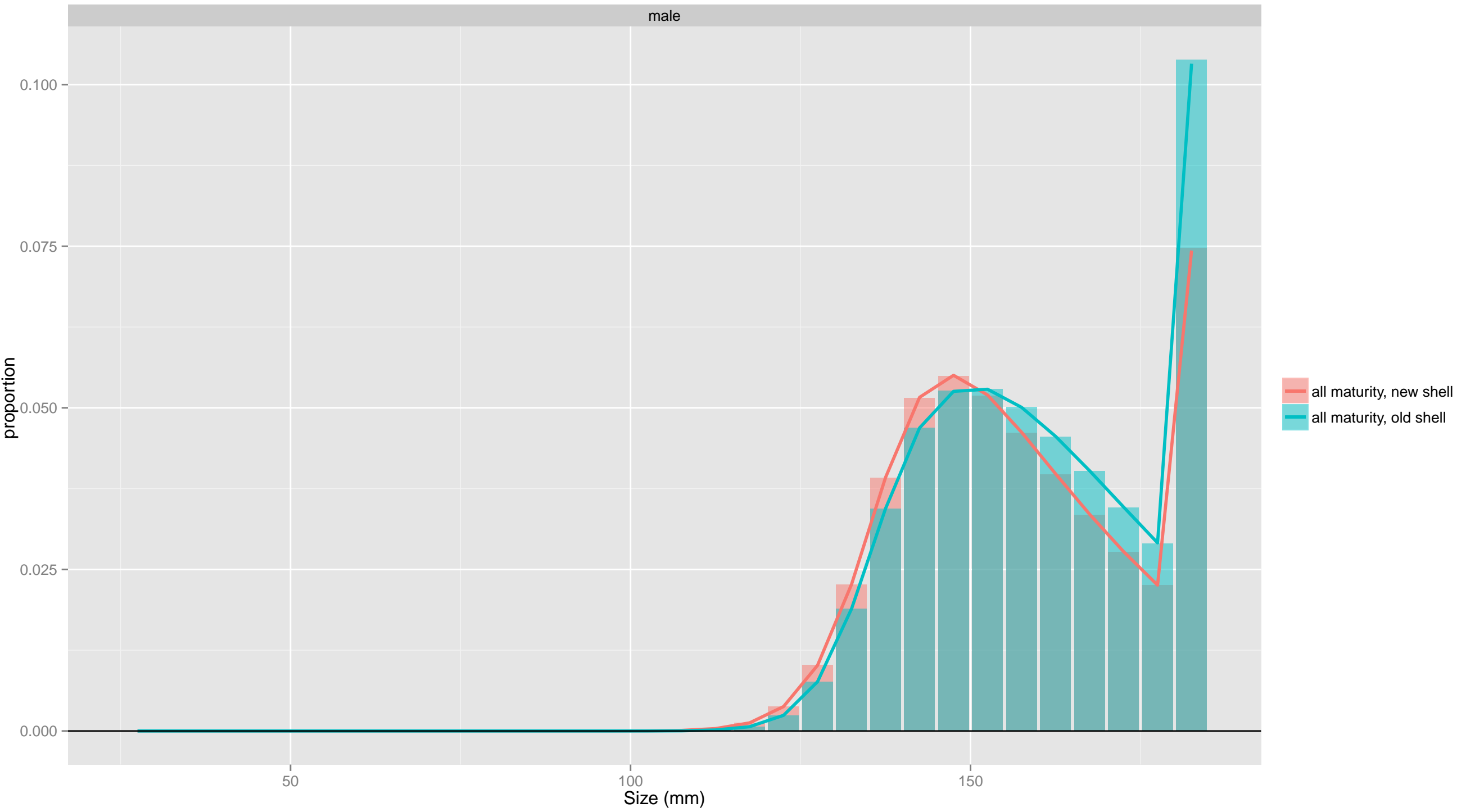


Retained Catch: TCF: male



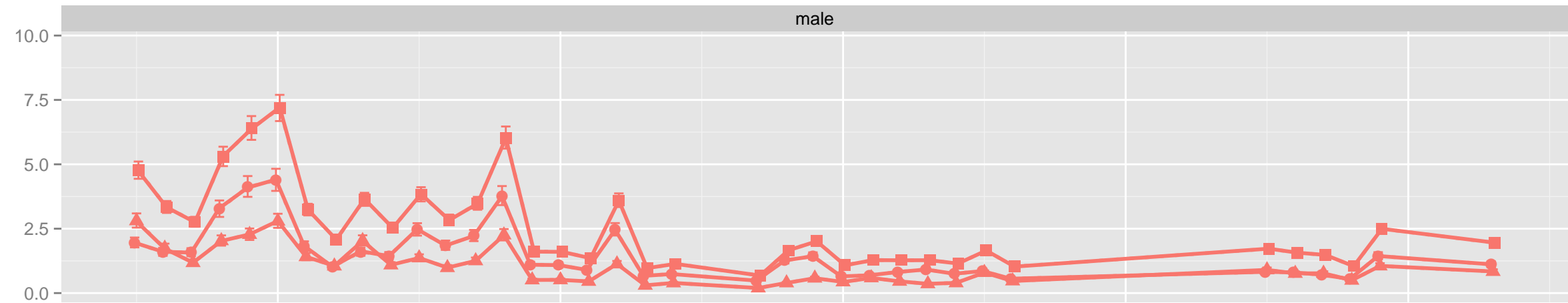
Retained Catch: TCF

male

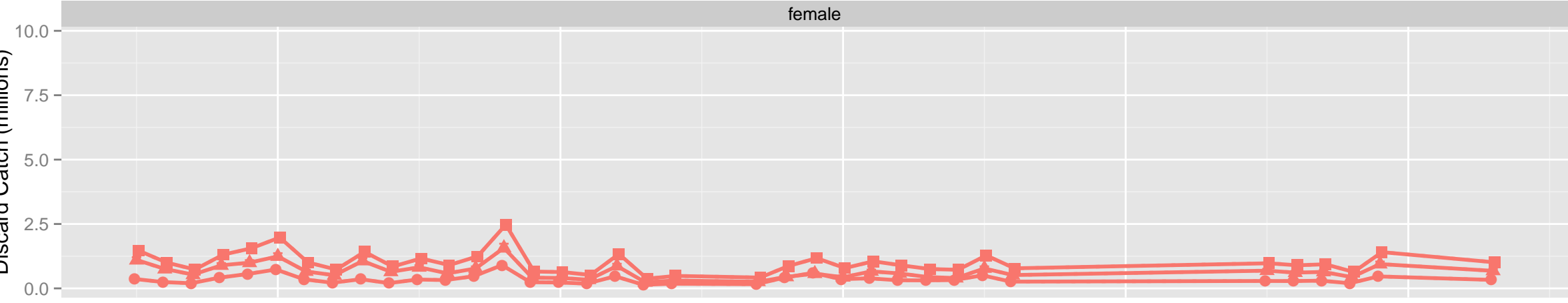


TCF

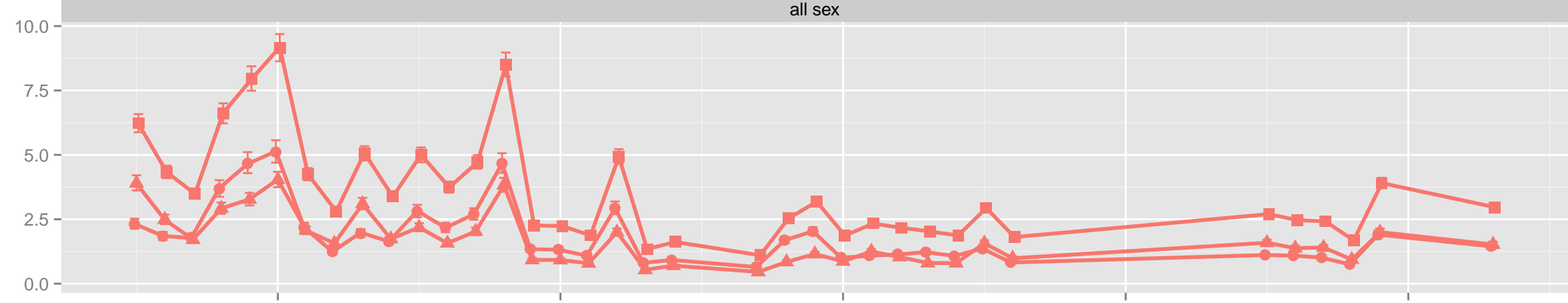
male



female



all sex



s

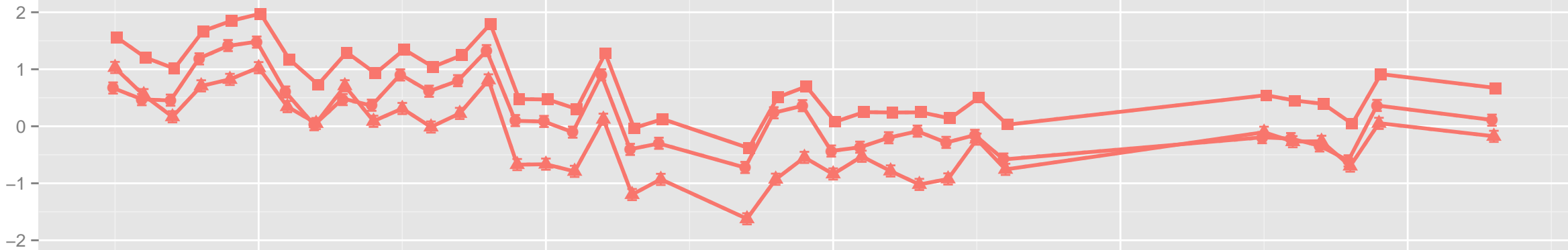
- new shell
- ▲ old shell
- all shell

m

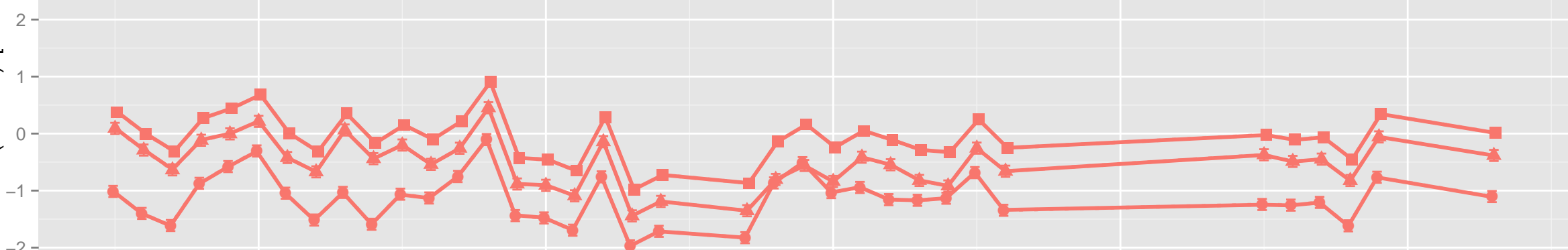
- all maturity

TCF

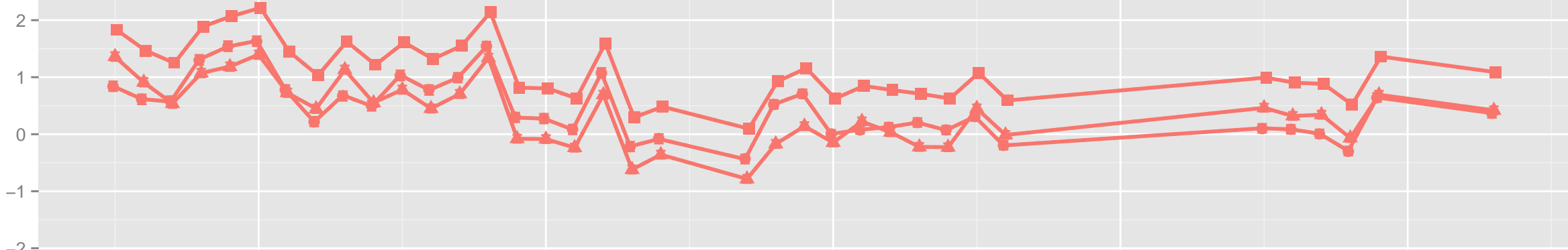
male



female

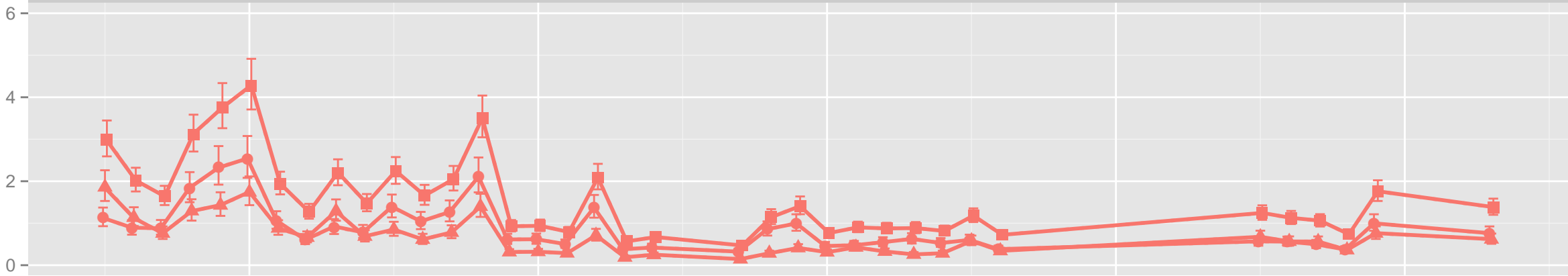


all sex

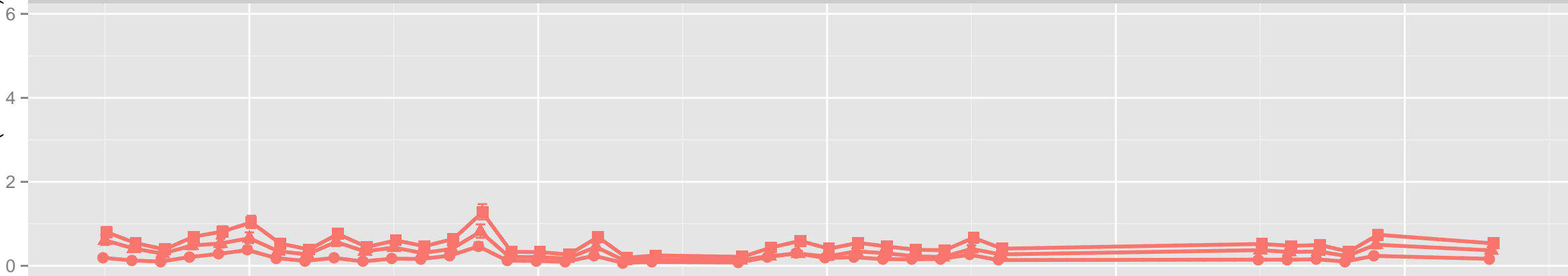


TCF

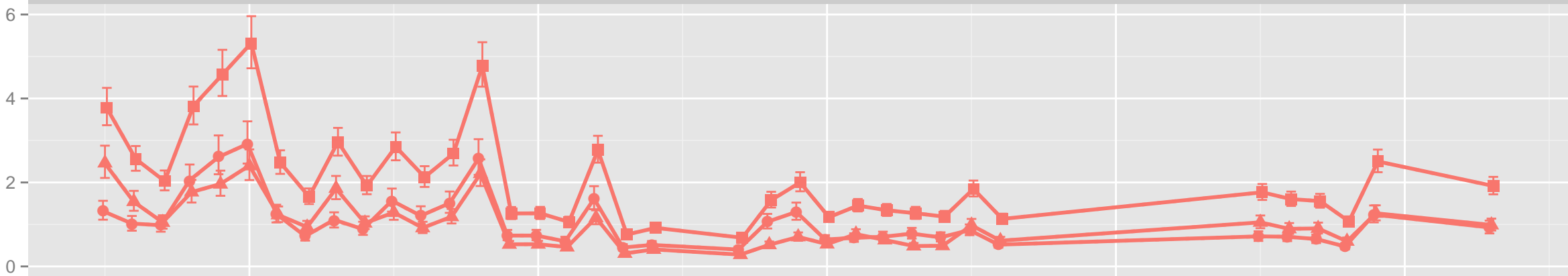
male



female



all sex



s

- new shell
- ▲ old shell
- all shell

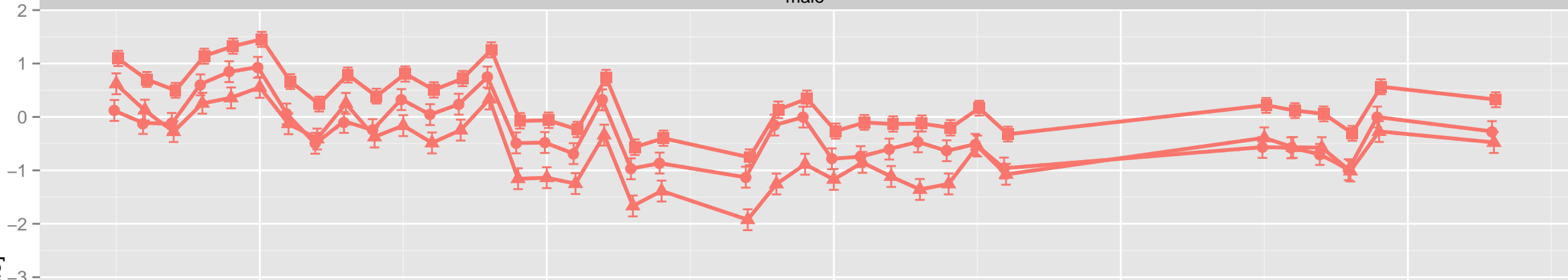
m

- all maturity

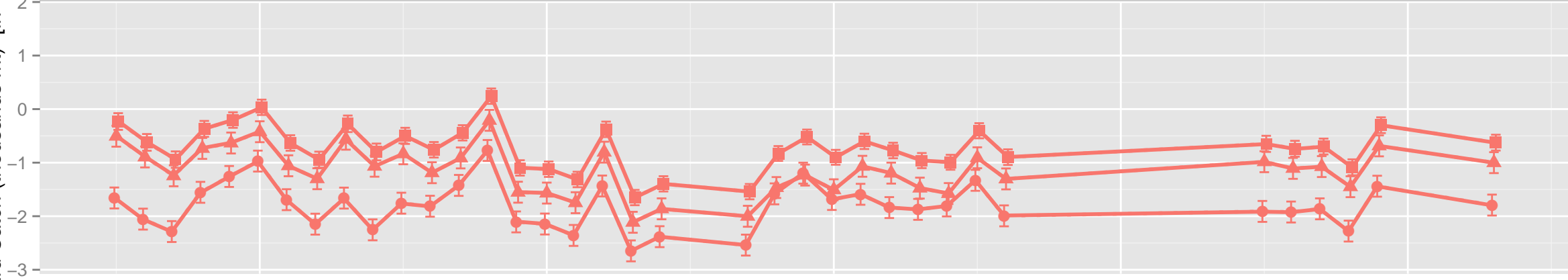
y

TCF

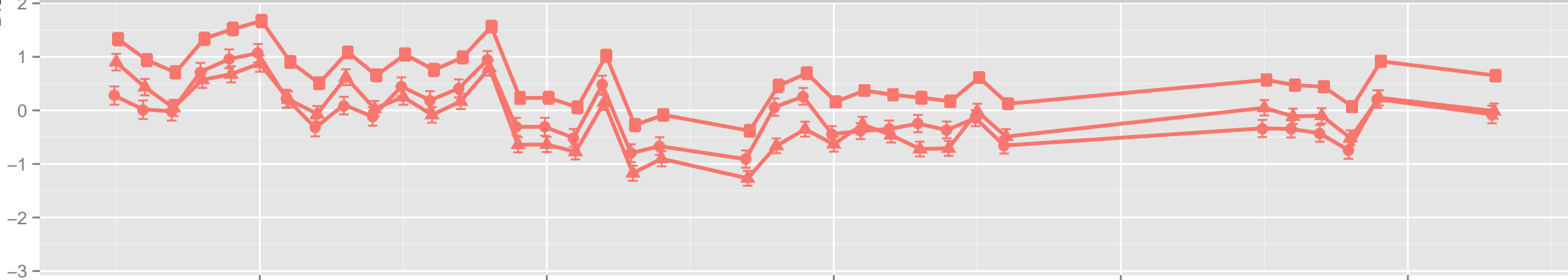
male



female



all sex



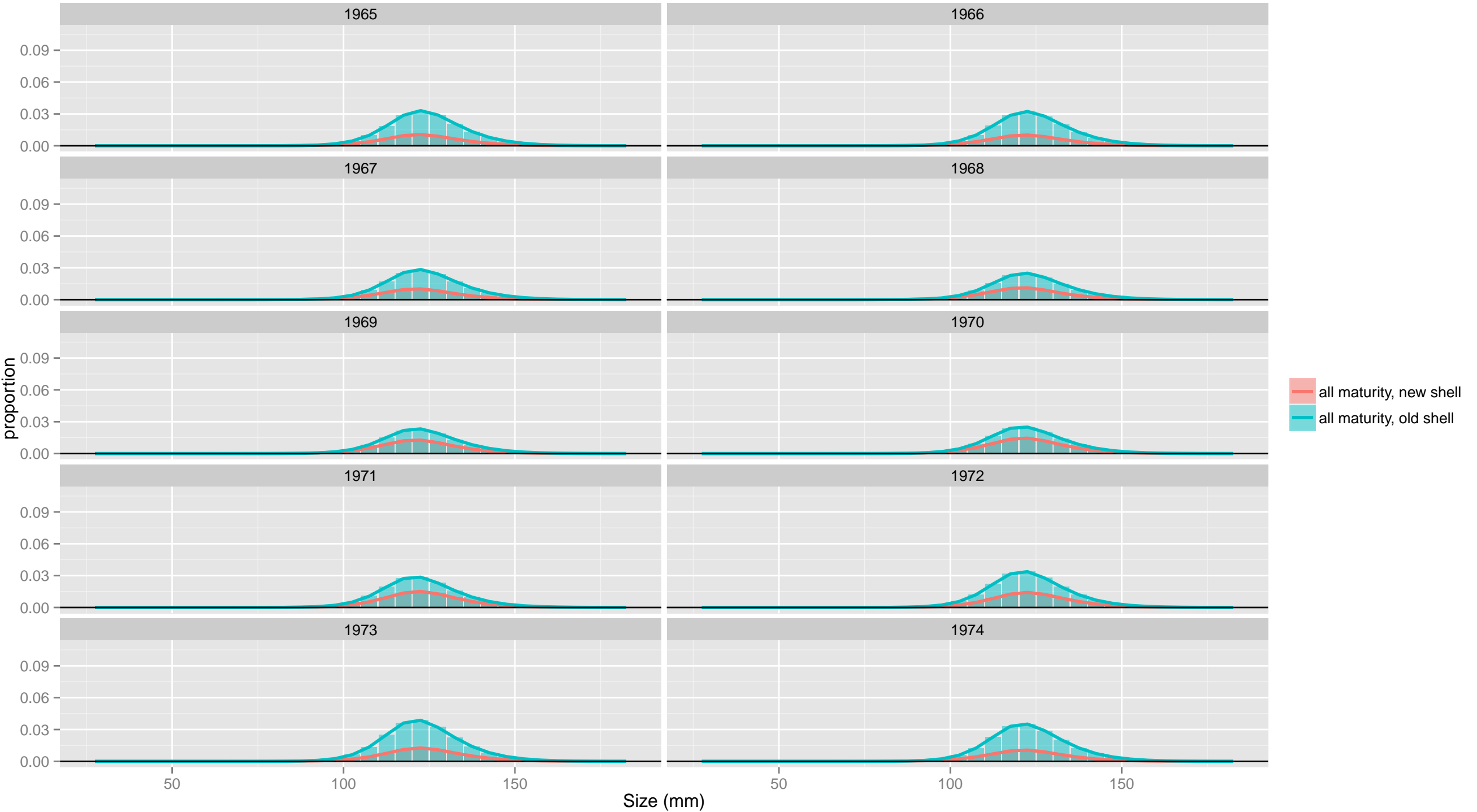
s

- new shell
- ▲ old shell
- all shell

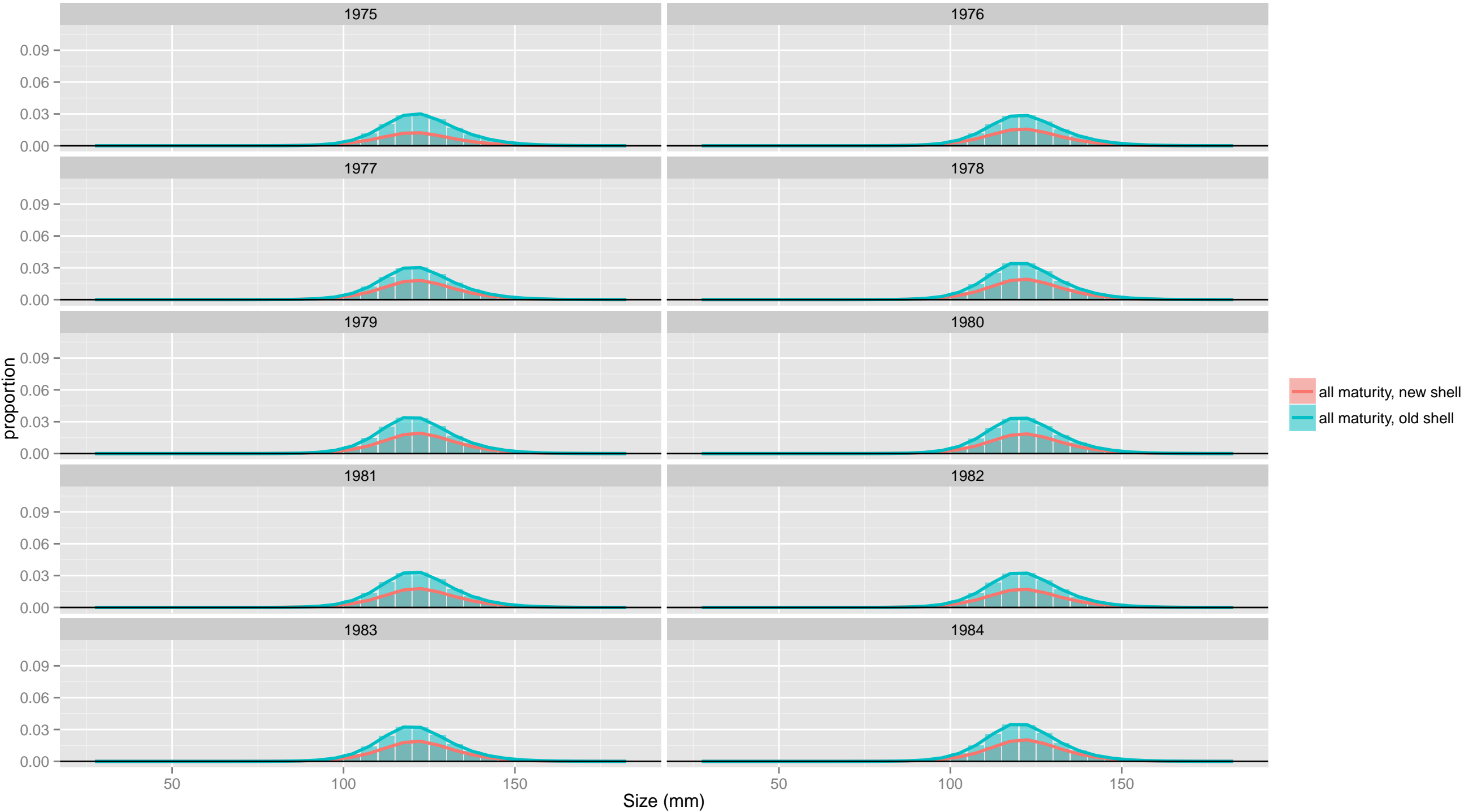
m

- all maturity

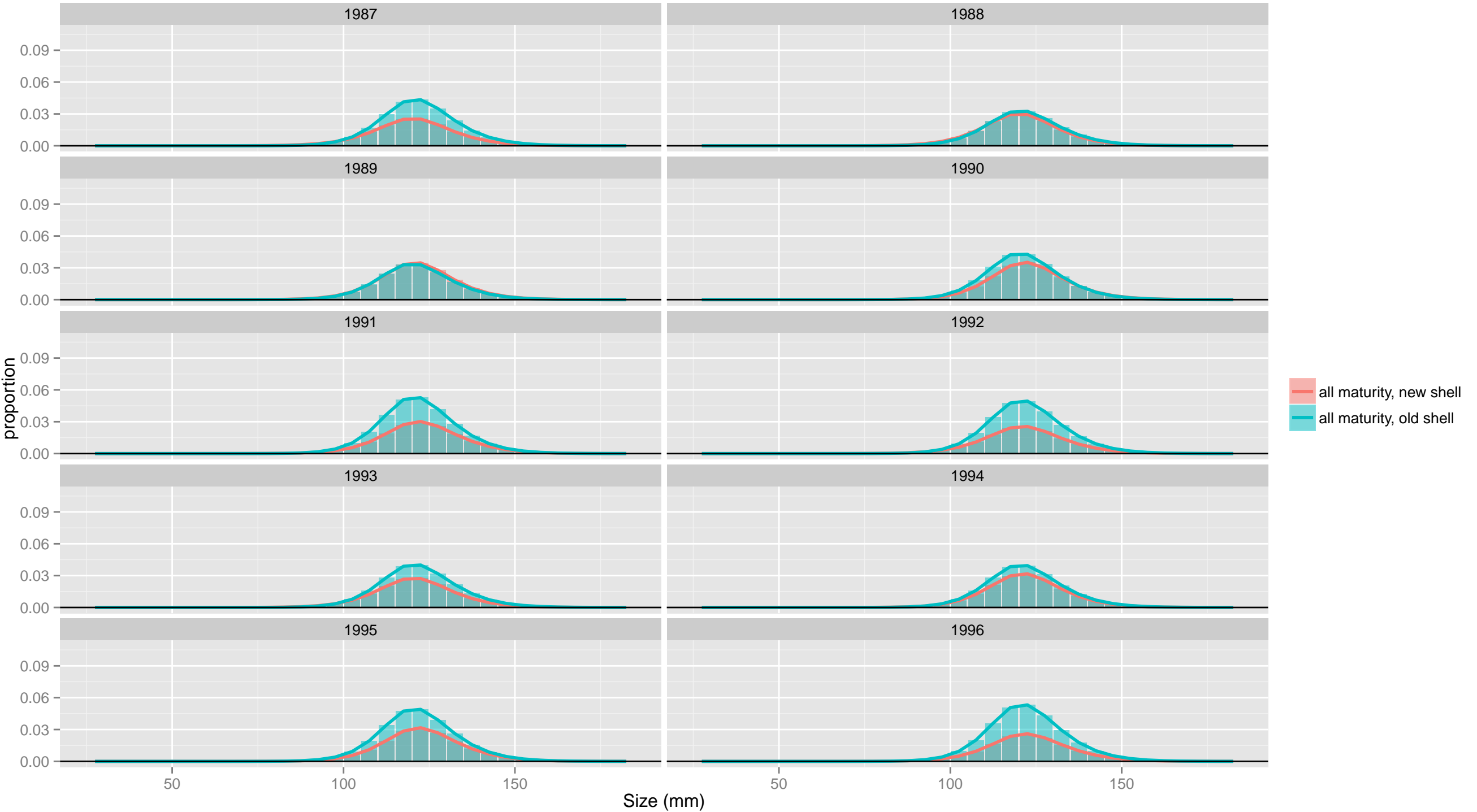
Discard Catch: TCF: female



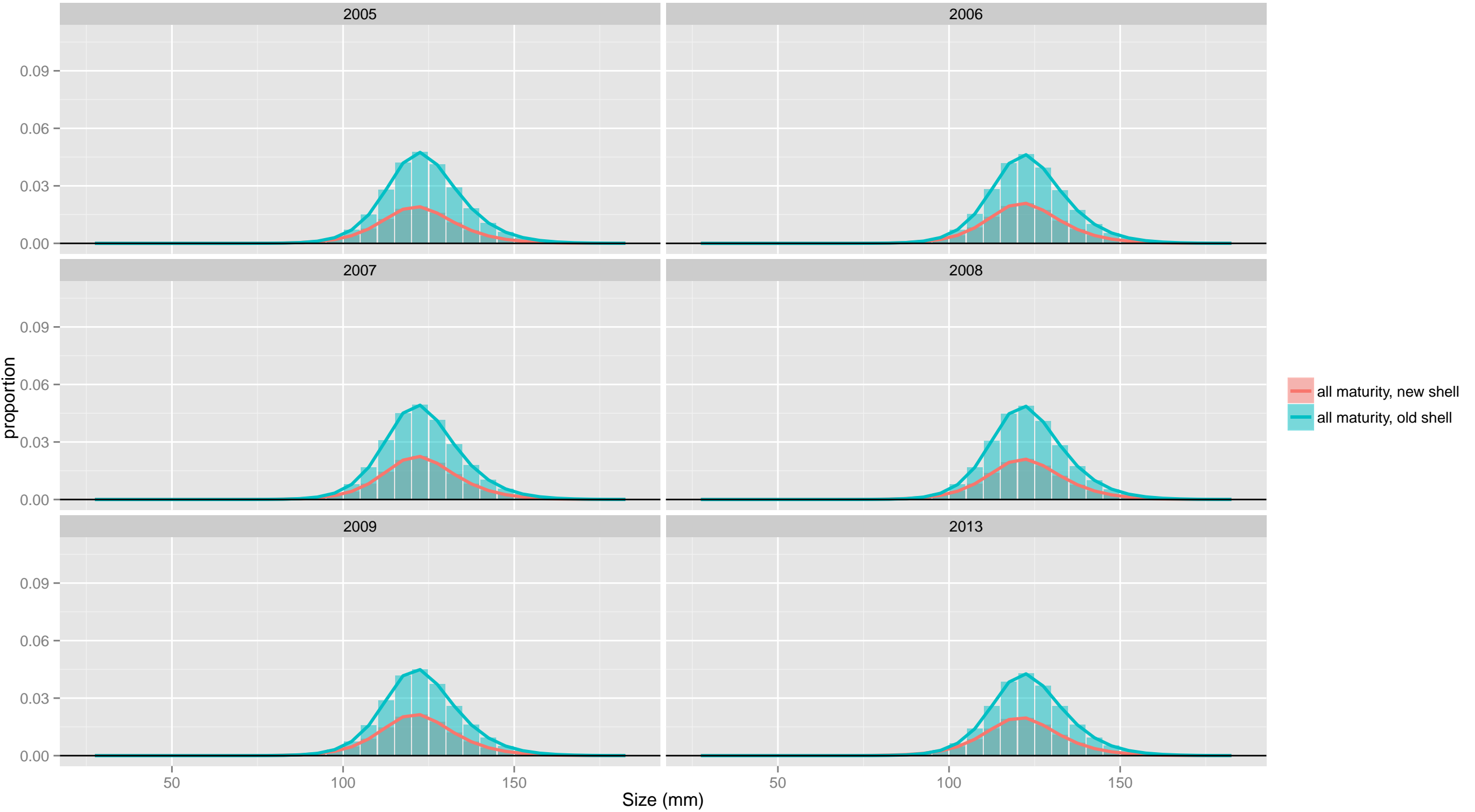
Discard Catch: TCF: female



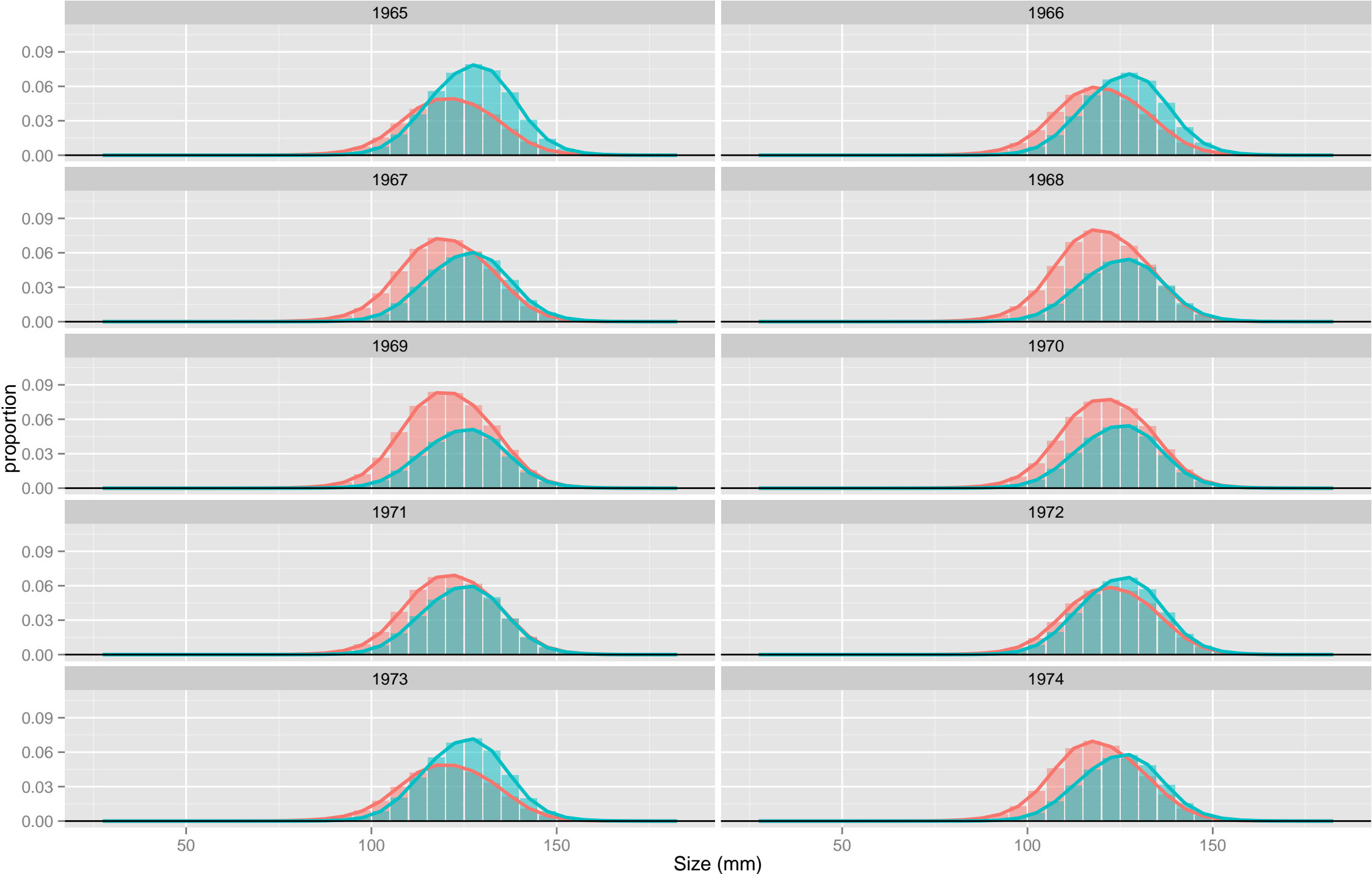
Discard Catch: TCF: female



Discard Catch: TCF: female

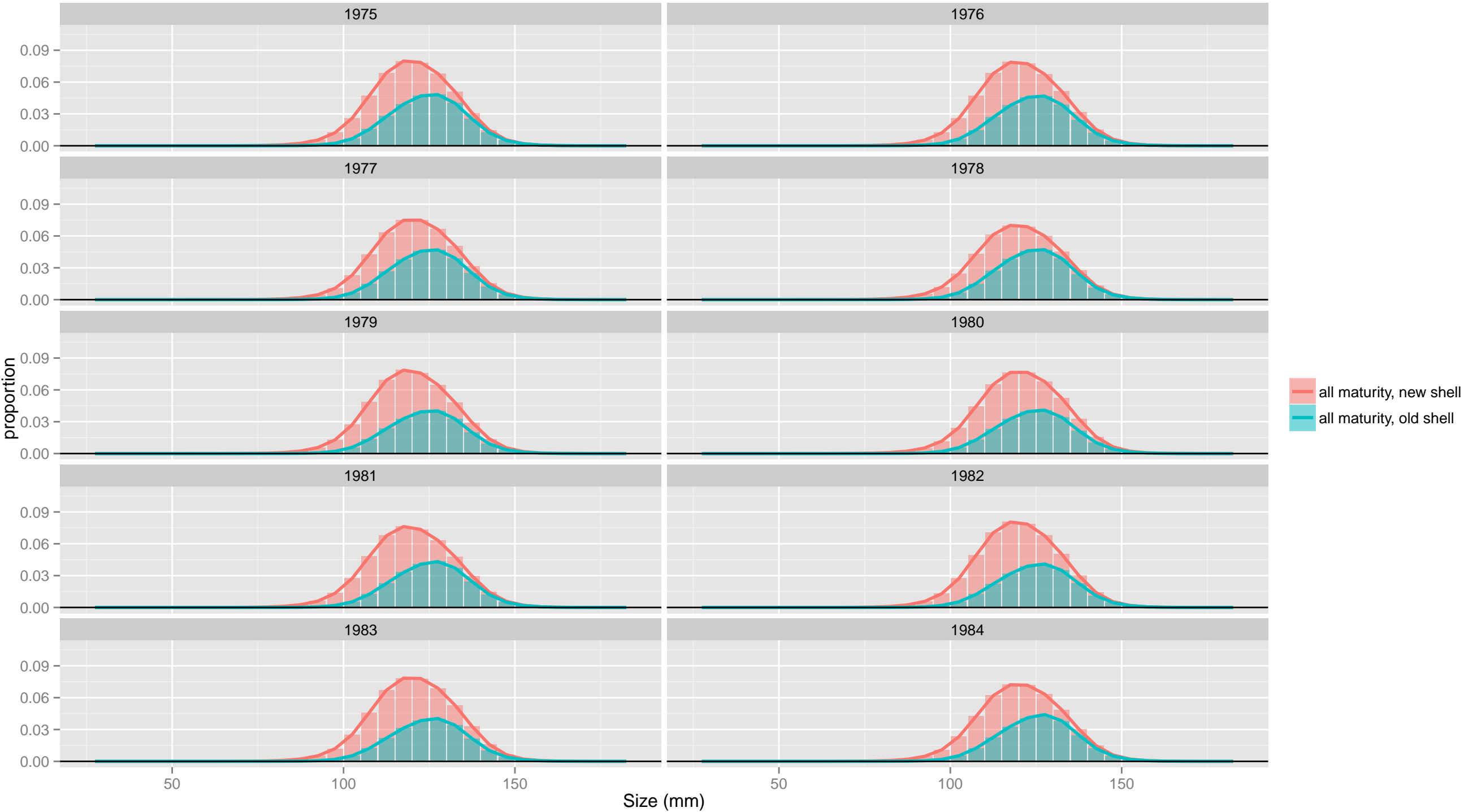


Discard Catch: TCF: male

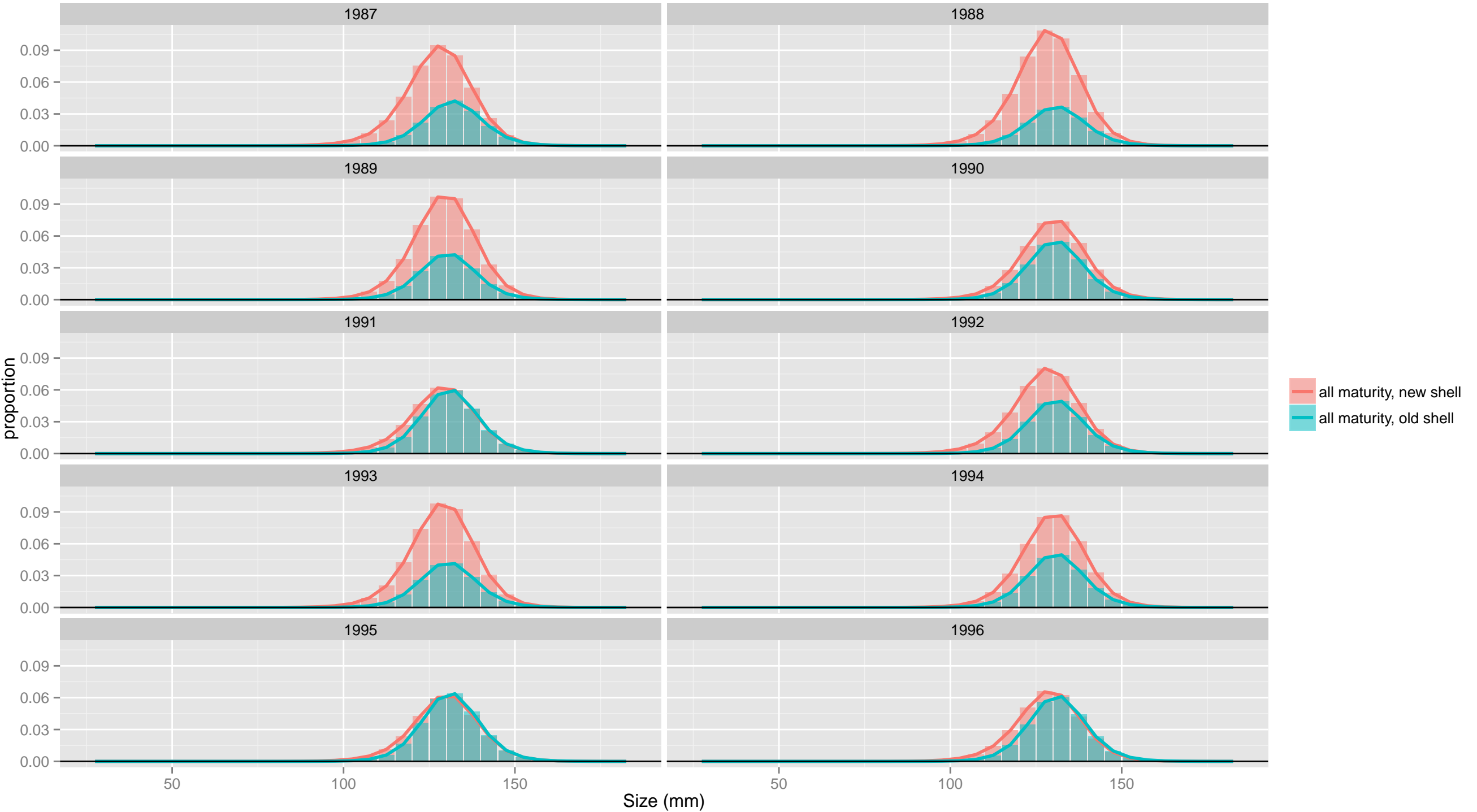


— all maturity, new shell
— all maturity, old shell

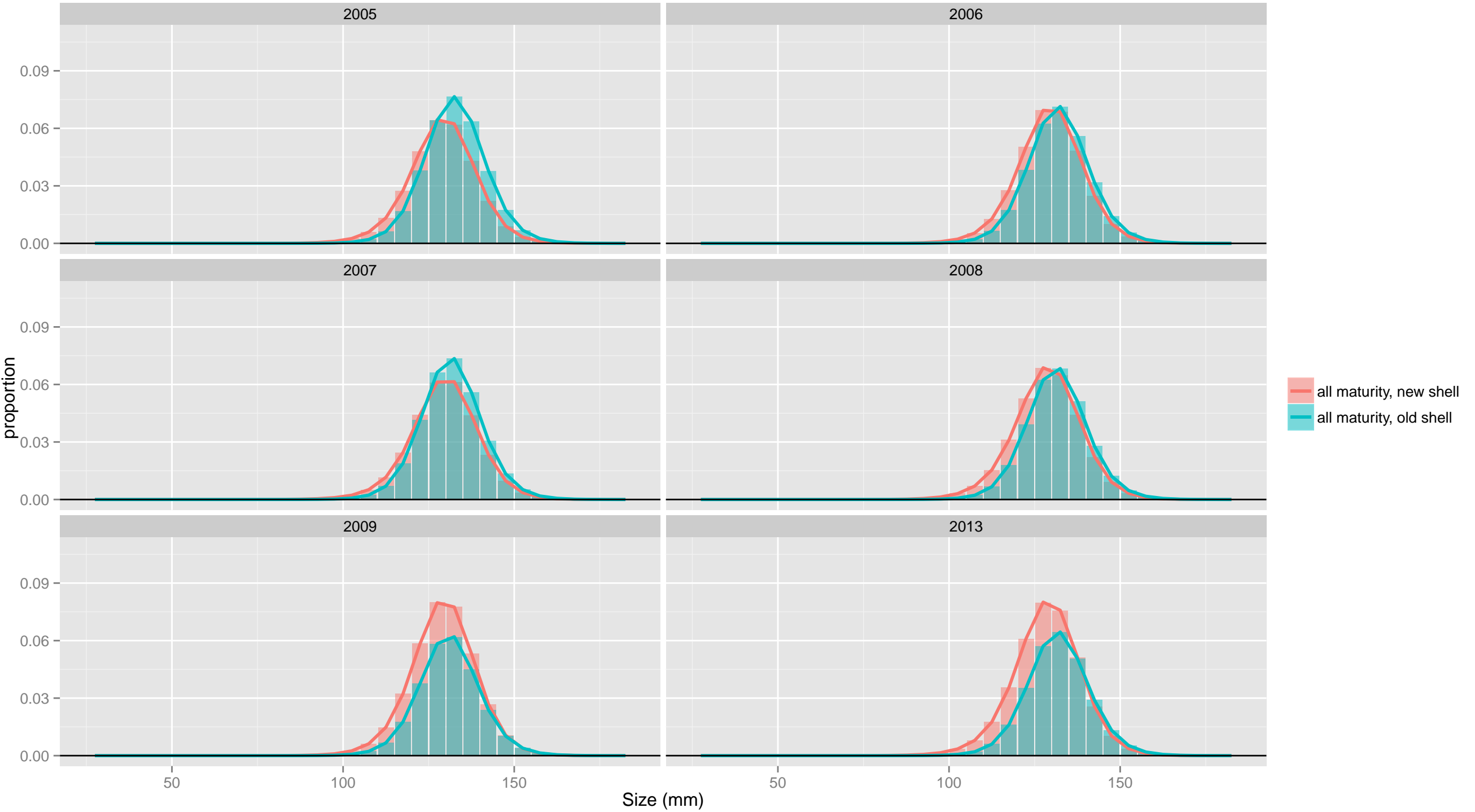
Discard Catch: TCF: male



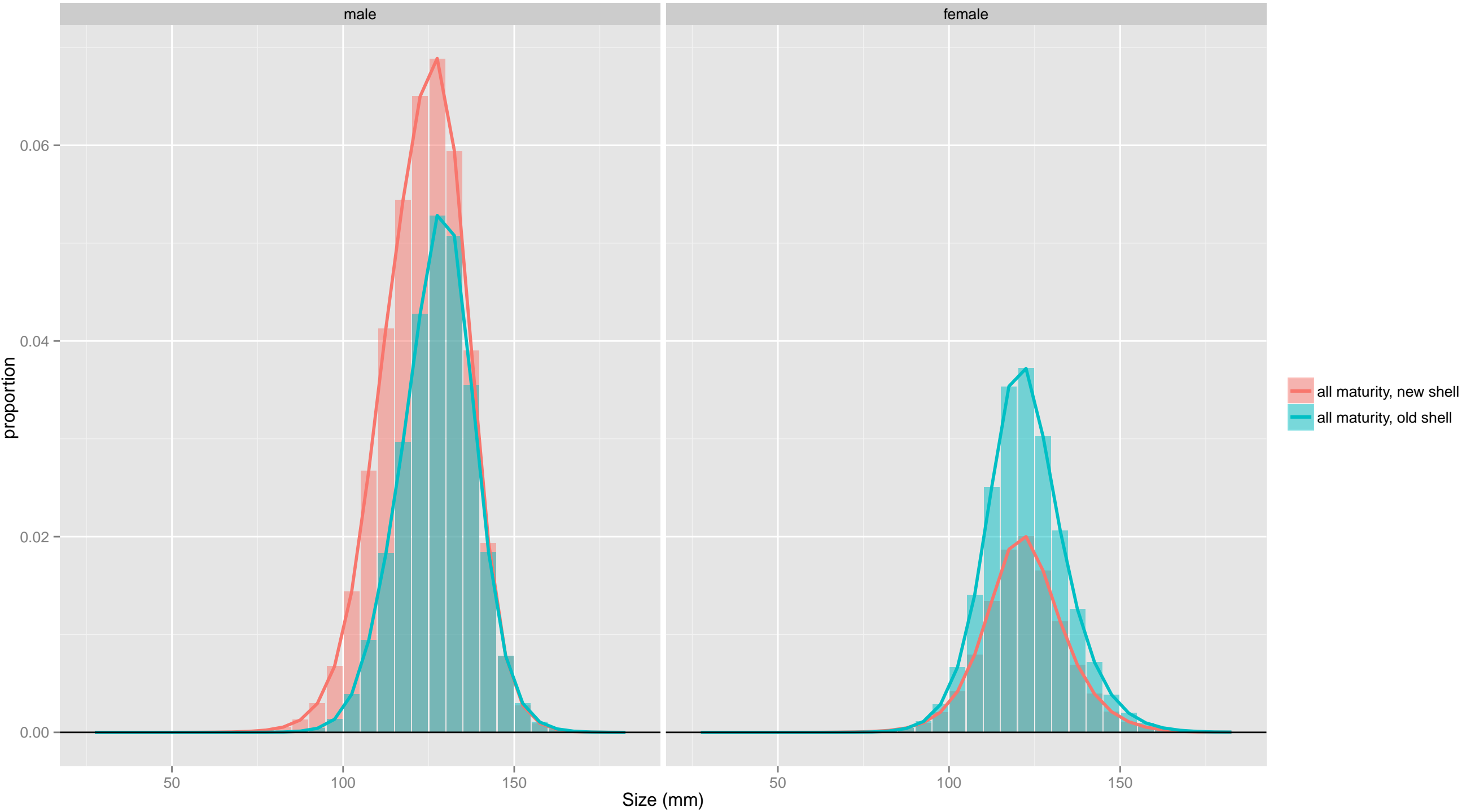
Discard Catch: TCF: male



Discard Catch: TCF: male

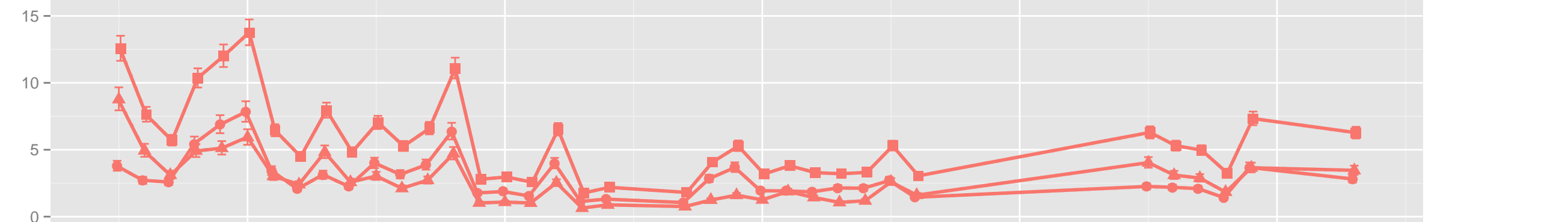


Discard Catch: TCF

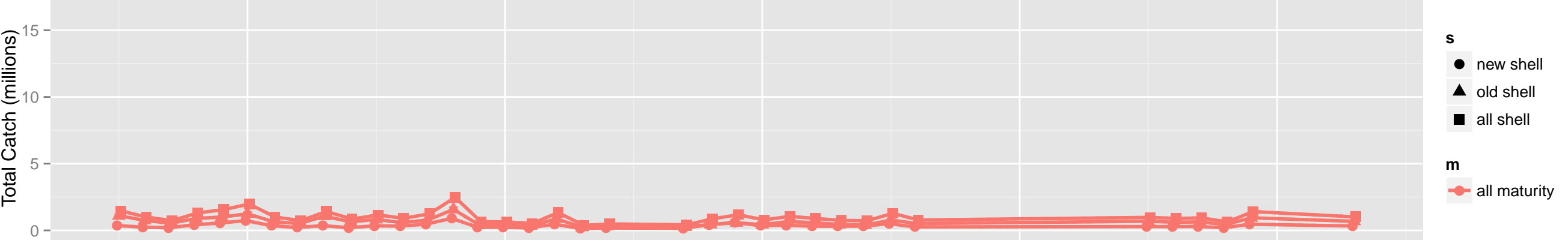


TCF

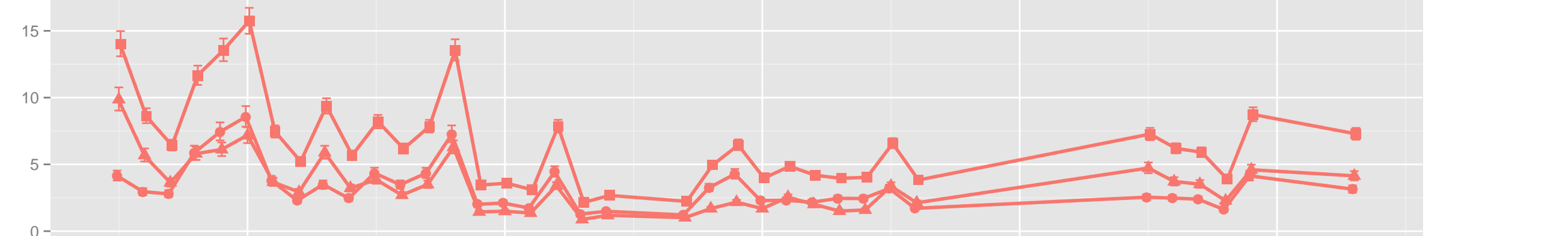
male



female



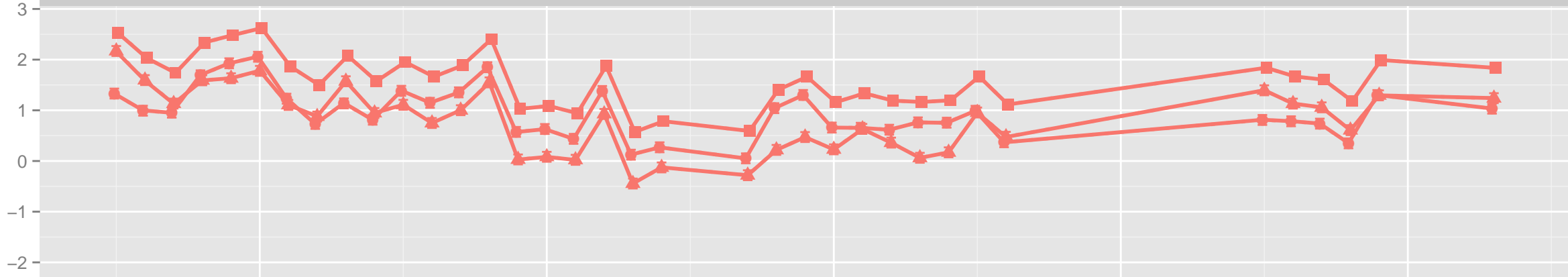
all sex



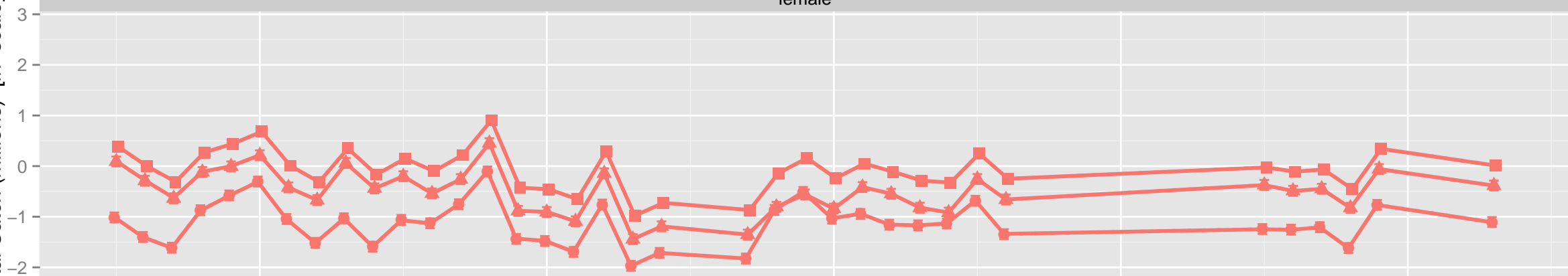
y

TCF

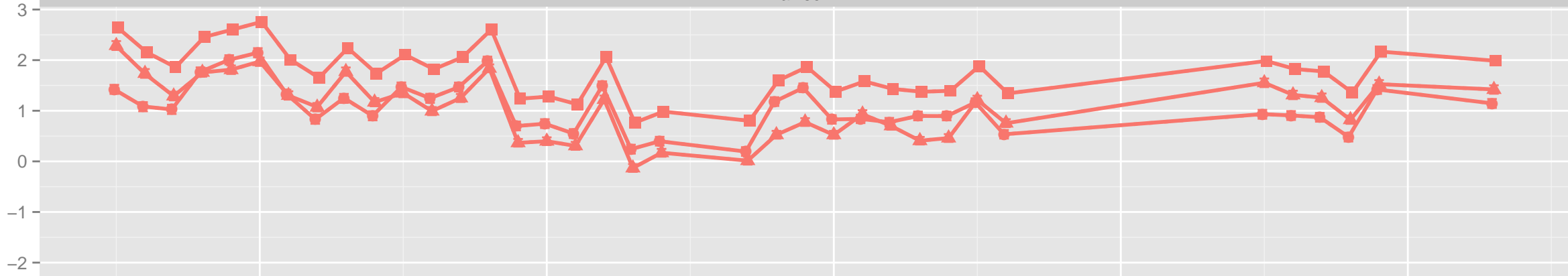
male



female

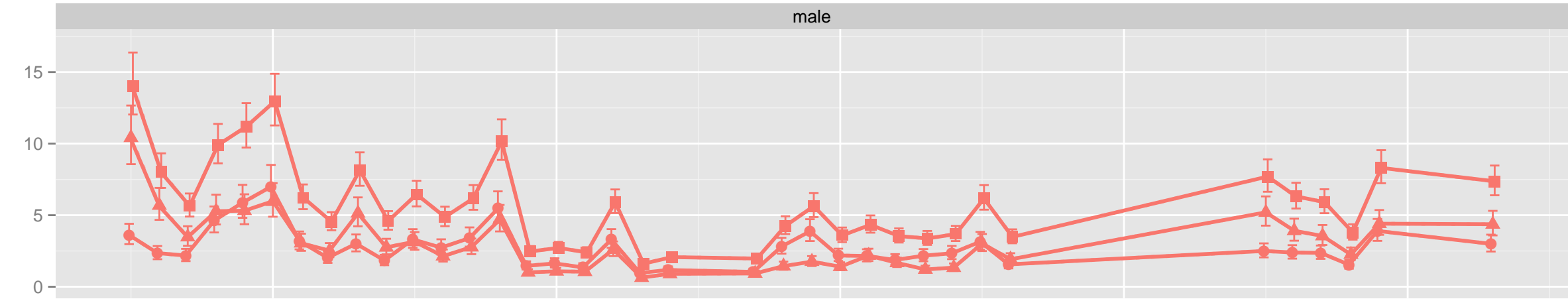


all sex

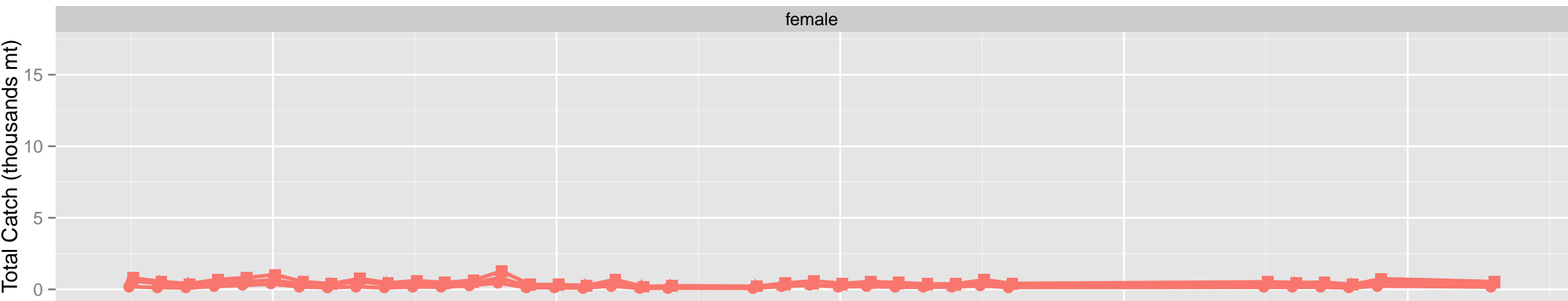


TCF

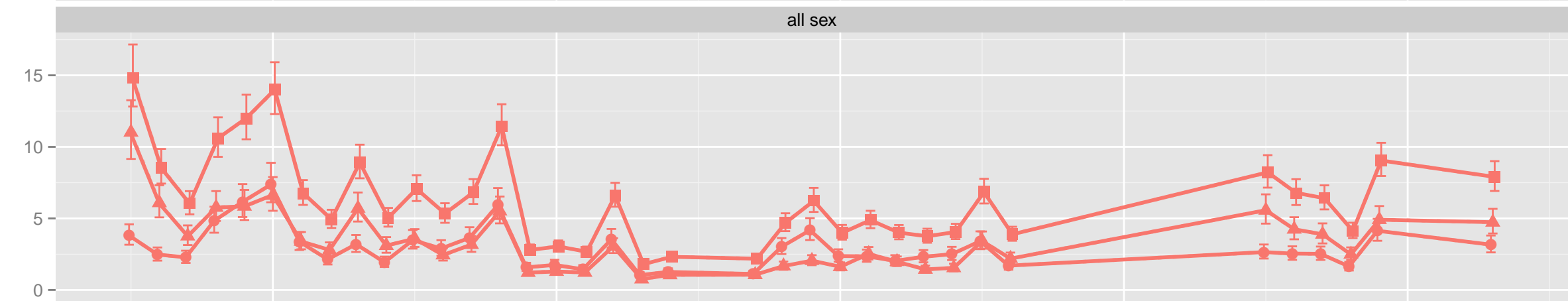
male



female



all sex



s

- new shell
- ▲ old shell
- all shell

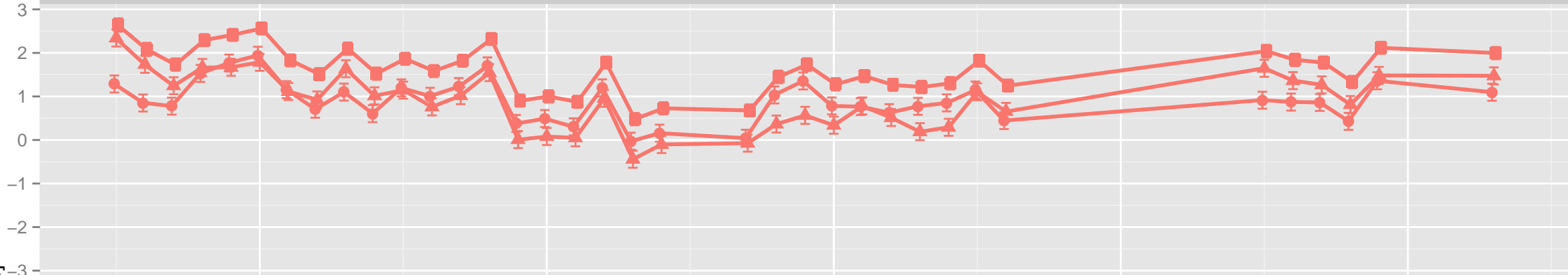
m

- all maturity

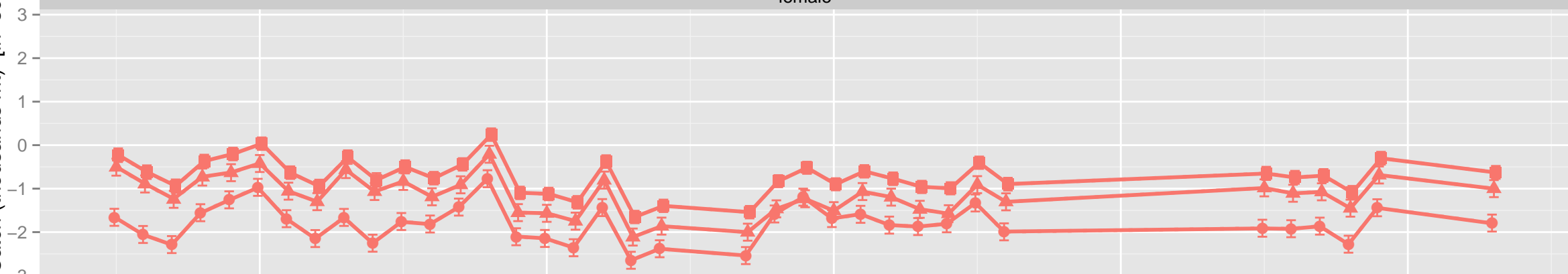
y

TCF

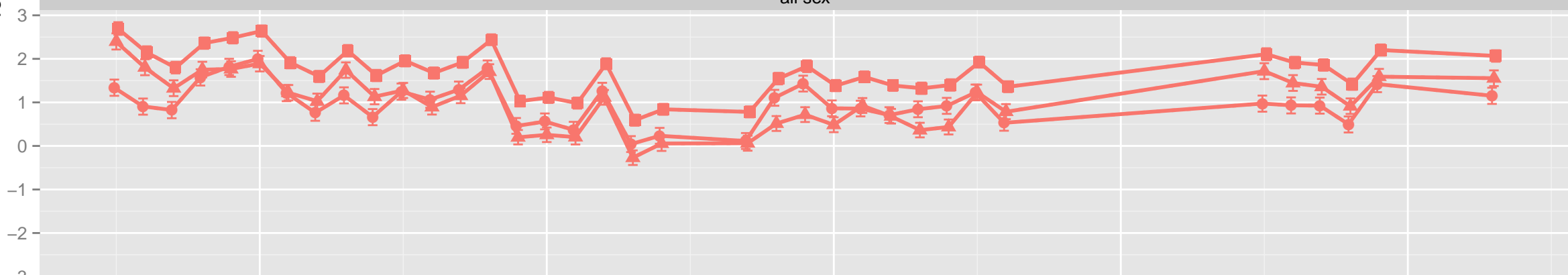
male



female



all sex



y

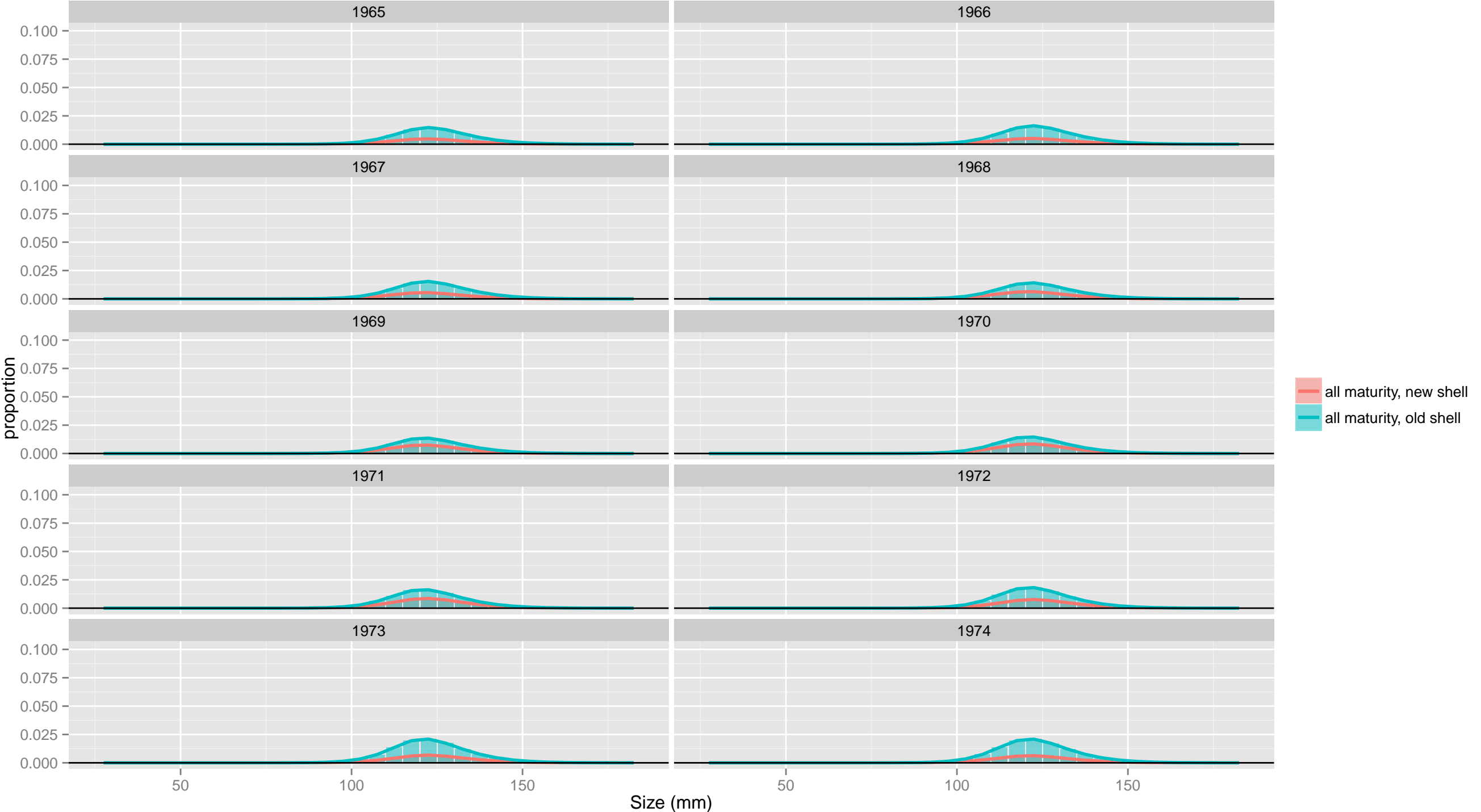
s

- new shell
- ▲ old shell
- all shell

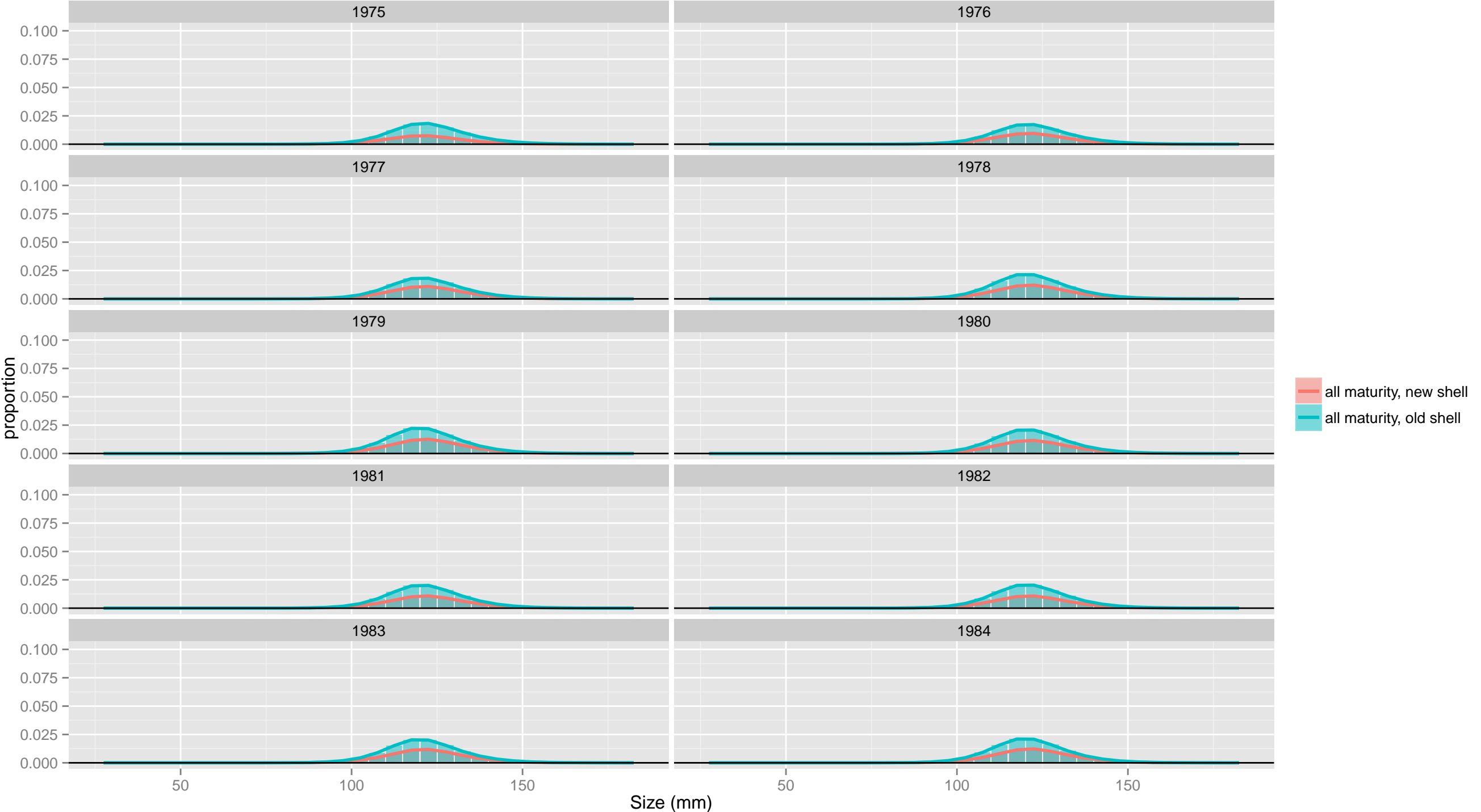
m

- all maturity

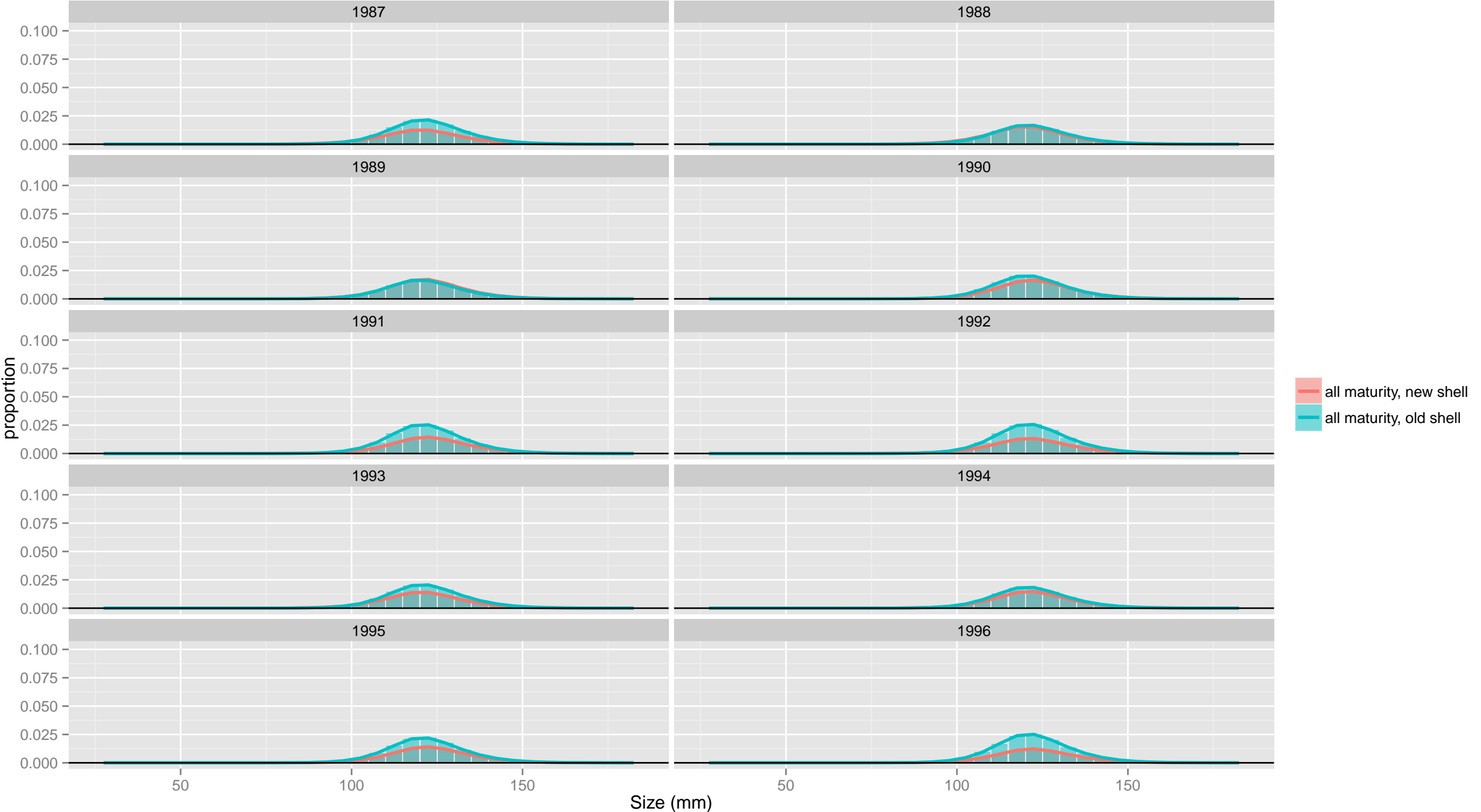
Total Catch: TCF: female



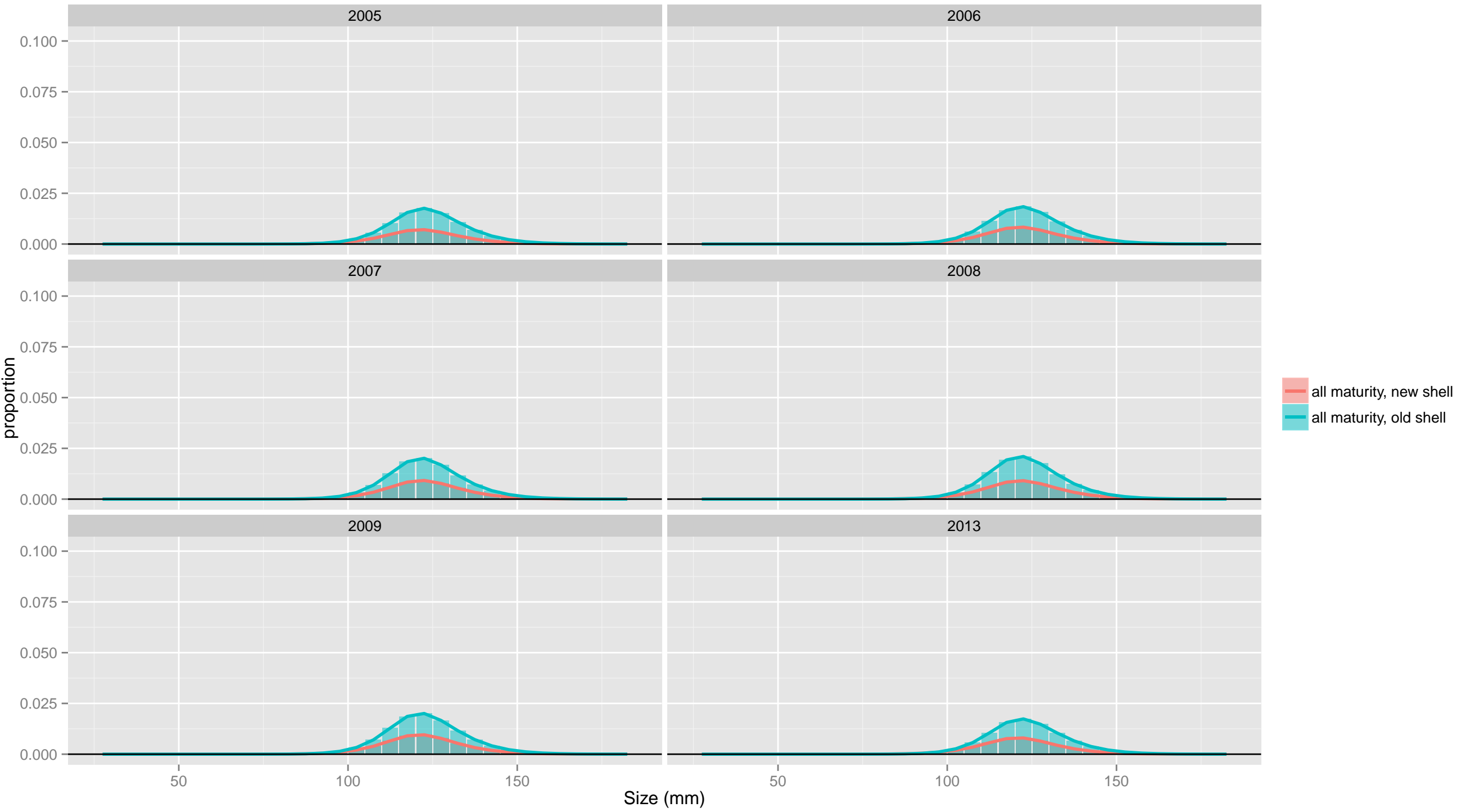
Total Catch: TCF: female



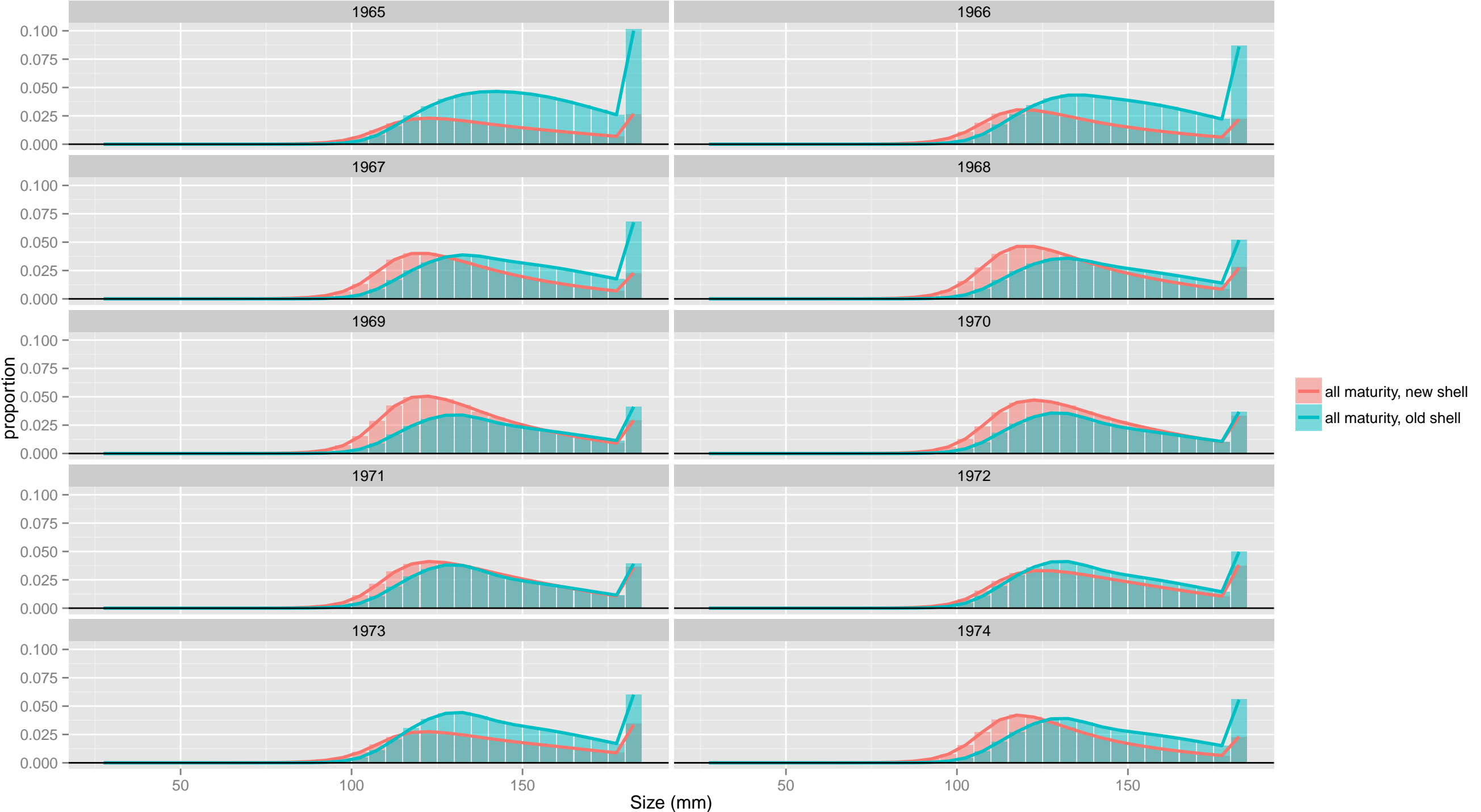
Total Catch: TCF: female



Total Catch: TCF: female



Total Catch: TCF: male



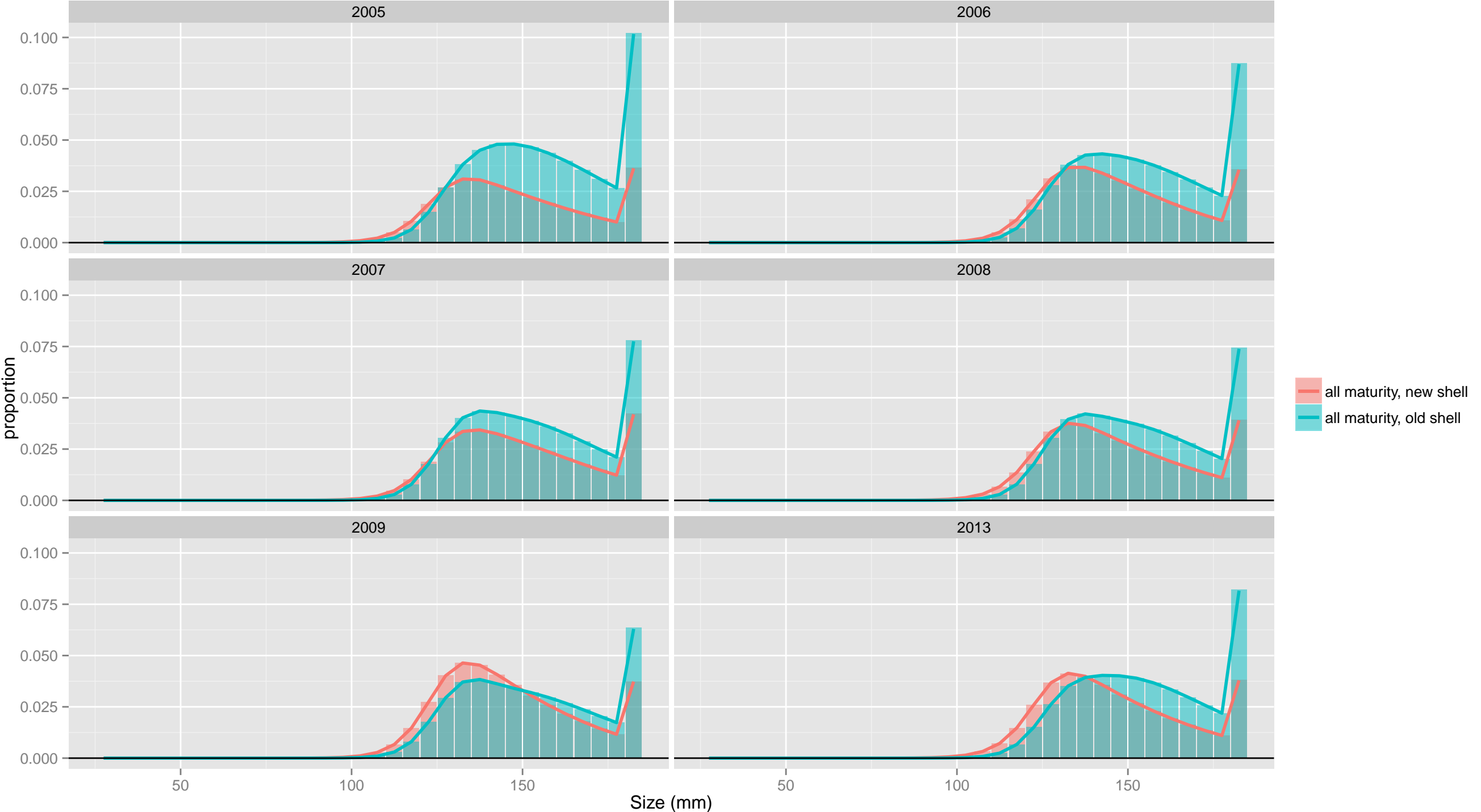
Total Catch: TCF: male



Total Catch: TCF: male



Total Catch: TCF: male



Total Catch: TCF

male

female

0.05
0.04
0.03
0.02
0.01
0.00

50

100

150

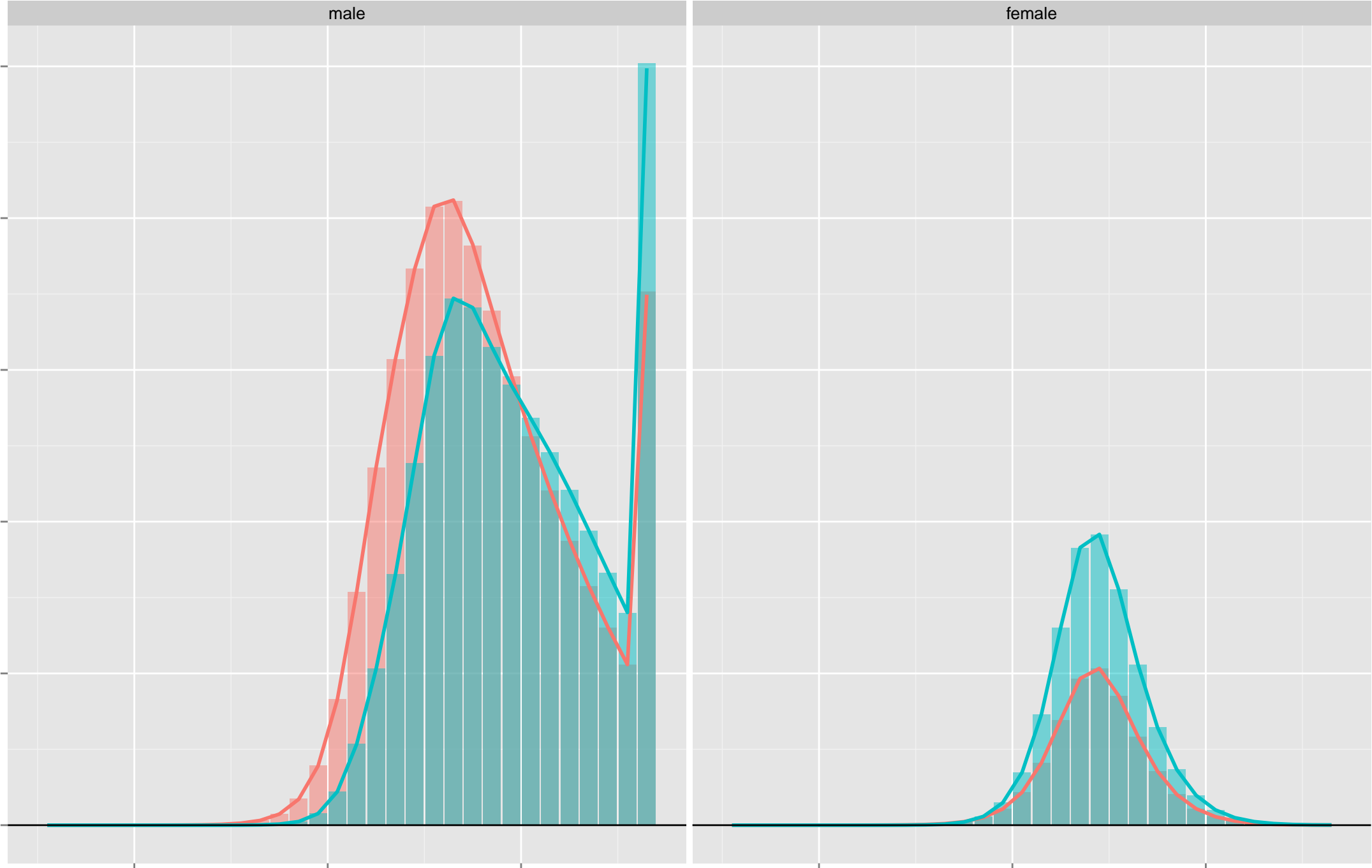
Size (mm)

50

100

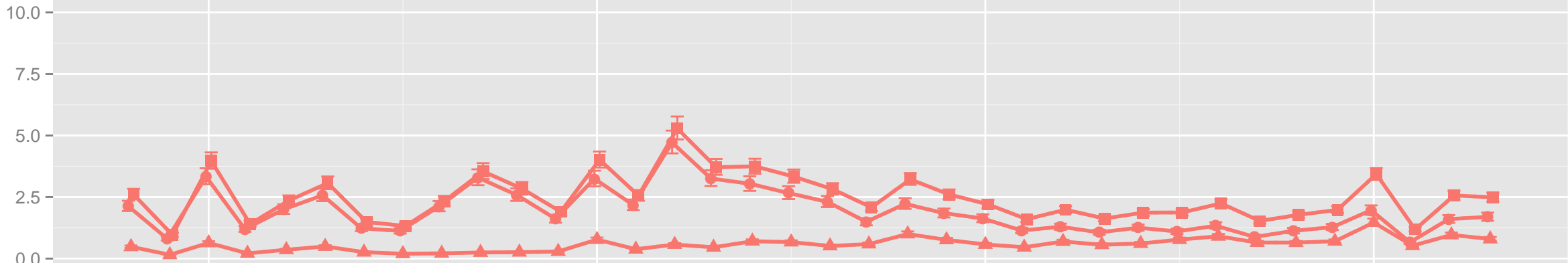
150

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

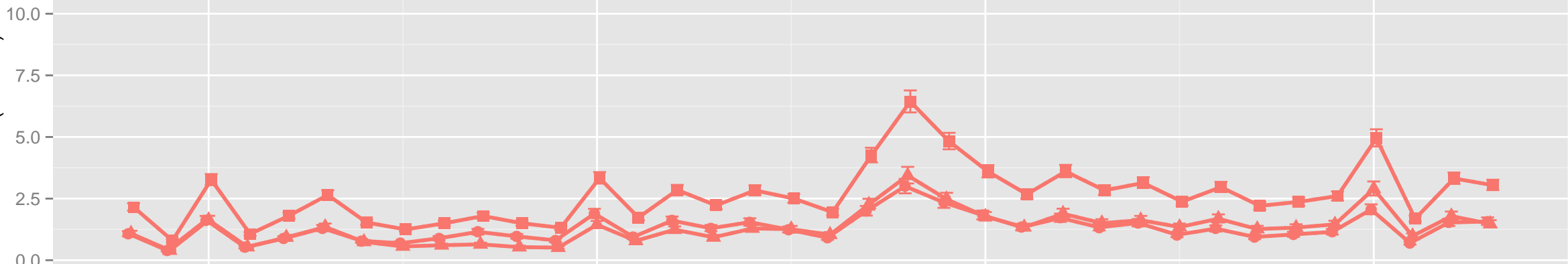


SCF

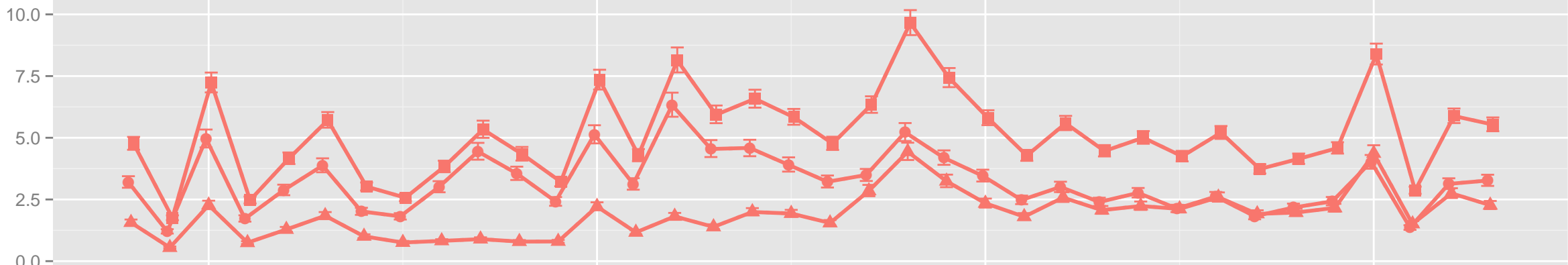
male



female



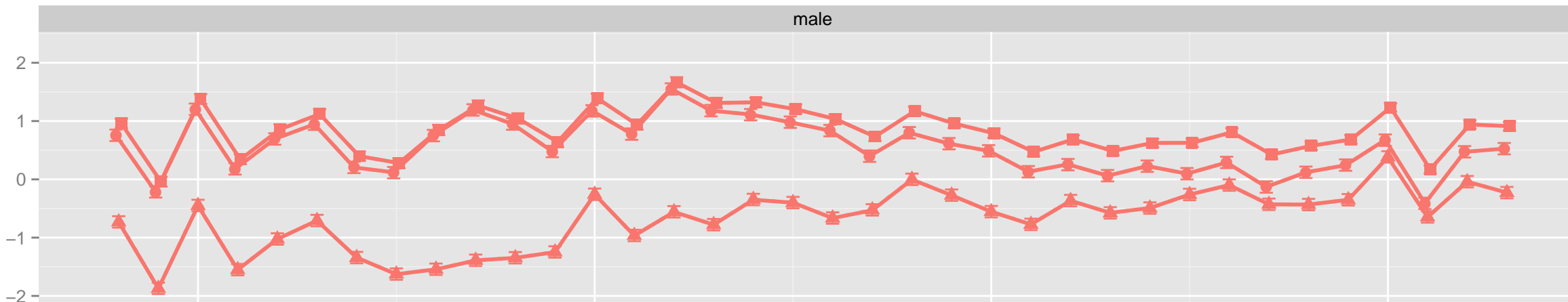
all sex



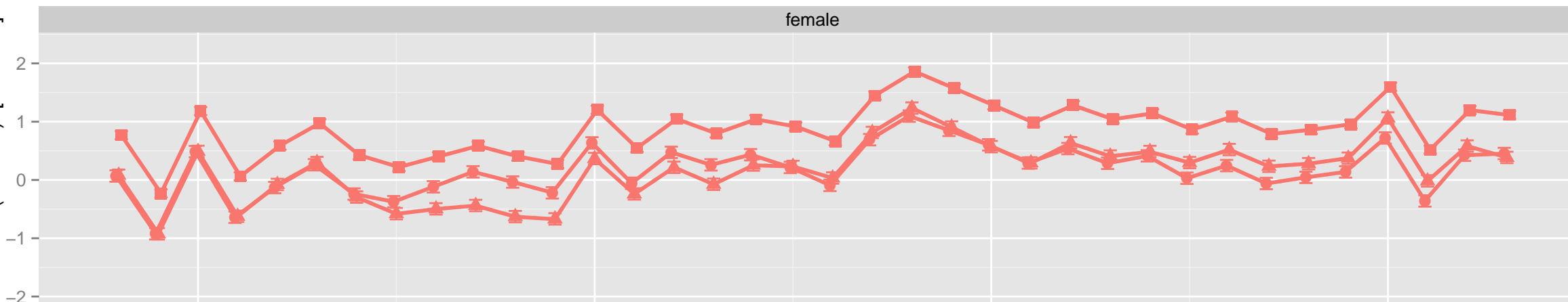
y

SCF

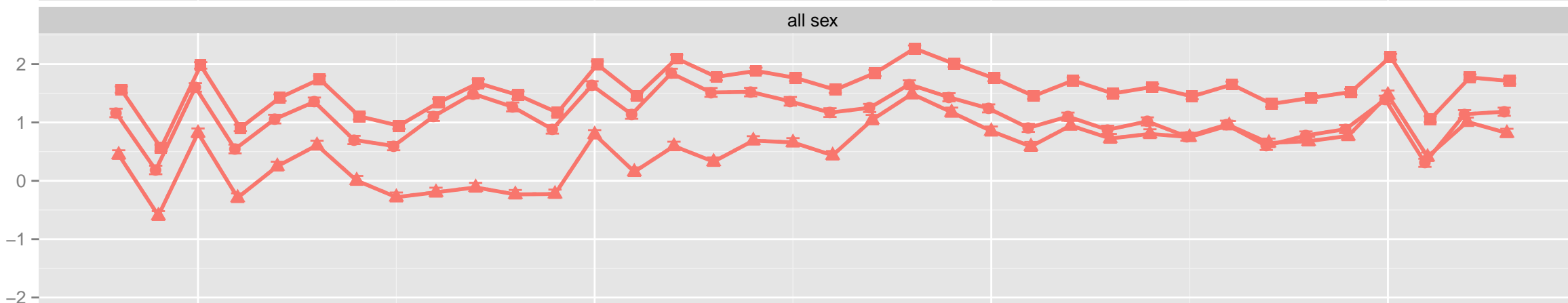
male



female



all sex



s

- new shell
- ▲ old shell
- all shell

m

- all maturity

Total Catch (millions) [ln-scale]

1980

1990

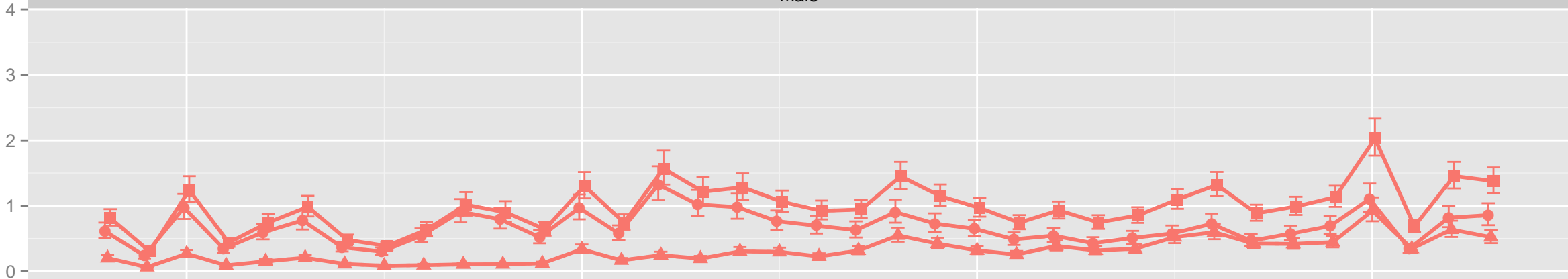
2000

2010

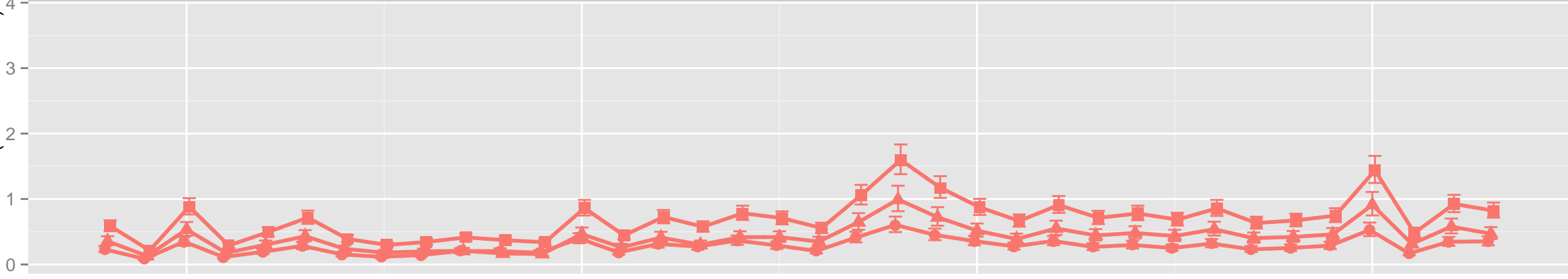
y

SCF

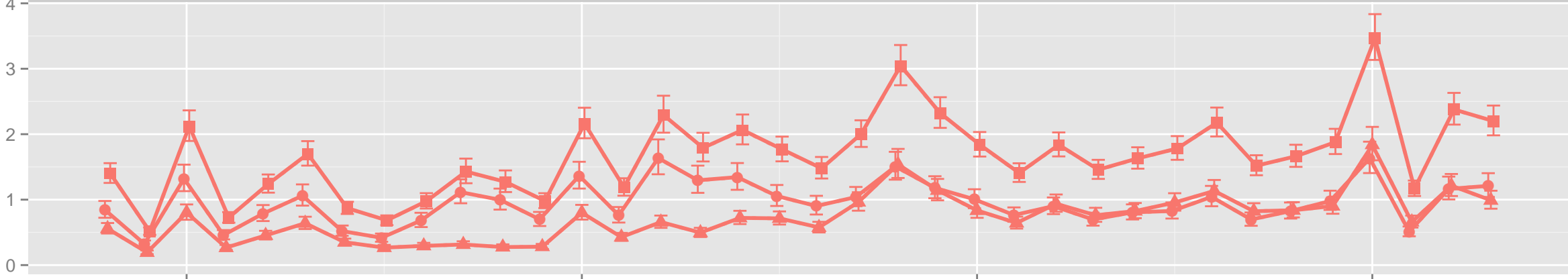
male



female

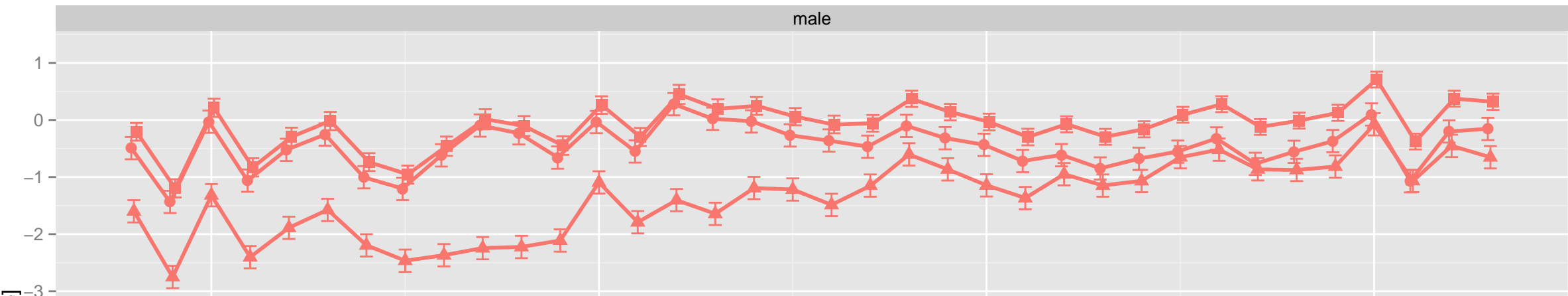


all sex

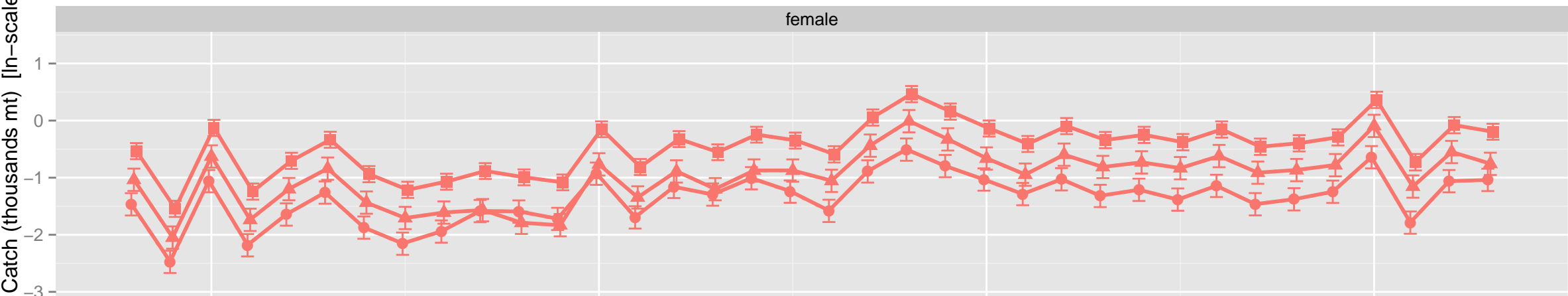


SCF

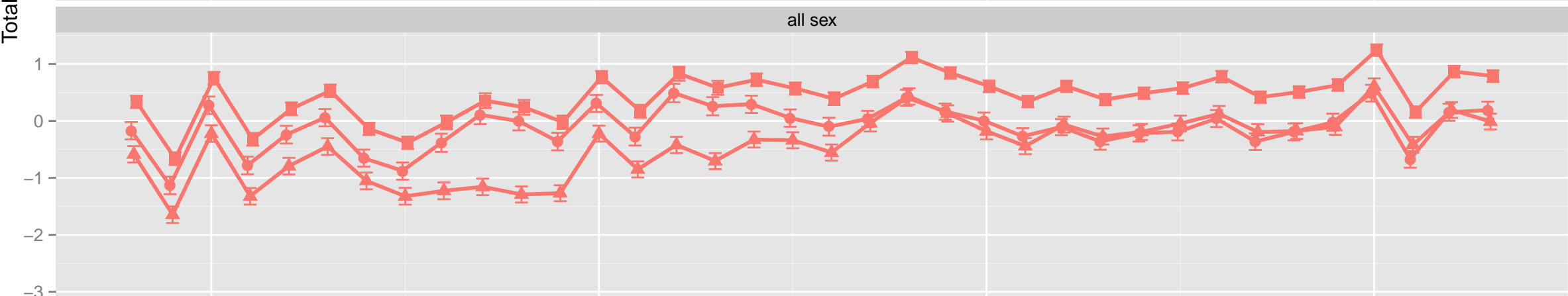
male



female



all sex



s

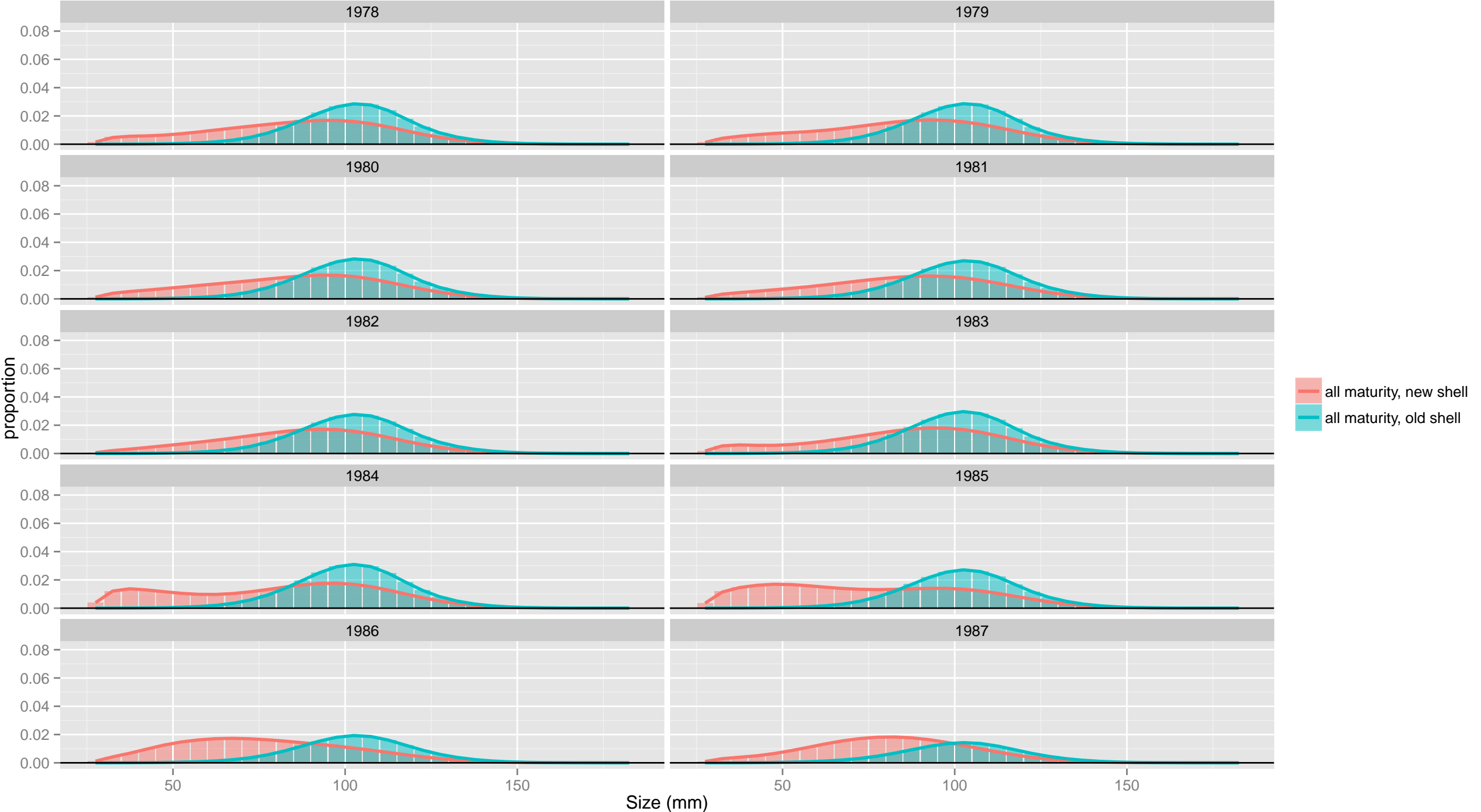
- new shell
- ▲ old shell
- all shell

m

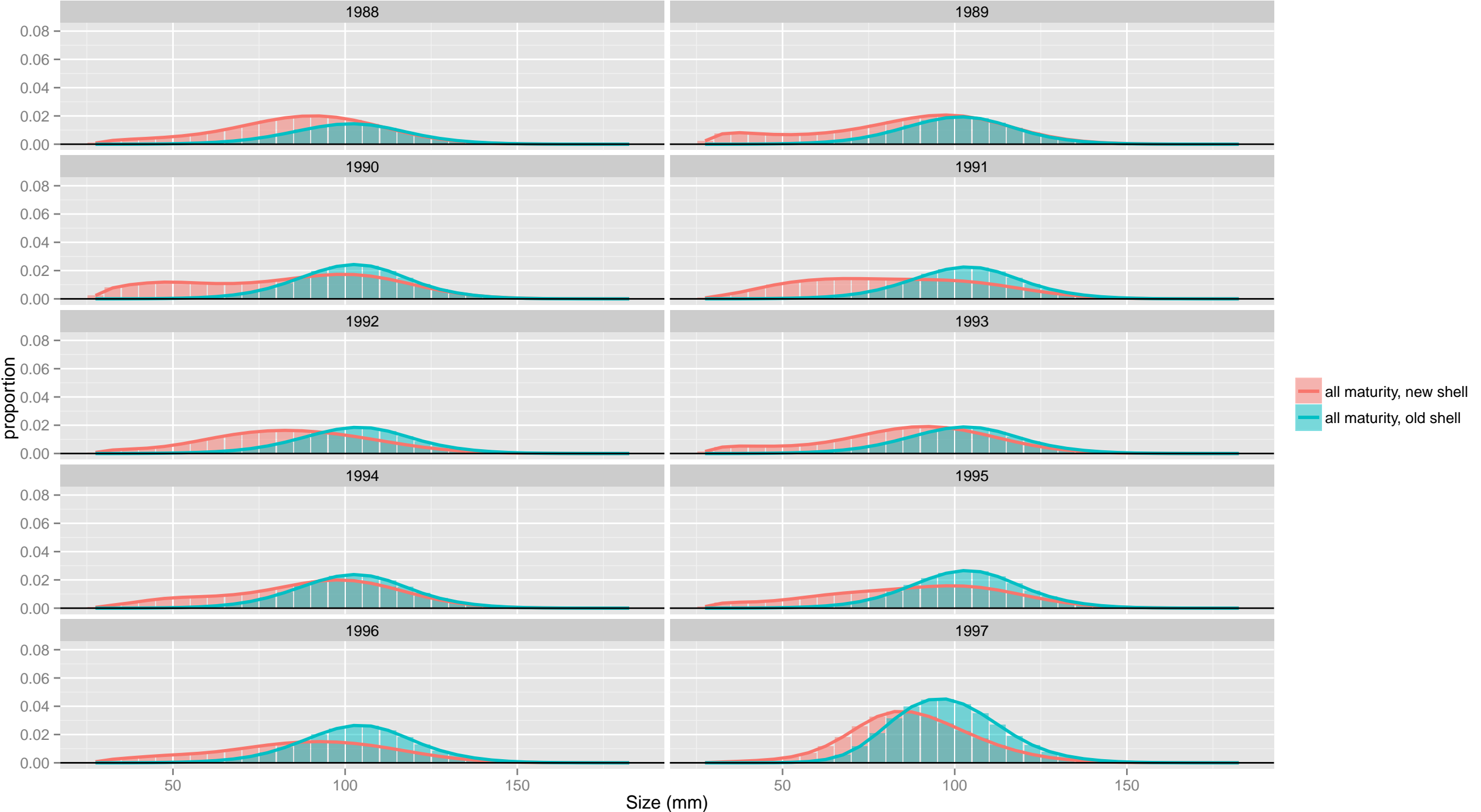
- all maturity

y

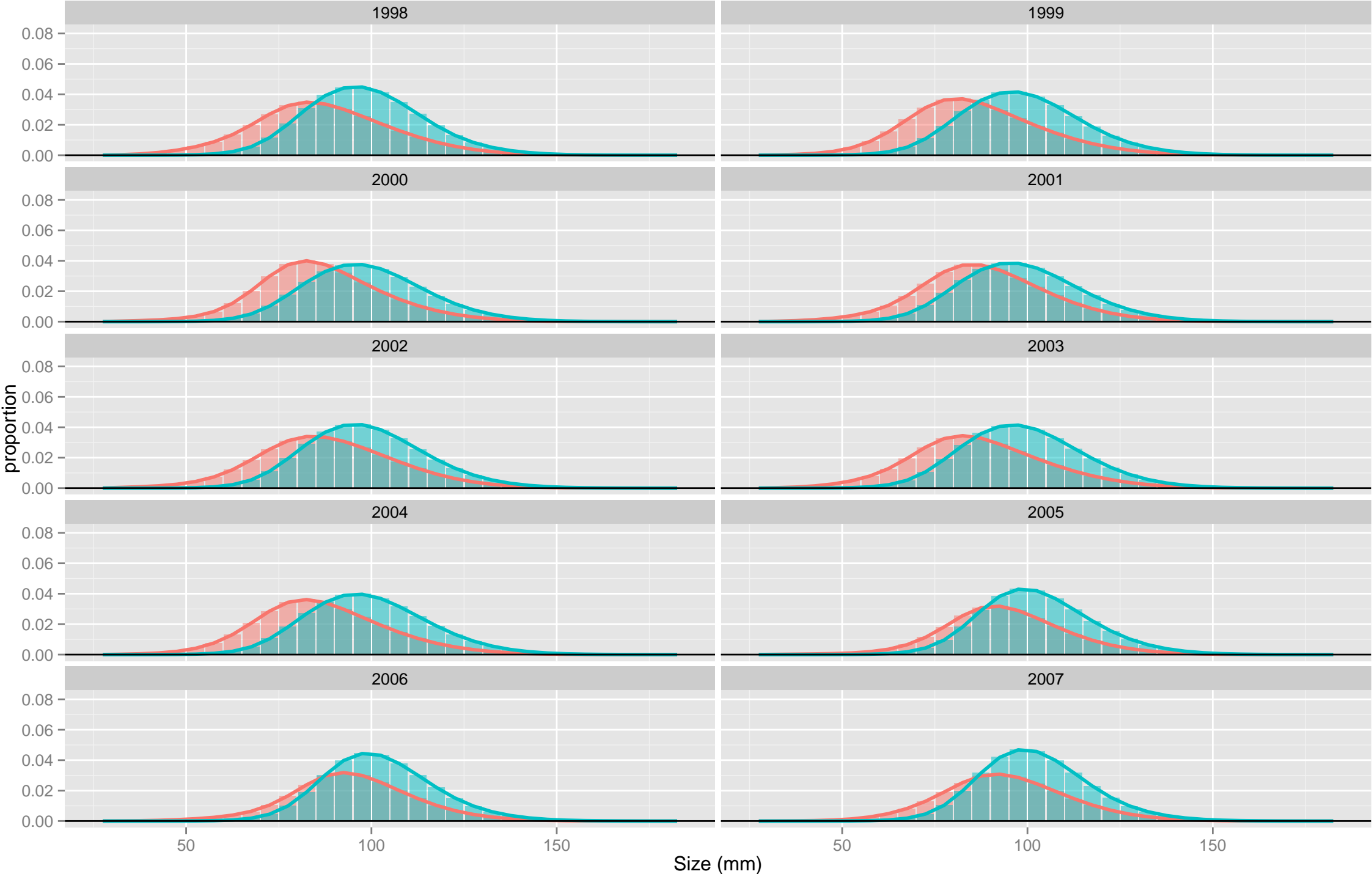
Total Catch: SCF: female



Total Catch: SCF: female

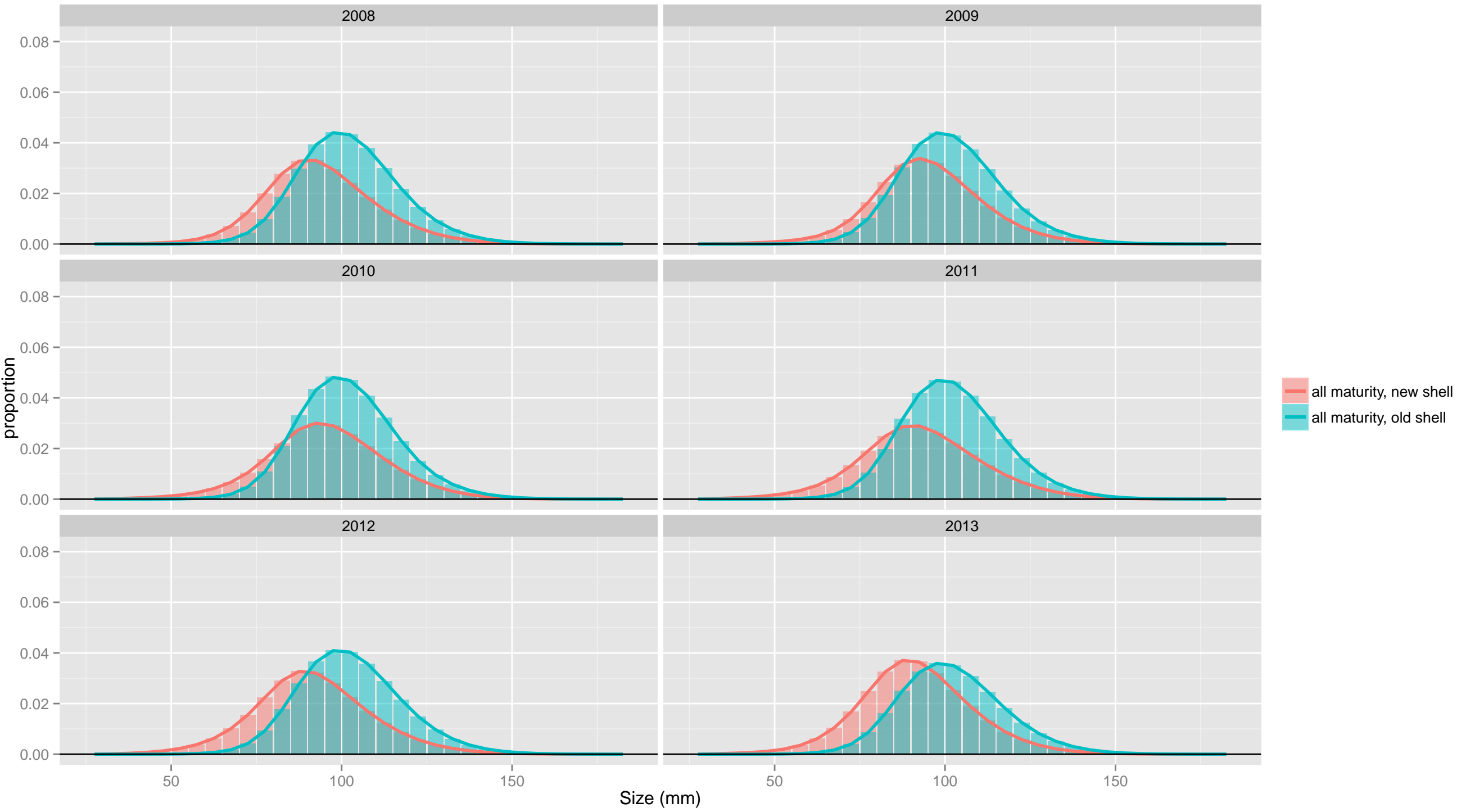


Total Catch: SCF: female

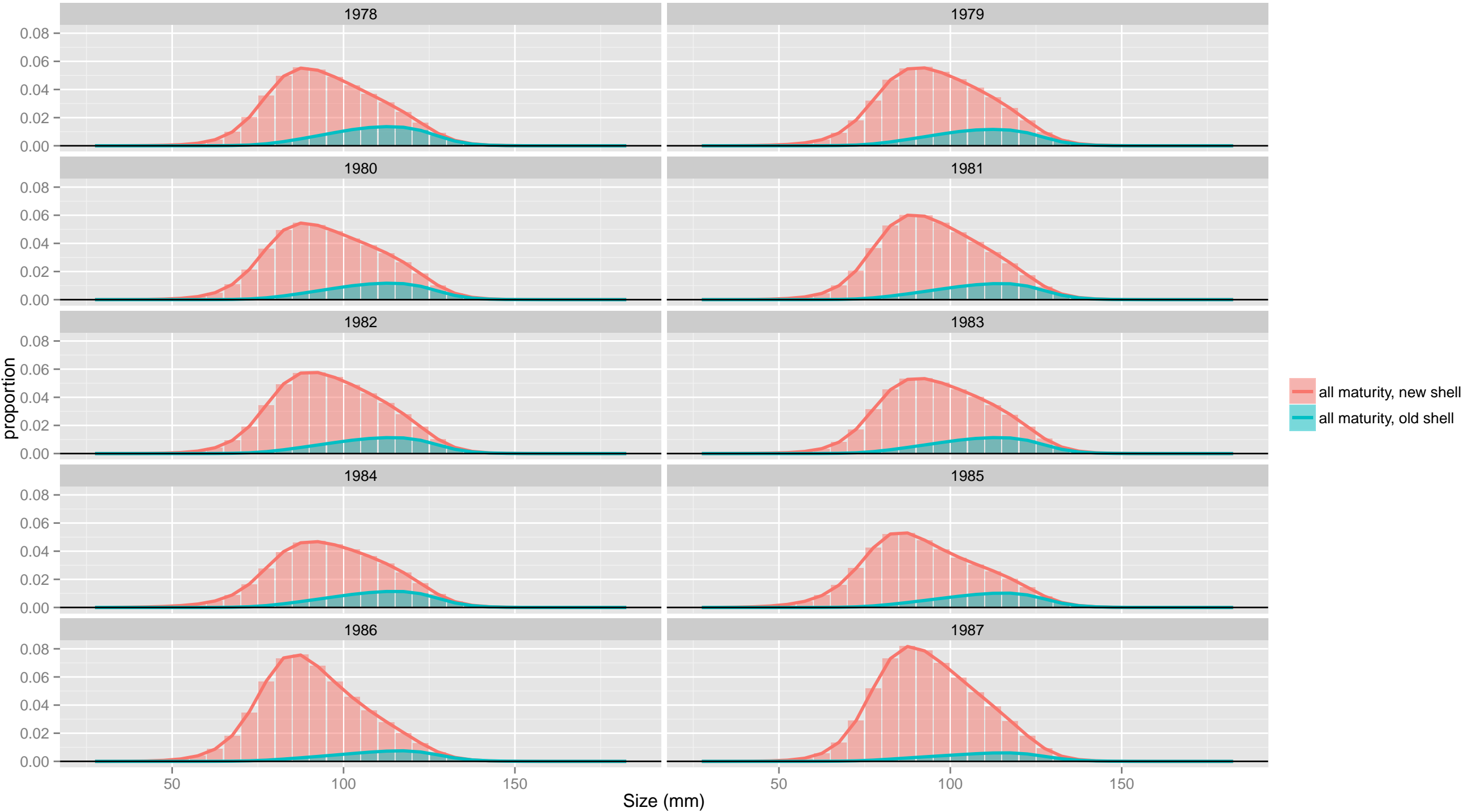


- all maturity, new shell
- all maturity, old shell

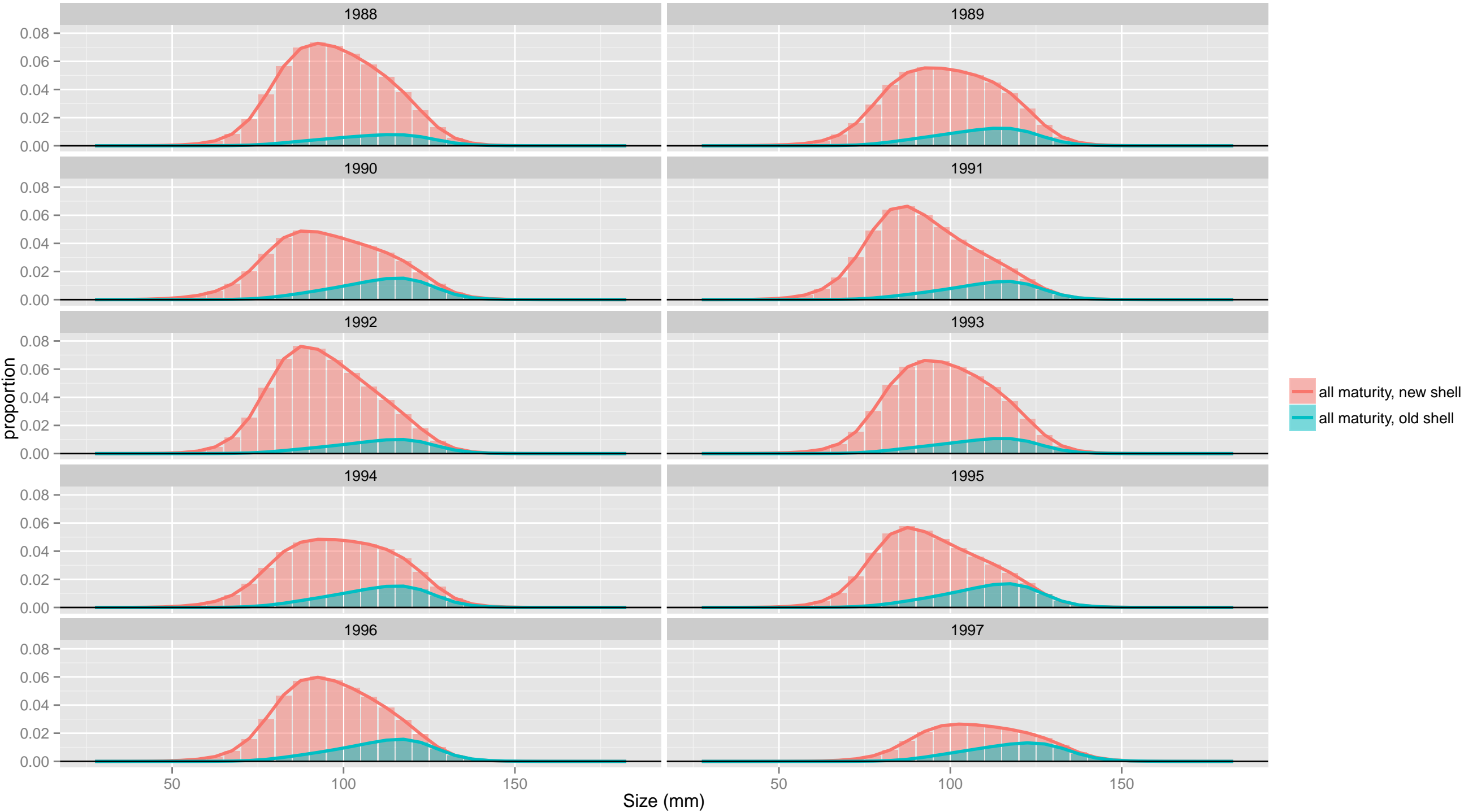
Total Catch: SCF: female



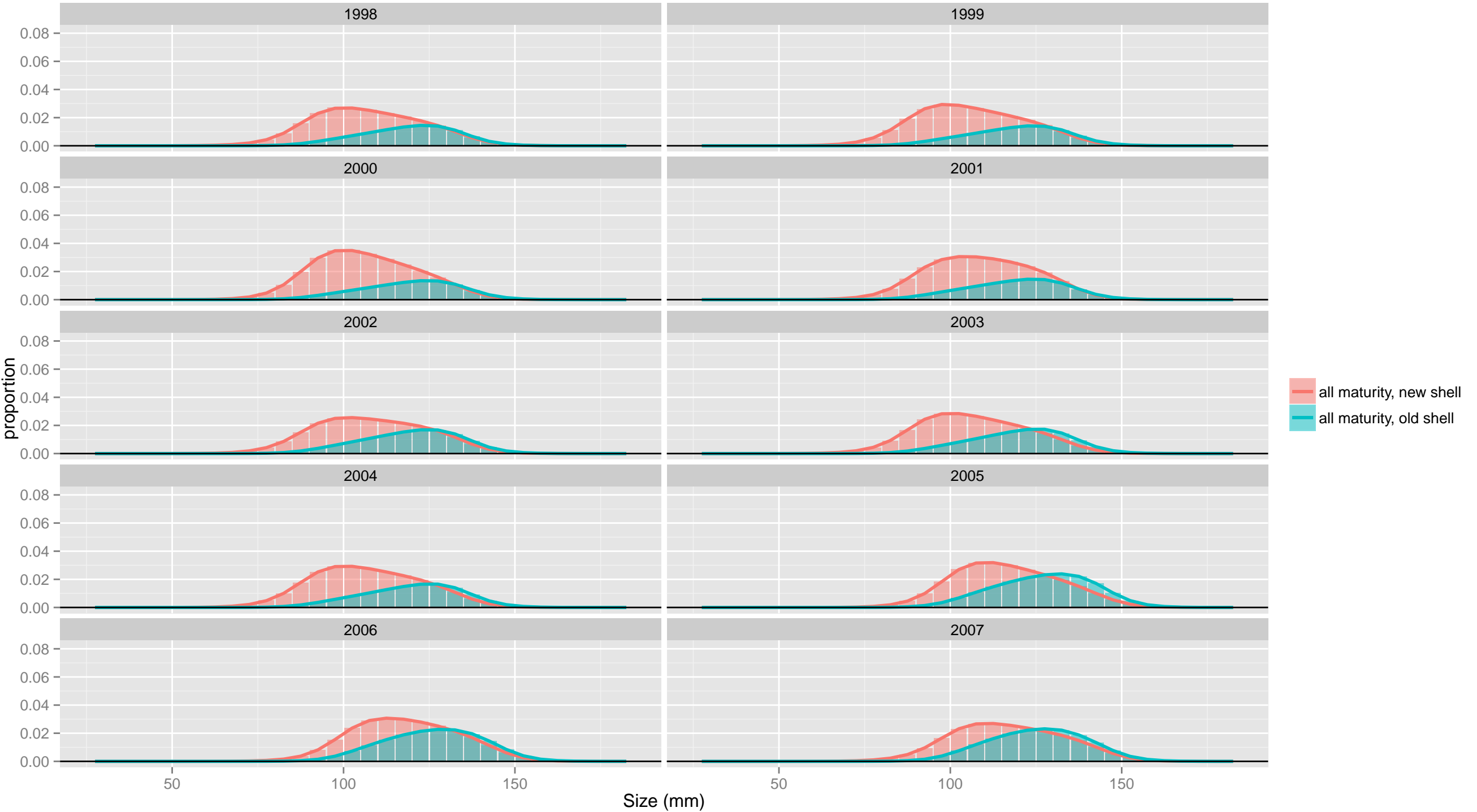
Total Catch: SCF: male



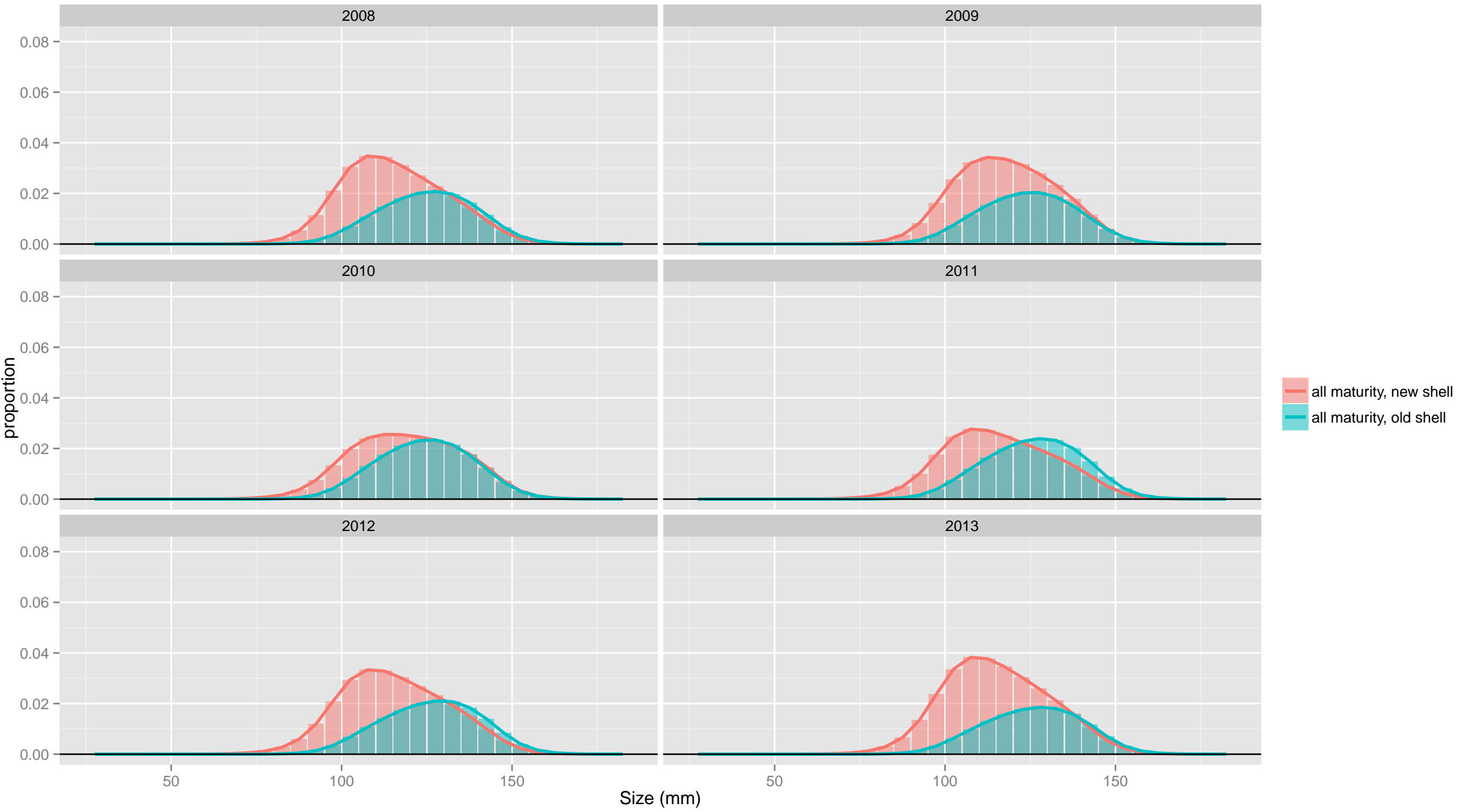
Total Catch: SCF: male



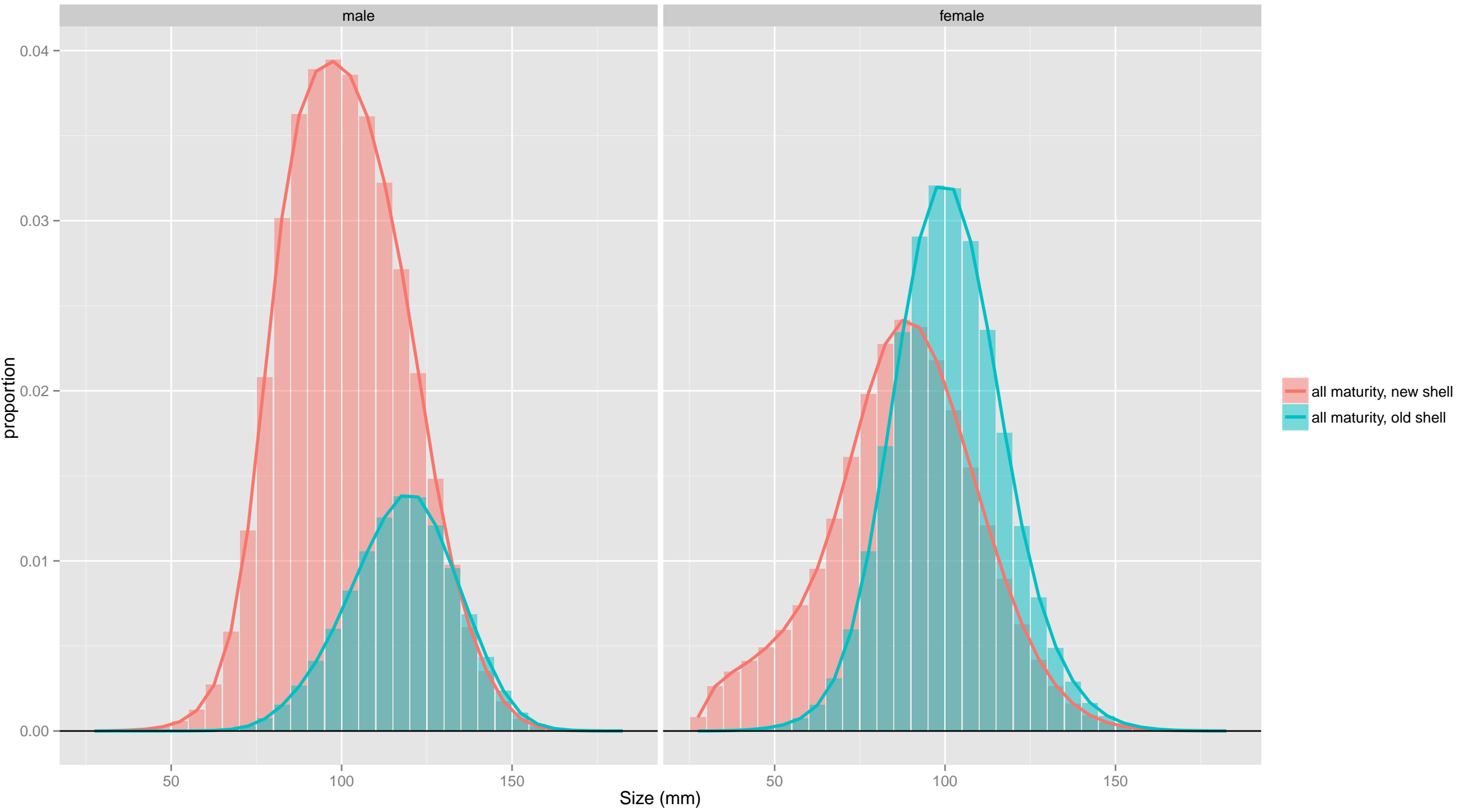
Total Catch: SCF: male



Total Catch: SCF: male



Total Catch: SCF



RKF

male

3

2

1

0

female

3

2

1

0

all sex

3

2

1

0

1980

1990

2000

2010

y

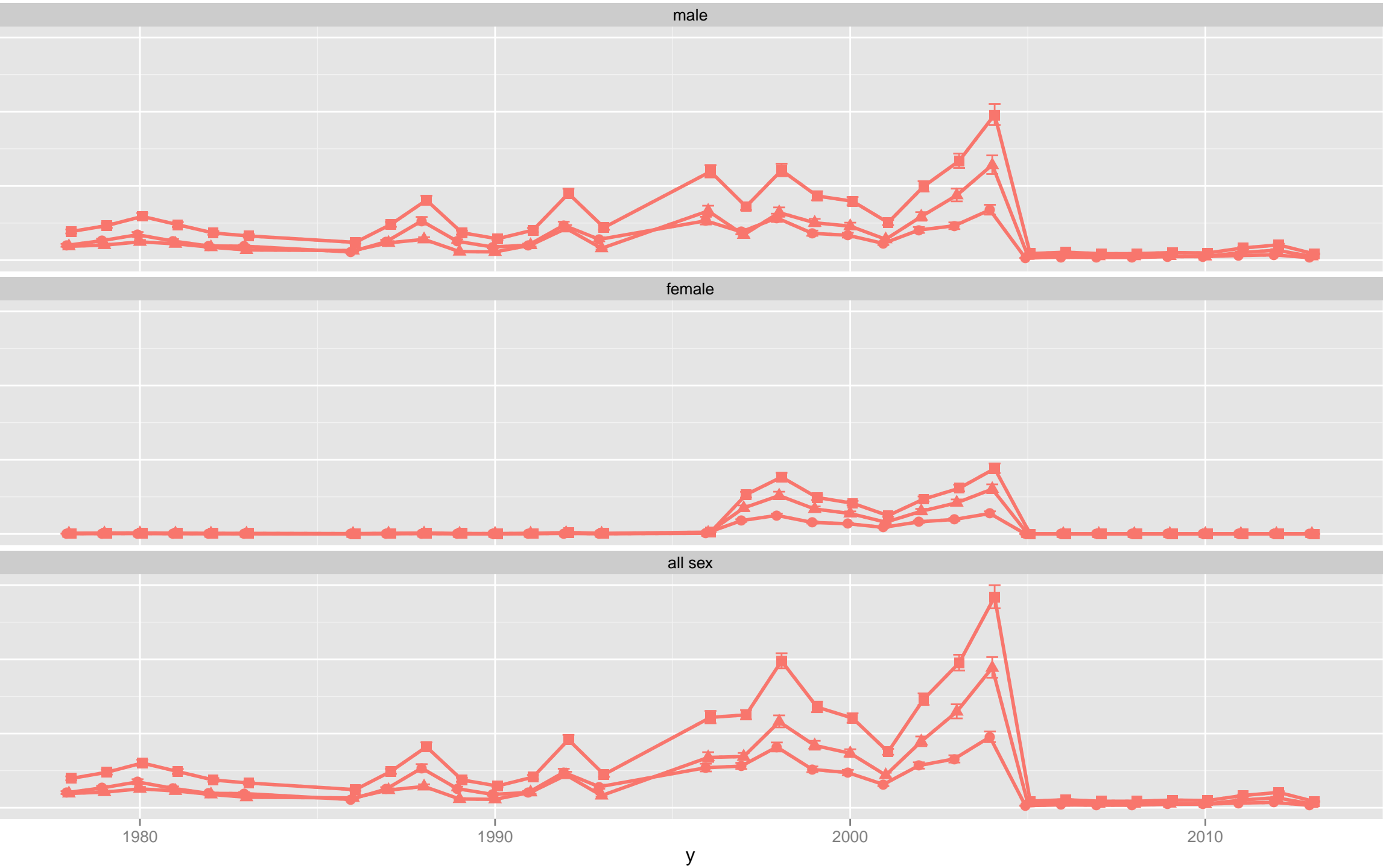
s

- new shell
- ▲ old shell
- all shell

m

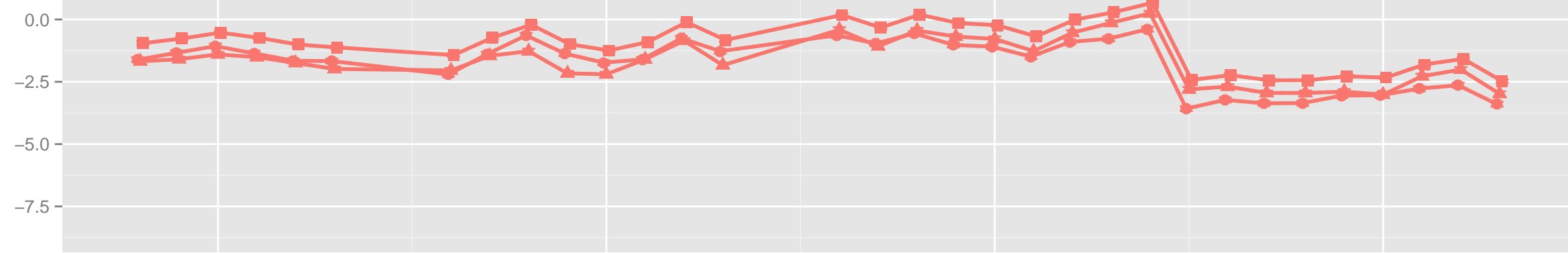
- all maturity

Total Catch (millions)

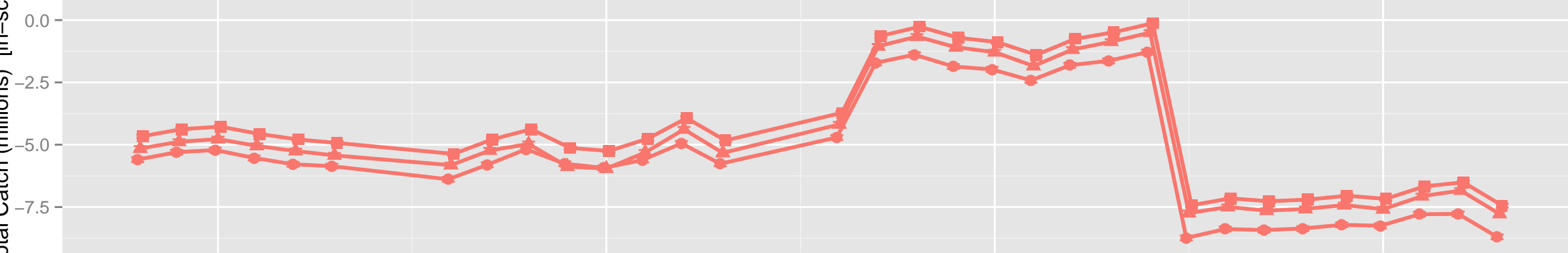


RKF

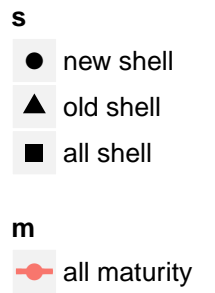
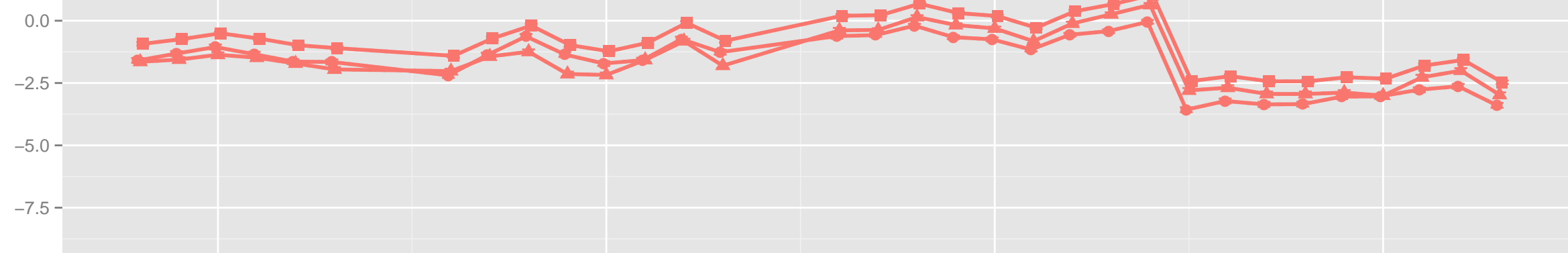
male



female

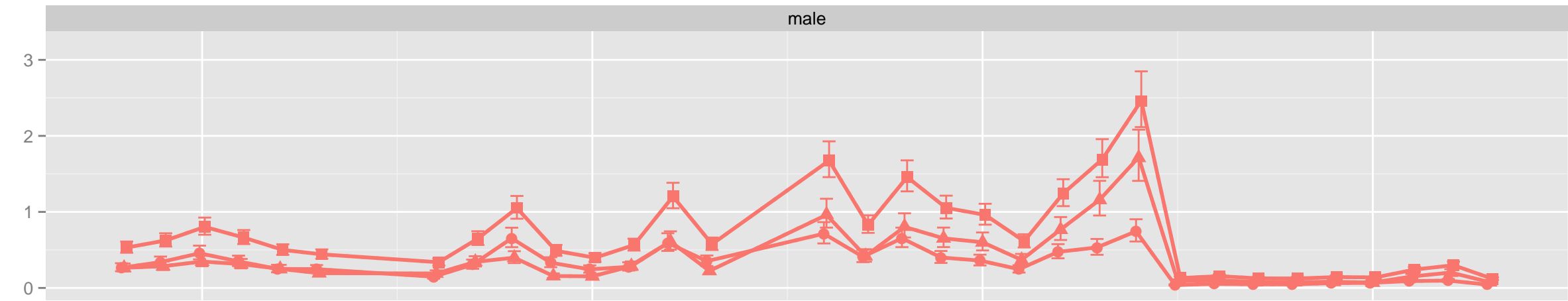


all sex

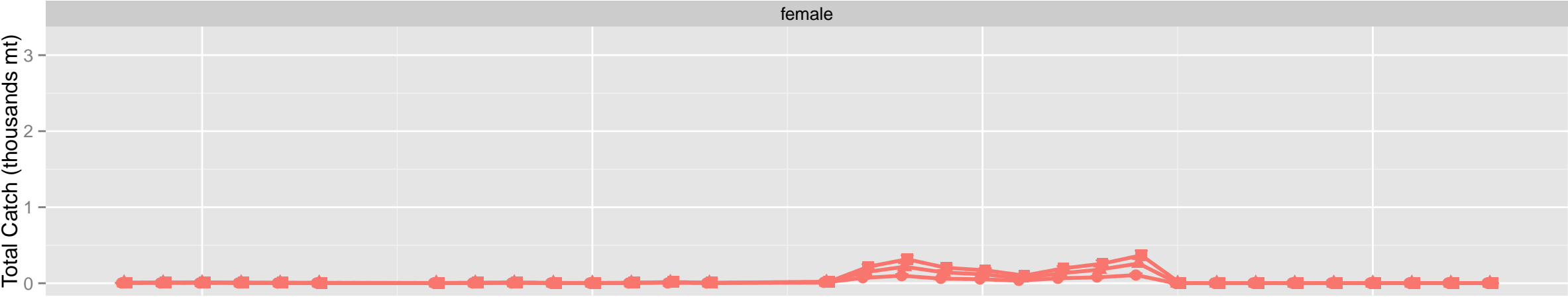


RKF

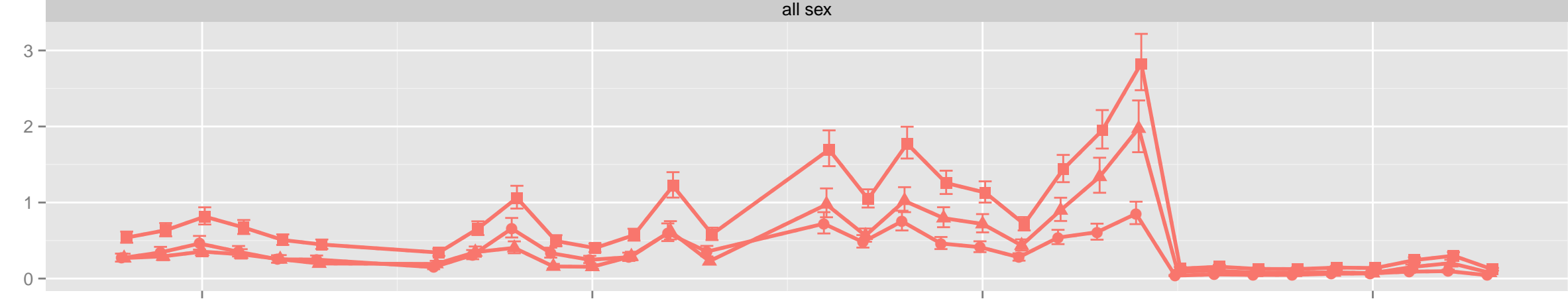
male



female

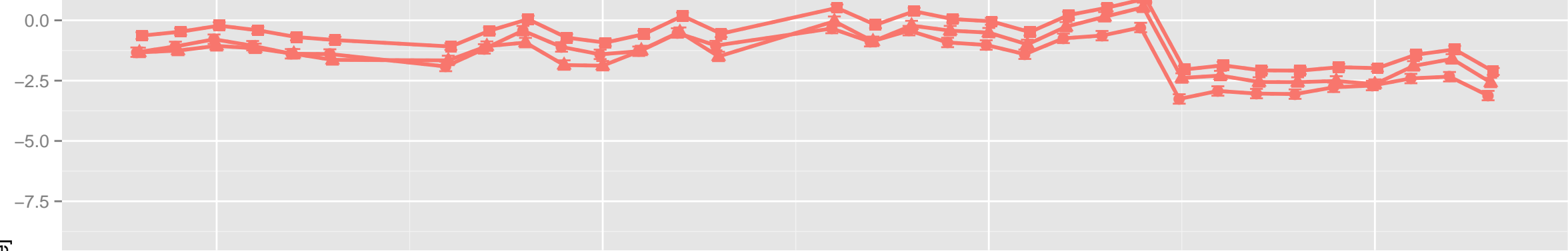


all sex

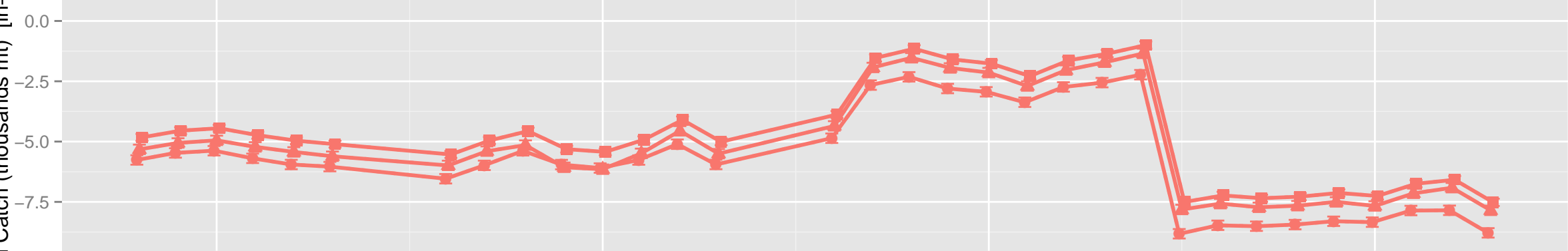


RKF

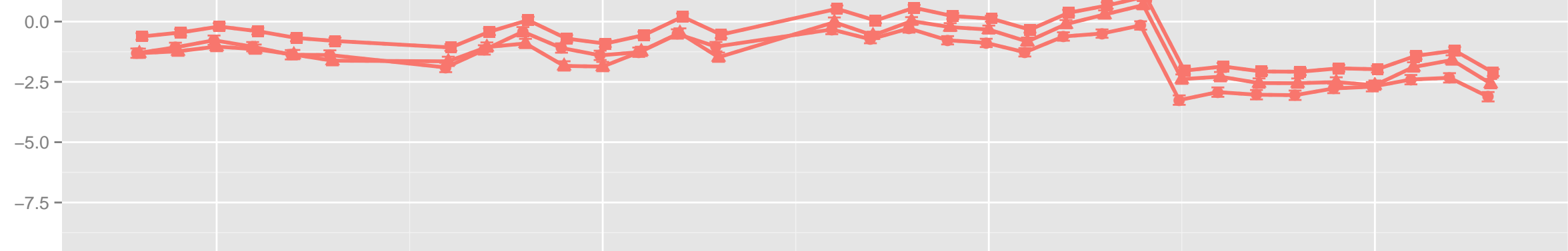
male



female

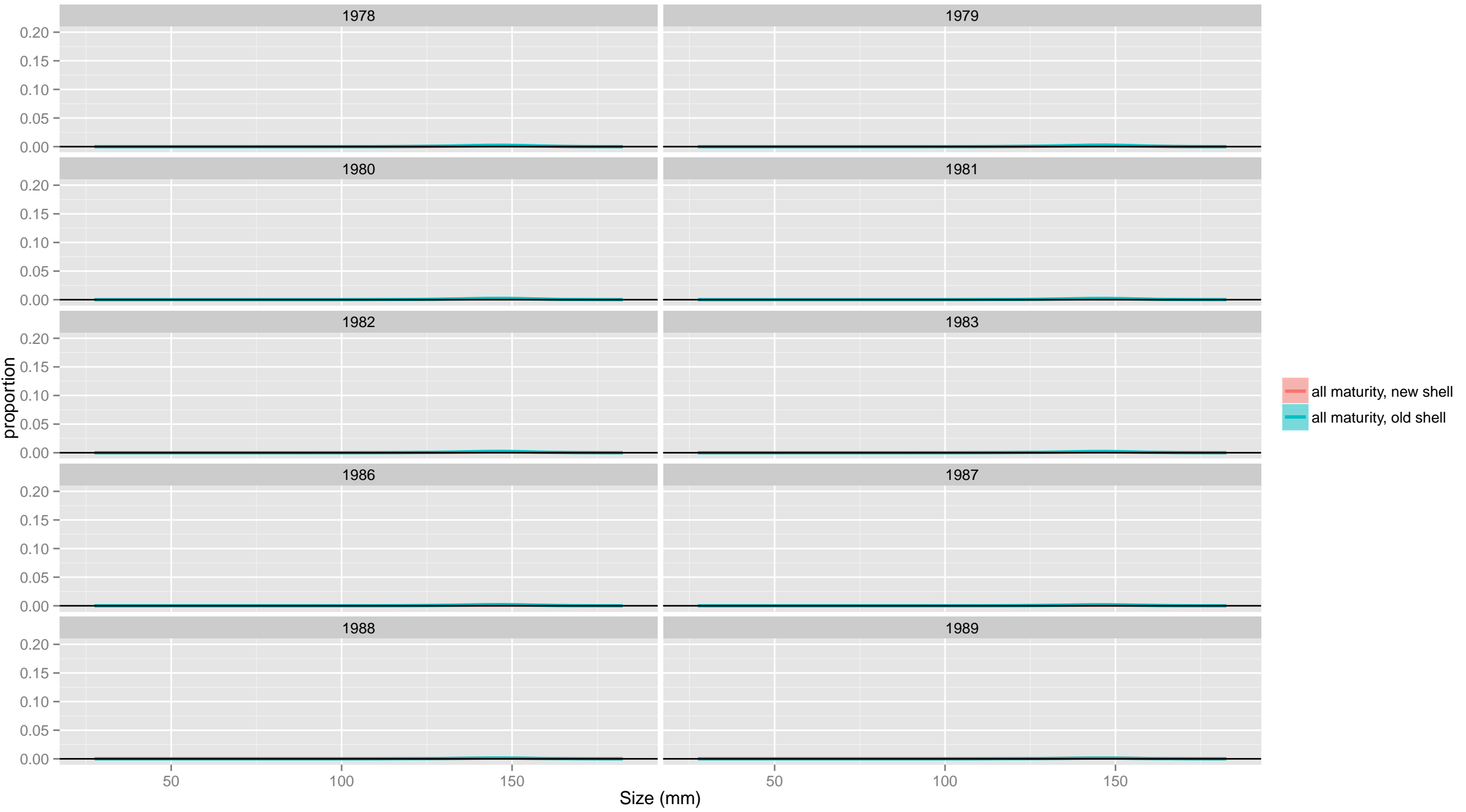


all sex

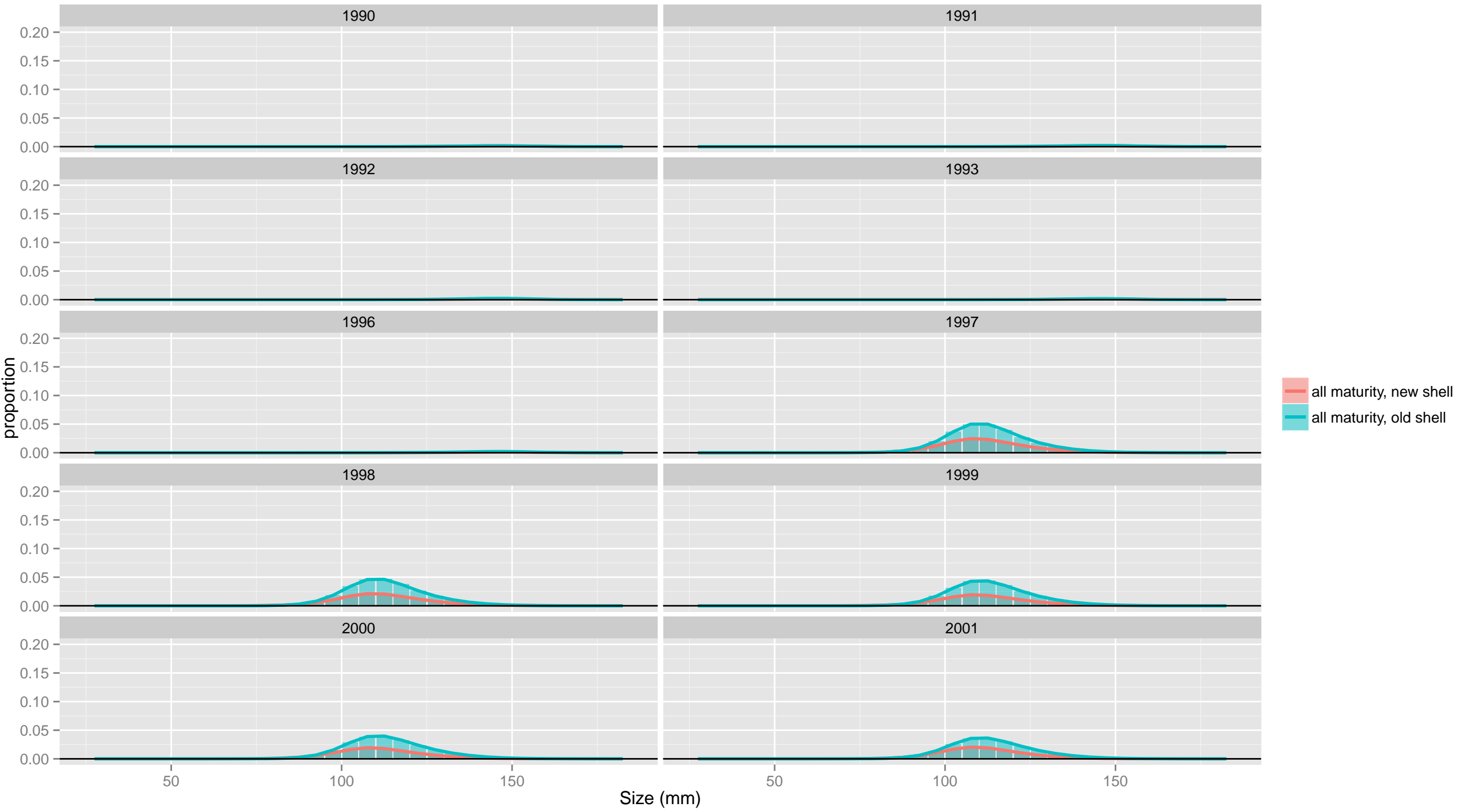


- s**
- new shell
 - ▲ old shell
 - all shell
- m**
- all maturity

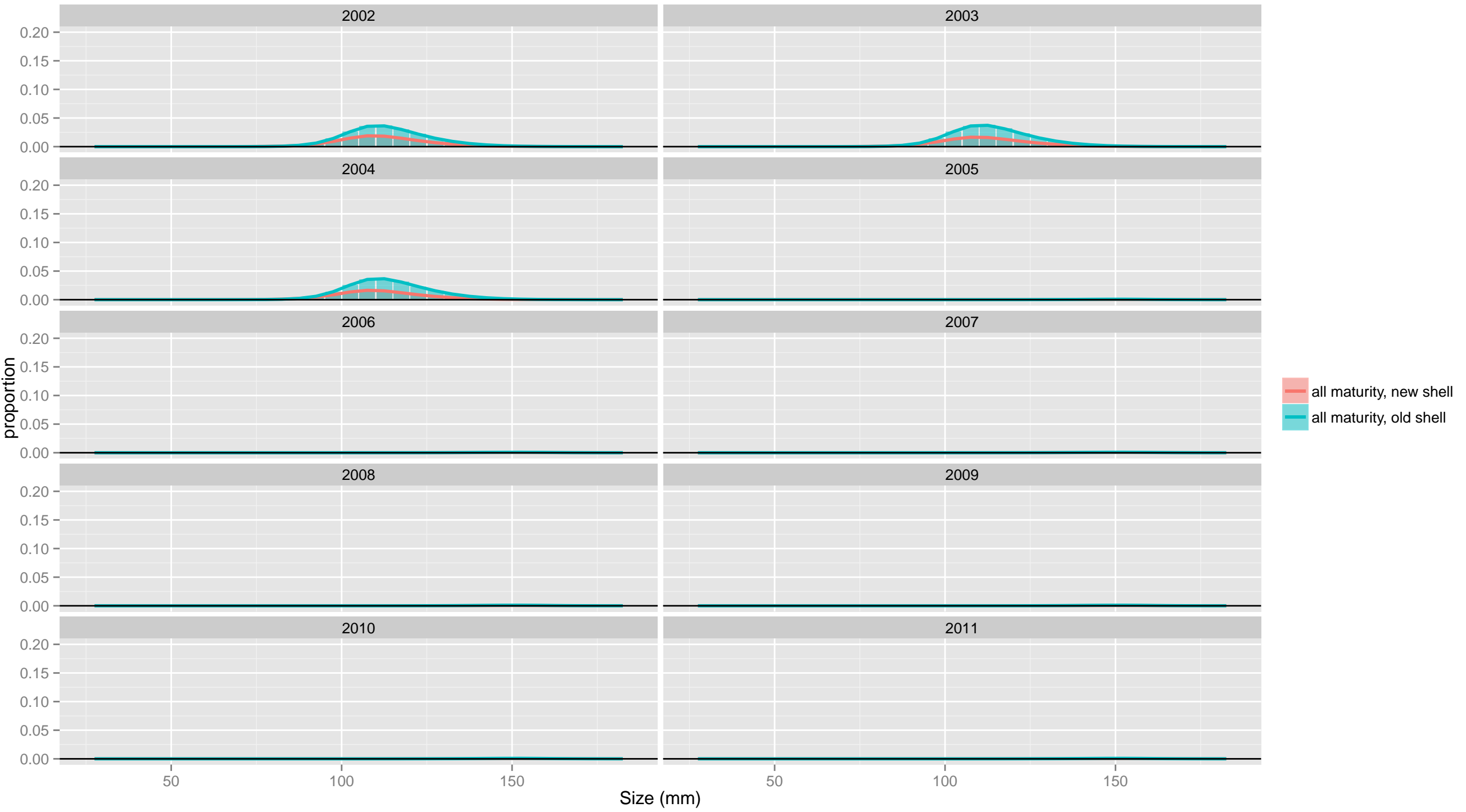
Total Catch: RKF: female



Total Catch: RKF: female



Total Catch: RKF: female



Total Catch: RKF: female

2012

2013

0.20
0.15
0.10
0.05
0.00

50

100

150

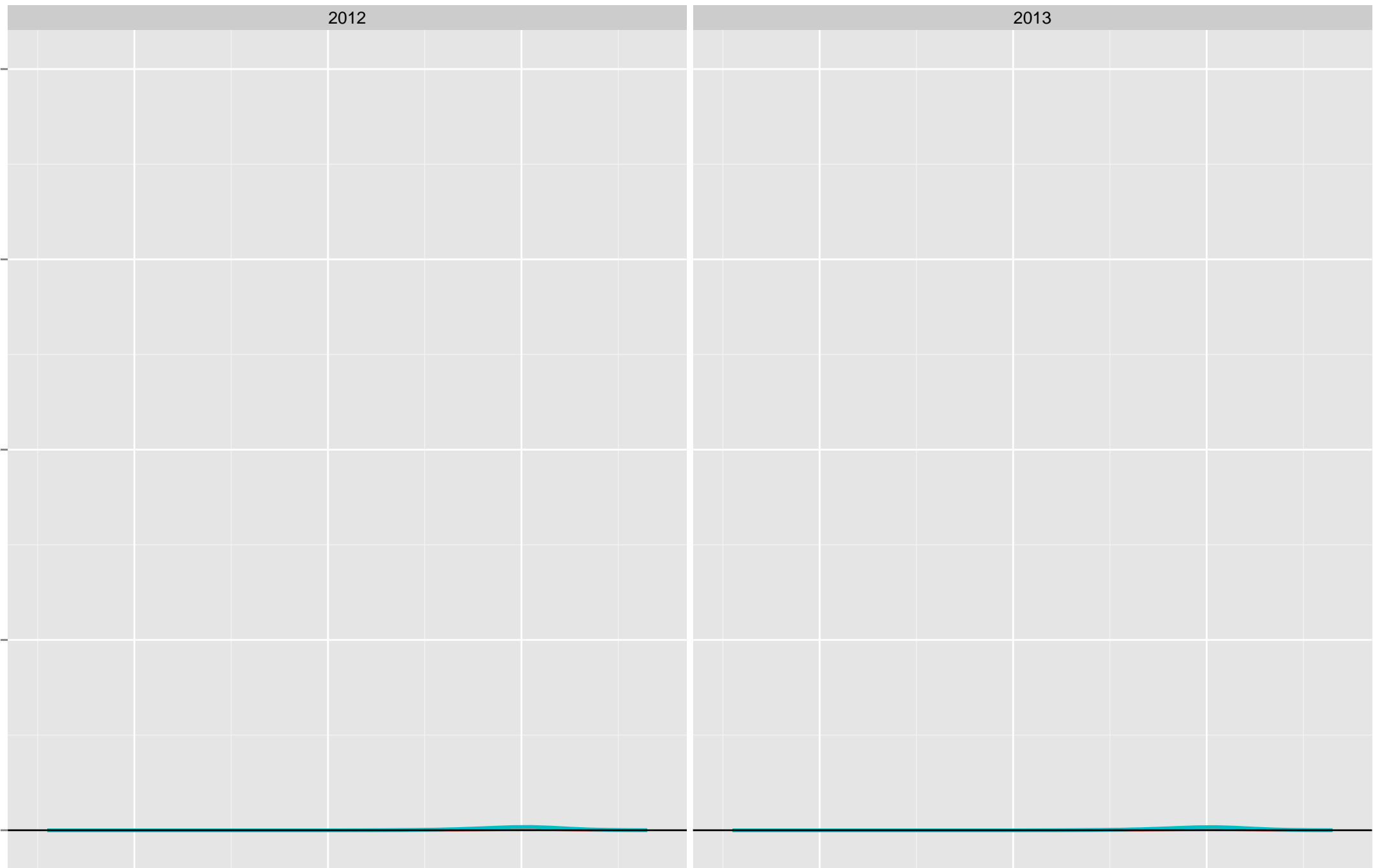
Size (mm)

50

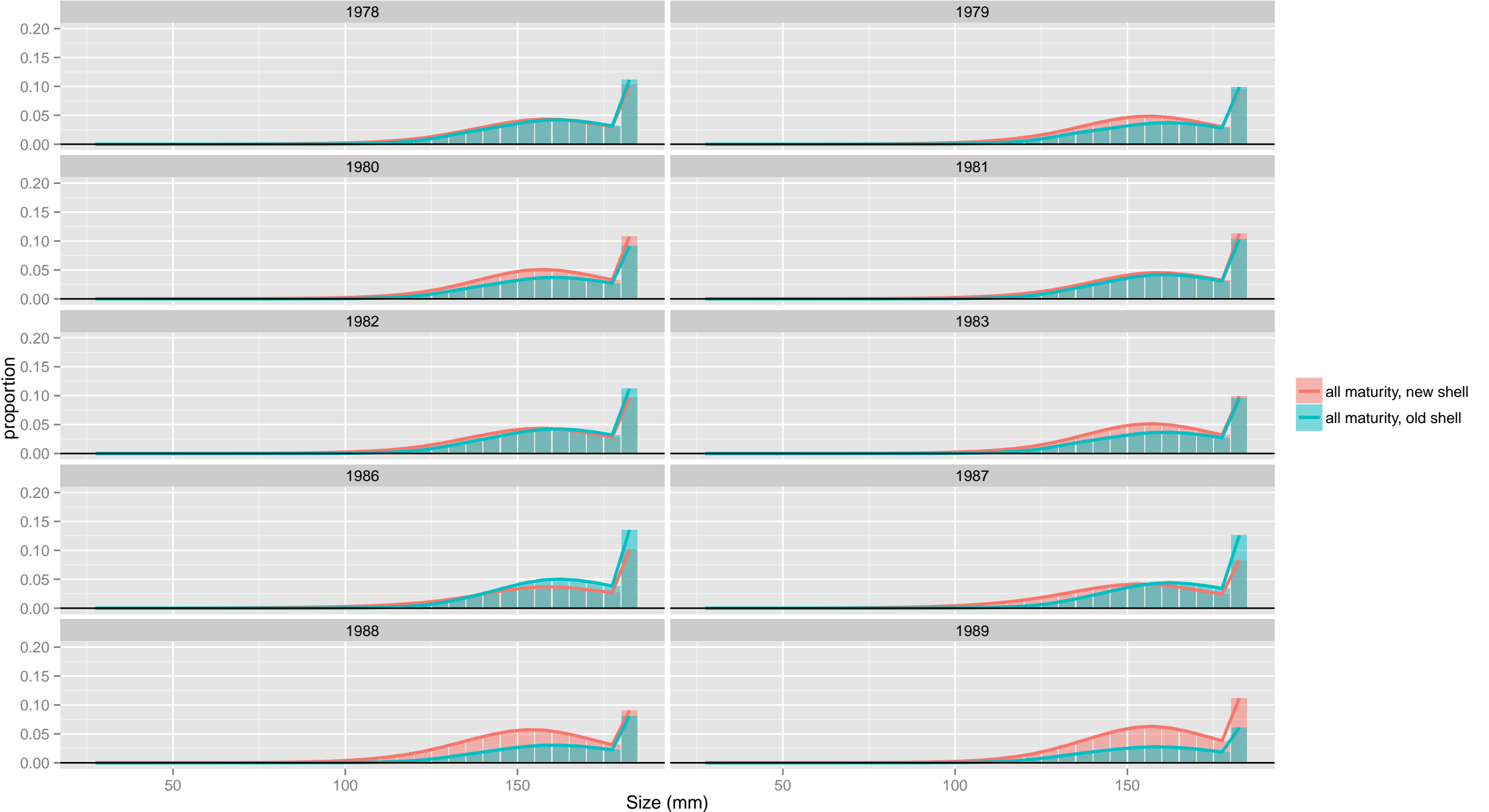
100

150

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



Total Catch: RKF: male



Total Catch: RKF: male



Total Catch: RKF: male



Total Catch: RKF: male

2012

2013

0.20
0.15
0.10
0.05
0.00

50

100

150

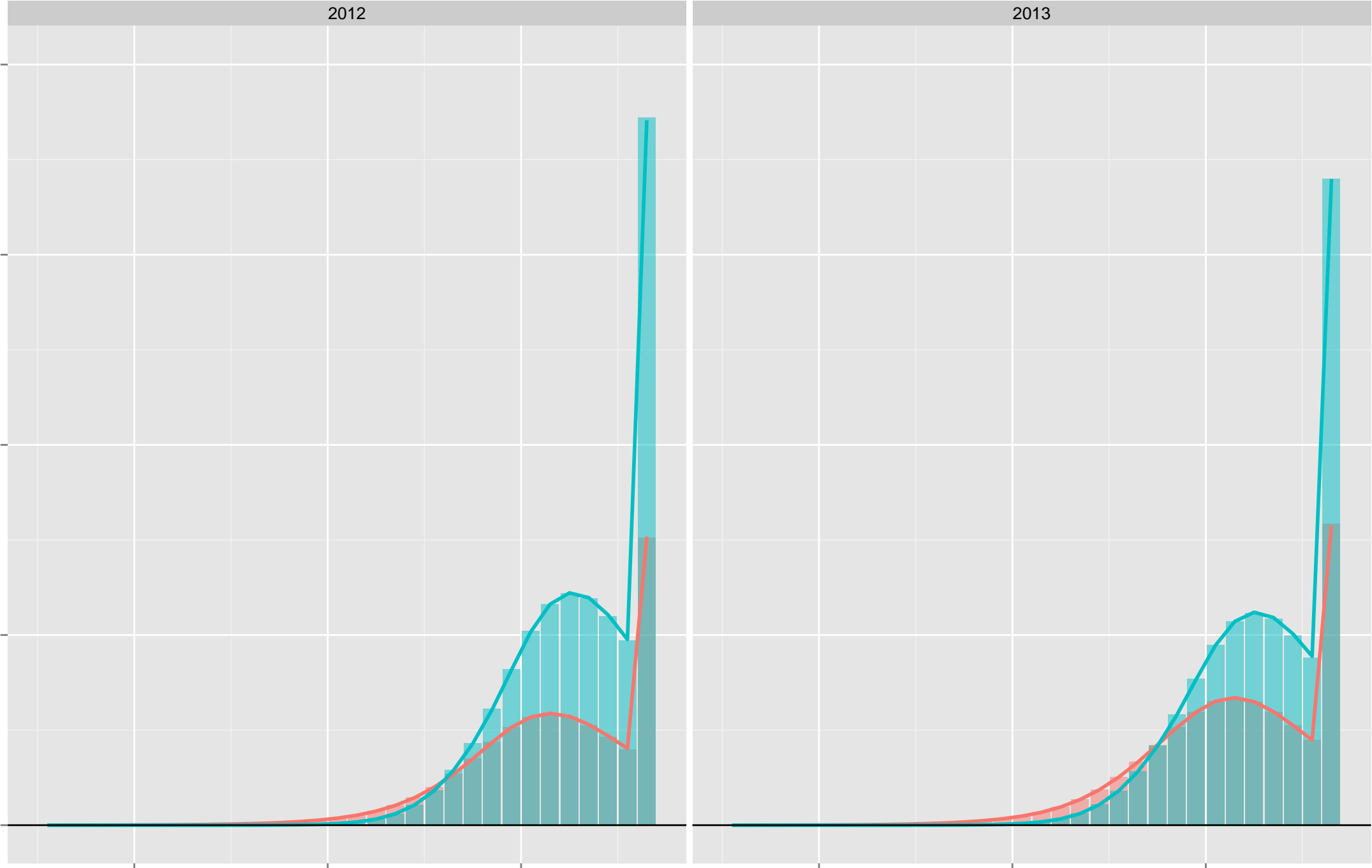
Size (mm)

50

100

150

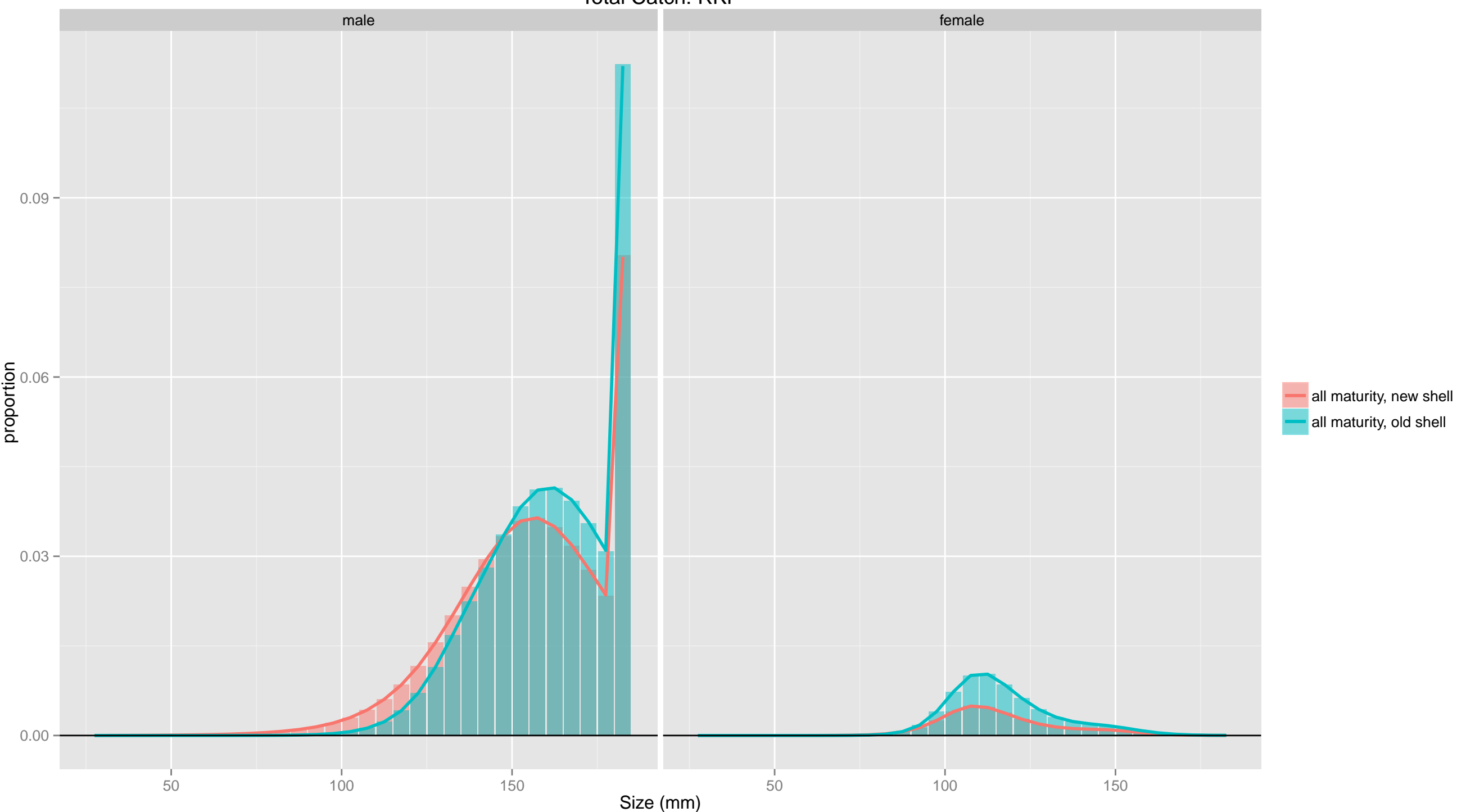
- all maturity, new shell
- all maturity, old shell



Total Catch: RKF

male

female



GTF

male

20

15

10

5

0

female

20

15

10

5

0

all sex

20

15

10

5

0

y

1980

1990

2000

2010

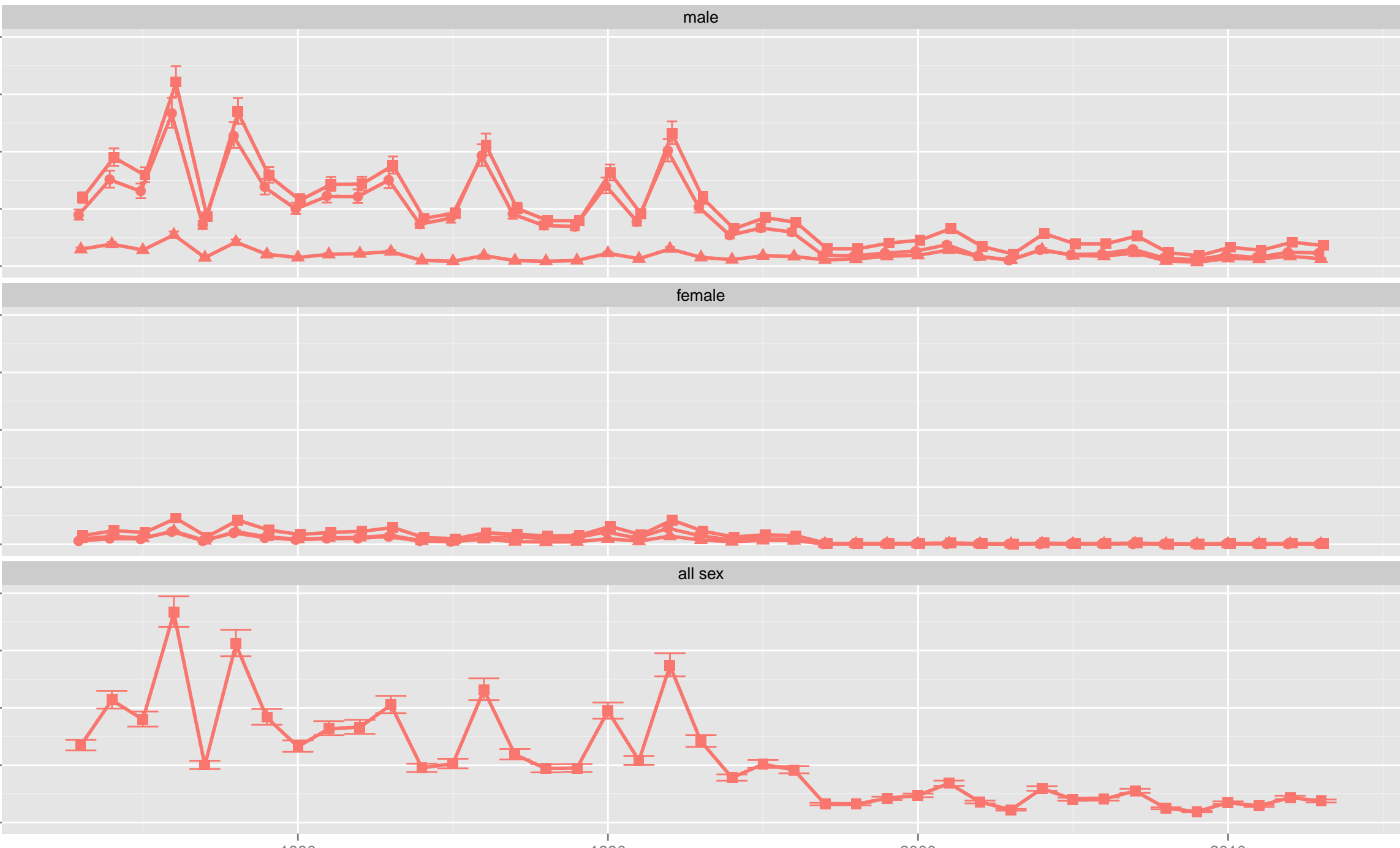
s

- new shell
- ▲ old shell
- all shell

m

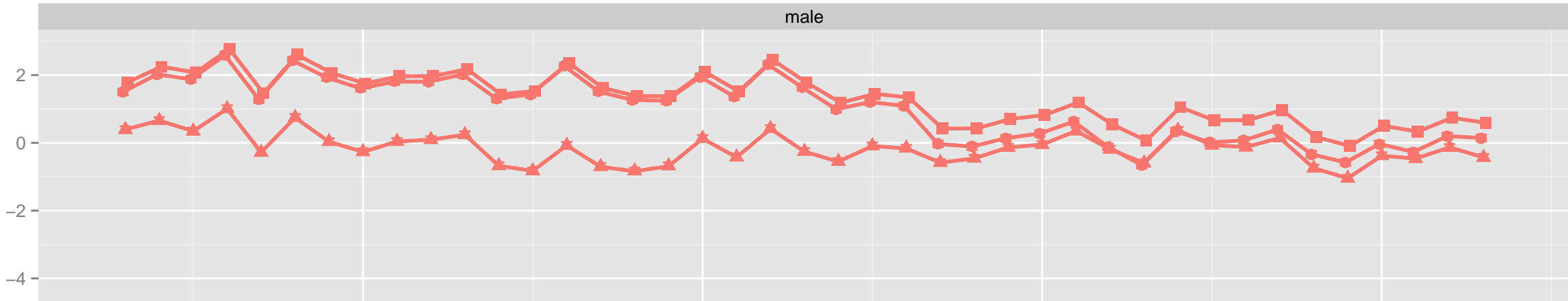
- all maturity

Total Catch (millions)

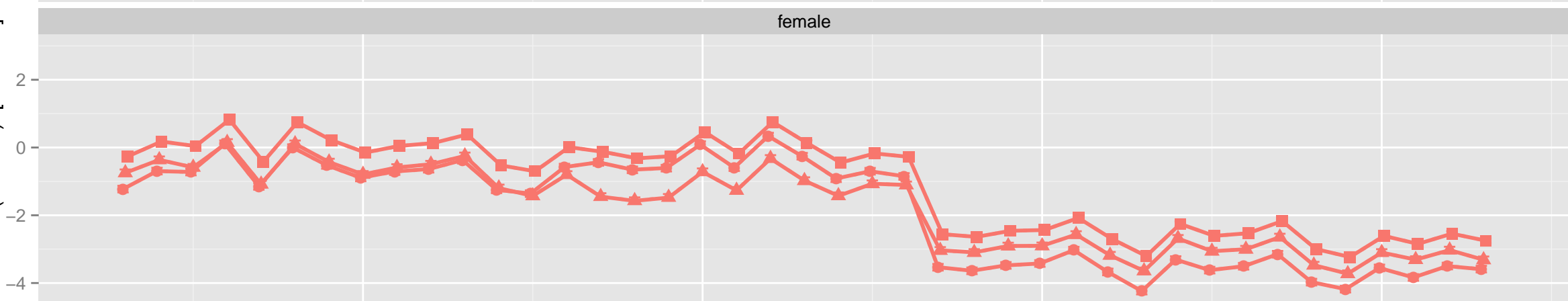


GTF

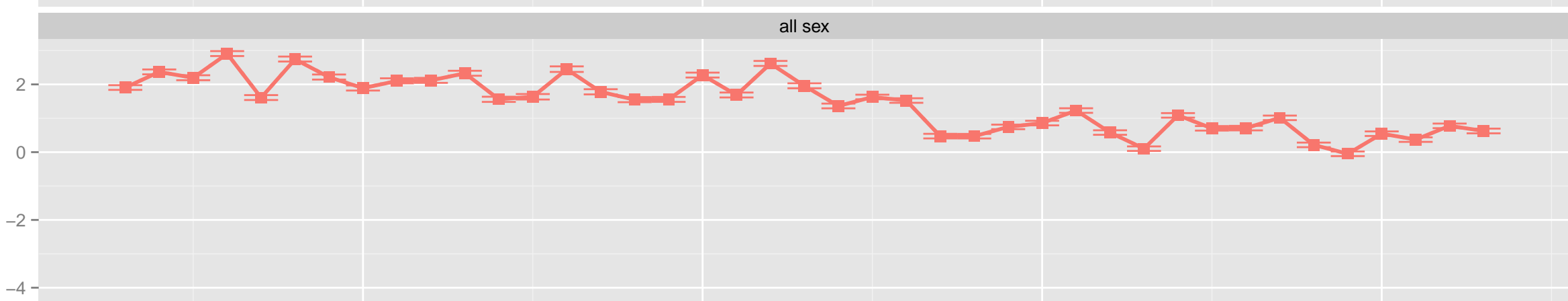
male



female



all sex



s

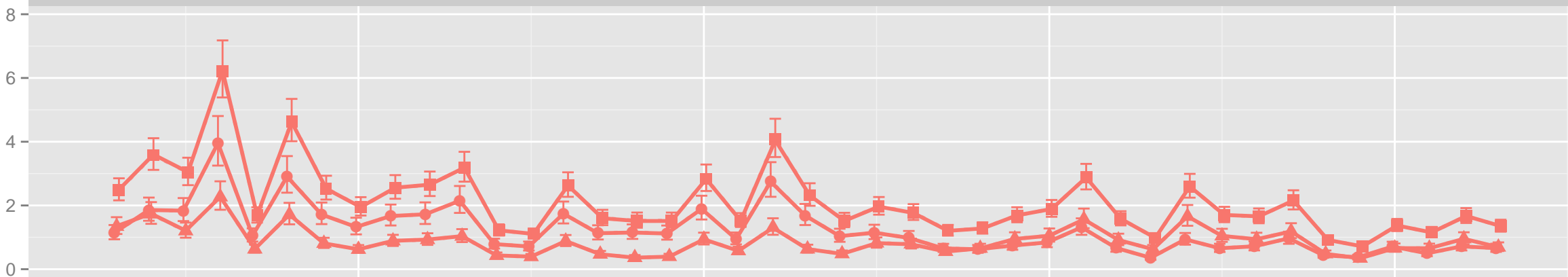
- new shell
- ▲ old shell
- all shell

m

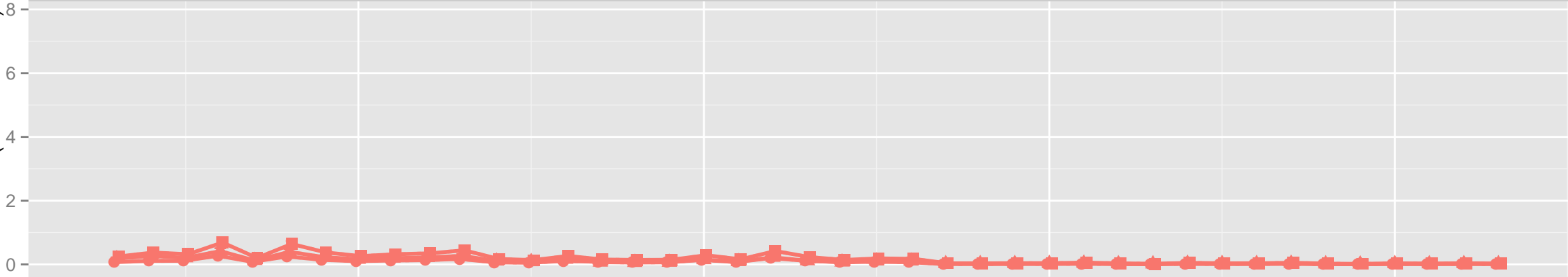
- all maturity

GTF

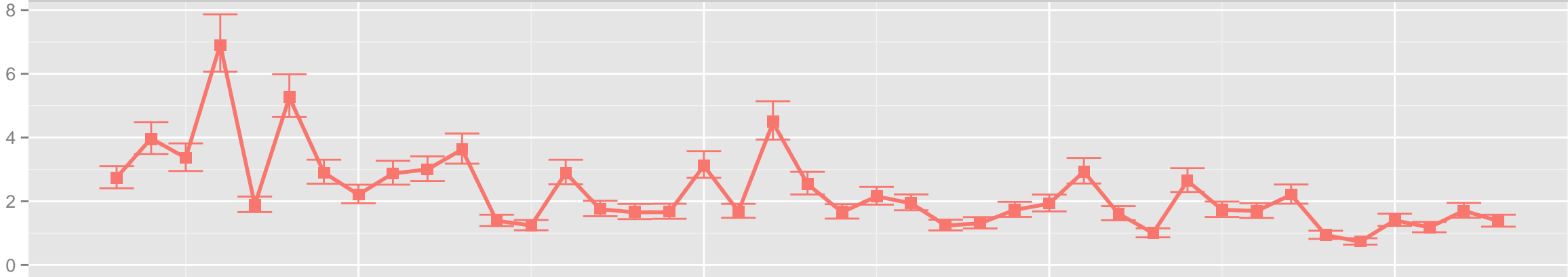
male



female



all sex



s

- new shell
- ▲ old shell
- all shell

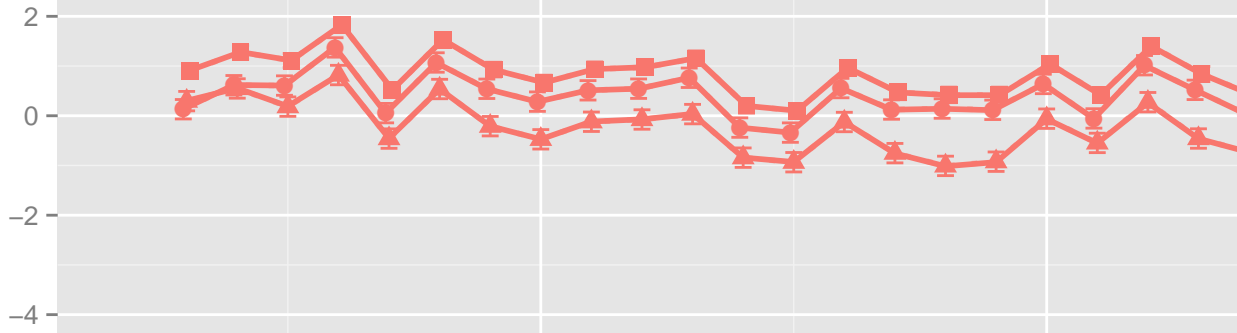
m

- all maturity

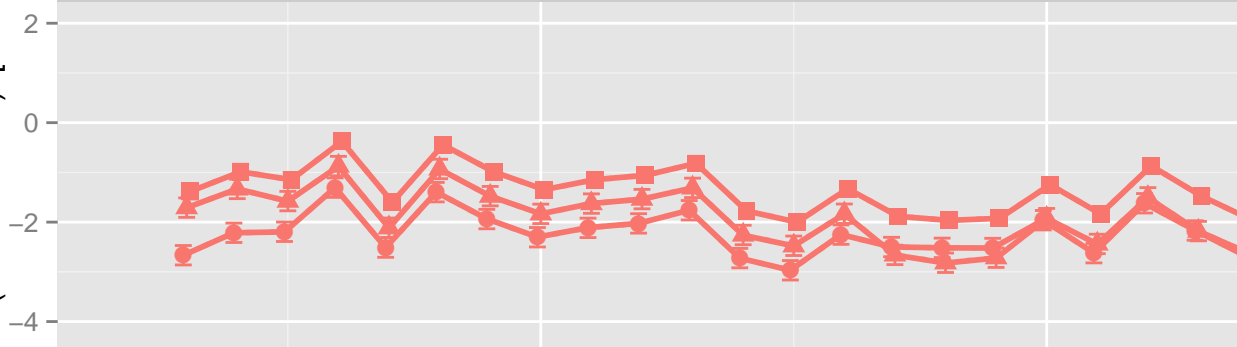
y

GTF

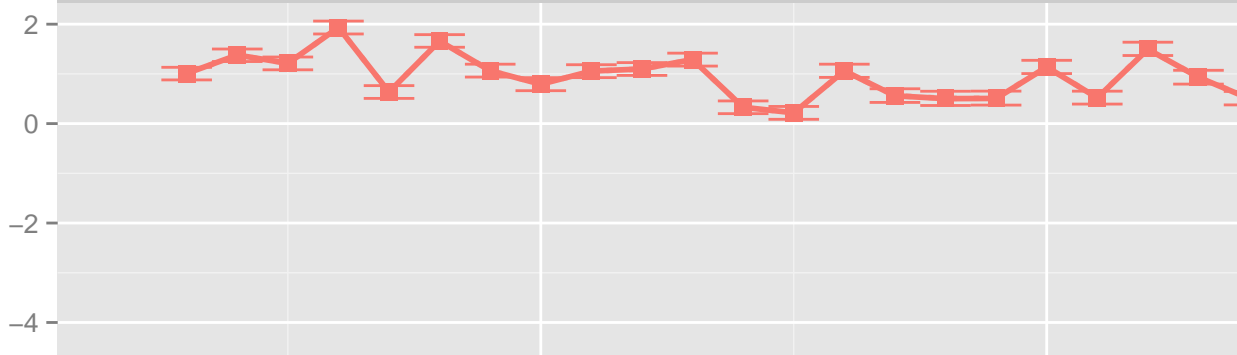
male



female



all sex



s

- new shell
- ▲ old shell
- all shell

m

- all maturity

Total Catch (thousands mt) [ln-scale]

1980

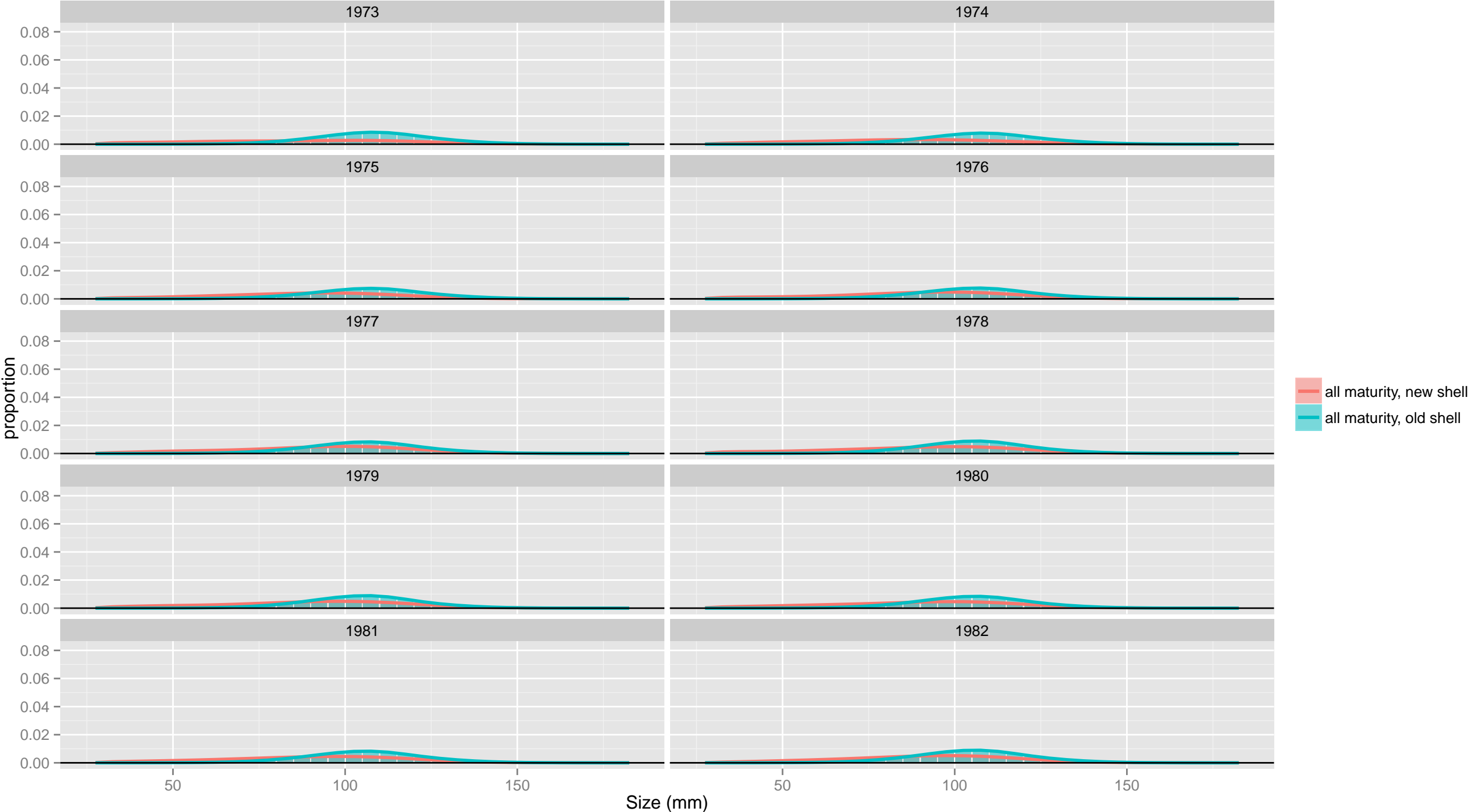
1990

2000

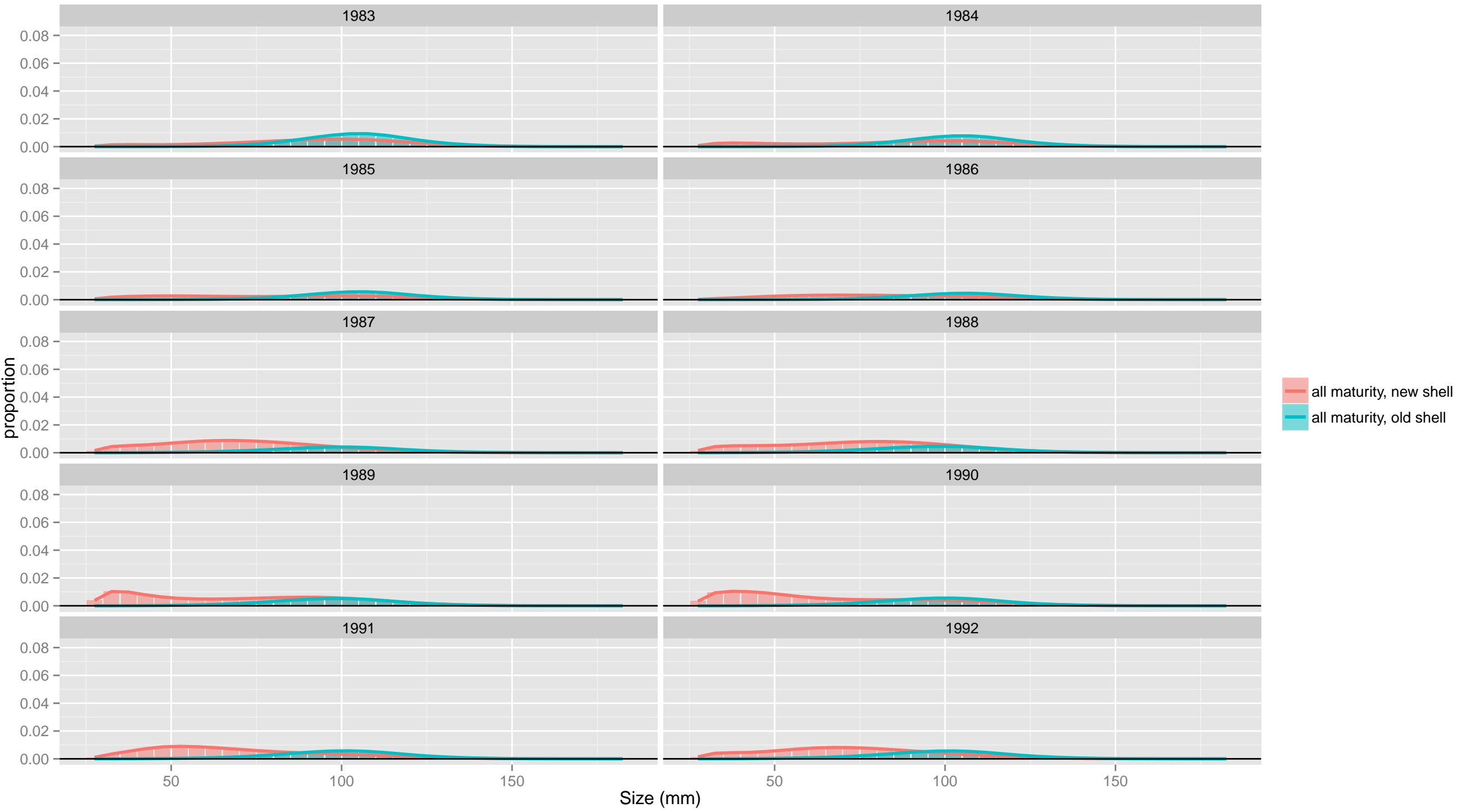
2010

y

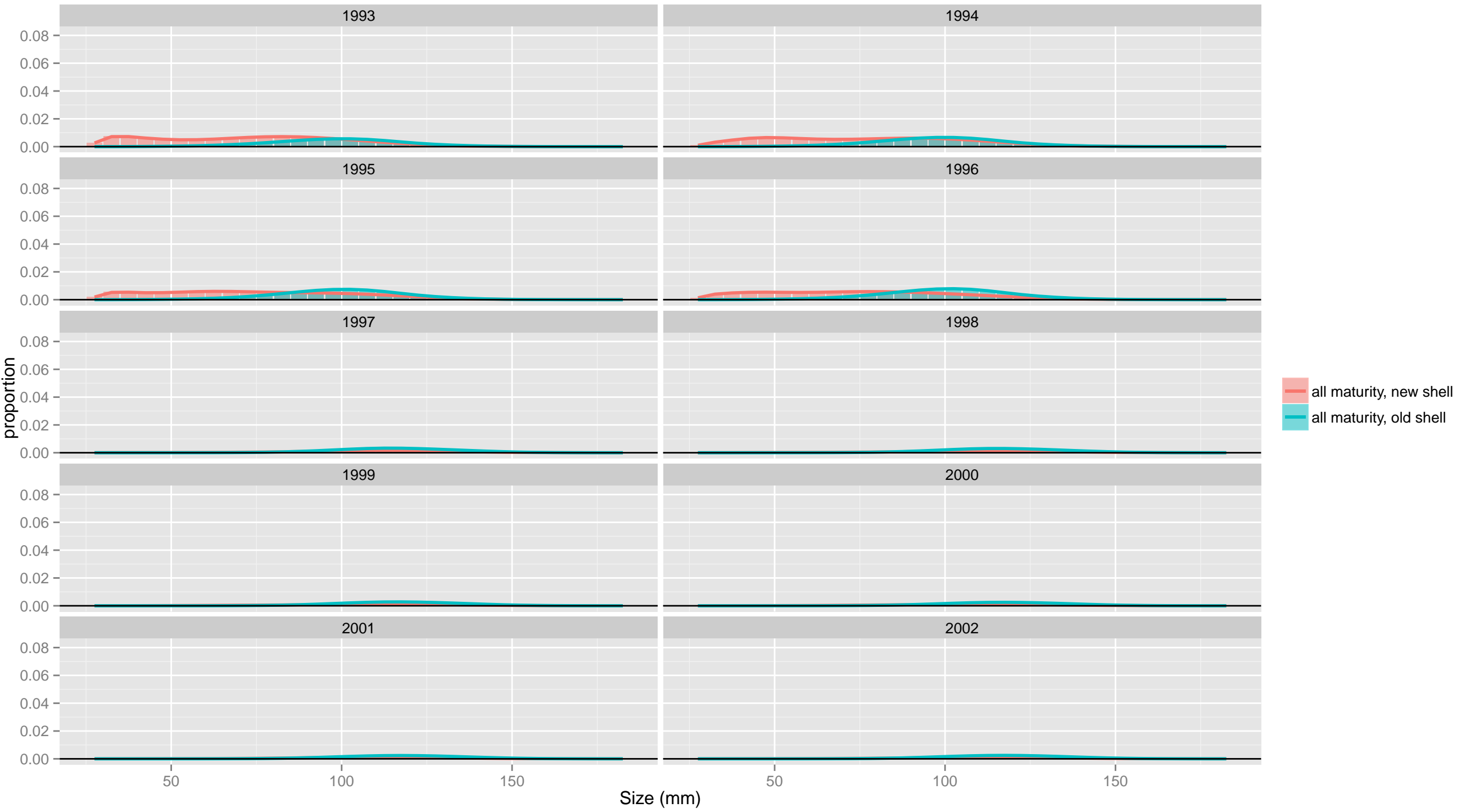
Total Catch: GTF: female



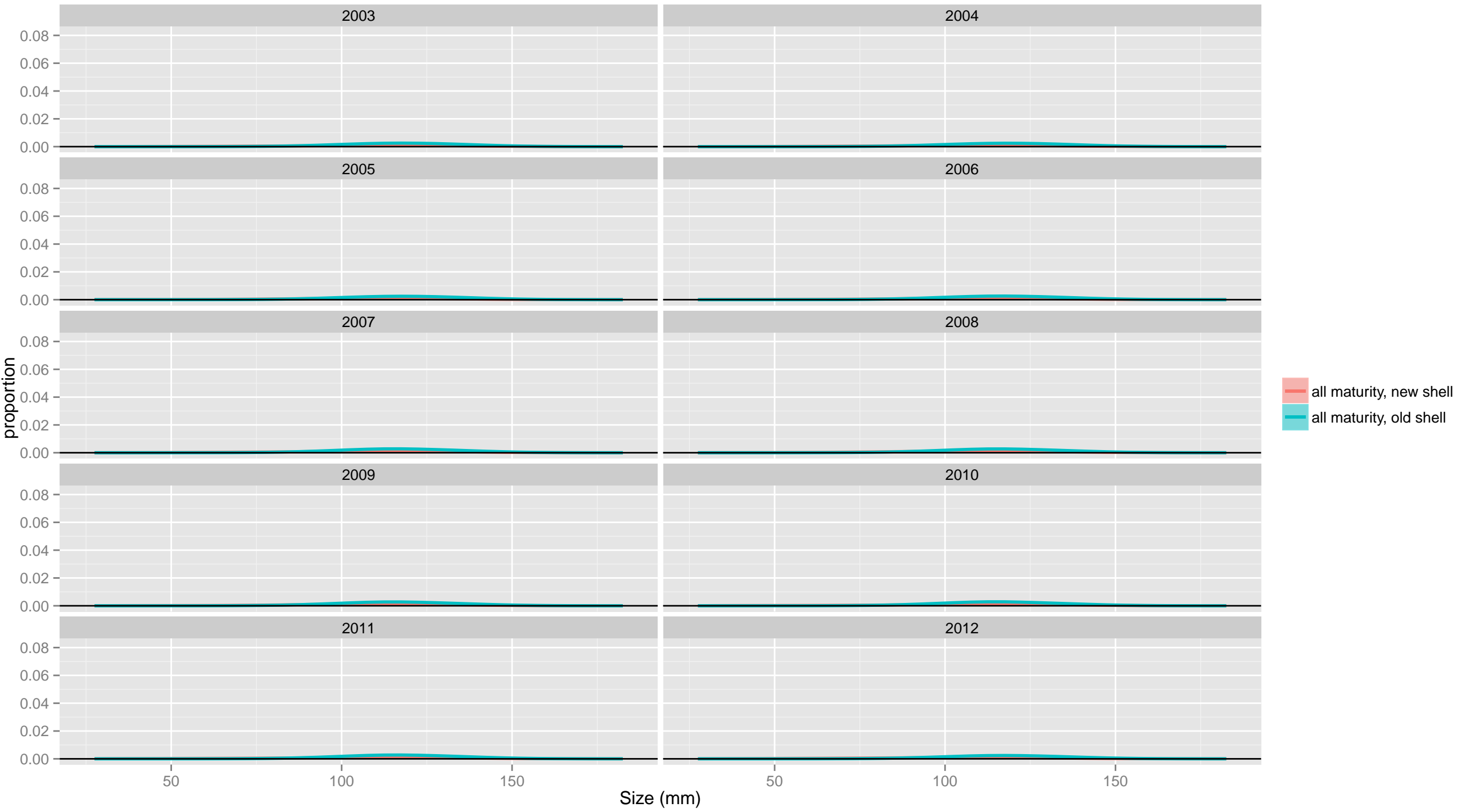
Total Catch: GTF: female



Total Catch: GTF: female

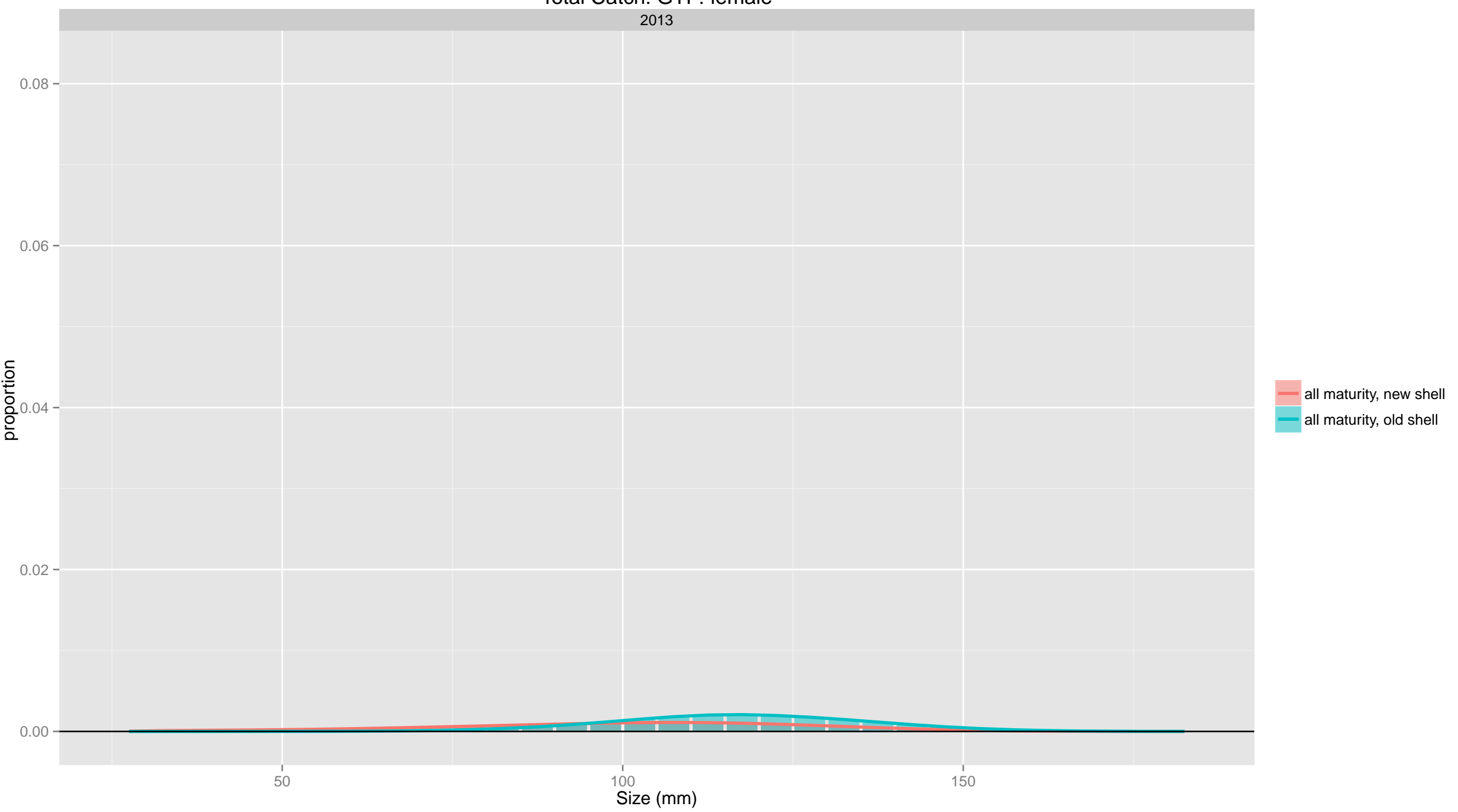


Total Catch: GTF: female

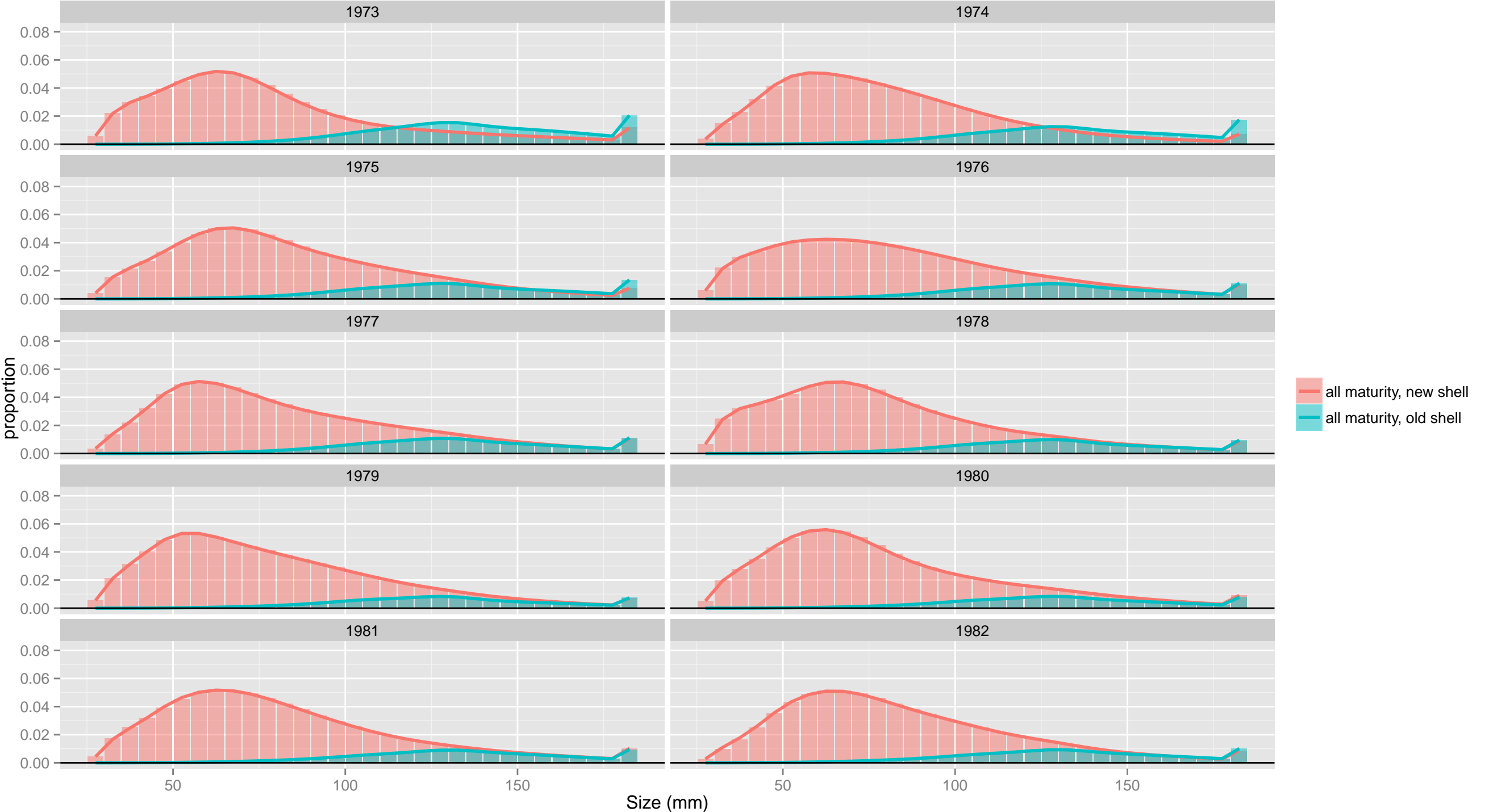


Total Catch: GTF: female

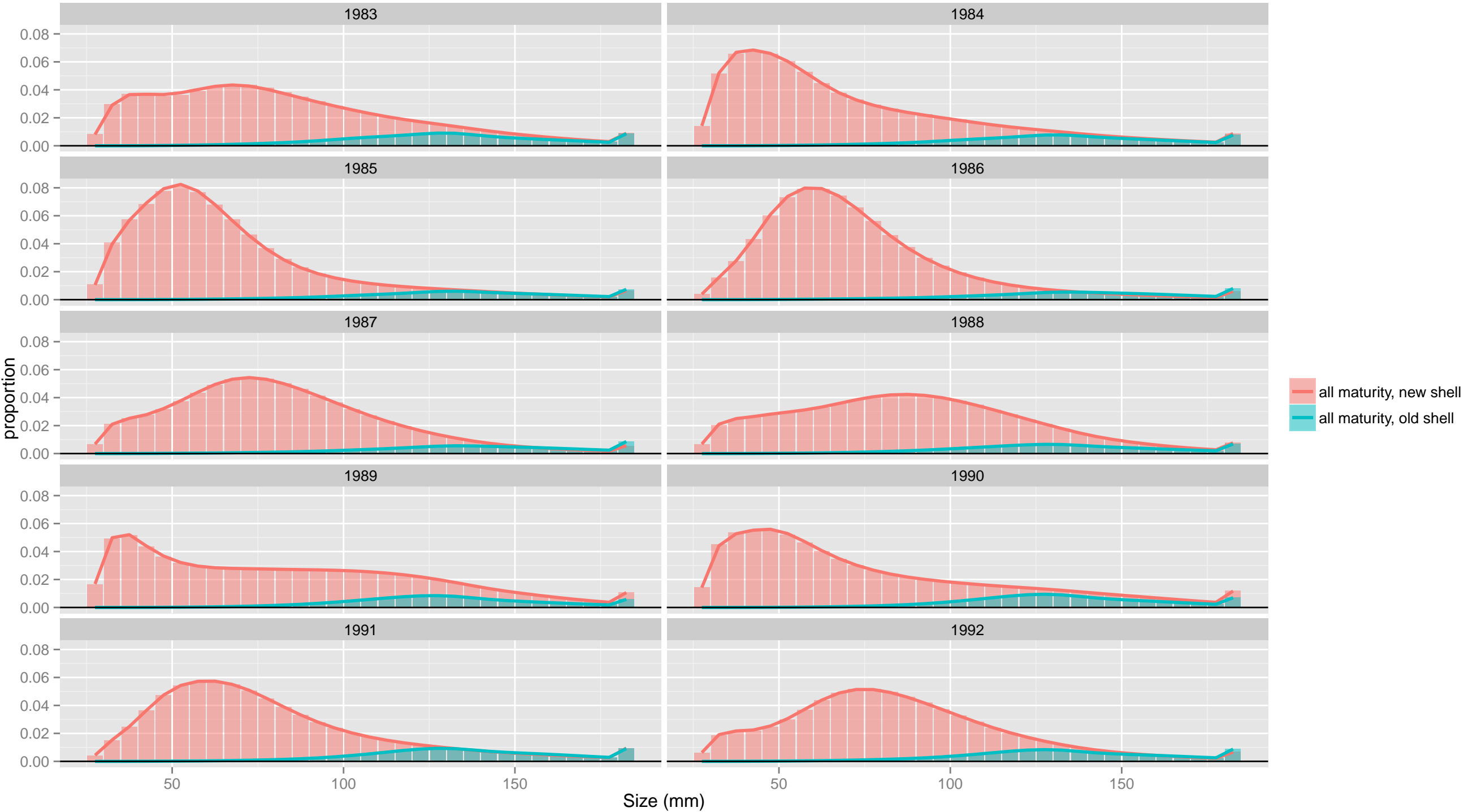
2013



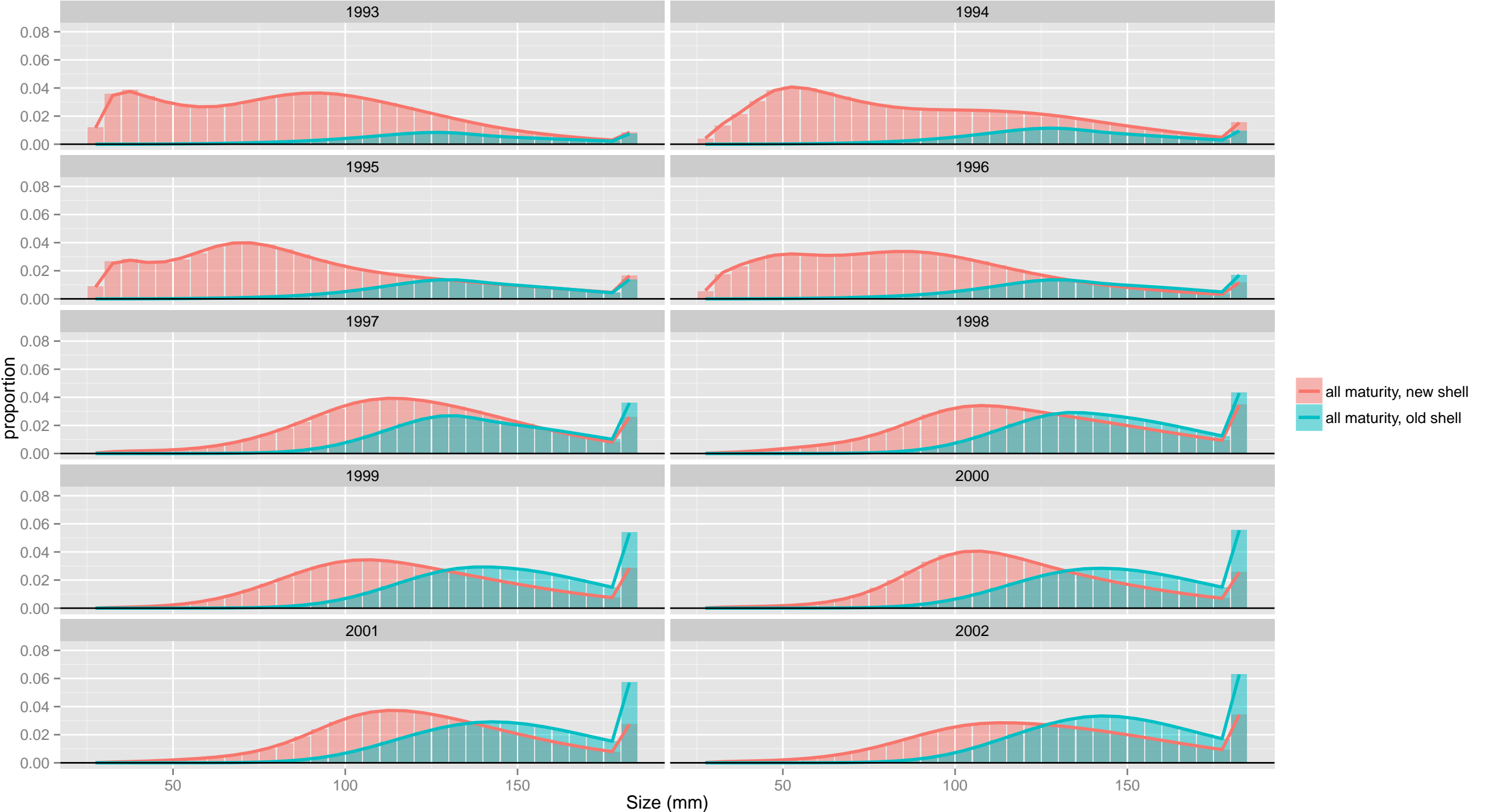
Total Catch: GTF: male



Total Catch: GTF: male



Total Catch: GTF: male



Total Catch: GTF: male



Total Catch: GTF: male

2013

proportion

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

50

Size (mm)

100

150

0.00

0.02

0.04

0.06

0.08

Total Catch: GTF

male

female

0.03
0.02
0.01
0.00

50

100

150

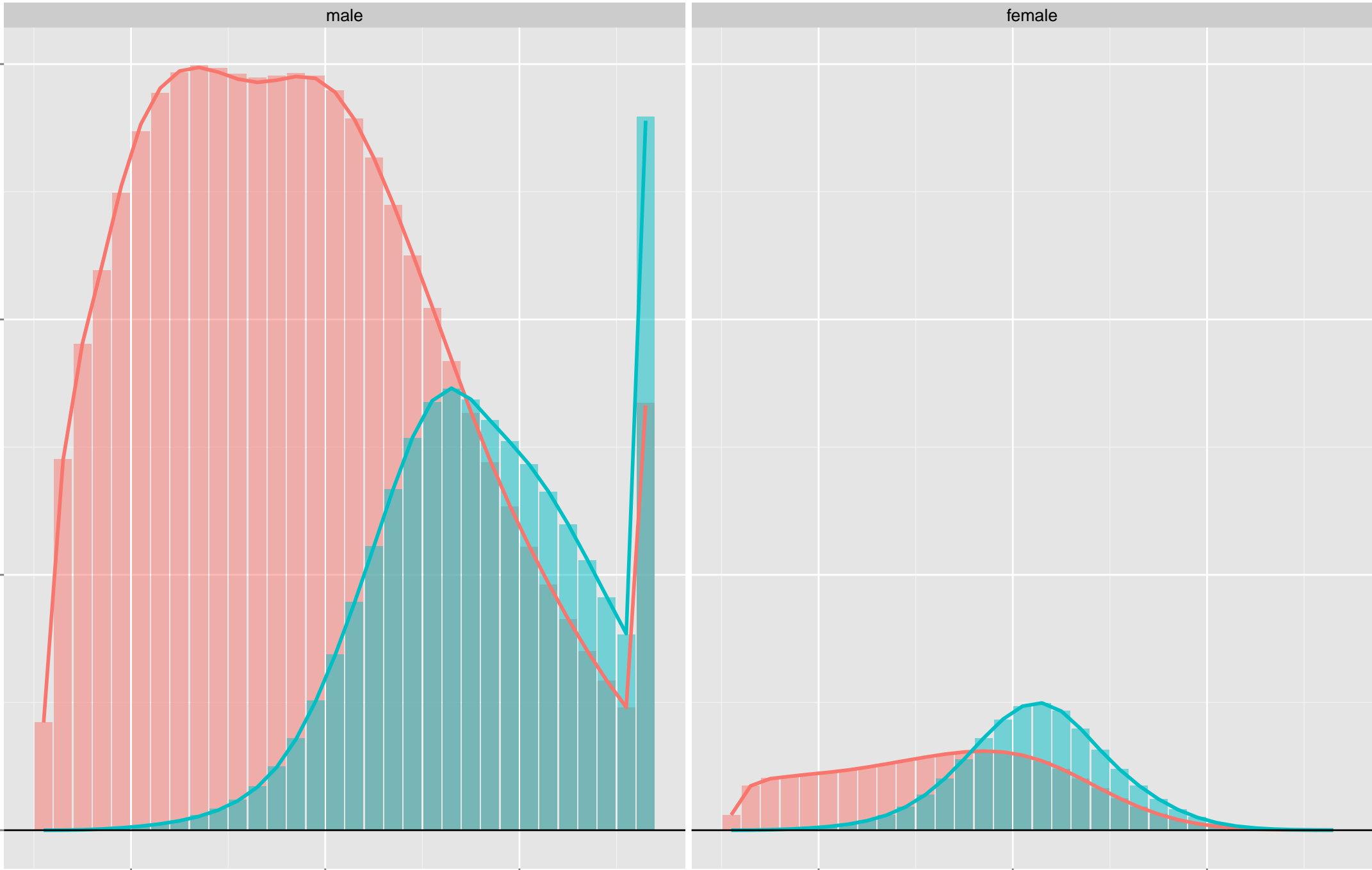
Size (mm)

50

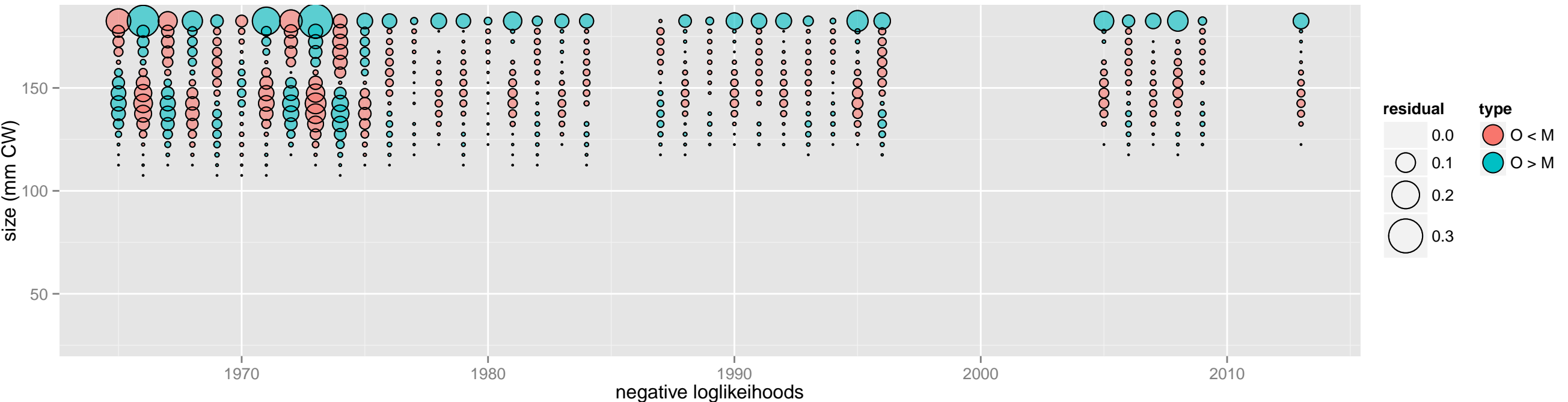
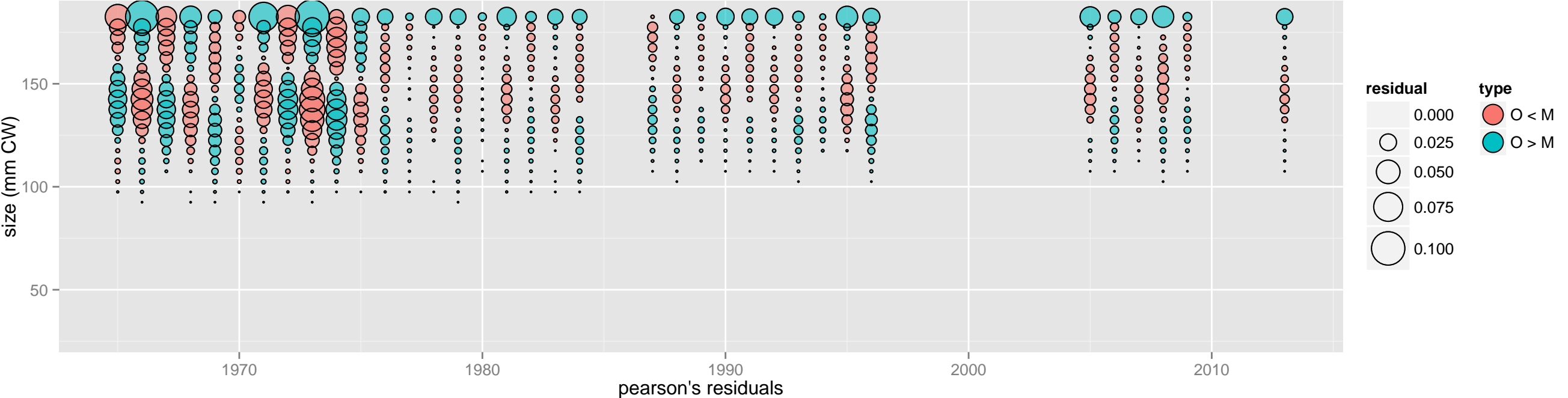
100

150

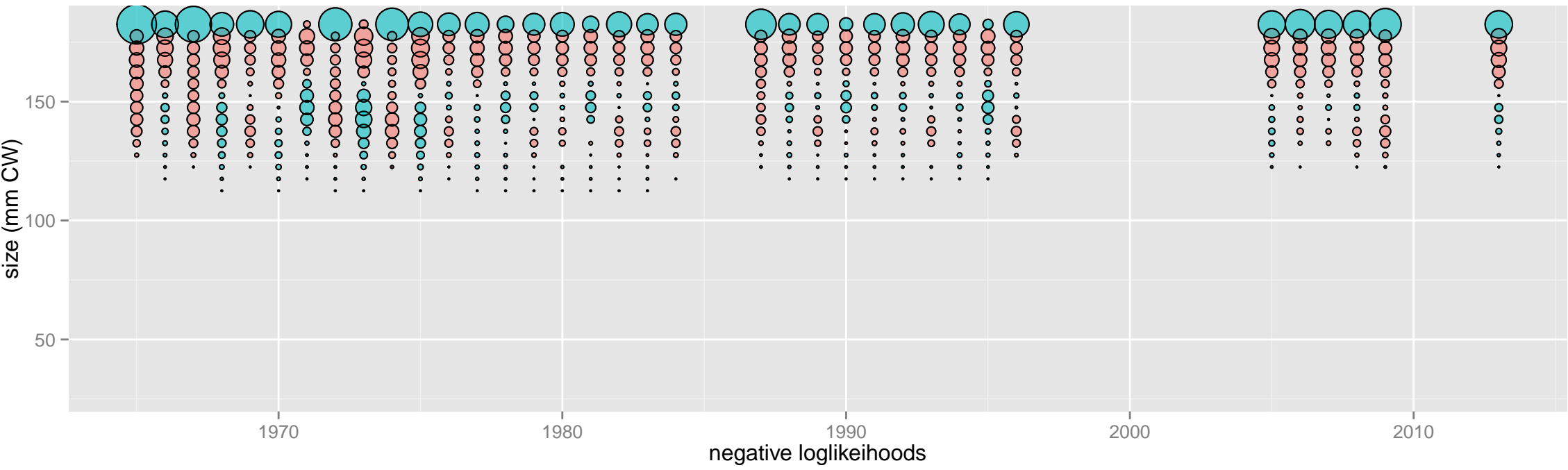
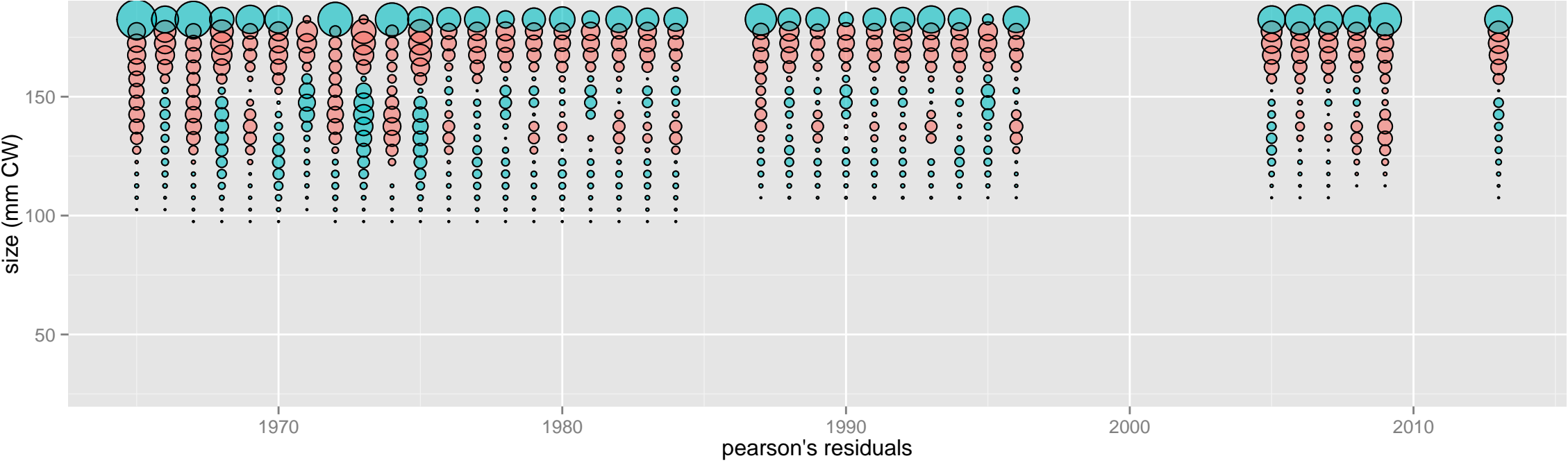
- all maturity, new shell
- all maturity, old shell



TCF: retained catch: male, new shell



TCF: retained catch: male, old shell



NMFS_trawl_survey

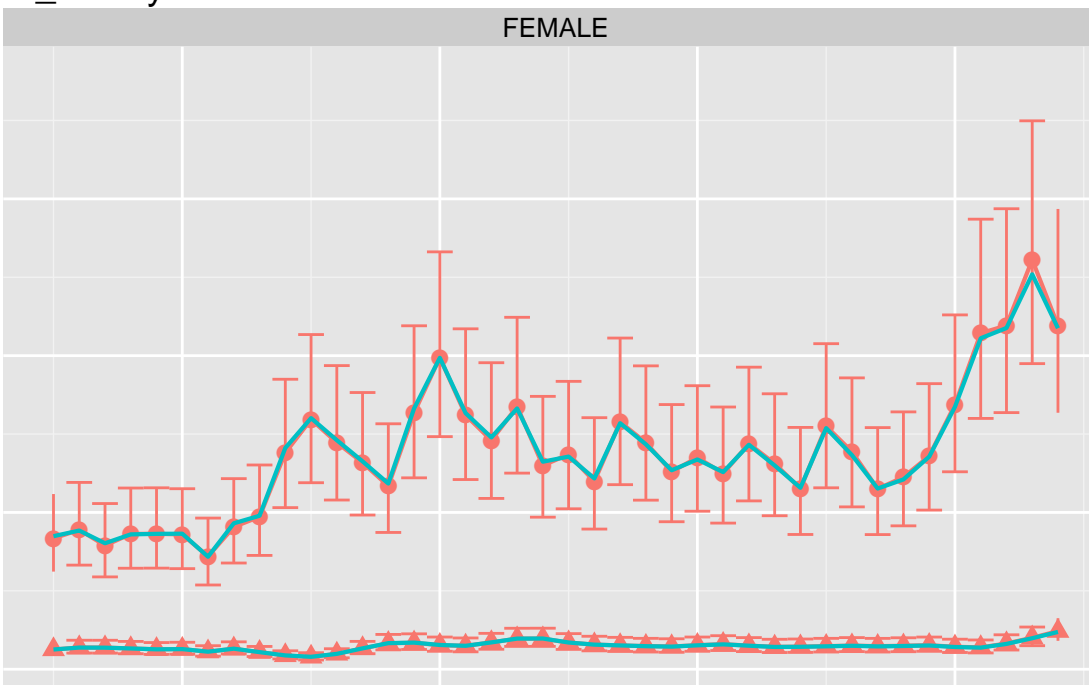
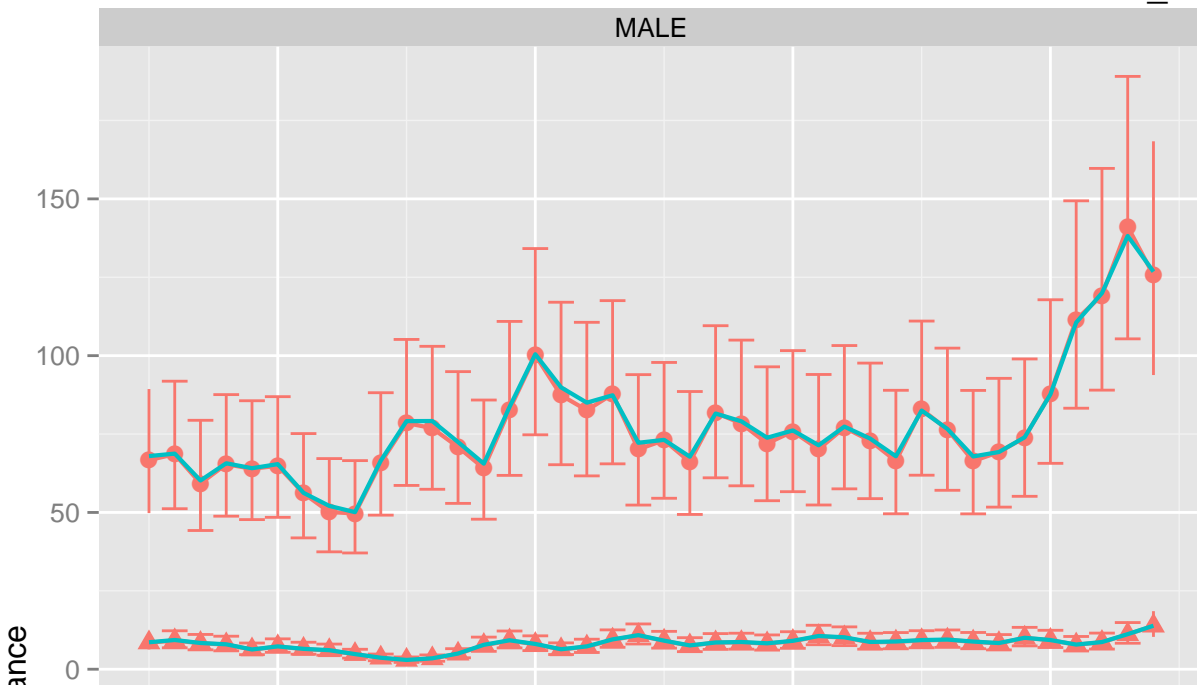
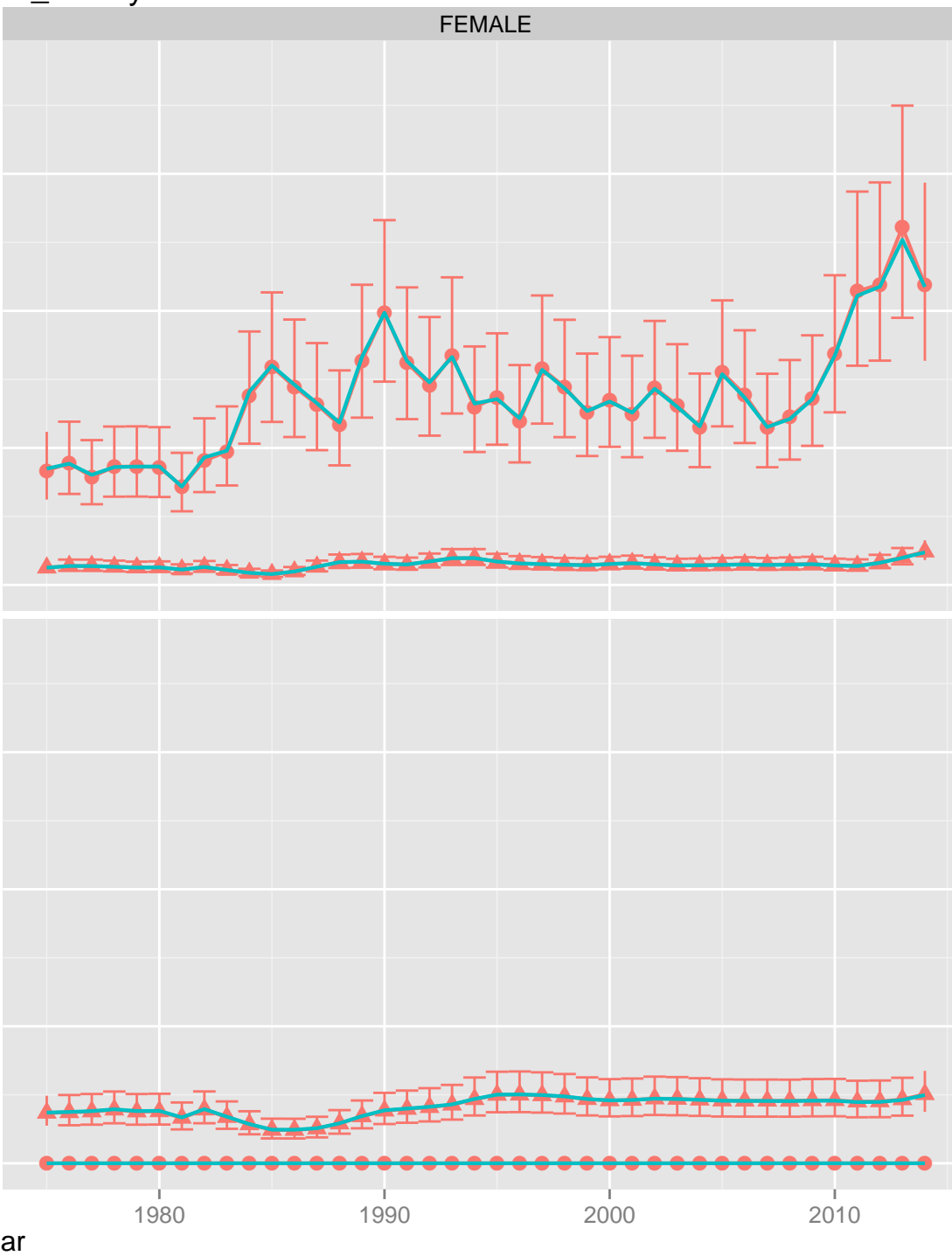
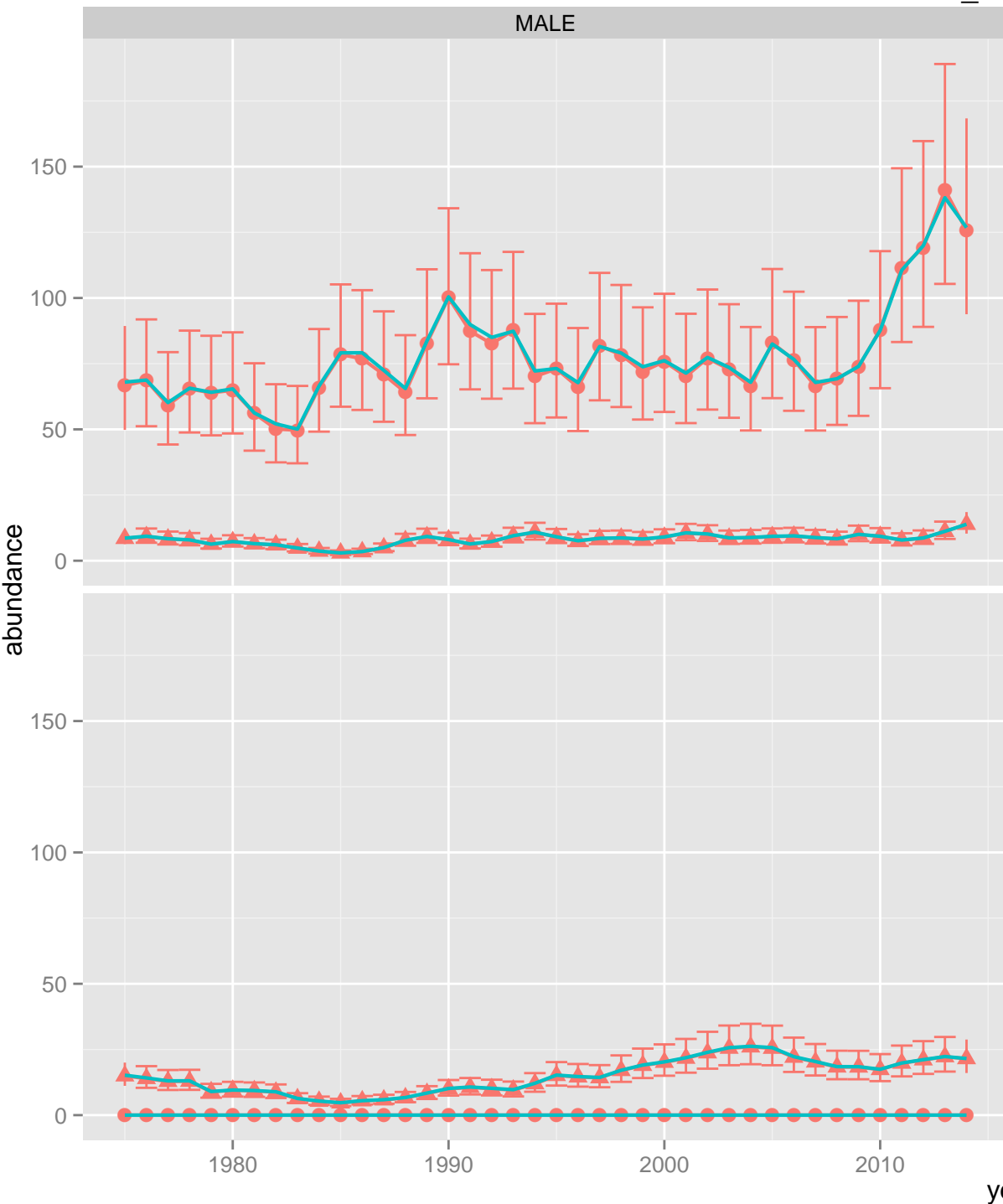
MALE

FEMALE

NEW_SHELL

OLD_SHELL

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



NMFS_trawl_survey



NMFS_trawl_survey

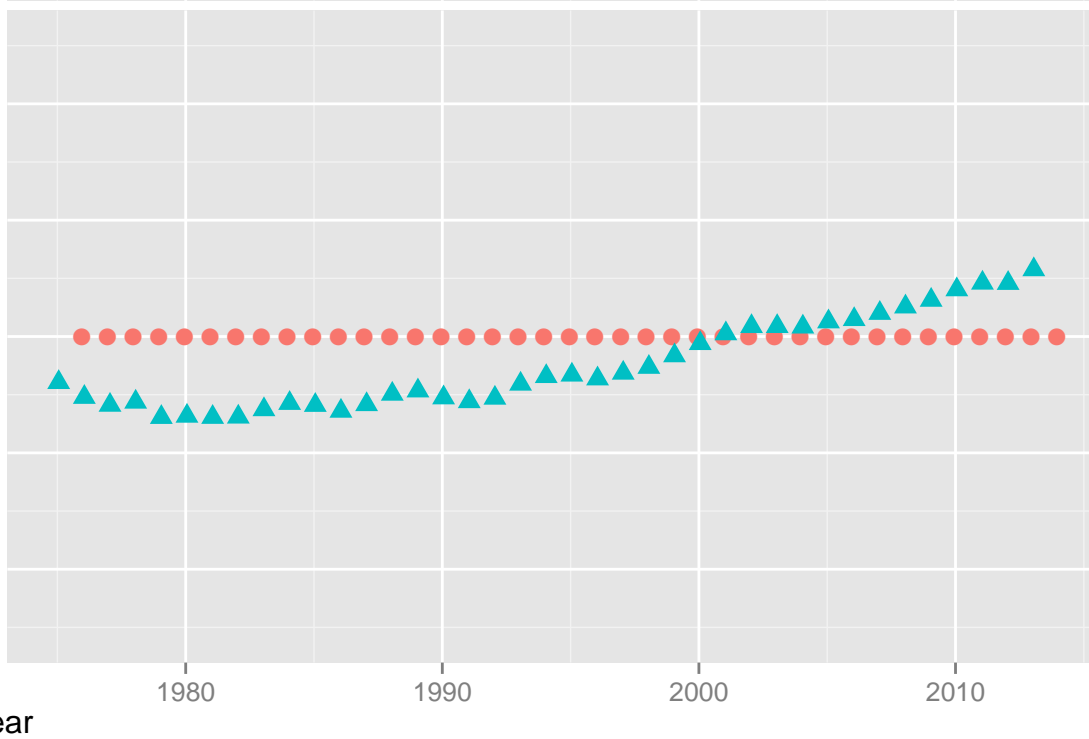
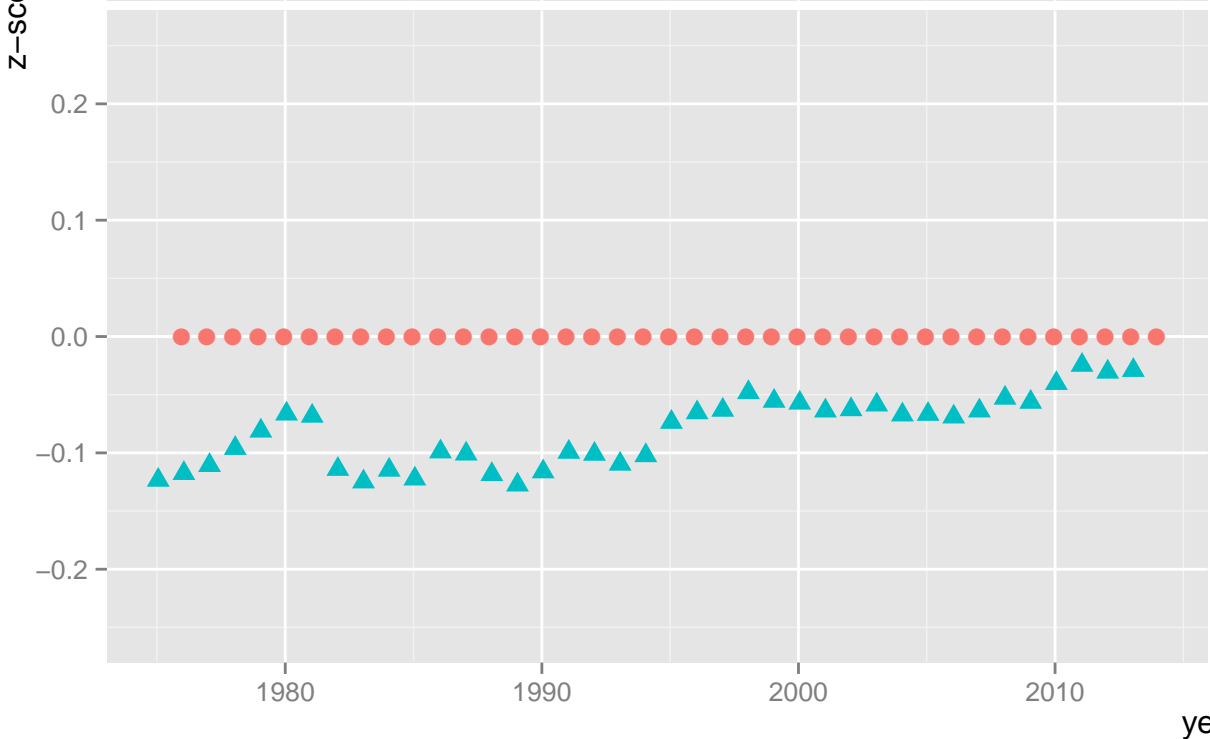
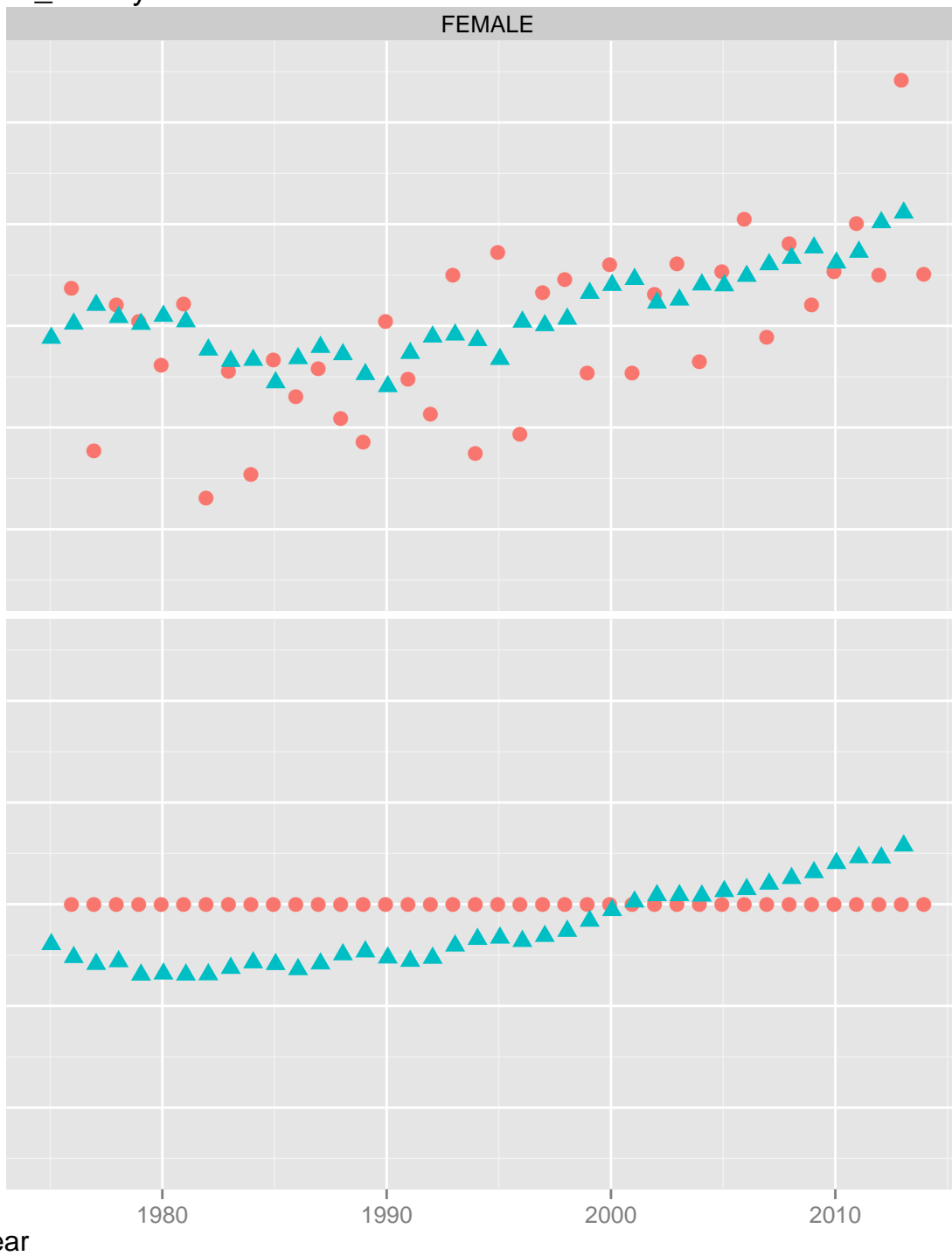
MALE

FEMALE

NEW_SHELL

OLD_SHELL

maturity
● IMMATURE
▲ MATURE



NMFS_trawl_survey



NMFS_trawl_survey

MALE

FEMALE

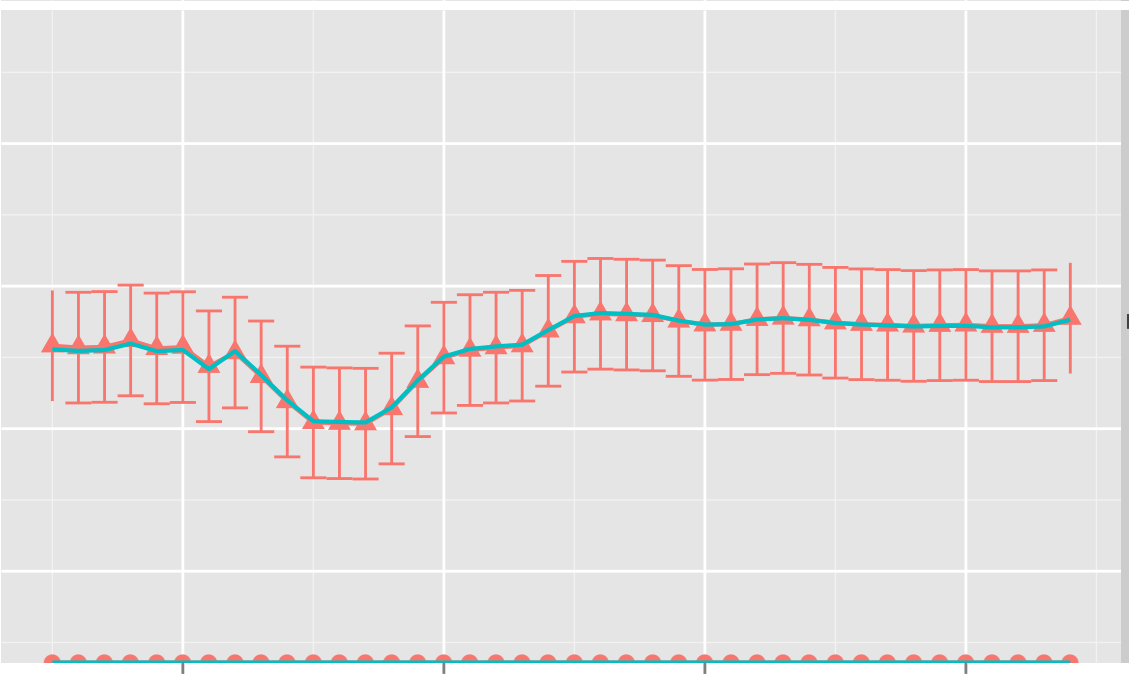
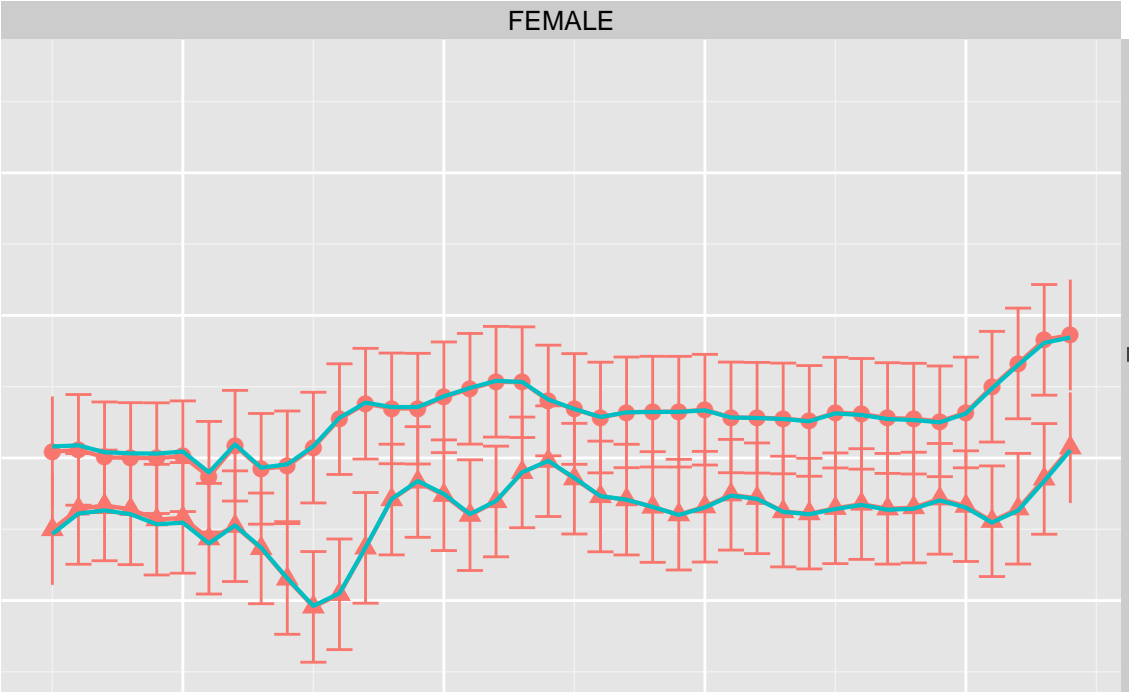
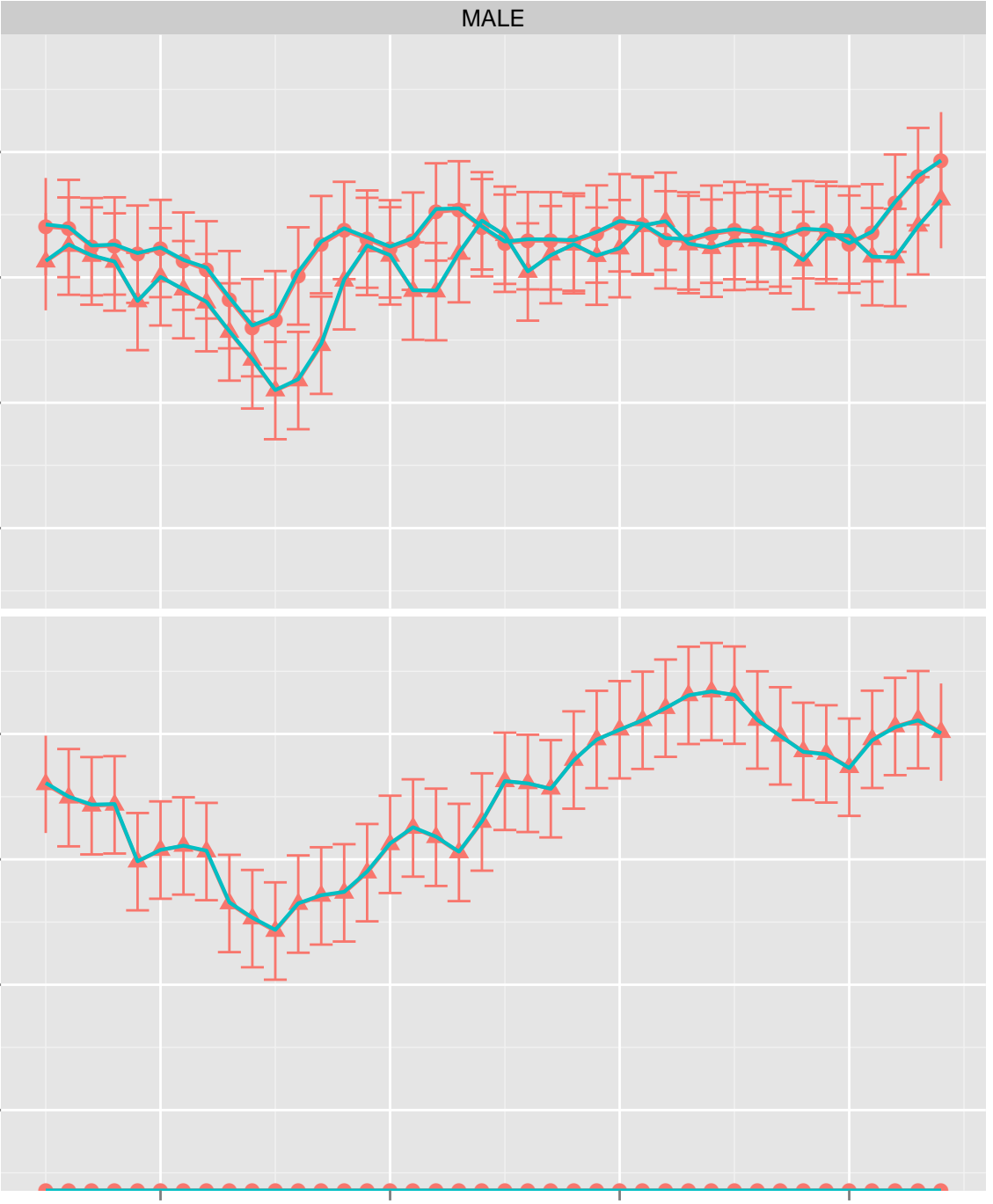
NEW_SHELL

OLD_SHELL

biomass [ln-scale]

year

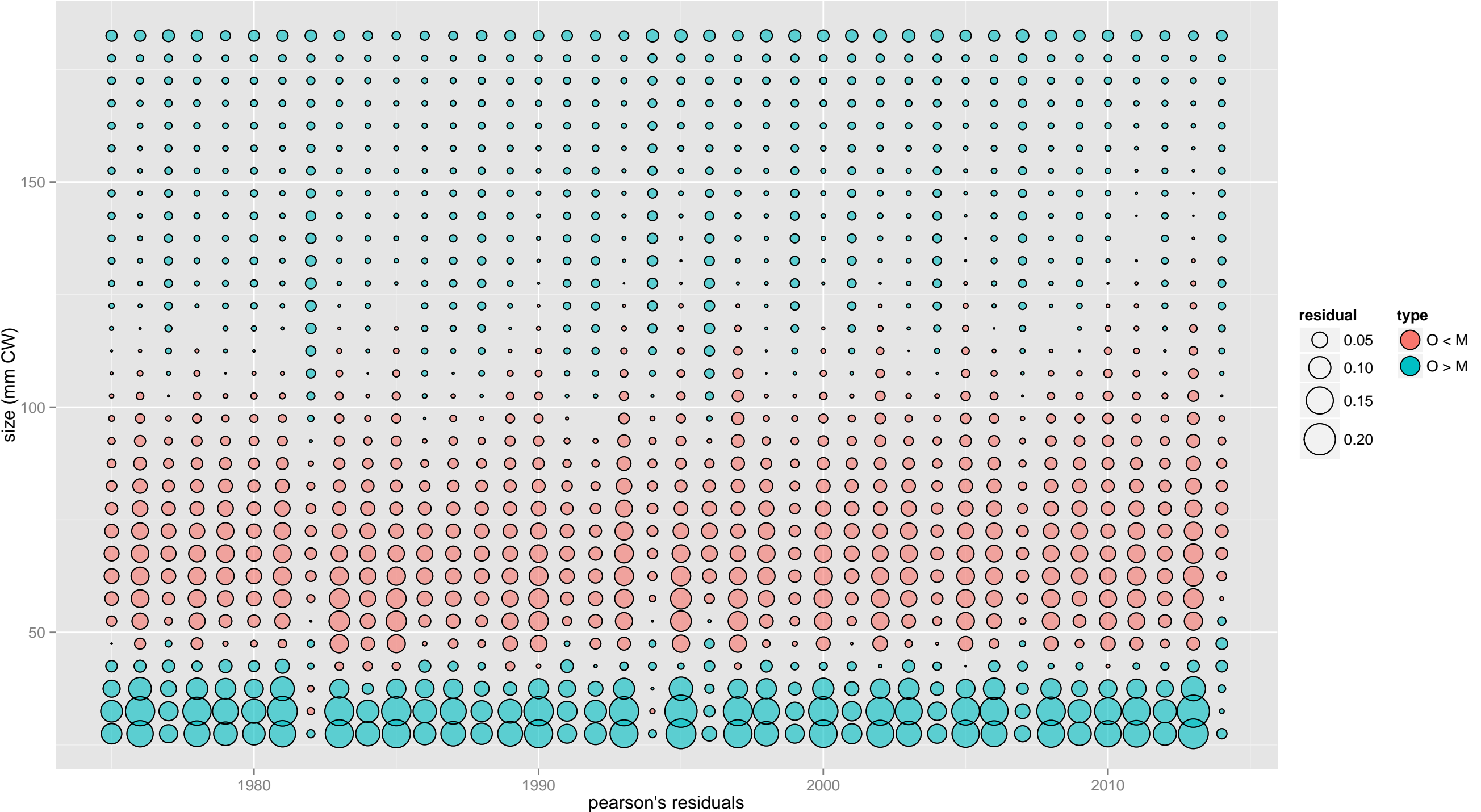
- maturity**
- IMMATURE
 - ▲ MATURE
- type**
- observed
 - estimated

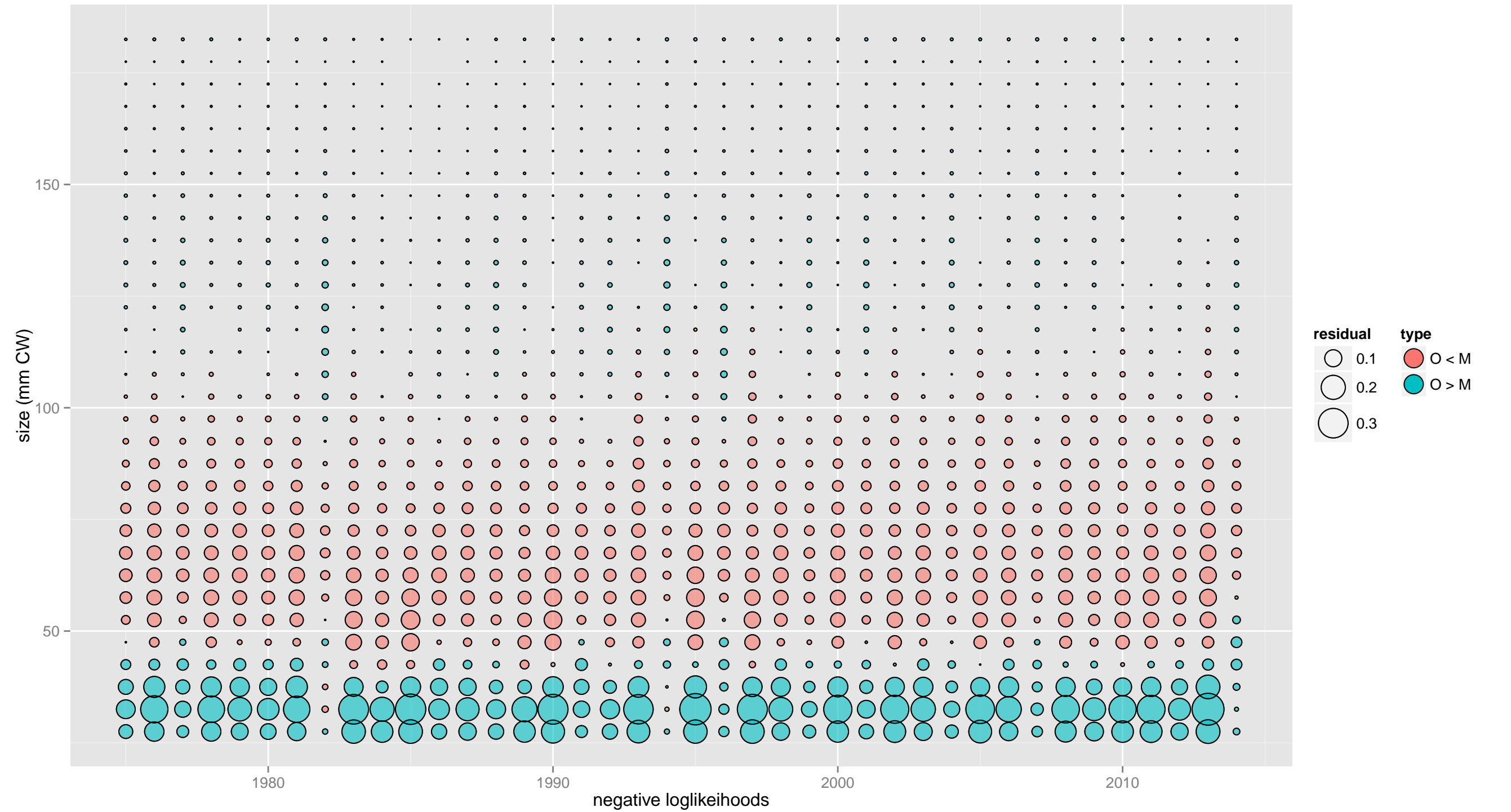


NMFS_trawl_survey

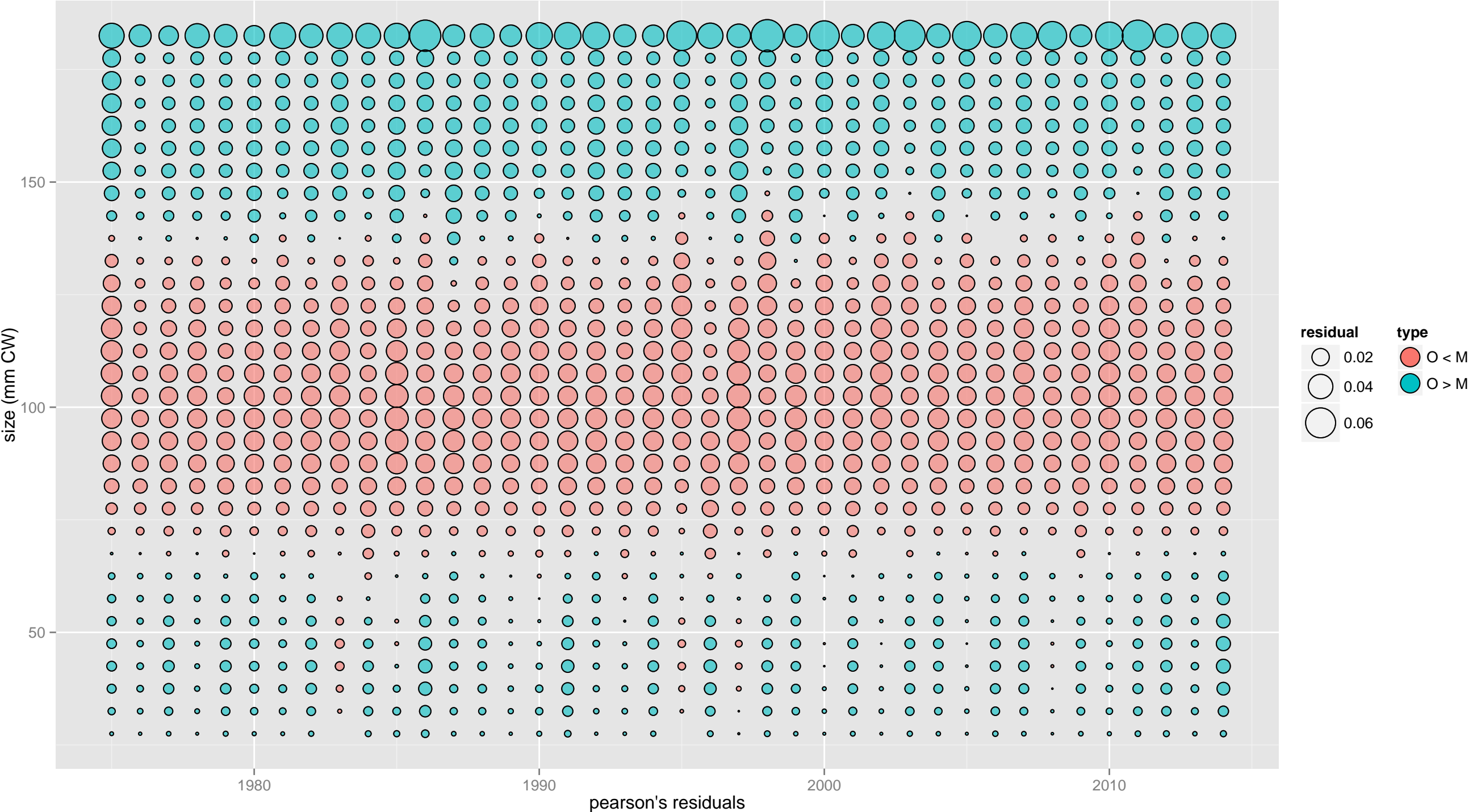


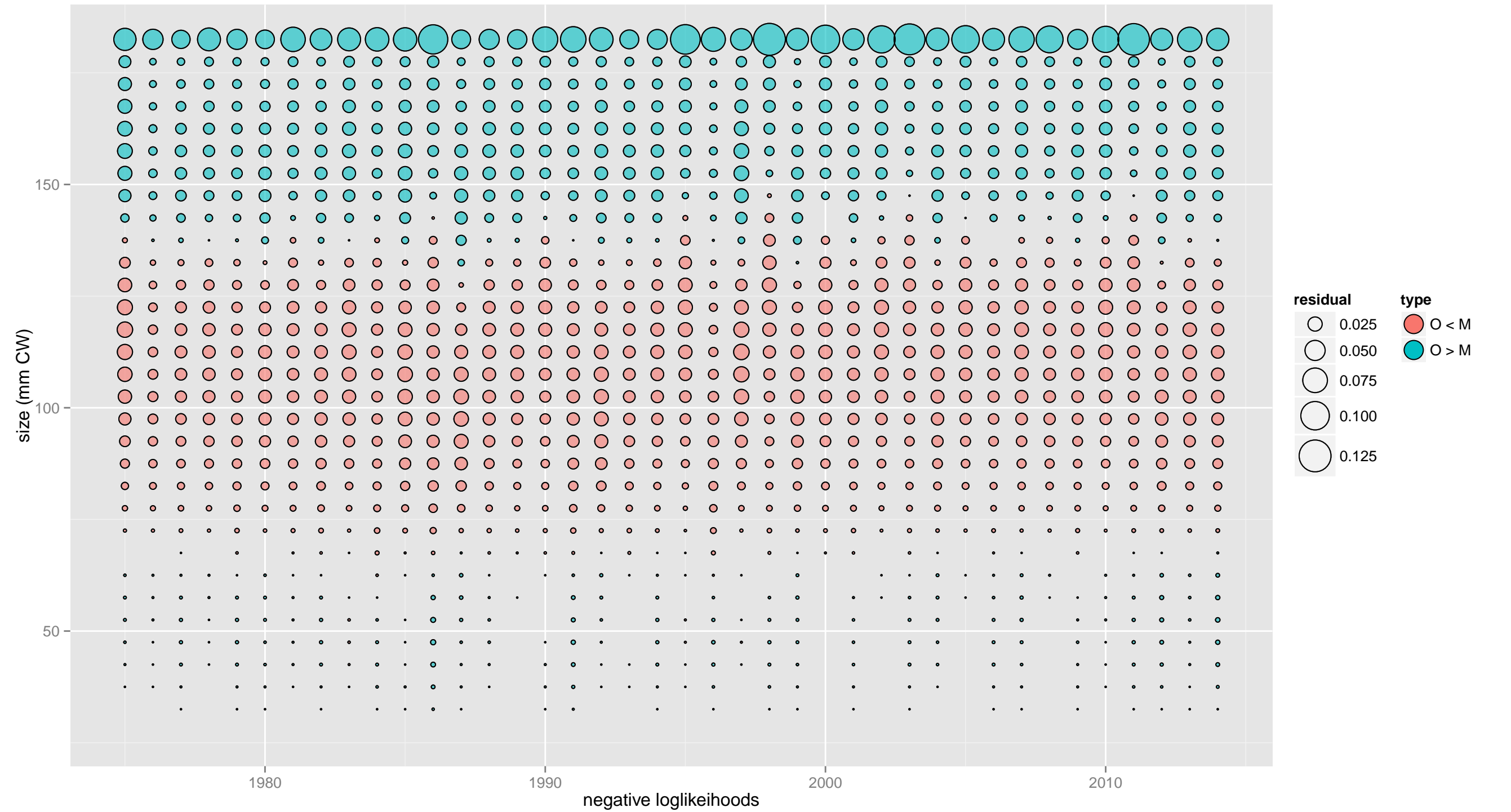
NMFS_trawl_survey: male, immature, new shell



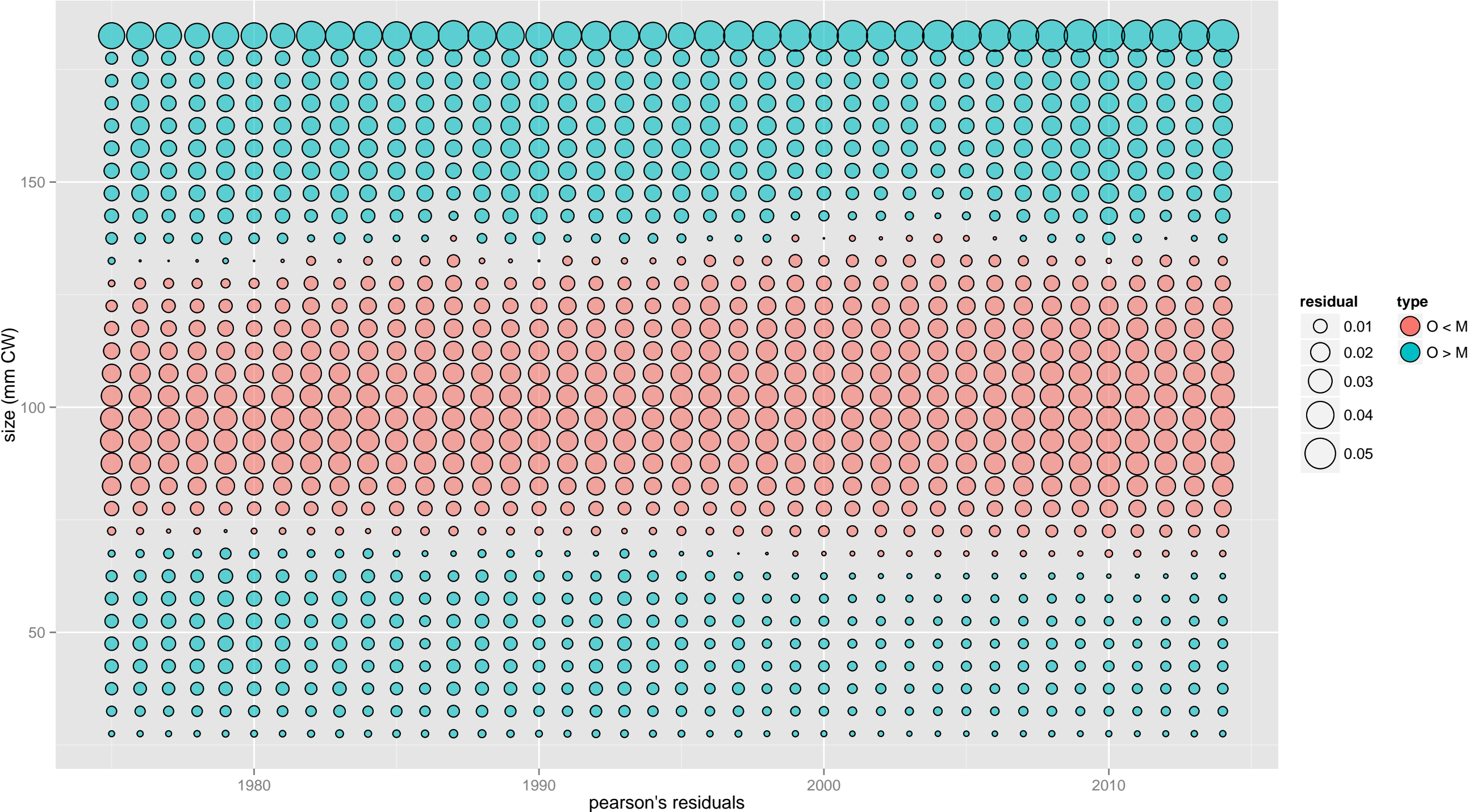


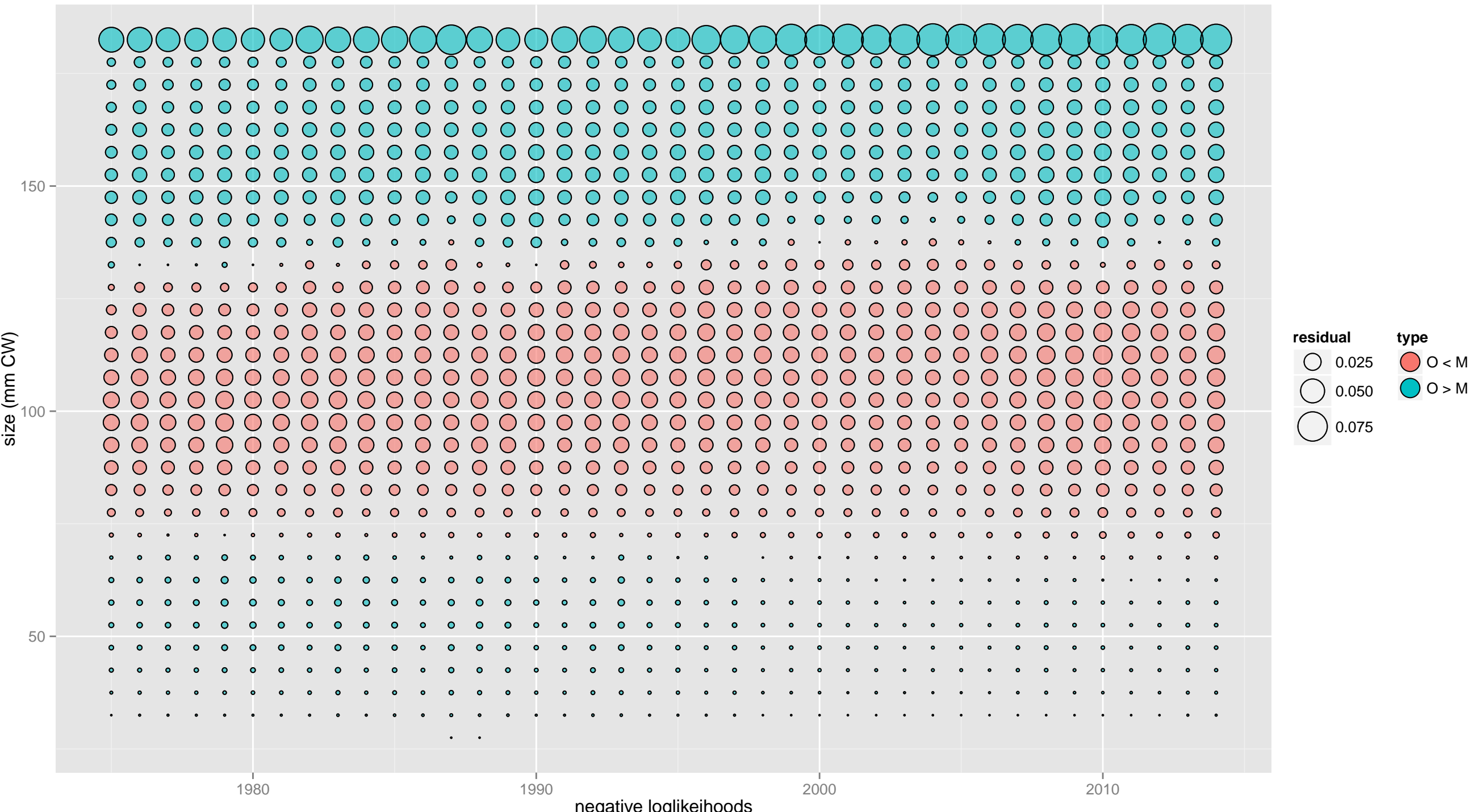
NMFS_trawl_survey: male, mature, new shell



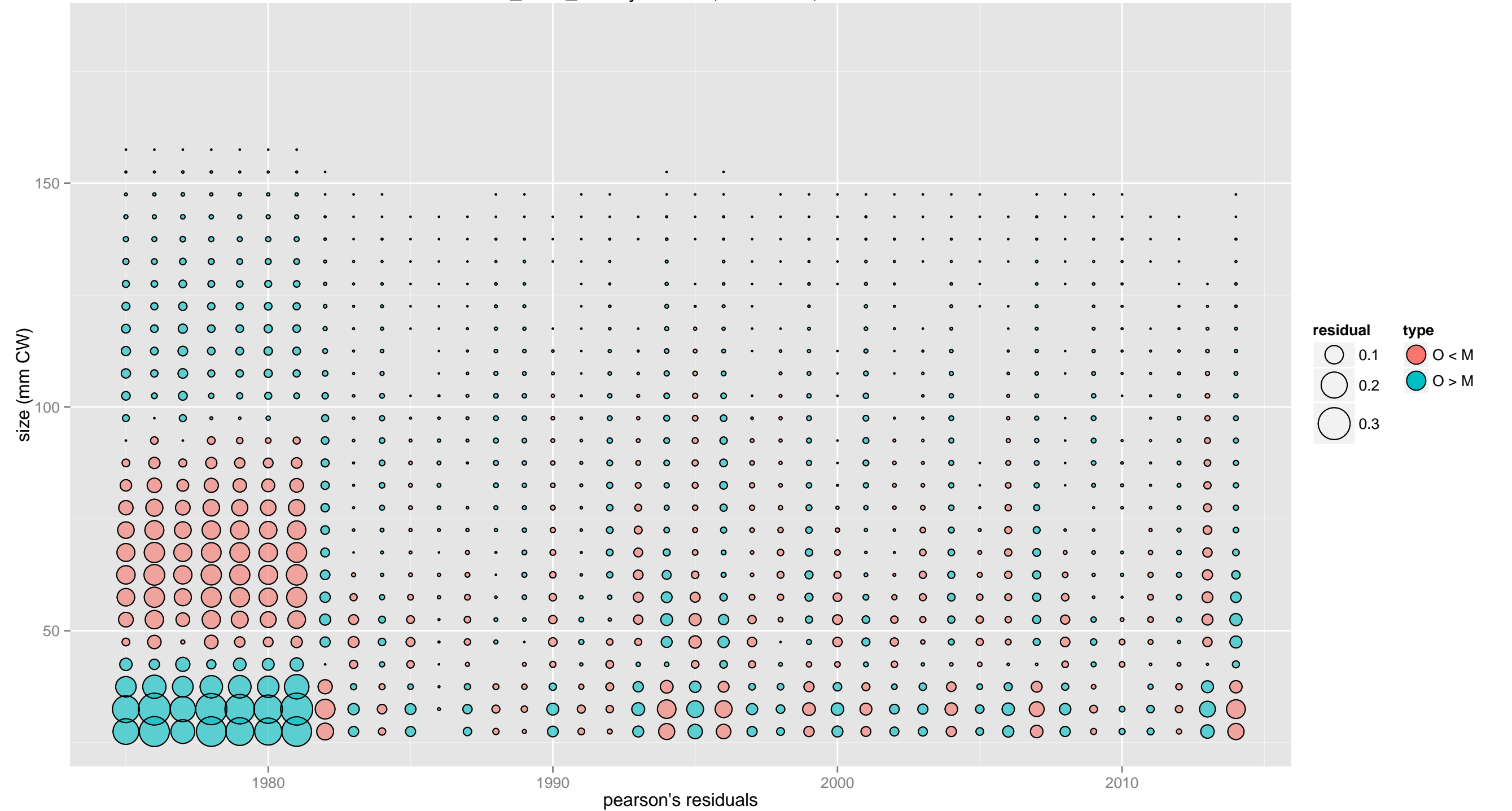


NMFS_trawl_survey: male, mature, old shell



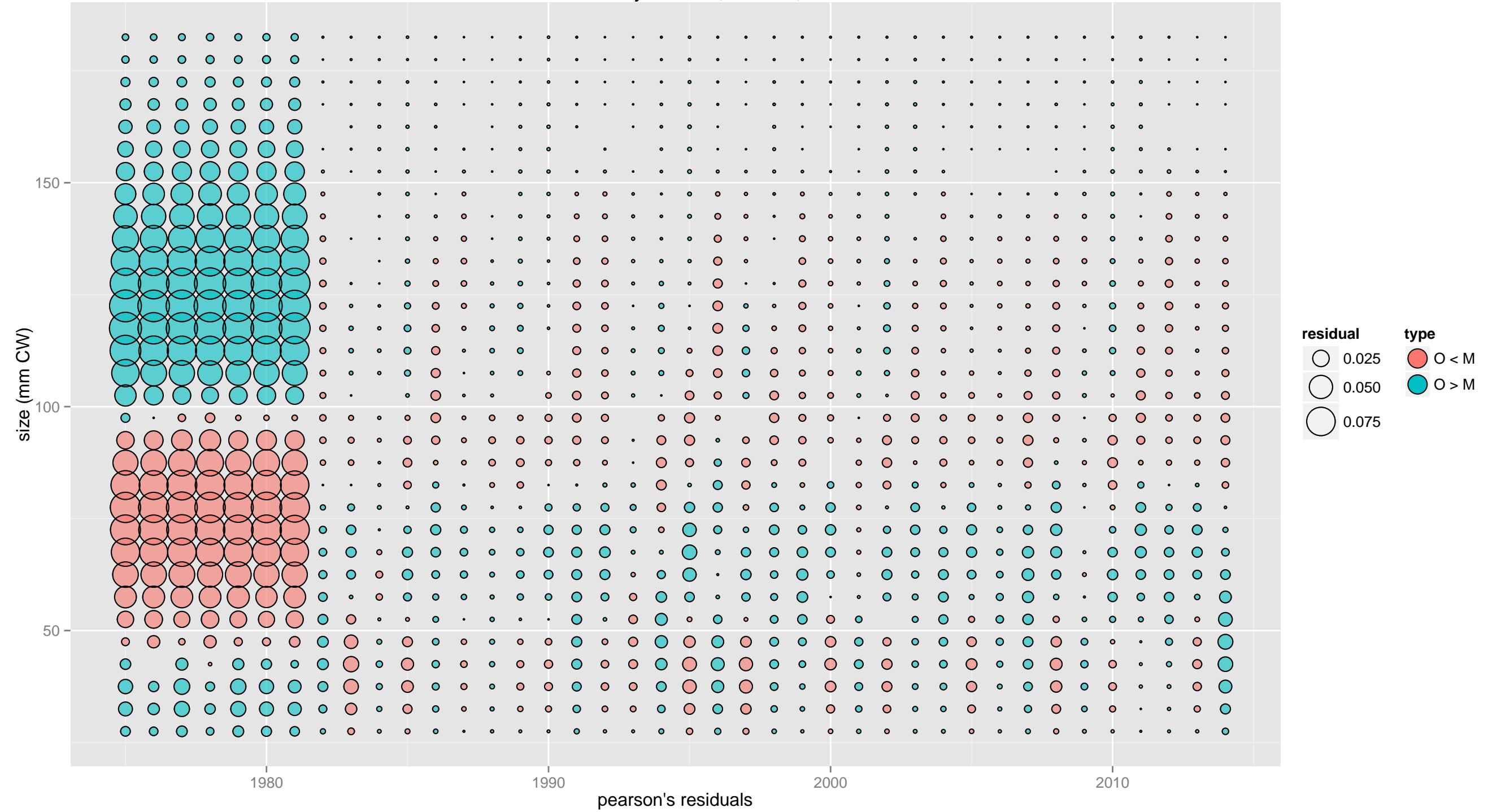


NMFS_trawl_survey: female, immature, new shell



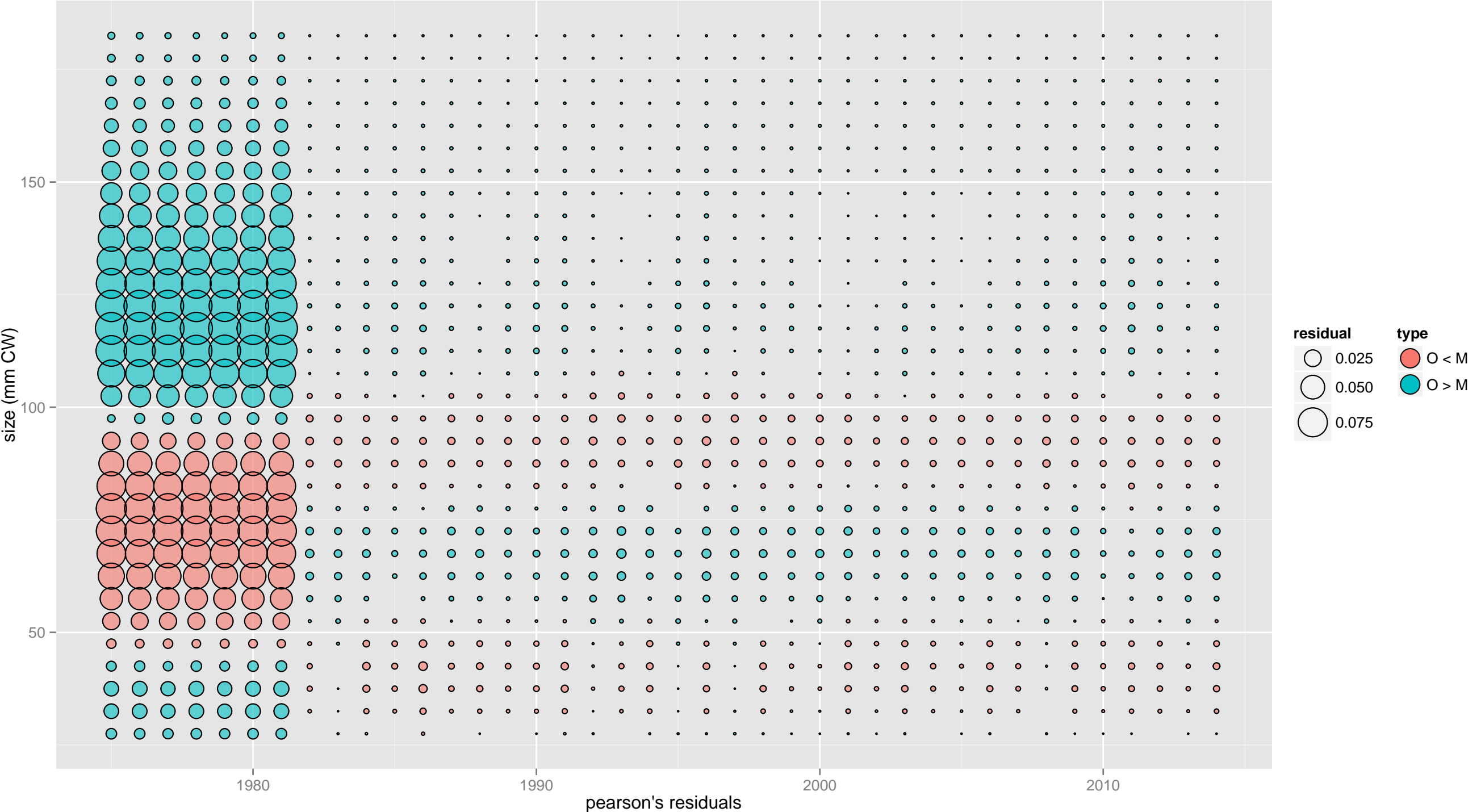


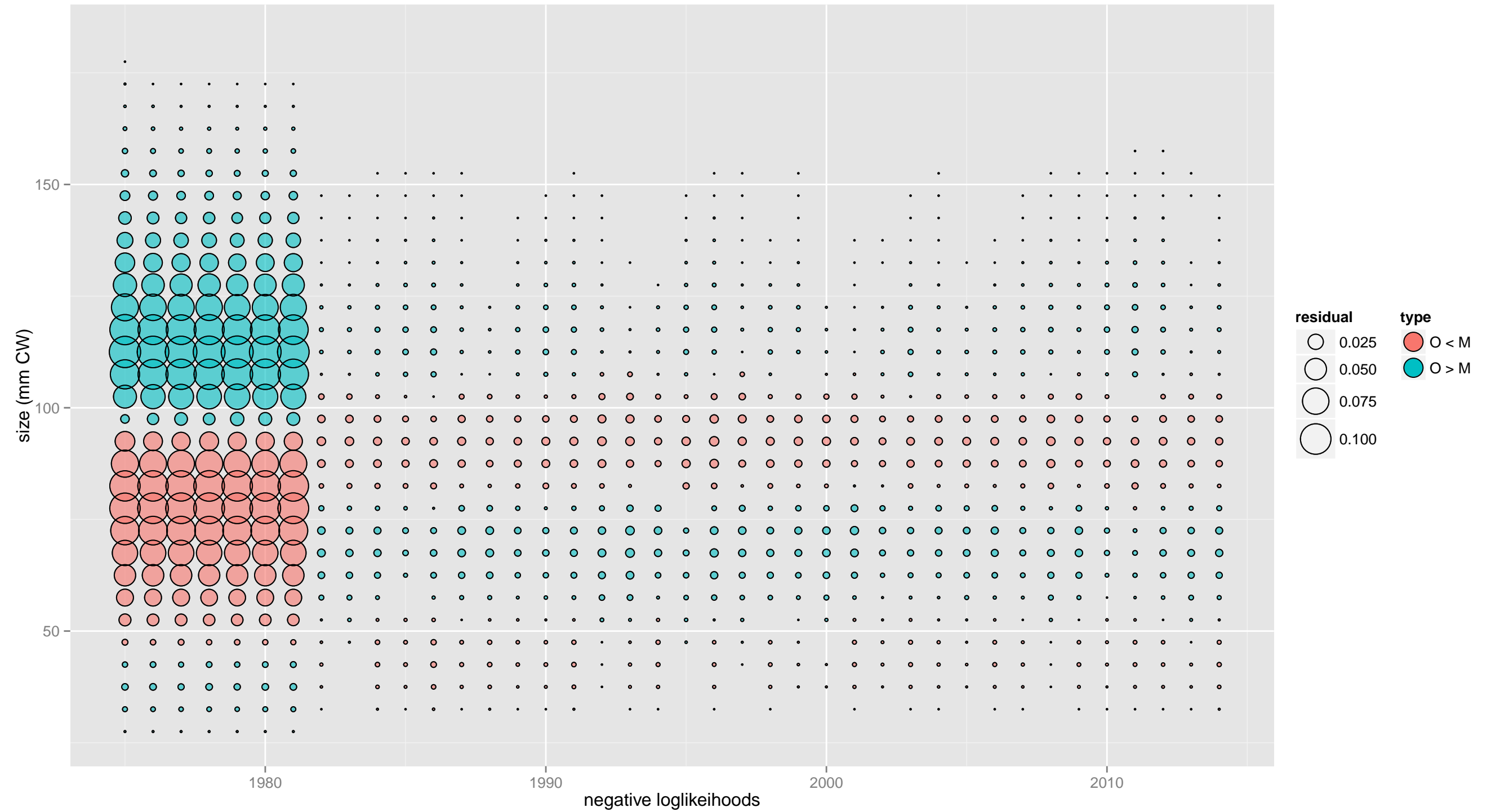
NMFS_trawl_survey: female, mature, new shell



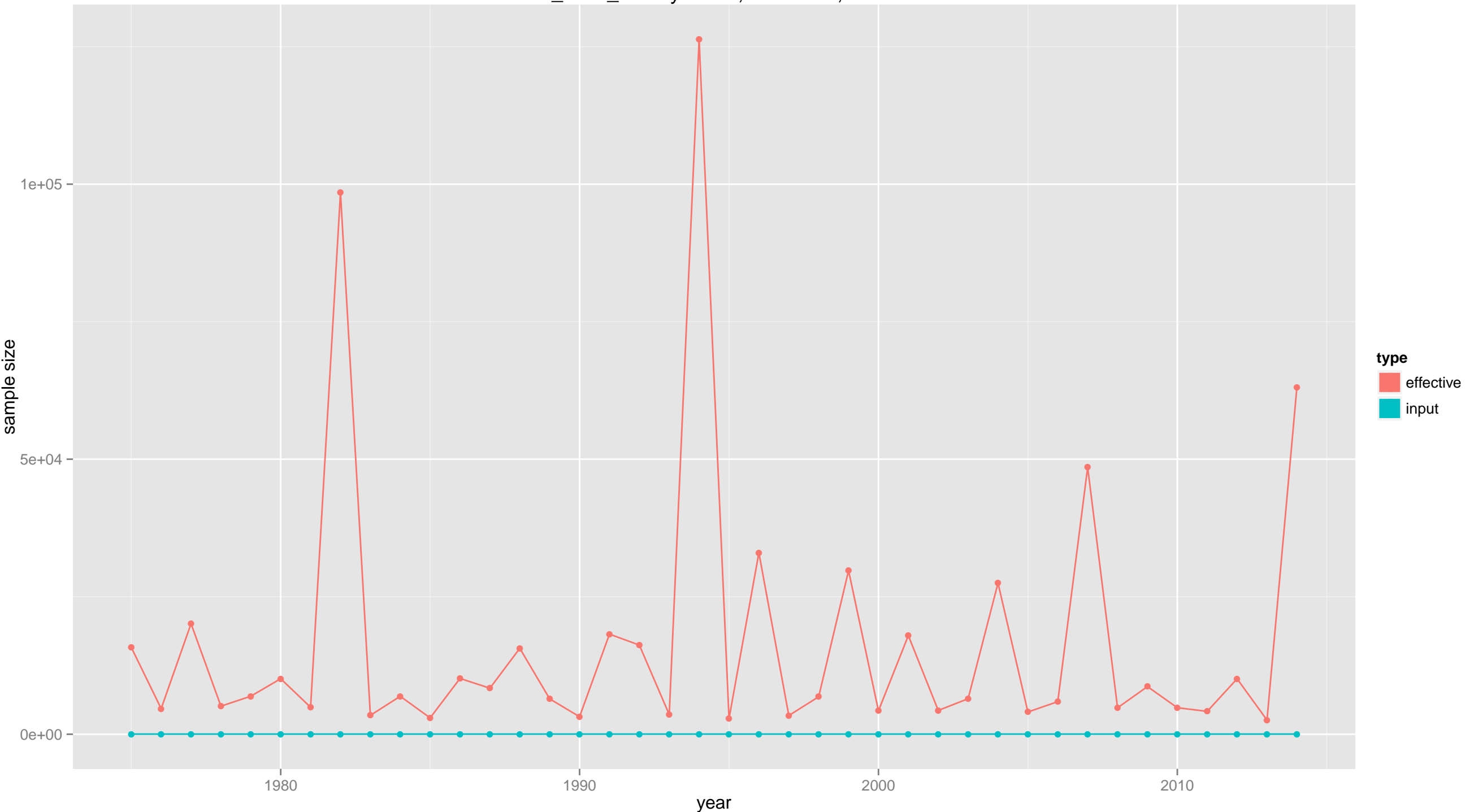


NMFS_trawl_survey: female, mature, old shell

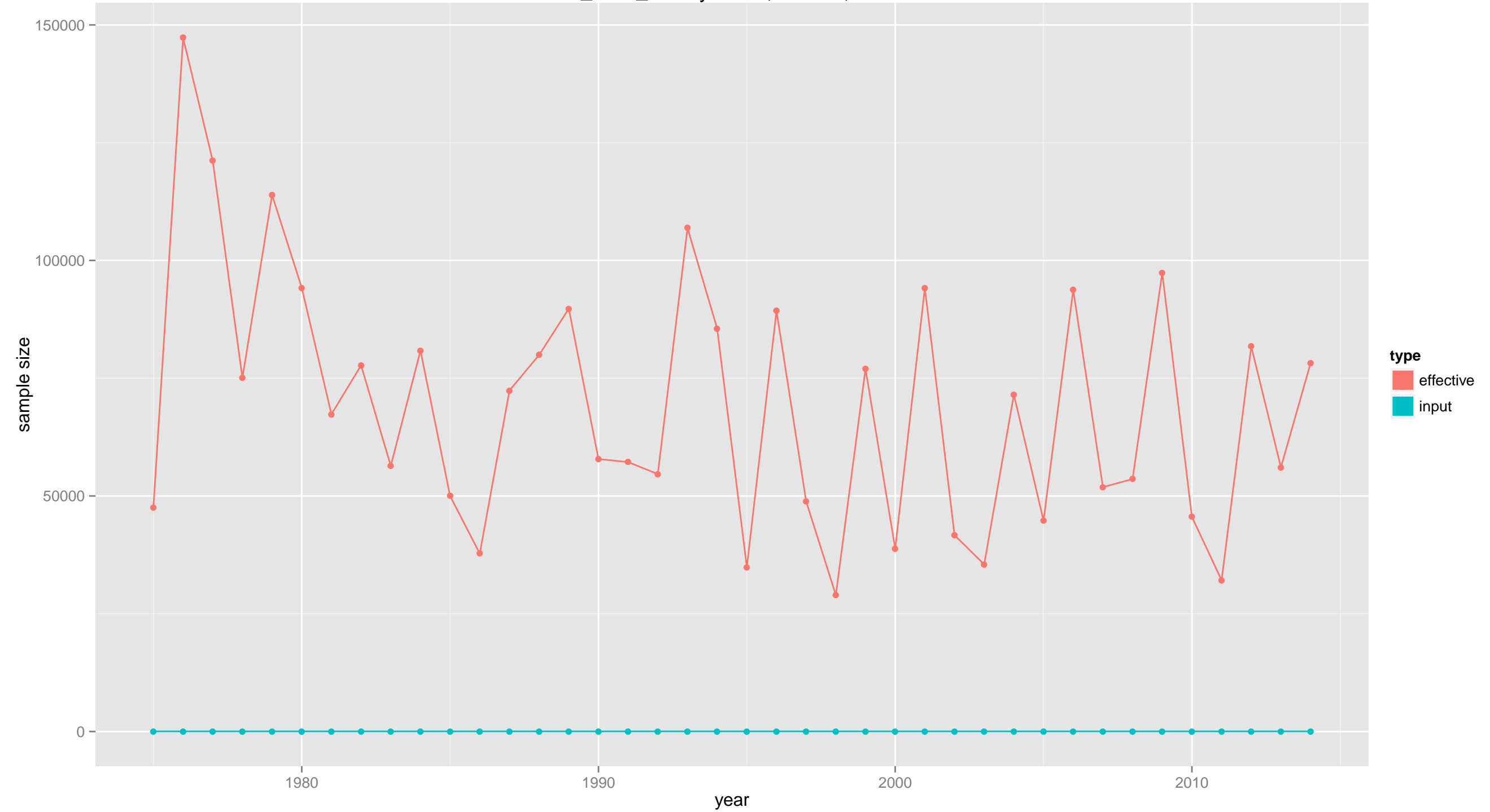




NMFS_trawl_survey: male, immature, new shell



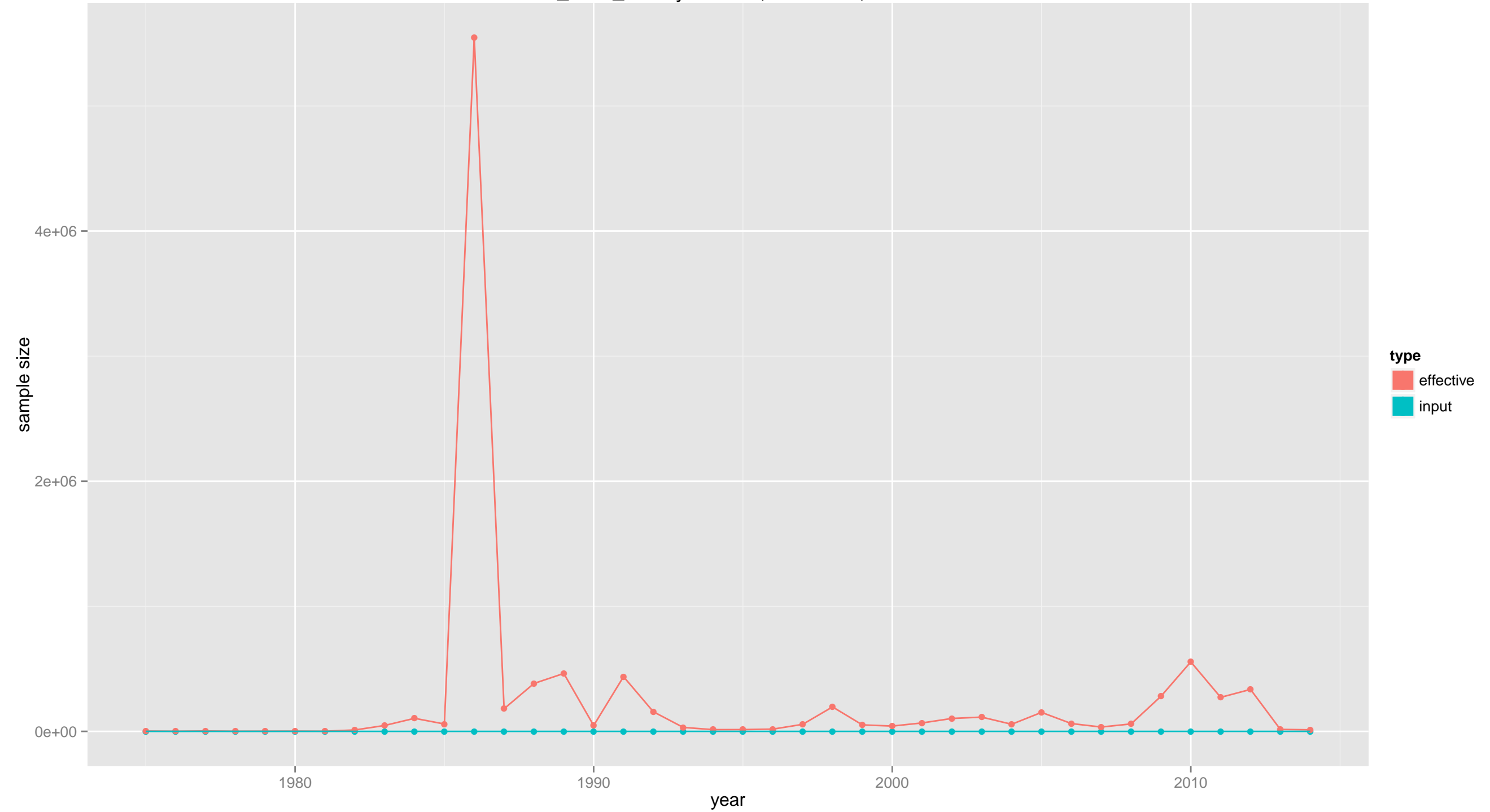
NMFS_trawl_survey: male, mature, new shell



NMFS_trawl_survey: male, mature, old shell



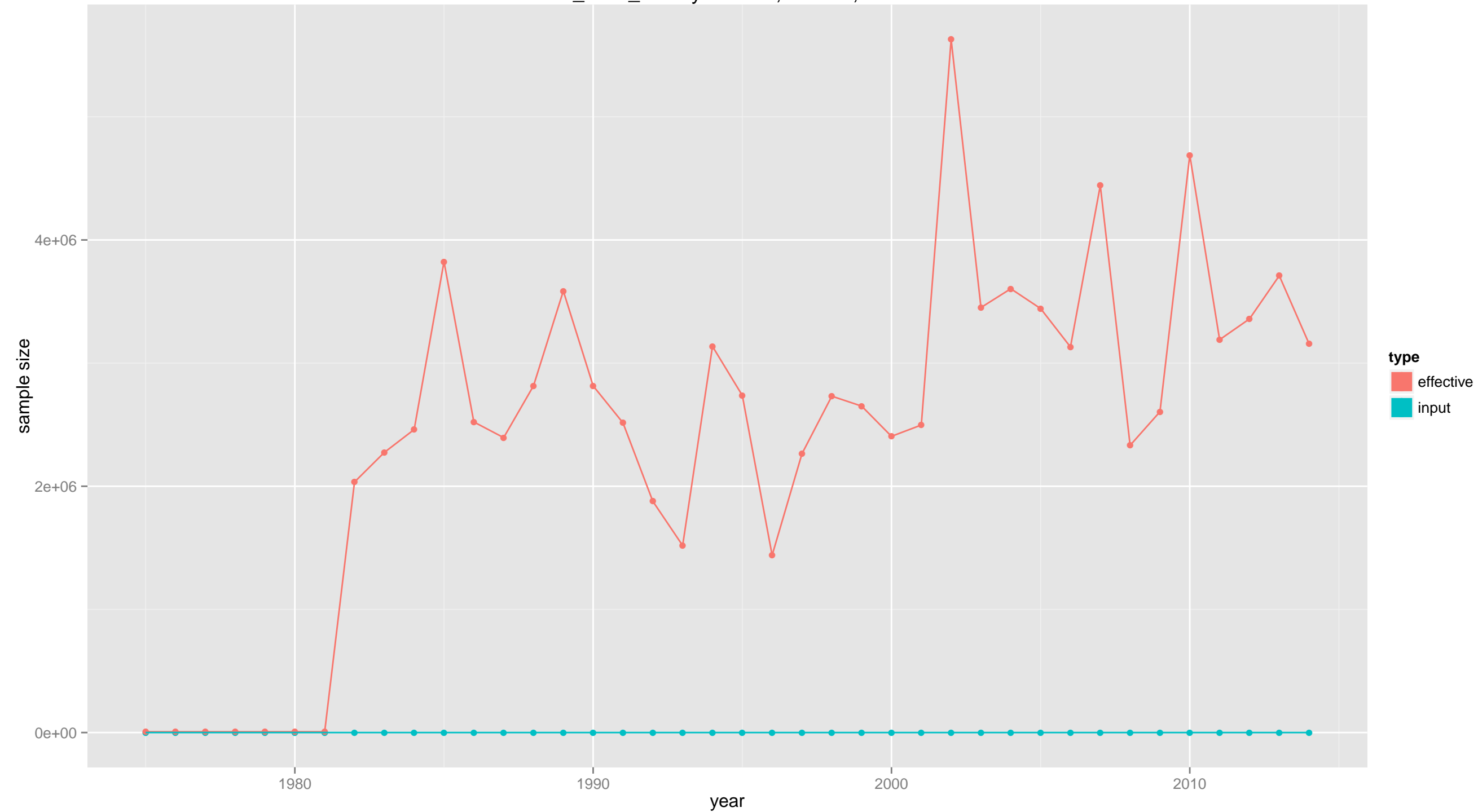
NMFS_trawl_survey: female, immature, new shell



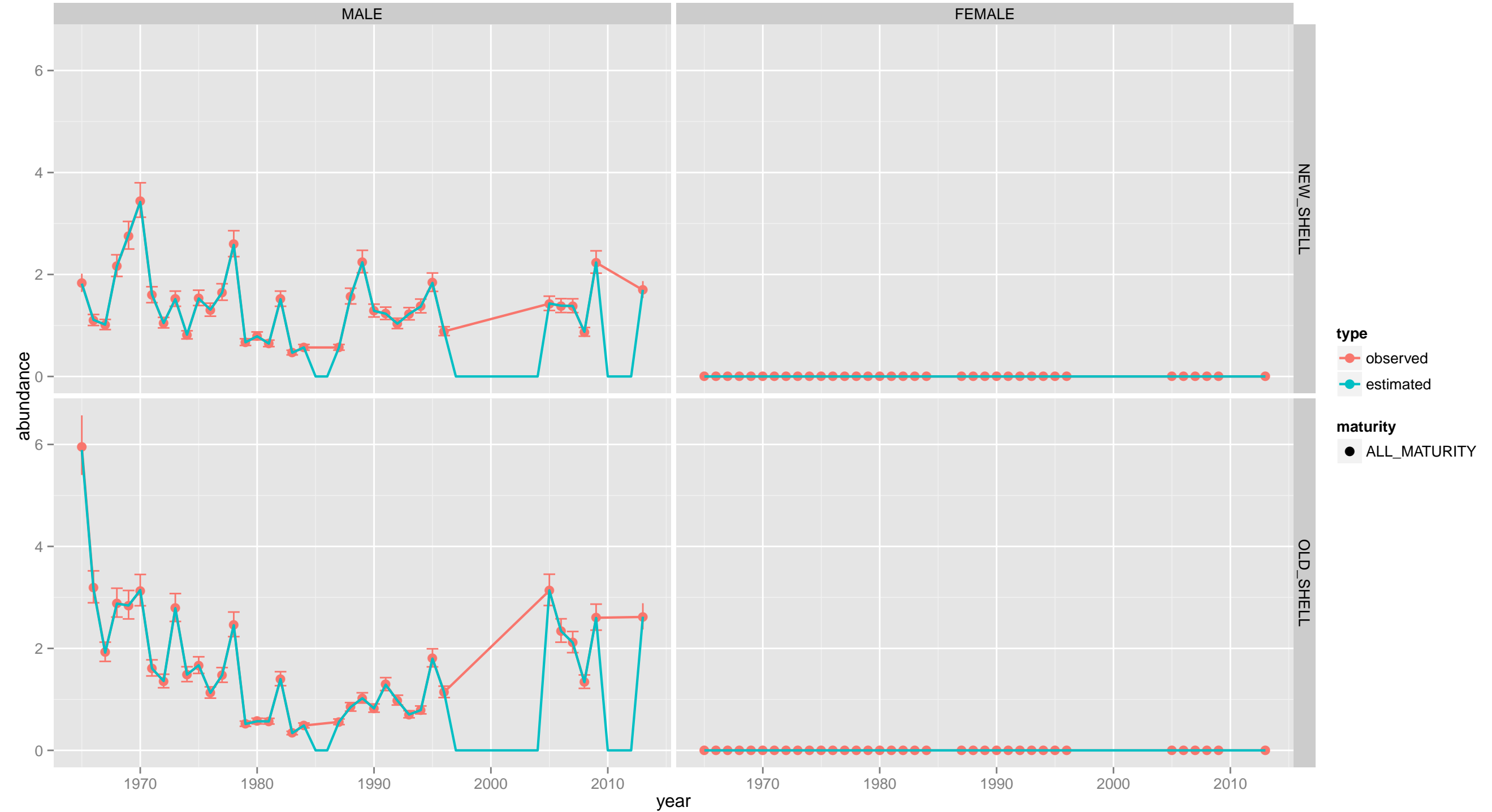
NMFS_trawl_survey: female, mature, new shell



NMFS_trawl_survey: female, mature, old shell



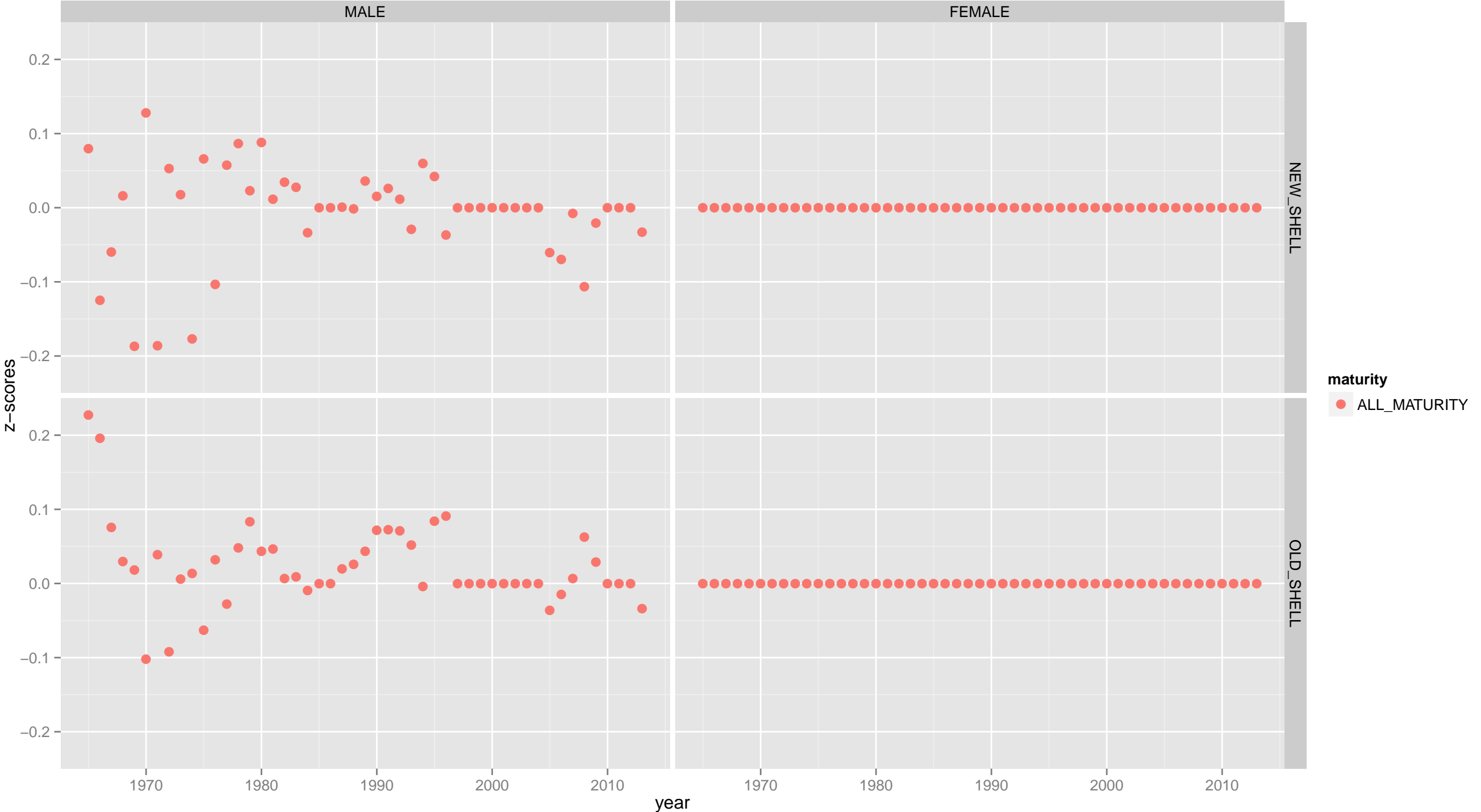
TCF: retained catch abundance



TCF: retained catch abundance



TCF: retained catch abundance



TCF: retained catch biomass

MALE

FEMALE

NEW_SHELL

OLD_SHELL

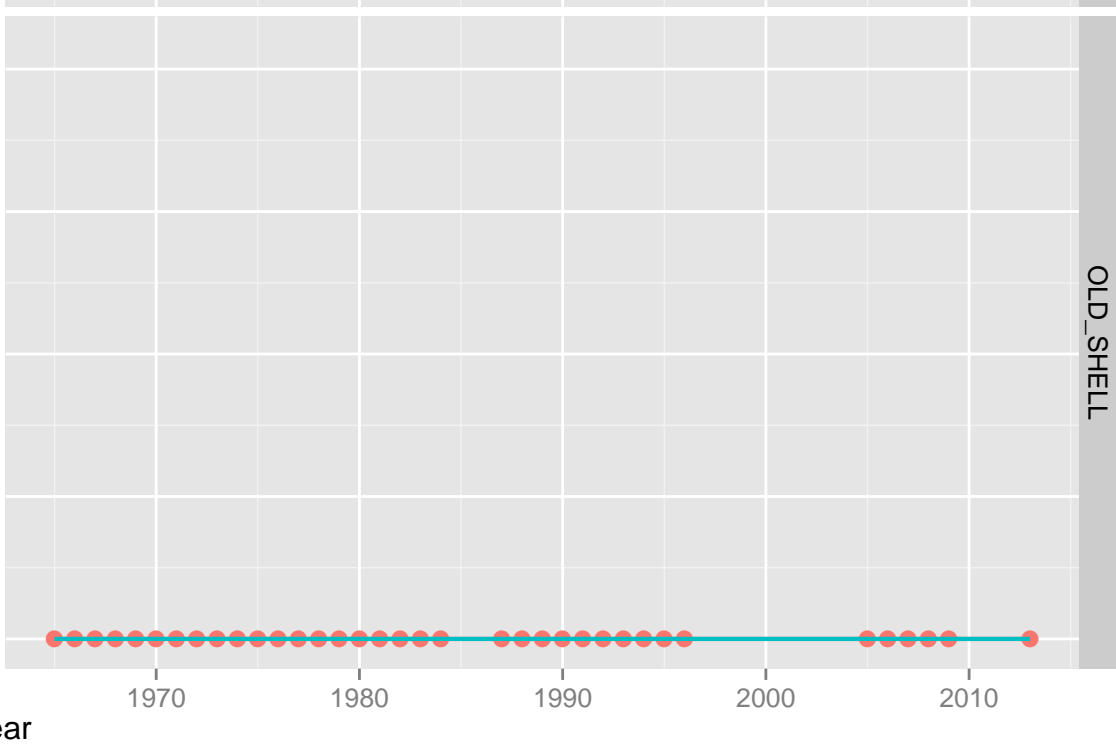
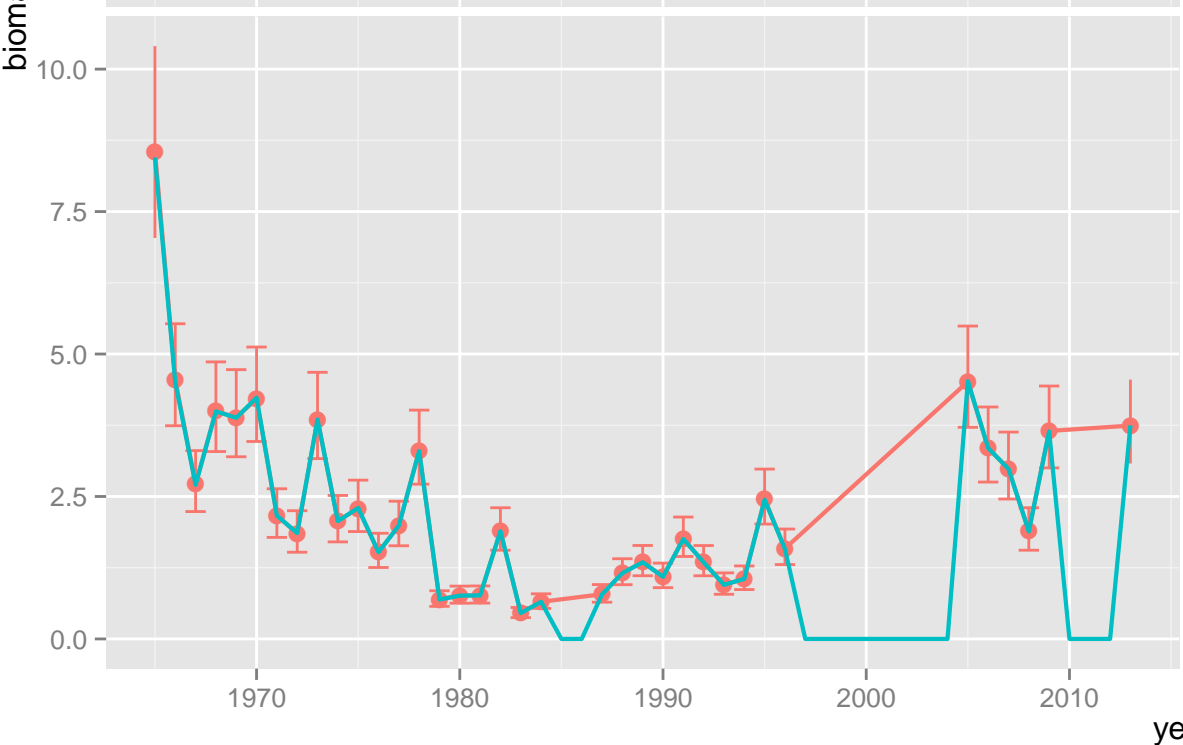
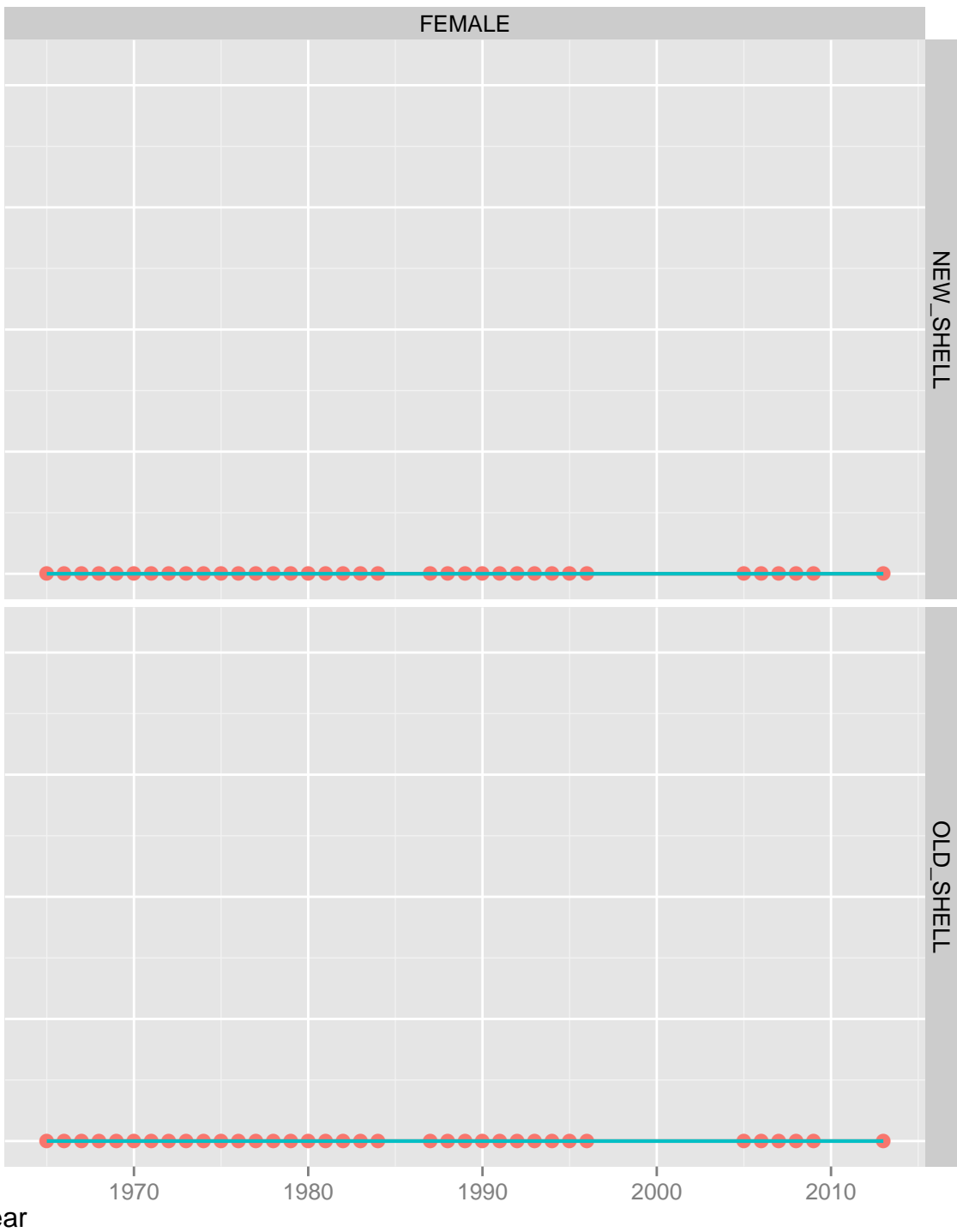
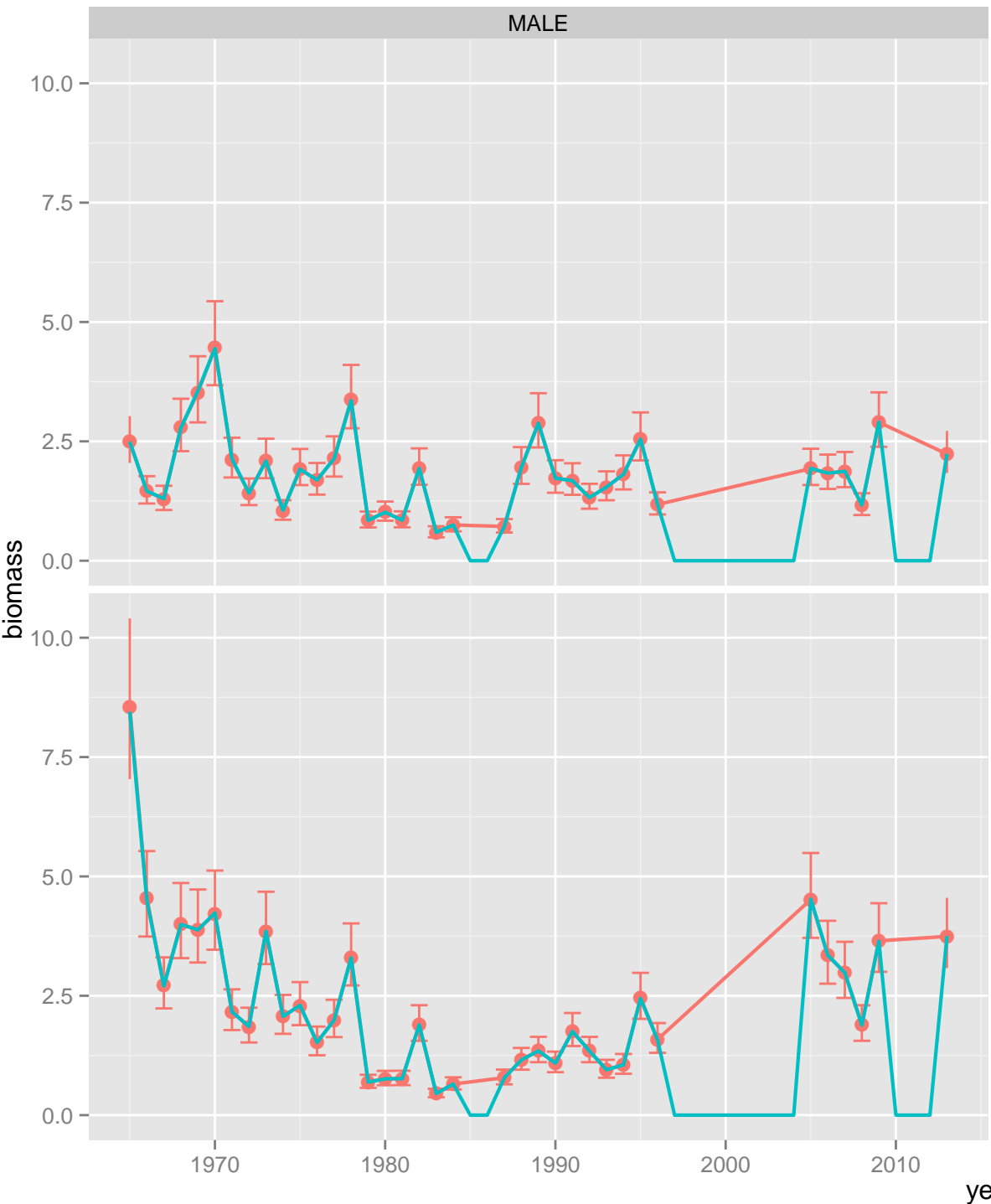
type

observed

estimated

maturity

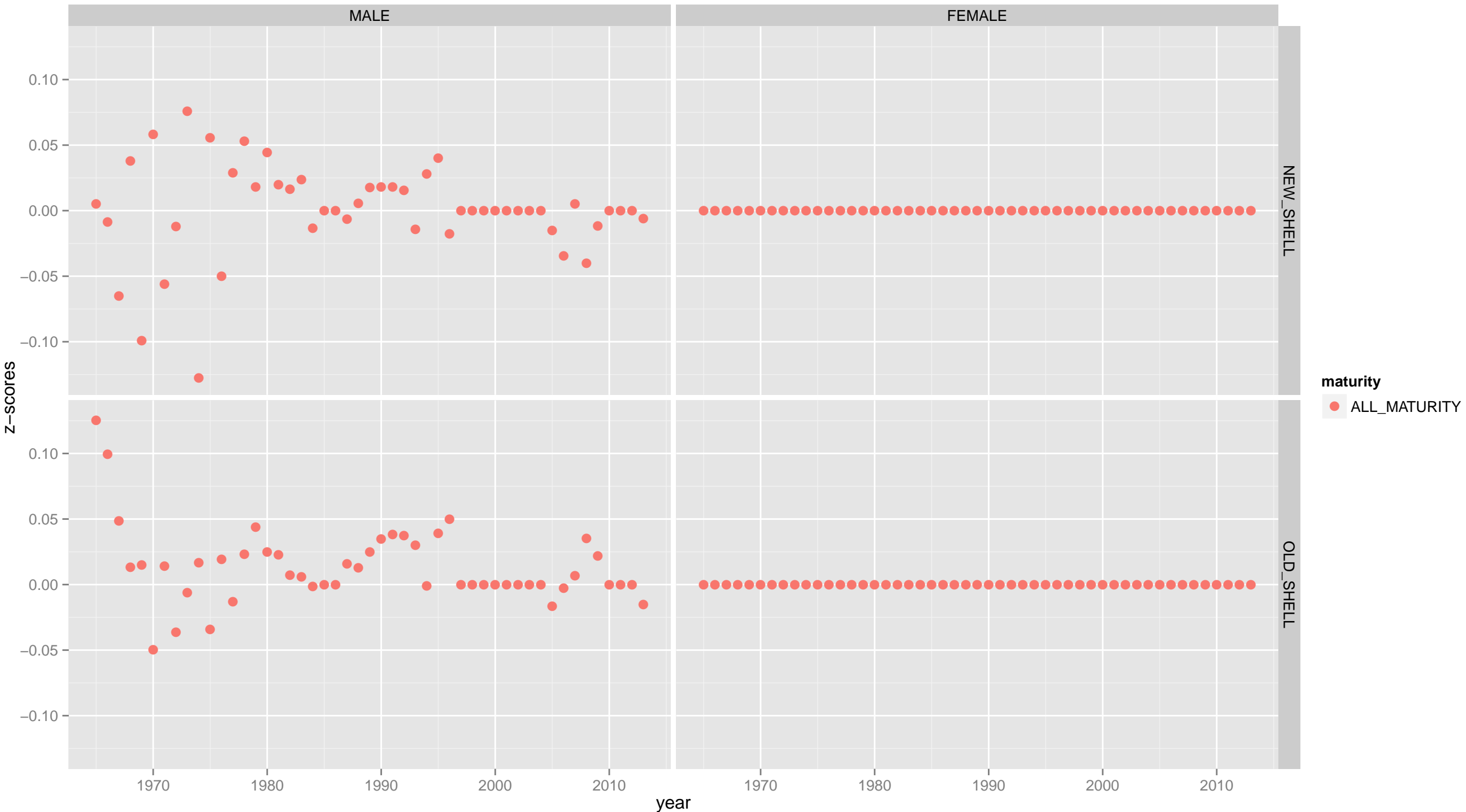
ALL_MATURITY



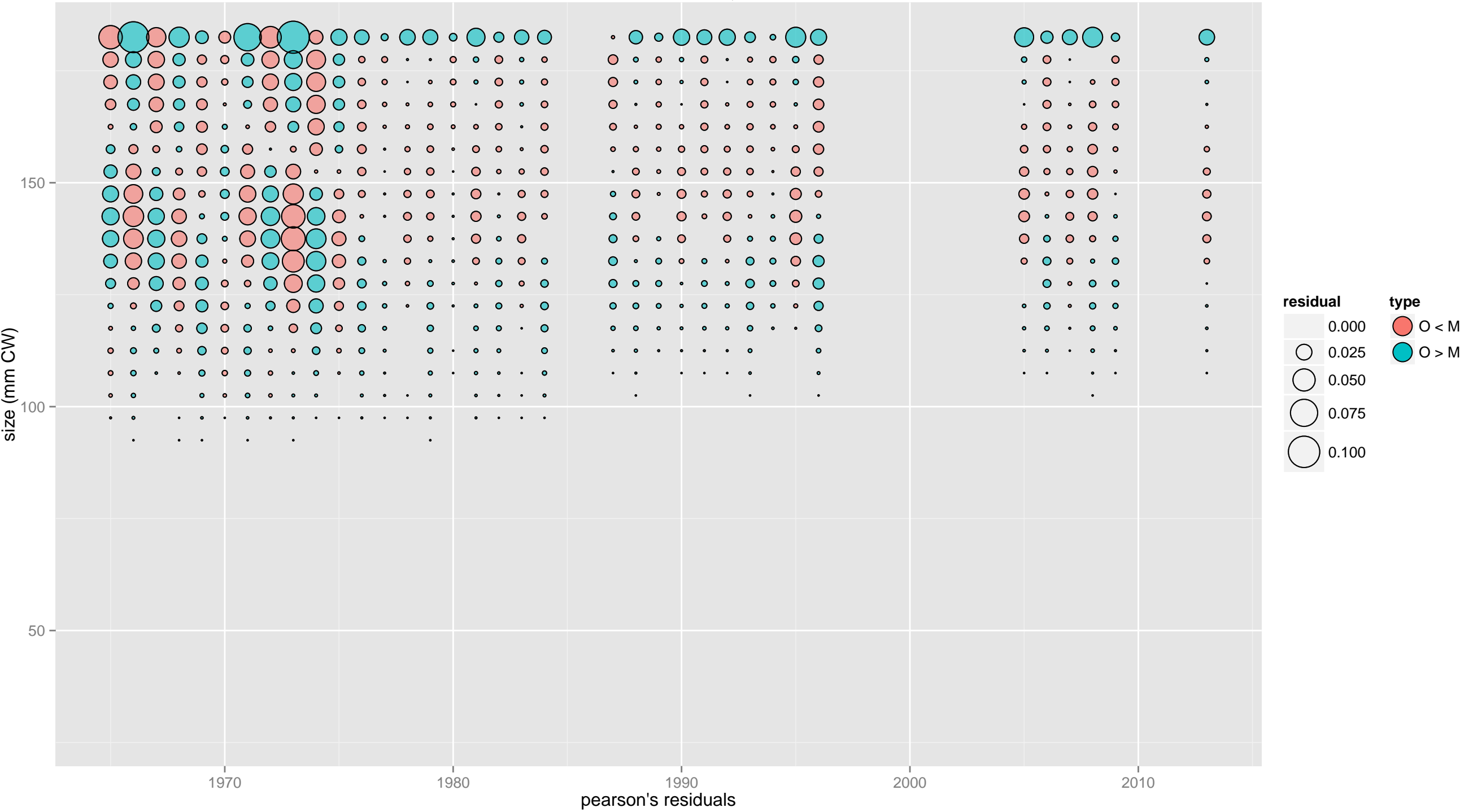
TCF: retained catch biomass

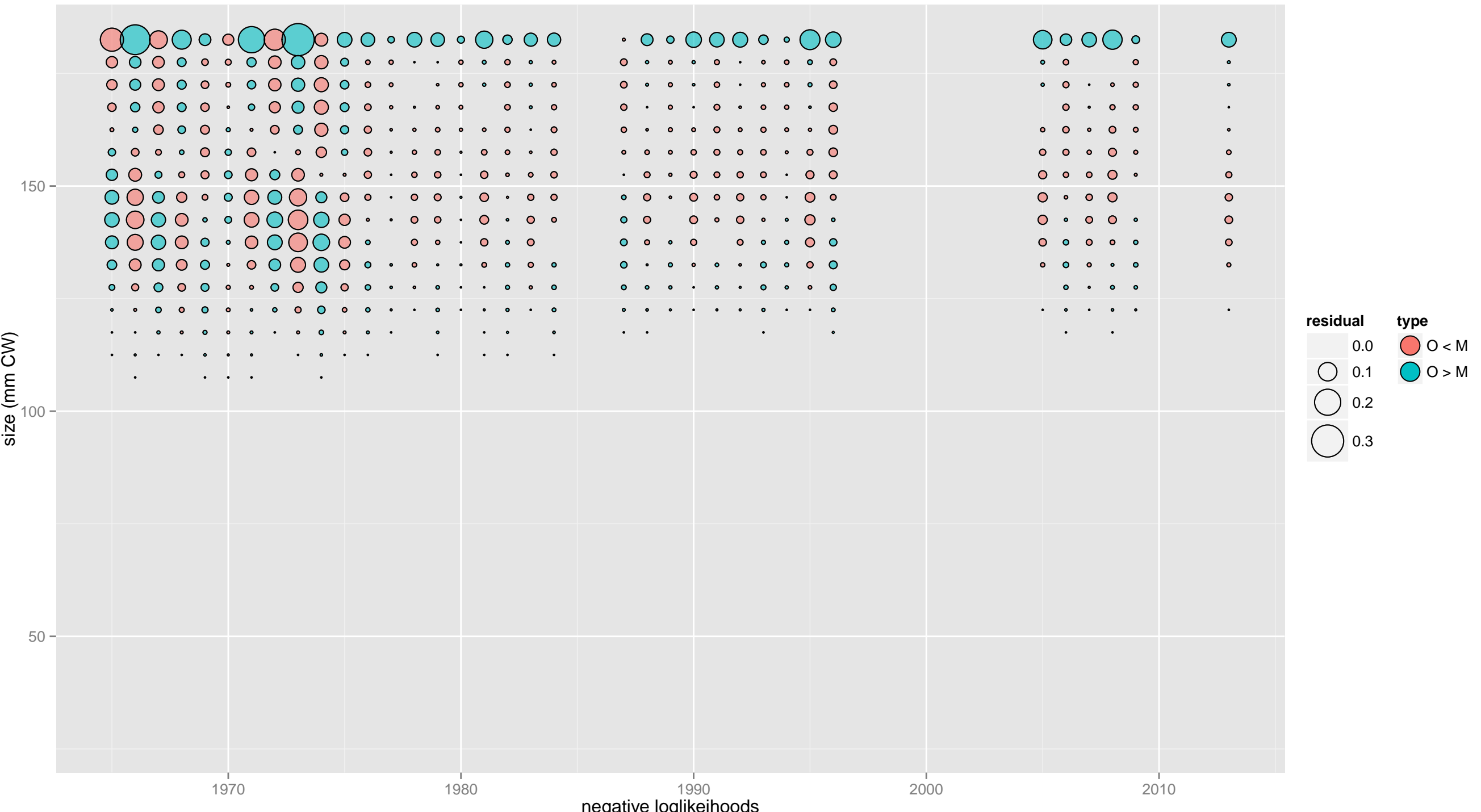


TCF: retained catch biomass

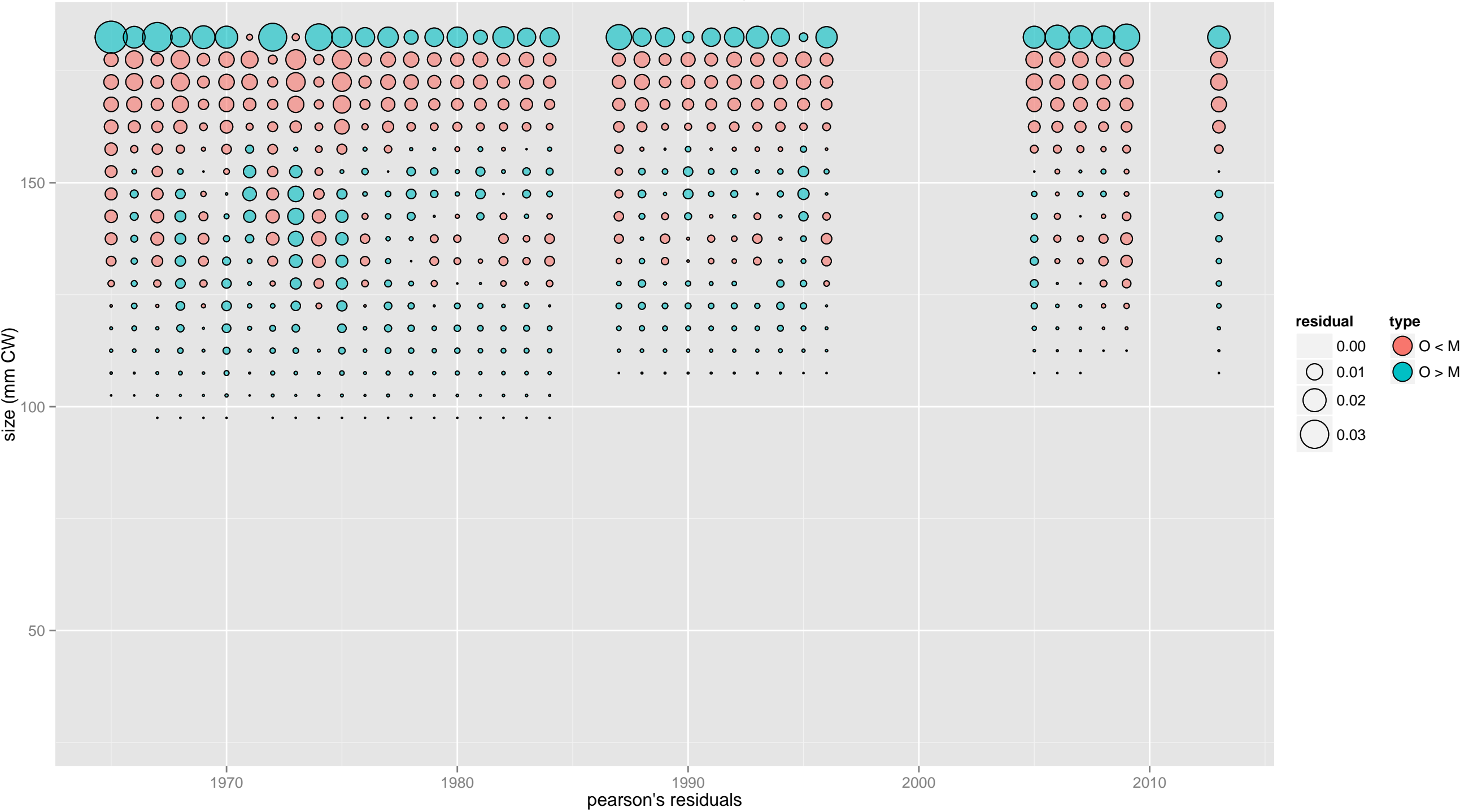


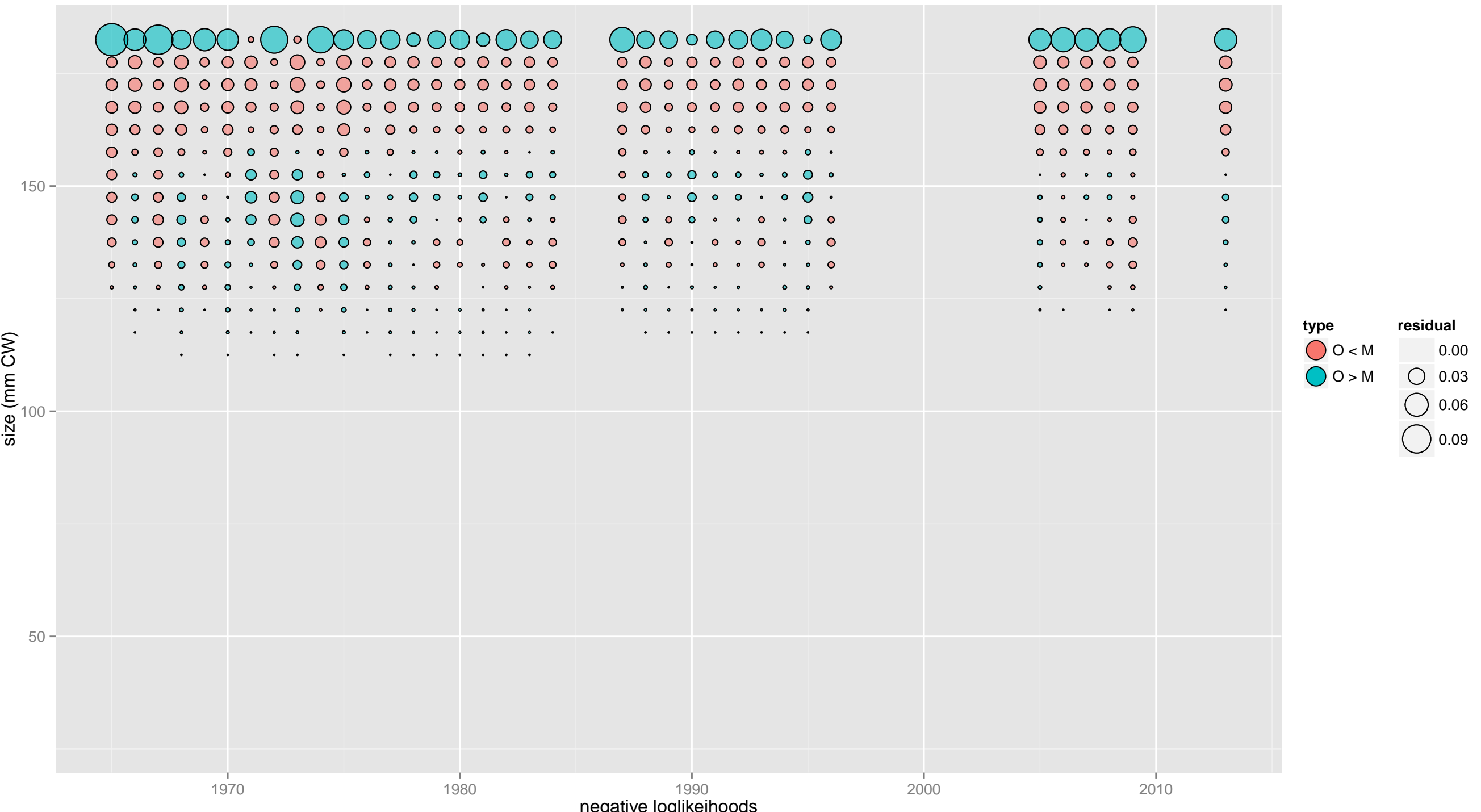
TCF: retained catch: male, new shell



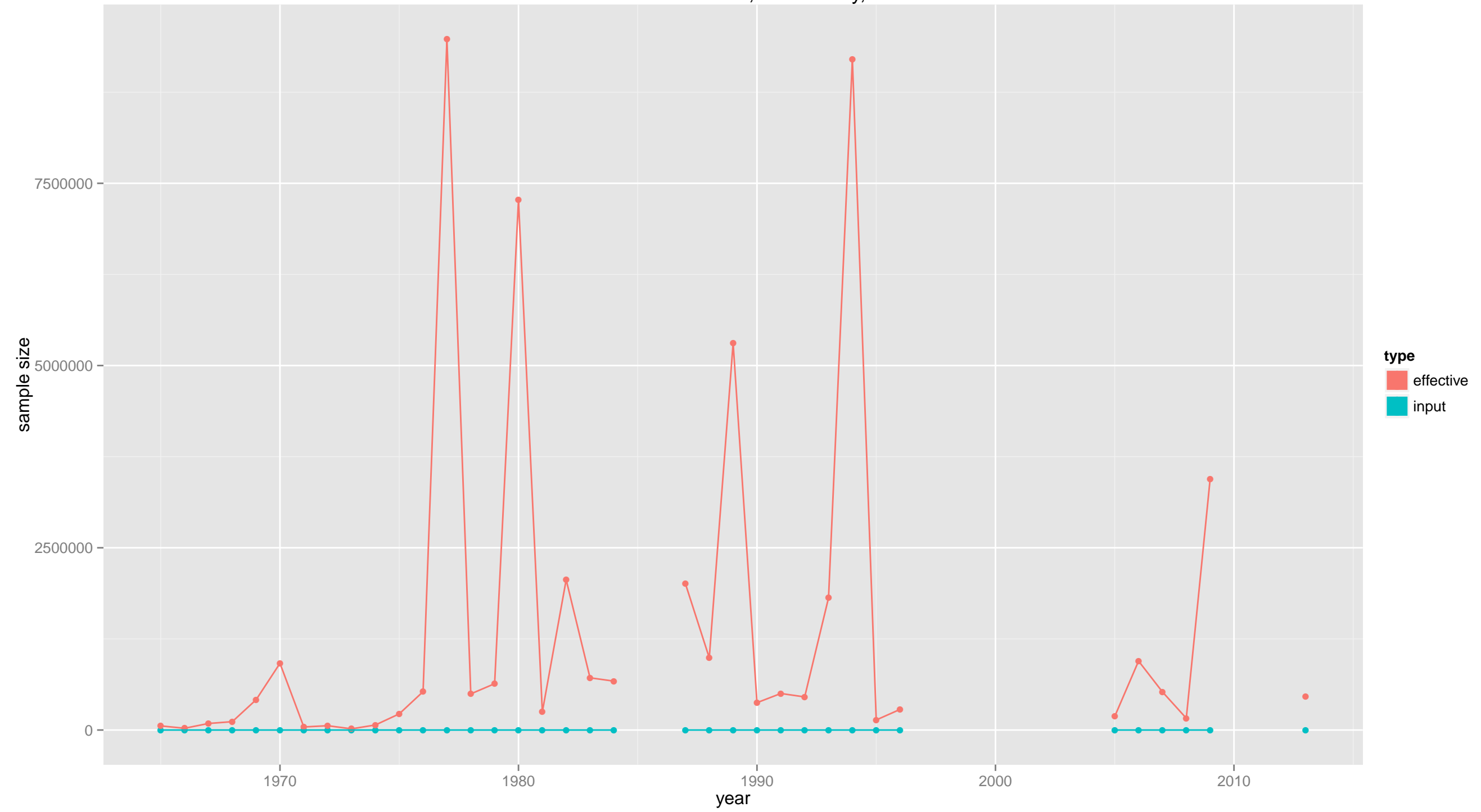


TCF: retained catch: male, old shell

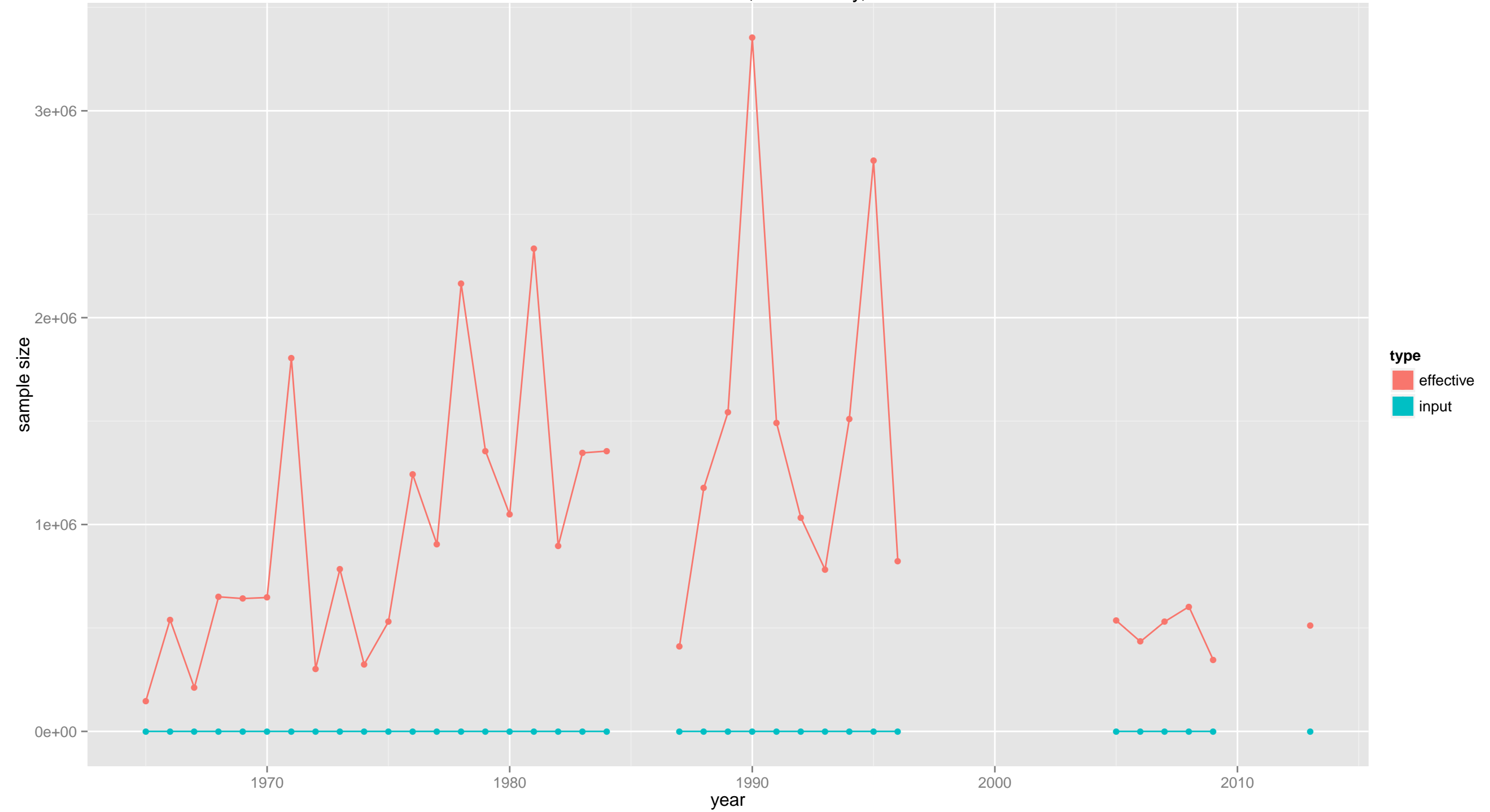




TCF: retained catch: male, all maturity, new shell



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



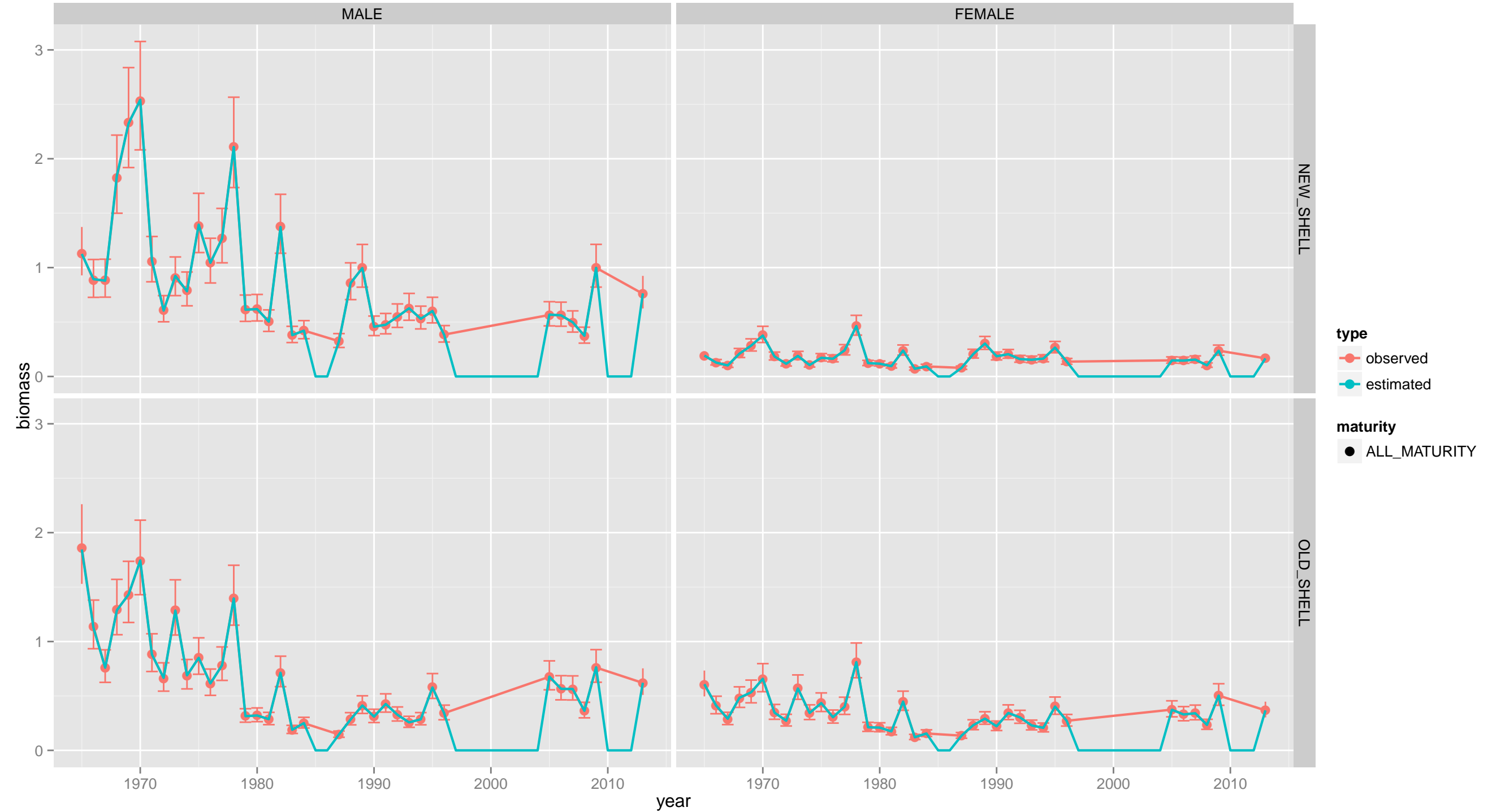
TCF: discard catch abundance



TCF: discard catch abundance



TCF: discard catch biomass



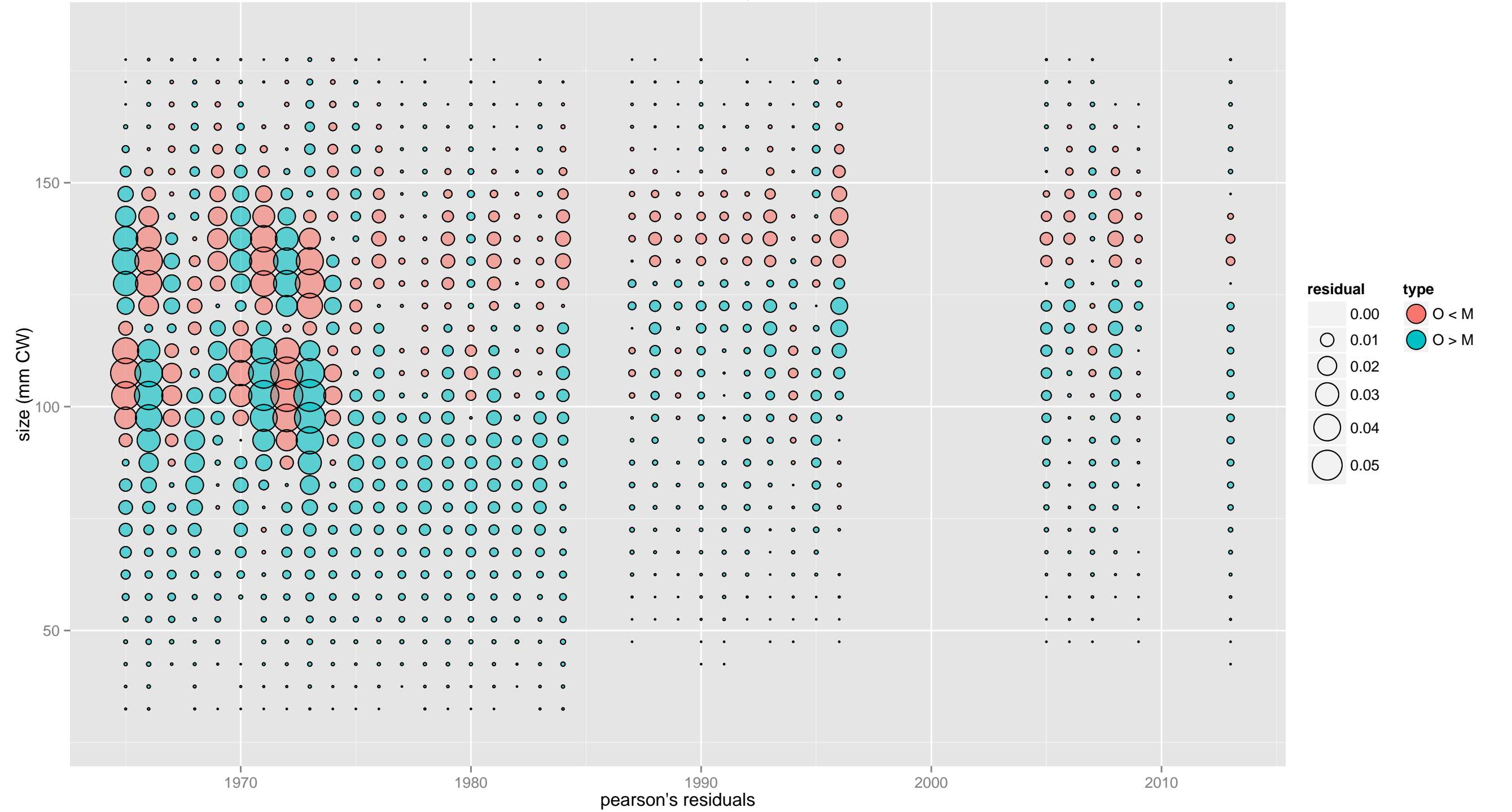
TCF: discard catch biomass

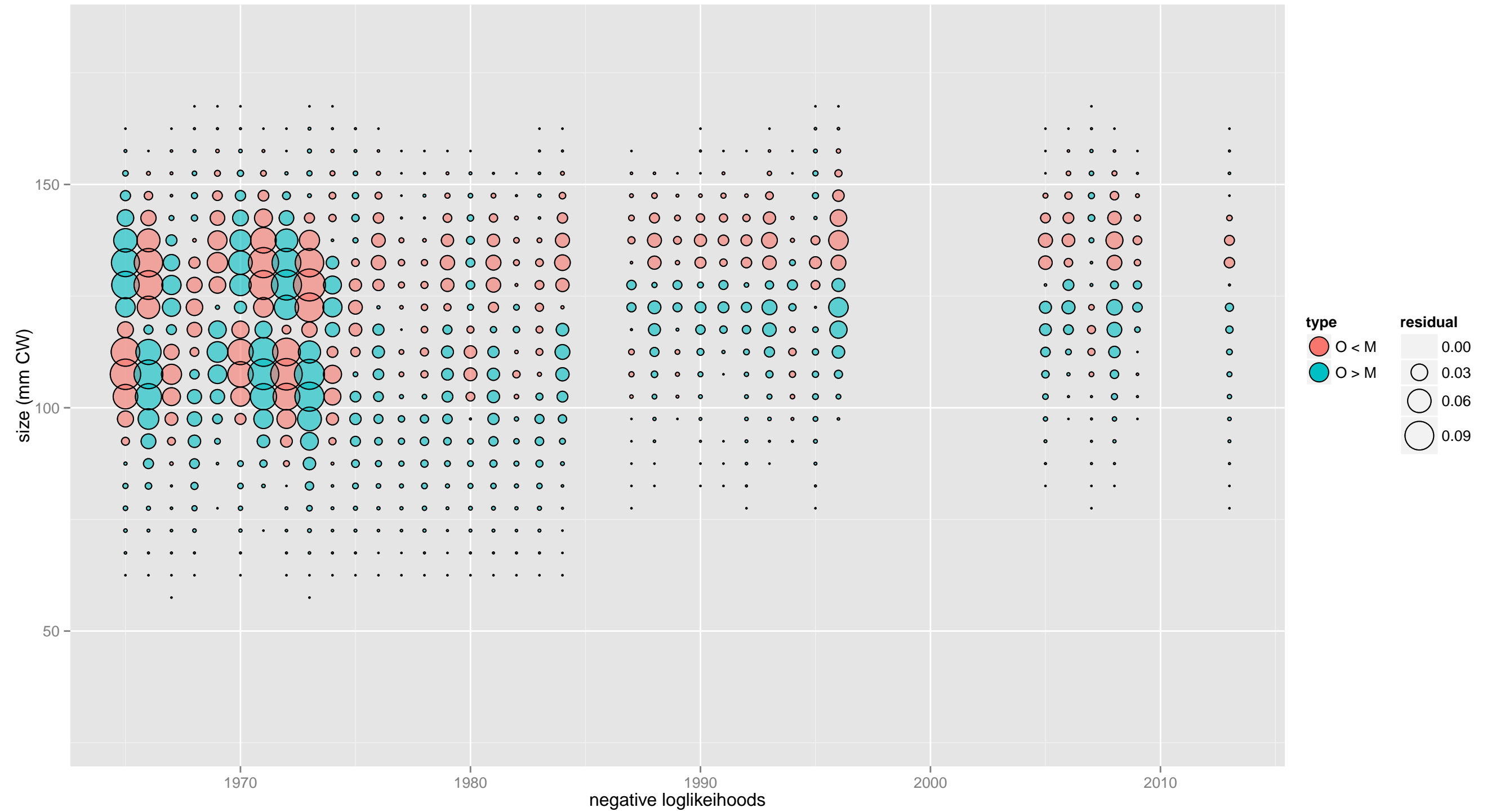


TCF: discard catch biomass



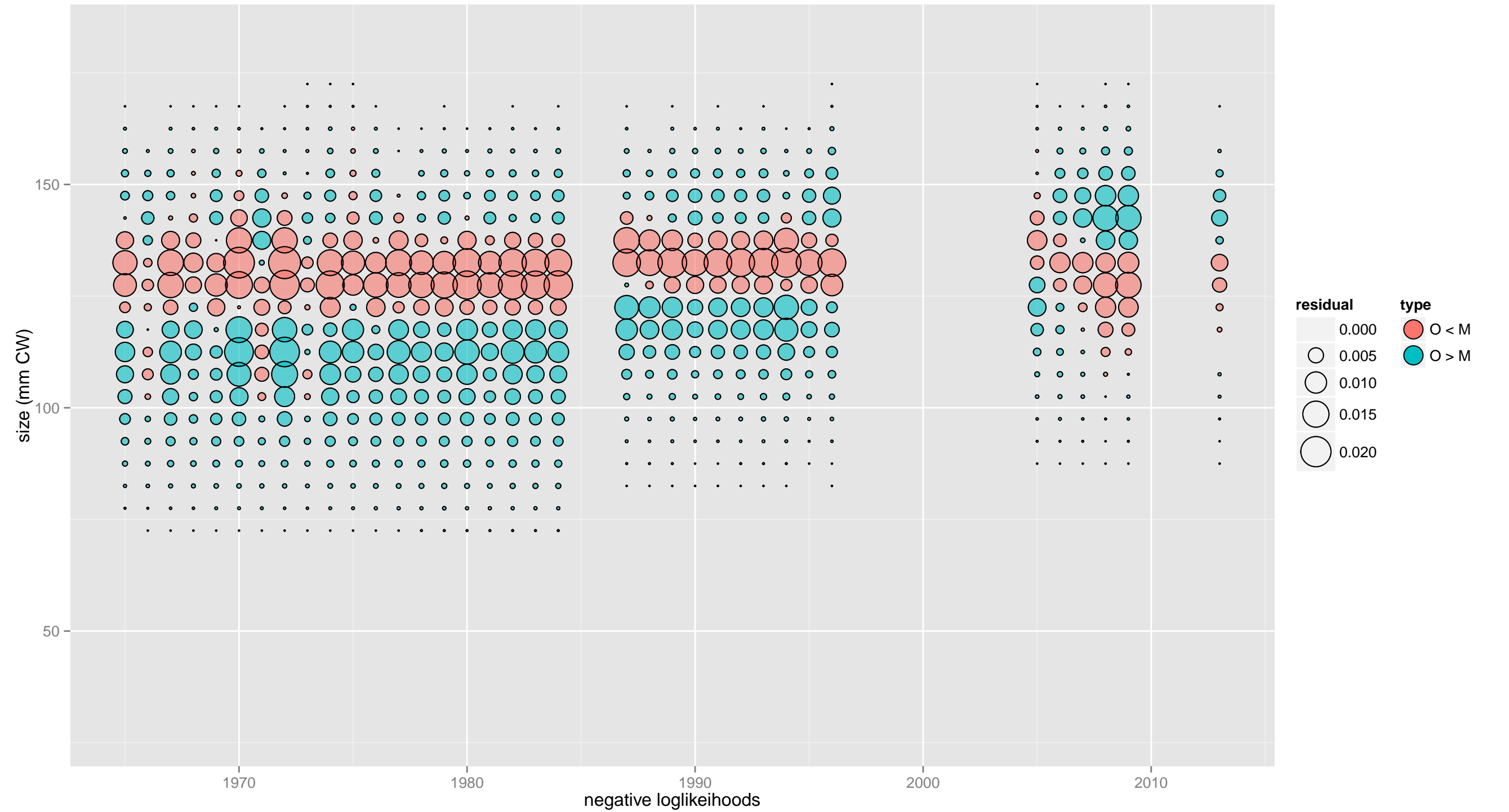
TCF: discard catch: male, new shell



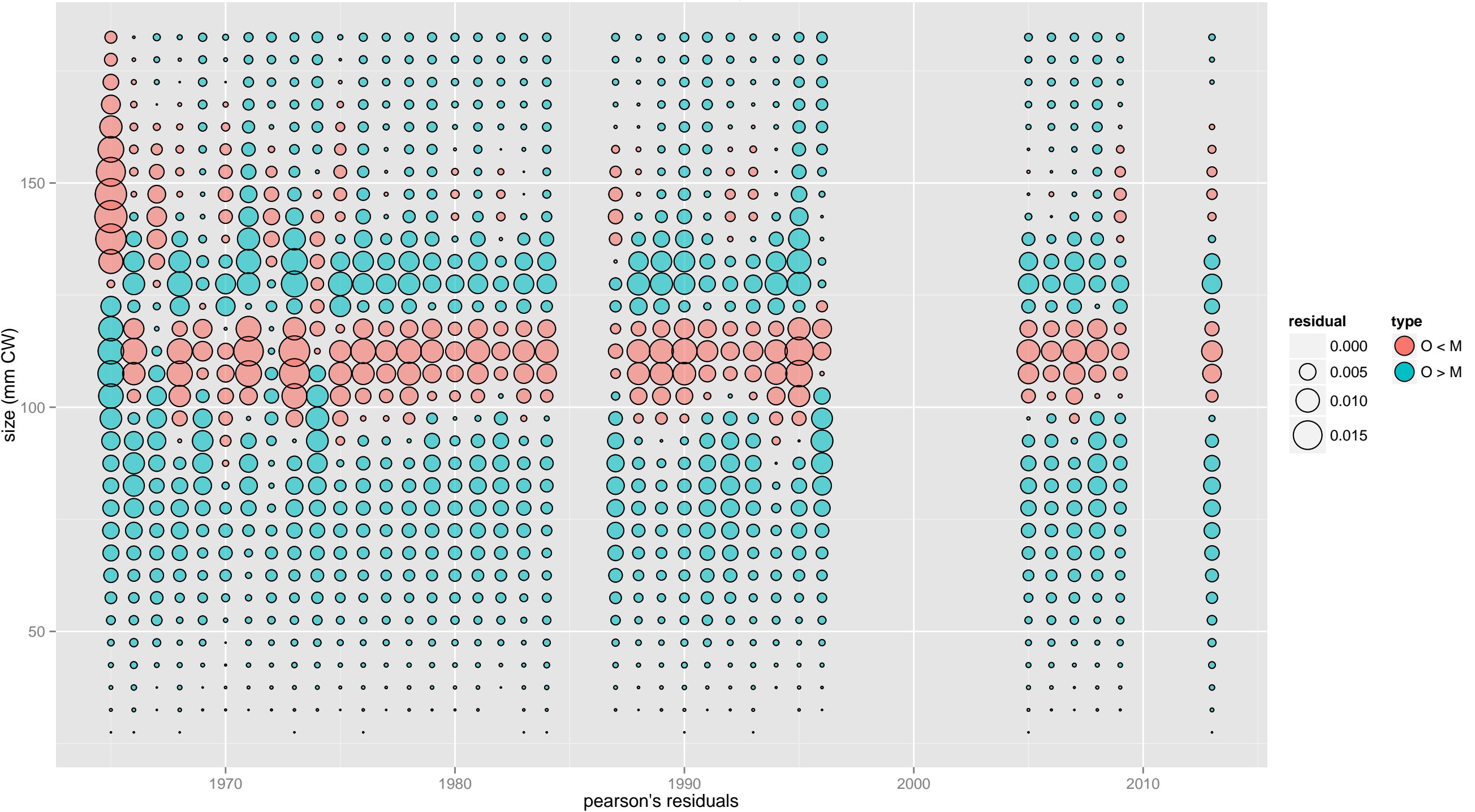


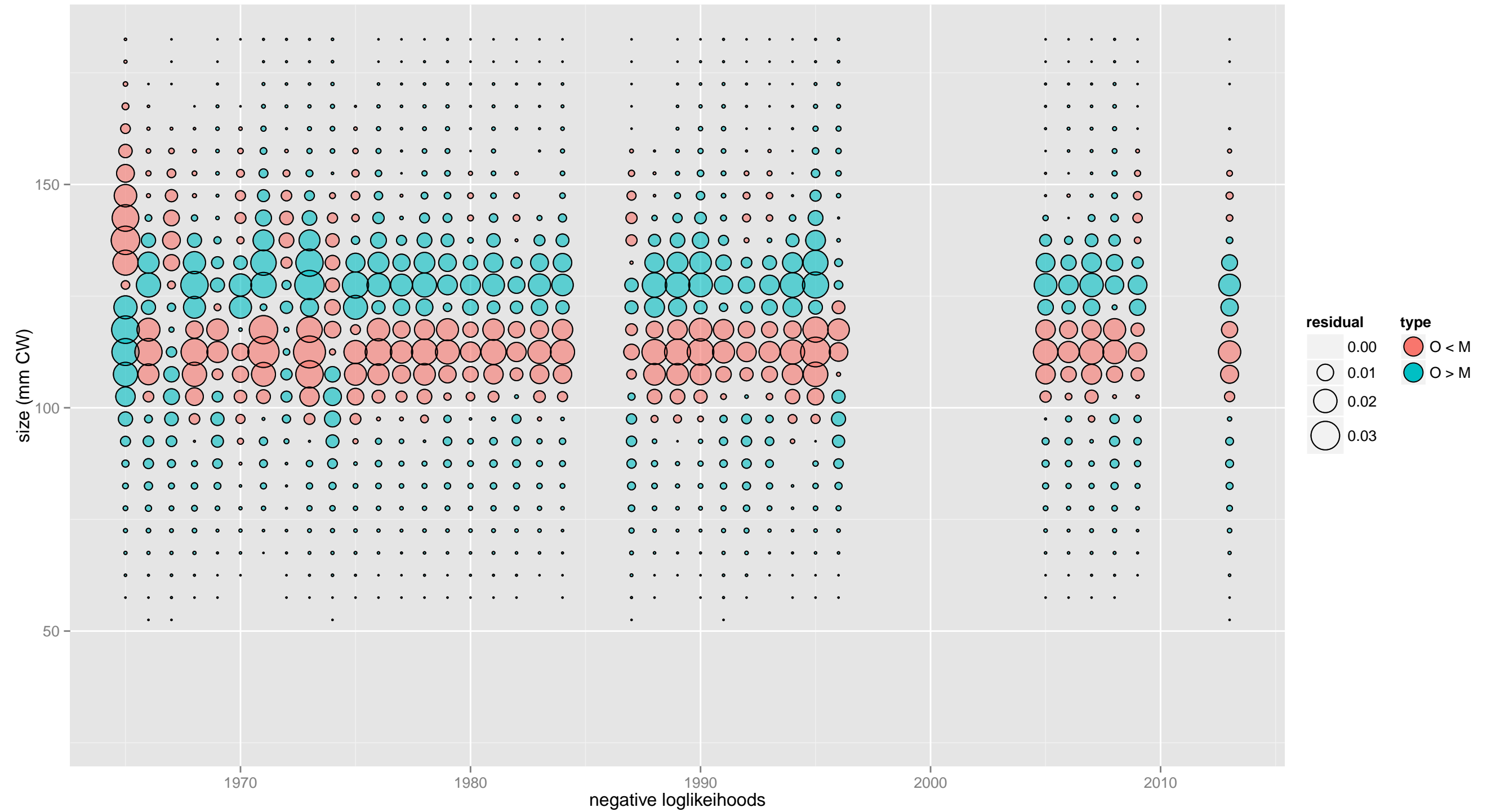
TCF: discard catch: male, old shell





TCF: discard catch: female, new shell



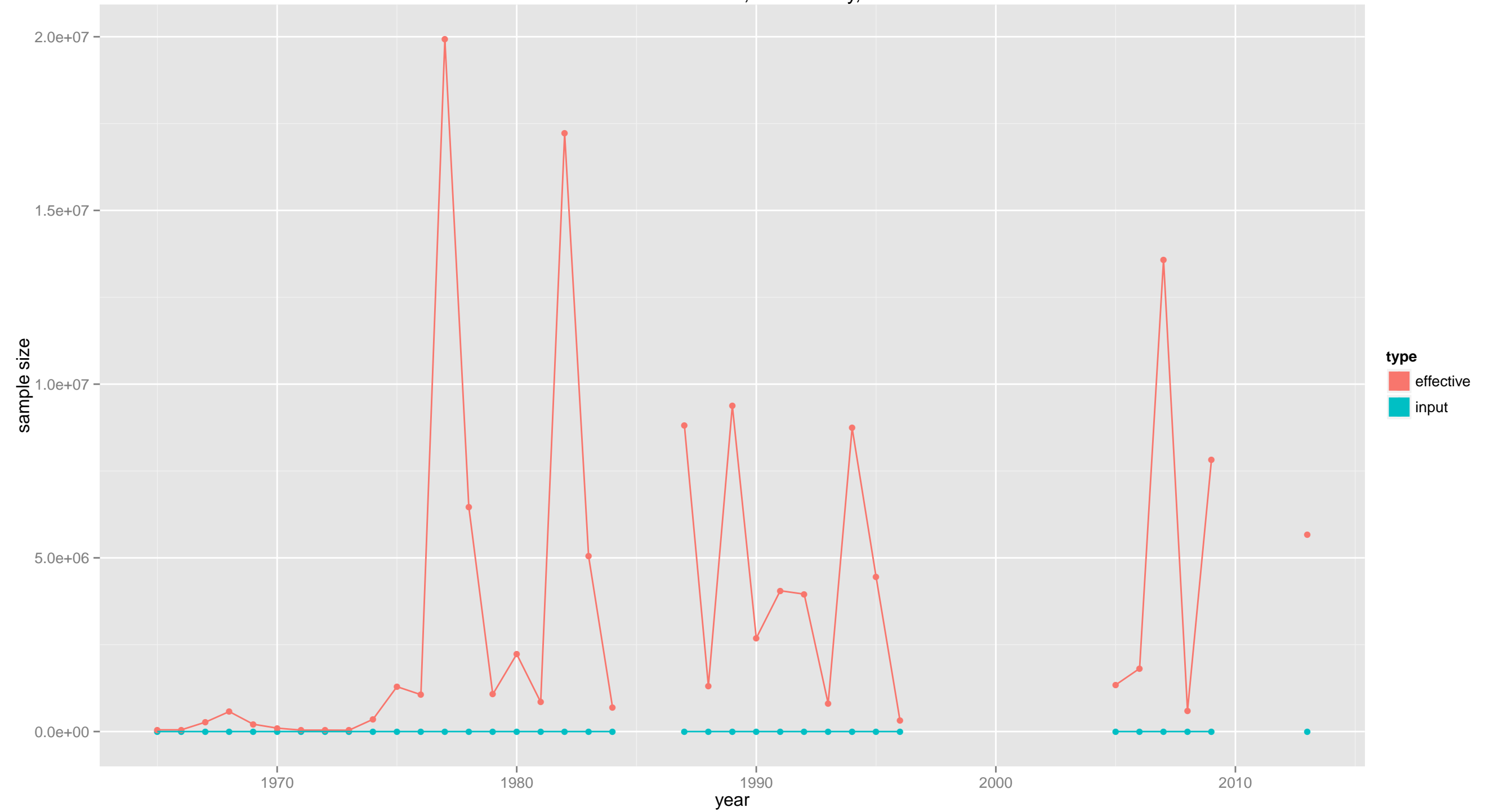


TCF: discard catch: female, old shell

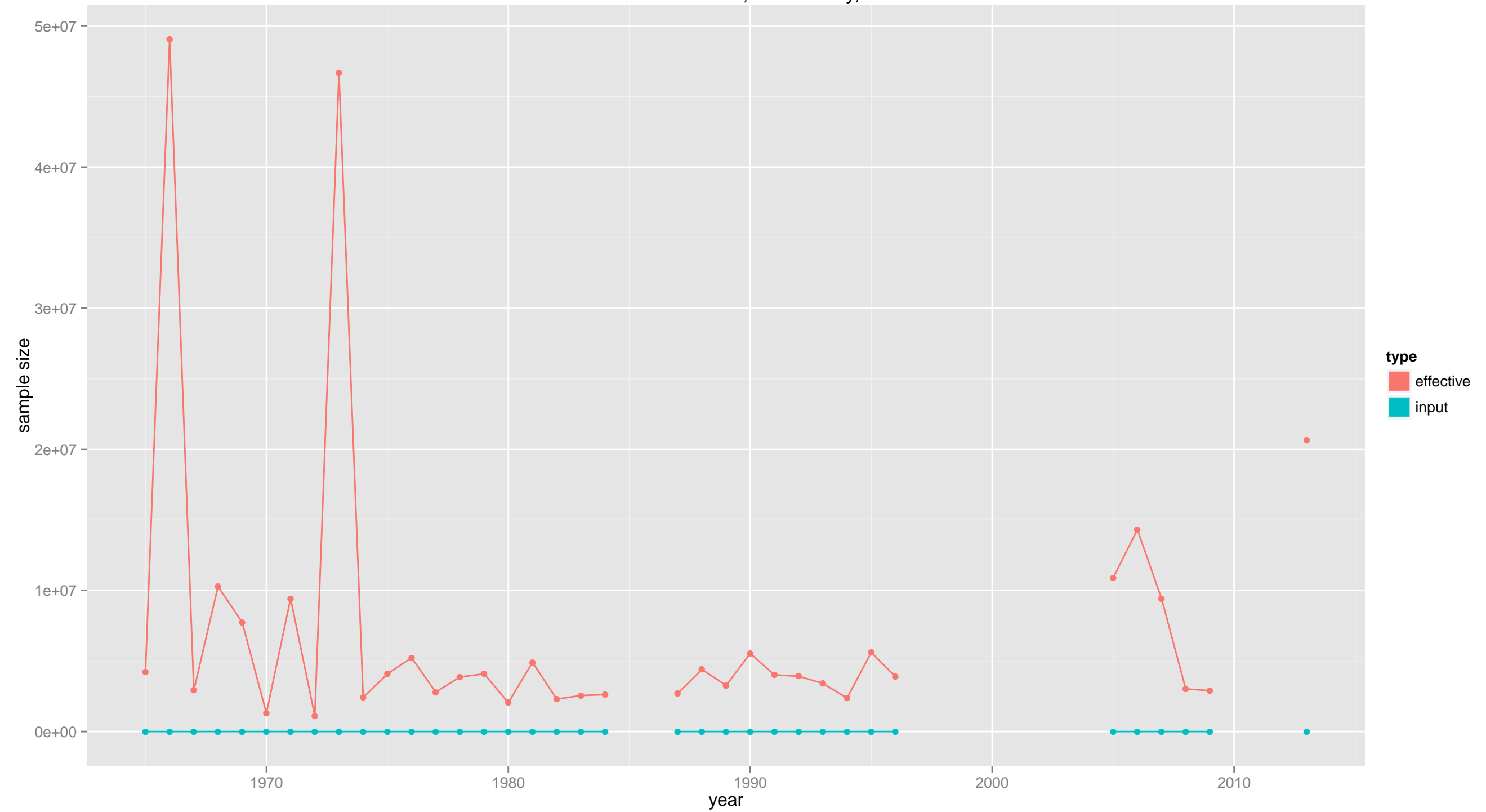




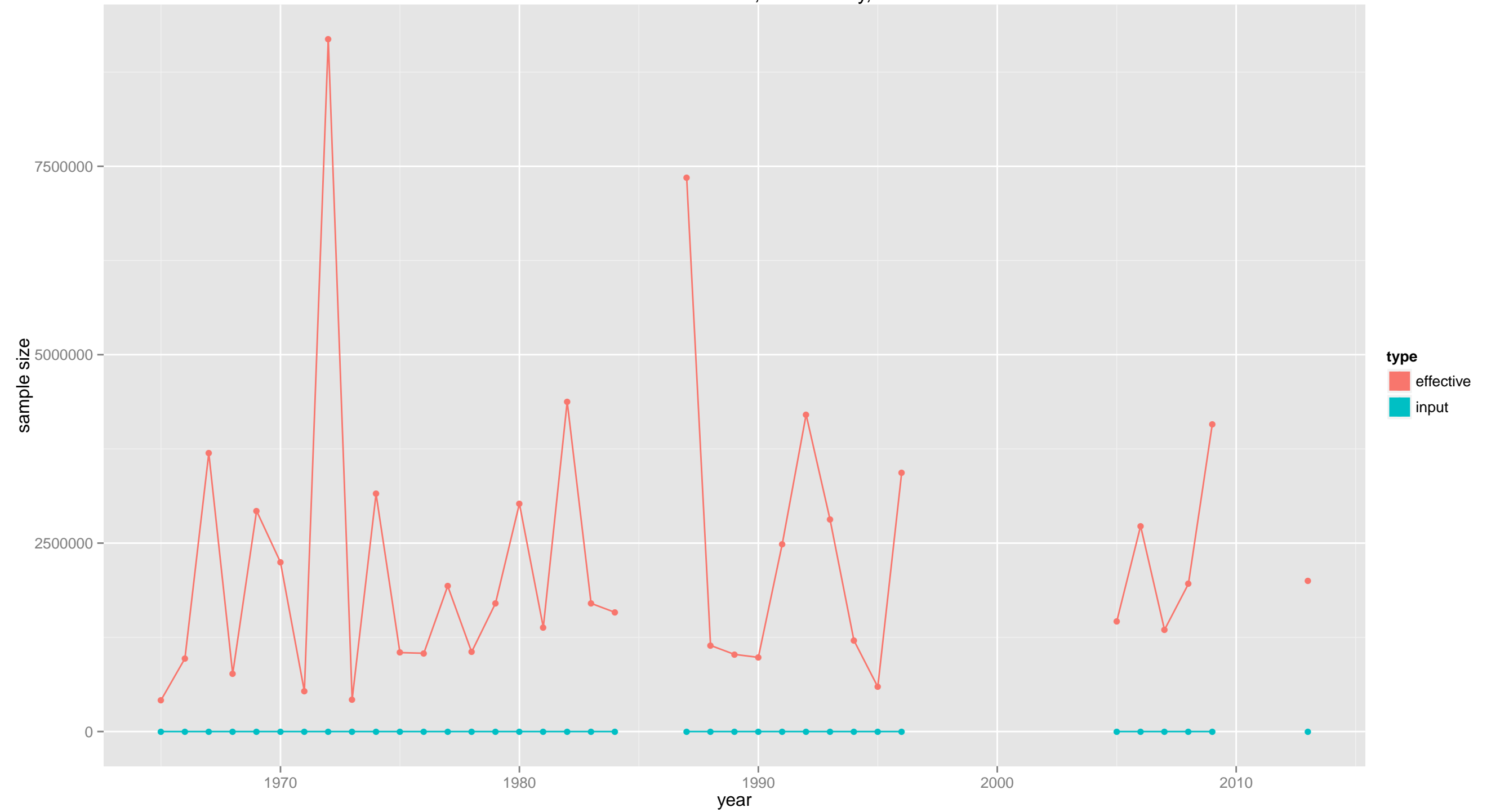
TCF: discard catch: male, all maturity, new shell



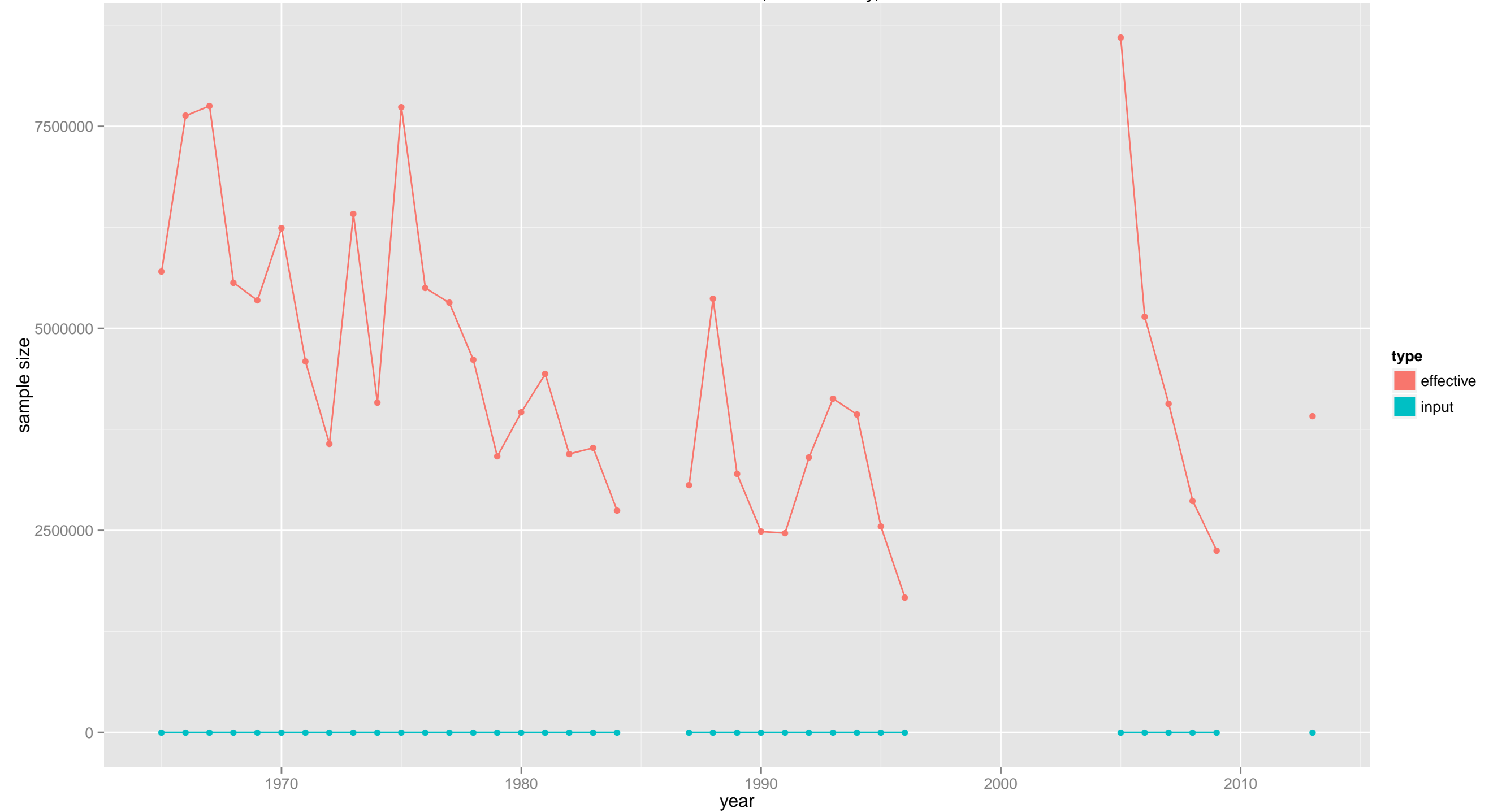
TCF: discard catch: male, all maturity, old shell



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



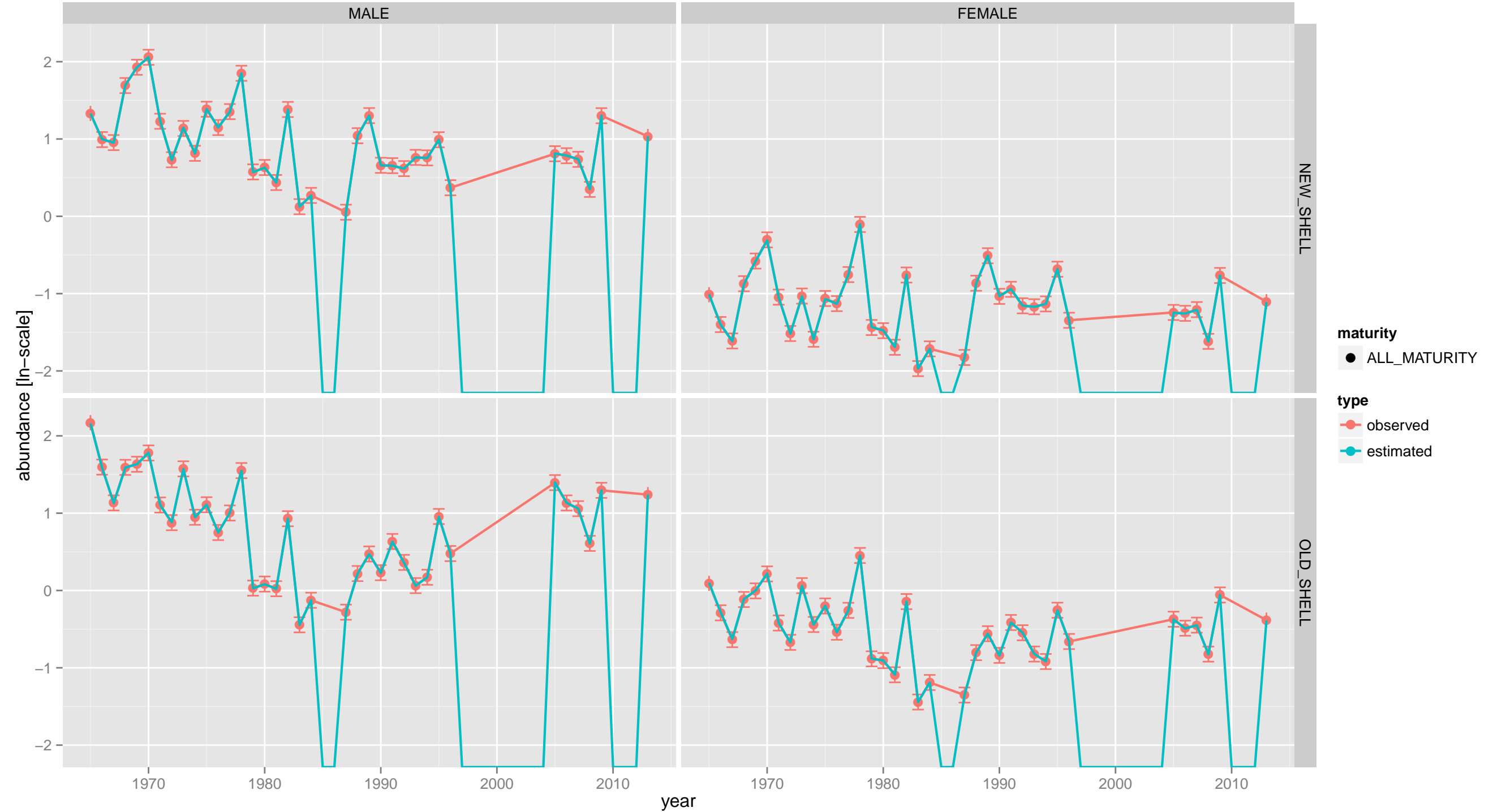
TCF: discard catch: female, all maturity, old shell



TCF: total catch abundance



TCF: total catch abundance



TCF: total catch abundance



TCF: total catch biomass



TCF: total catch biomass

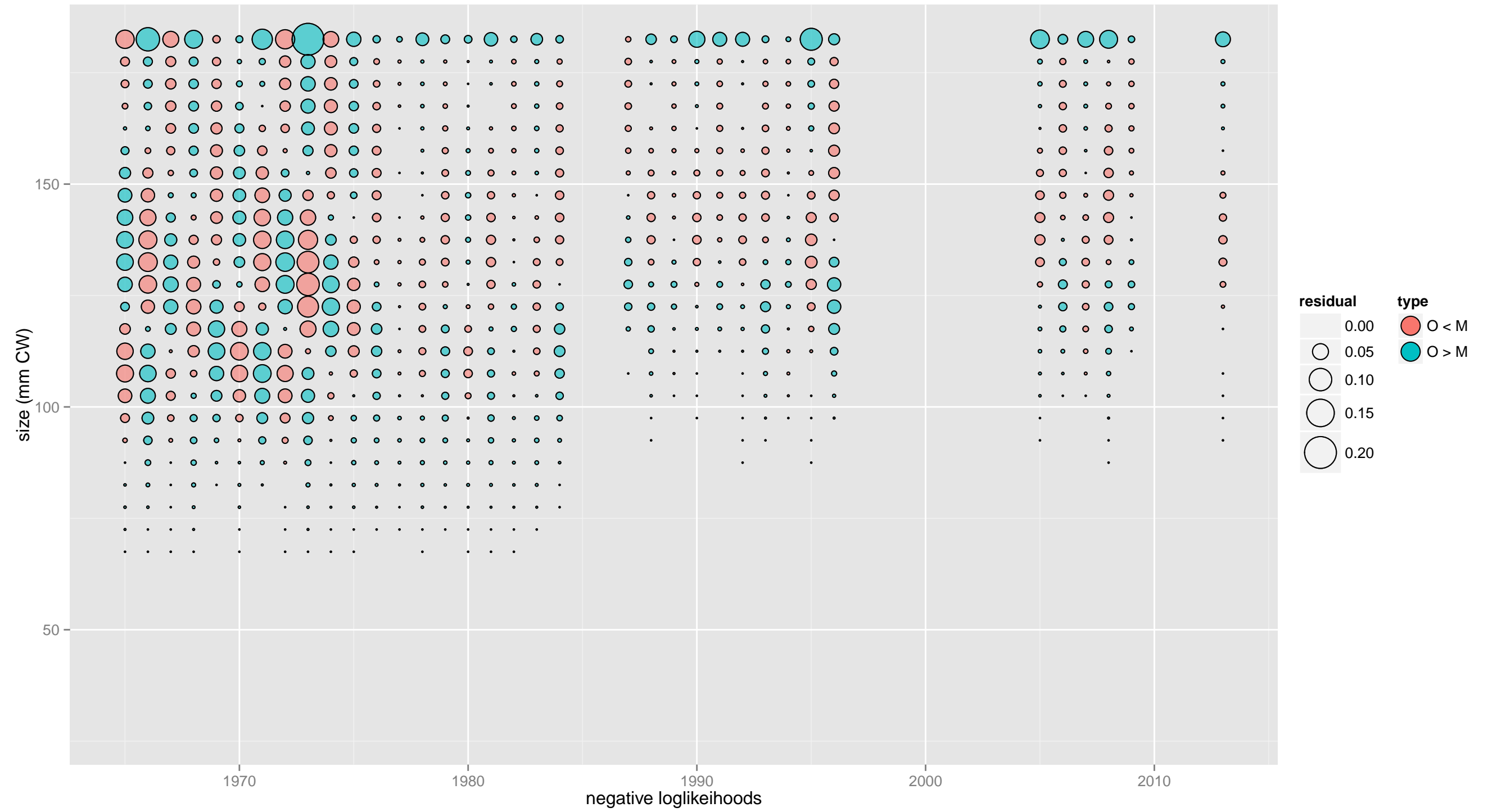


TCF: total catch biomass



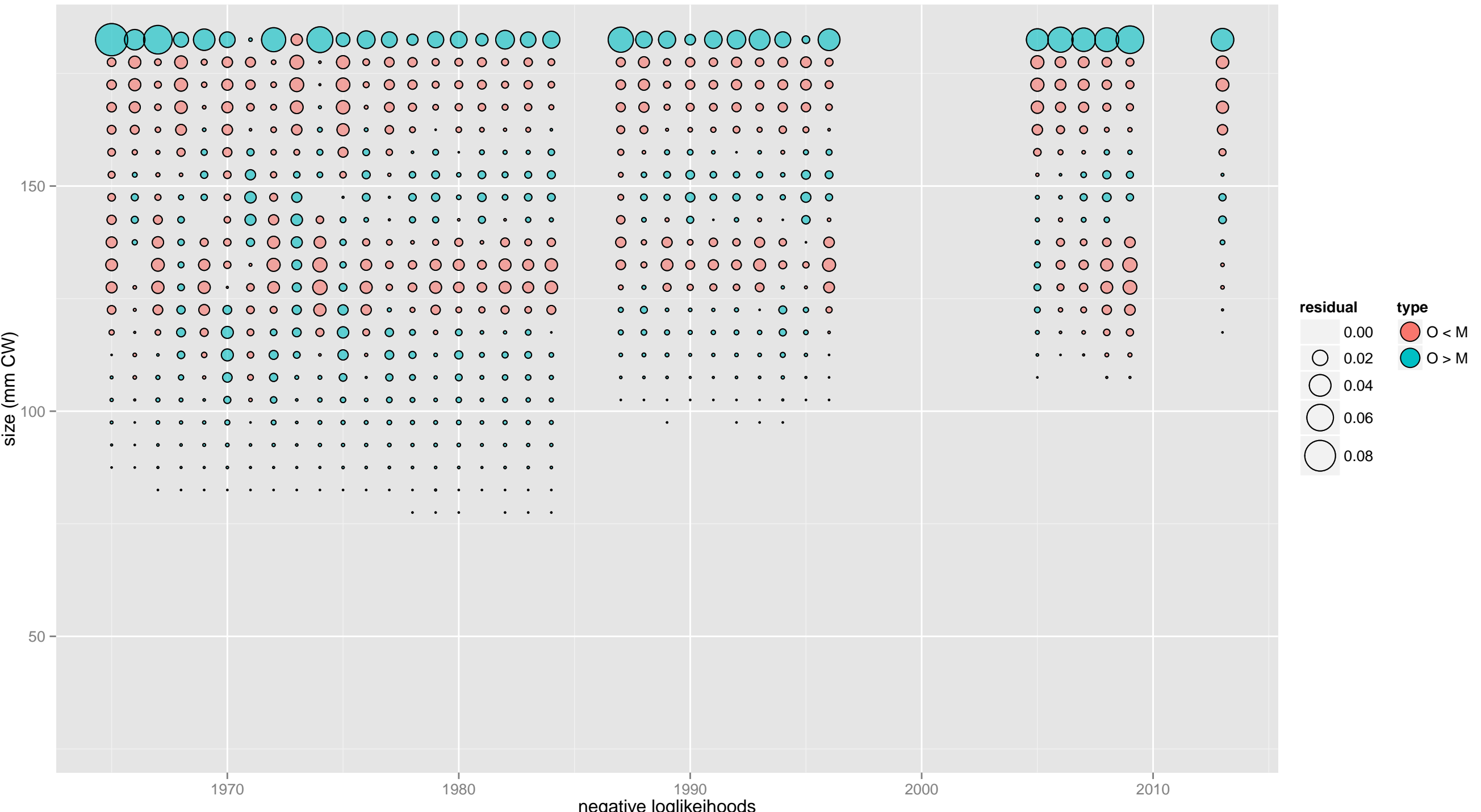
TCF: total catch: male, new shell





TCF: total catch: male, old shell





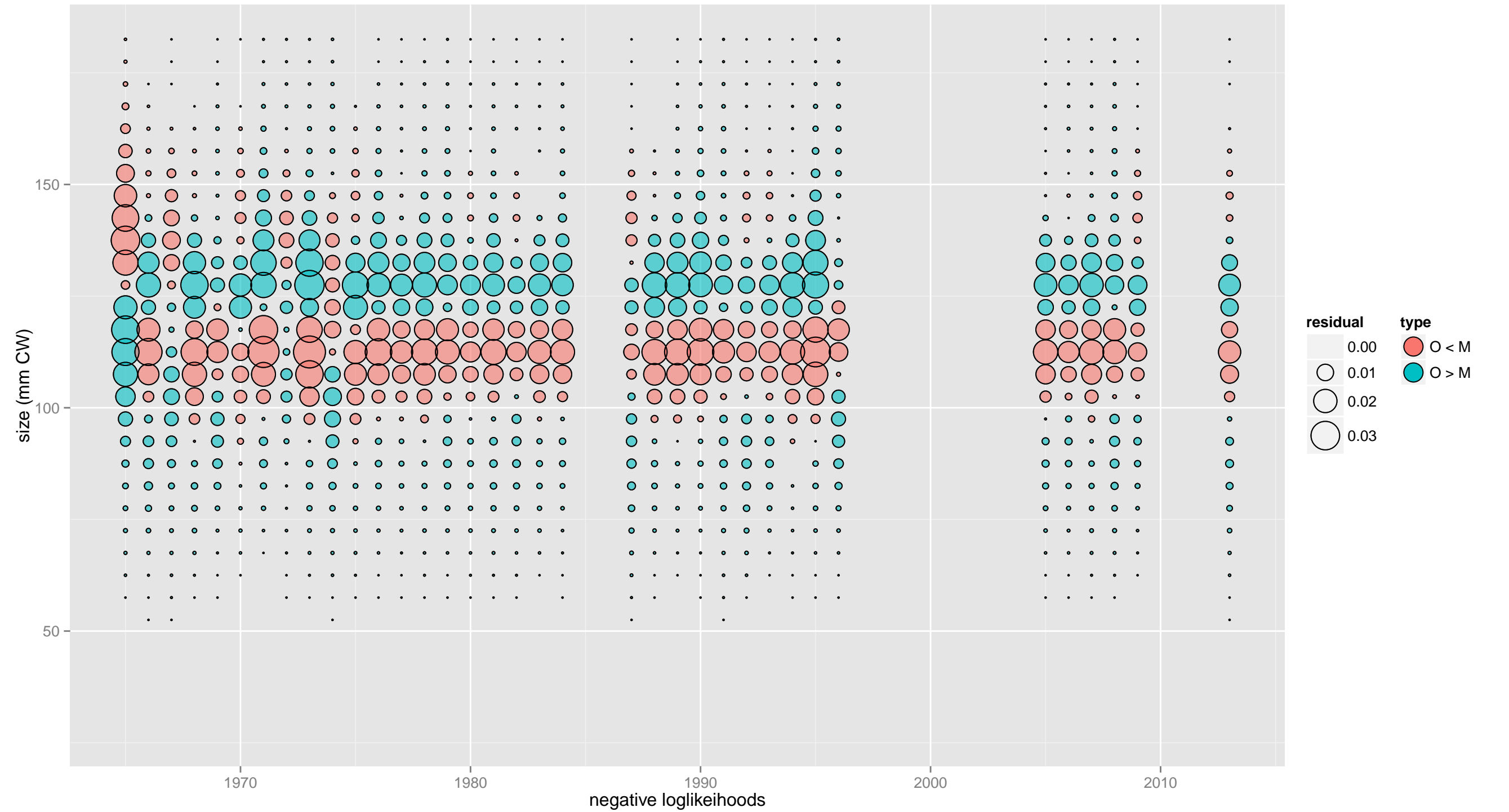
size (mm CW)

negative loglikelihoods



TCF: total catch: female, new shell



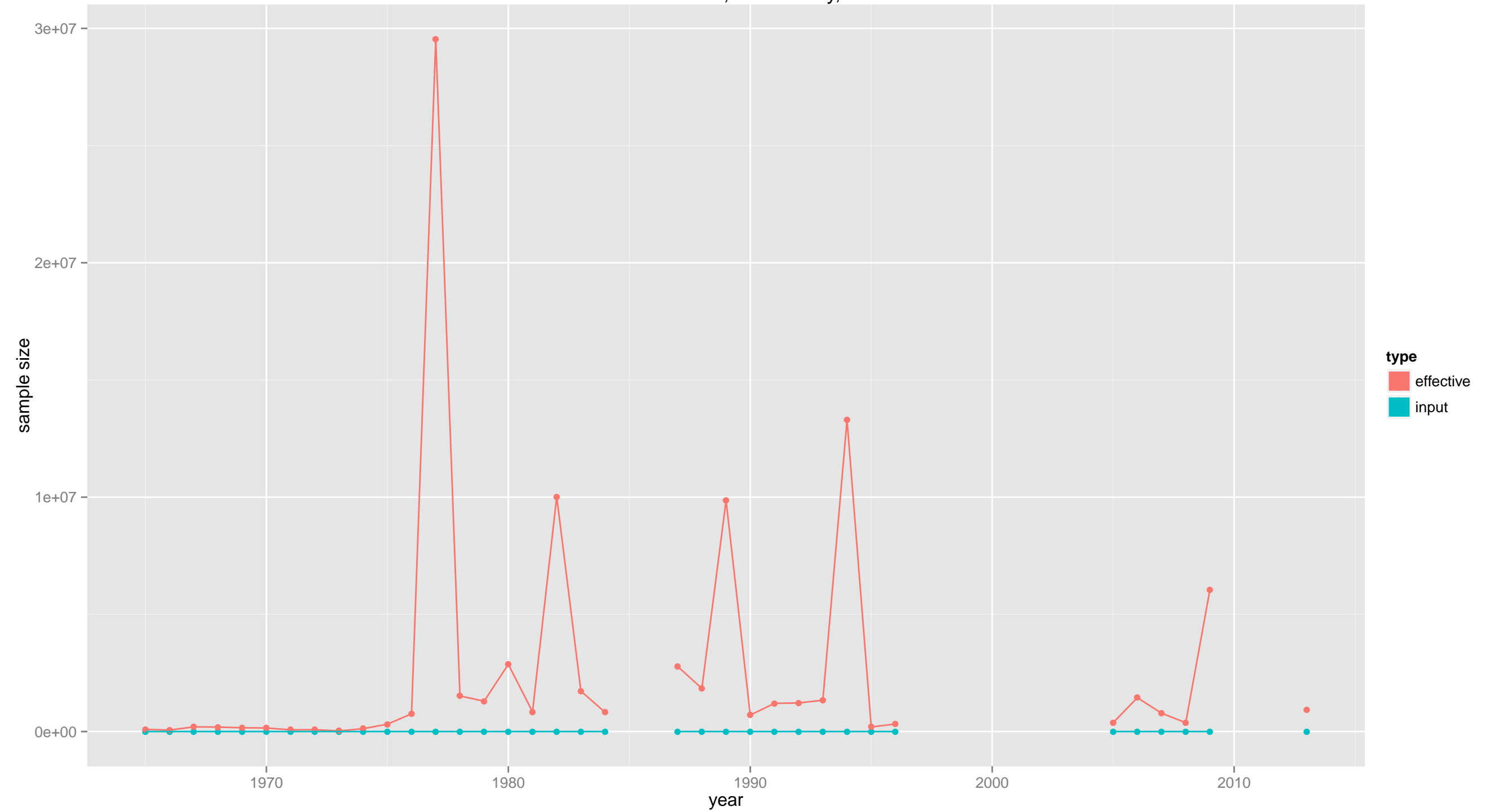


TCF: total catch: female, old shell

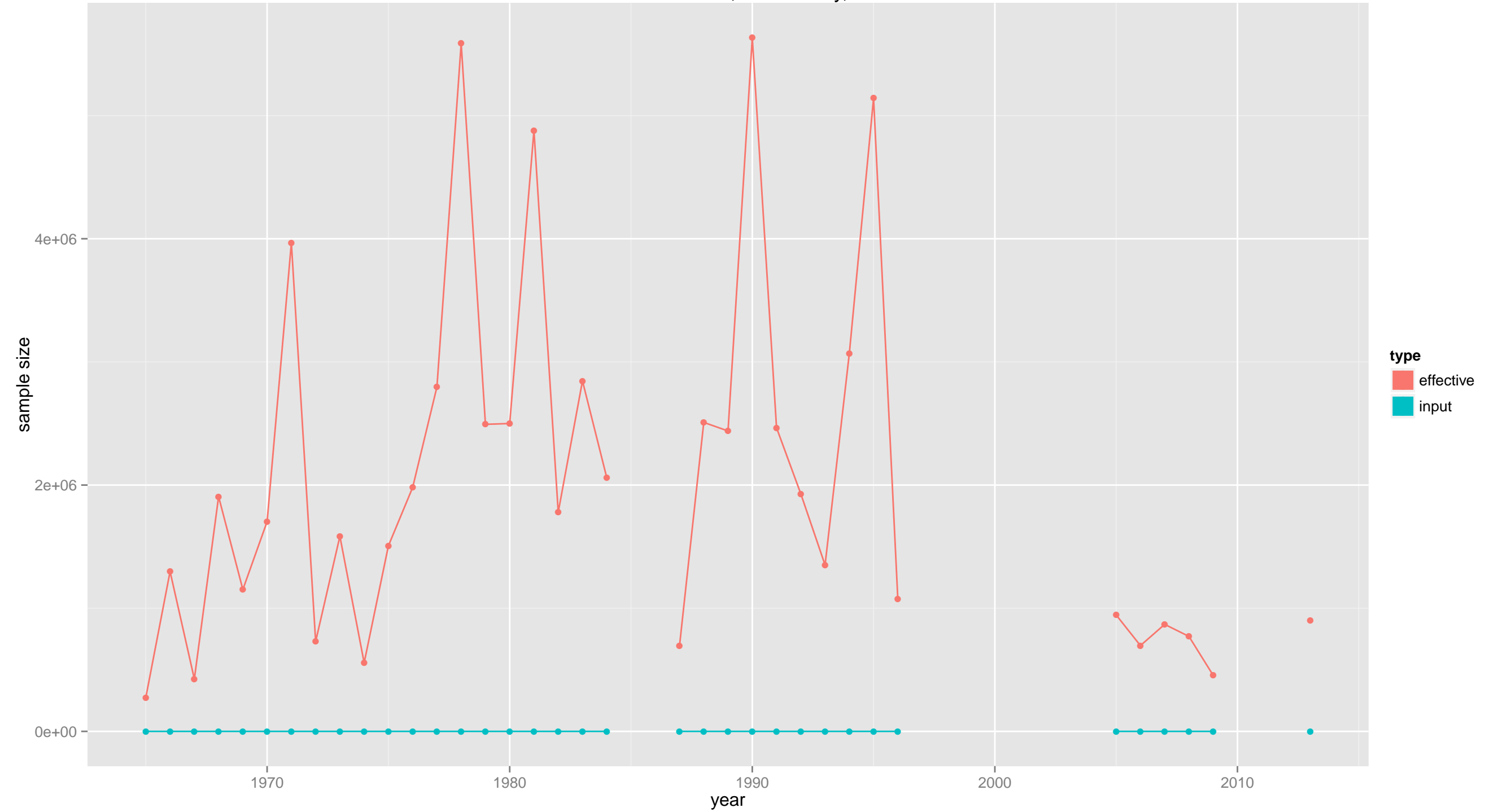




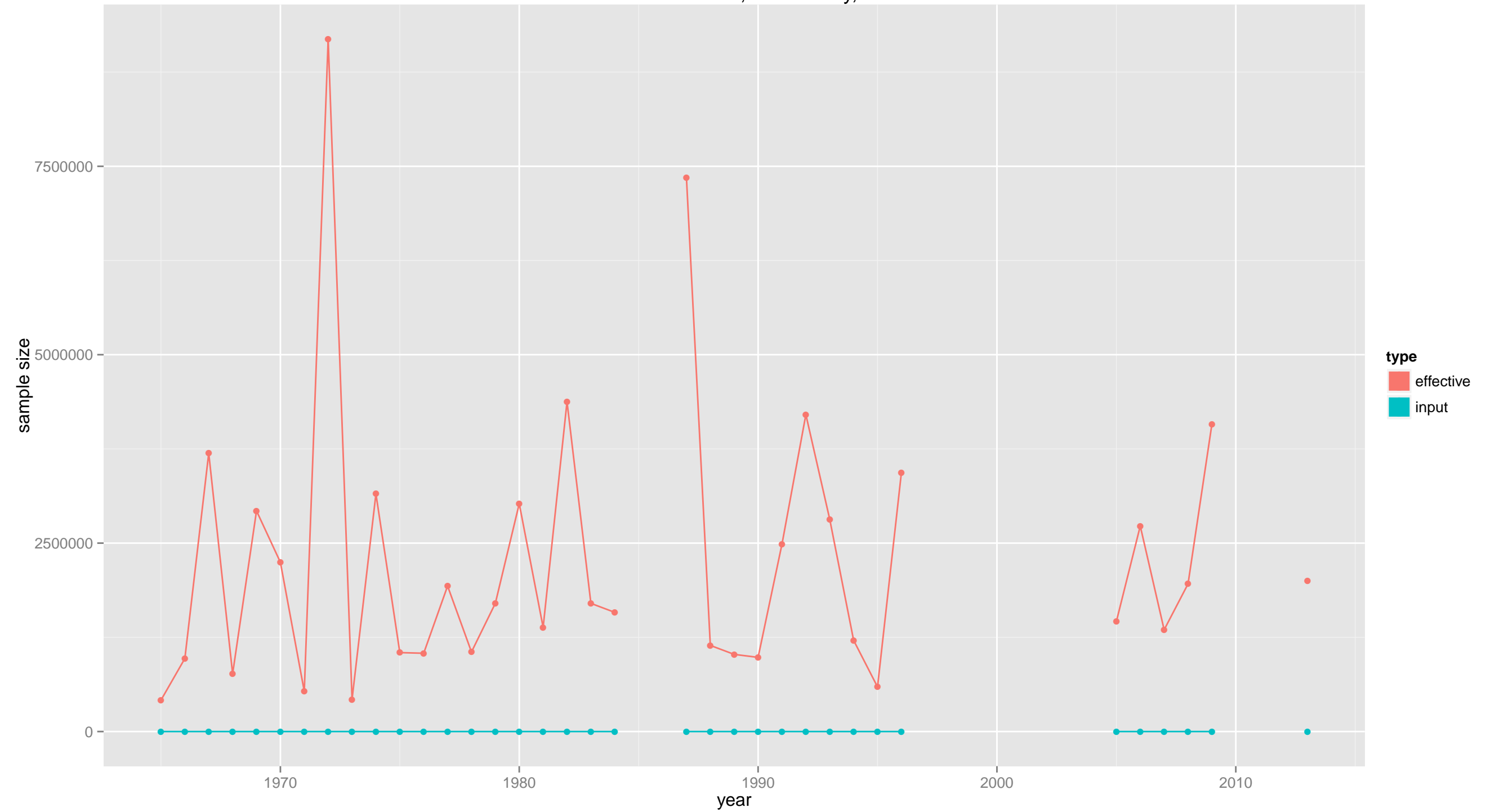
TCF: total catch: male, all maturity, new shell



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



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



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



SCF: total catch abundance

MALE

FEMALE

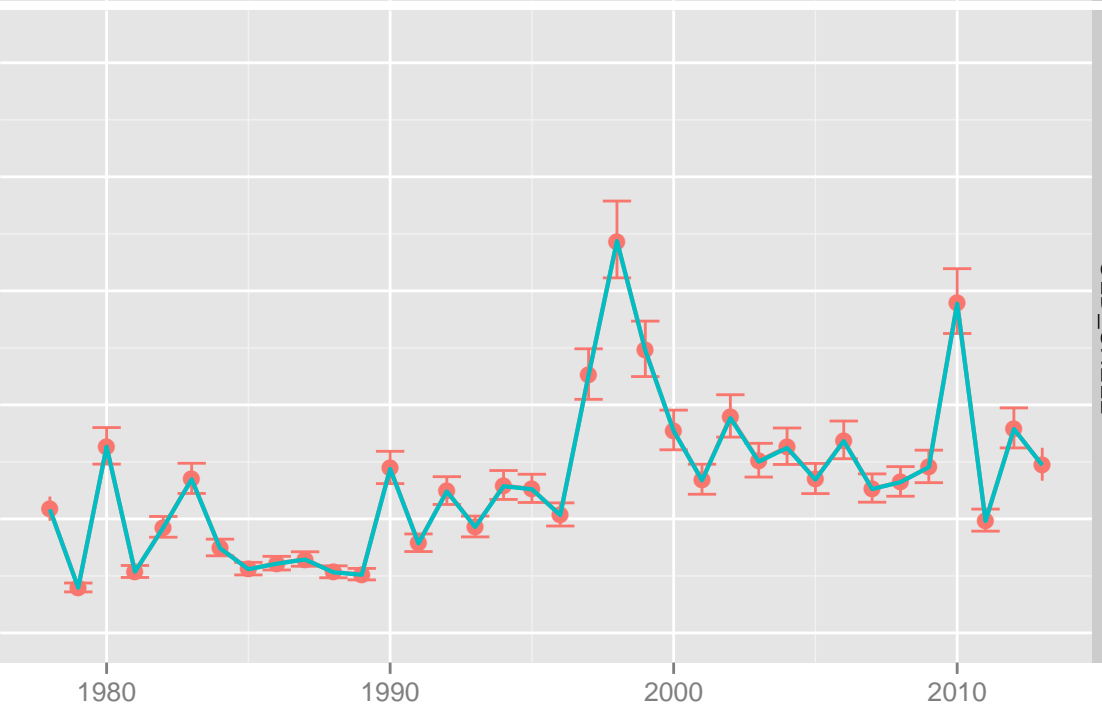
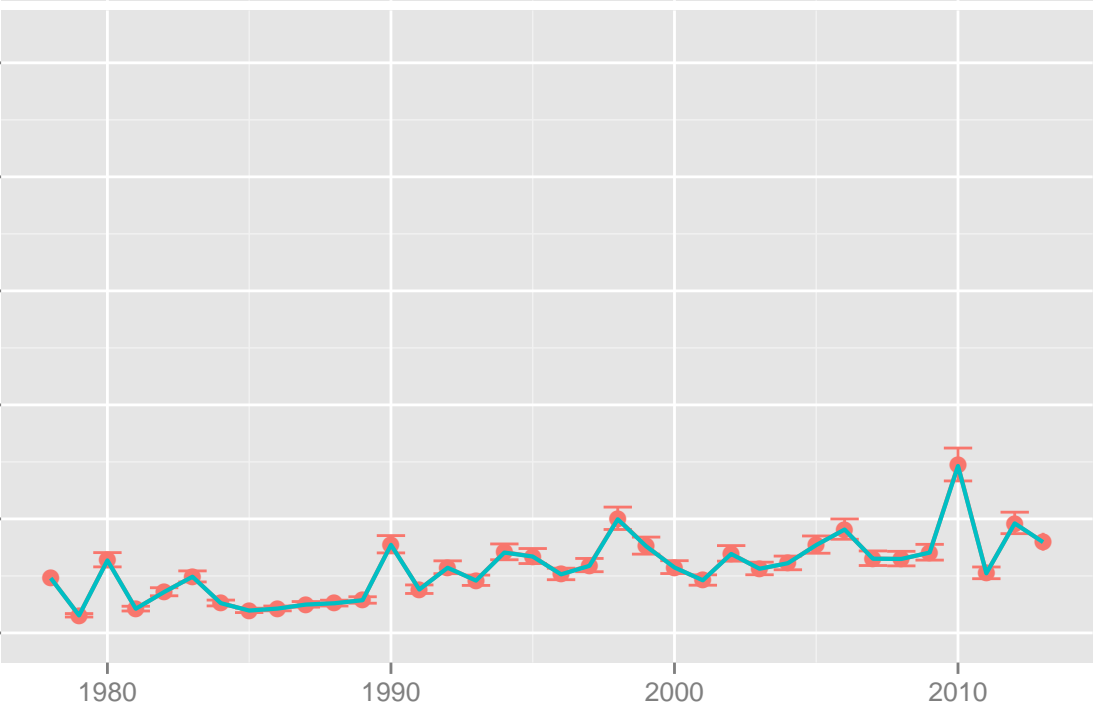
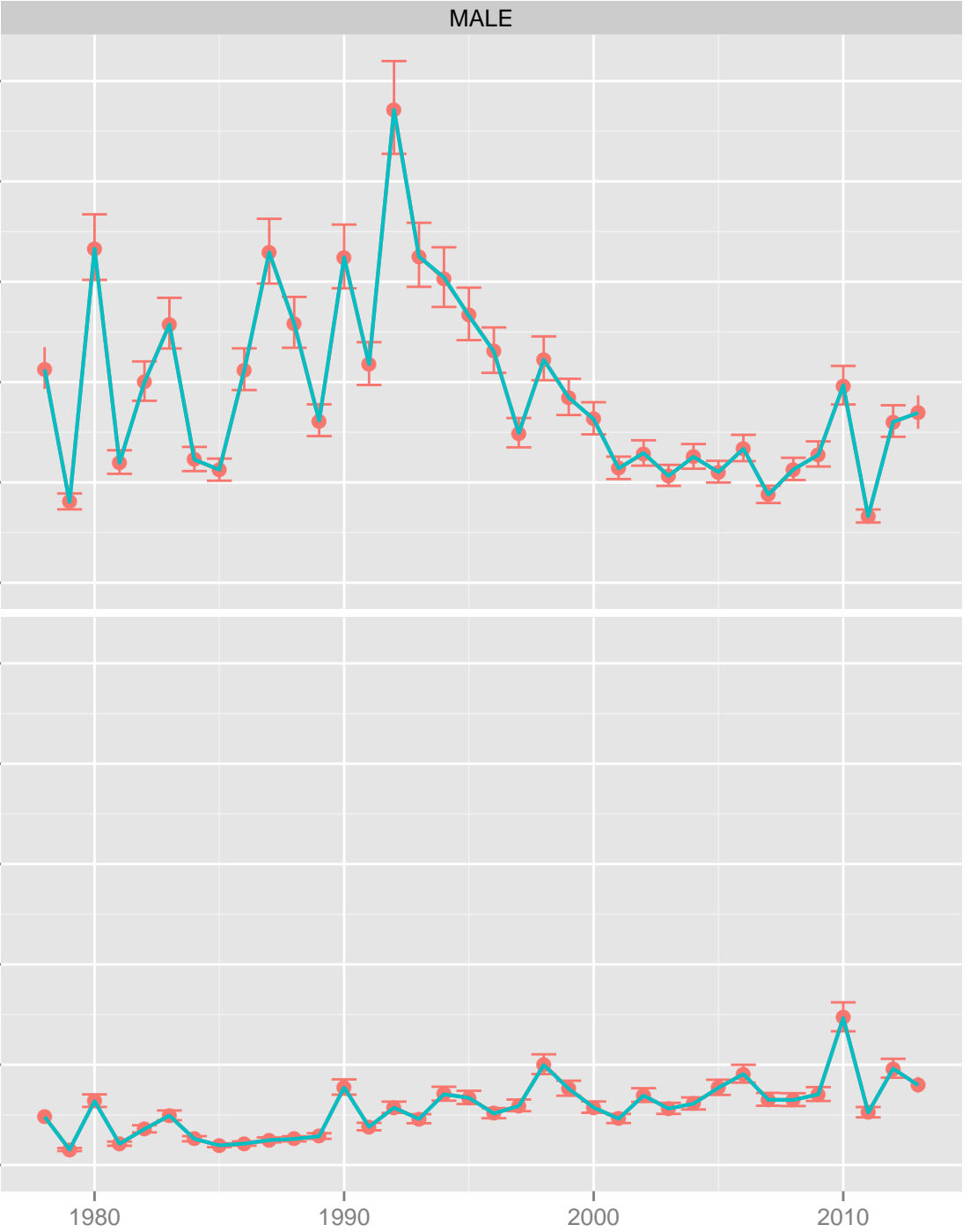
NEW_SHELL

OLD_SHELL

- type**
 - observed
 - estimated
- maturity**
 - ALL_MATURITY

abundance

year



SCF: total catch abundance



SCF: total catch abundance



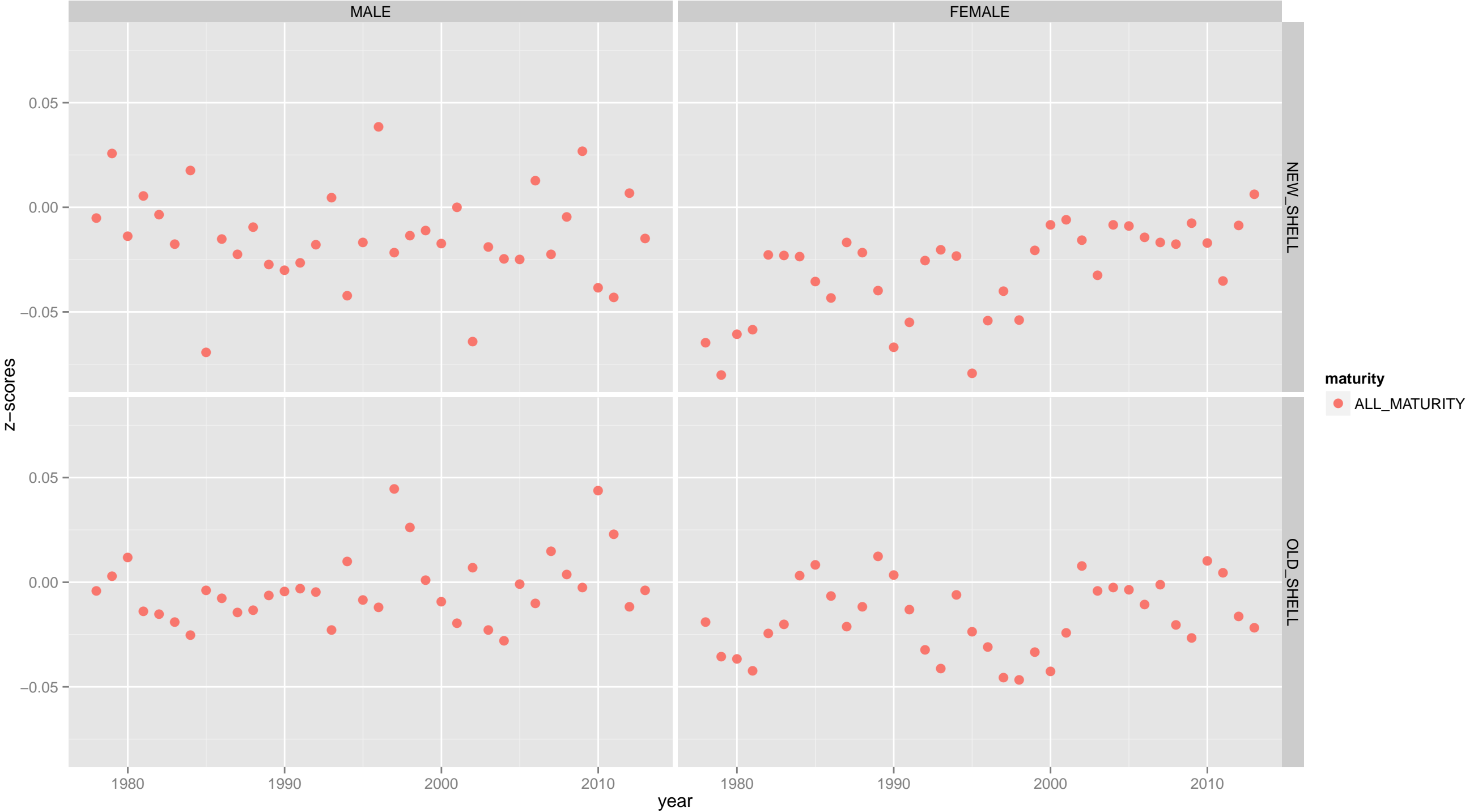
SCF: total catch biomass



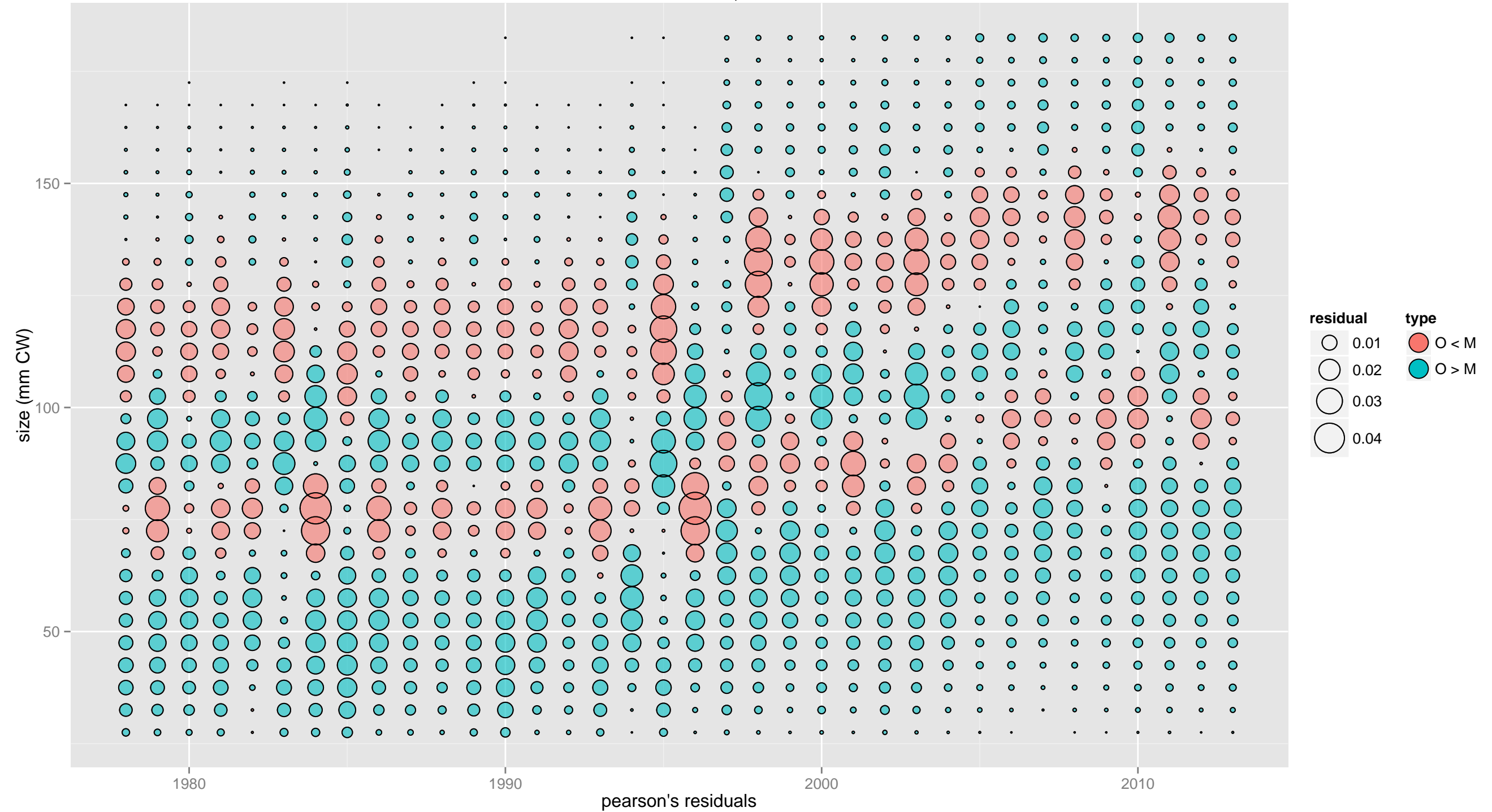
SCF: total catch biomass



SCF: total catch biomass

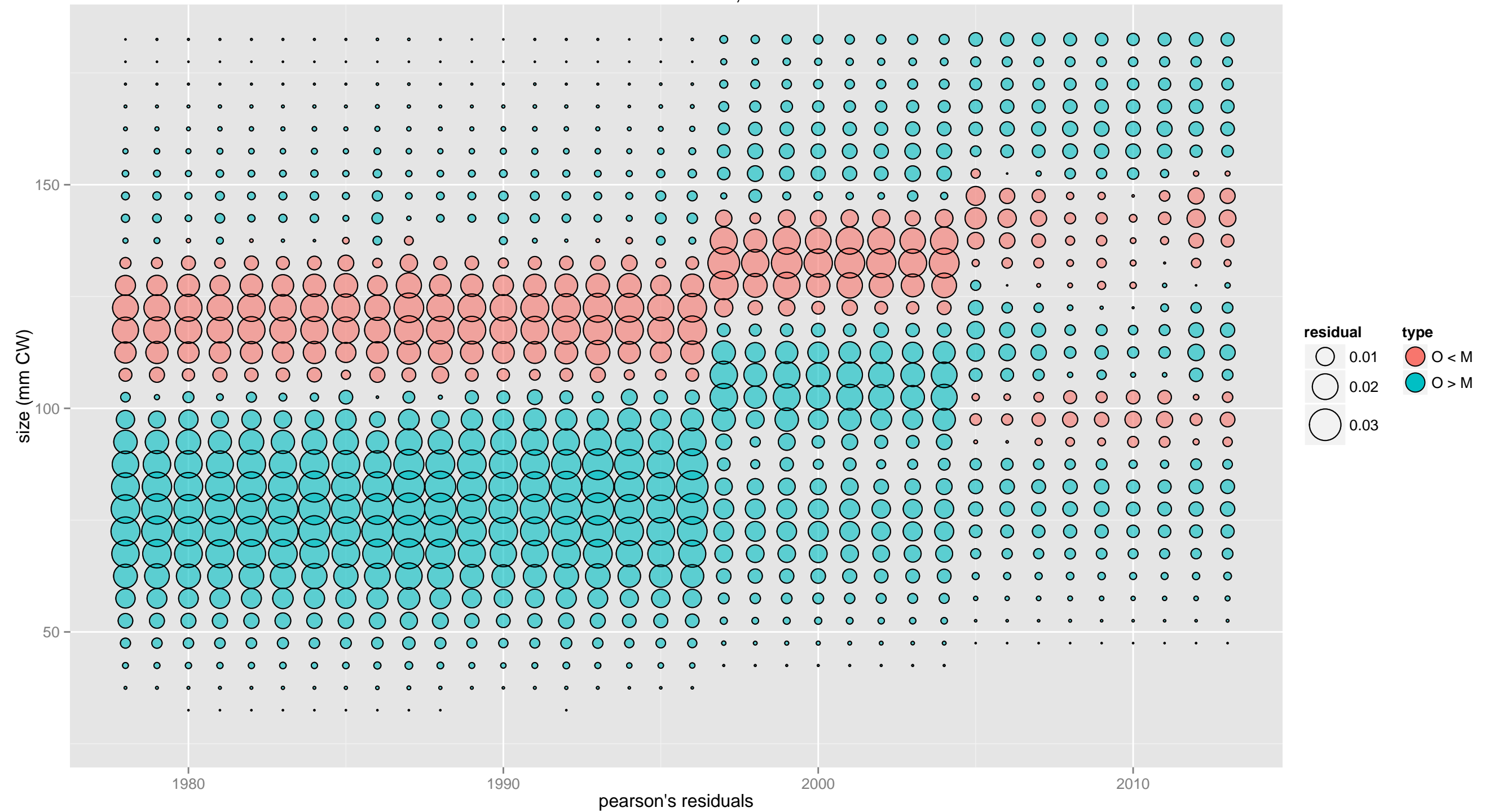


SCF: total catch: male, new shell



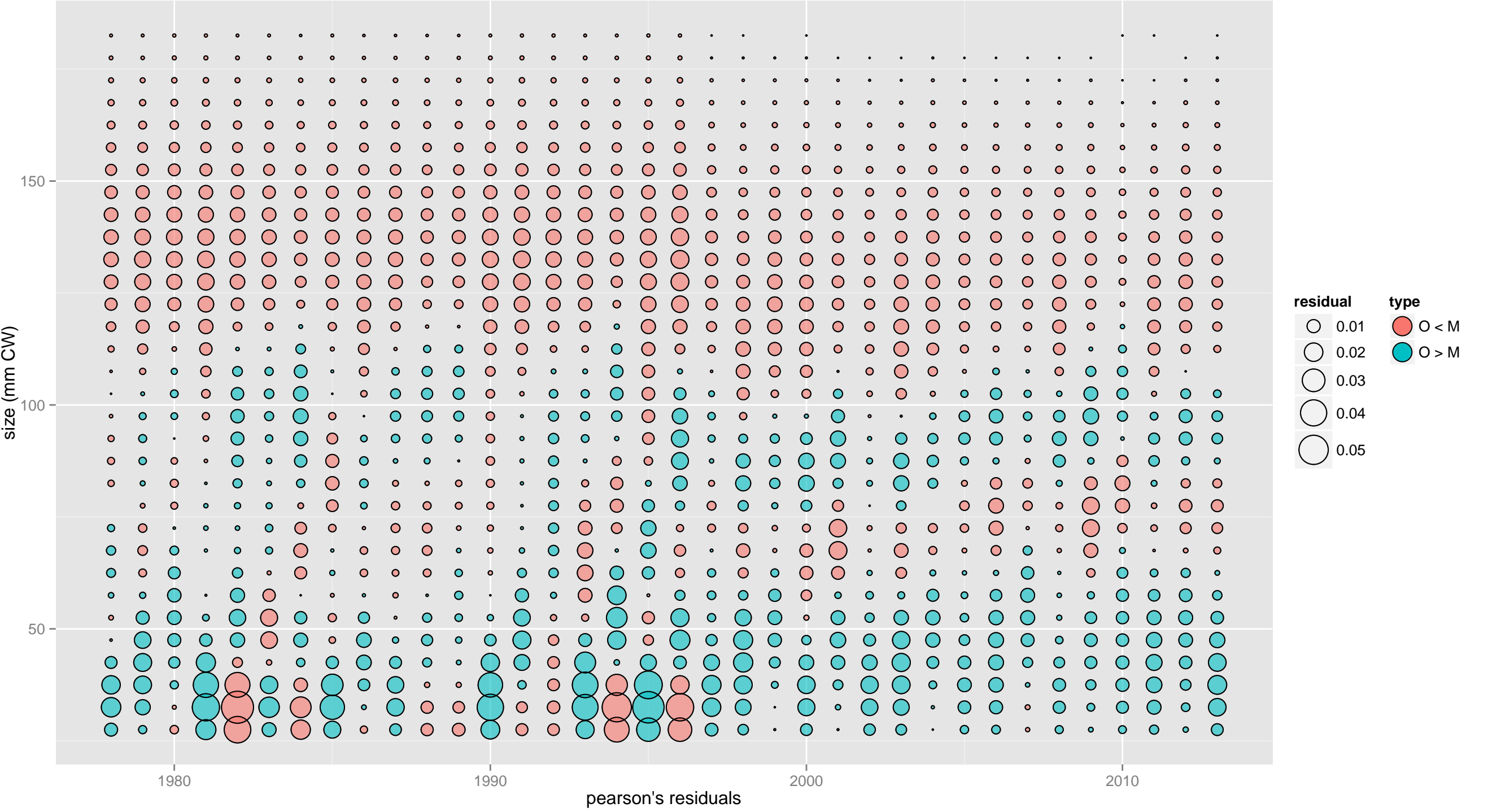


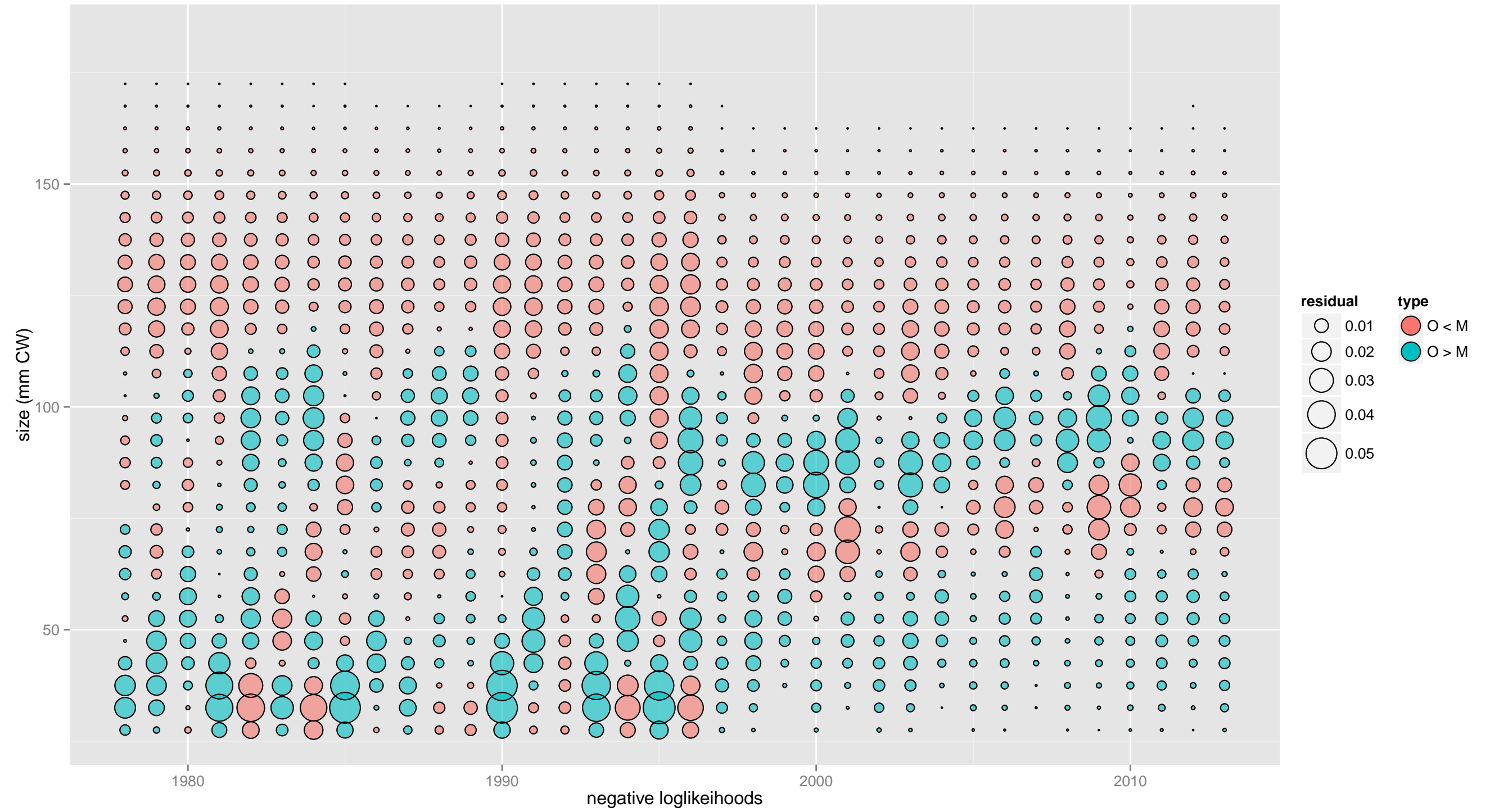
SCF: total catch: male, old shell



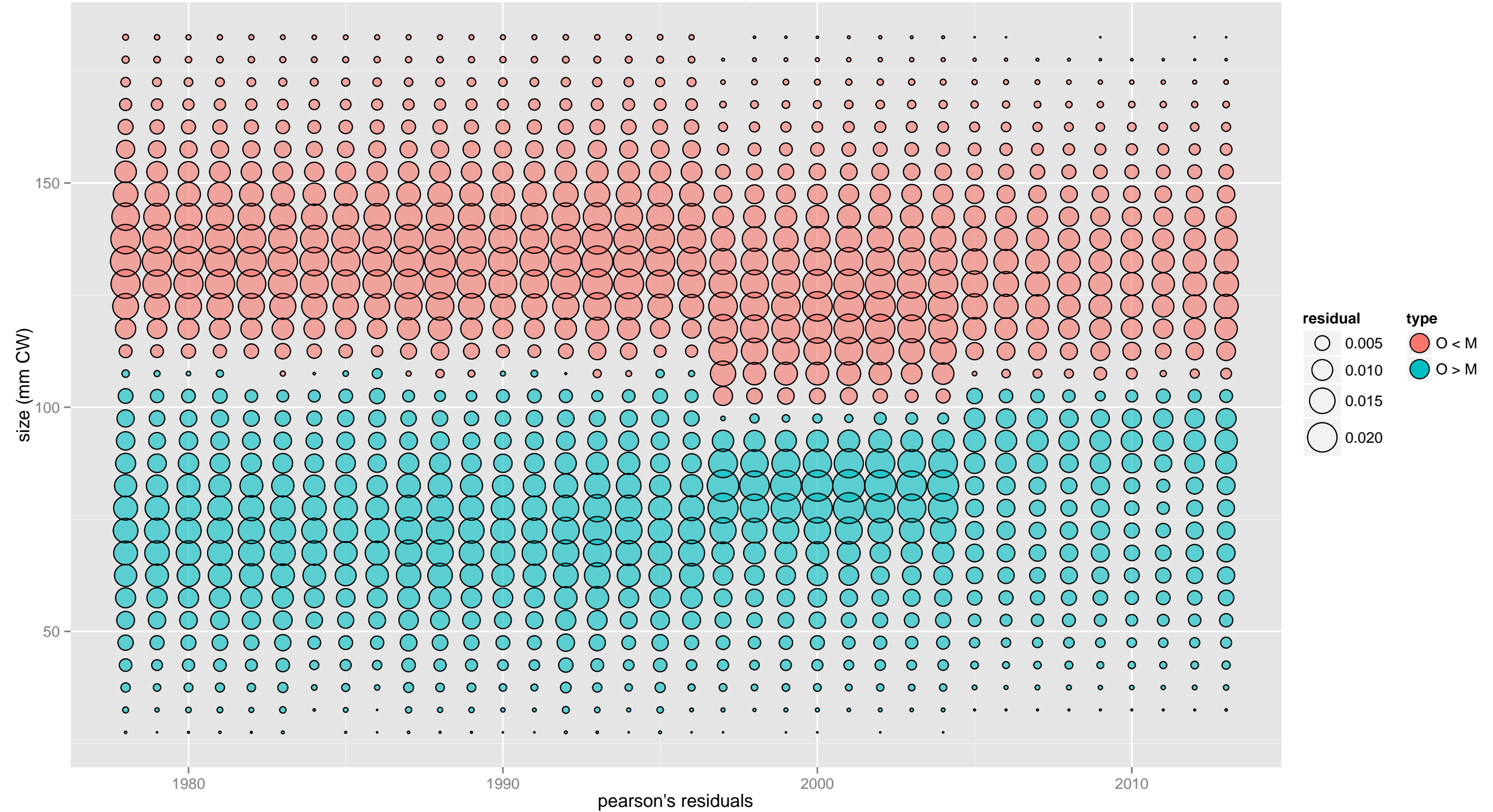


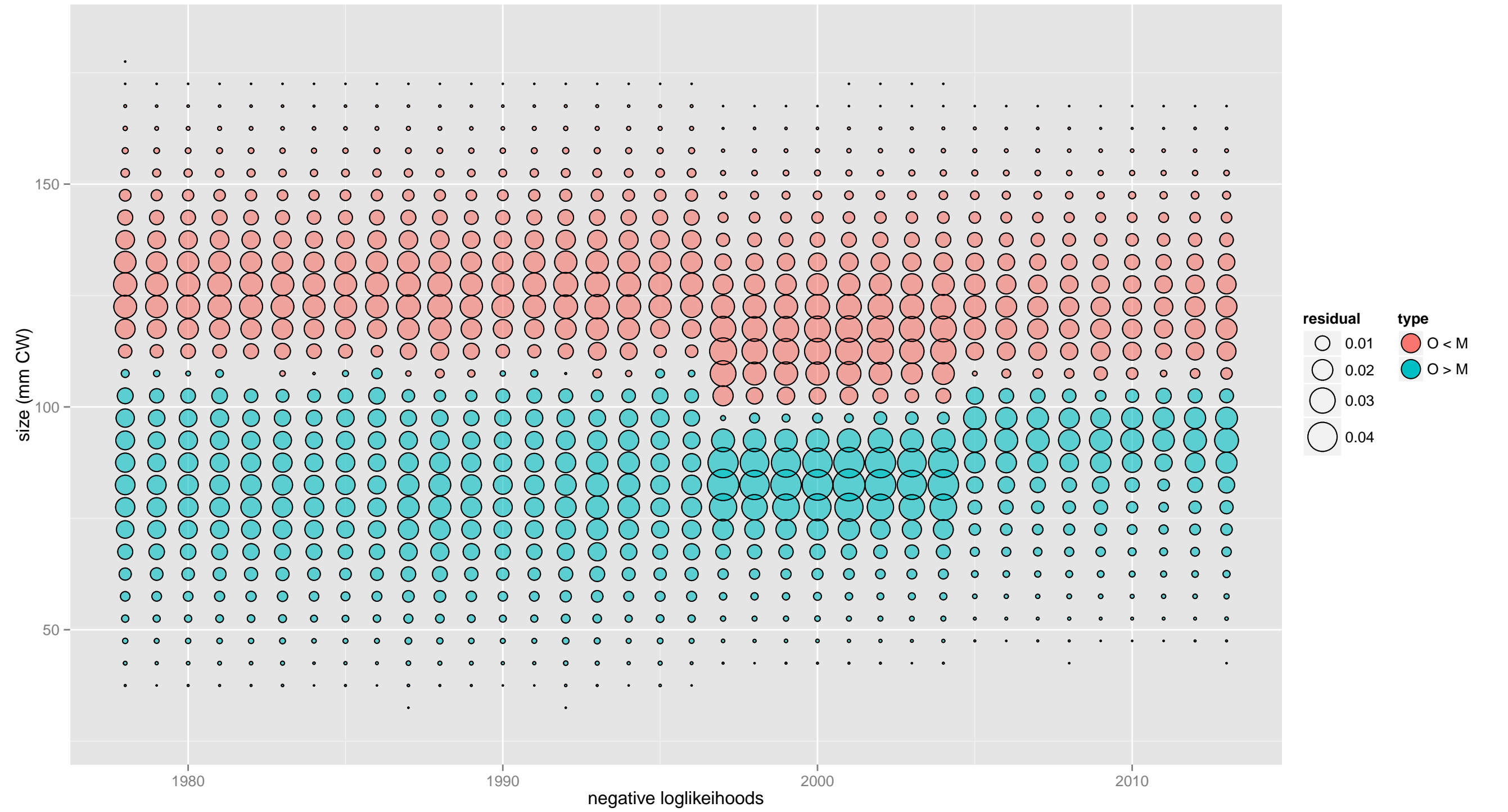
SCF: total catch: female, new shell



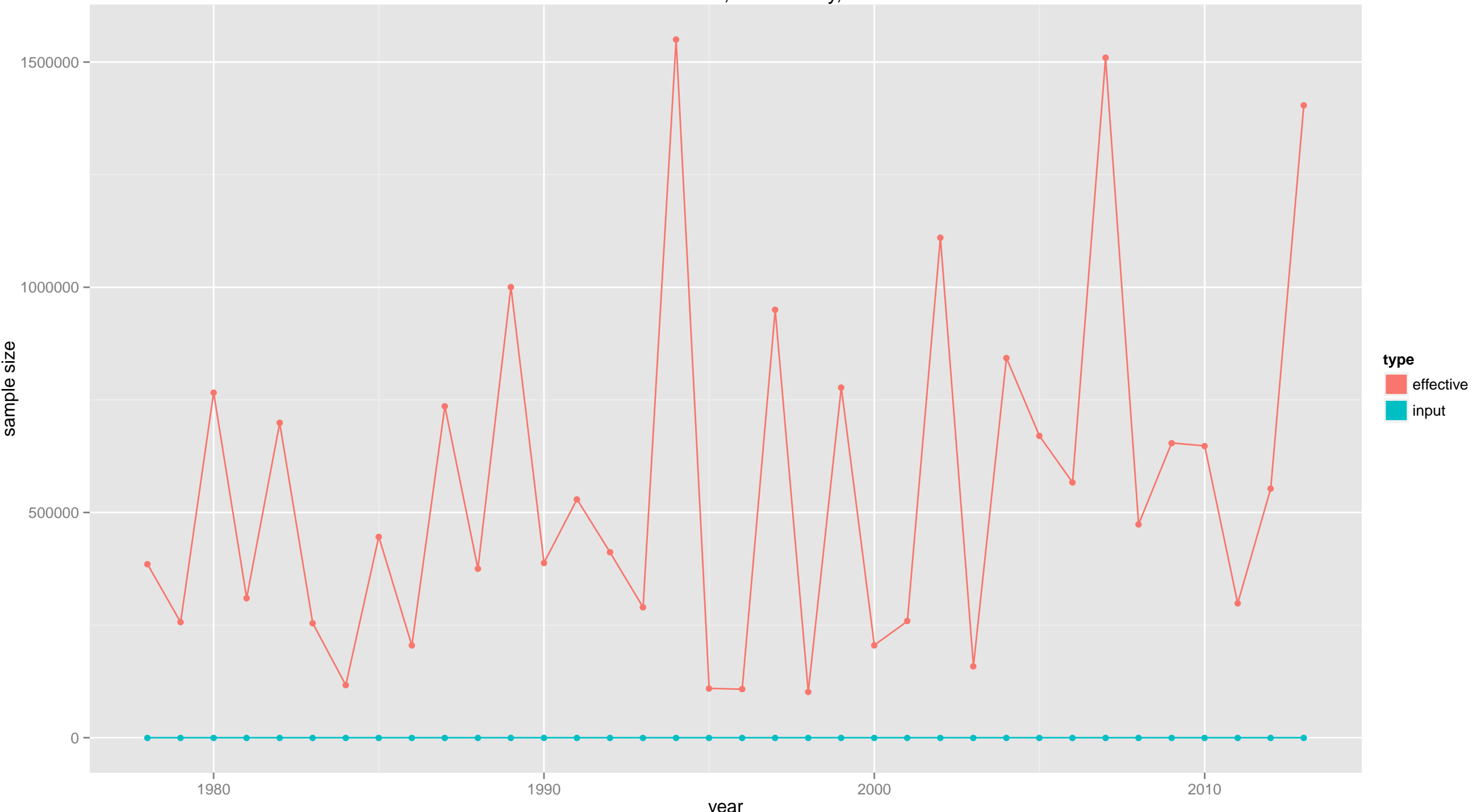


SCF: total catch: female, old shell

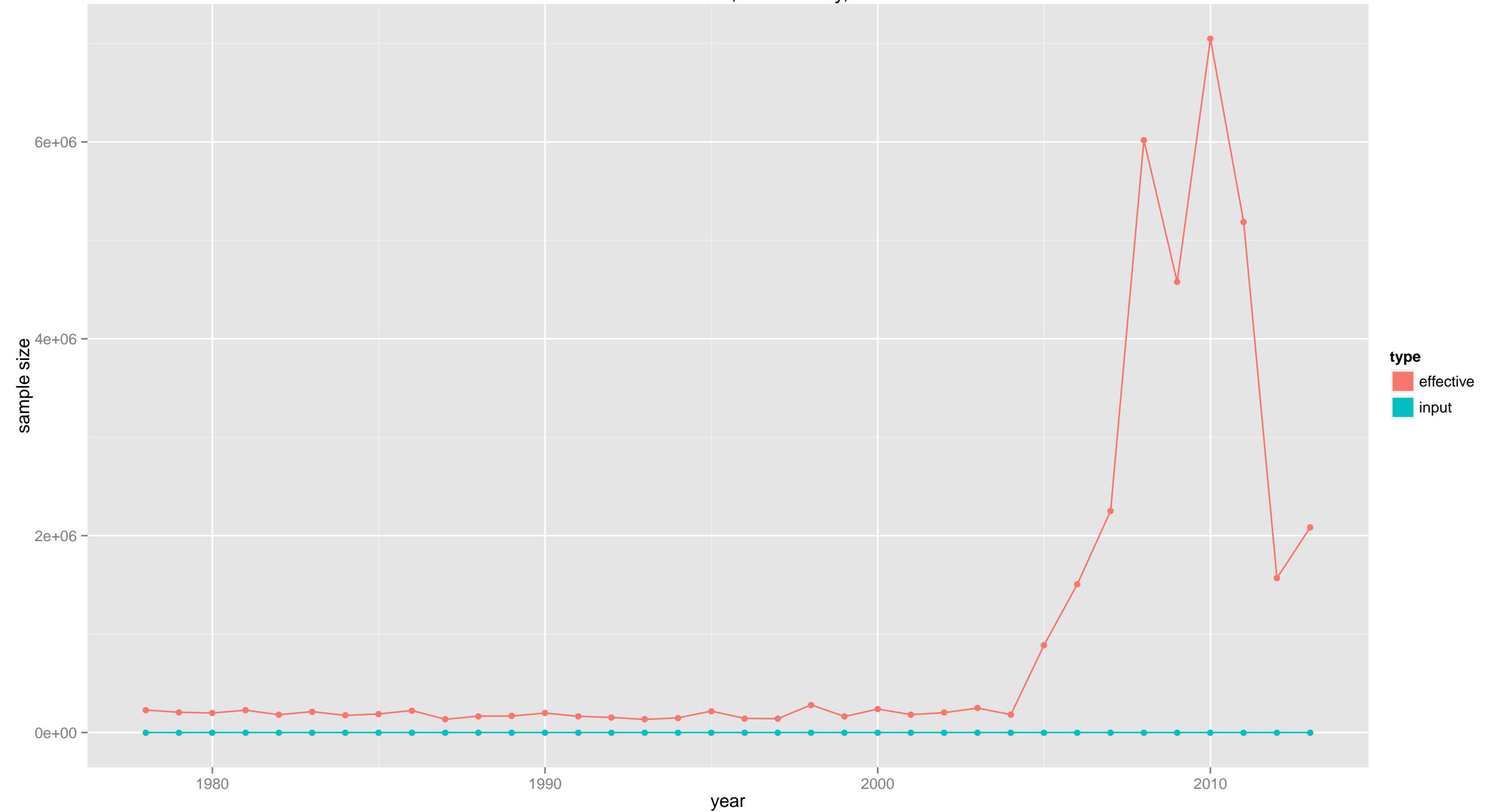




SCF: total catch: male, all maturity, new shell



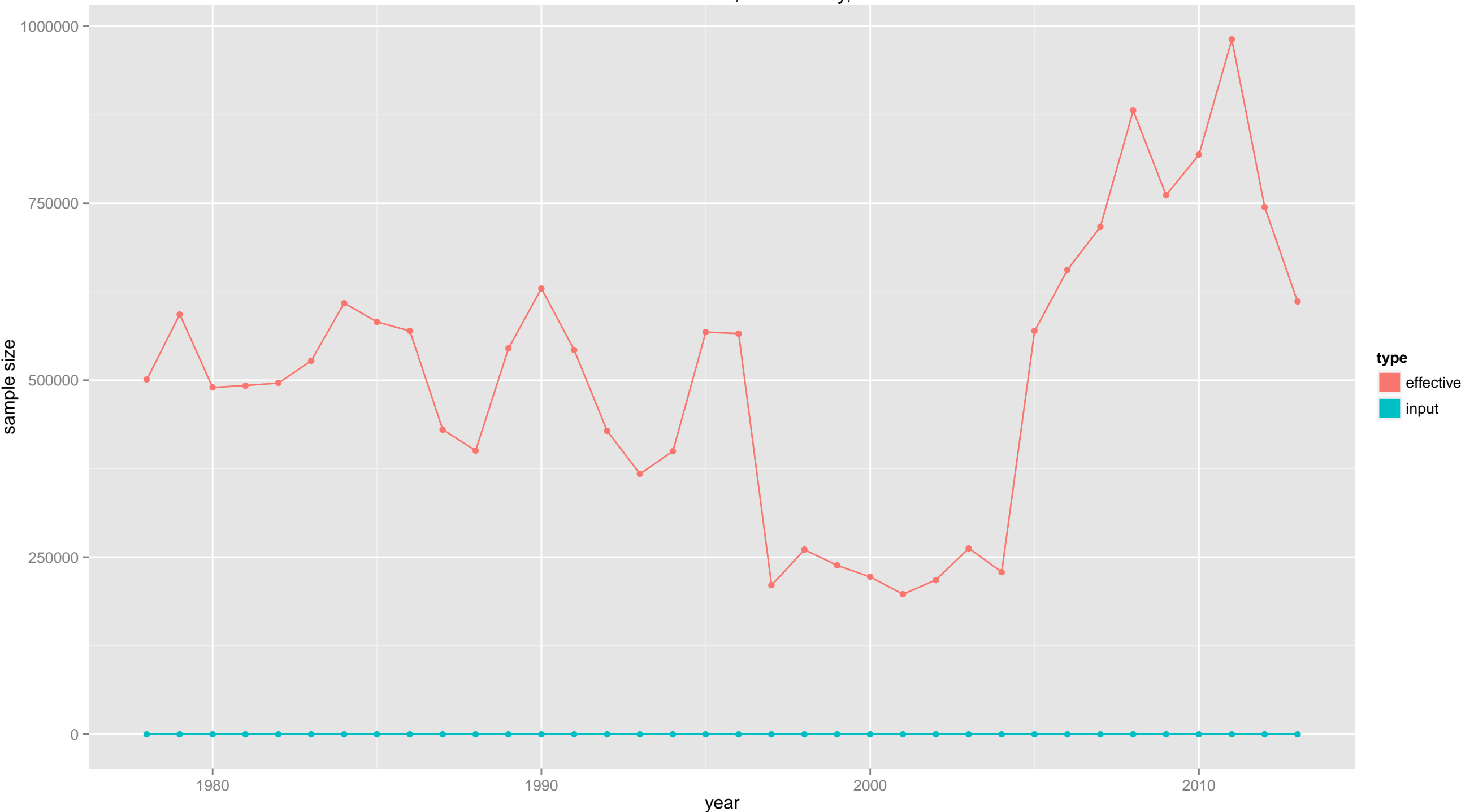
SCF: total catch: male, all maturity, old shell



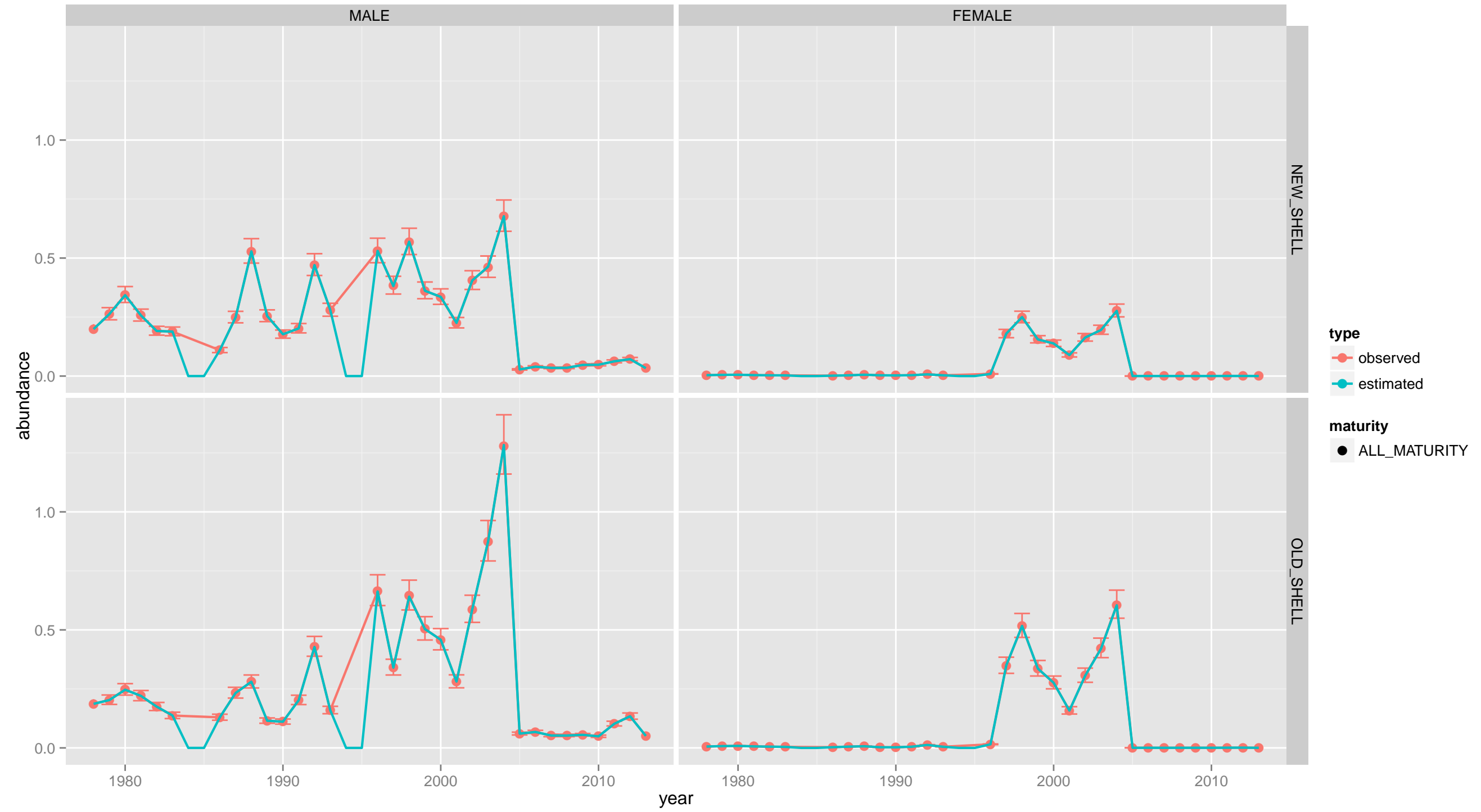
SCF: total catch: female, all maturity, new shell



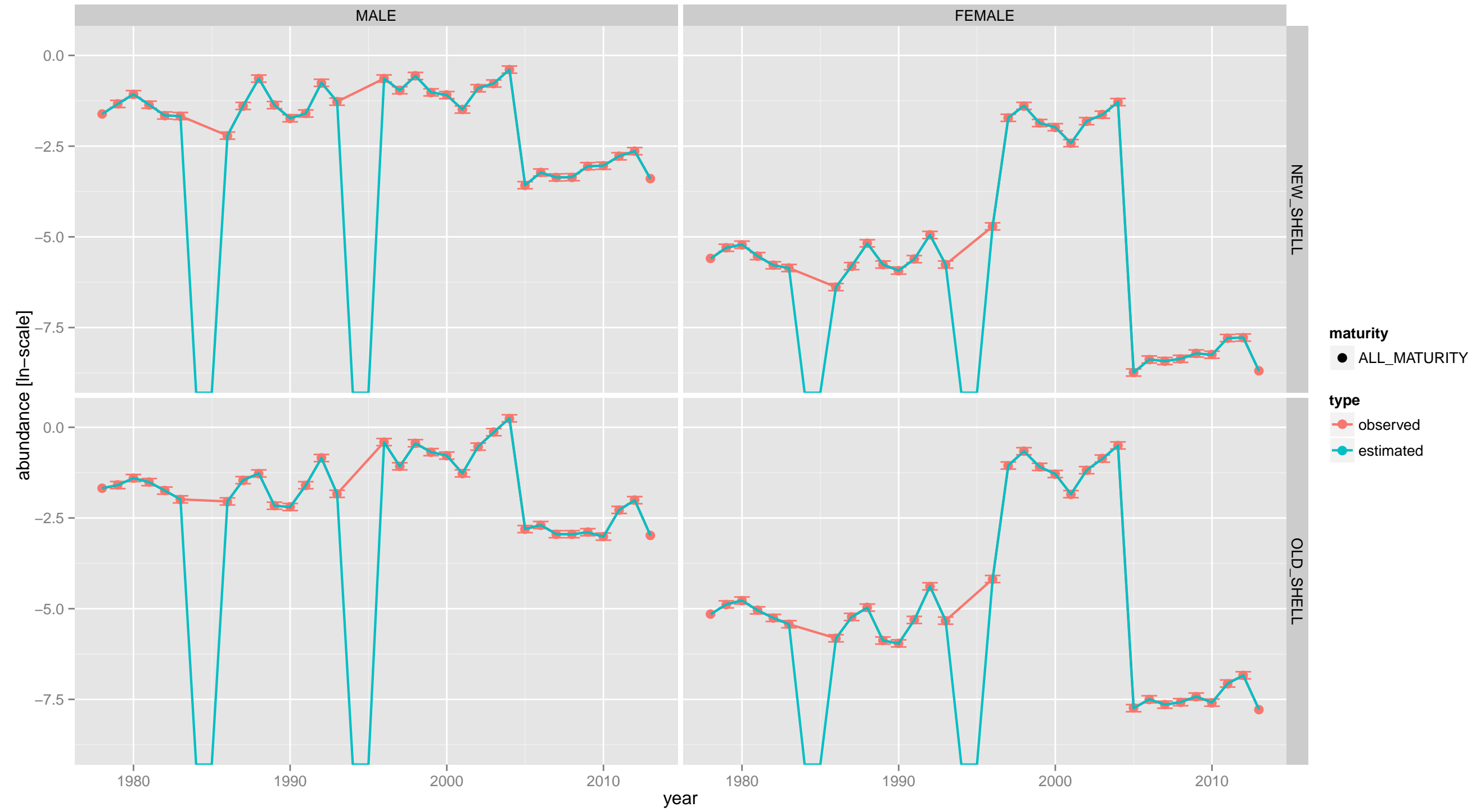
SCF: total catch: female, all maturity, old shell



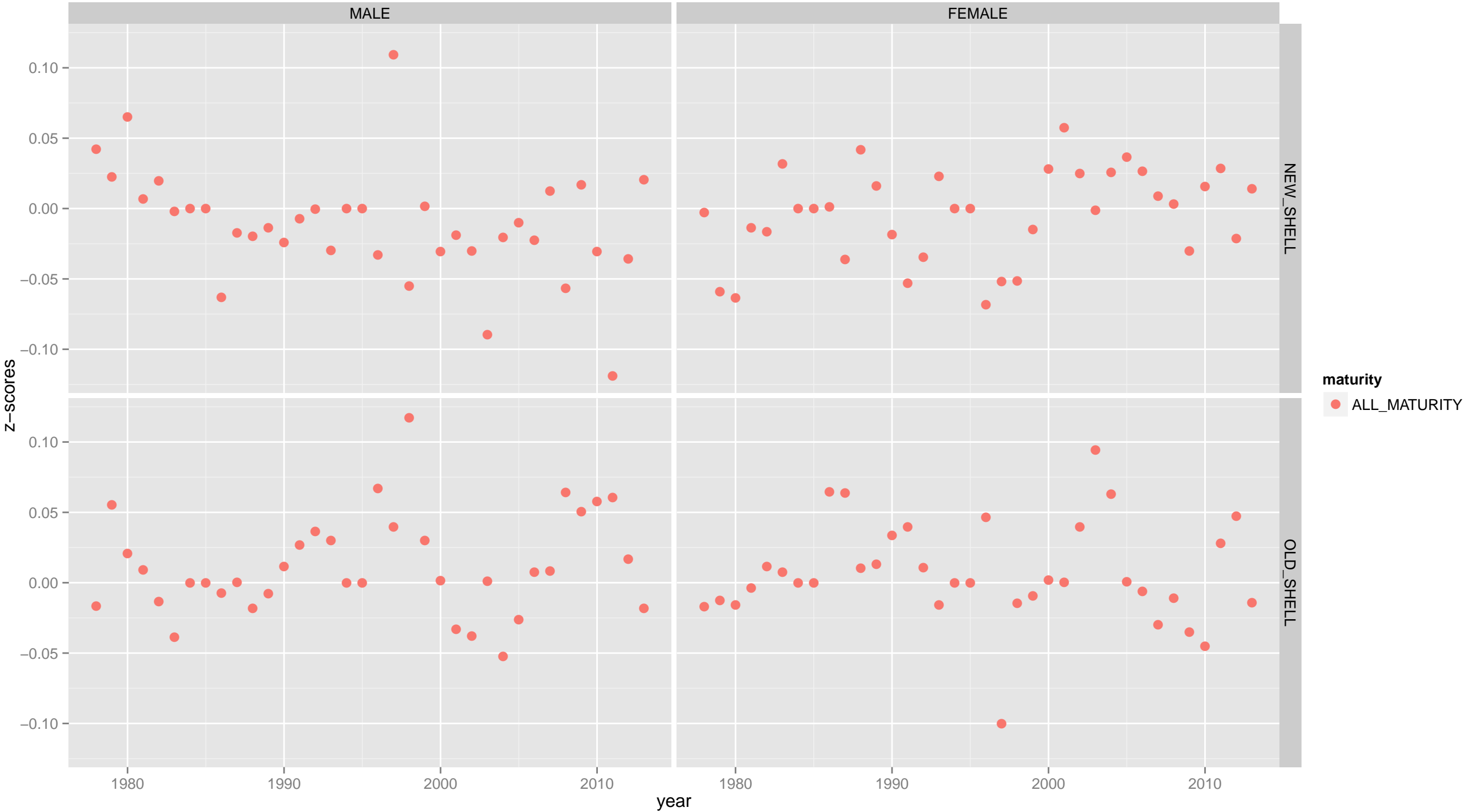
RKF: total catch abundance



RKF: total catch abundance



RKF: total catch abundance



RKF: total catch biomass

MALE

FEMALE

NEW_SHELL

OLD_SHELL

biomass

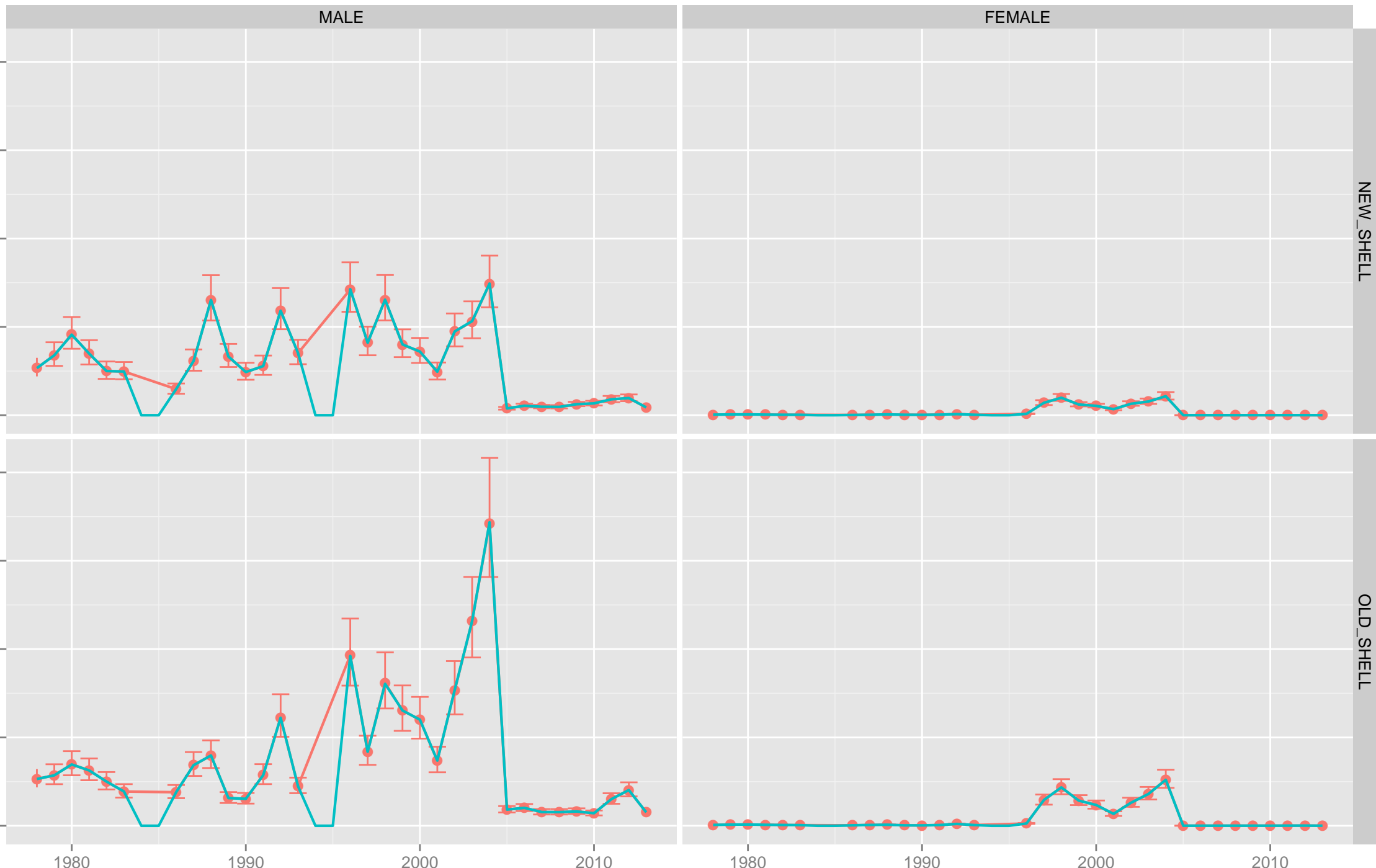
year

type

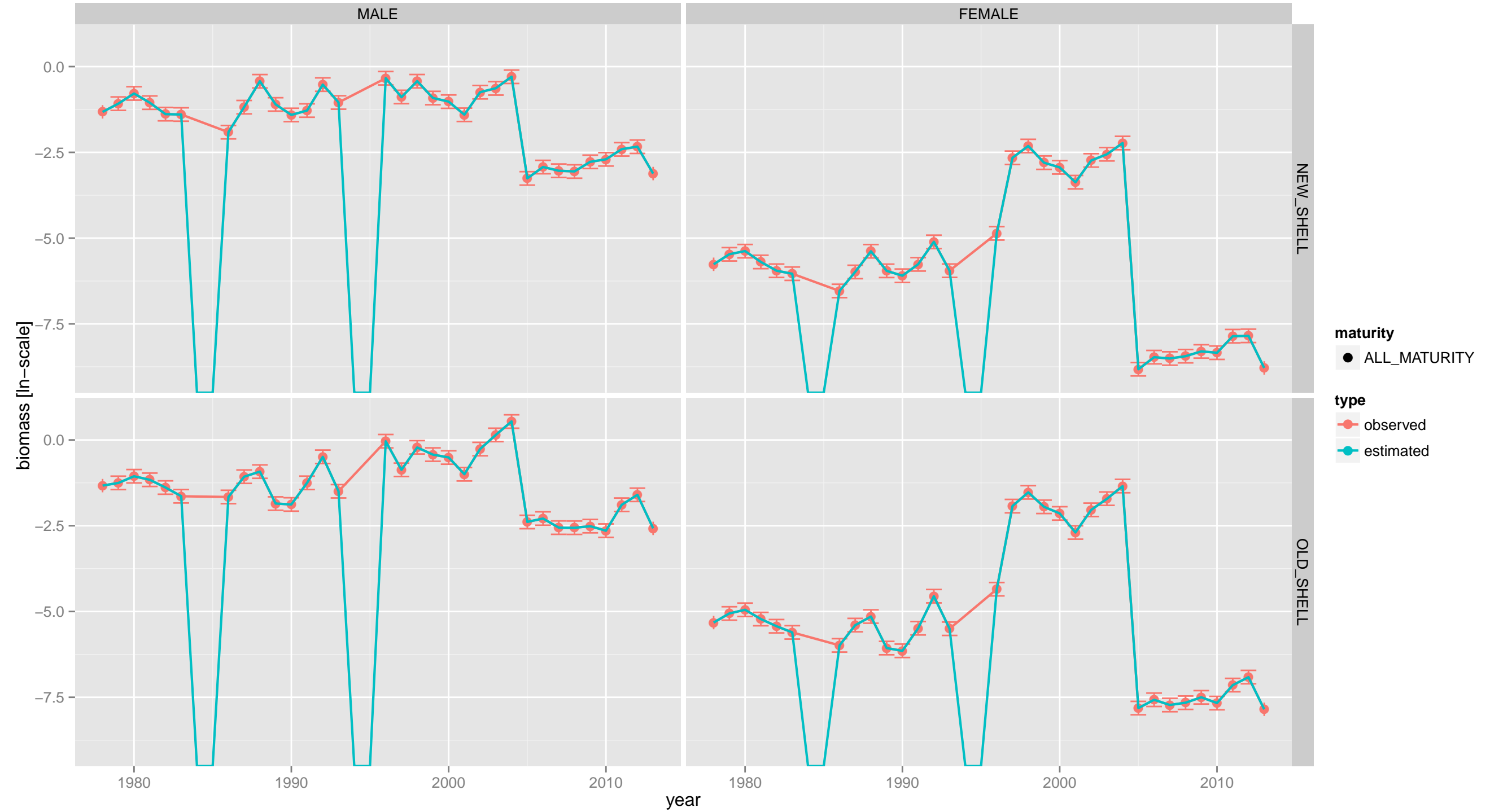
- observed
- estimated

maturity

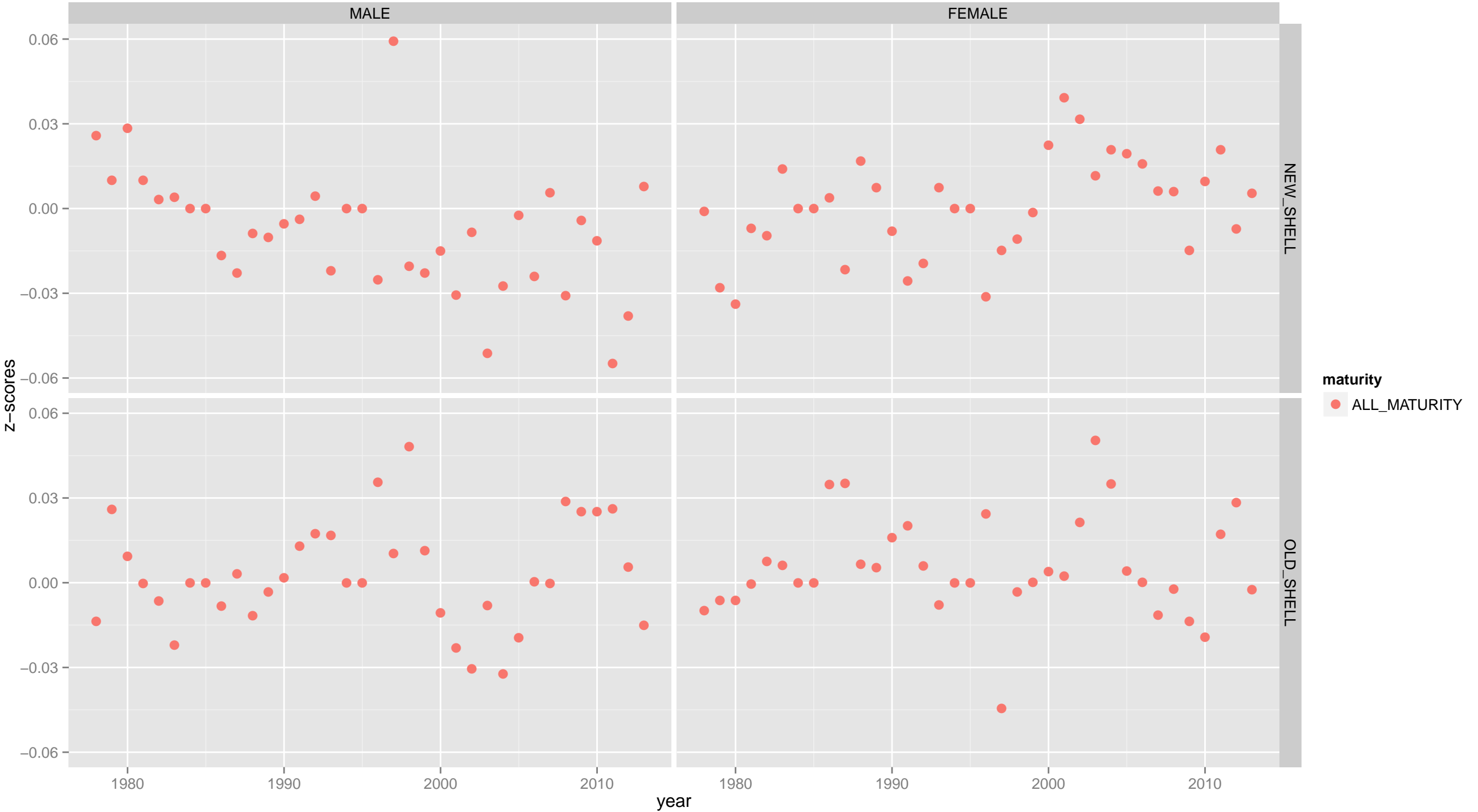
- ALL_MATURITY



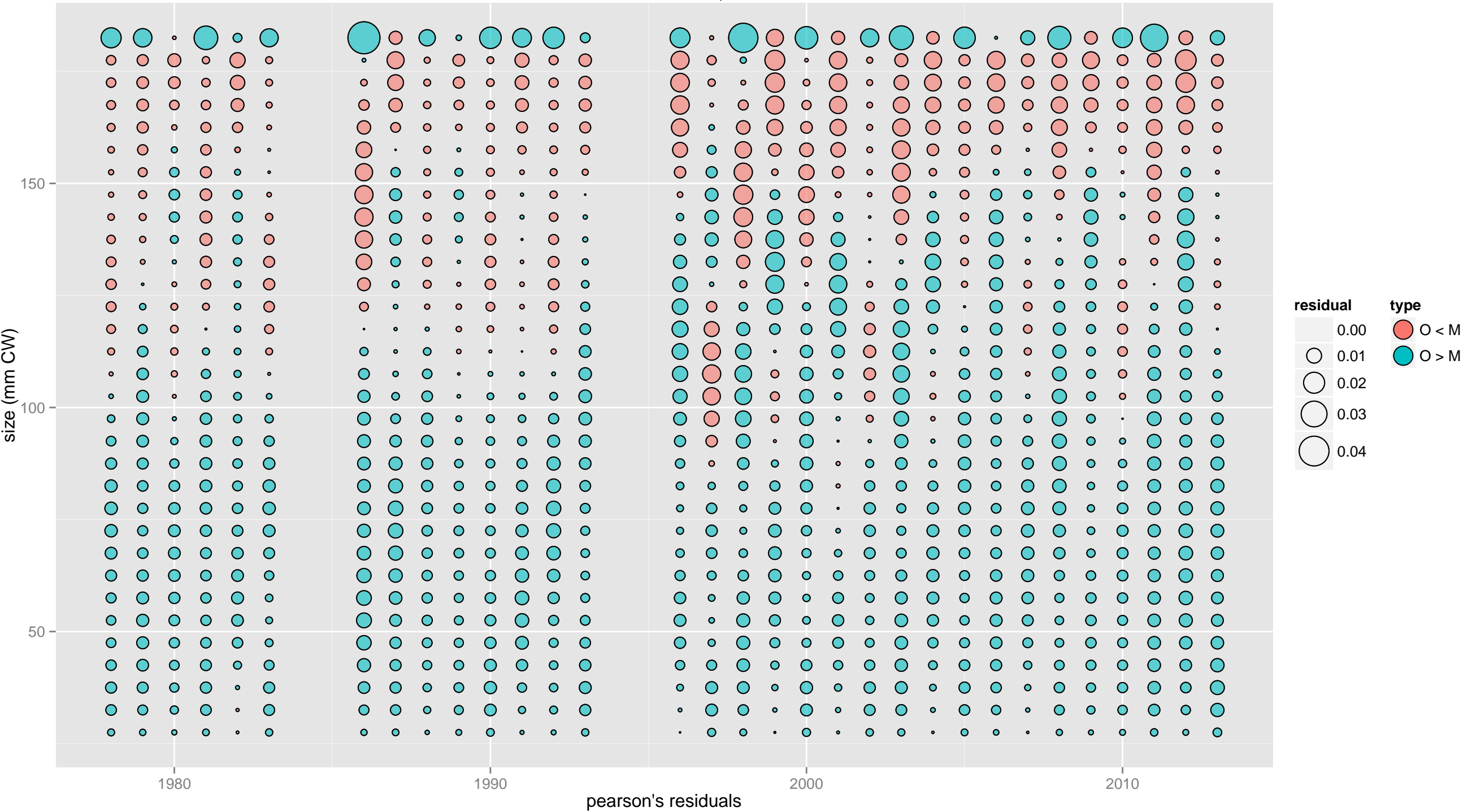
RKF: total catch biomass

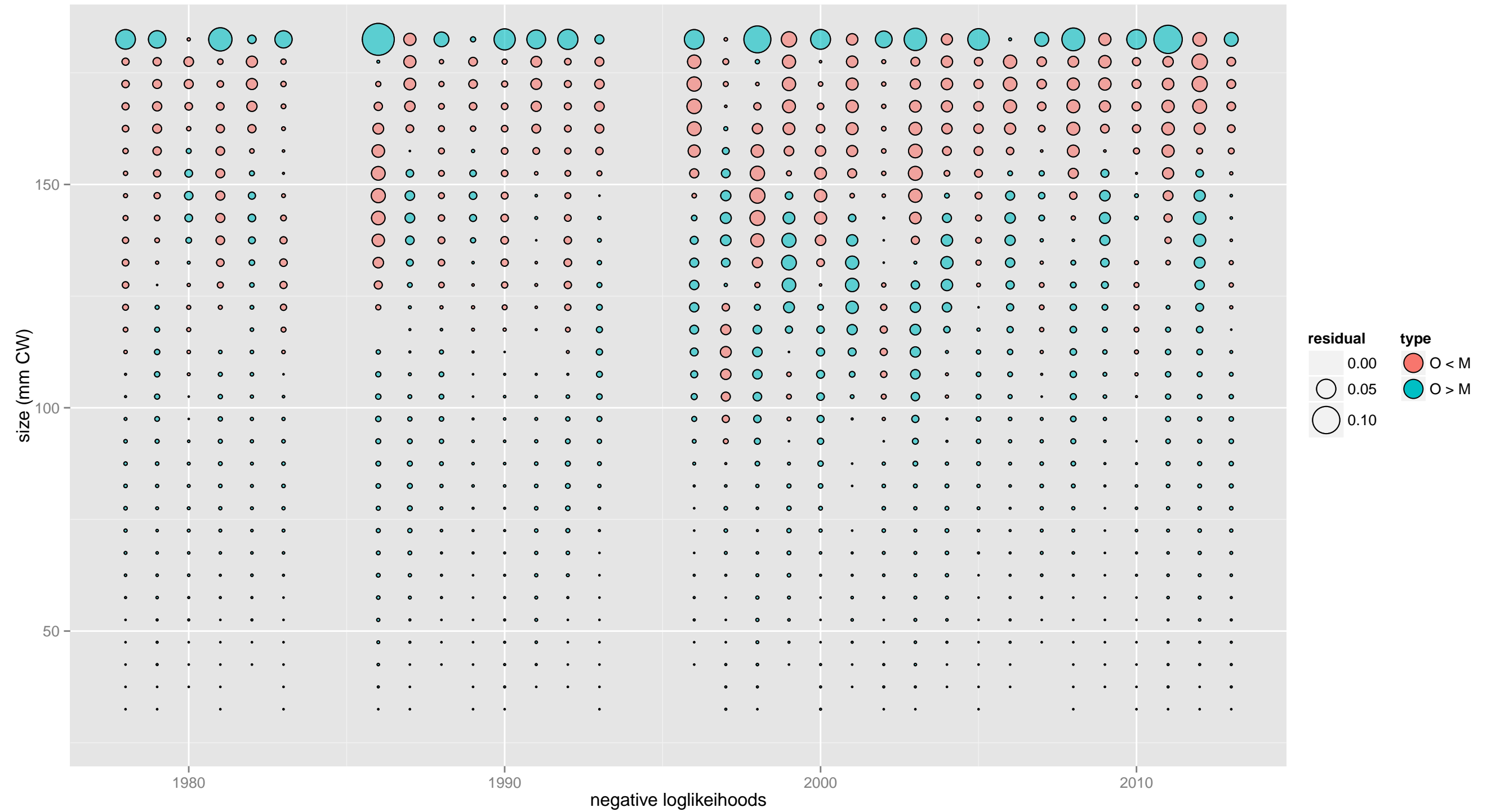


RKF: total catch biomass

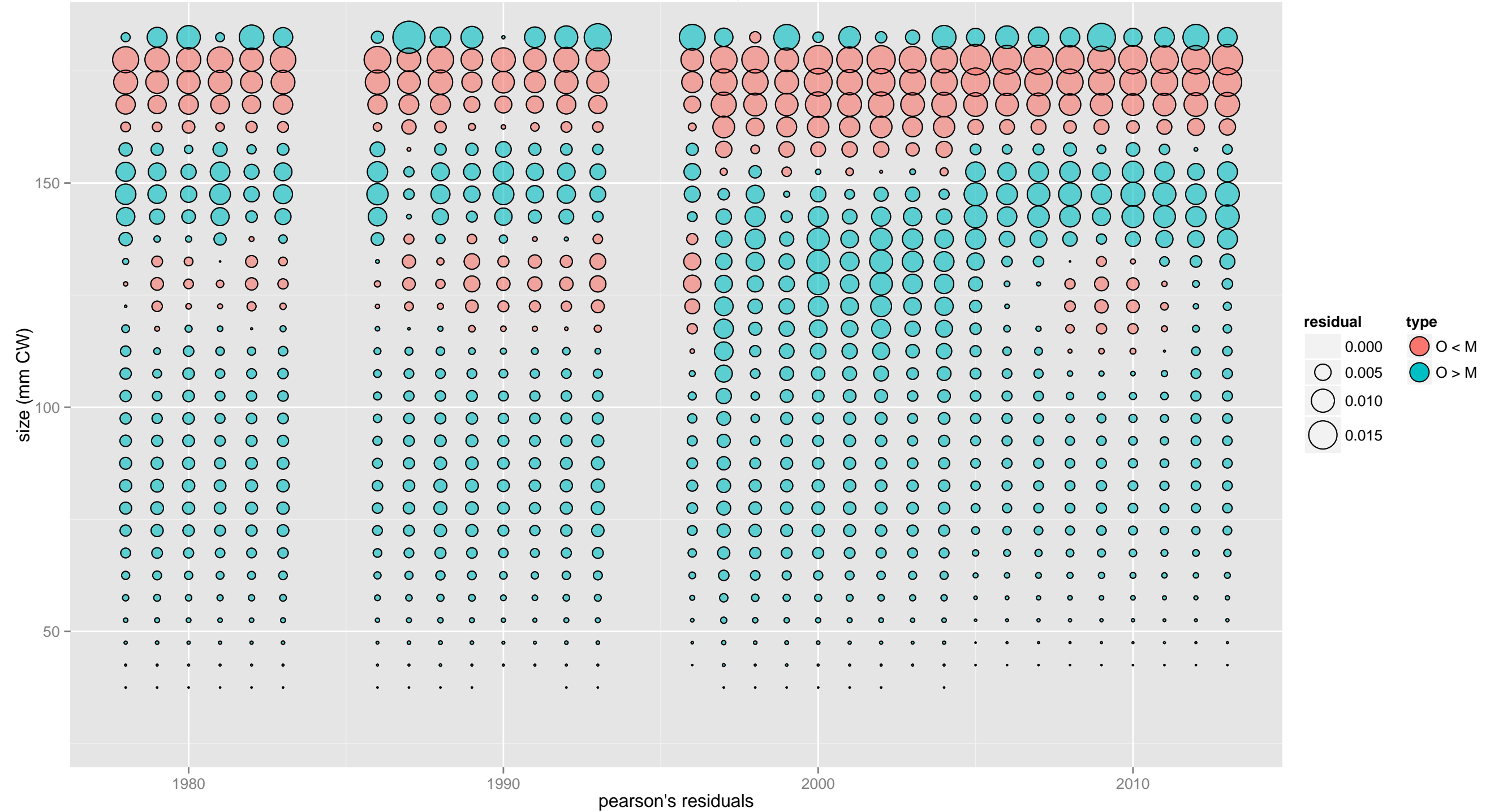


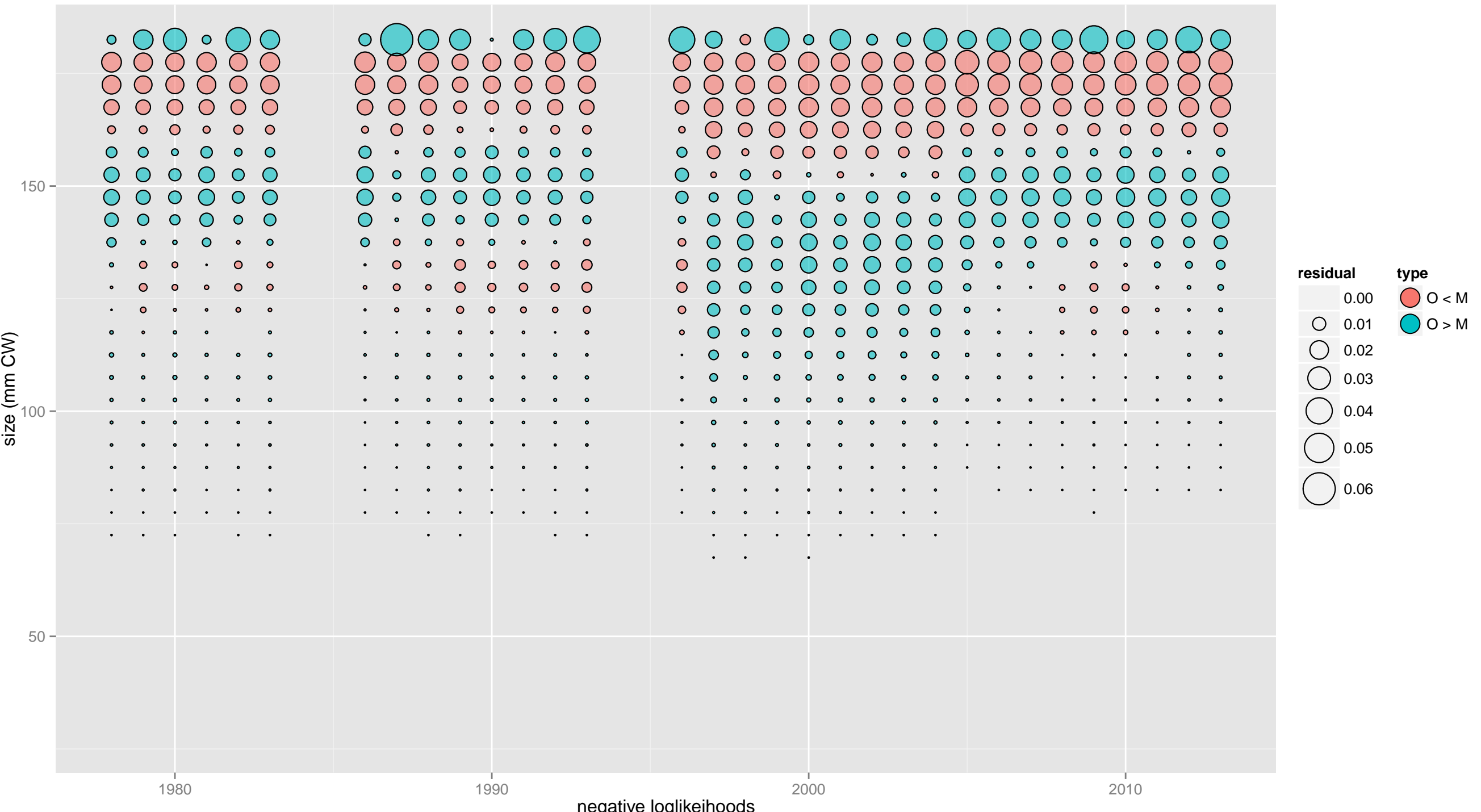
RKF: total catch: male, new shell



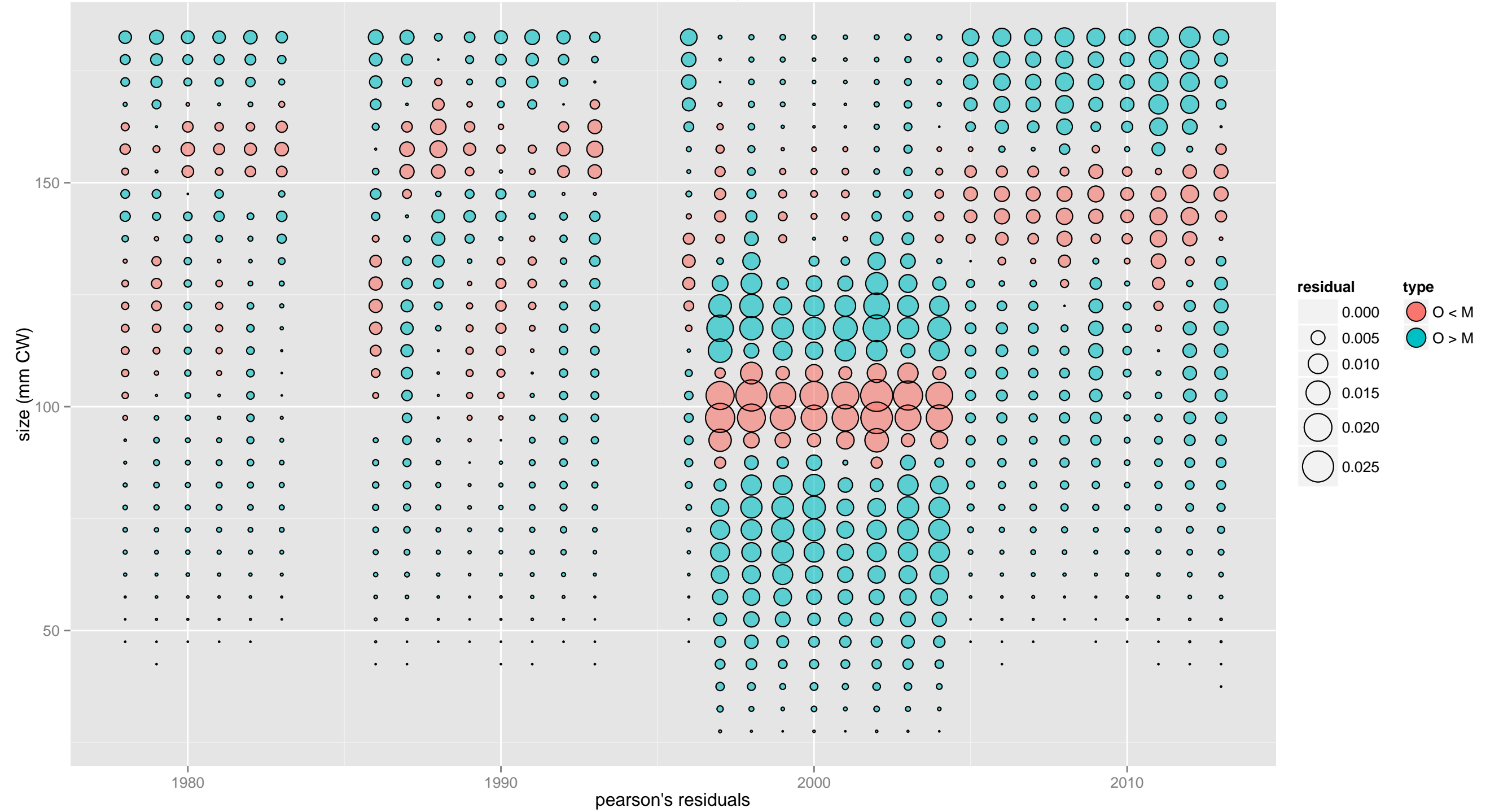


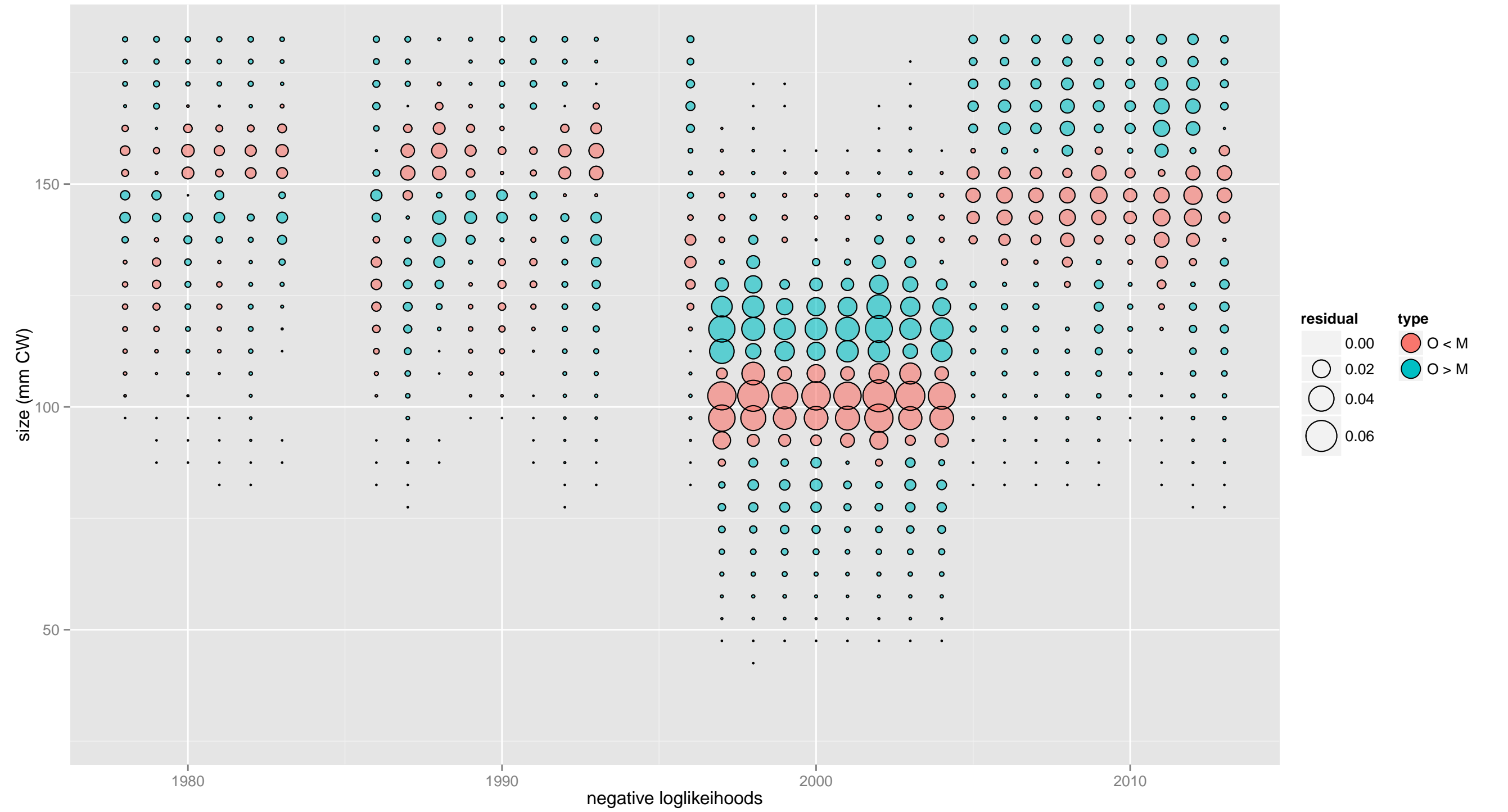
RKF: total catch: male, old shell





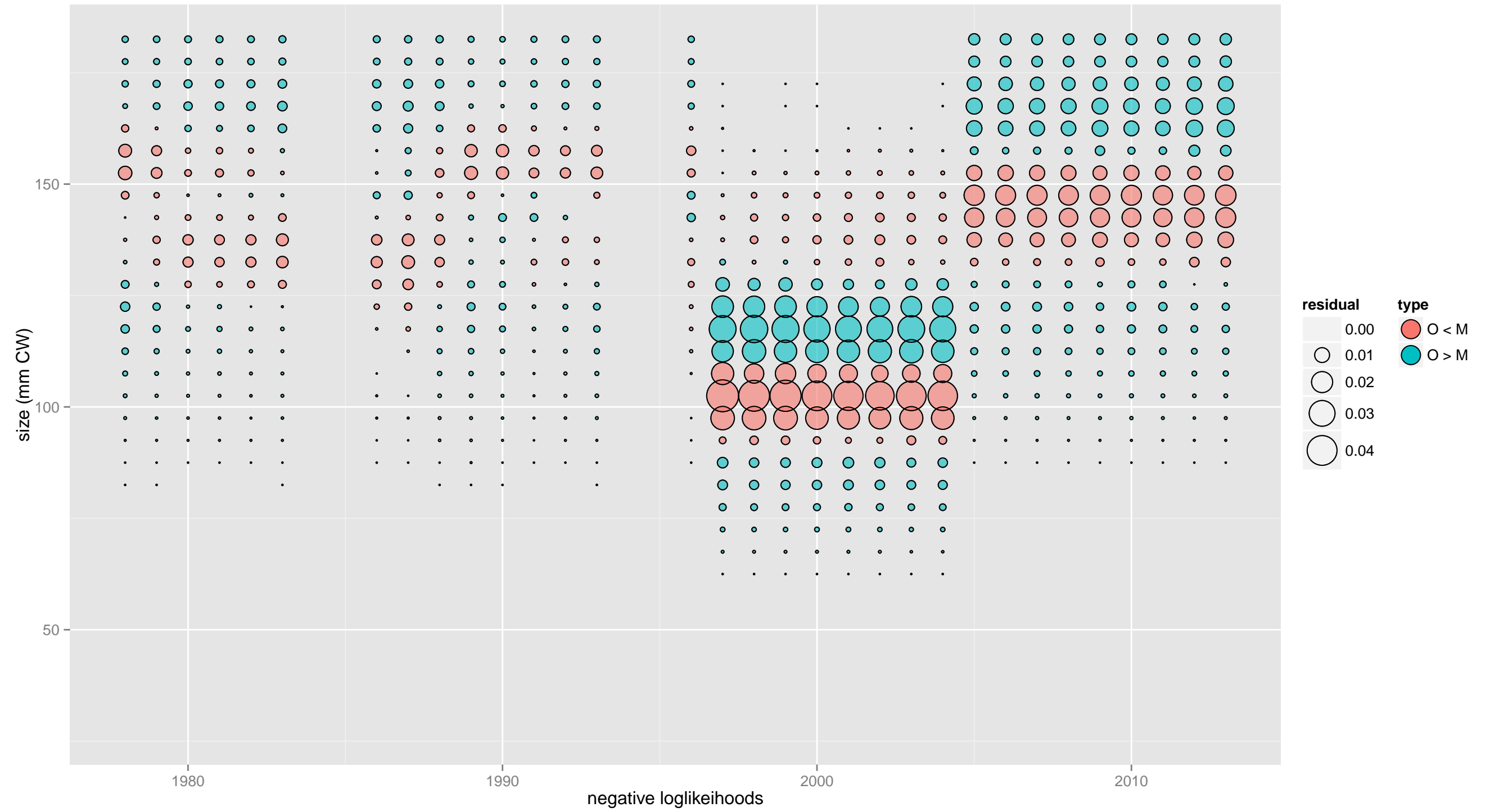
RKF: total catch: female, new shell





RKF: total catch: female, old shell

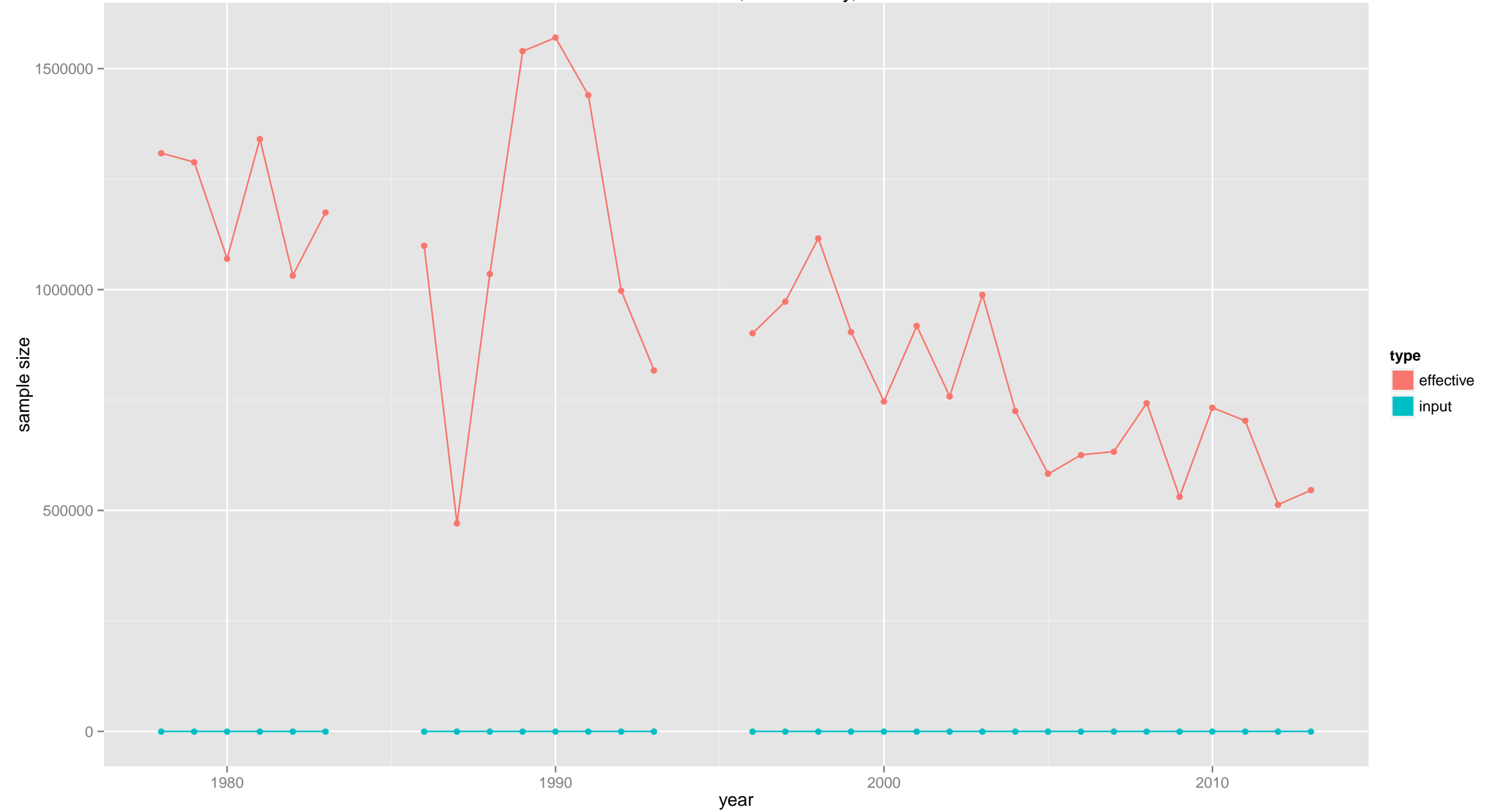




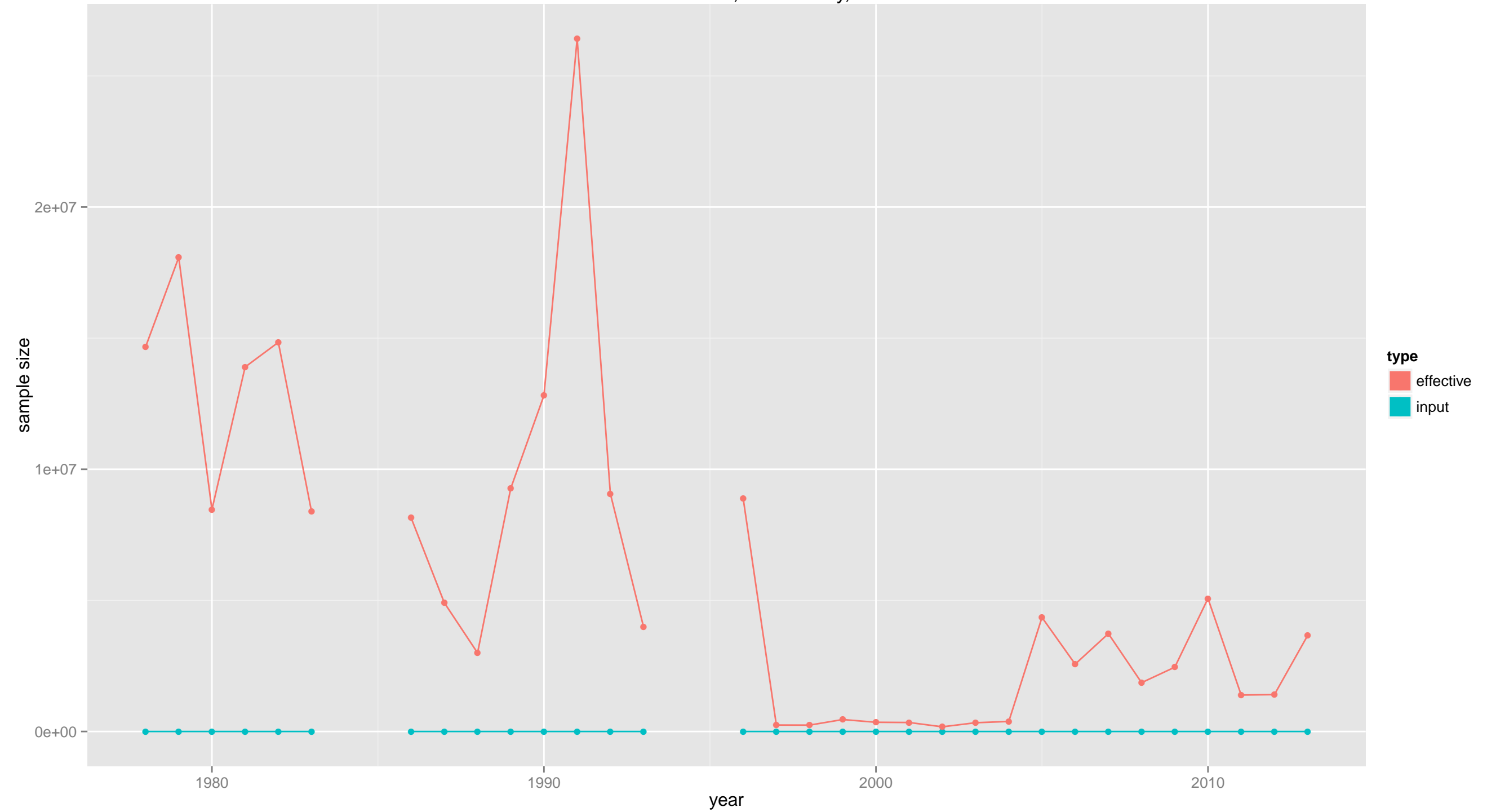
RKF: total catch: male, all maturity, new shell



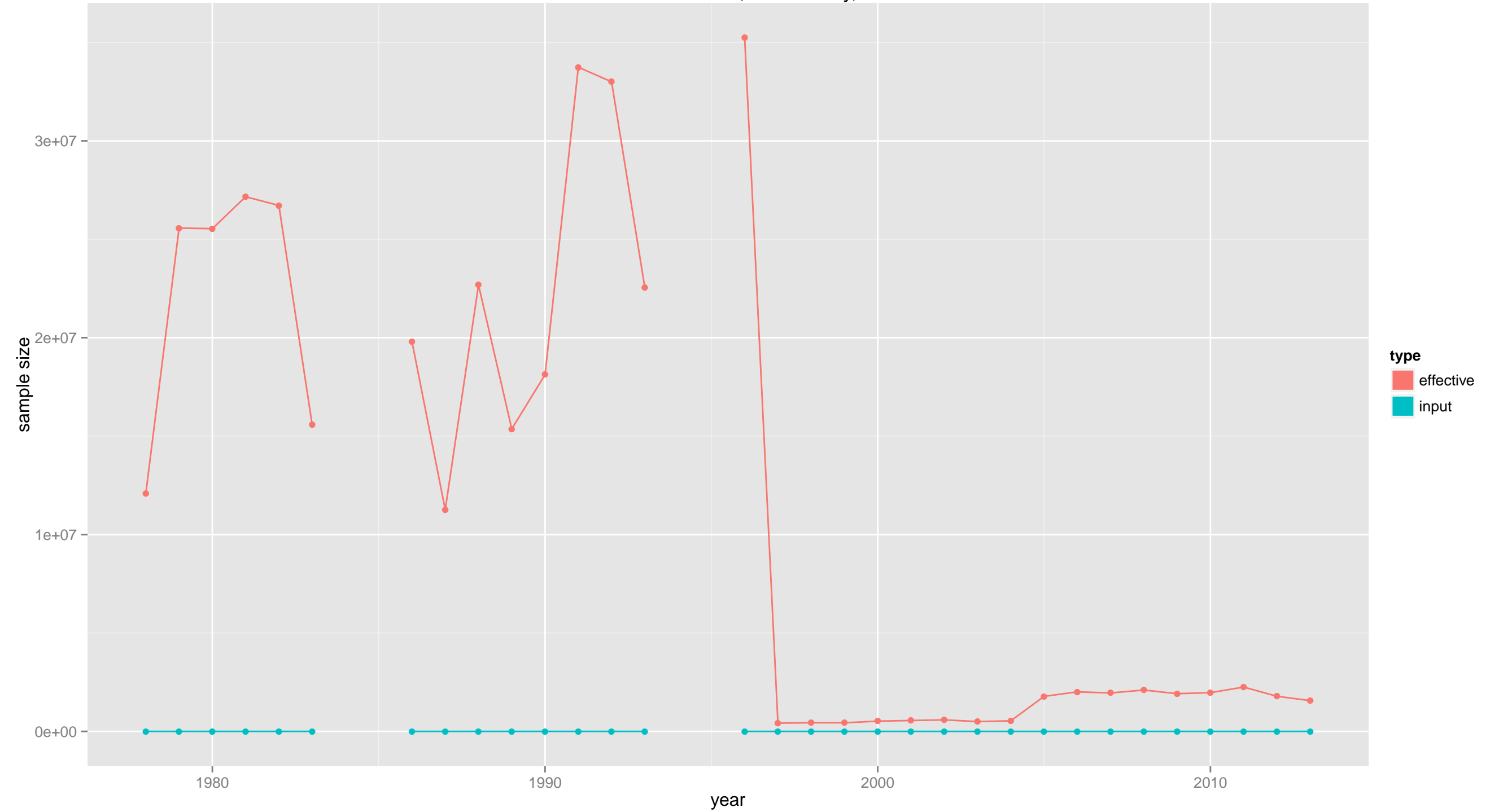
RKF: total catch: male, all maturity, old shell



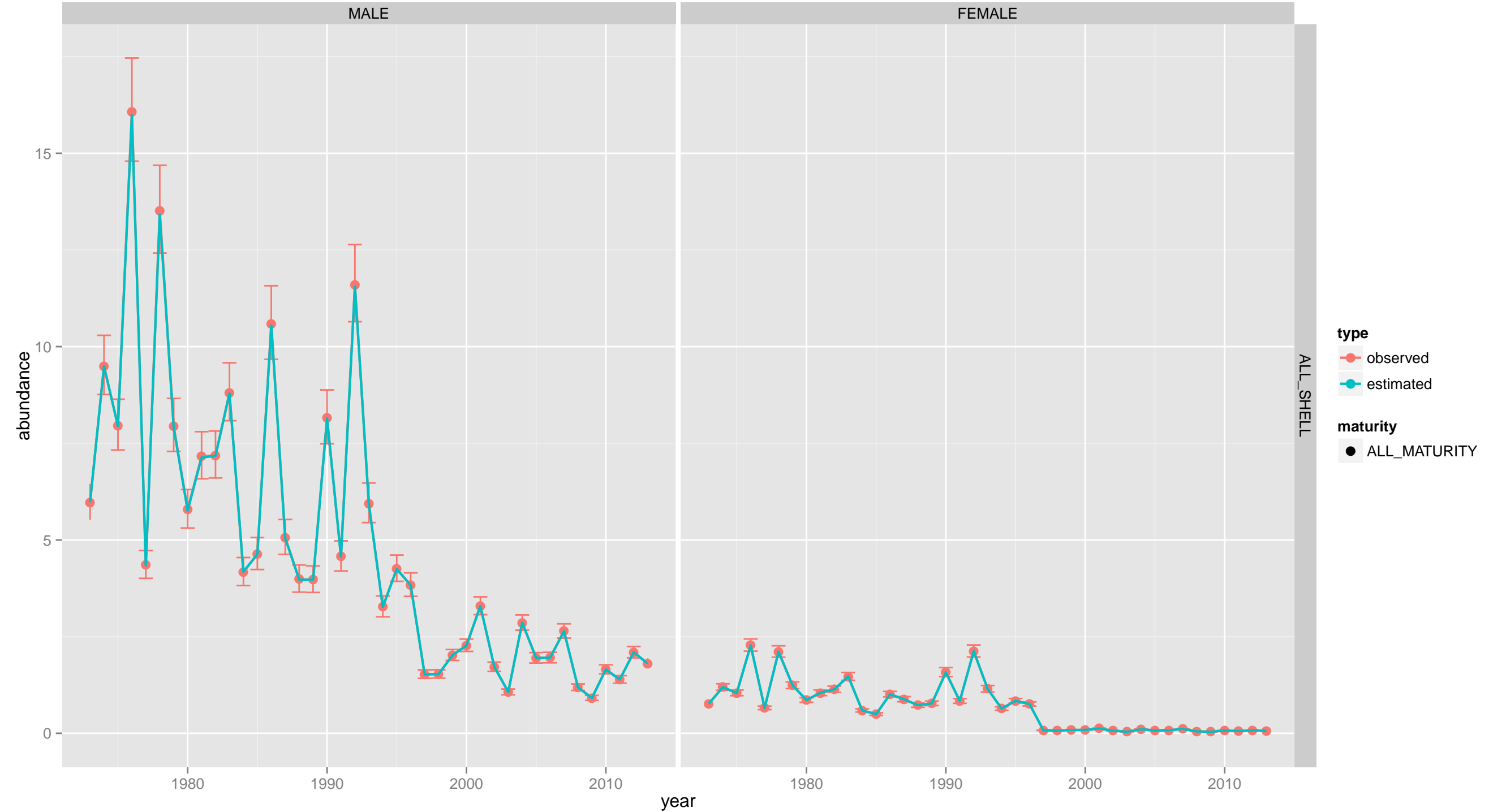
RKF: total catch: female, all maturity, new shell



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



GTF: total catch abundance



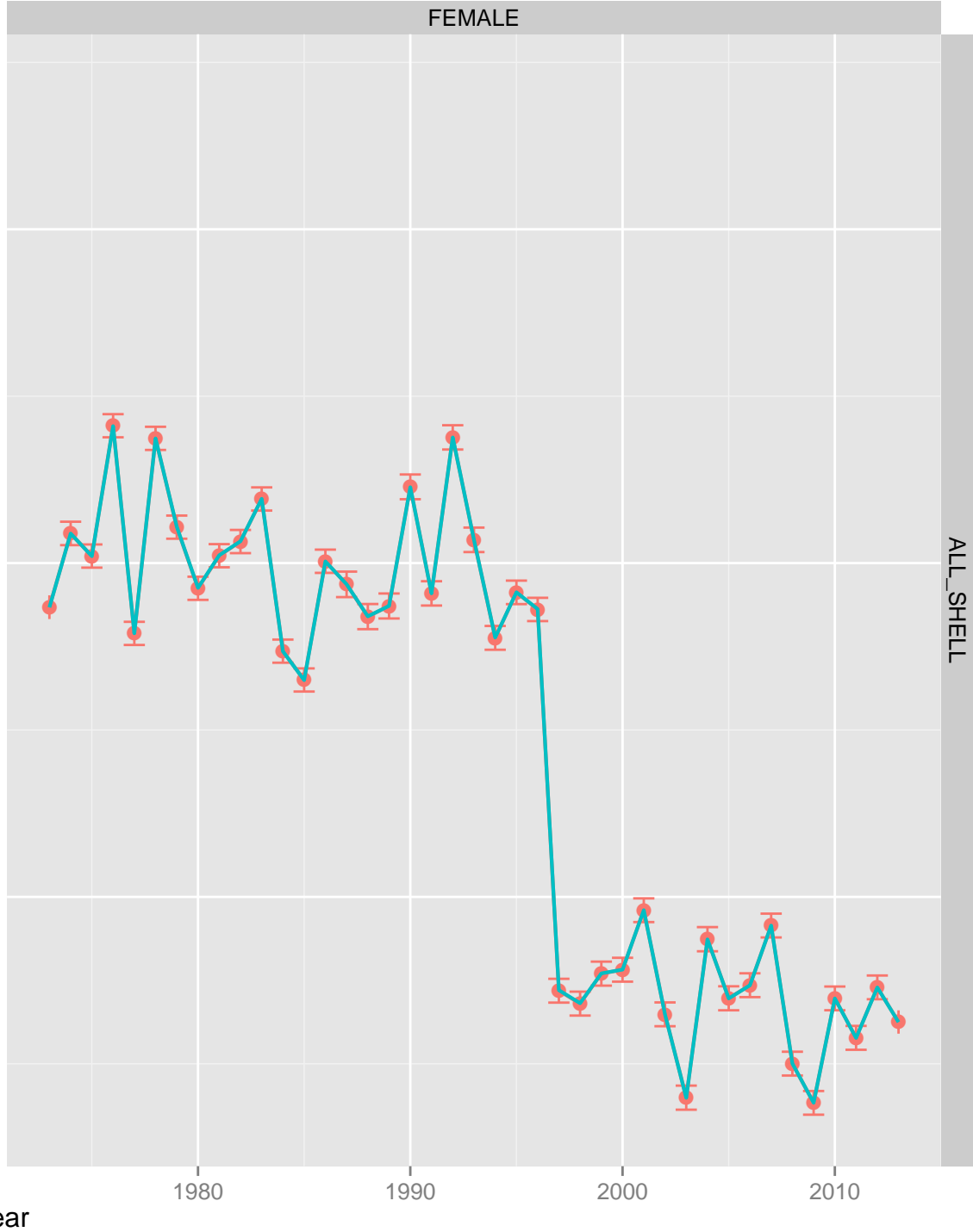
GTF: total catch abundance

MALE

FEMALE

ALL_SHELL

- maturity**
 - ALL_MATURITY
- type**
 - observed
 - estimated



GTF: total catch abundance



GTF: total catch biomass

MALE

FEMALE

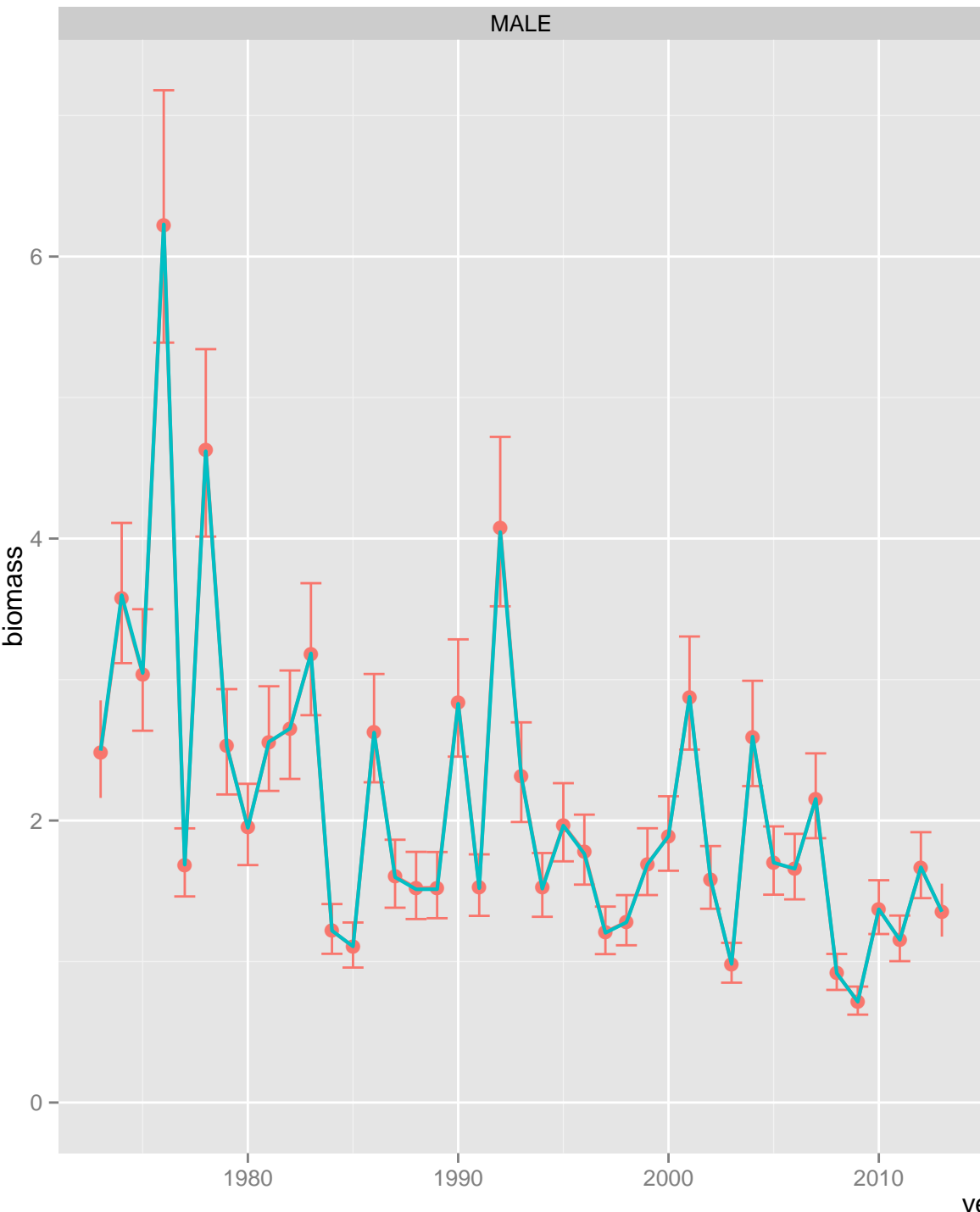
ALL_SHELL

type

- observed
- estimated

maturity

- ALL_MATURITY



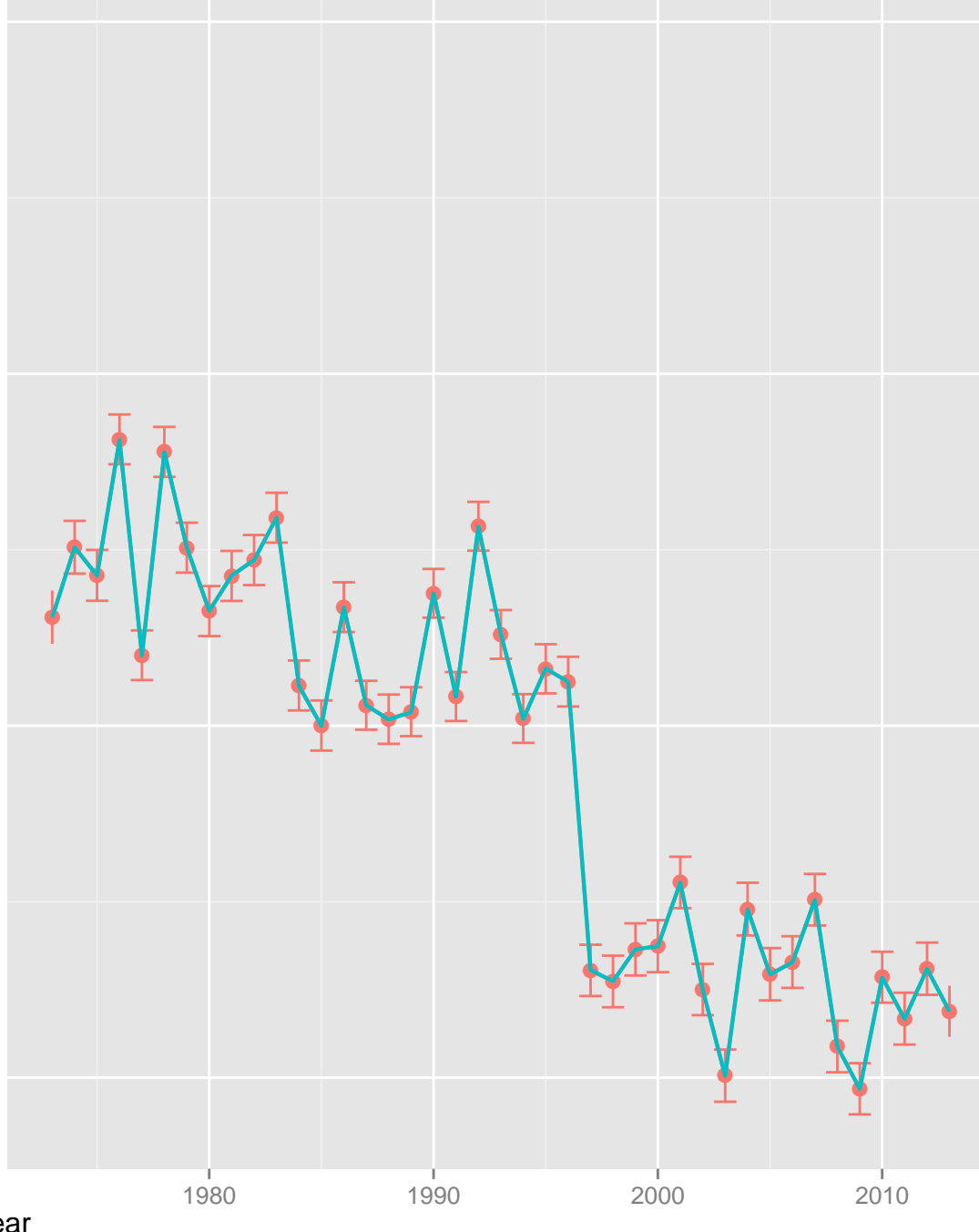
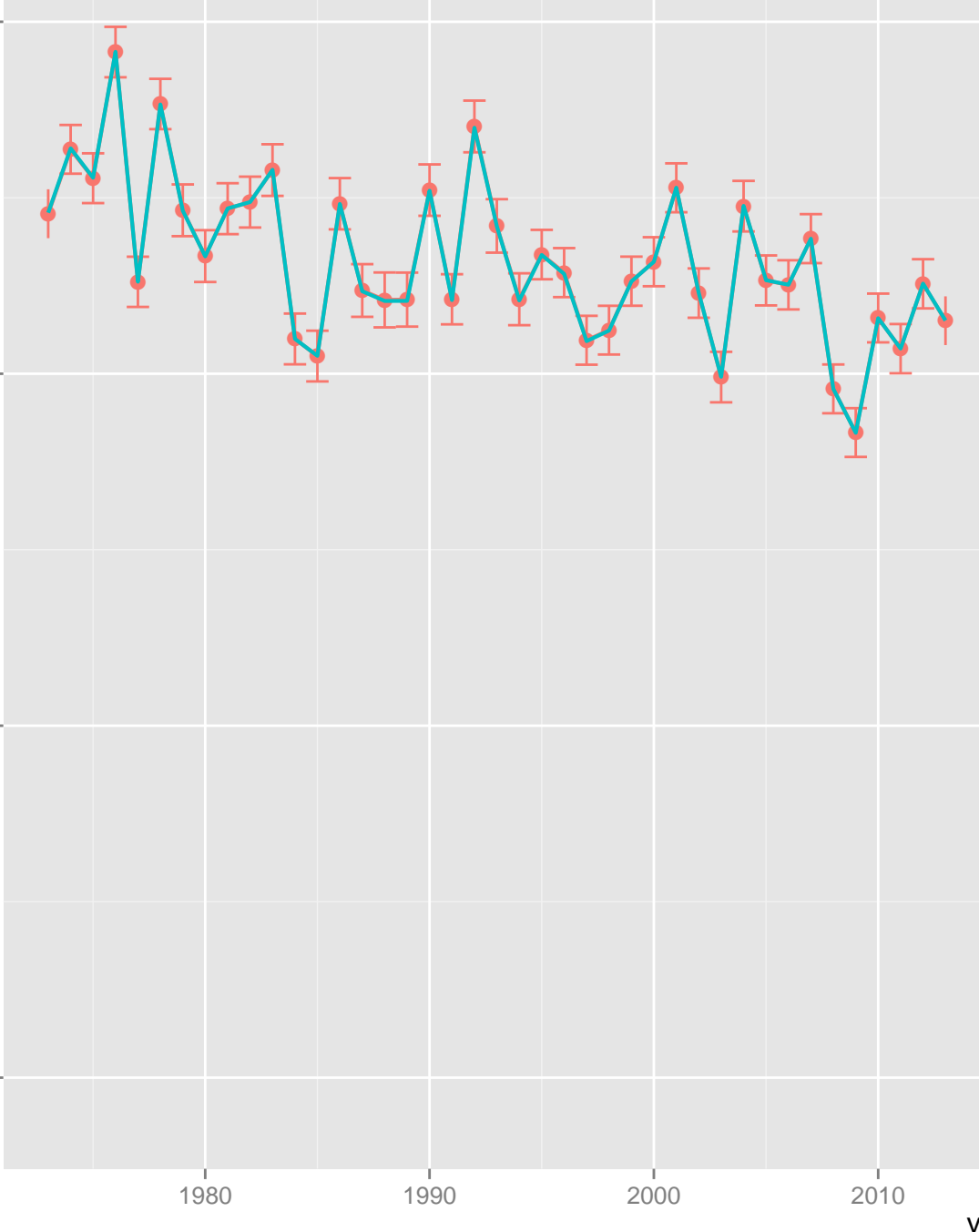
year

GTF: total catch biomass

MALE

FEMALE

biomass [ln-scale]



- maturity**
 - ALL_MATURITY
- type**
 - observed
 - estimated

ALL_SHELL

year

GTF: total catch biomass

MALE

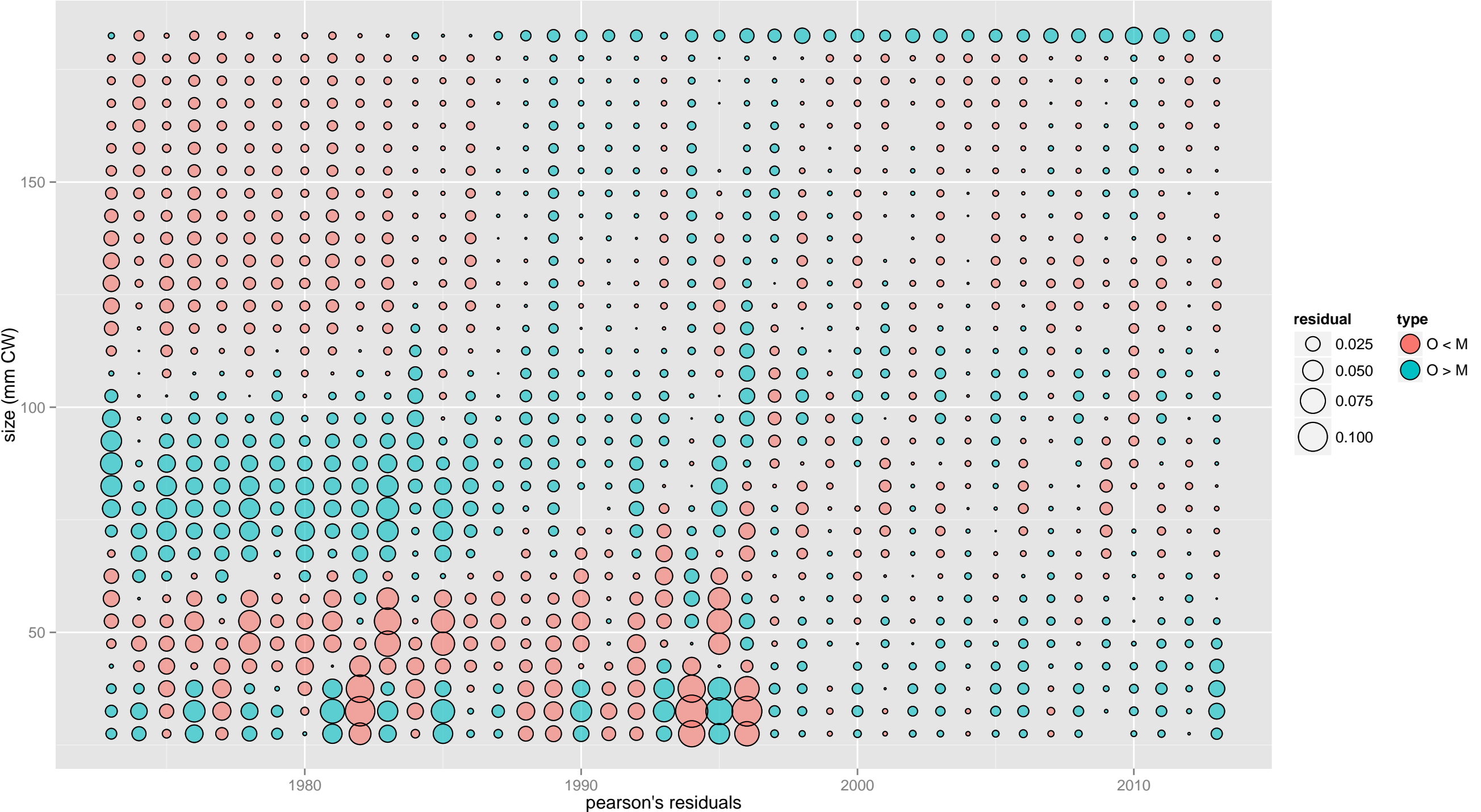
FEMALE

ALL_SHELL

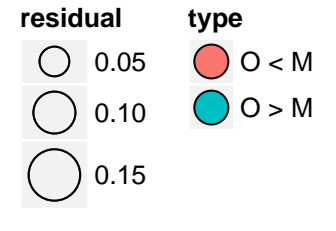
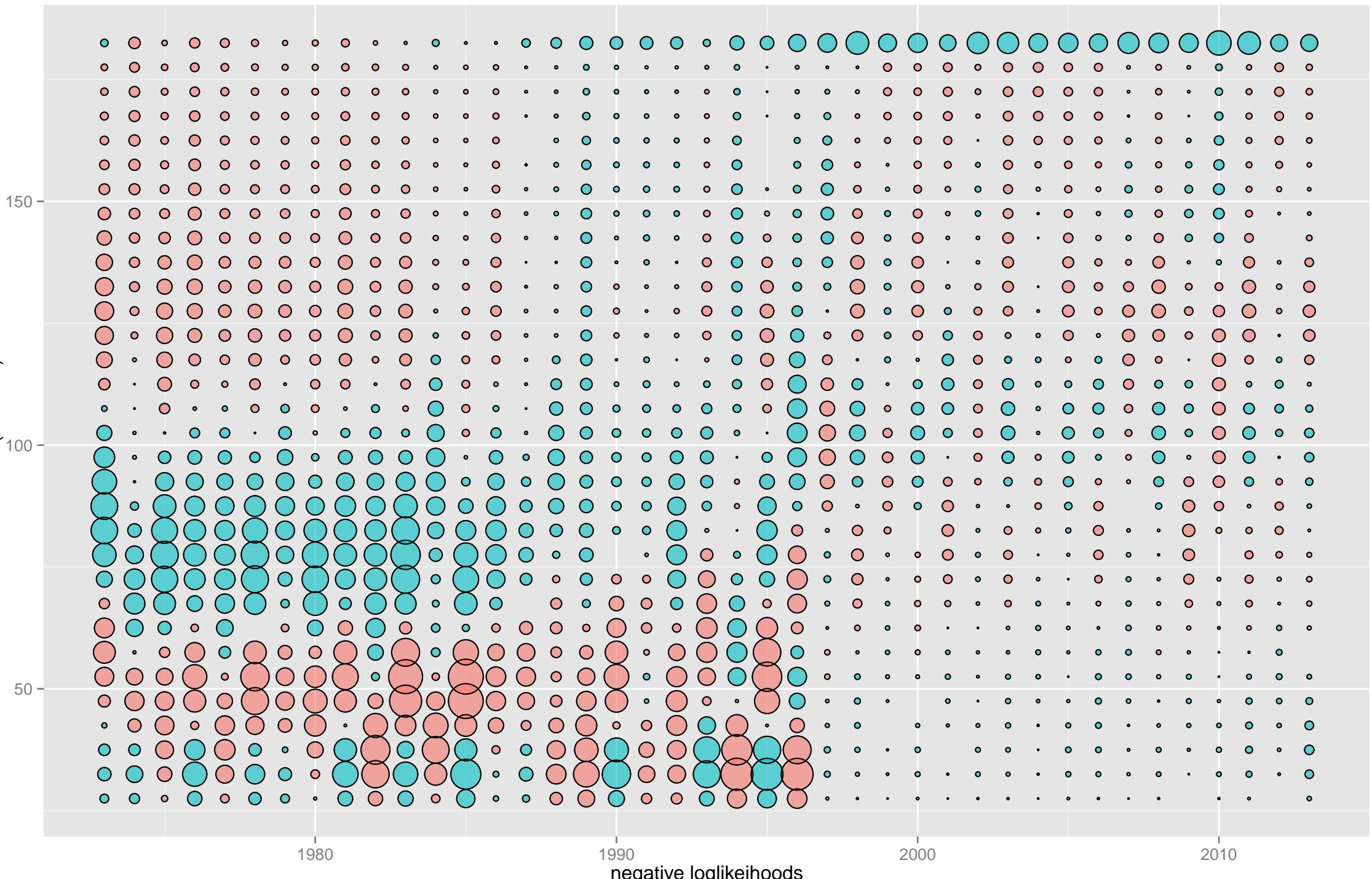
maturity
● ALL_MATURITY



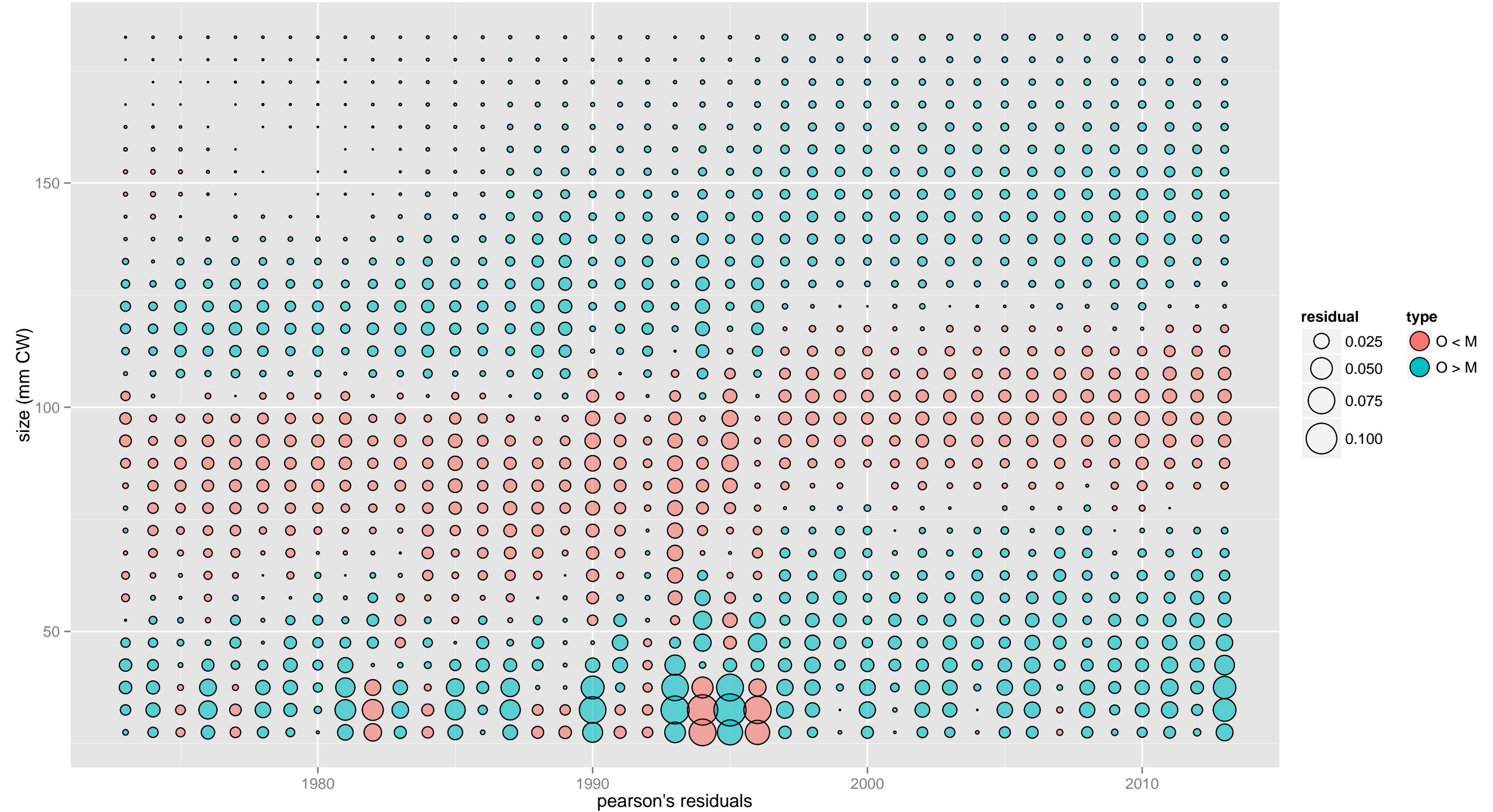
GTF: total catch: male

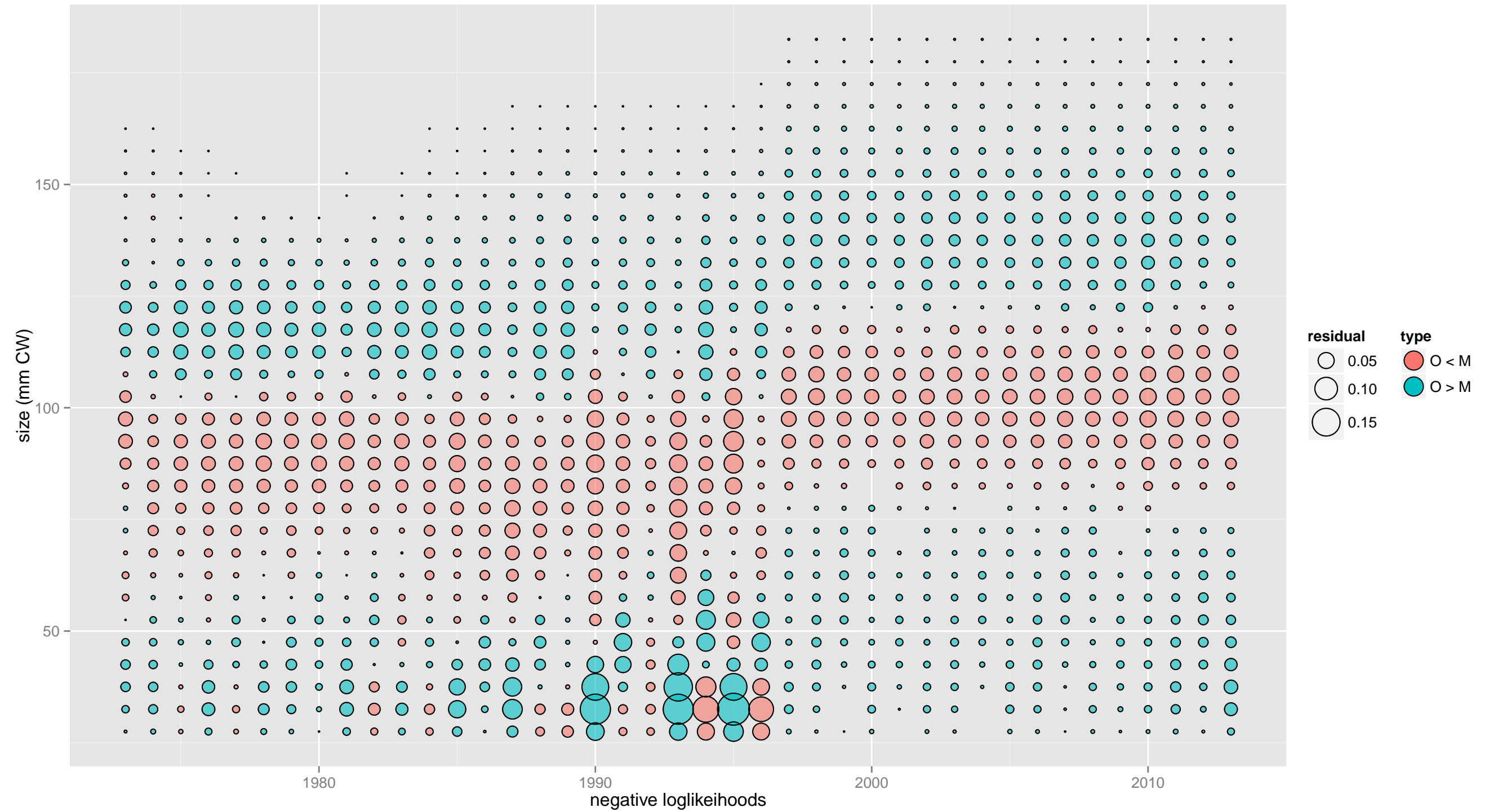


size (mm CW)



GTF: total catch: female

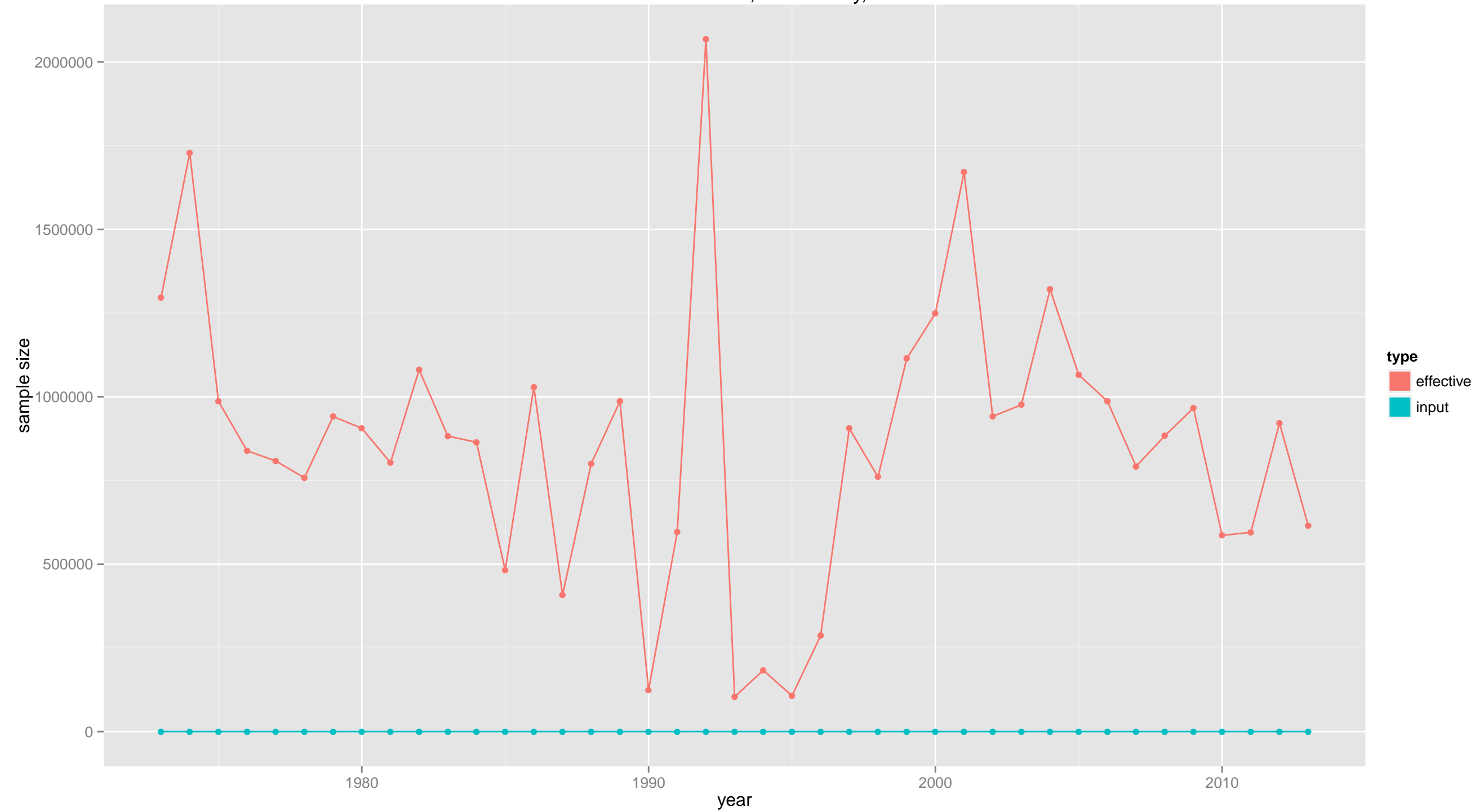


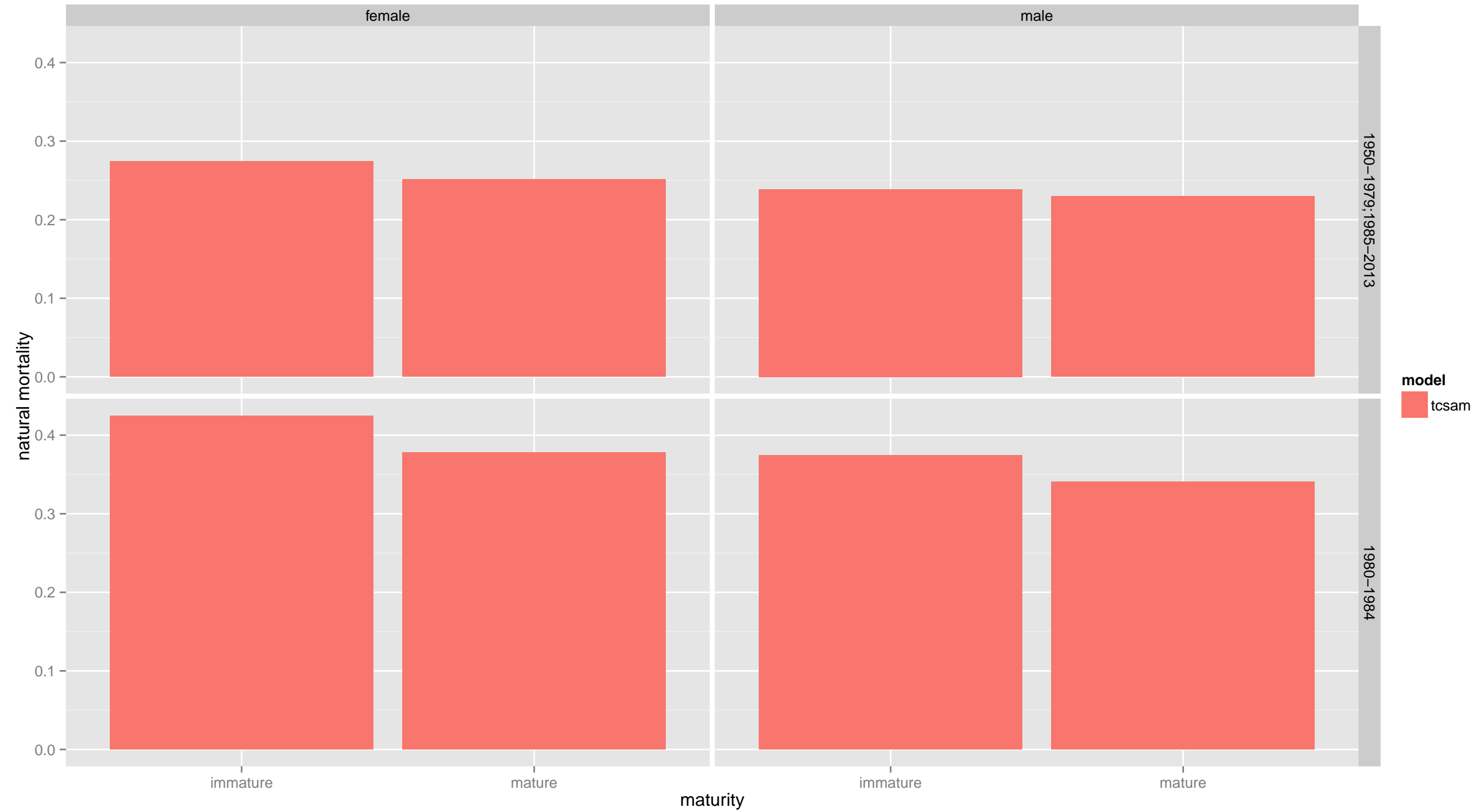


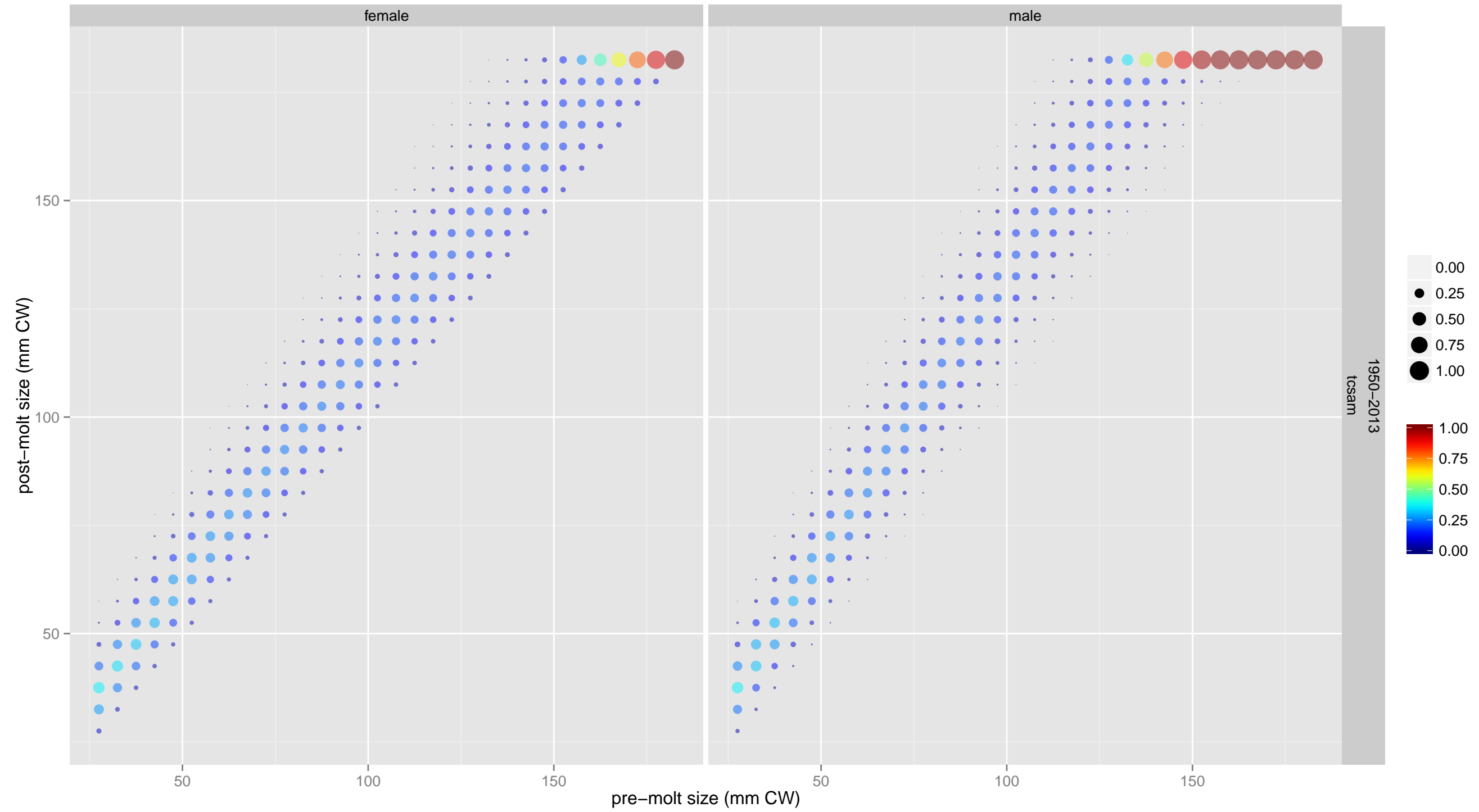
GTF: total catch: male, all maturity, all shell

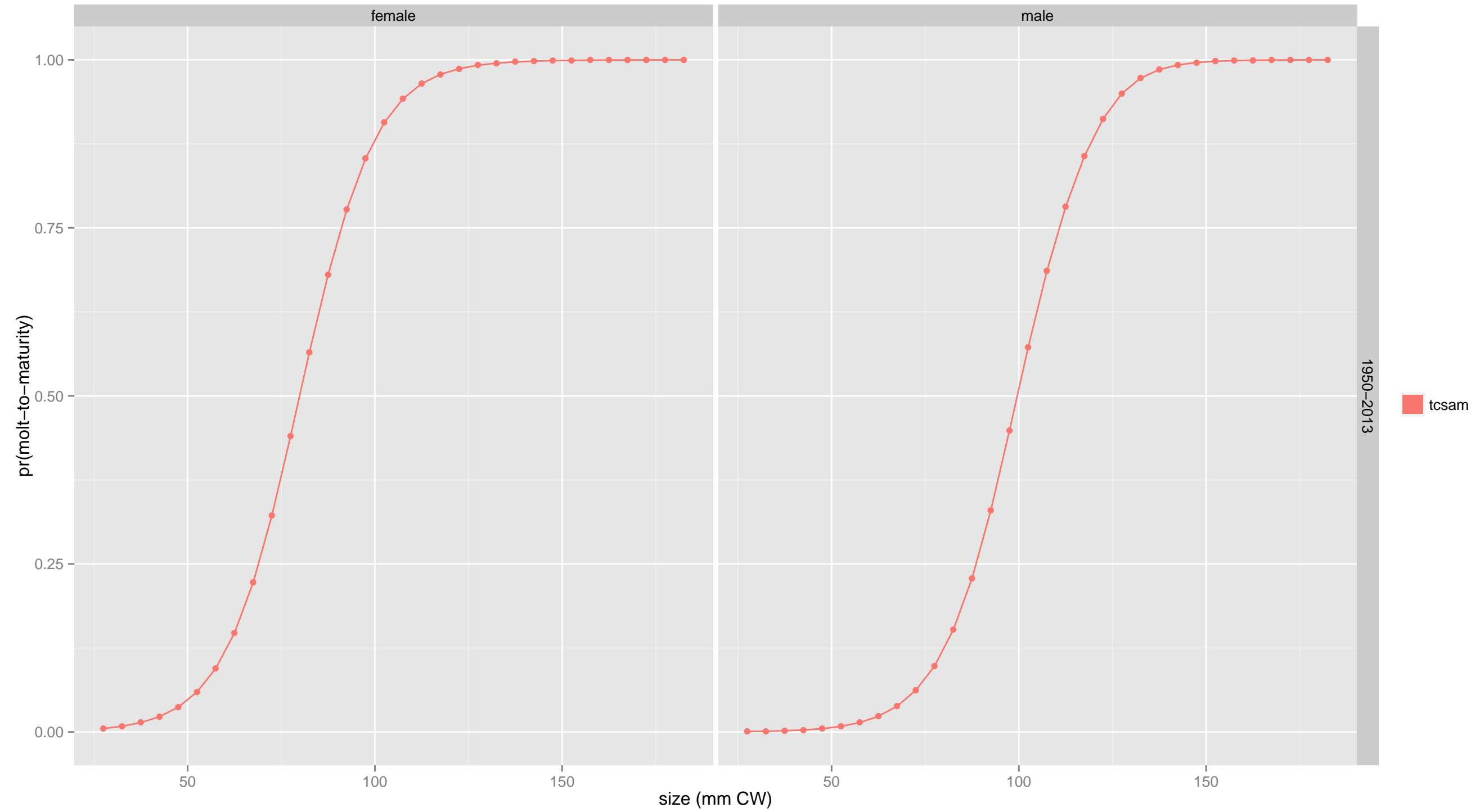


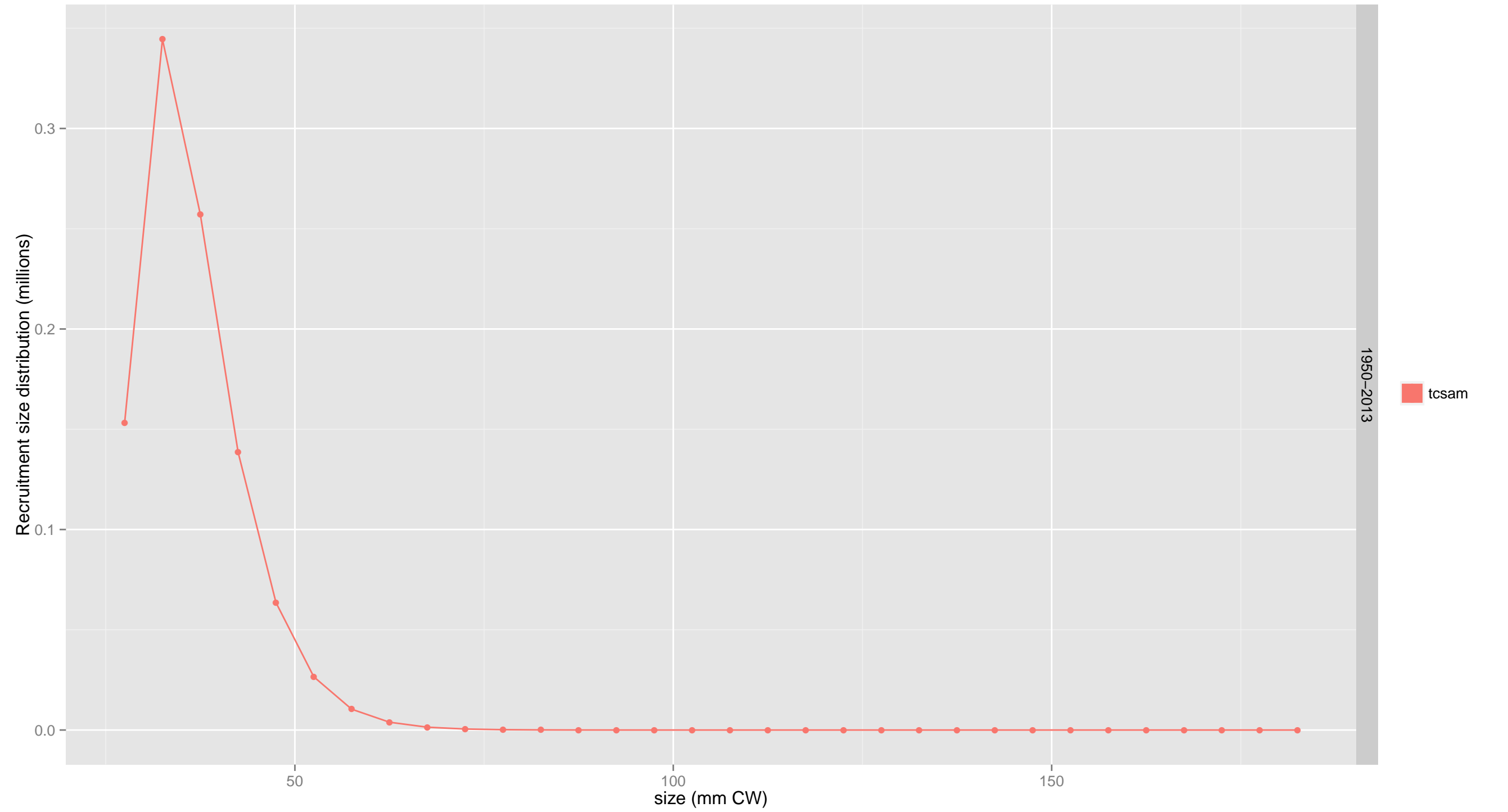
GTF: total catch: female, all maturity, all shell



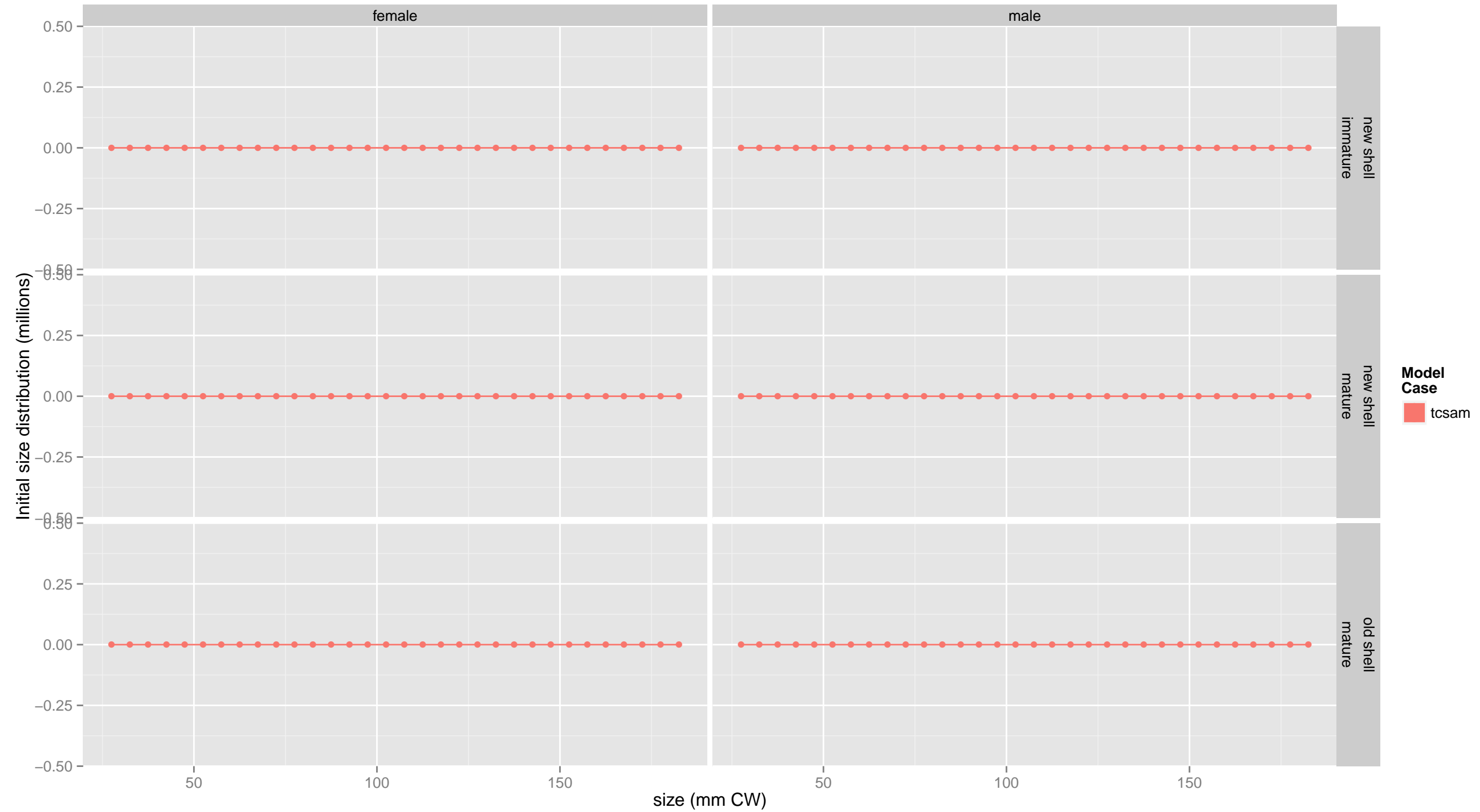


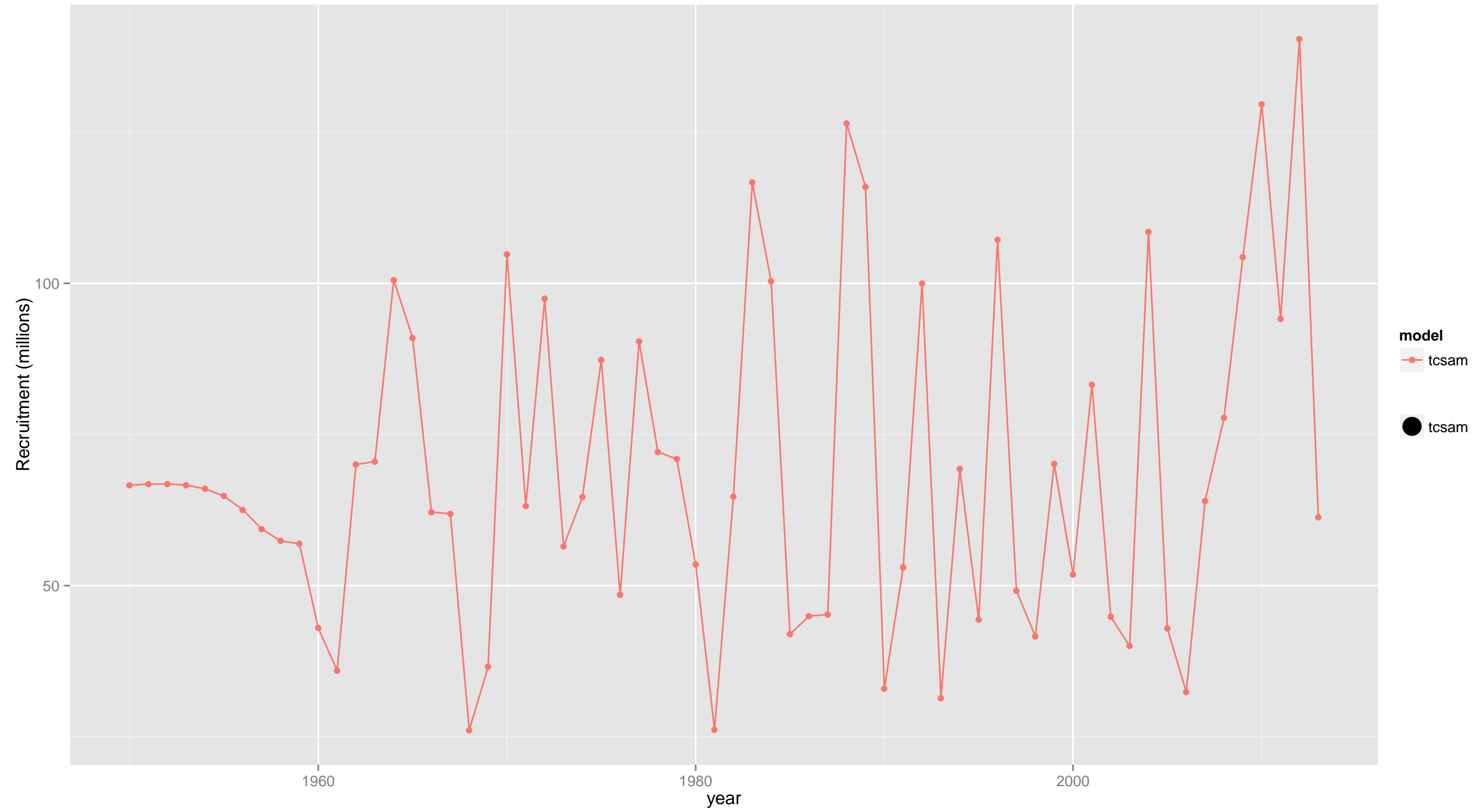


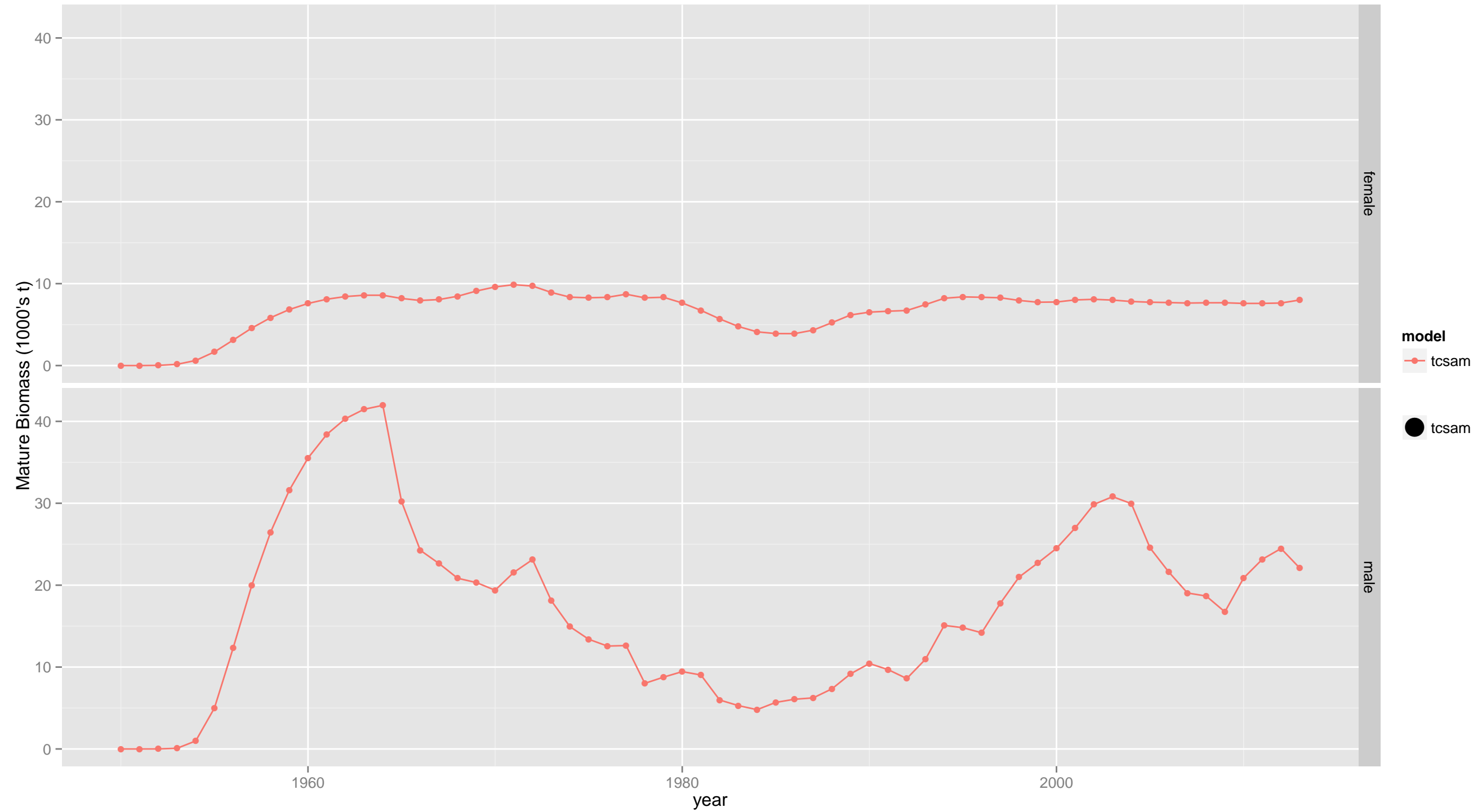


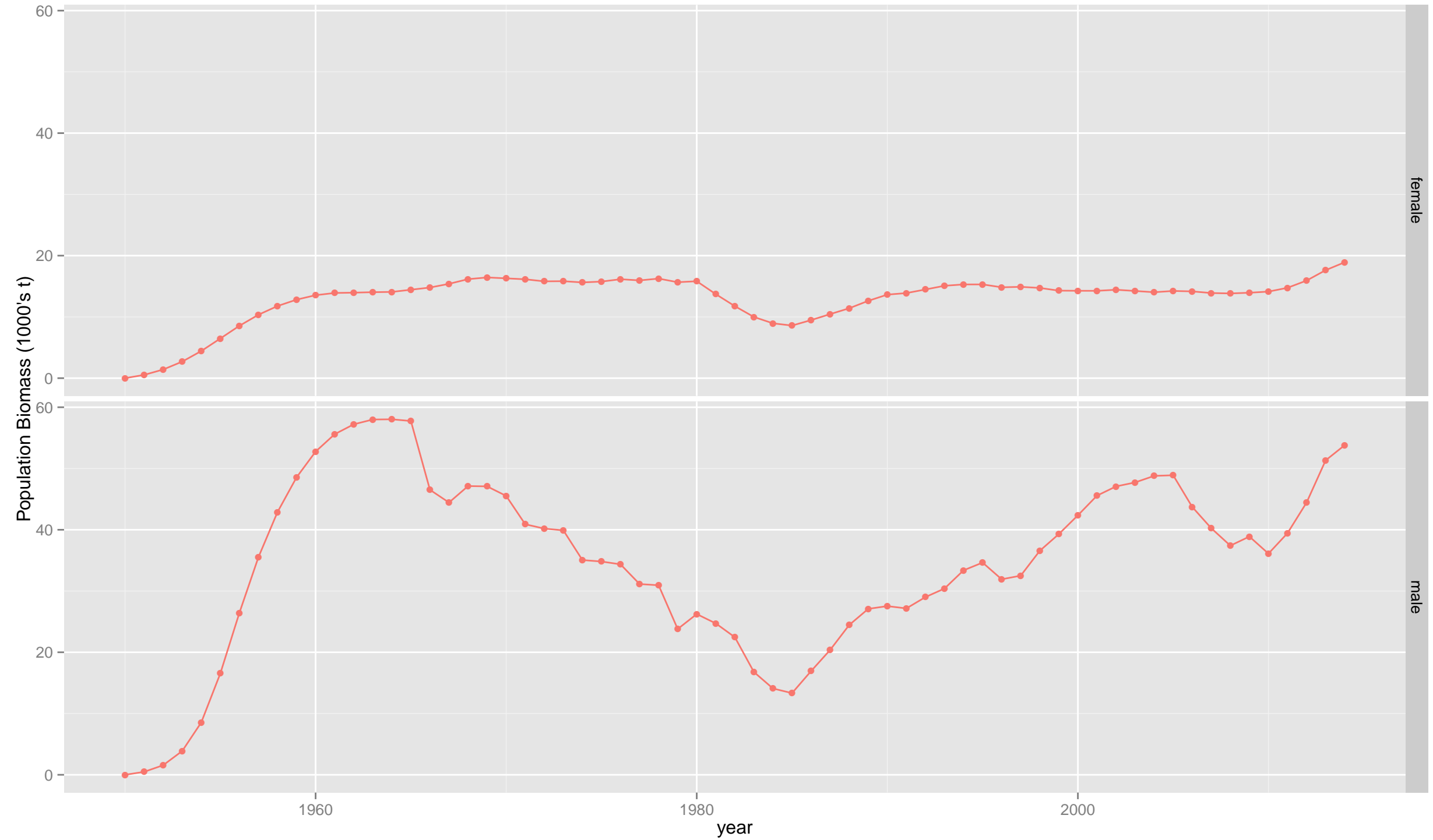






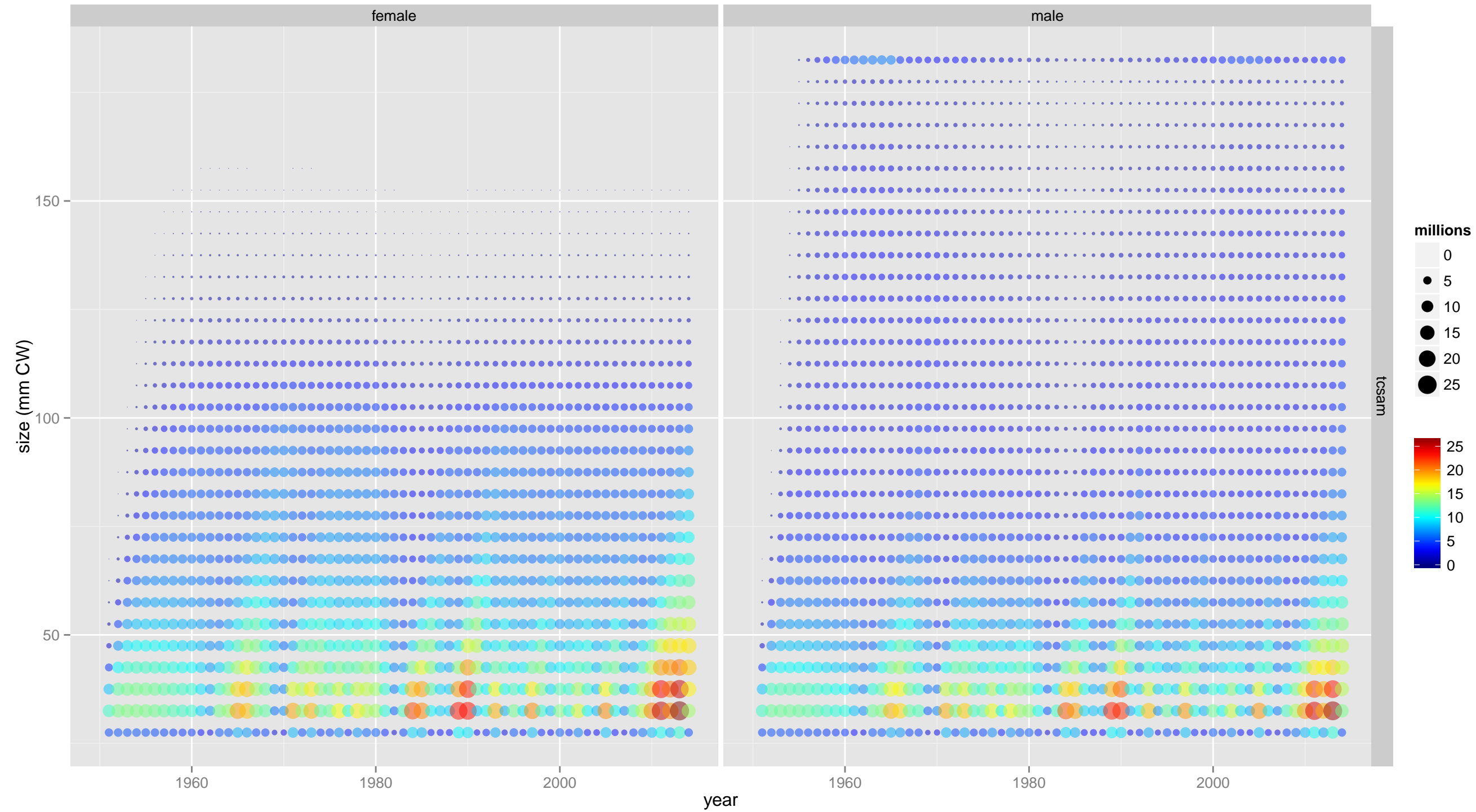


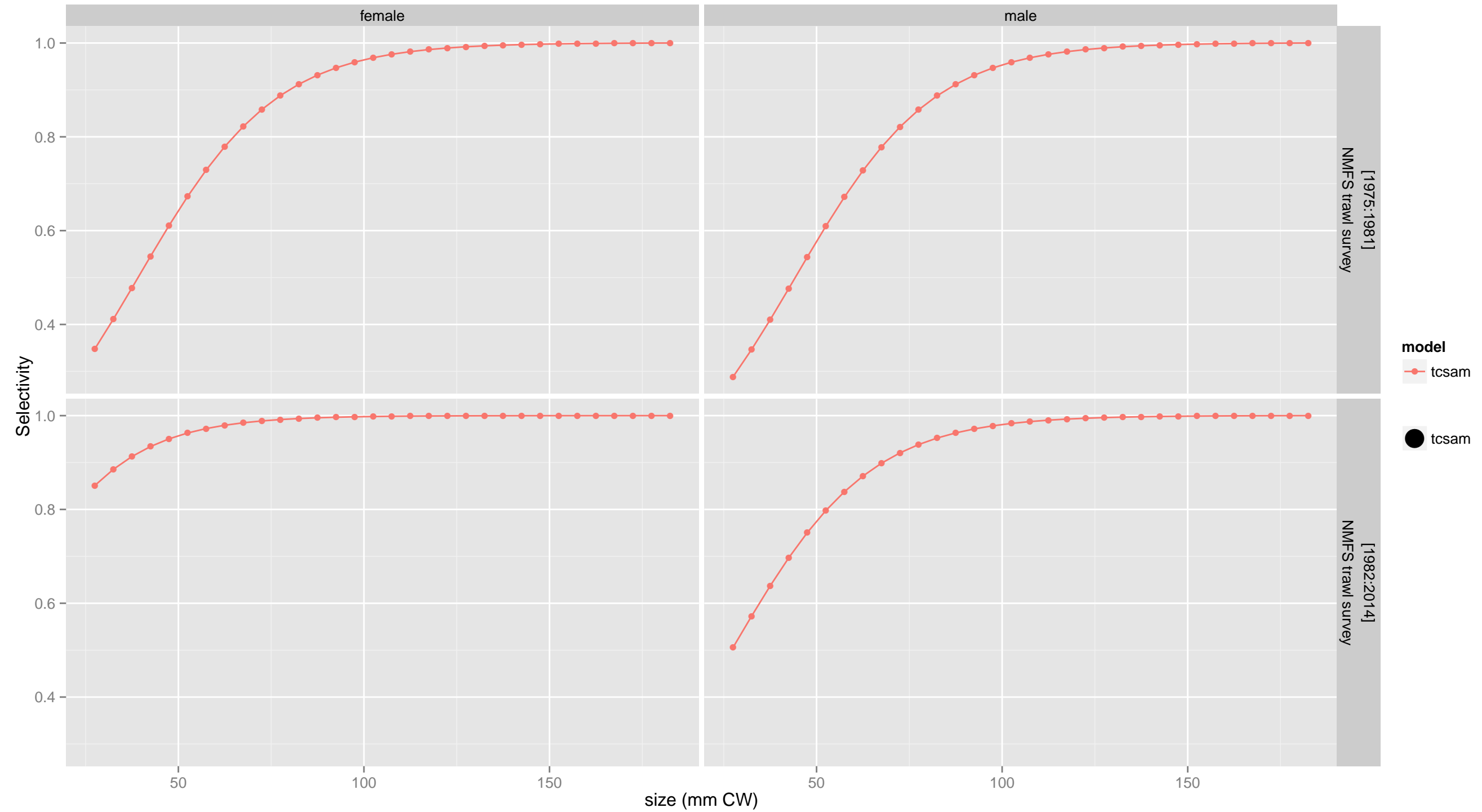




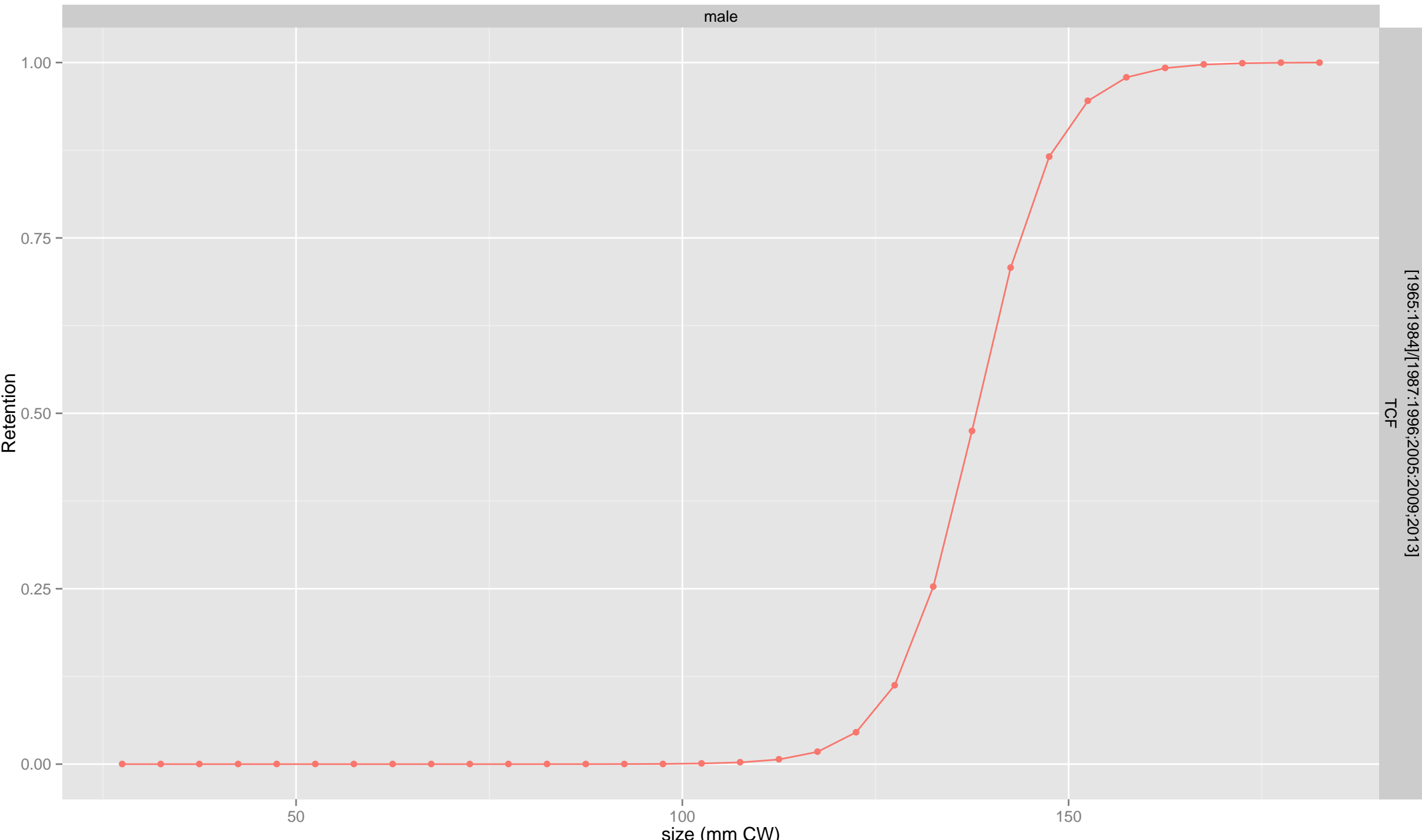
tcsam







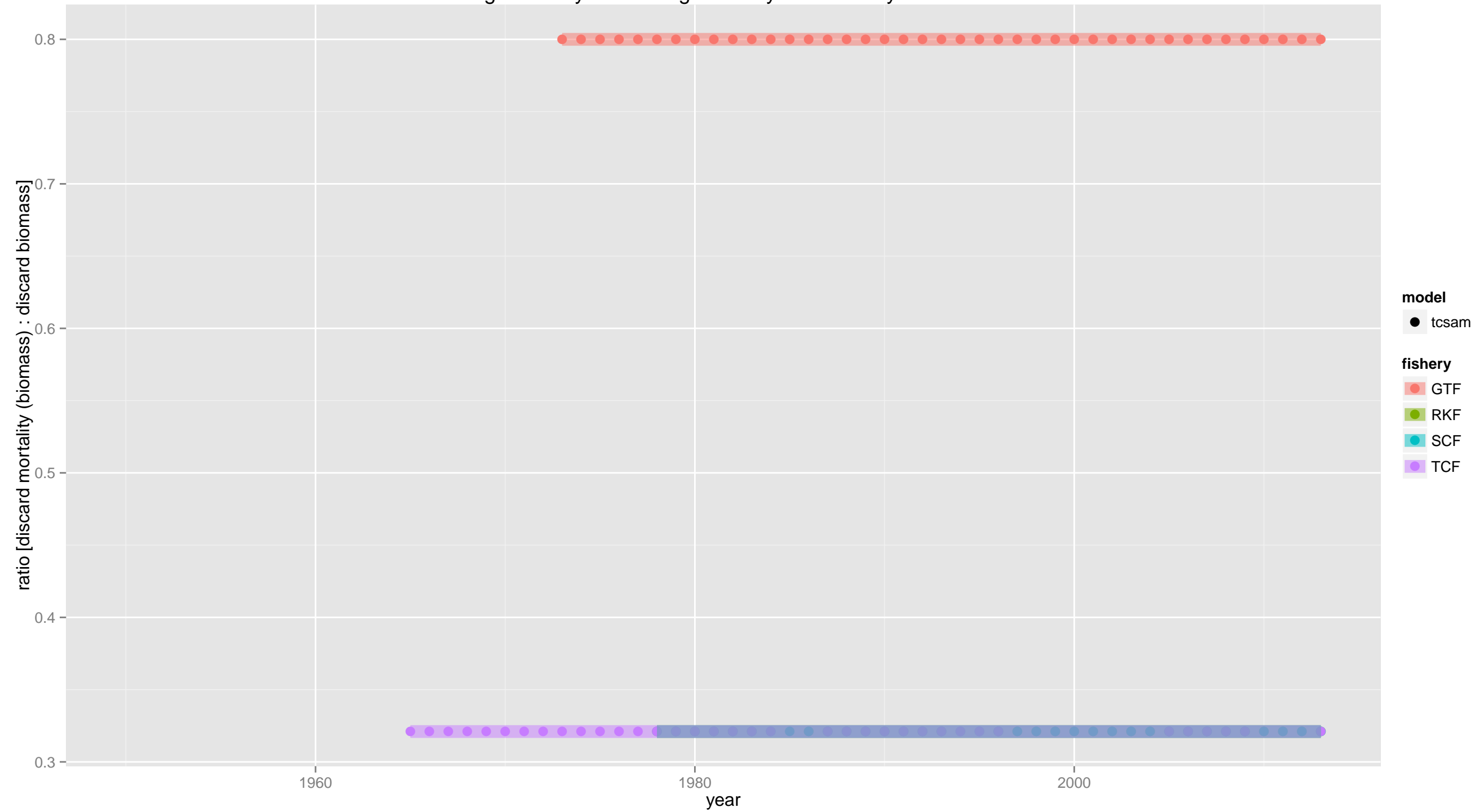
male



model
—●— tcsam
● tcsam

[1965:1984]/[1987:1996;2005:2009;2013]
TCF

gmacs-style Handling Mortality Consistency Check



TCF



TCF



SCF

female

male

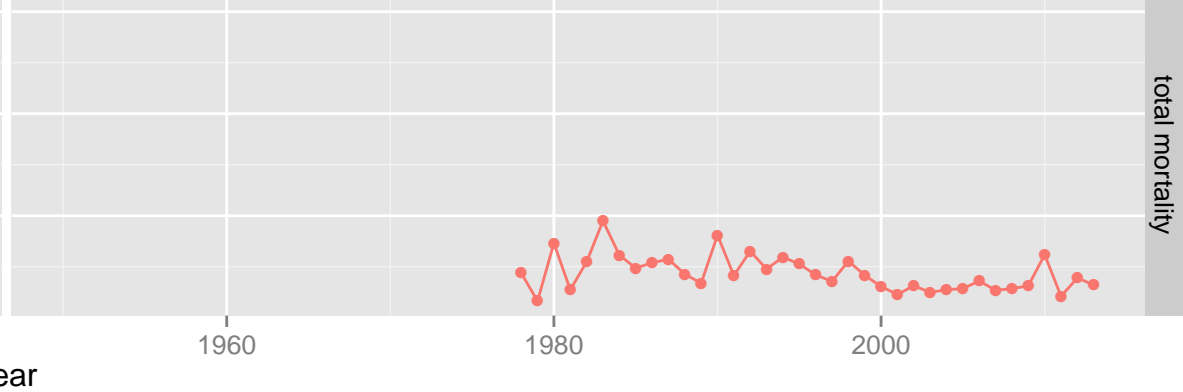
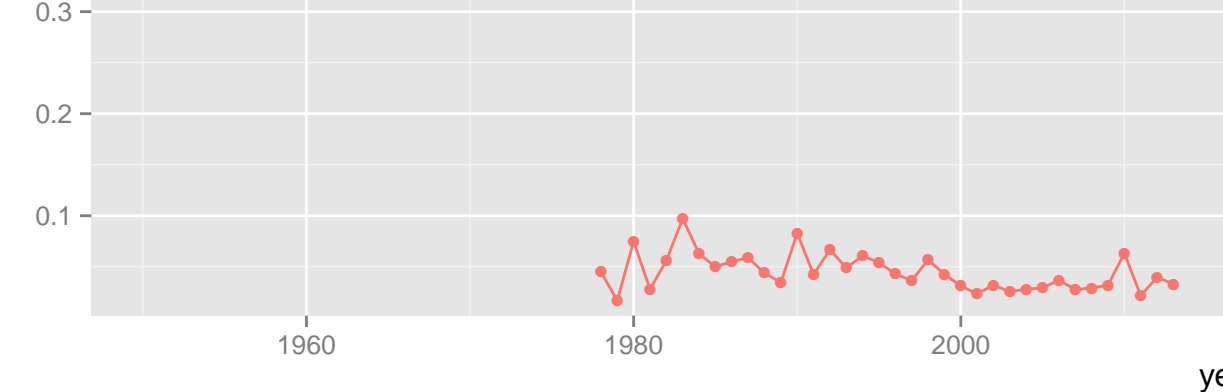
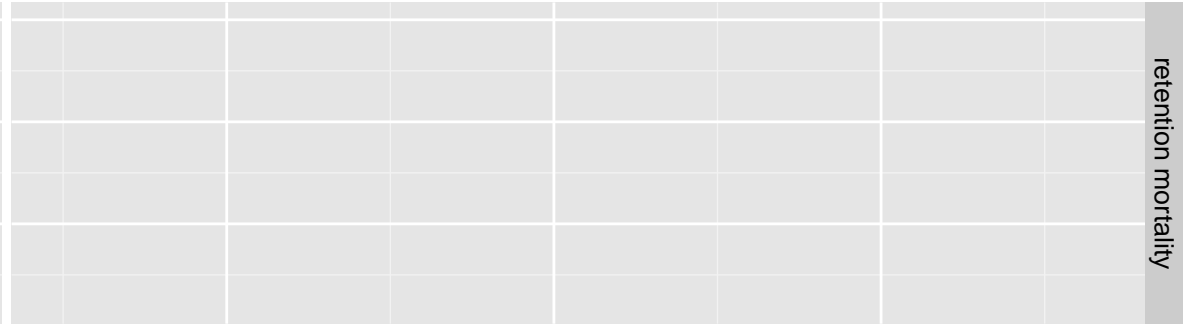
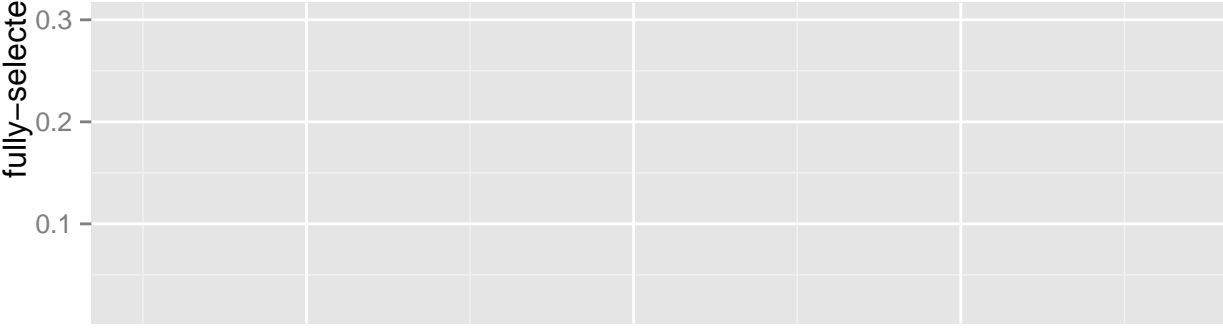
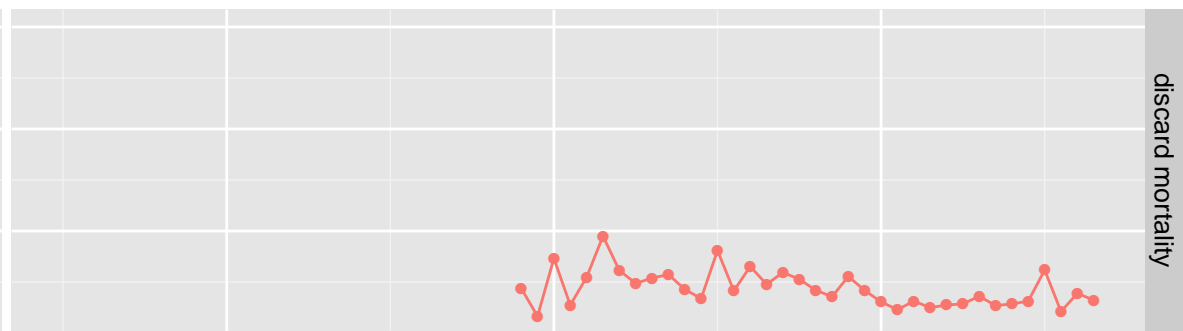
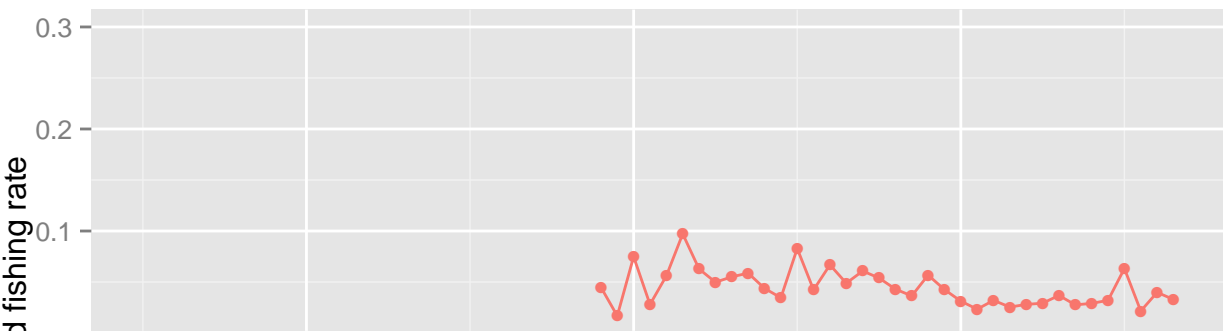
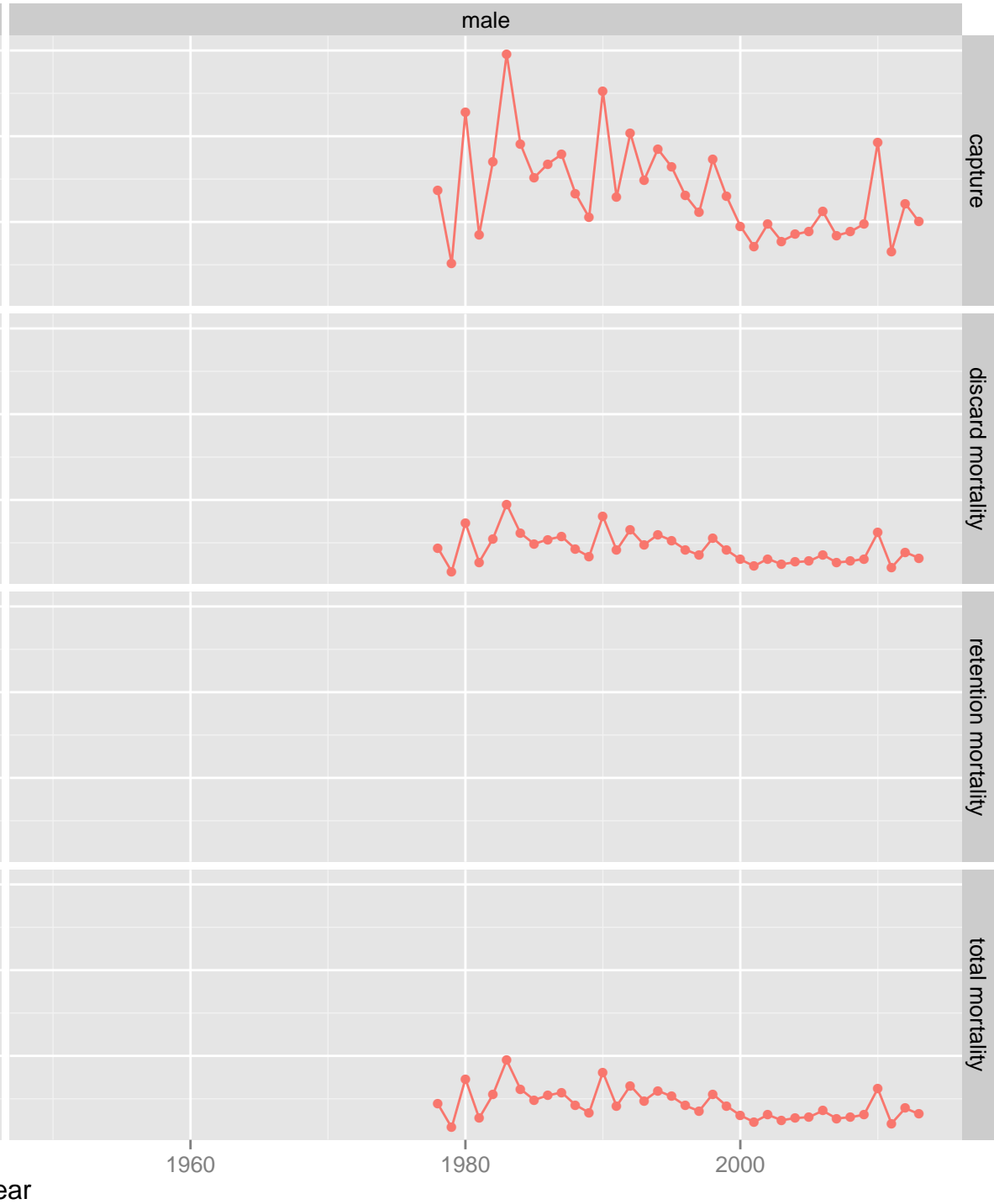
capture

discard mortality

retention mortality

total mortality

model
tcsam
model type
tcsam



SCF

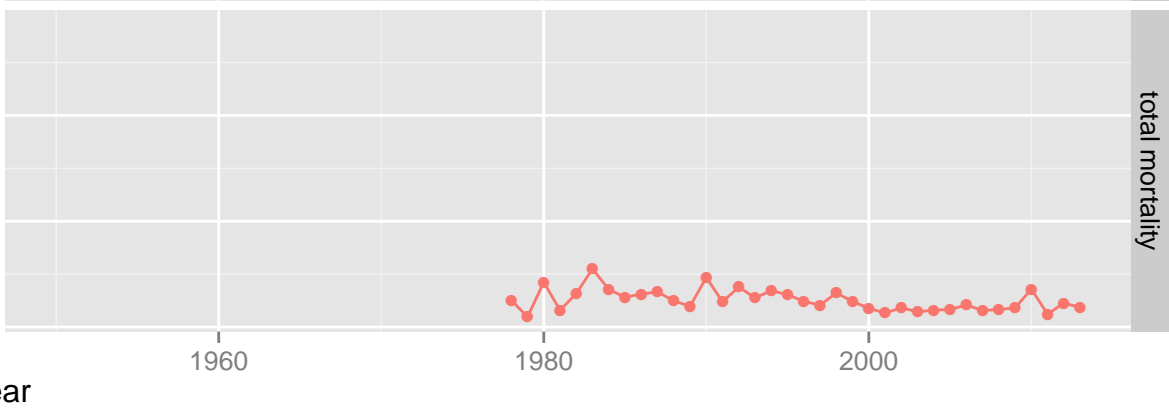
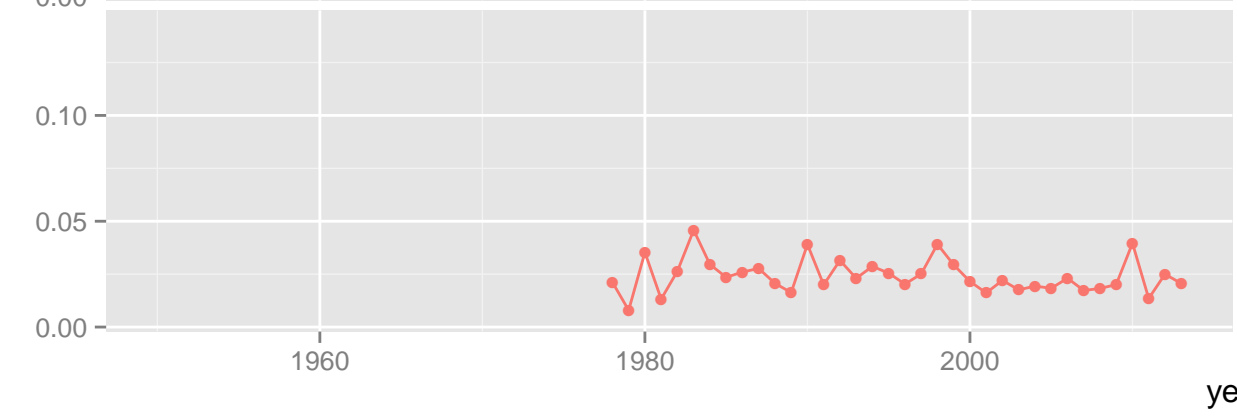
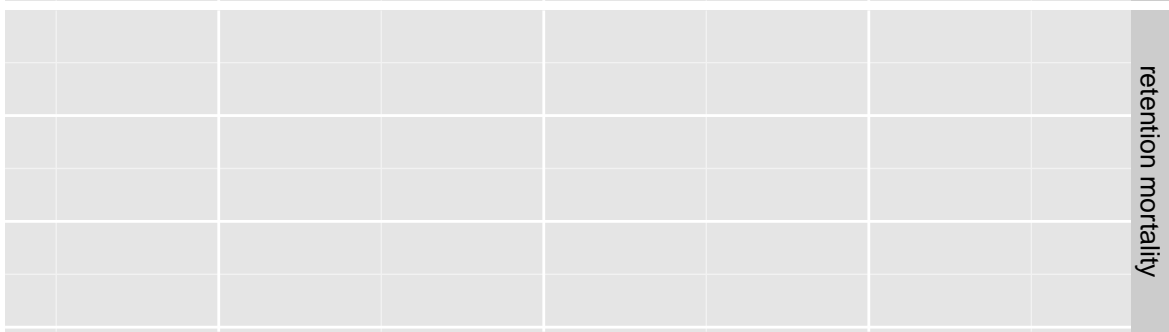
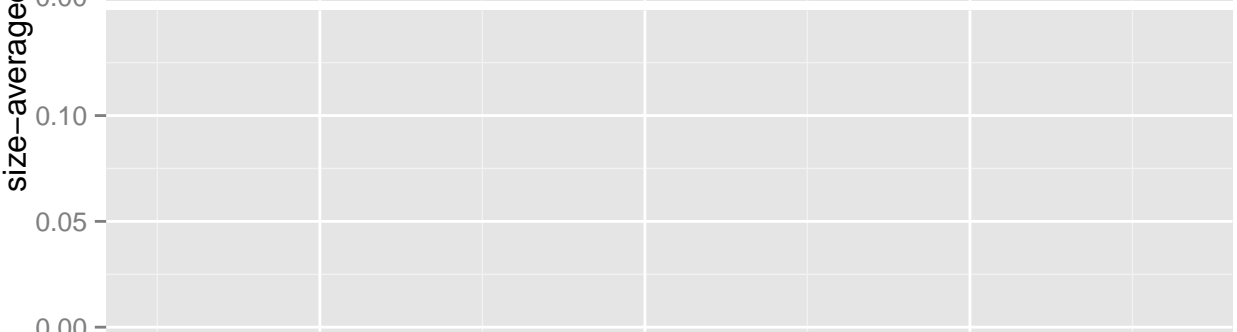
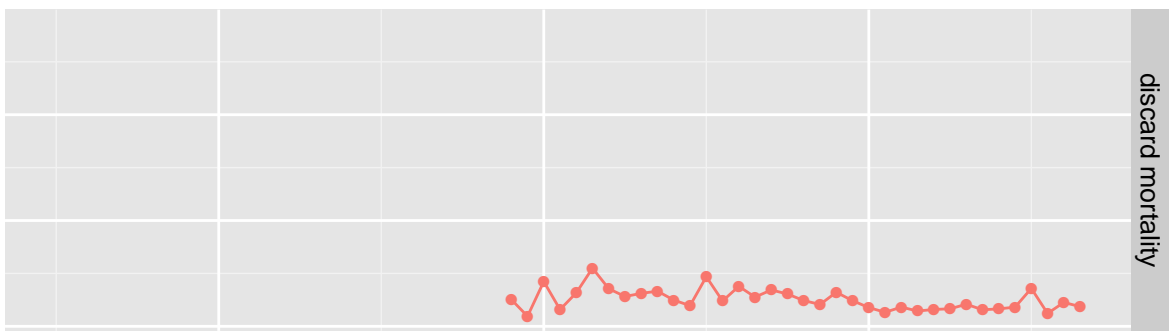
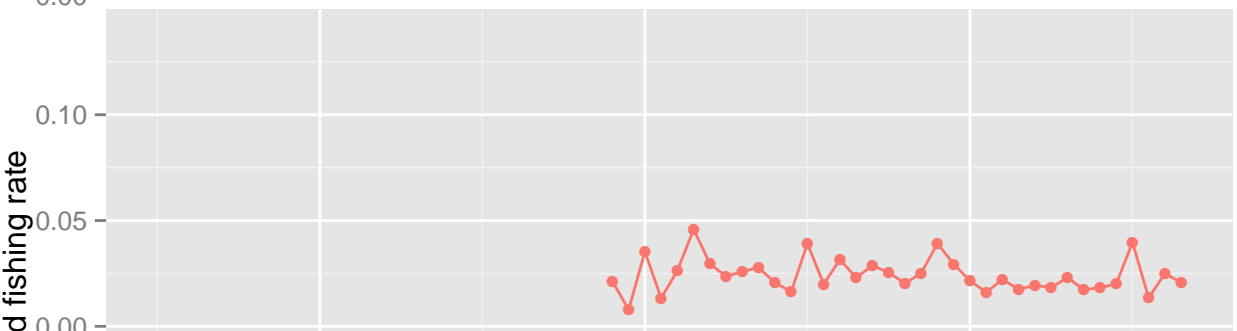
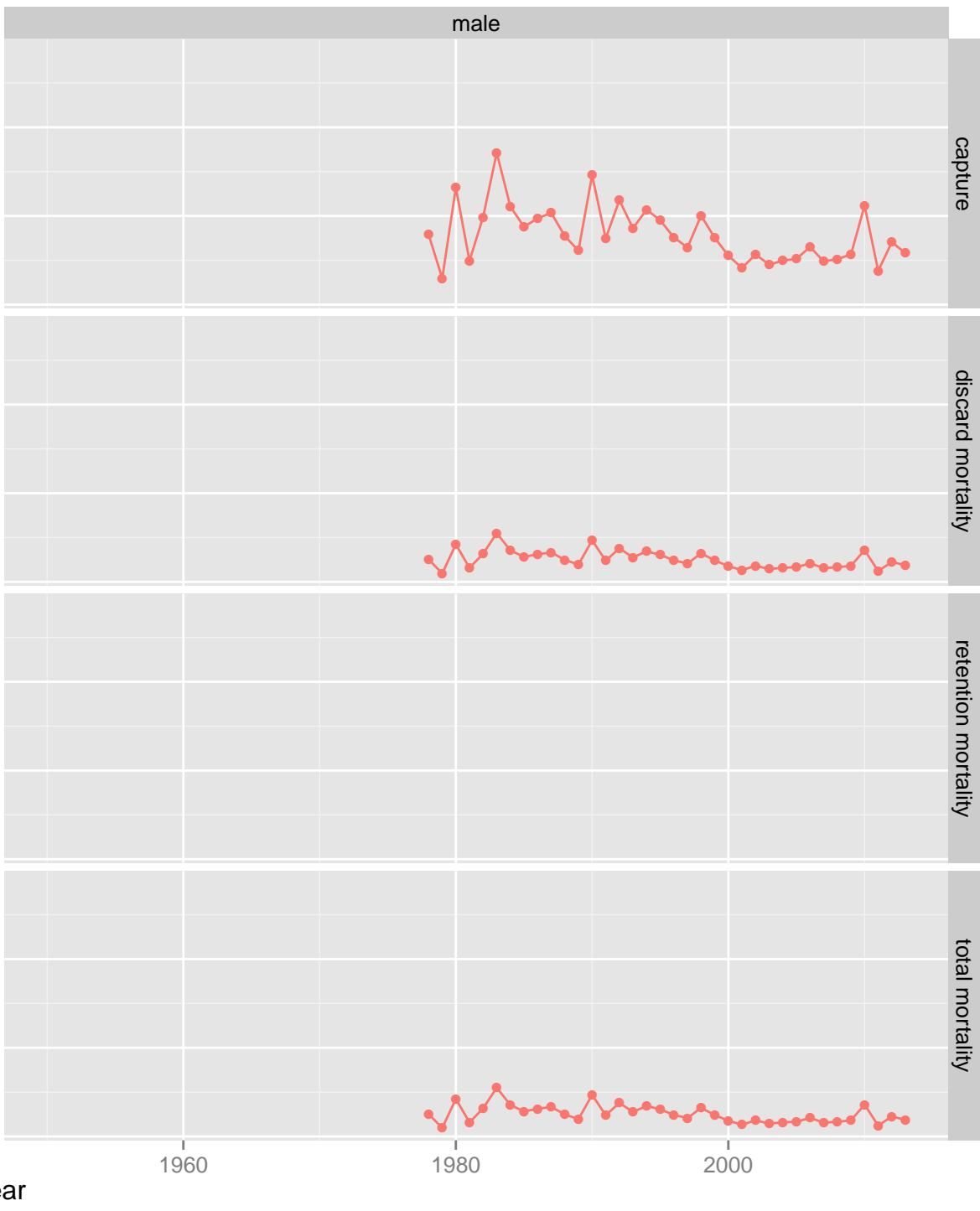
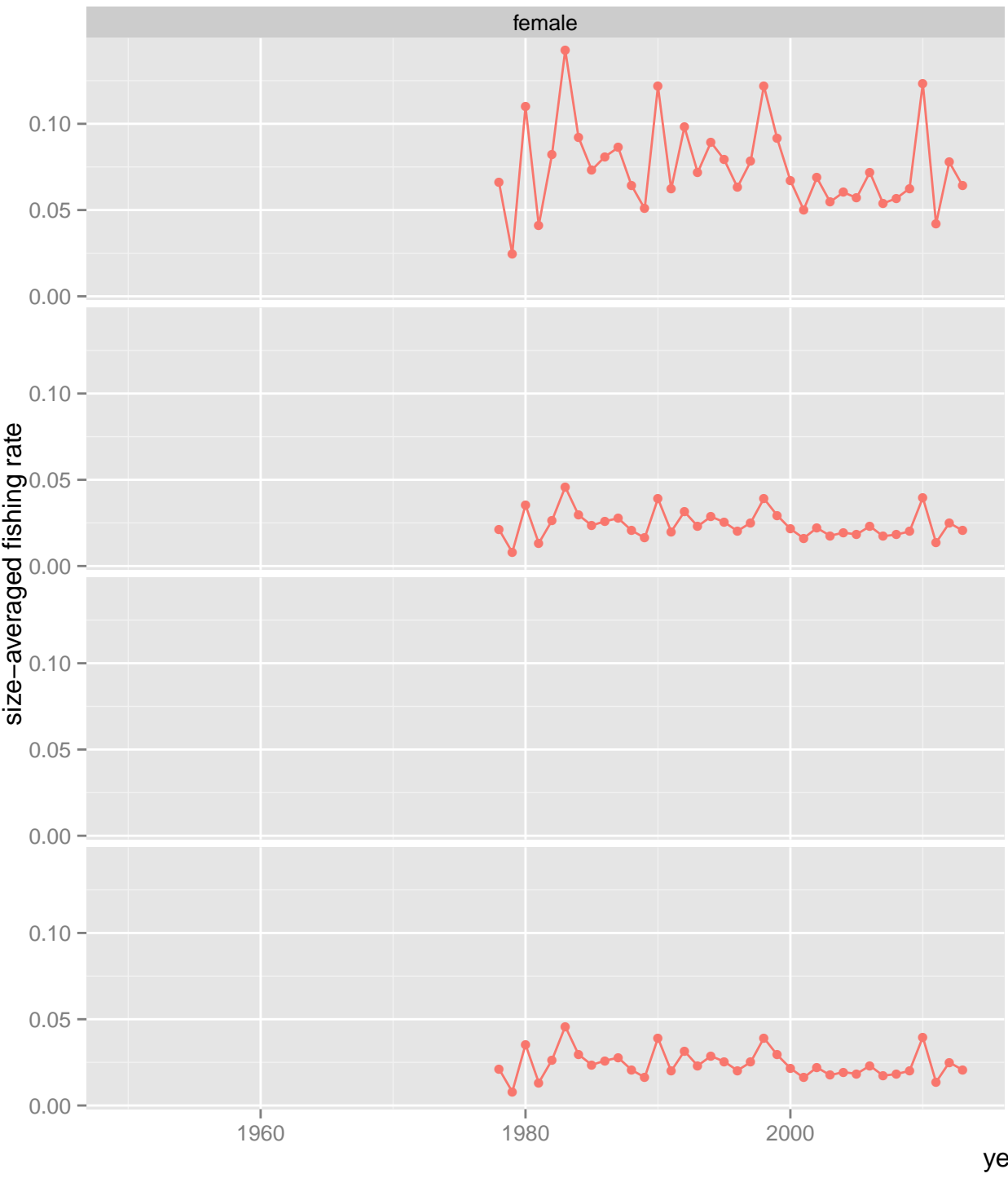
female

male

size-averaged fishing rate

capture
discard mortality
retention mortality
total mortality

model
tcsam
model type
tcsam



1960

1980

2000

year

1960

1980

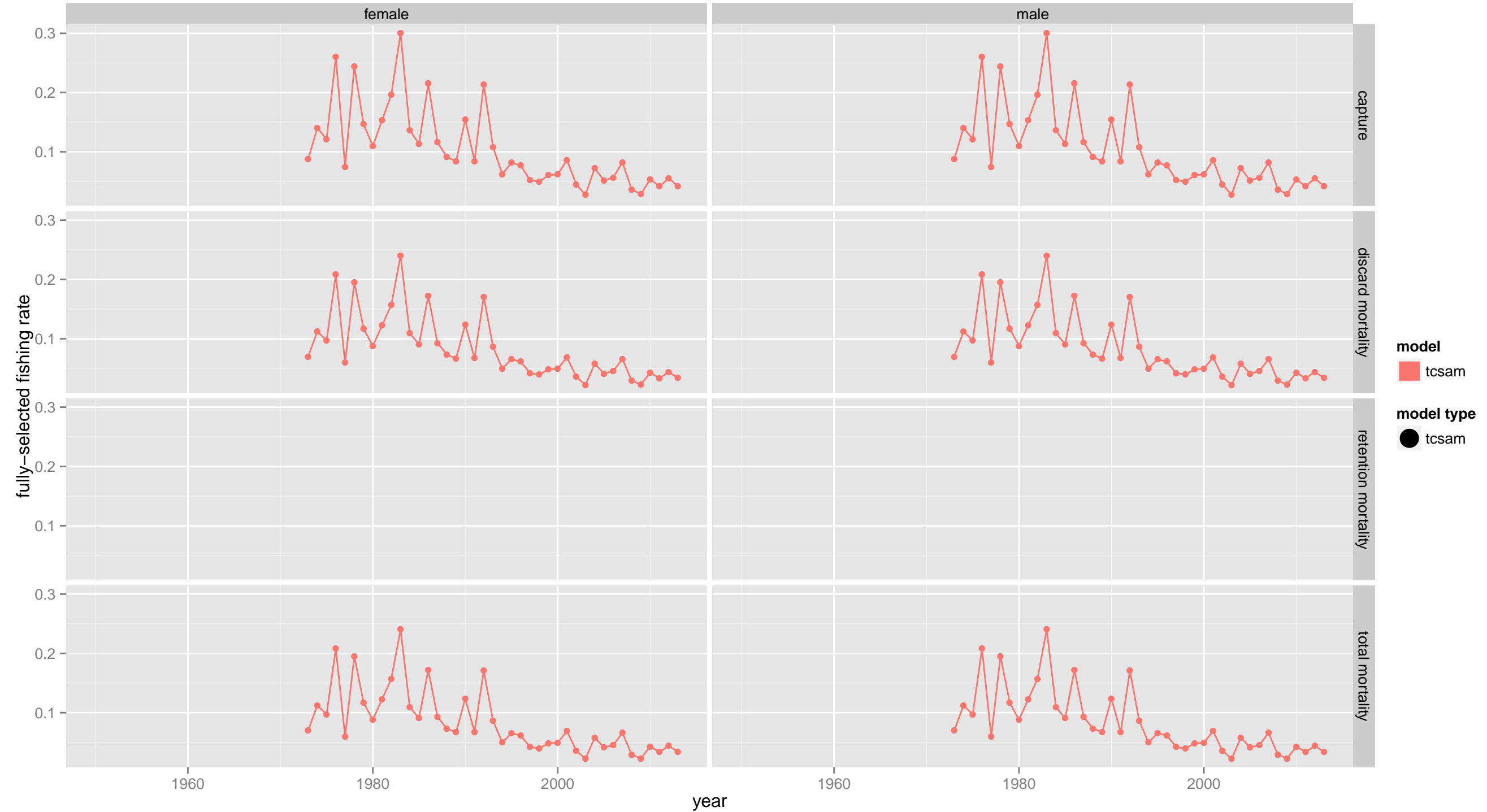
2000

total mortality

RKF



GTF



GTF



all fisheries



all fisheries

female

male

model

tcsam

model type

tcsam



TCF



SCF

female

male

captured

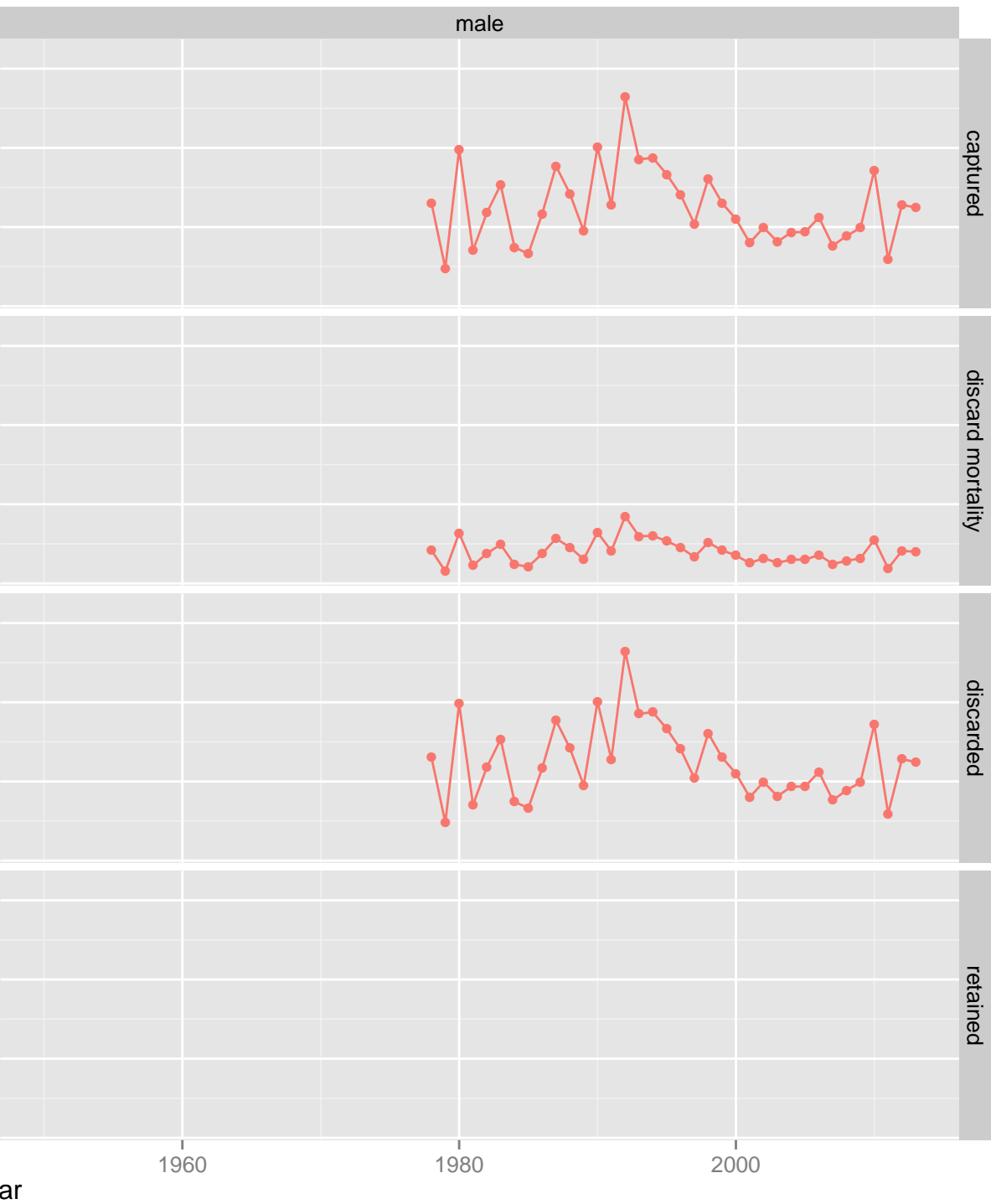
discard mortality

discarded

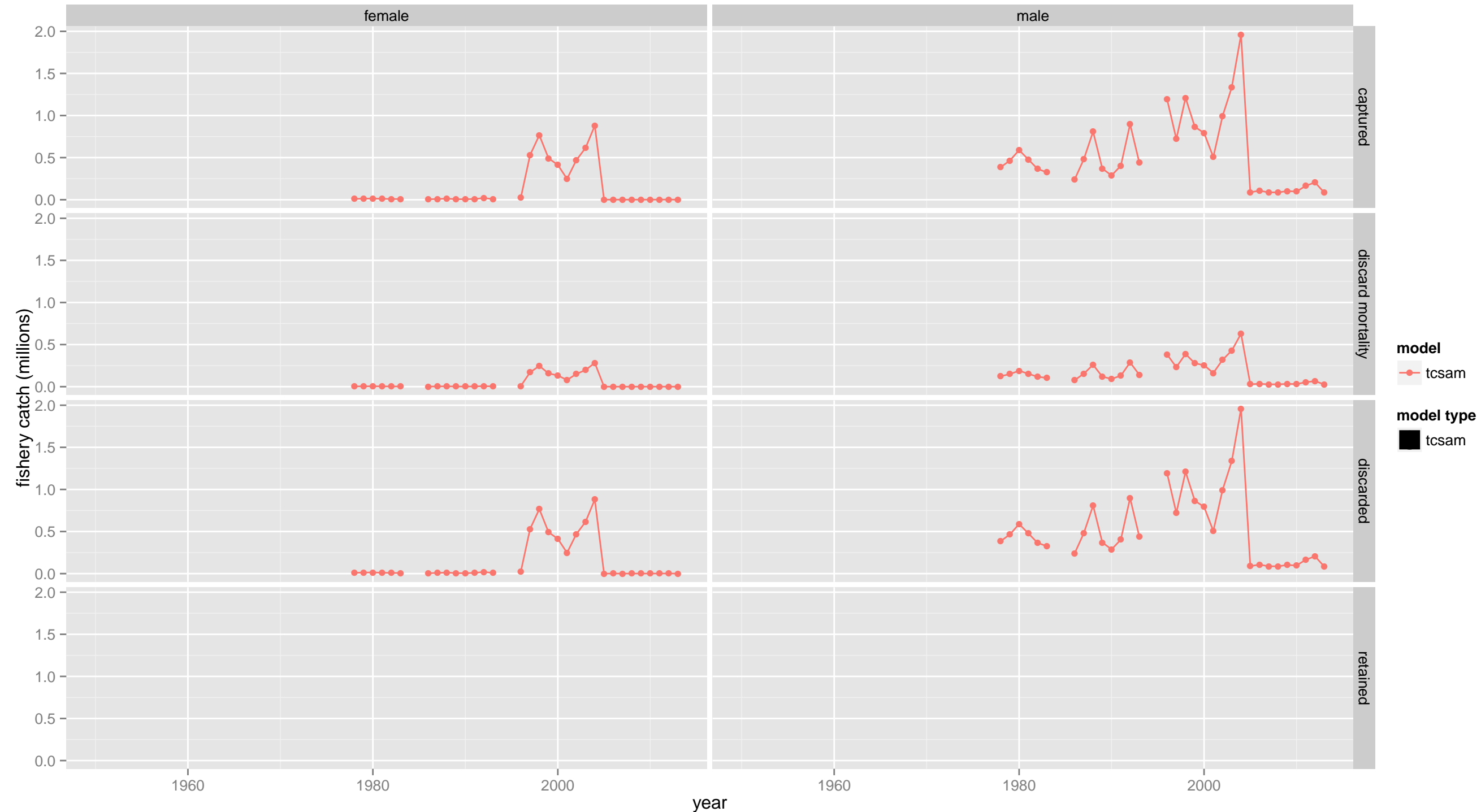
retained

model
—●— tcsam

model type
■ tcsam



RKF



GTF

female

male

captured

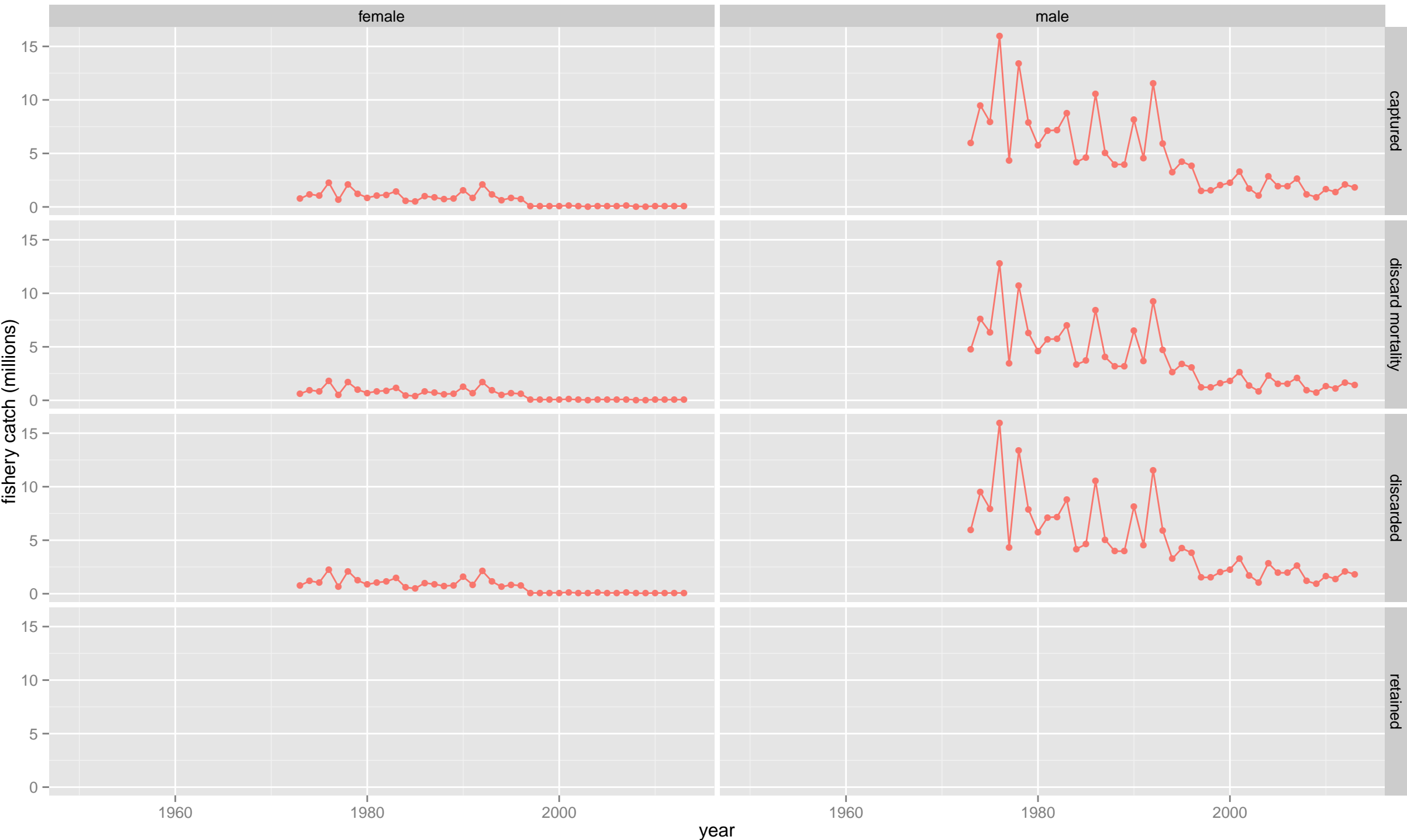
discard mortality

discarded

retained

model
—●— tcsam

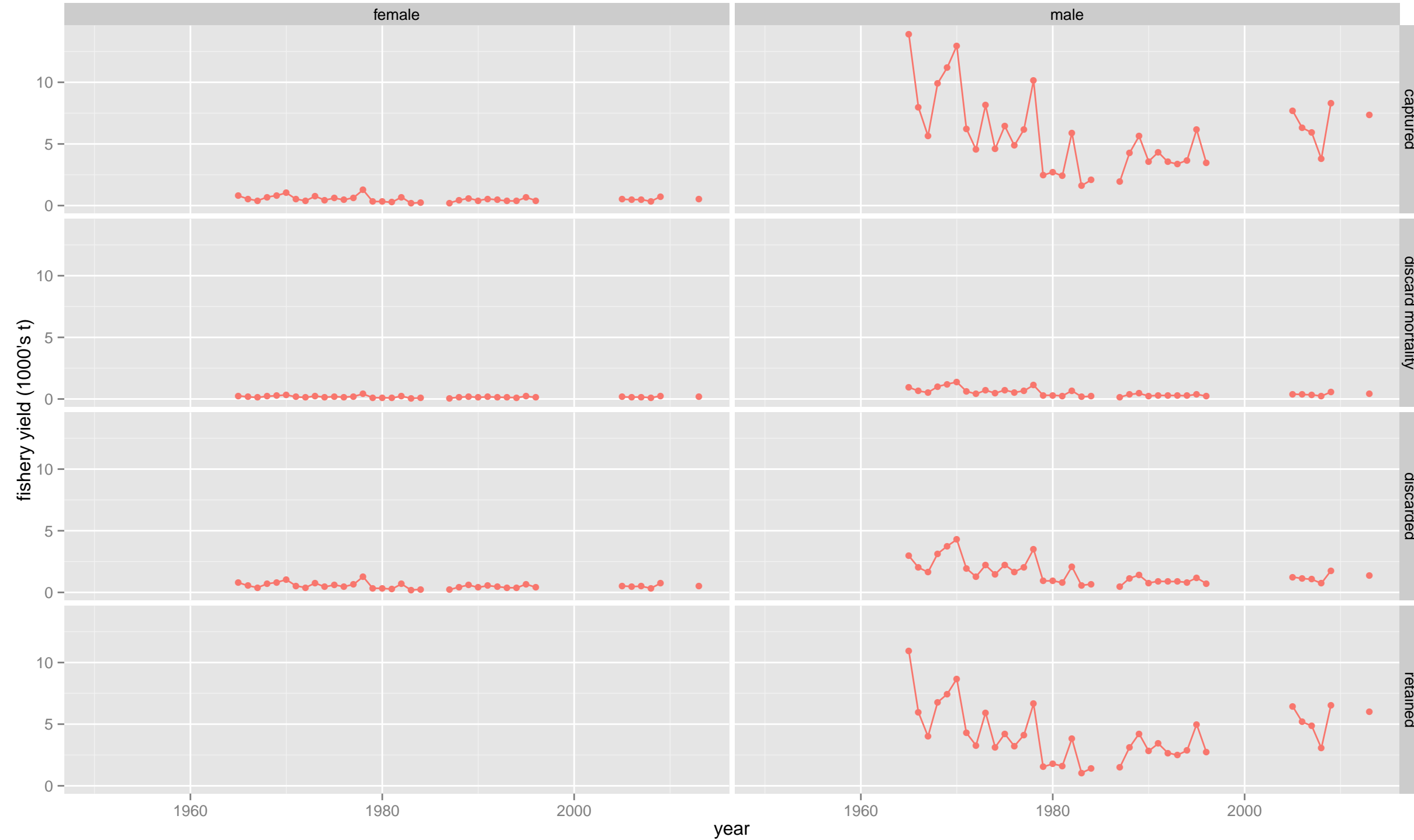
model type
■ tcsam



TCF

female

male



TCF



model
—●— tcsam

model type
■ tcsam

SCF

female

male

captured

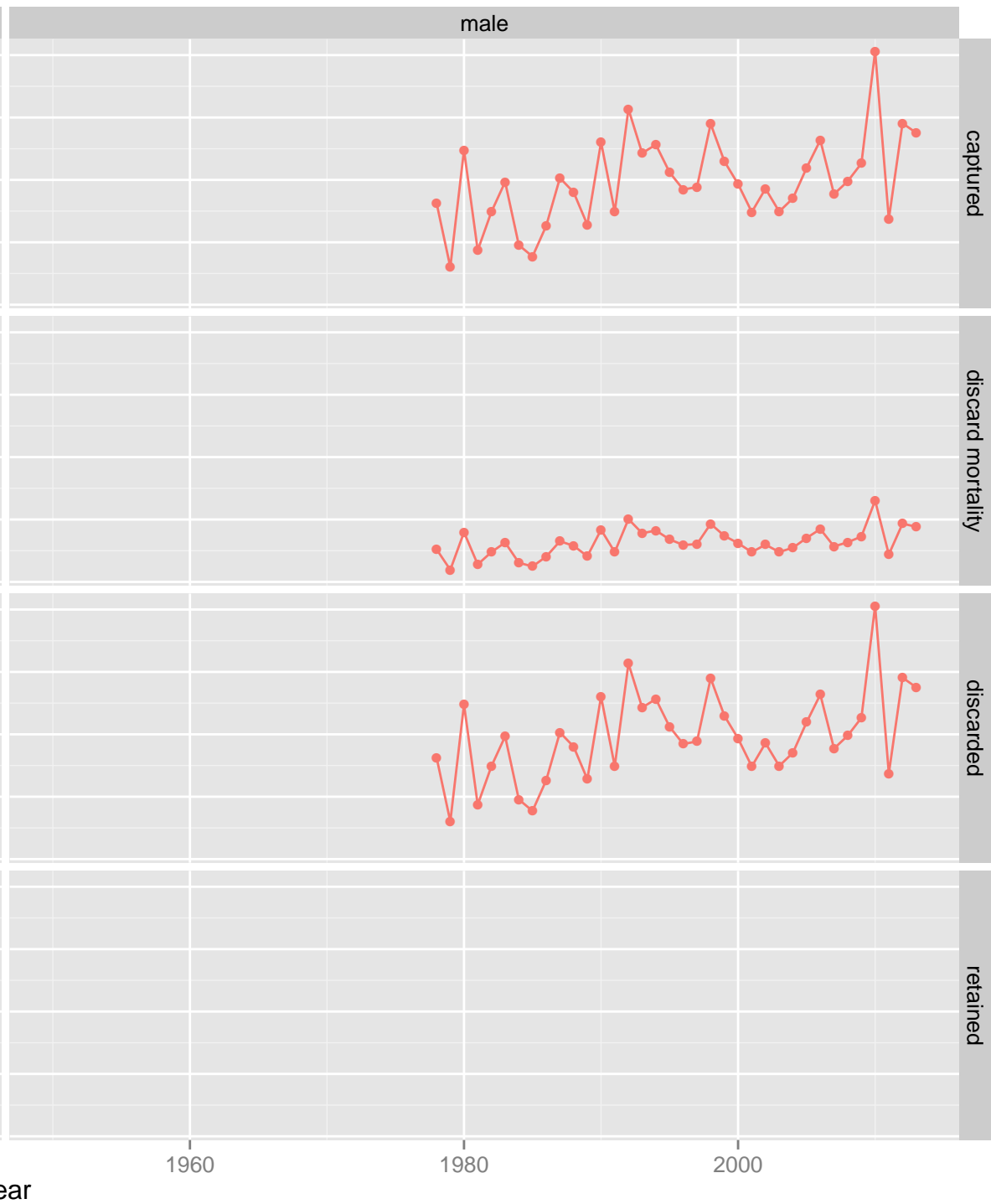
discard mortality

discarded

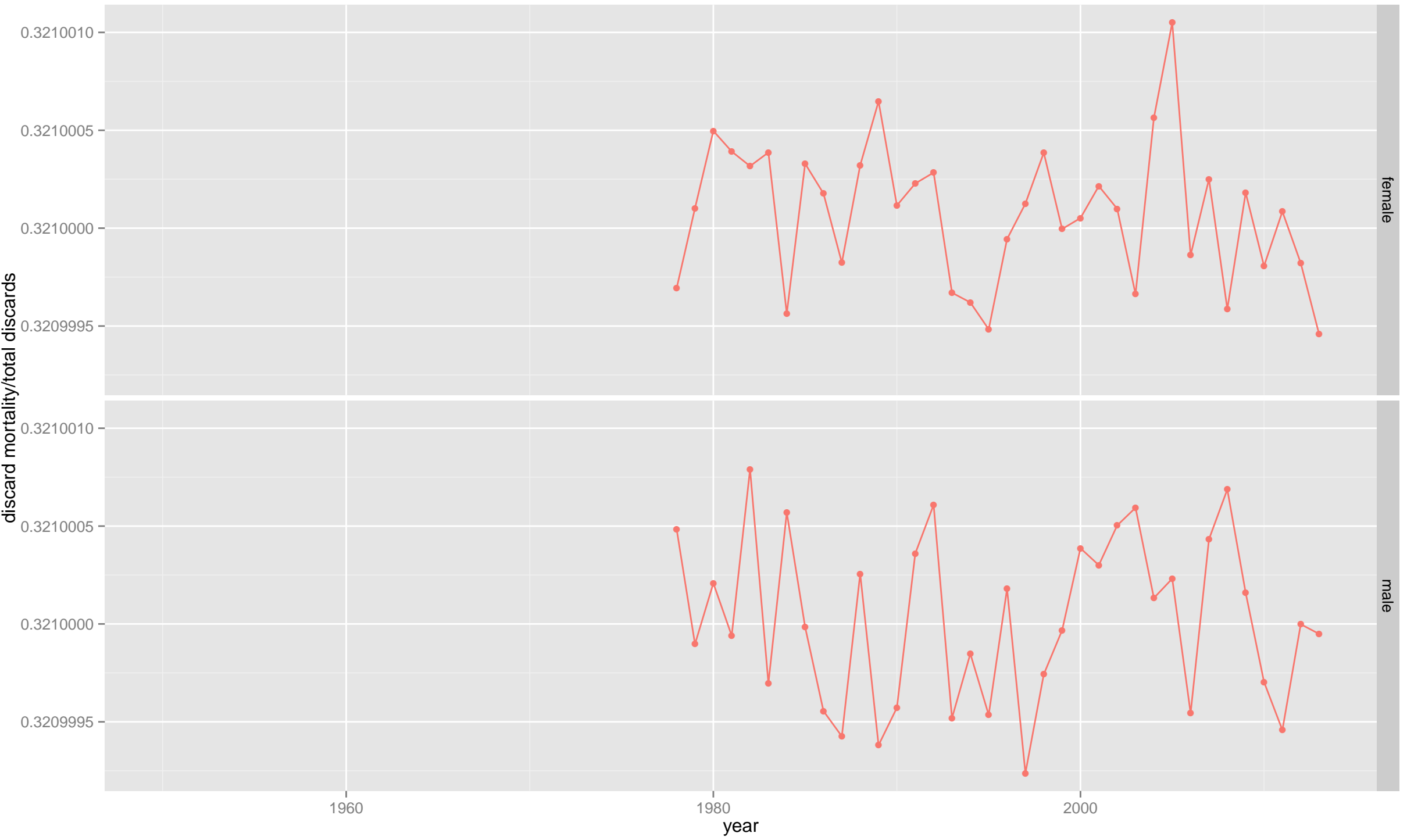
retained

model
—●— tcsam

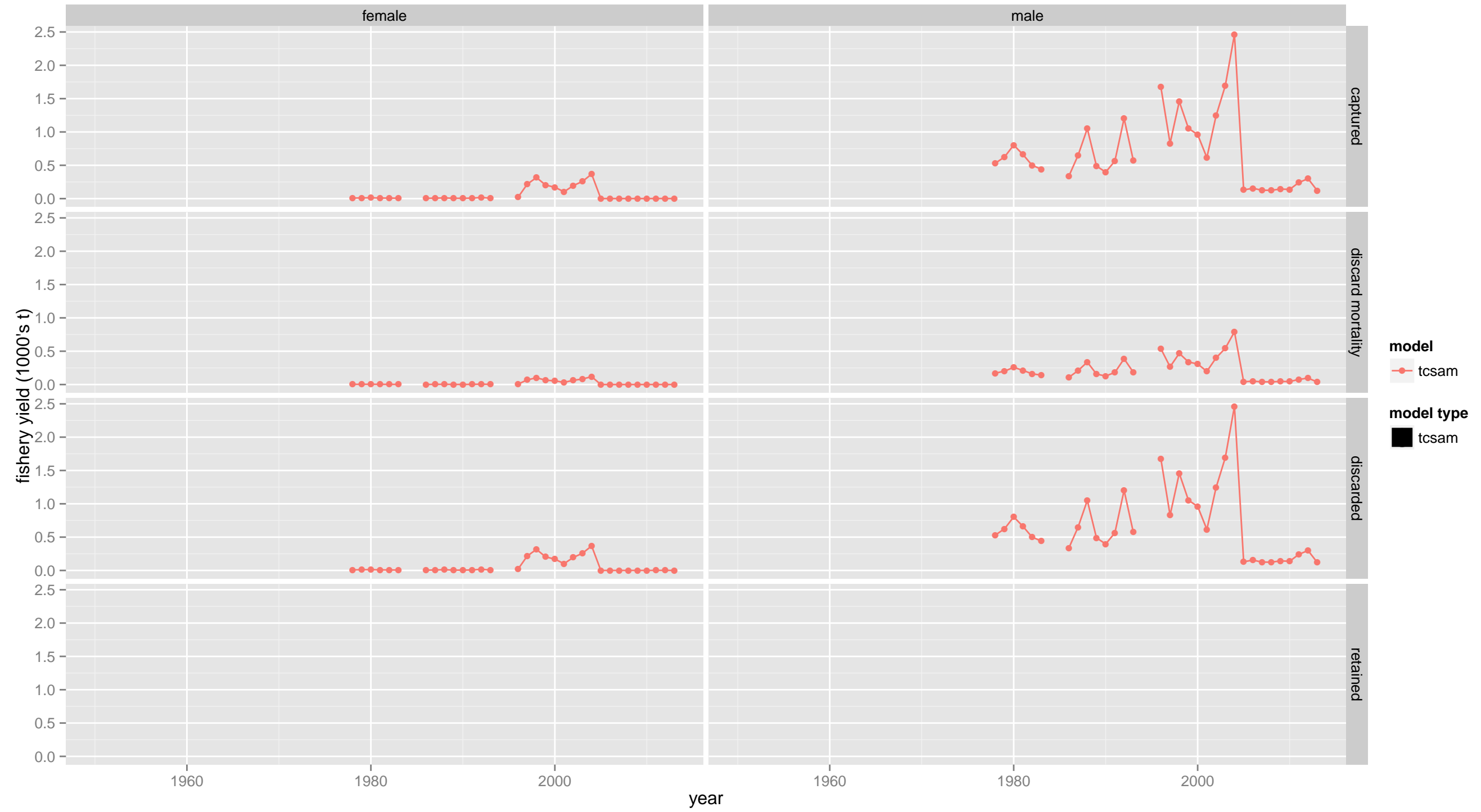
model type
■ tcsam



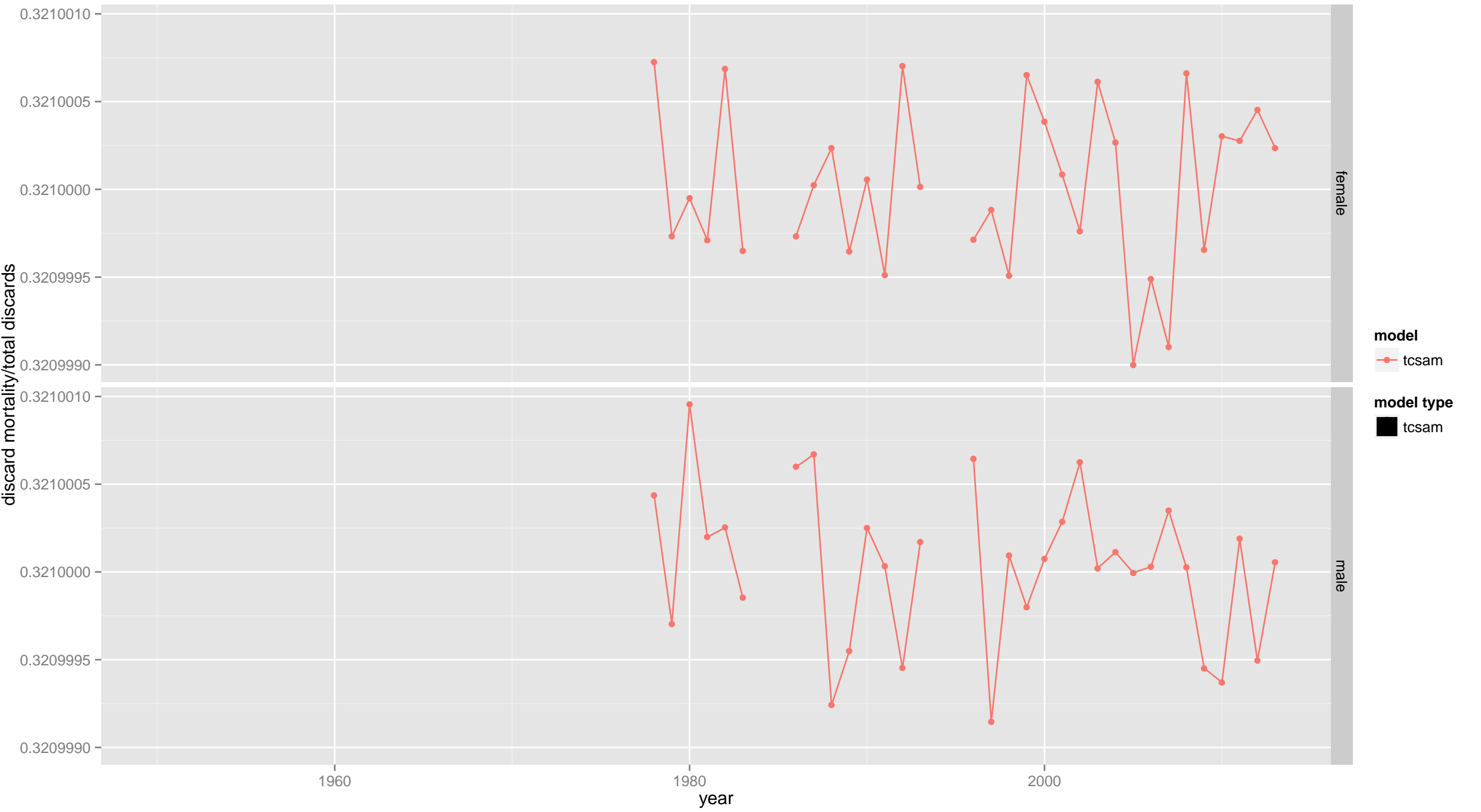
SCF



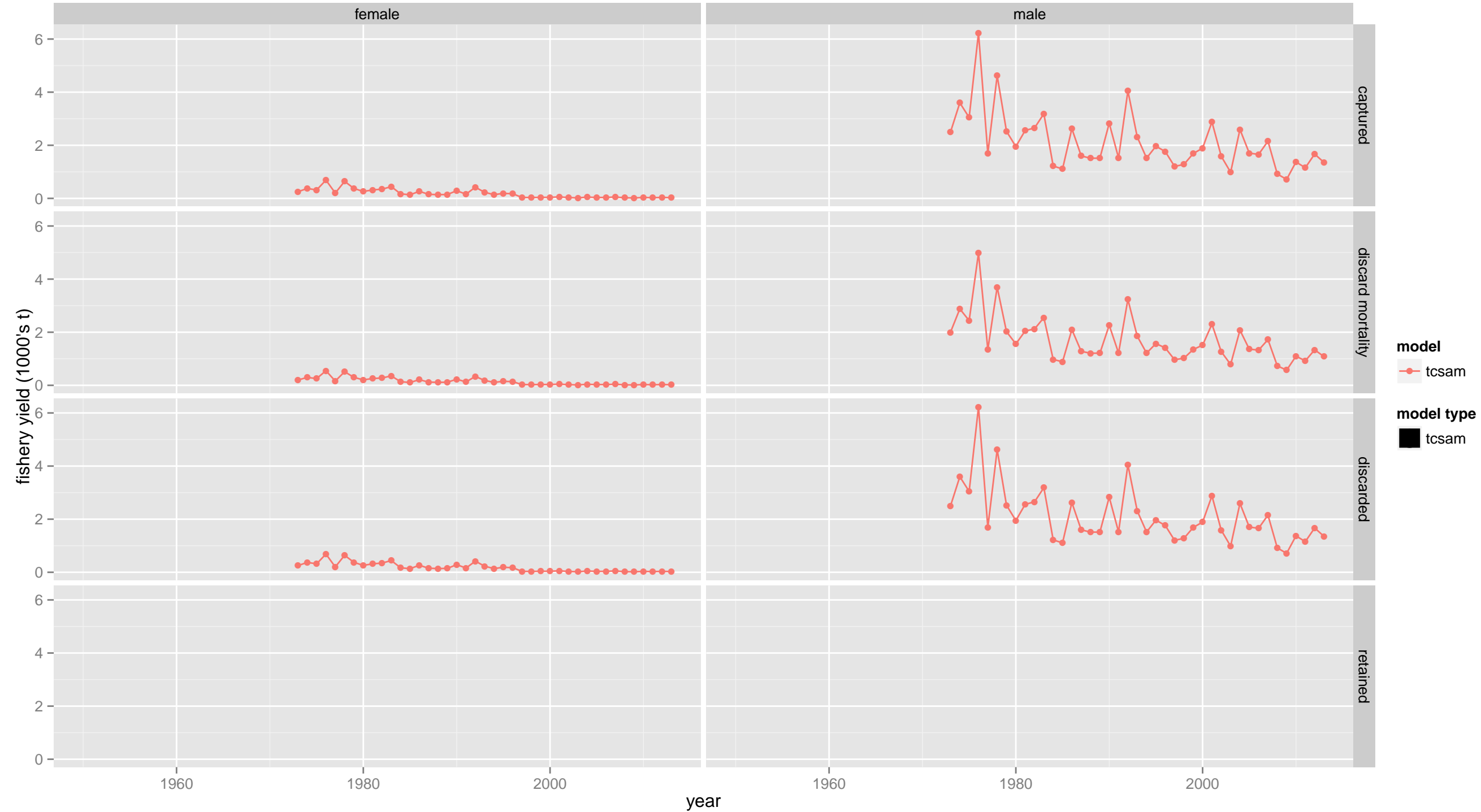
RKF



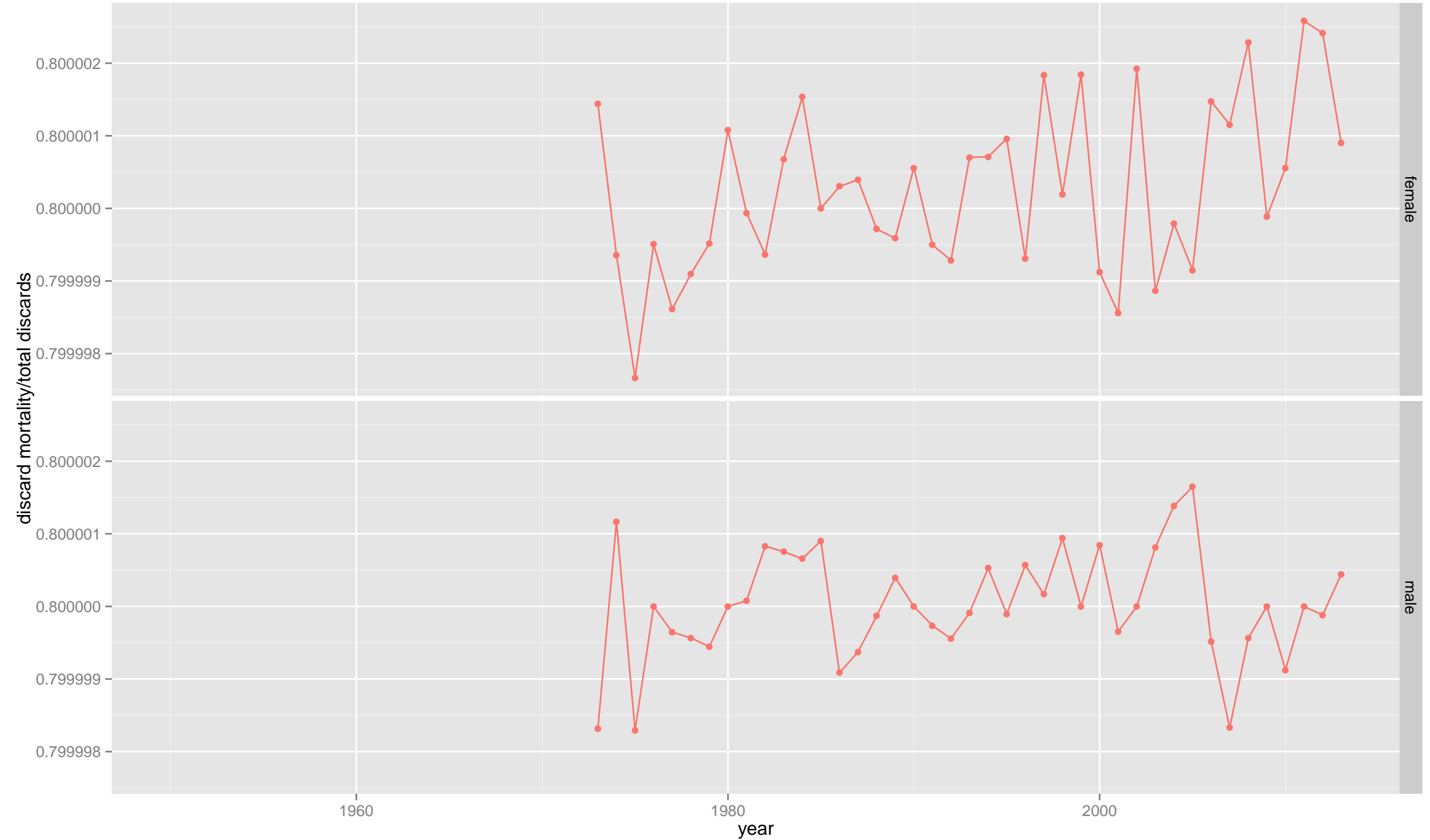
RKF



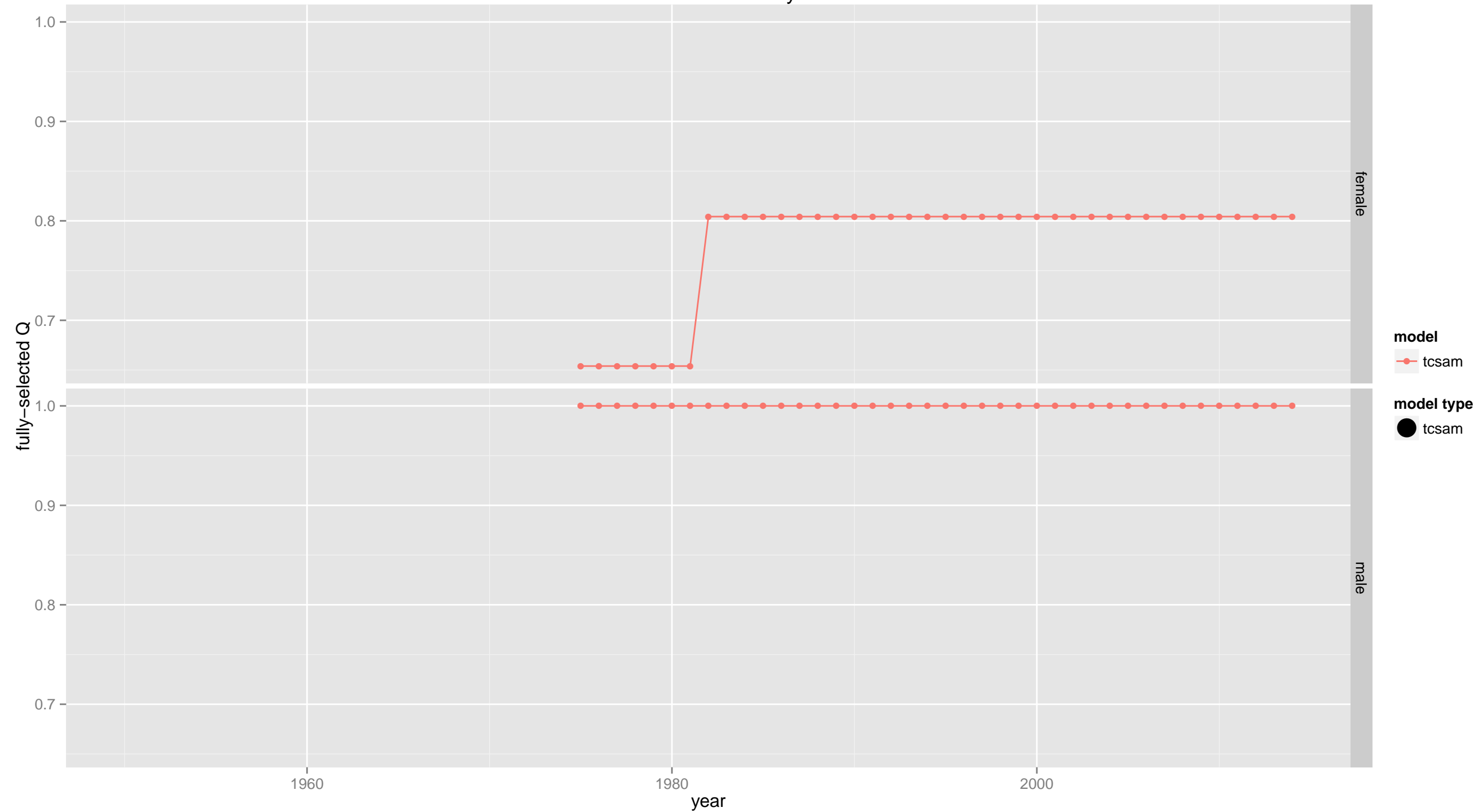
GTF



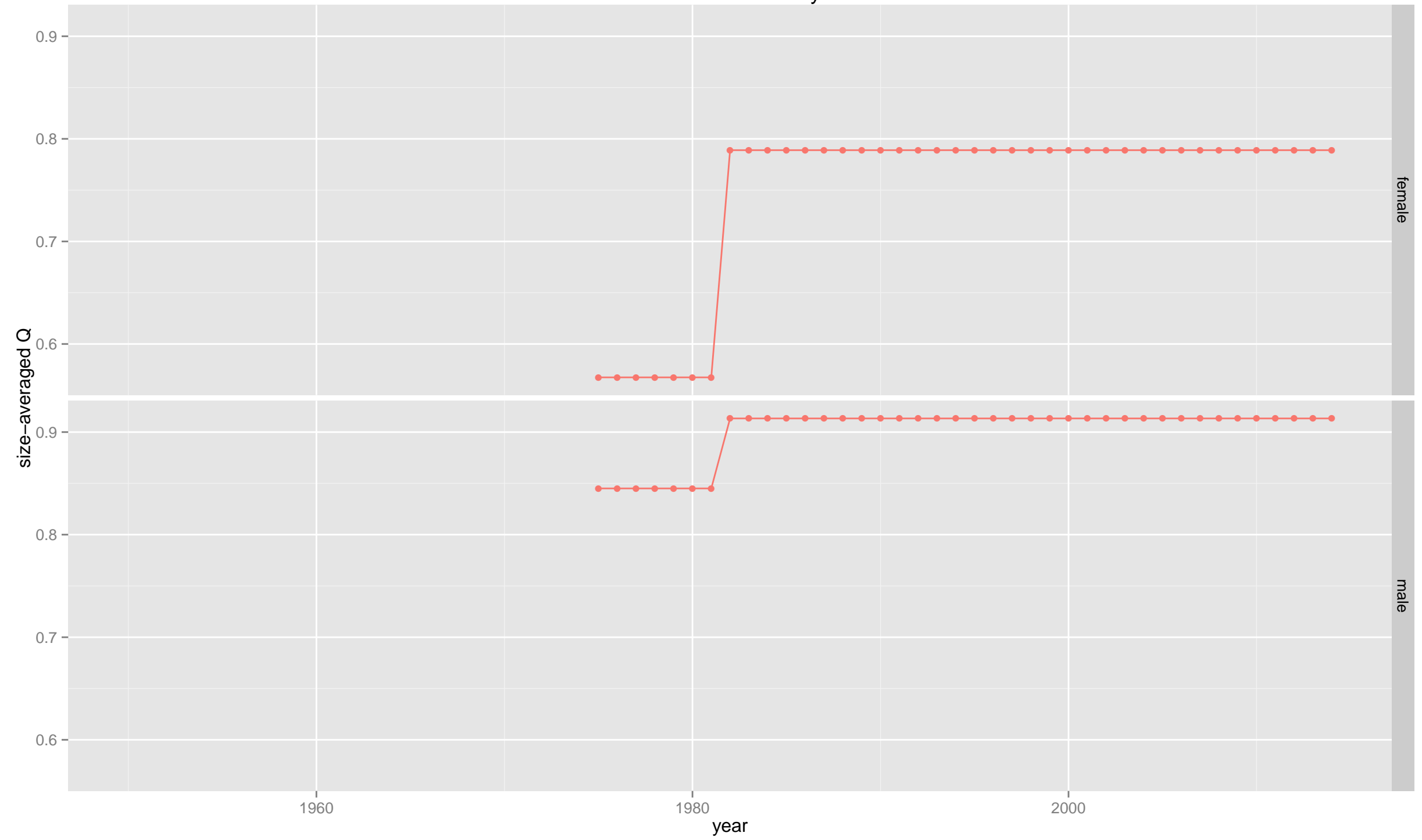
GTF



NMFS trawl survey



NMFS trawl survey



model
—●— tcsam

model type
● tcsam

female

male

NMFS trawl survey



NMFS trawl survey

