NOAA FISHERIES

SEDAR 57
Spiny Lobster

Review Workshop
Presentation 6
PR Base Model

July 9-11, 2019

PR Base Model

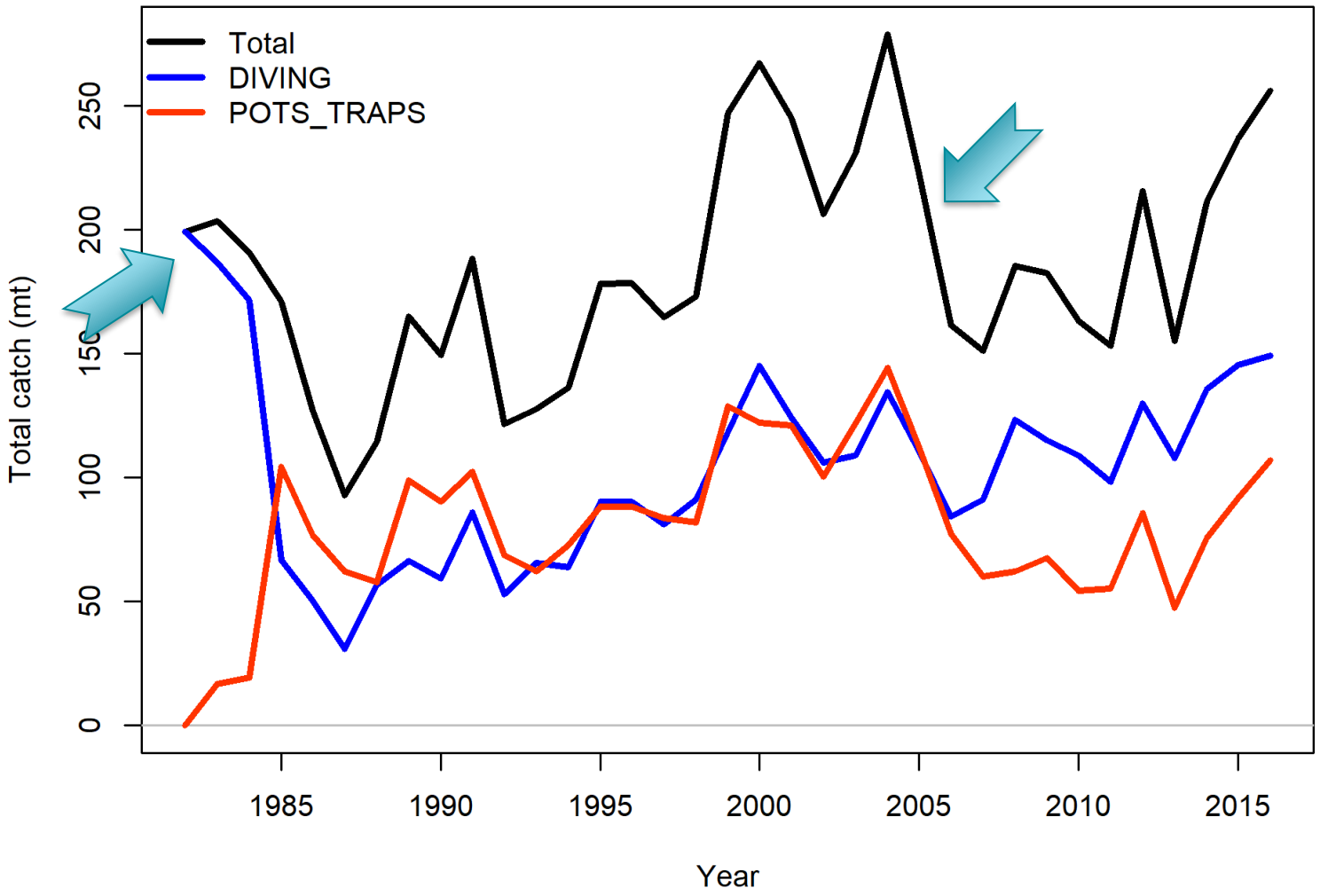
- Structure
- Model Fit
- Diagnostics
- Derived Quantities

Base Model Structure

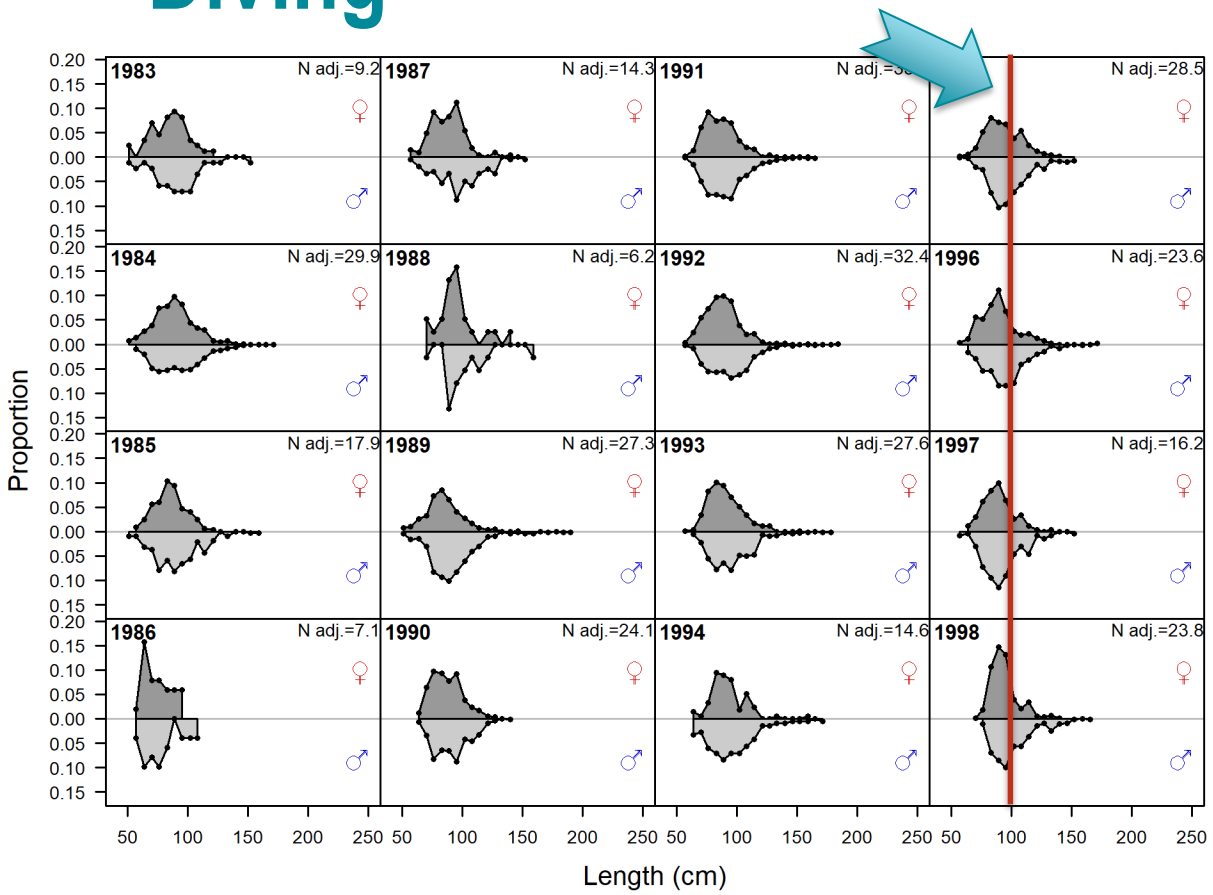
Fisheries

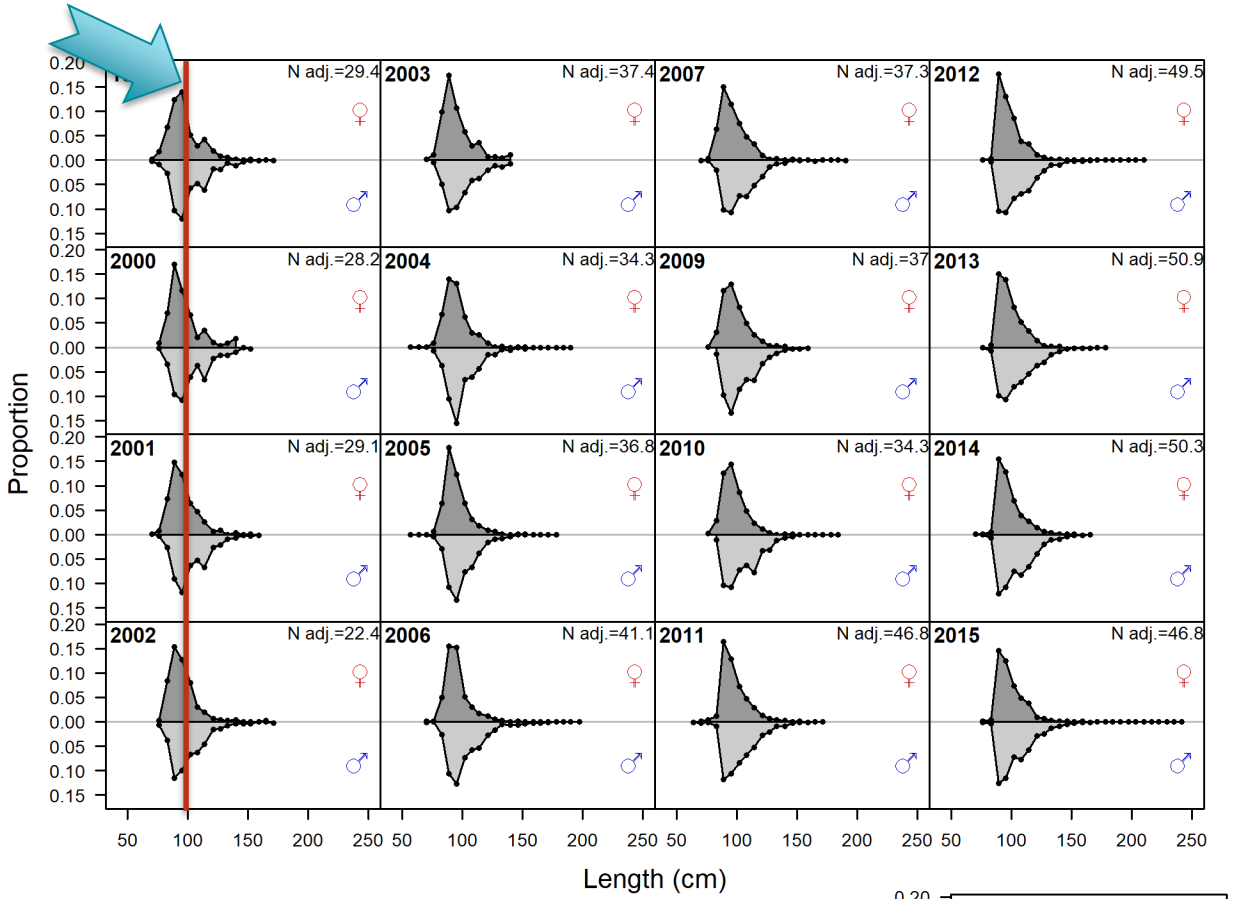
- Two fisheries:
  - Pots and traps, diving
  - Selectivity at length: estimated for both fleets using informed priors from STT
  - F initial = 0 for pots and traps; estimated for diving

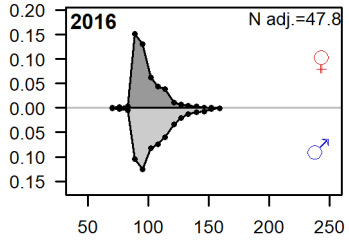
- Retention blocks:
  - Minimum size limit 89 mm (3.5”) introduced in 1985, enforced 1999+
  - Time block for retention and selectivity: 1999-2016
  - Change in retention to exclude smaller individuals and apparent adaptation of fishery selectivity in both fleets towards generally targeting large individuals


Total
DIVING
POTS_TRAPS
Total catch (mt)
0
50
100
150
200
250
1985
1990
1995
2000
2005
2010
2015
Year

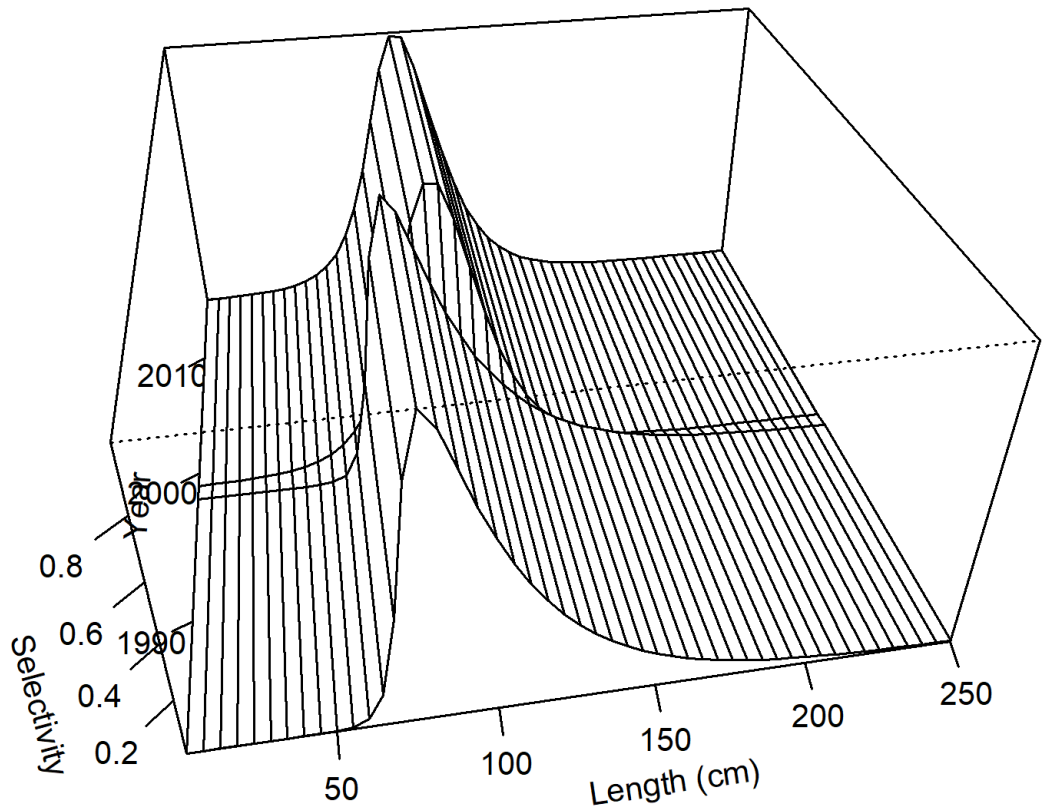
Diving


1983 N adj.=9.2
1987 N adj.=14.3
1991 N adj.=
N adj.=28.5
1984 N adj.=29.9
1988 N adj.=6.2
1992 N adj.=32.4
1996 N adj.=23.6
1985 N adj.=17.9
1989 N adj.=27.3
1993 N adj.=27.6
1997 N adj.=16.2
1986 N adj.=7.1
1990 N adj.=24.1
1994 N adj.=14.6
1998 N adj.=23.8
Proportion
Length (cm)

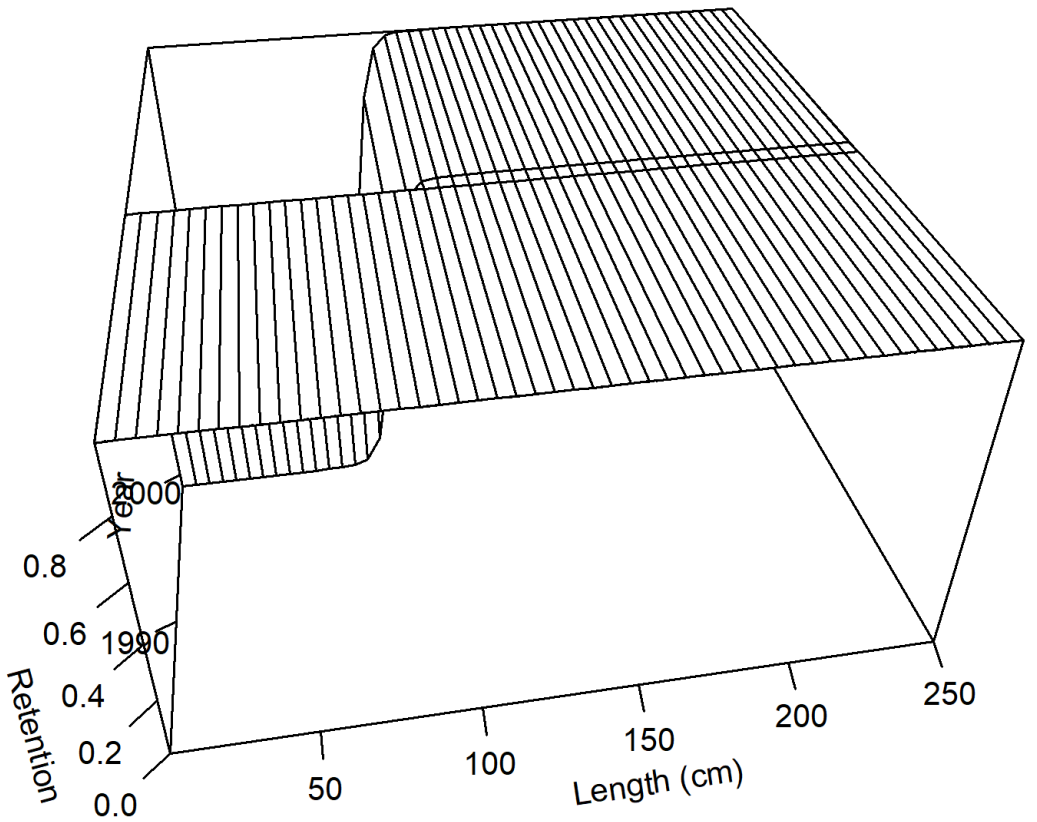

N adj.=29.4
2003 N adj.=37.4
2007 N adj.=37.3
2012 N adj.=49.5
2000 N adj.=28.2
2004 N adj.=34.3
2009 N adj.=37
2013 N adj.=50.9
2001 N adj.=29.1
2005 N adj.=36.8
2010 N adj.=34.3
2014 N adj.=50.3
2002 N adj.=22.4
2006 N adj.=41.1
2011 N adj.=46.8
2015 N adj.=46.8
Proportion
Length (cm)


2016 N adj.=47.8

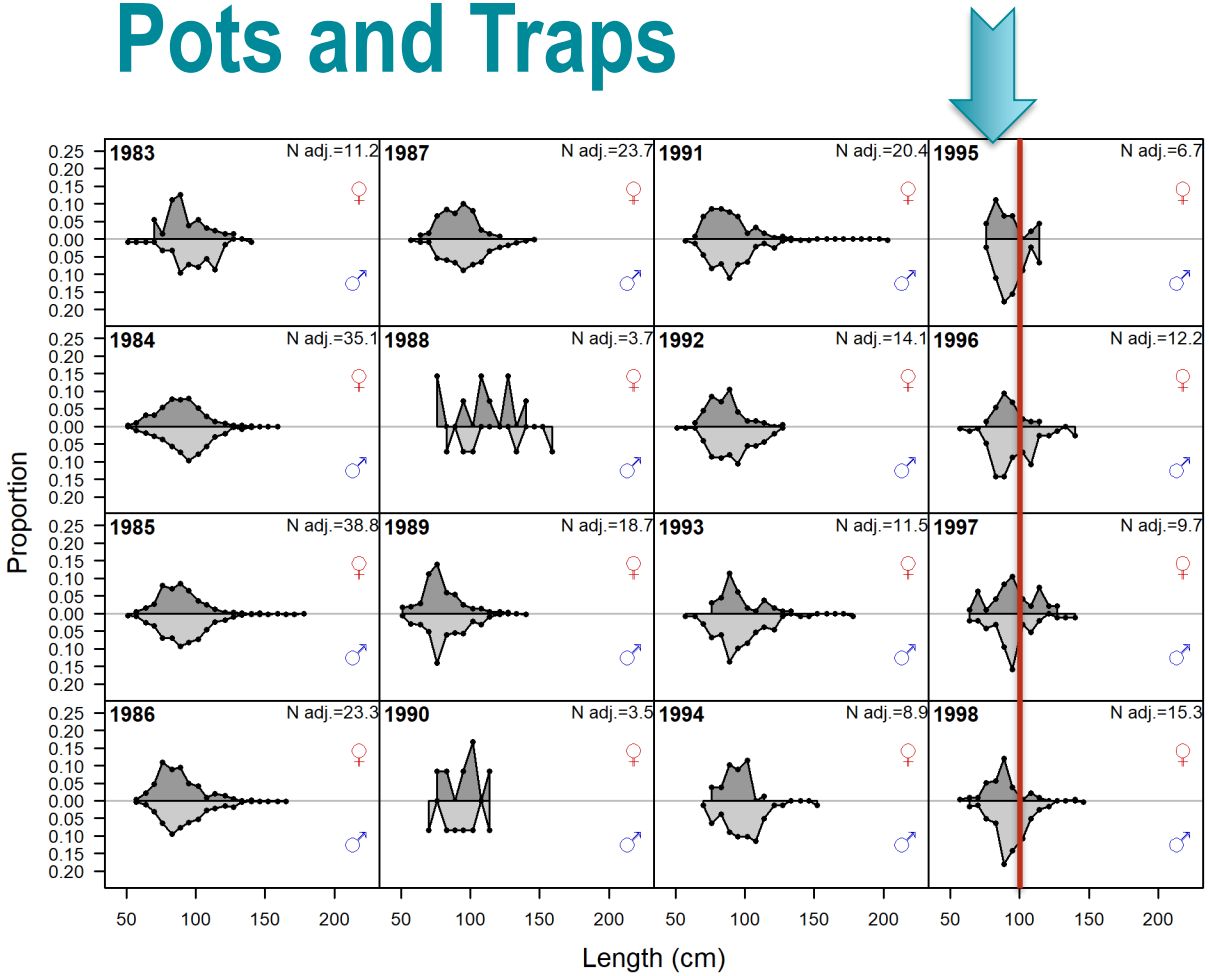
Female time-varying selectivity for DIVING

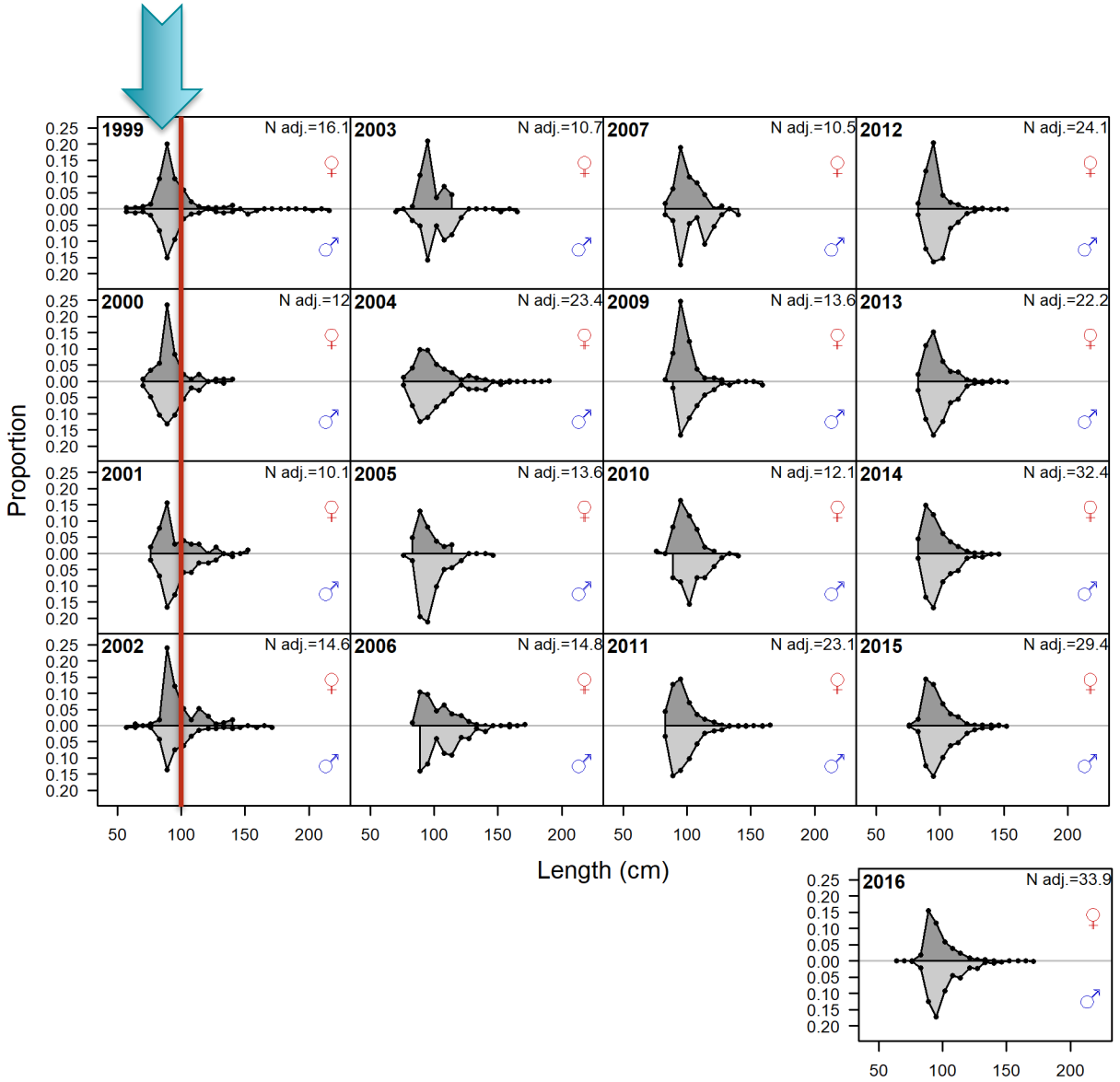


Female time-varying retention for DIVING

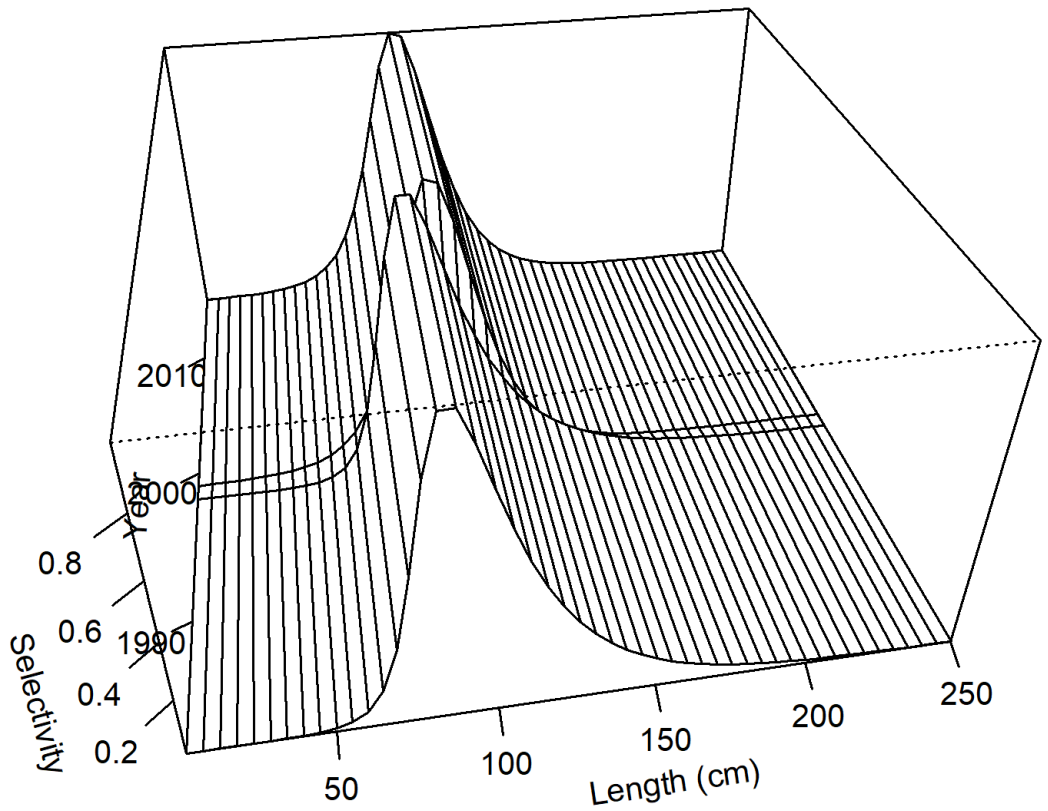


Pots and Traps

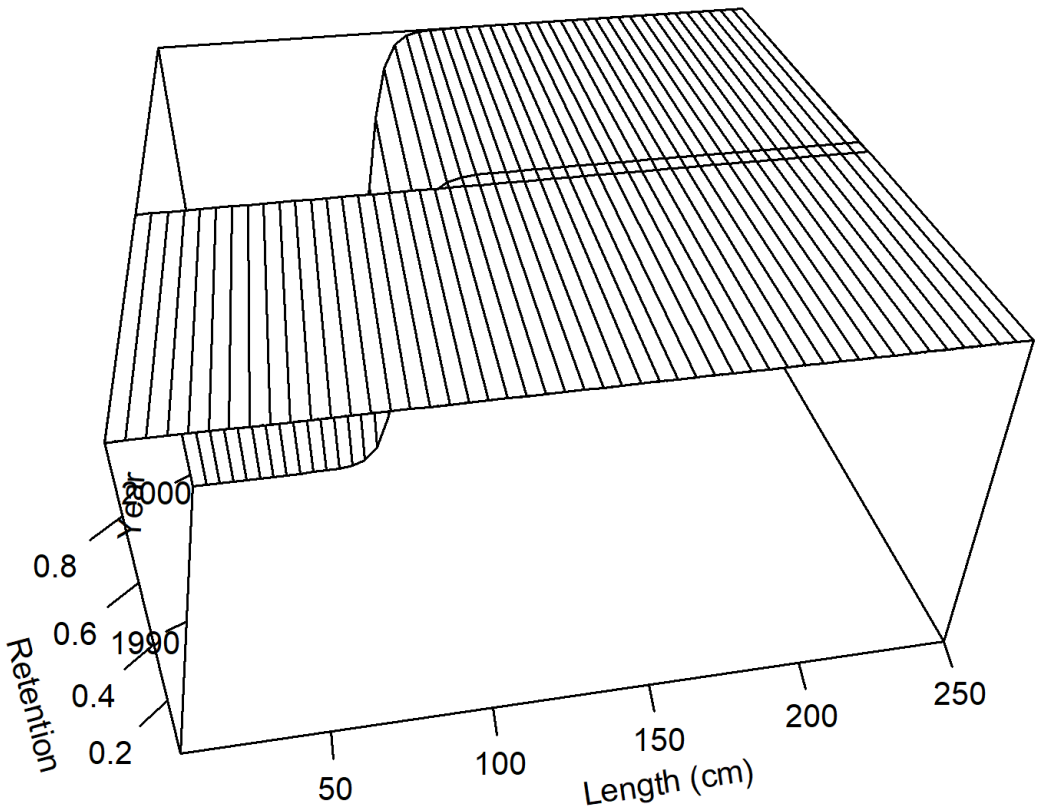




Female time-varying selectivity for POTS_TRAPS



Female time-varying retention for POTS_TRAPS



Fixed and estimated quantities

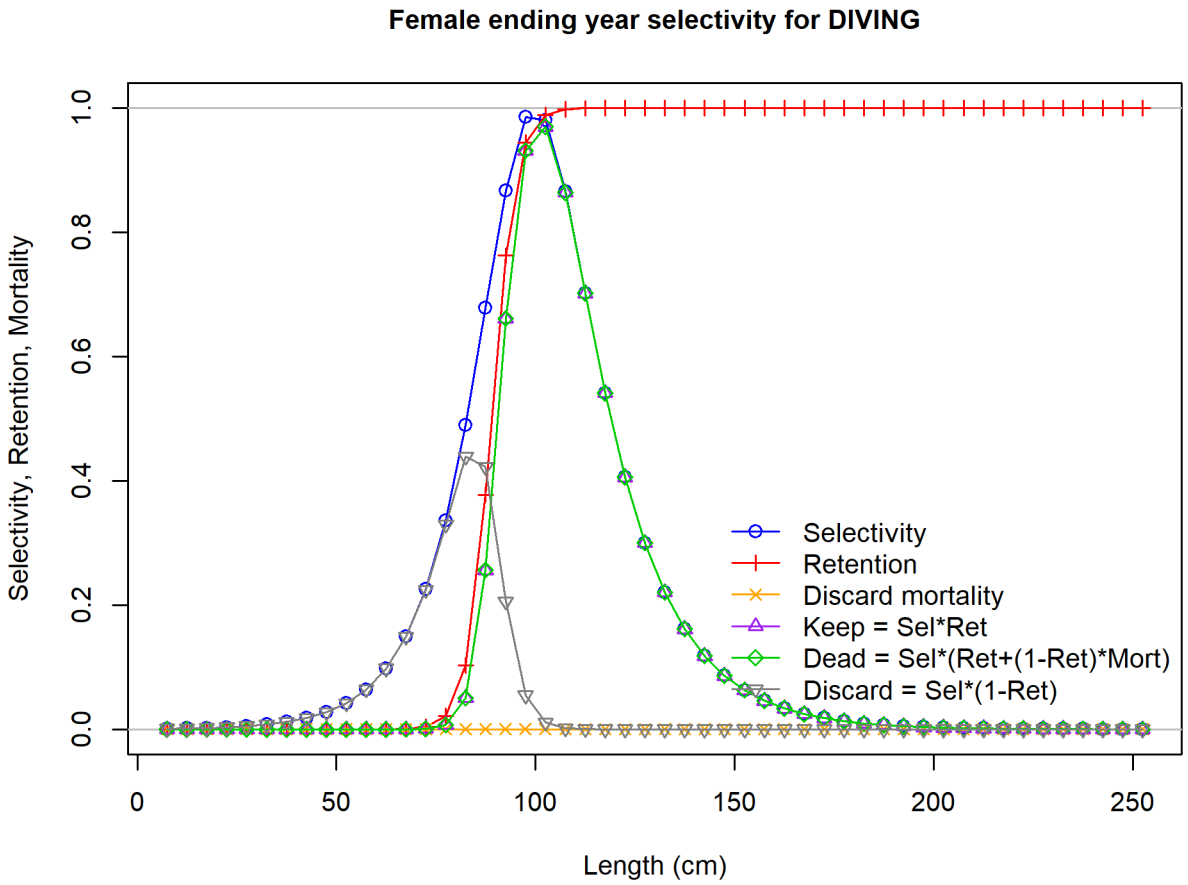
Estimated quantities:

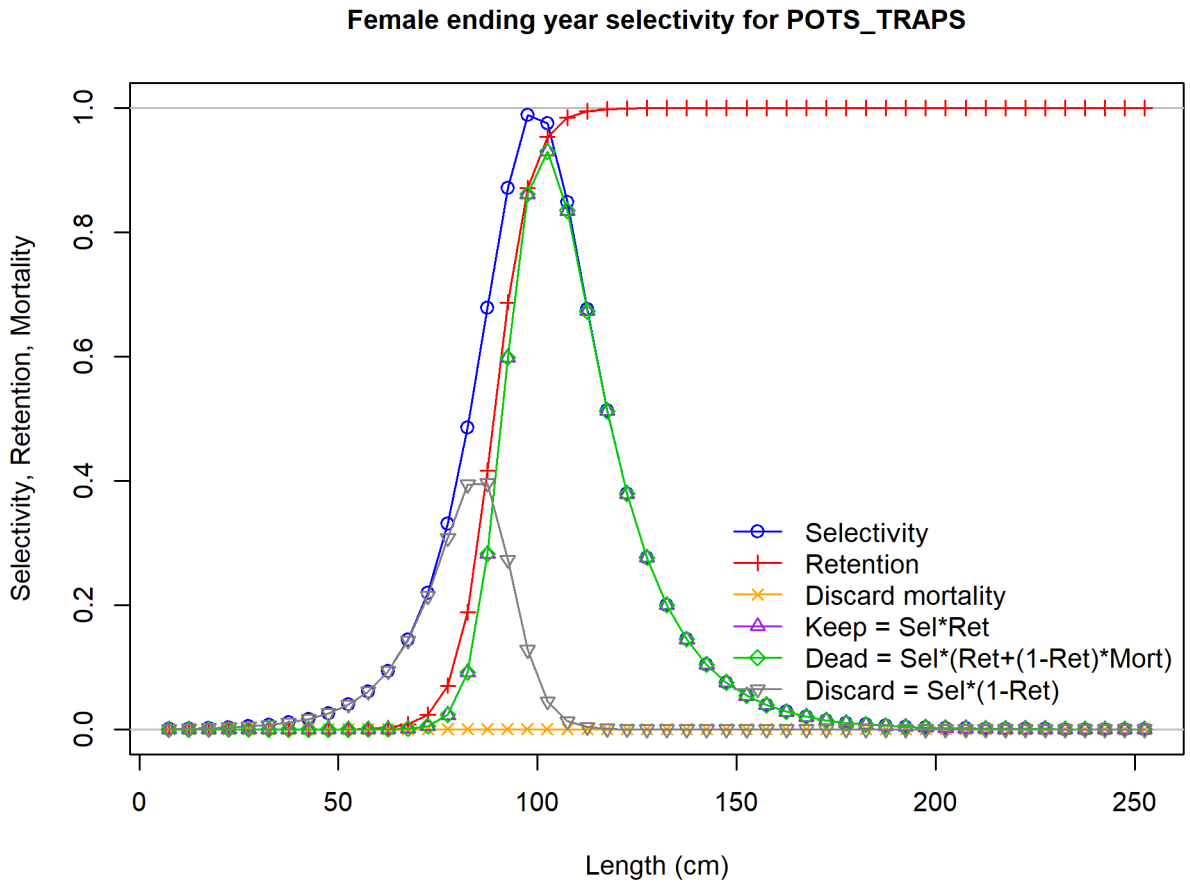
- Unfished recruitment (R0)
- Initial F
- Selectivity – 3 parameters for each fleet and time period (3*2*2)
- Retention – 1 parameter for each fleet (1*2)

Fixed quantities:

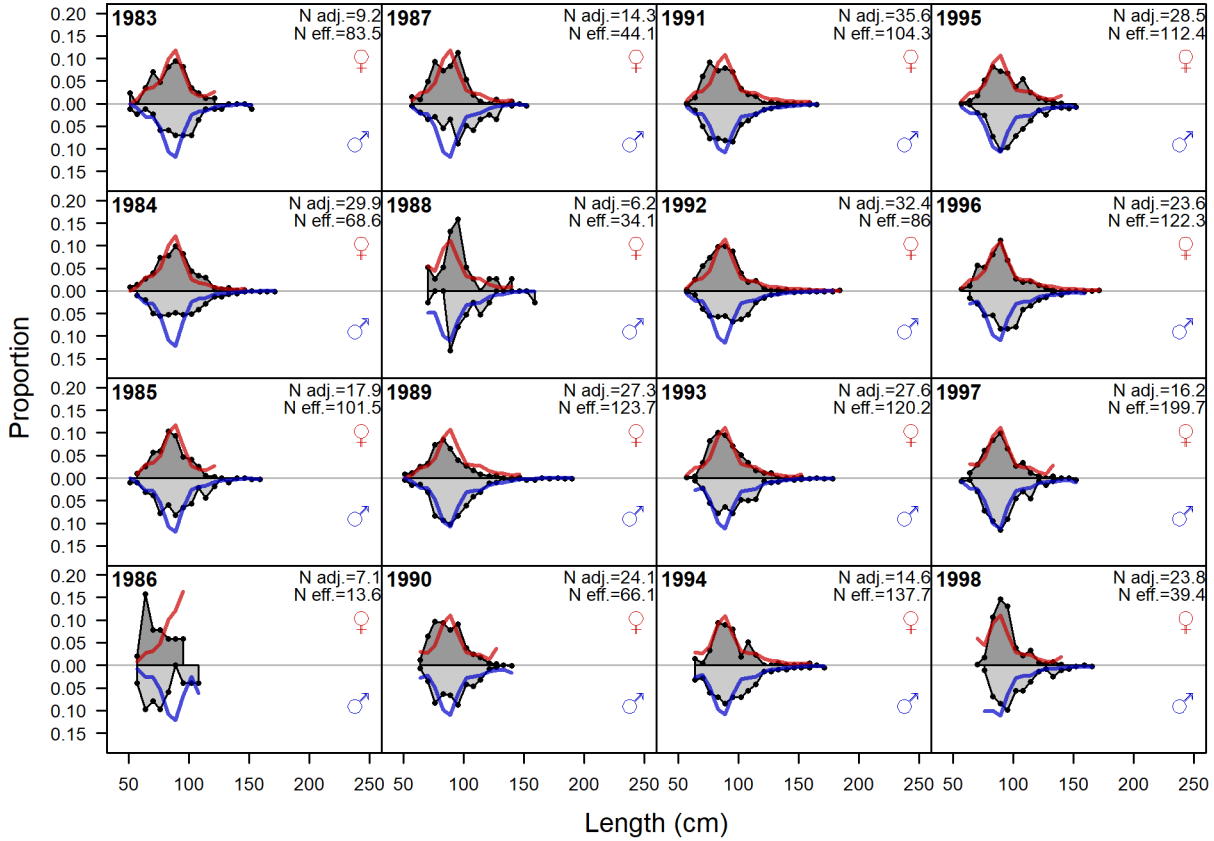
- LVB Female: Linf=191 mm, K=0.25 /year
- LVB Male: Linf=195, K=0.24 /year
- M=0.34 /year
- Maturity function, L50=92 mm; L-W relationship
- Steepness, h=0.95

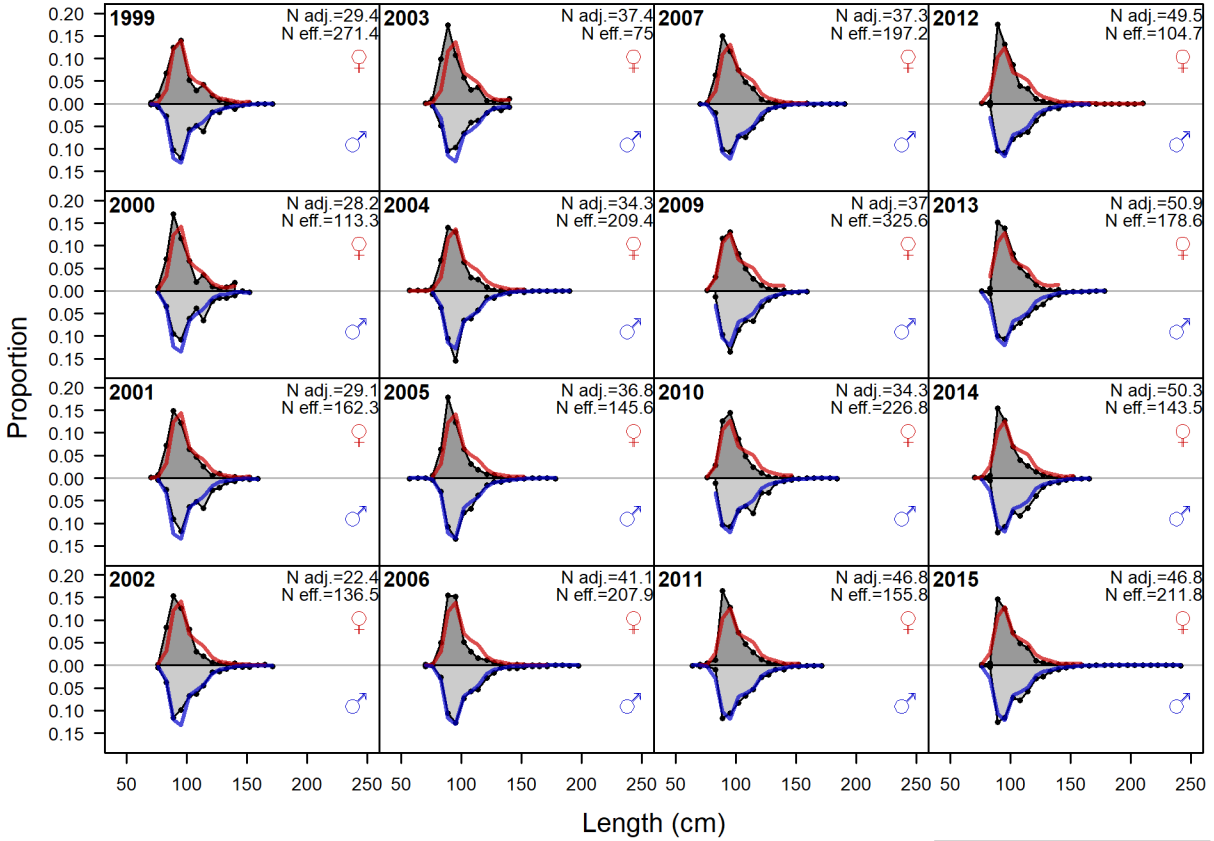
Model Fit

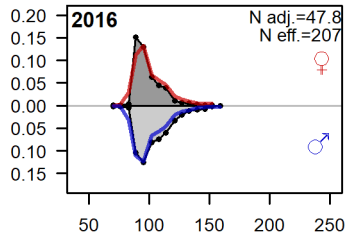

Female ending year selectivity for DIVING
Selectivity, Retention, Mortality
0.0
0.2
0.4
0.6
0.8
1.0
0
50
100
150
200
250
Length (cm)
Selectivity
Retention
Discard mortality
Keep = Sel*Ret
Dead = Sel*(Ret+(1-Ret)*Mort)
Discard = Sel*(1-Ret)


Female ending year selectivity for POTS_TRAPS
Selectivity, Retention, Mortality
0.0
0.2
0.4
0.6
0.8
1.0
0
50
100
150
200
250
Length (cm)
Selectivity
Retention
Discard mortality
Keep = Sel*Ret
Dead = Sel*(Ret+(1-Ret)*Mort)
Discard = Sel*(1-Ret)

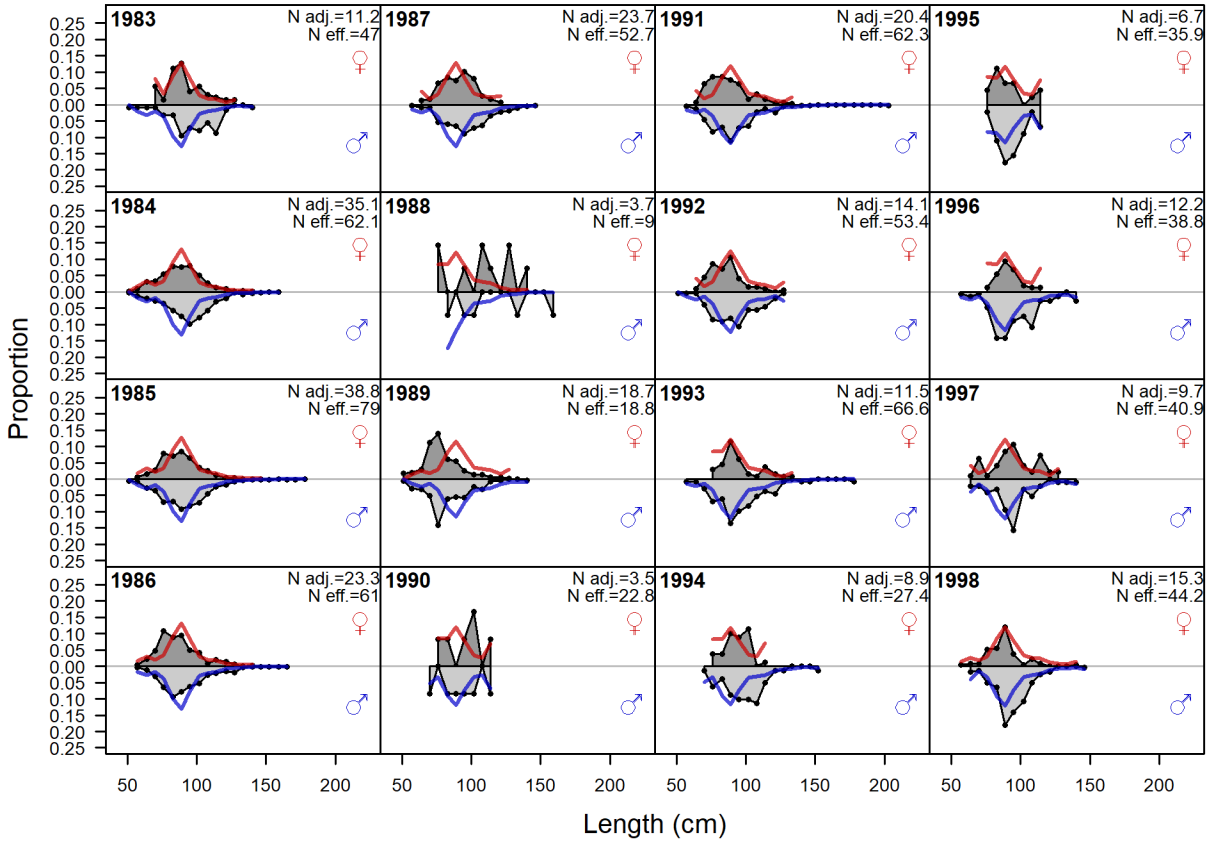
Dive

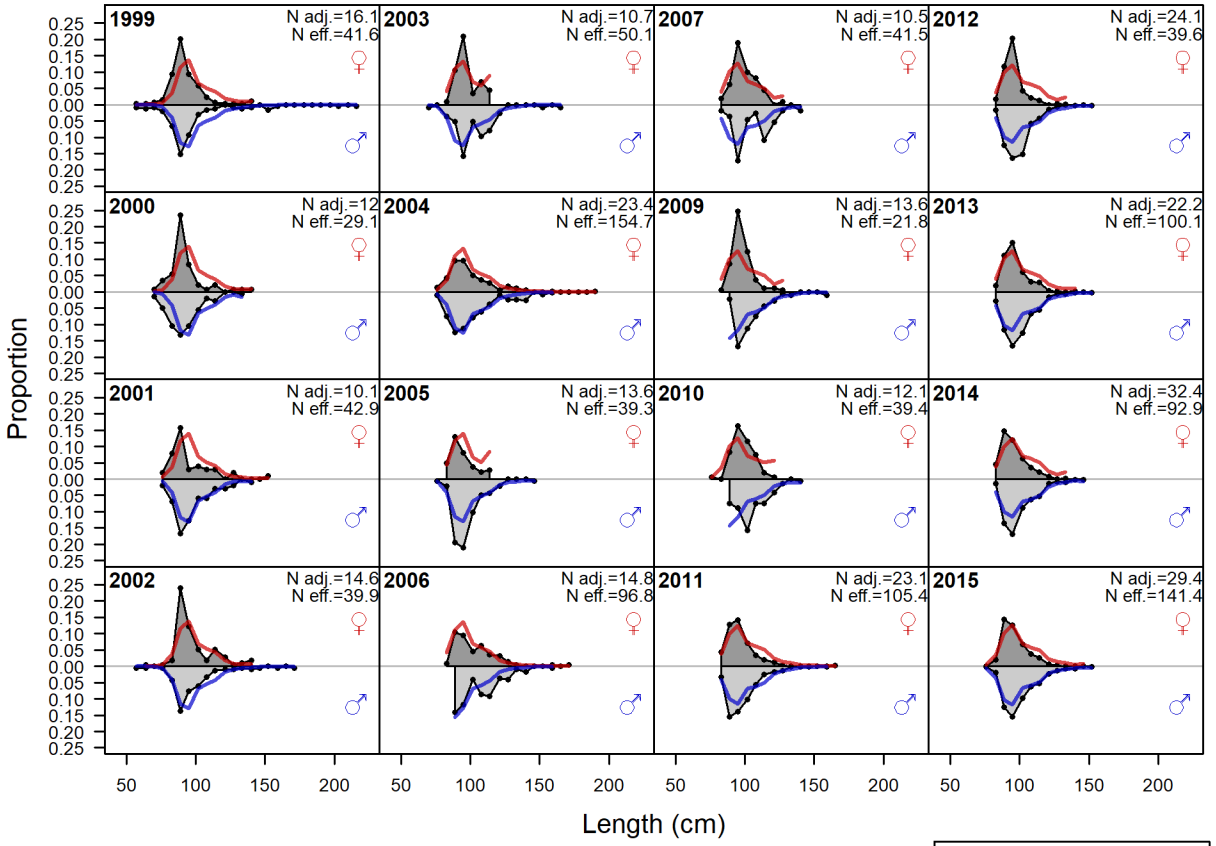

1983 N adj.=9.2 N eff.=83.5
1987 N adj.=14.3 N eff.=44.1
1991 N adj.=35.6 N eff.=104.3
1995 N adj.=28.5 N eff.=112.4
1984 N adj.=29.9 N eff.=68.6
1988 N adj.=6.2 N eff.=34.1
1992 N adj.=32.4 N eff.=86
1996 N adj.=23.6 N eff.=122.3
1985 N adj.=17.9 N eff.=101.5
1989 N adj.=27.3 N eff.=123.7
1993 N adj.=27.6 N eff.=120.2
1997 N adj.=16.2 N eff.=199.7
1986 N adj.=7.1 N eff.=13.6
1990 N adj.=24.1 N eff.=66.1
1994 N adj.=14.6 N eff.=137.7
1998 N adj.=23.8 N eff.=39.4
Proportion
Length (cm)

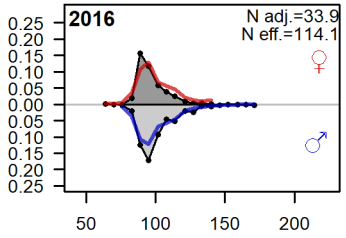

1999 N adj.=29.4 N eff.=271.4
2003 N adj.=37.4 N eff.=75
2007 N adj.=37.3 N eff.=197.2
2012 N adj.=49.5 N eff.=104.7
2000 N adj.=28.2 N eff.=113.3
2004 N adj.=34.3 N eff.=209.4
2009 N adj.=37 N eff.=325.6
2013 N adj.=50.9 N eff.=178.6
2001 N adj.=29.1 N eff.=162.3
2005 N adj.=36.8 N eff.=145.6
2010 N adj.=34.3 N eff.=226.8
2014 N adj.=50.3 N eff.=143.5
2002 N adj.=22.4 N eff.=136.5
2006 N adj.=41.1 N eff.=207.9
2011 N adj.=46.8 N eff.=155.8
2015 N adj.=46.8 N eff.=211.8
Proportion
Length (cm)


2016 N adj.=47.8 N eff.=207

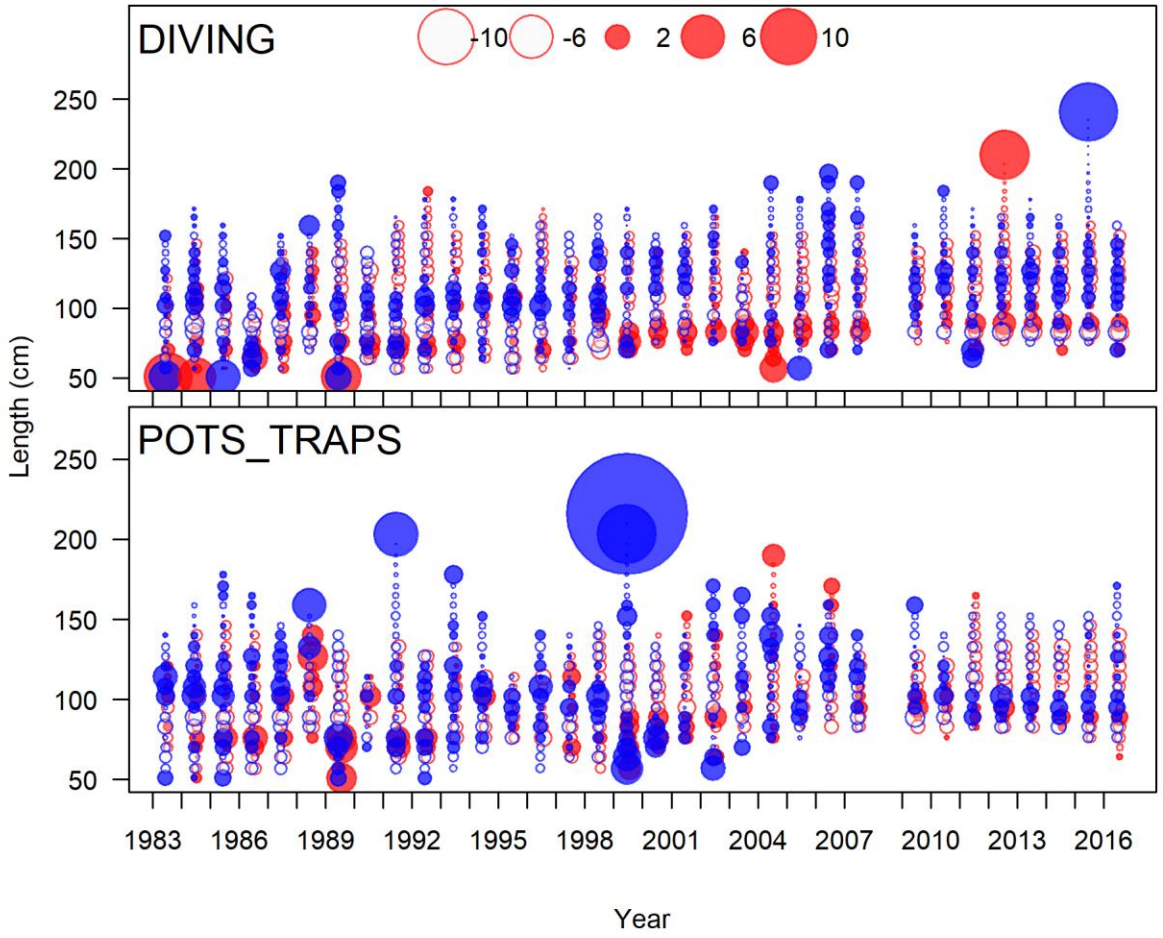
Pots and traps



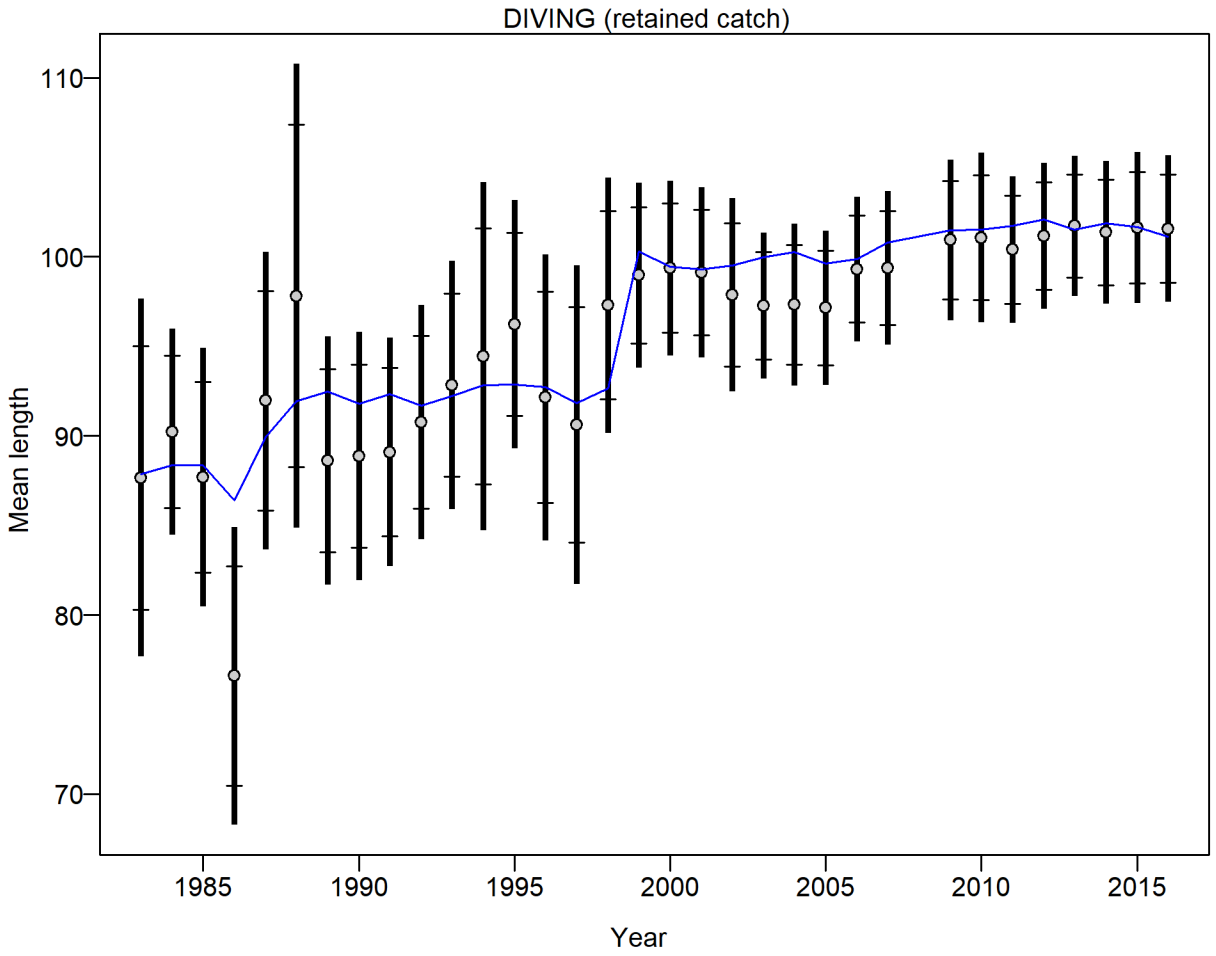




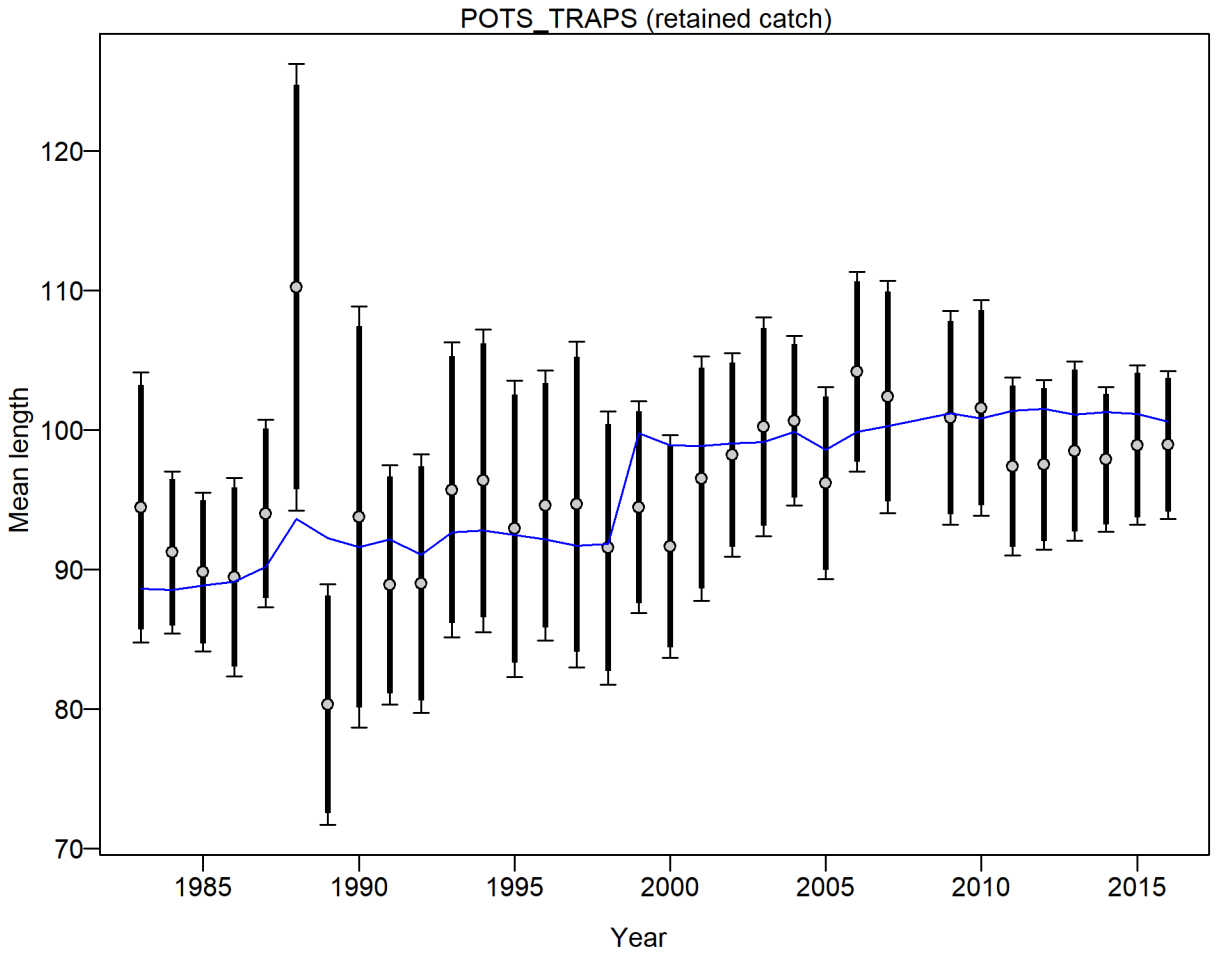
Length composition residuals



Dive

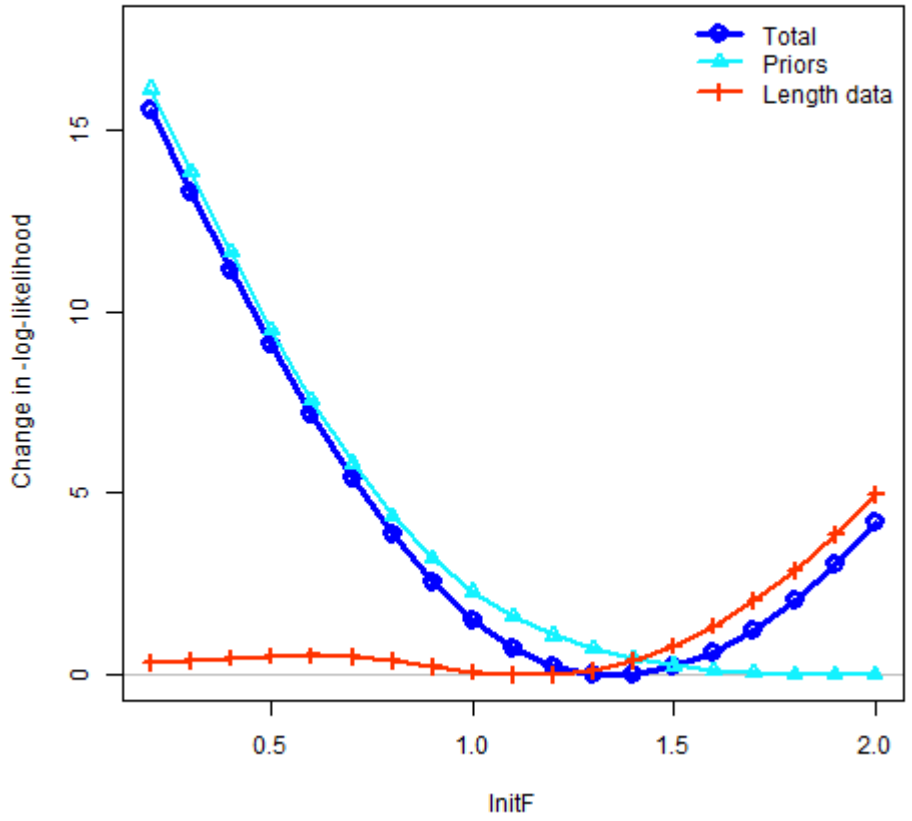

DIVING (retained catch)
Mean length
110
100
90
80
70
1985
1990
1995
2000
2005
2010
2015
Year

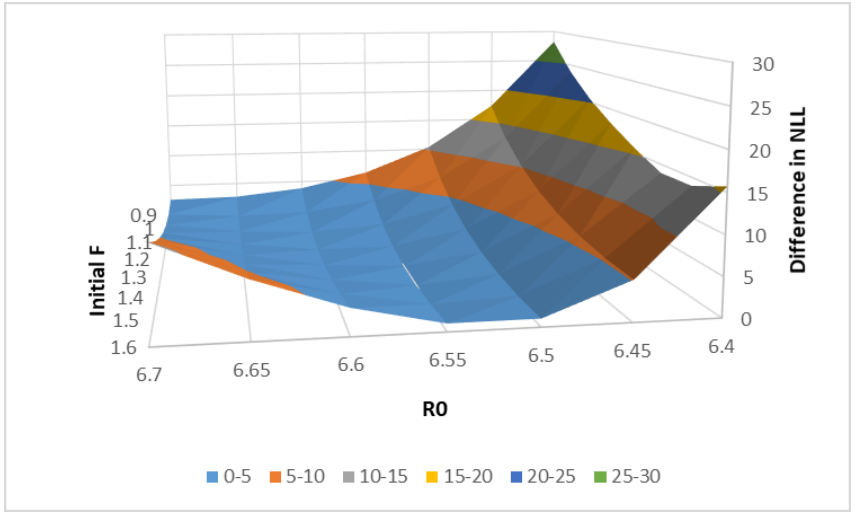
Pots and traps

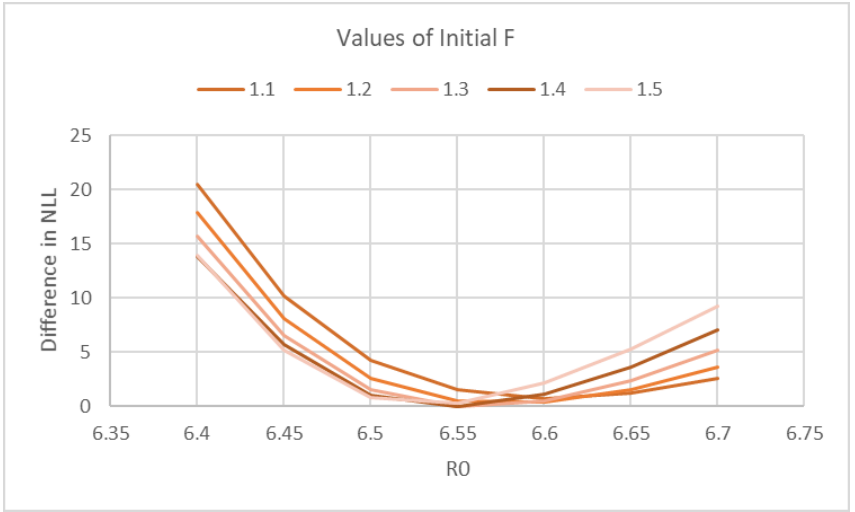


Diagnostics

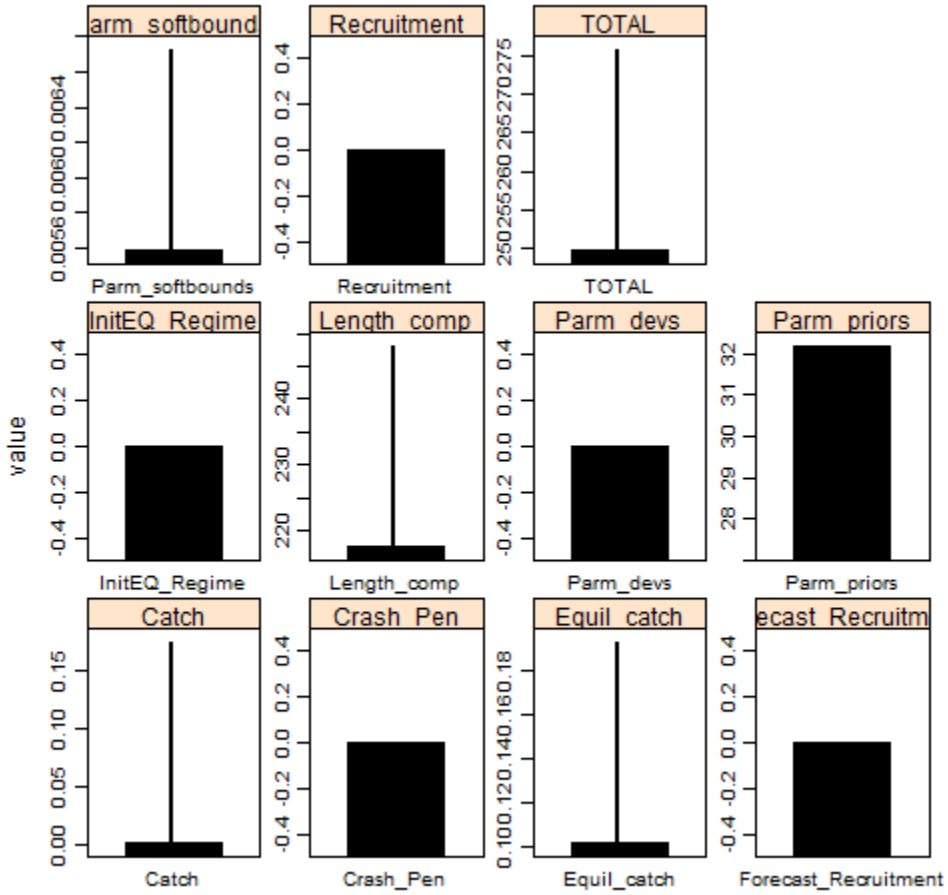
Profile likelihood

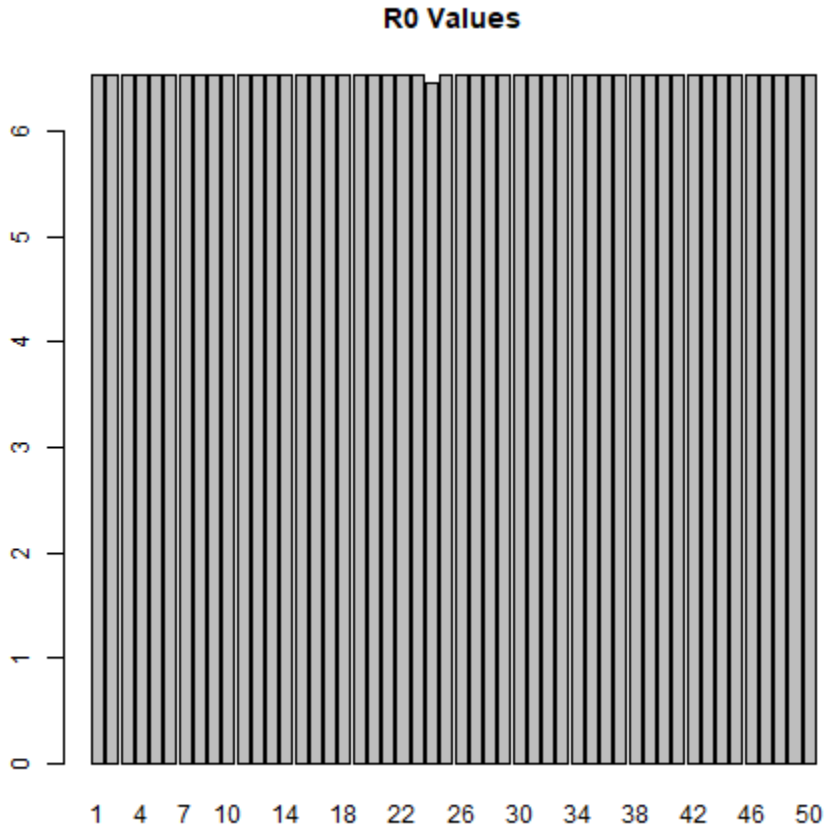






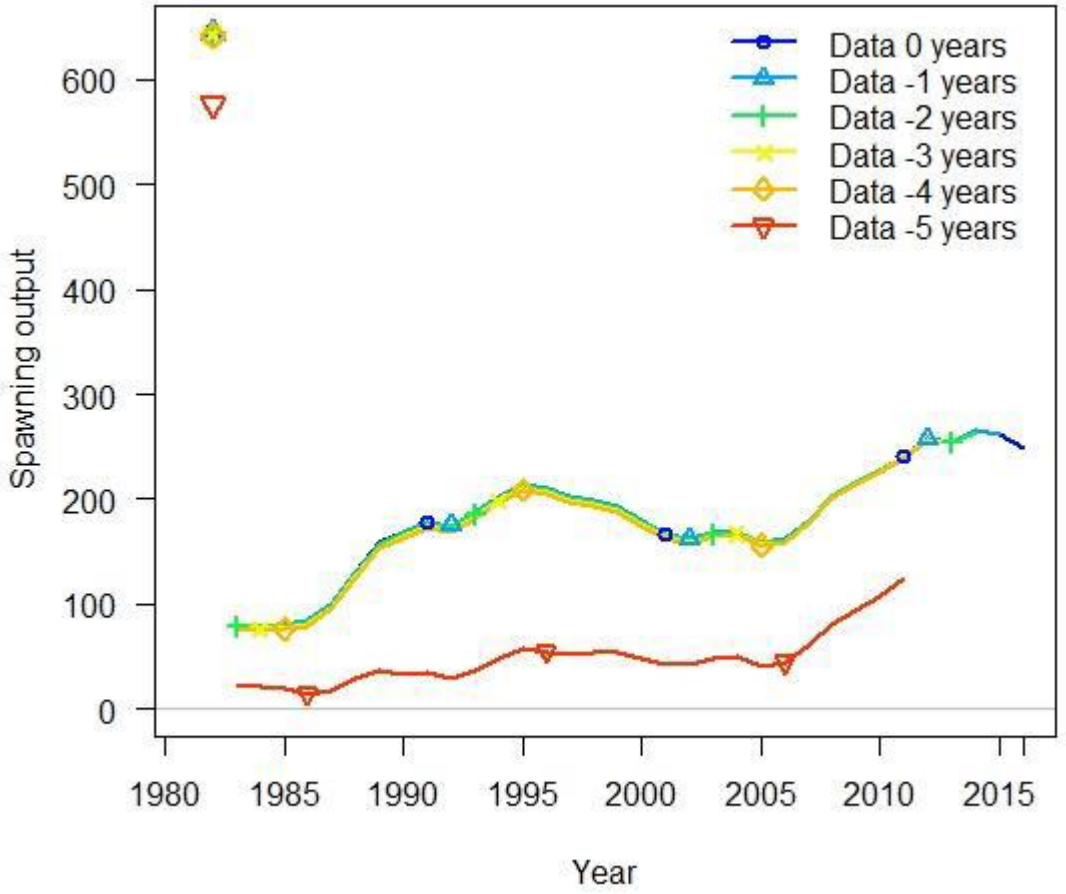
Jitter

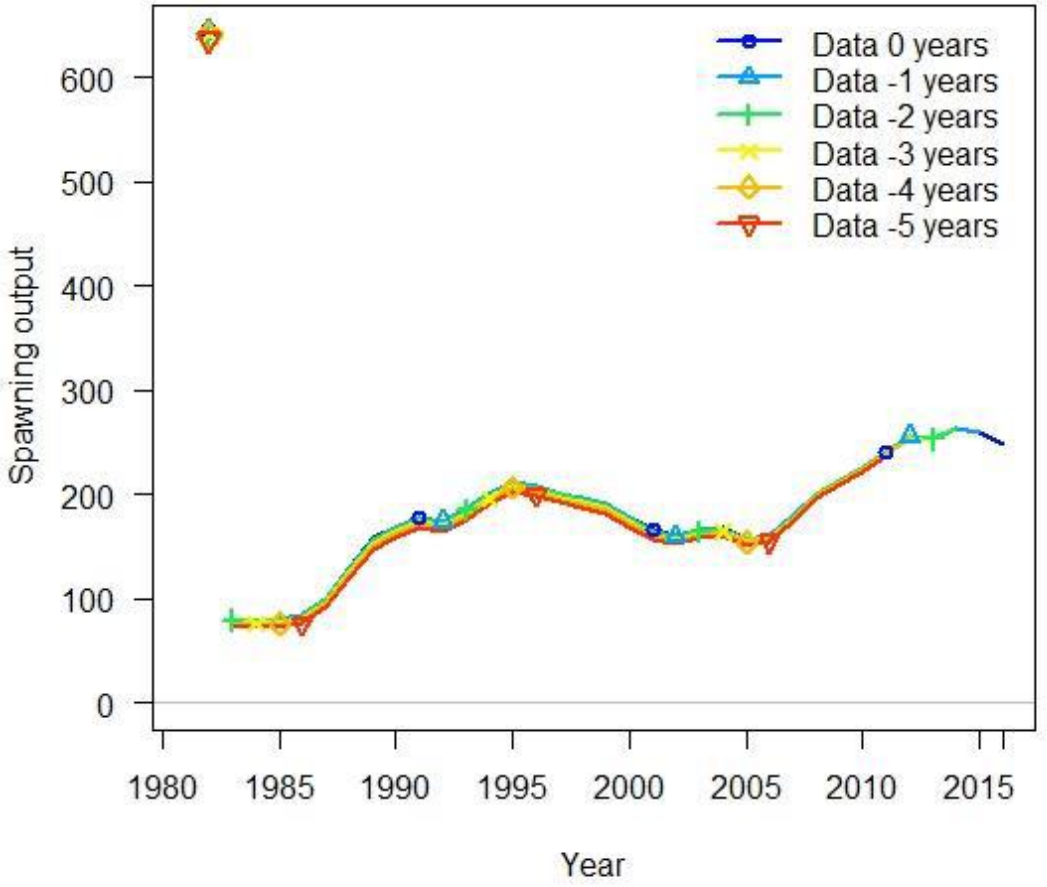

arm_softbound
Recruitment
TOTAL
Parm_softbounds
Recruitment
TOTAL
InitEQ_Regime
Length_comp
Parm_devs
Parm_priors
InitEQ_Regime
Length_comp
Parm_devs
Parm_priors
Catch
Crash_Pen
Equil_catch
ecast_Recruitm
Catch
Crash_Pen
Equil_catch
Forecast_Recruitment
value


R0 Values
0
1
2
3
4
5
6
1
4
7
10
14
18
22
26
30
34
38
42
46
50

Retrospective patterns

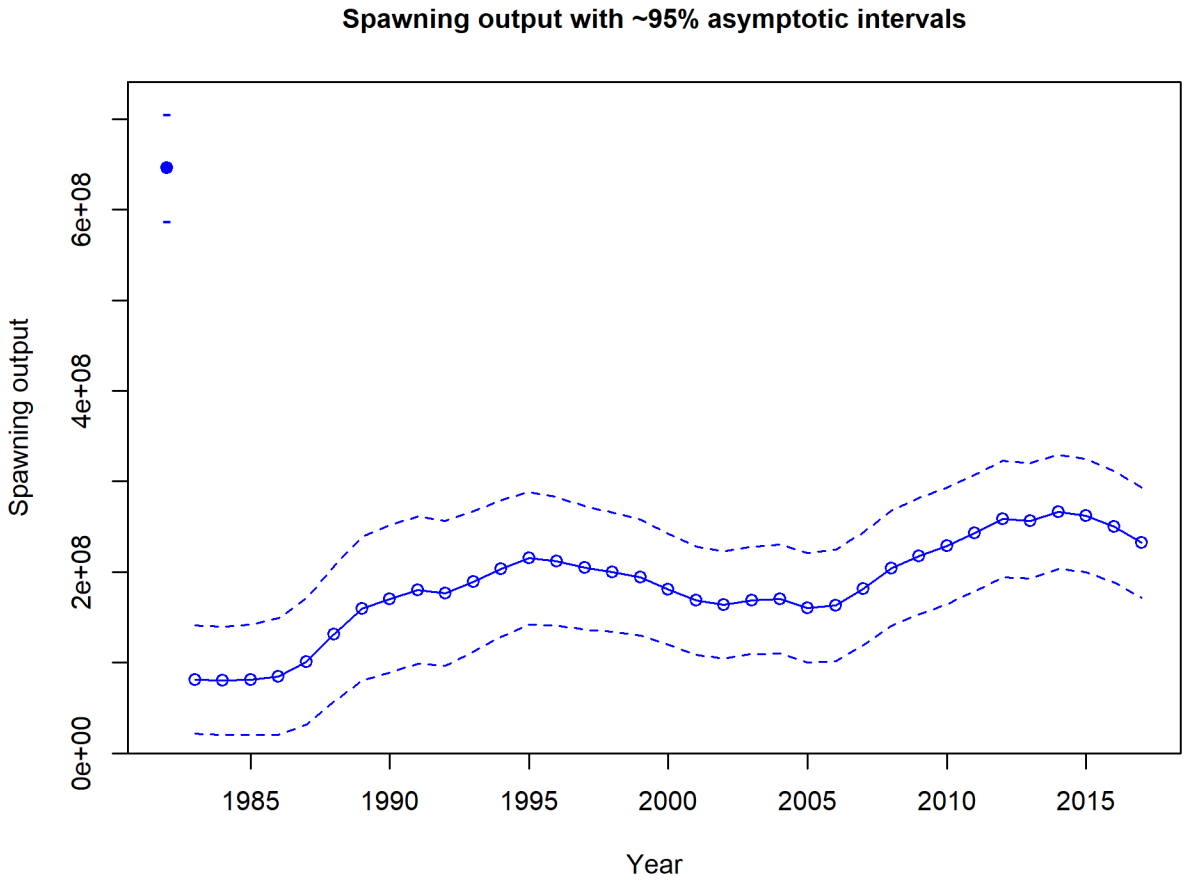
filtered to remove years with small sample size ($\sqrt{n} < 8$)

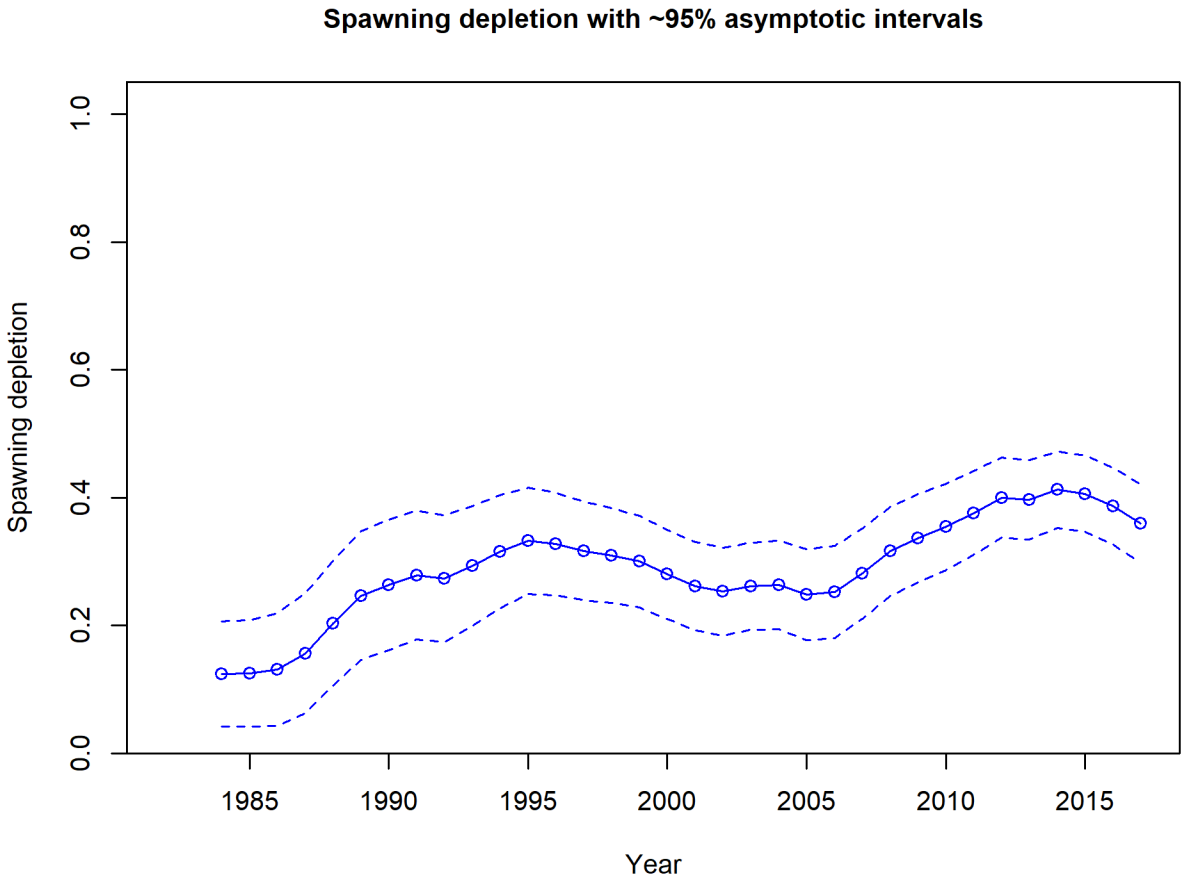




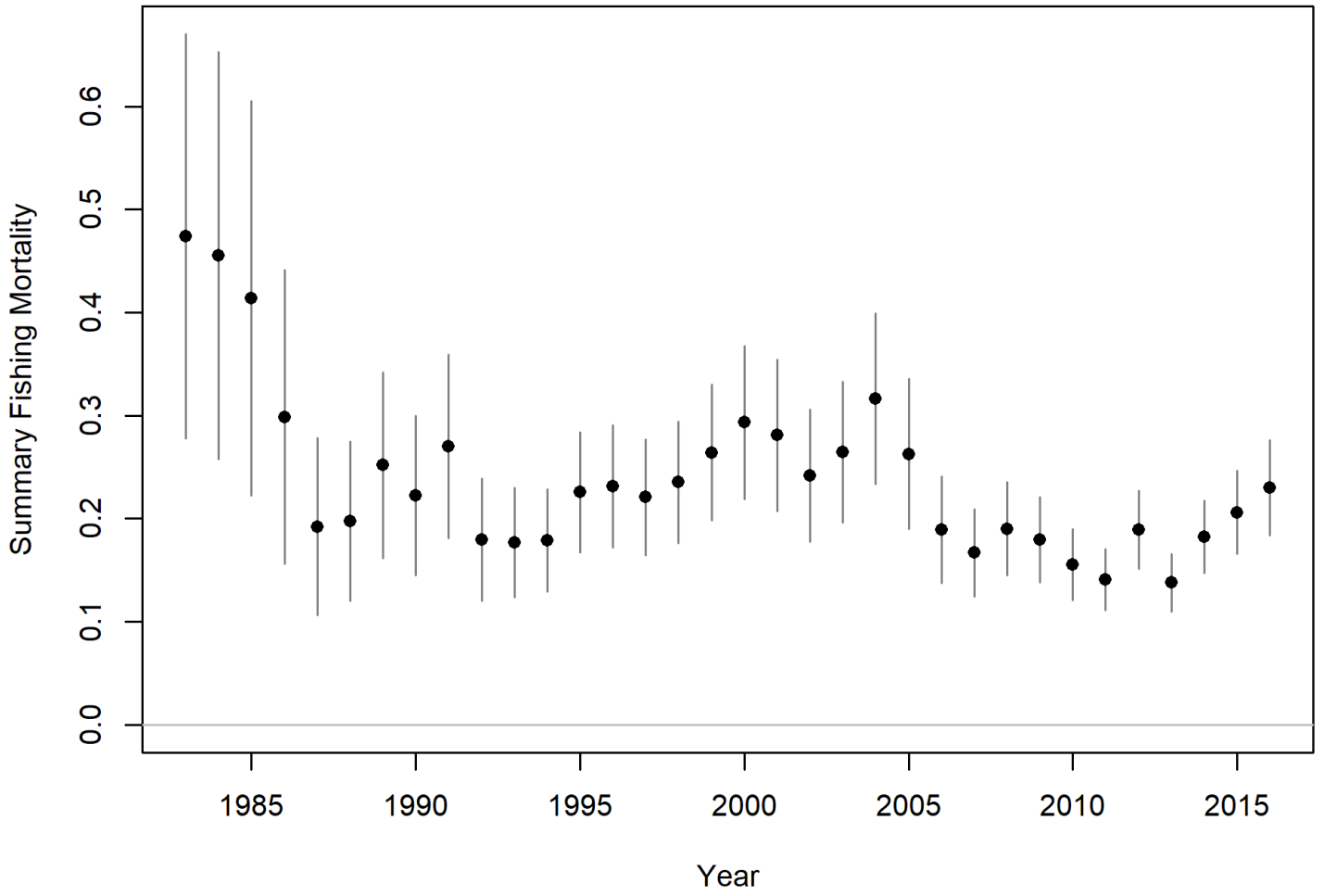
Derived Quantities

Biomass trend





Harvest rate (biomass landed / total biomass)



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