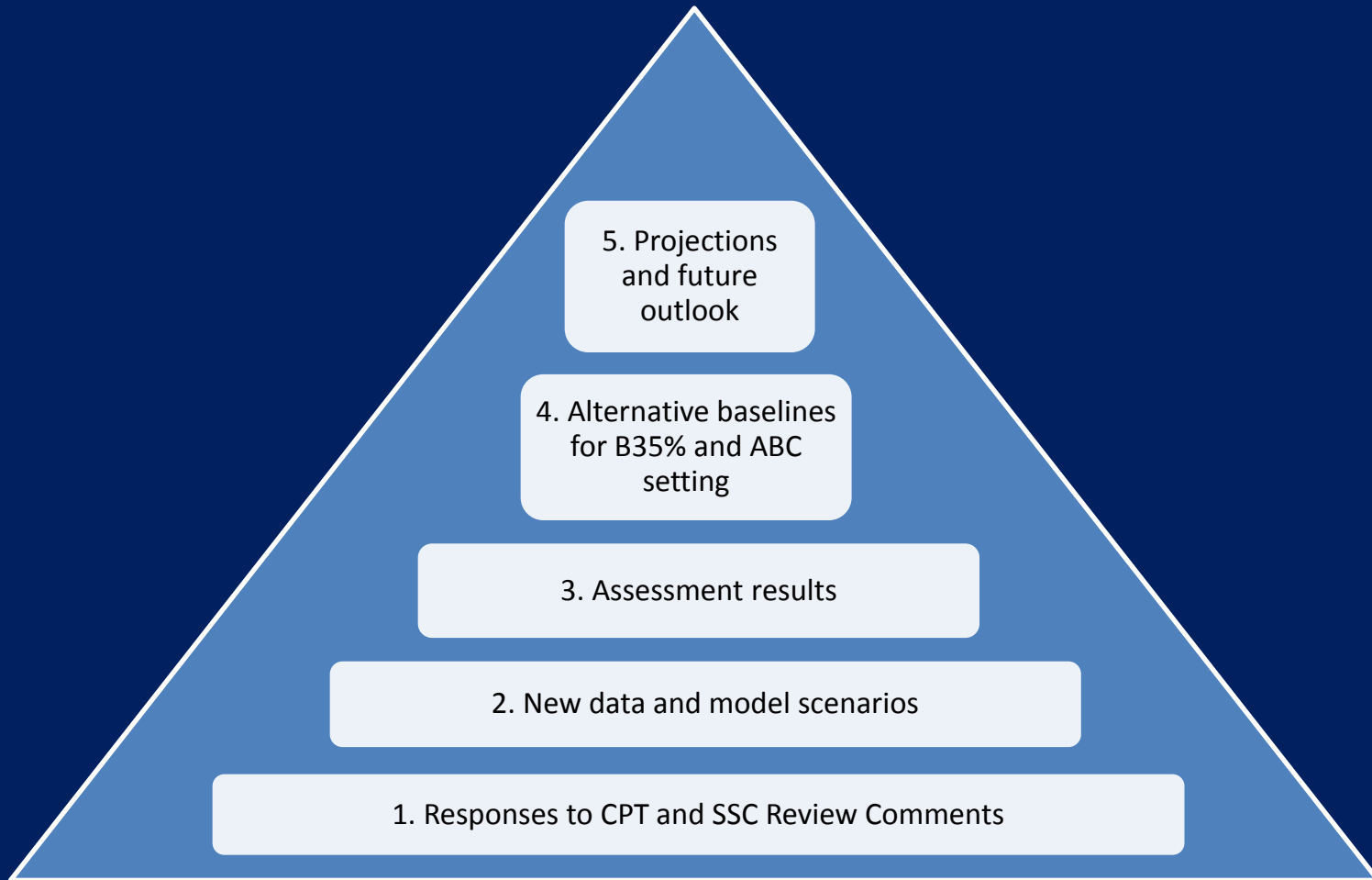


# **Bristol Bay Red King Crab Assessment in Fall 2014**

**J. Zheng and M.S.M. Siddeek**  
**ADF&G, Juneau**

# Outline



# Response to CPT Comments

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*“1. Drop Scenarios 4 and 4b because these use the old data.”*

Done.

*“2. Move forward with Scenarios 4na, 4nb for September 2014.”*

Done.

*“3. Although it appears to result in improved model fits, drop Scenario 4nb7 from consideration until a mechanism for the estimated higher M can be established; this scenario can be presented for reconsideration once a plausible mechanism has been identified.”*

SSC asked to continue 4nb7, which has been changed to 4n7. So scenario 4n7 is still in the SAFE report for September 2014.

*“4. Add the number of estimated parameters to tables that compare values for likelihood components from different Scenarios so that the degree of improved fit can be more easily evaluated. Also, express the values of log-likelihood components between the base and alternative models as differences (e.g., base less alternative), rather than reporting the actual values because it is the differences in log-likelihood values that are informative.”*

Done.

# Response to SSC Comments

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1. Include scenario 4n7.
2. Need to change scenario names
3. A scenario with random walk may be added in May assessments in the future.
4. Recruitment dynamics is the top priority for our research. We will continue to investigate factors that impact recruitment strength.

# Summary of Major Changes in 2014

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1. Changes to the input data:
  - a. Newly re-estimated trawl survey results provided by NMFS in 2014 were used.
  - b. Catch and bycatch data were updated with 2014 data.
  - c. Trawl bycatch length frequency data during 1986-2012 and trawl bycatch abundance data during 2009-2012 were revised based on the new data provided by NMFS in 2014.
  - d. Tanner crab fishery bycatch length frequency and abundance data were revised based on the revised data provided by ADF&G in 2014.

# Summary of Major Changes in 2014

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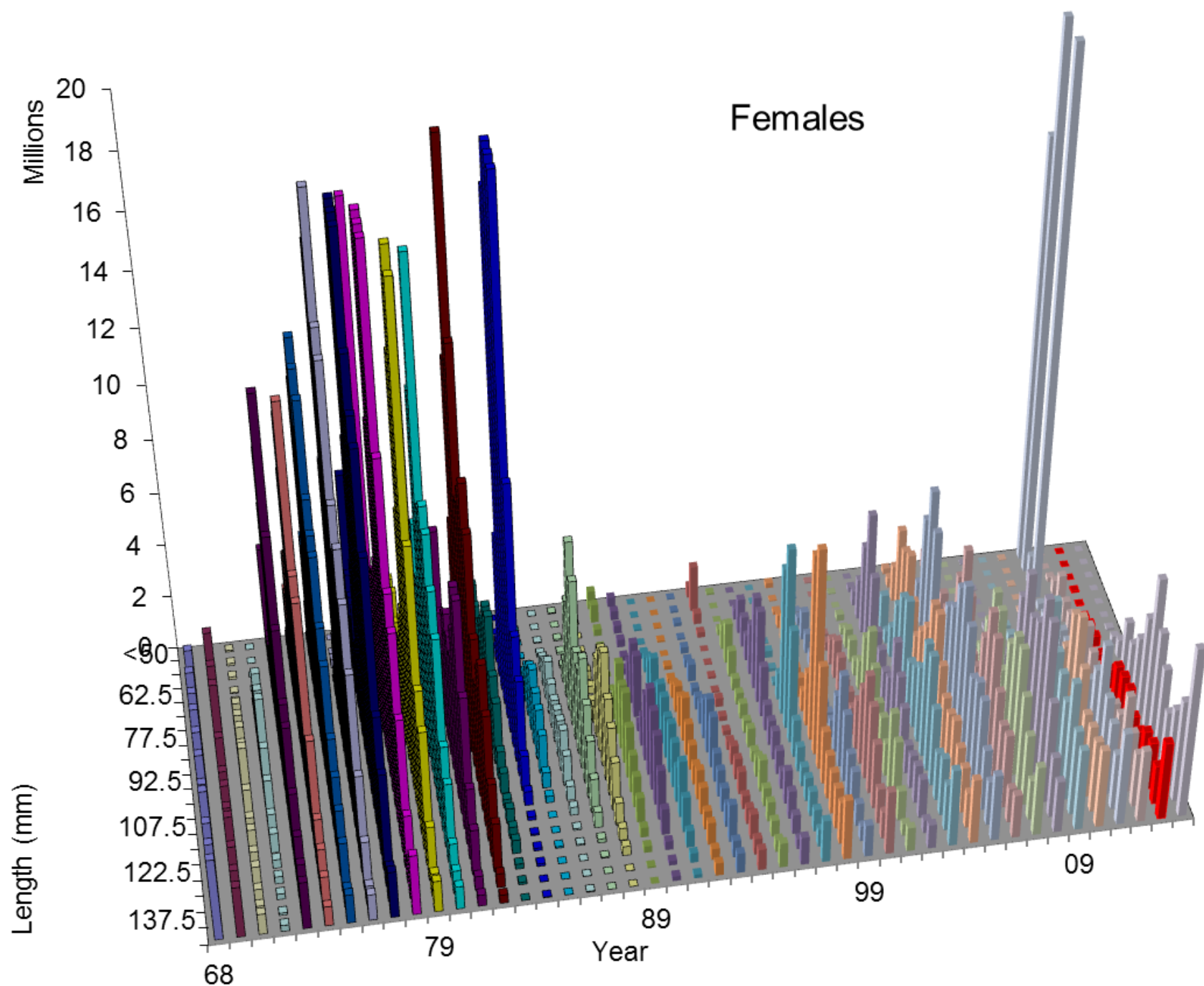
## 2. Changes to the assessment methodology:

Three model scenarios are evaluated in this report:

Scenarios 4na and 4nb: the same as scenarios 4na and 4nb in the SAFE report in May 2014. Scenario 4na is the same as scenario 4 used to set OFL in 2013. Scenario 4nb differs with scenario 4na by estimating trawl survey catchability within the model.

Scenario 4n7: the same as scenario 4nb7 in the SAFE report in May 2014. Scenario 4n7 is the same as scenario 4nb except it estimates one additional natural mortality parameter for both males and females during 2006-2010.





Females

Millions

Length (mm)

Year

68

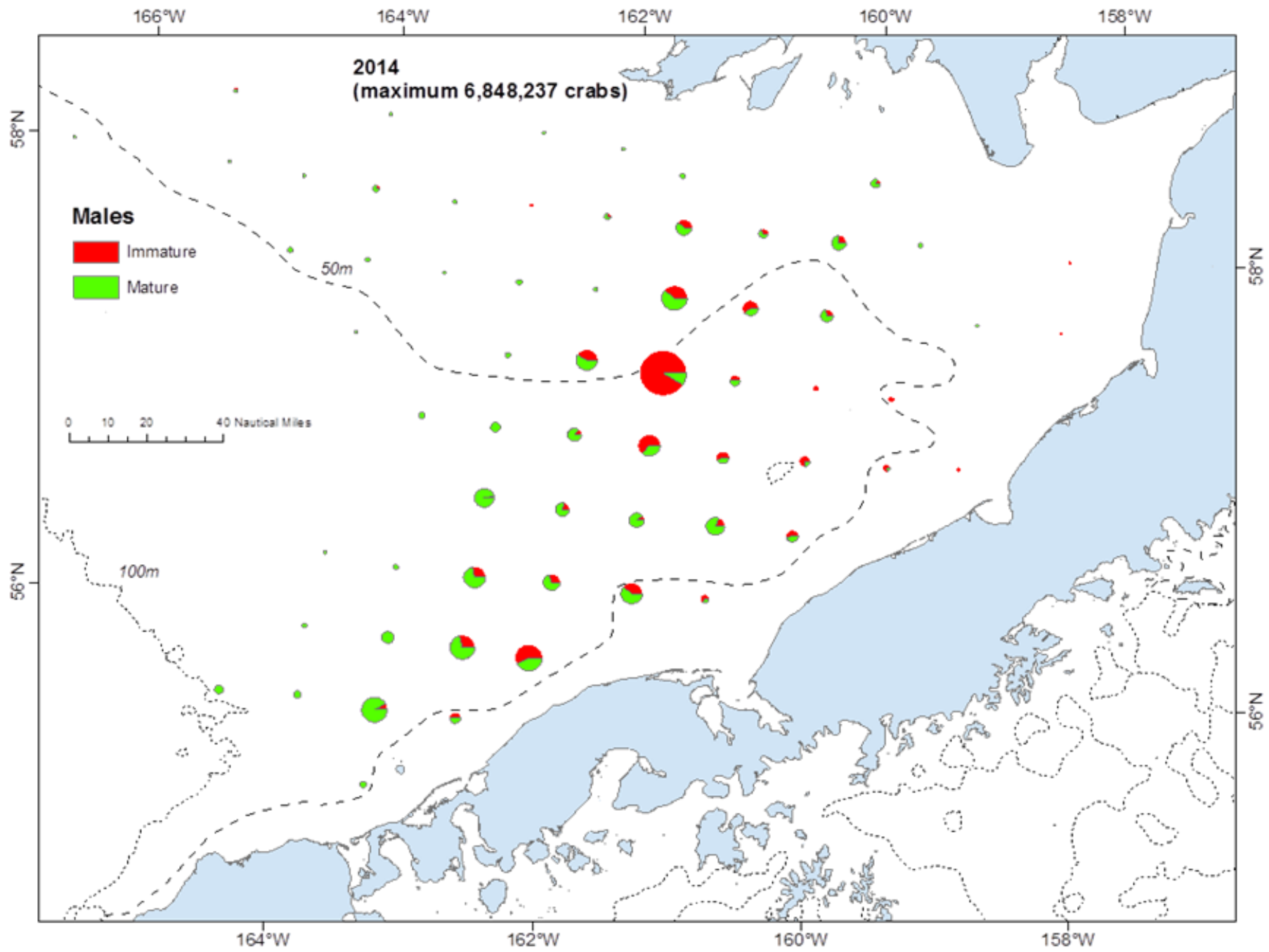
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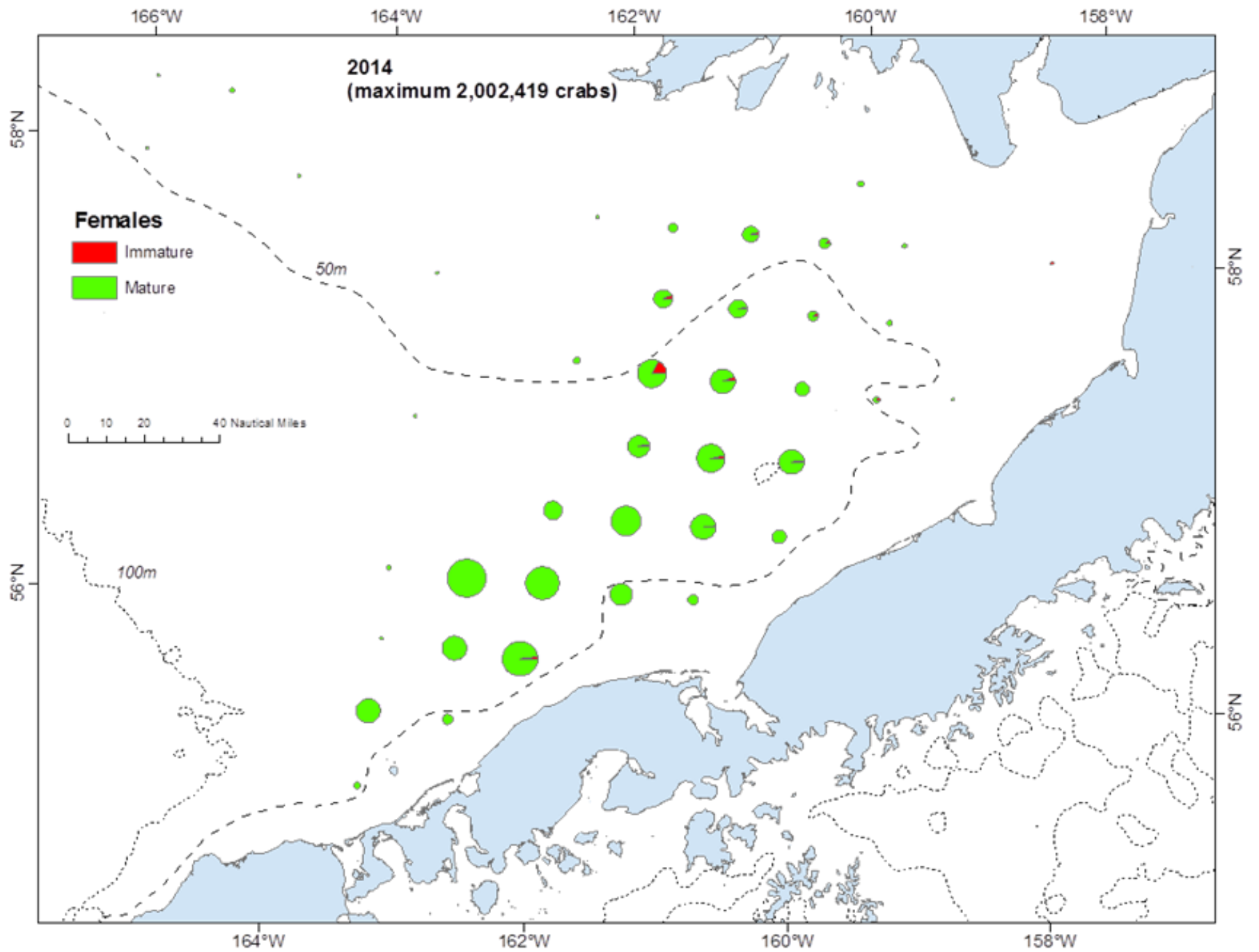
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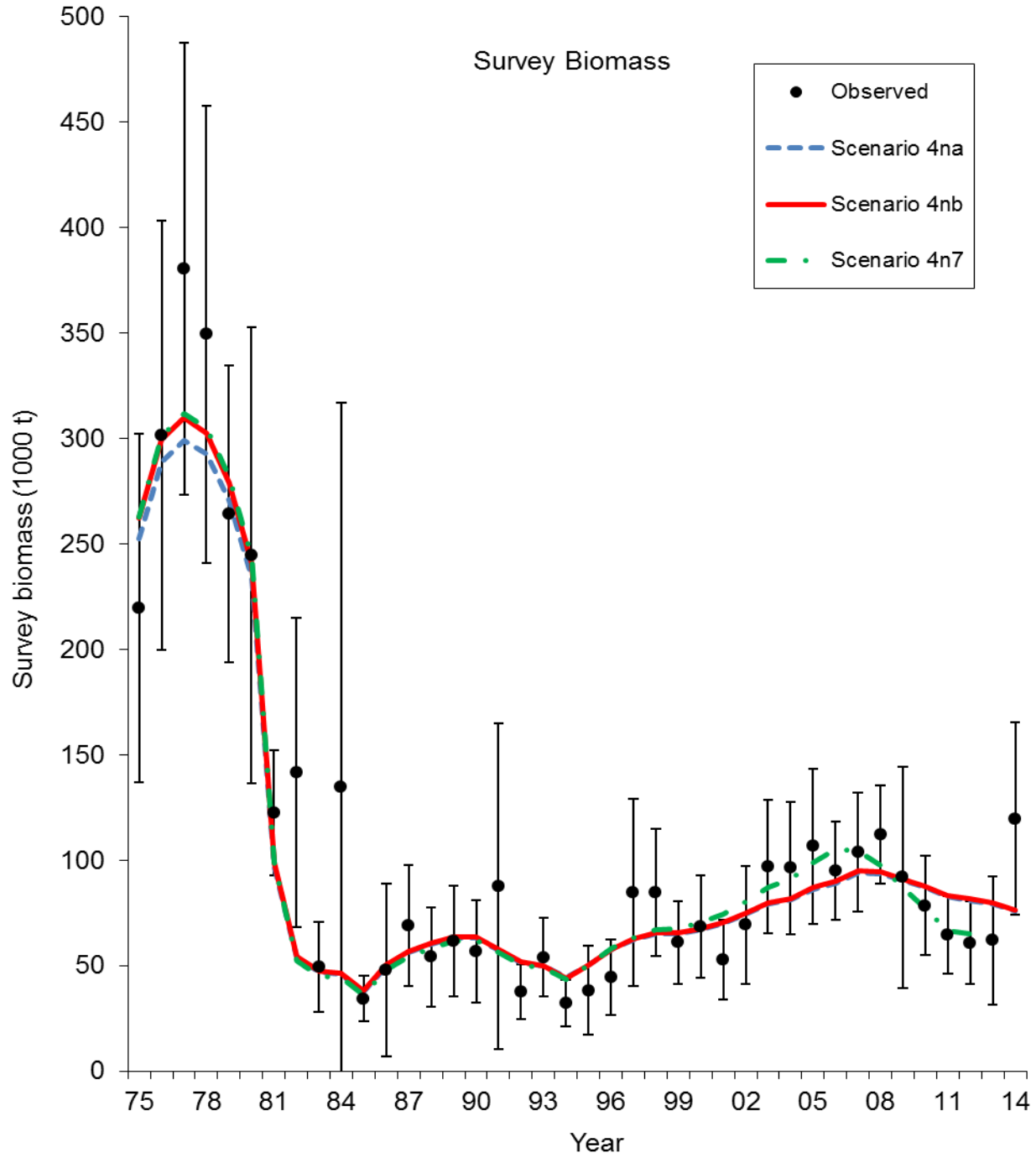
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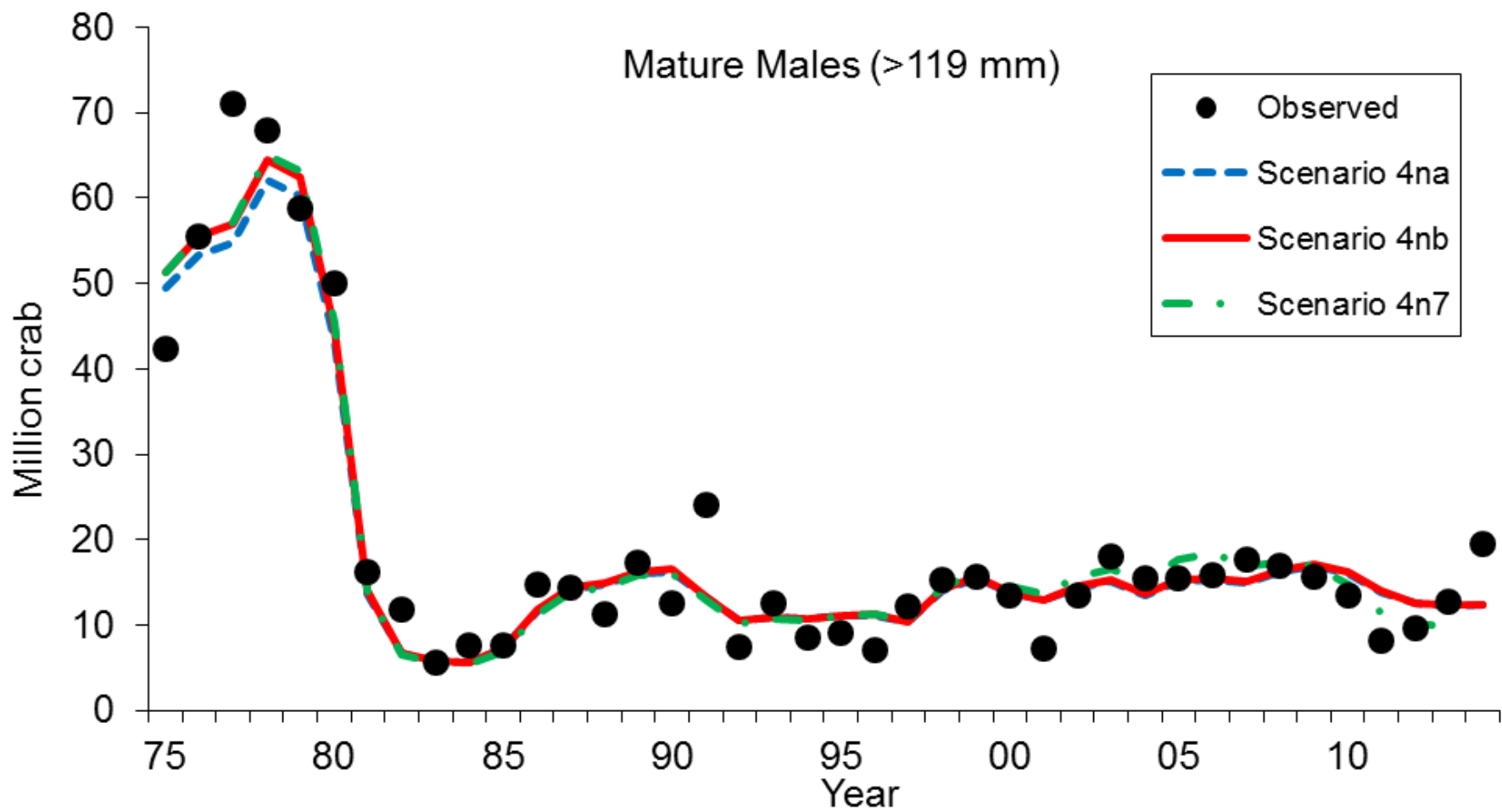
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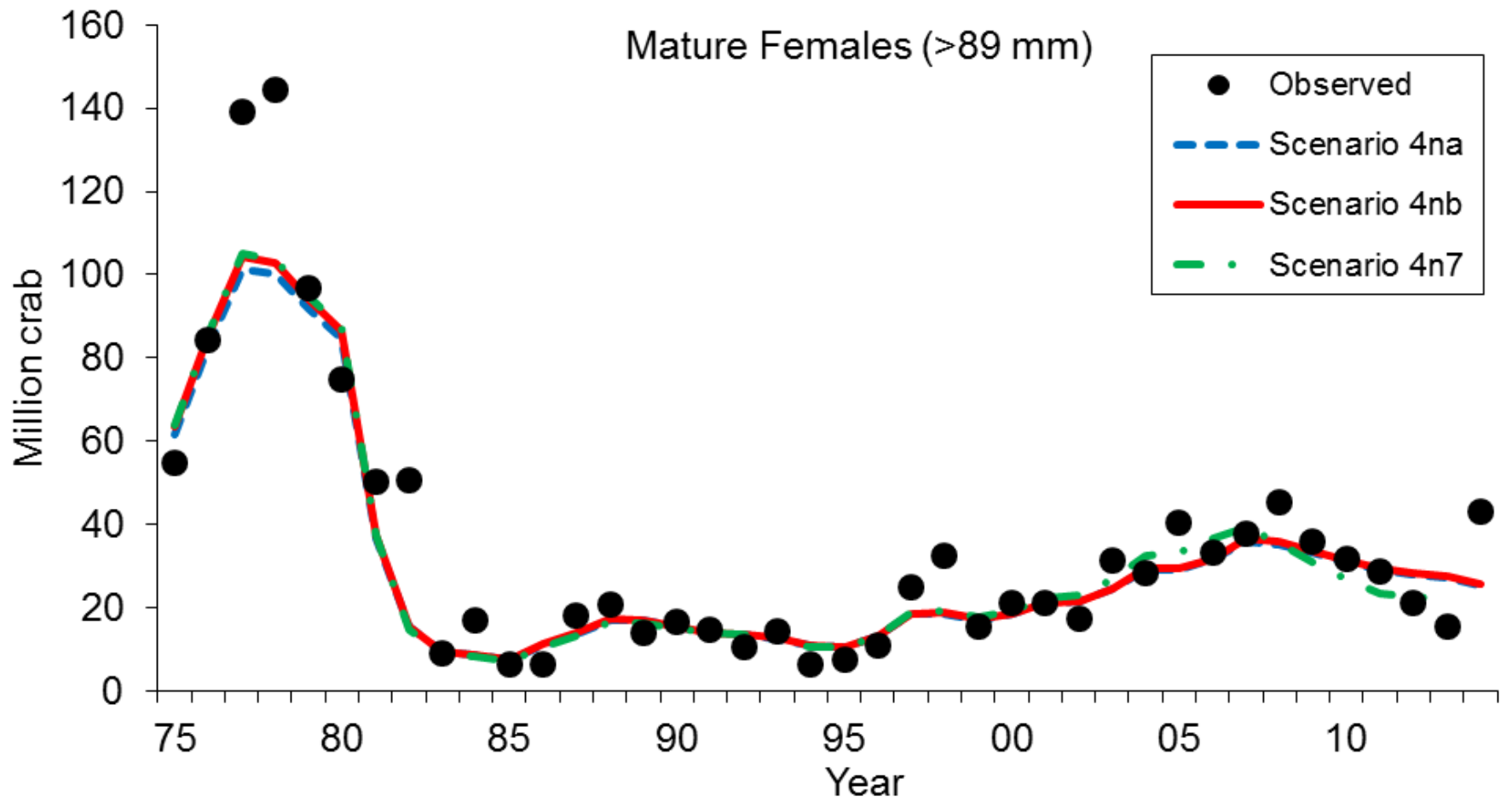


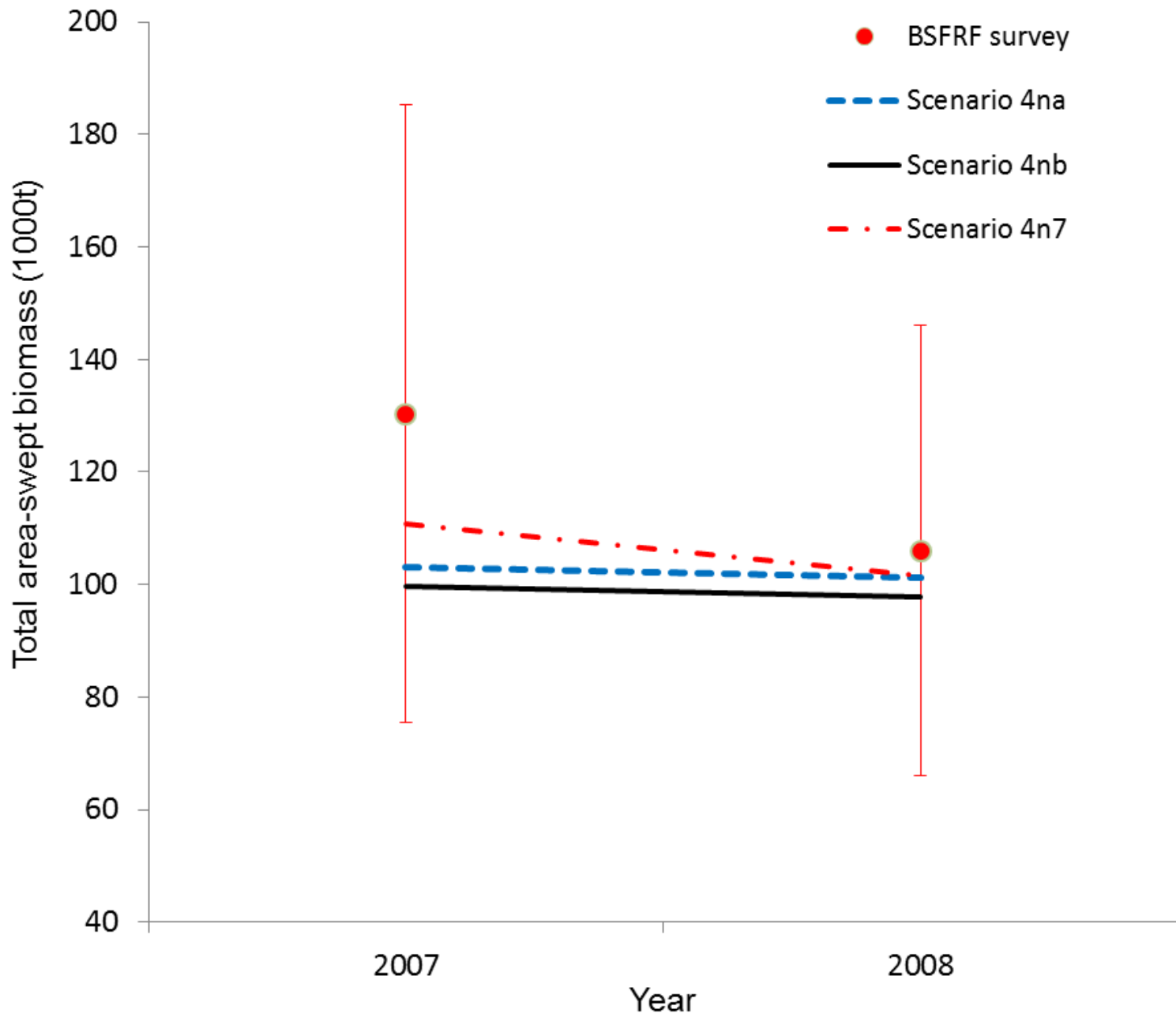










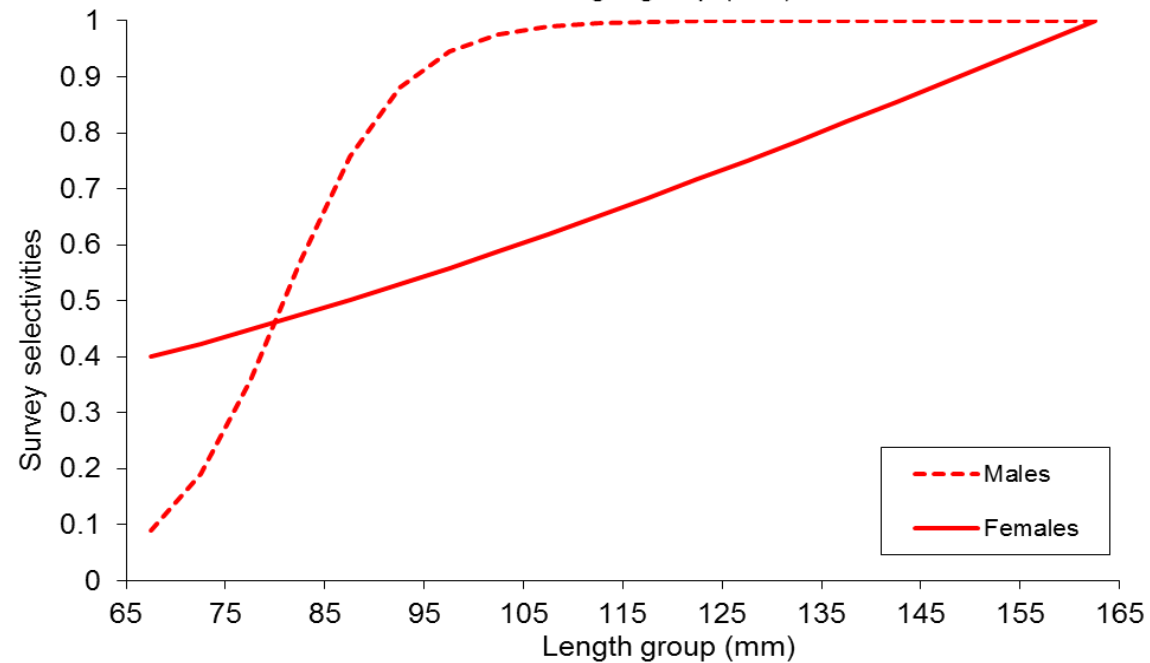
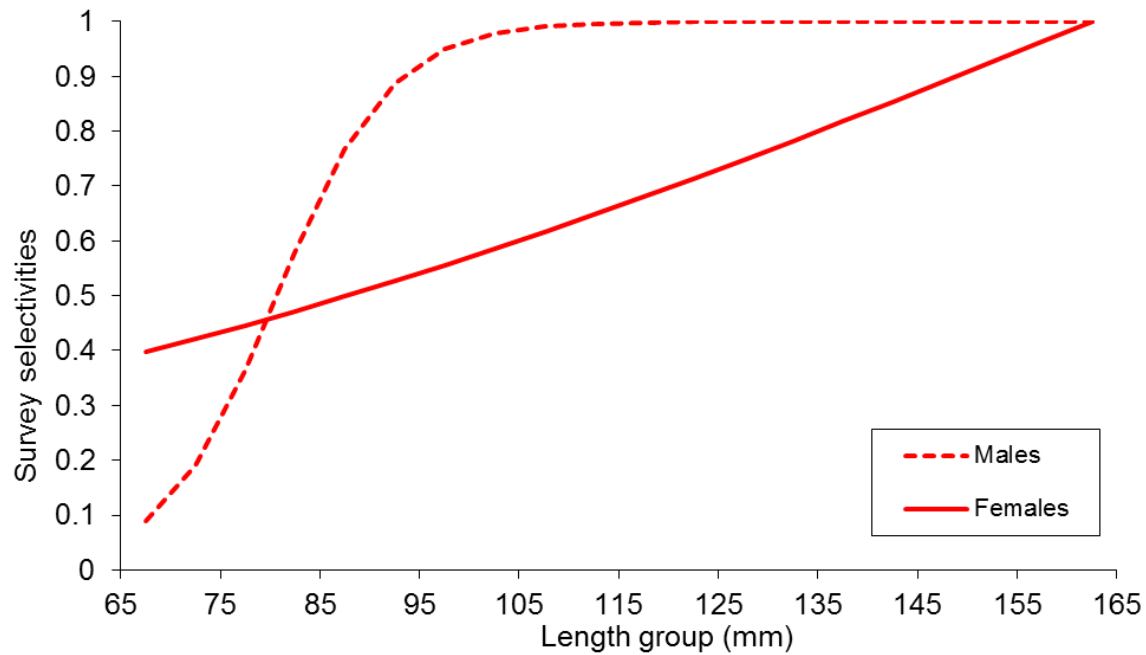


## Scenario

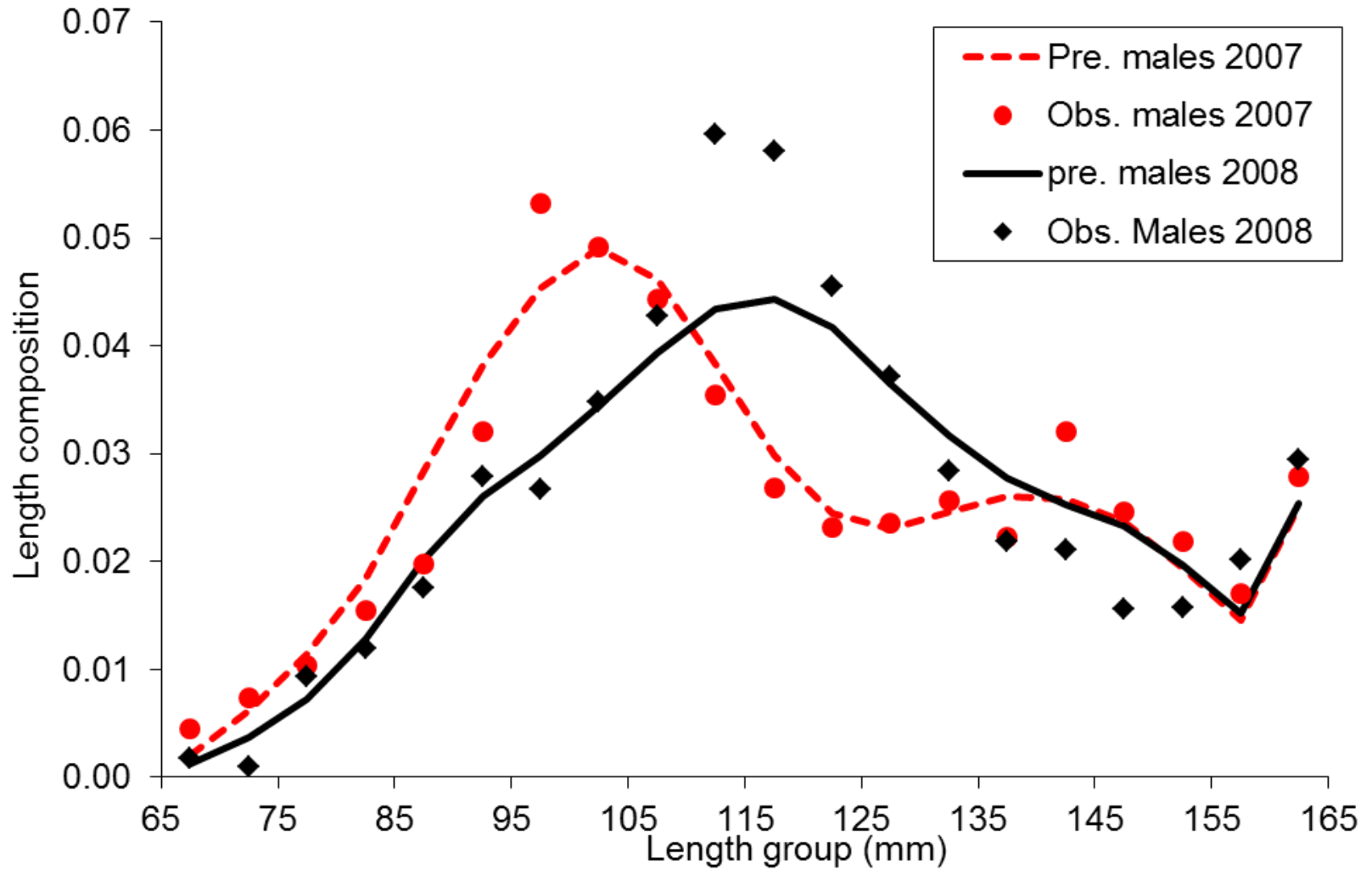
	4na	4nb-4na	4n7-4na	4n7-4nb
Negative log likelihood	4na	4nb-4na	4n7-4na	4n7-4nb
R-variation	78.08	-0.06	2.48	2.54
Length-like-retained	-948.94	-0.54	-2.90	-2.36
Length-like-discmale	-953.65	0.38	1.38	1.00
Length-like-discfemale	-2250.44	-0.67	2.26	2.93
Length-like-survey	-44871.50	-2.20	-12.30	-10.10
Length-like-disctrawl	-1967.16	1.03	2.17	1.14
Length-like-discTanner	-330.52	-0.27	-1.87	-1.60
Length-like-bsfrfsurvey	-237.28	-0.02	-1.71	-1.69
Catchbio_retained	46.35	0.29	-2.46	-2.74
Catchbio_discmale	210.62	-0.35	-6.11	-5.76
Catchbio-discfemale	0.14	0.00	0.03	0.03
Catchbio-disctrawl	0.86	0.00	-0.02	-0.02
Biomass-trawl survey	87.67	-2.31	-4.25	-1.95
Biomass-bsfrfsurvey	-5.42	1.00	2.00	1.00
Others	21.50	1.12	-1.40	-2.52
Total	-51119.70	-2.60	-22.70	-20.10
Free parameters	266	1	2	1

- ✓ The area-swept abundance estimates from the survey in 2014 are higher than expected and are not consistent with the results from the previous several years.
- ✓ Model estimated relative survey biomasses are very similar between scenarios 4na and 4nb and differ with those of 4n7. Increasing natural mortality from 0.18 to 0.27 during 2006-2010 under scenario 4n7 provided a better fit of trawl survey data during recent years, resulting in a much lower OFL.
- ✓ Scenario 4nb is recommended for overfishing determination this year. The full results for scenarios 4na and 4nb are presented in this report.

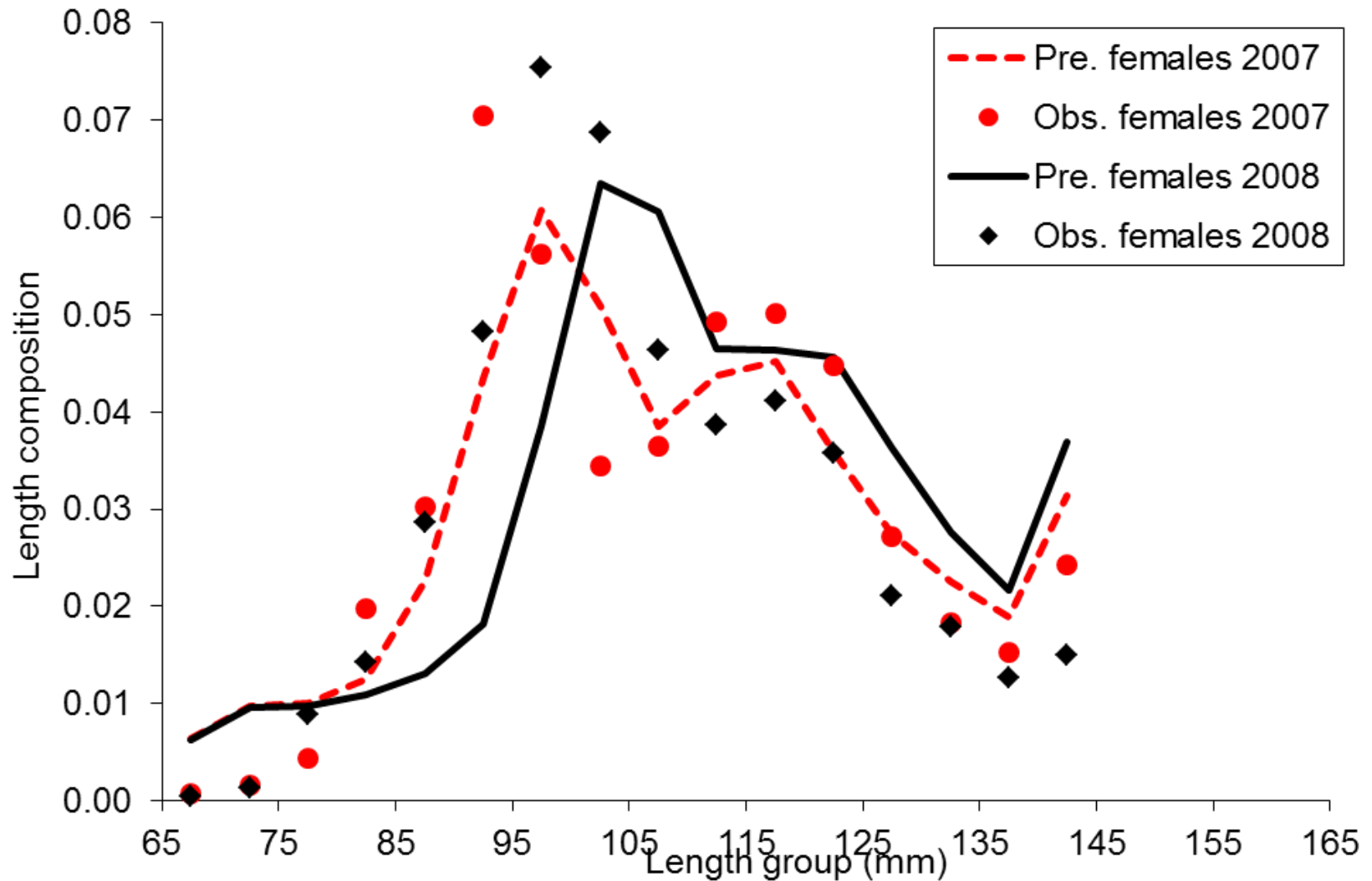




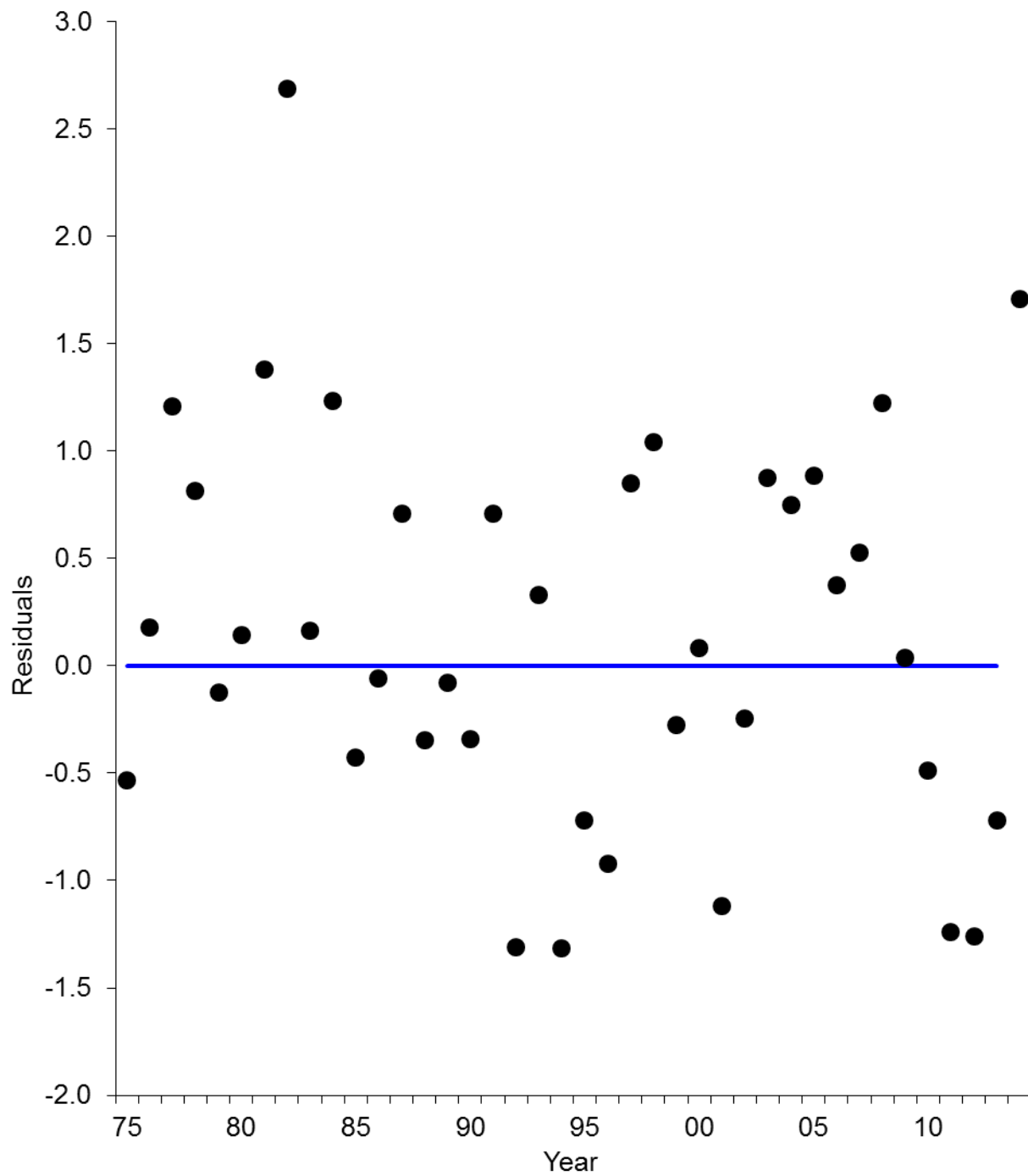
# BSFRF survey length frequency (scenario 4na)



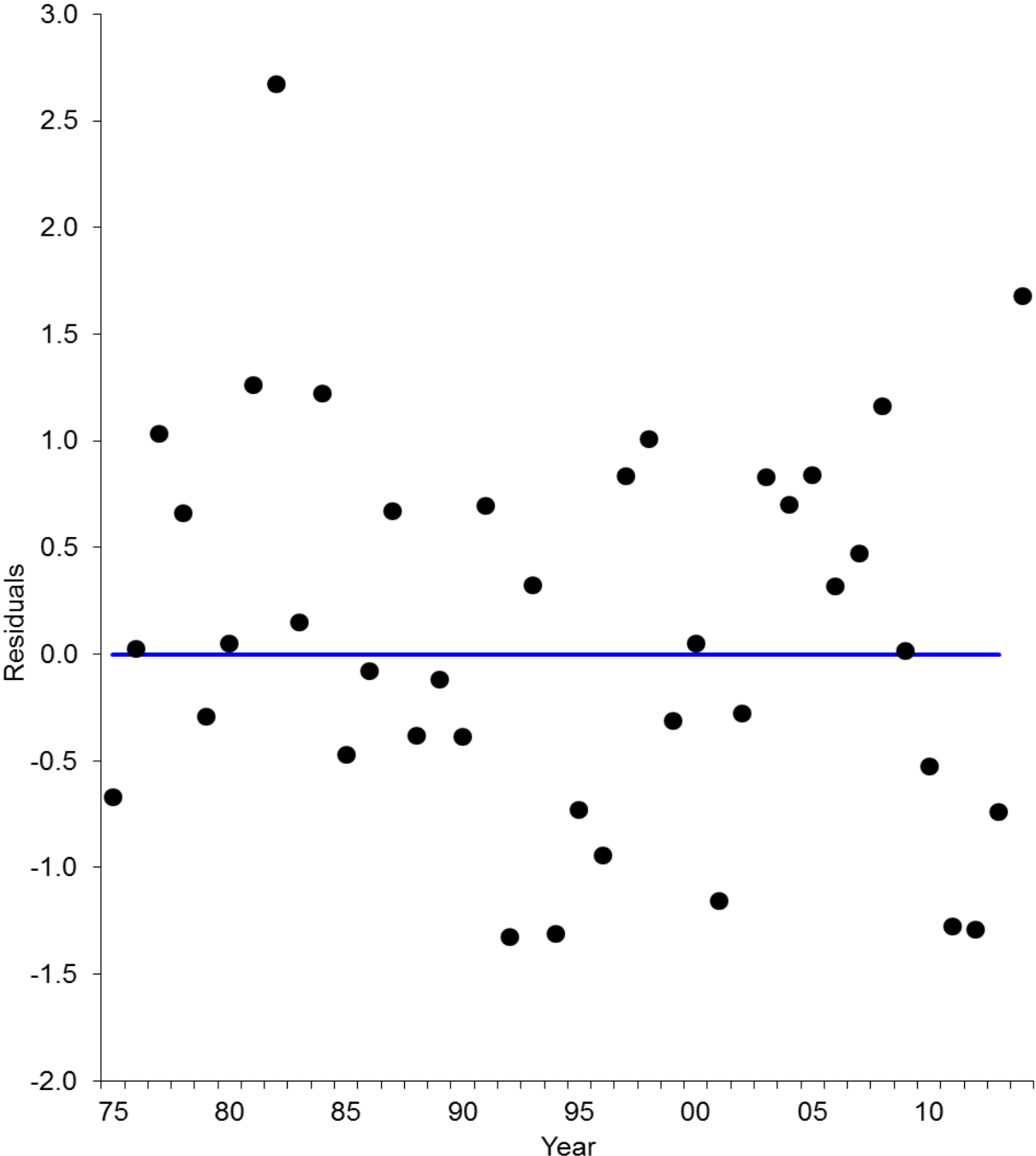
# BSFRF survey length frequency (scenario 4na)



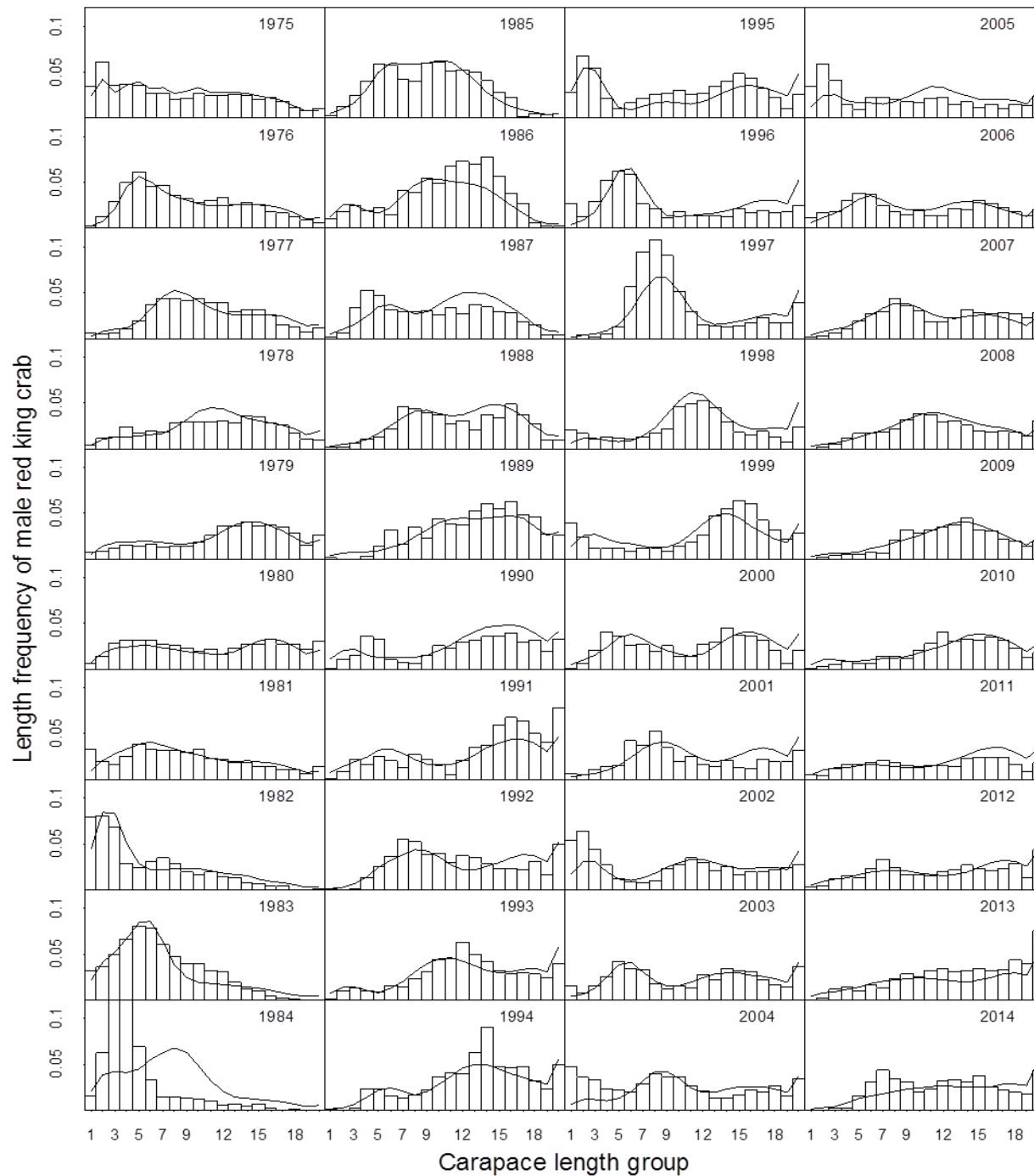
# Scenario 4na



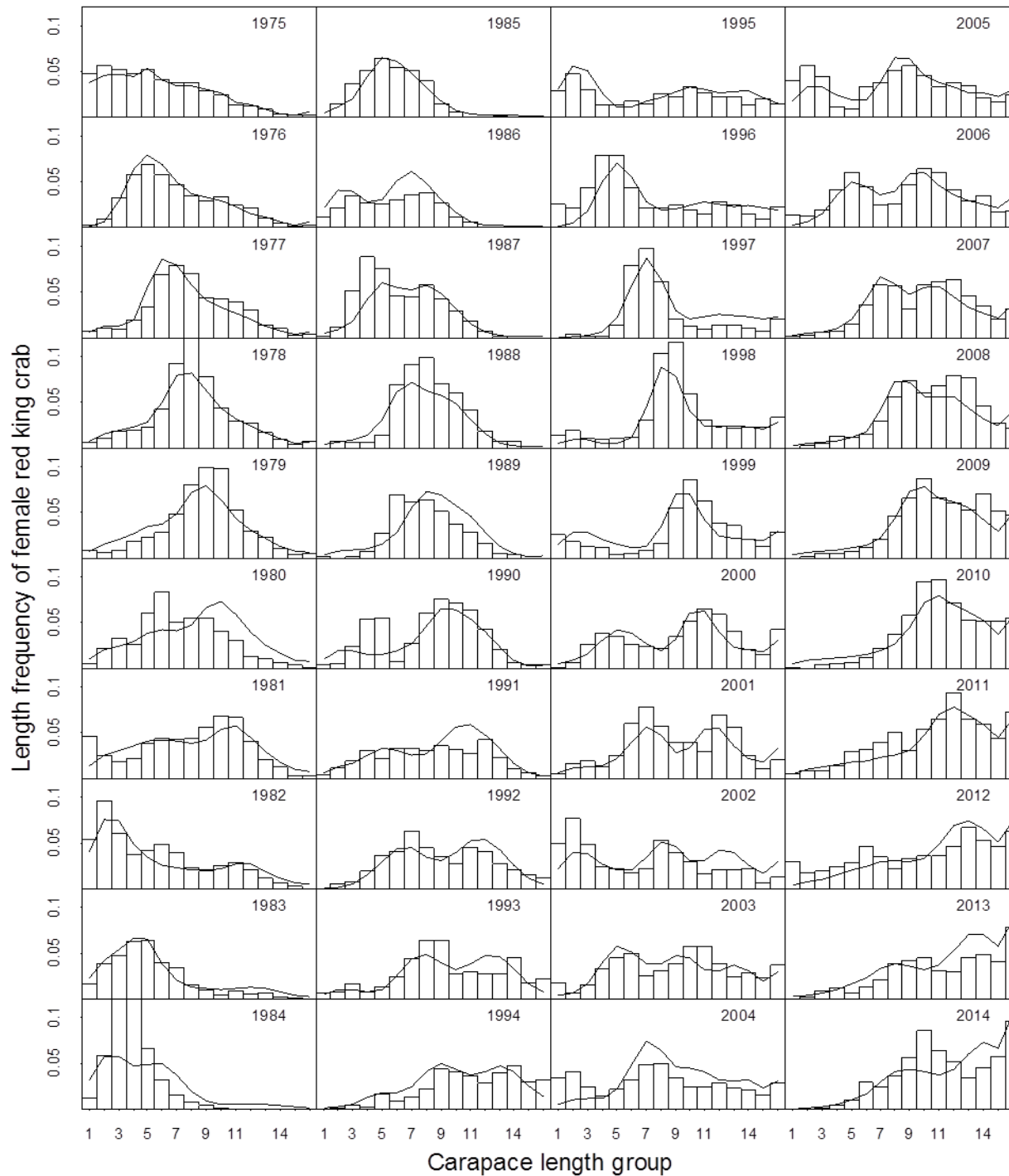
# Scenario 4nb

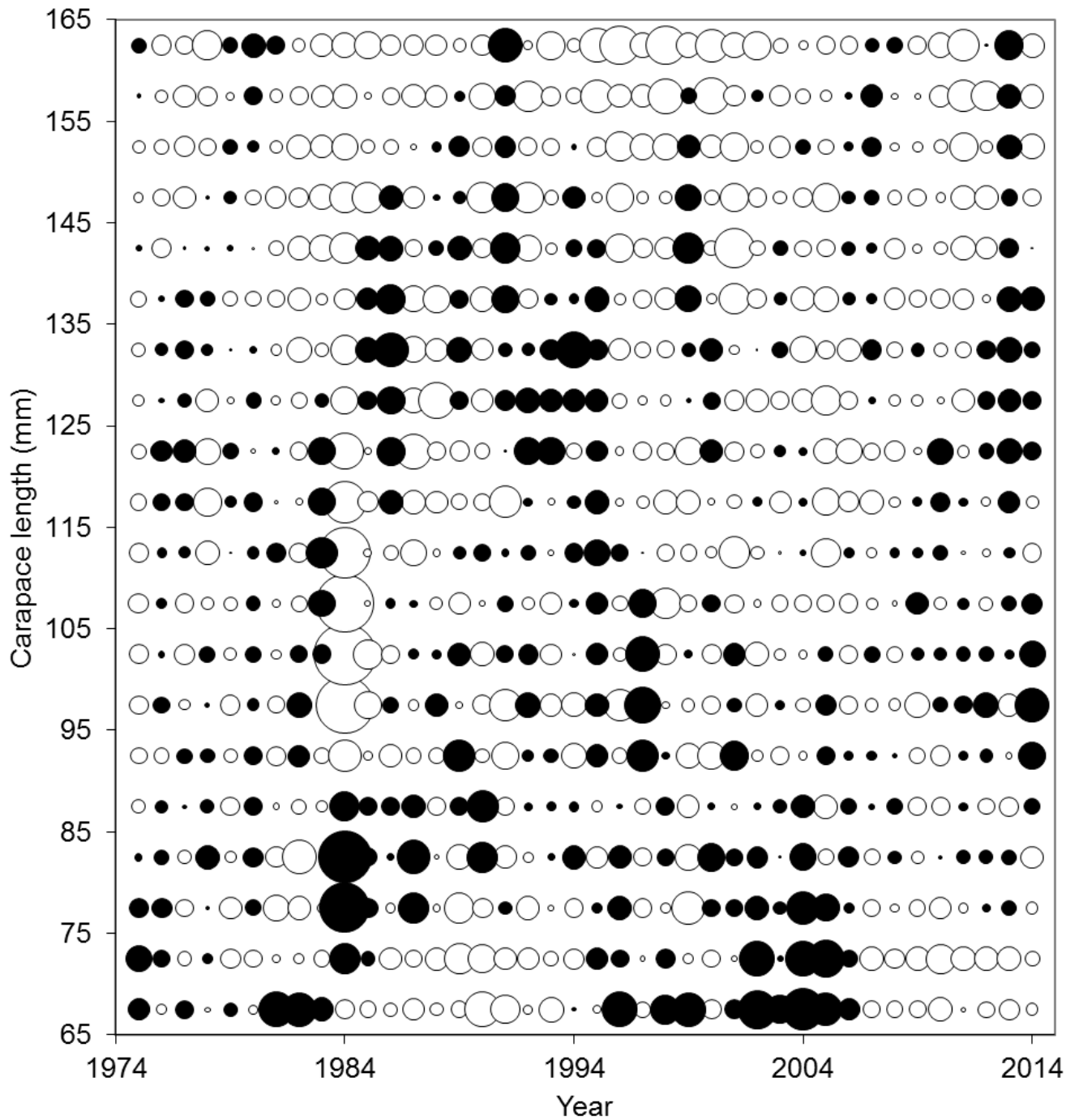


# Scenario 4na Males



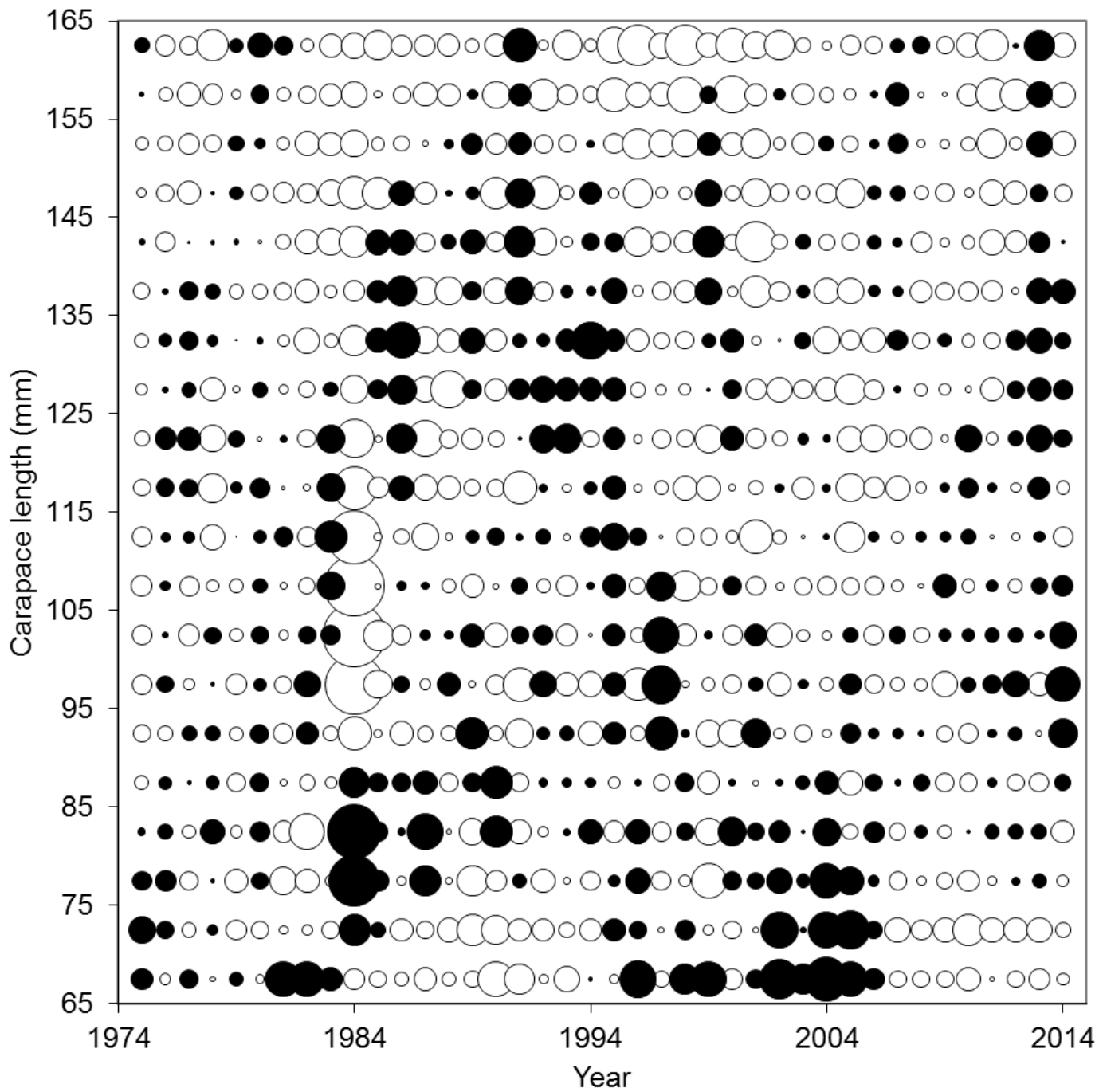
# Scenario 4na Females



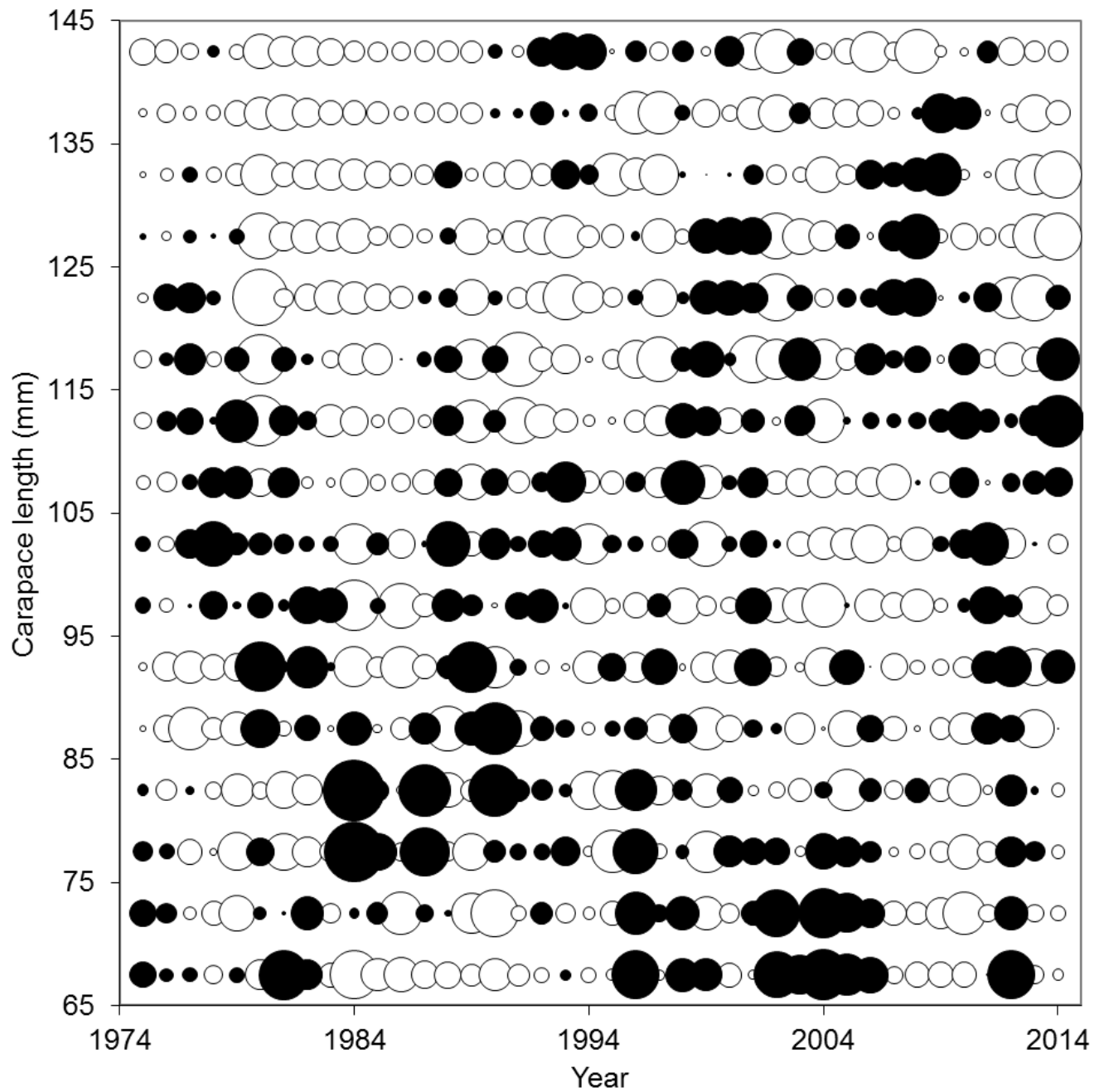


Scenario 4na  
Males

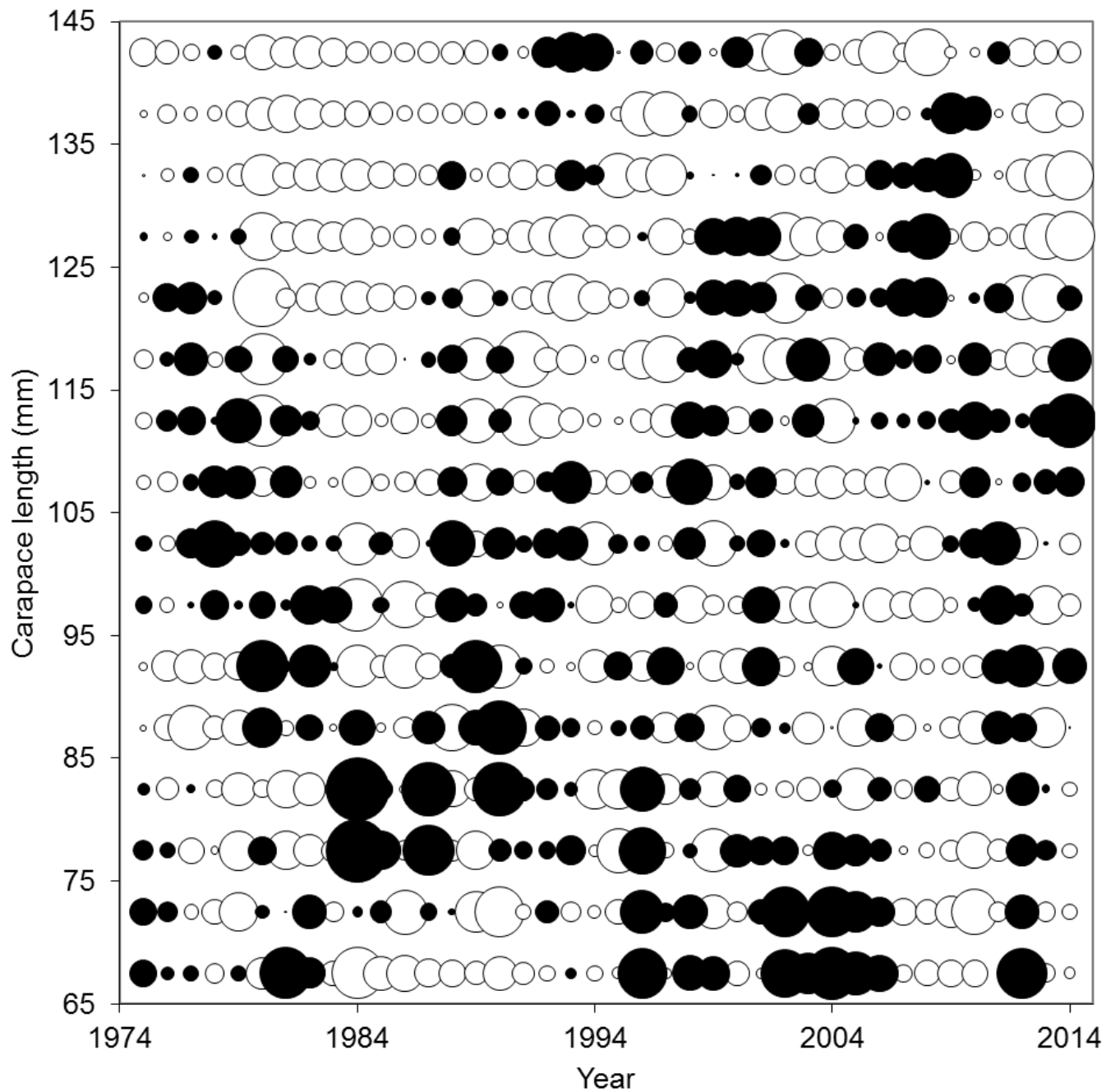




Scenario 4nb  
Males



Scenario 4na  
Females

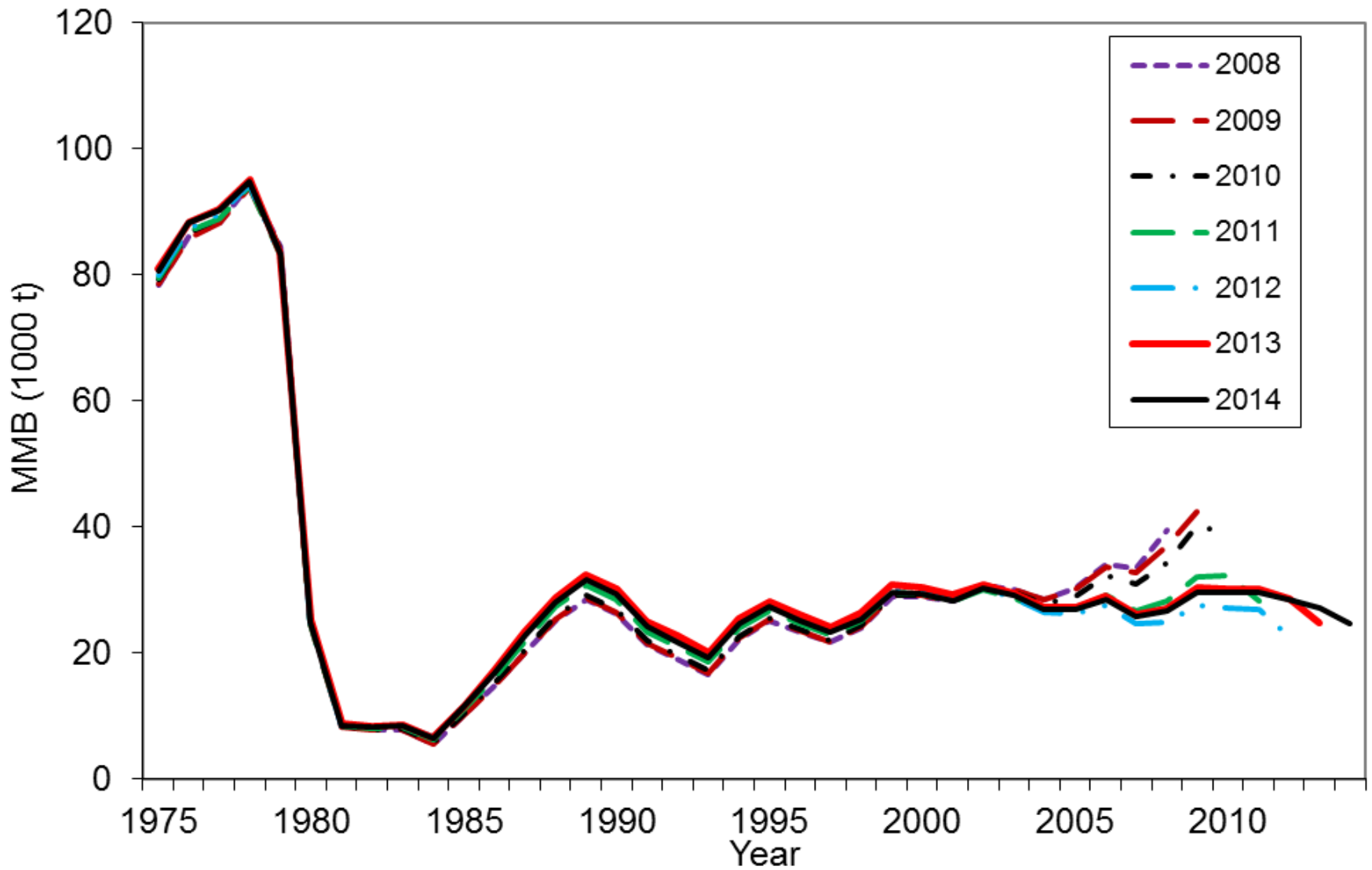


Scenario 4nb  
Females

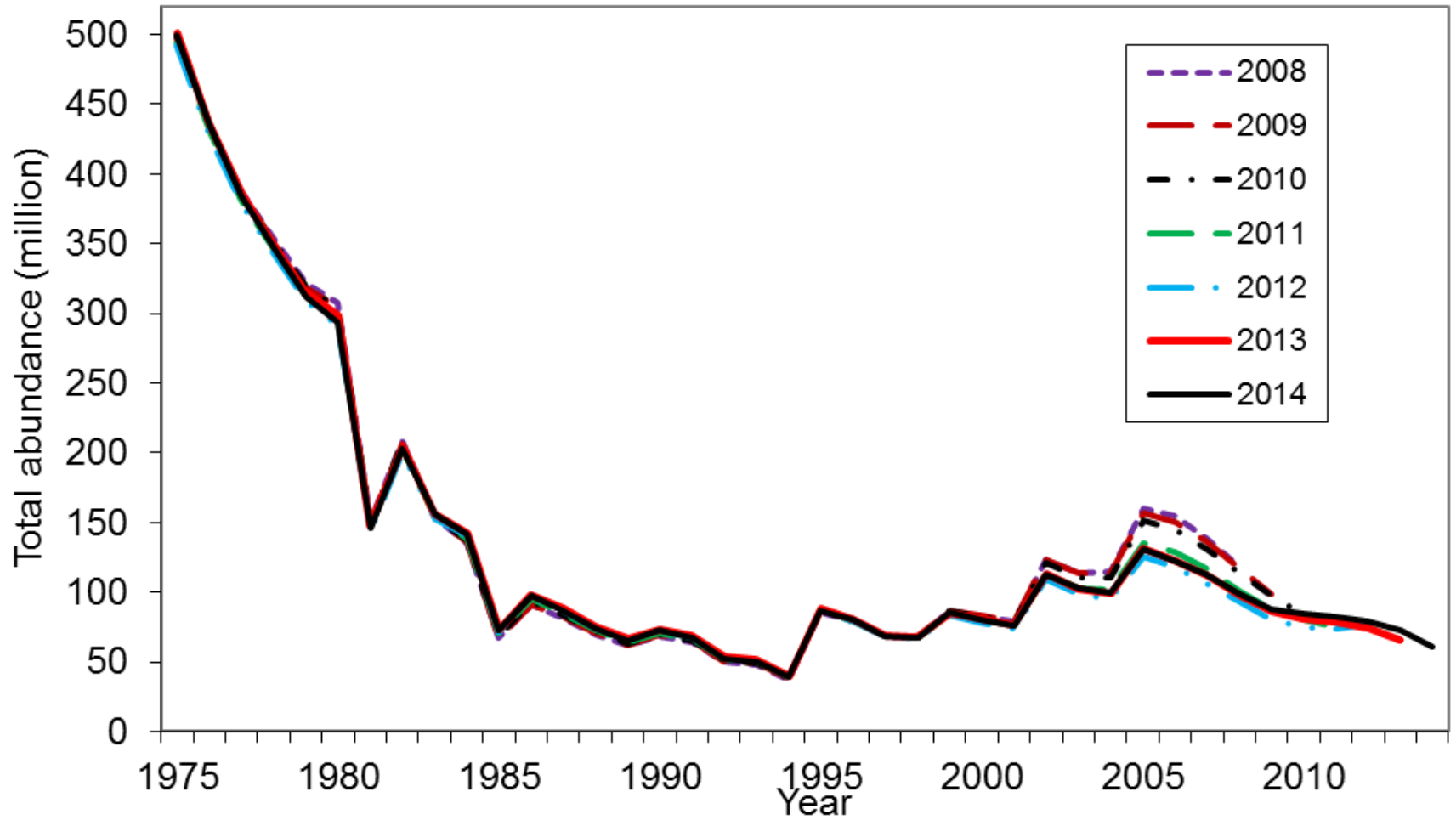




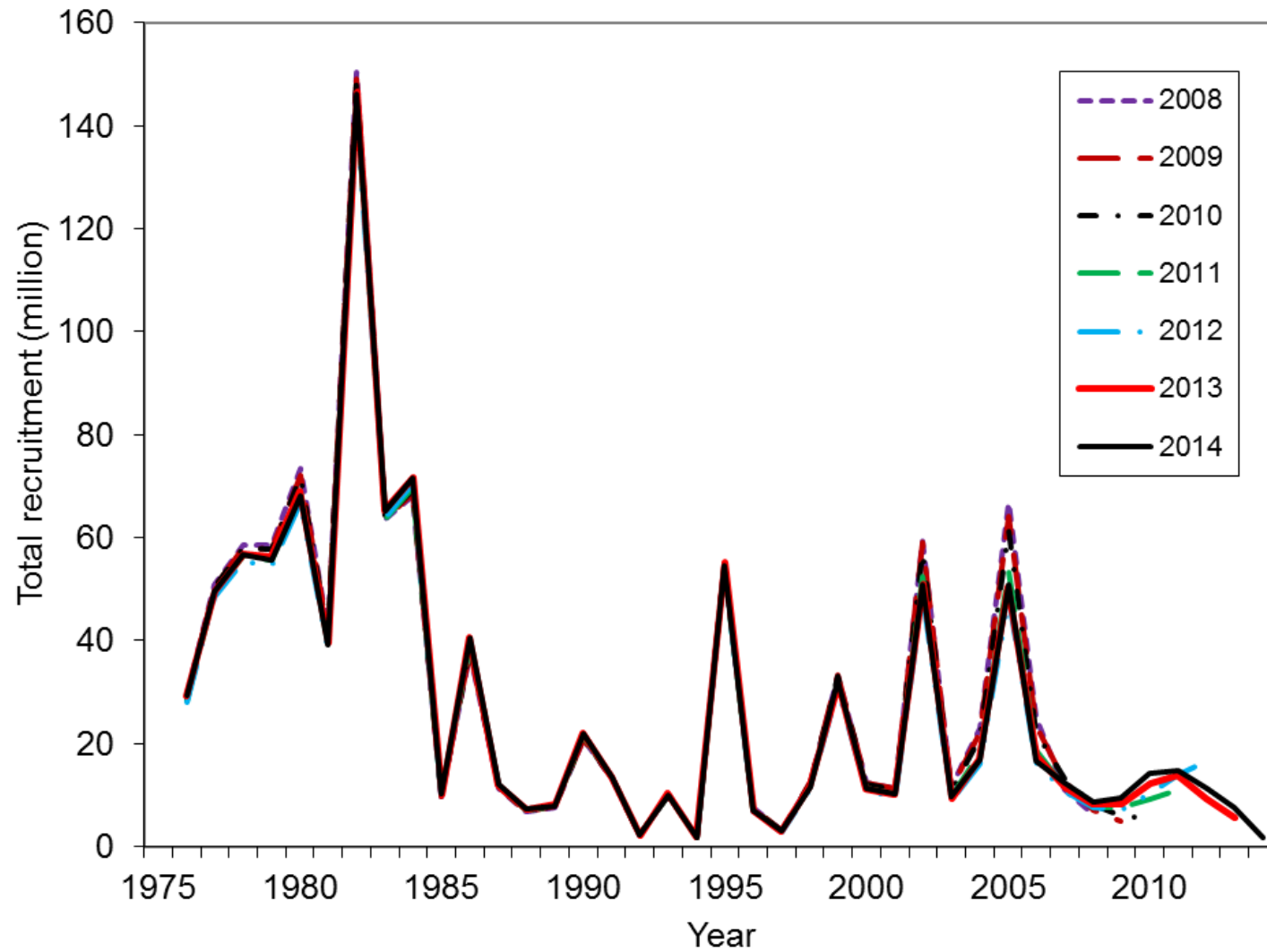
# Scenario 4nb, 2014 model



# Scenario 4nb, 2014 model

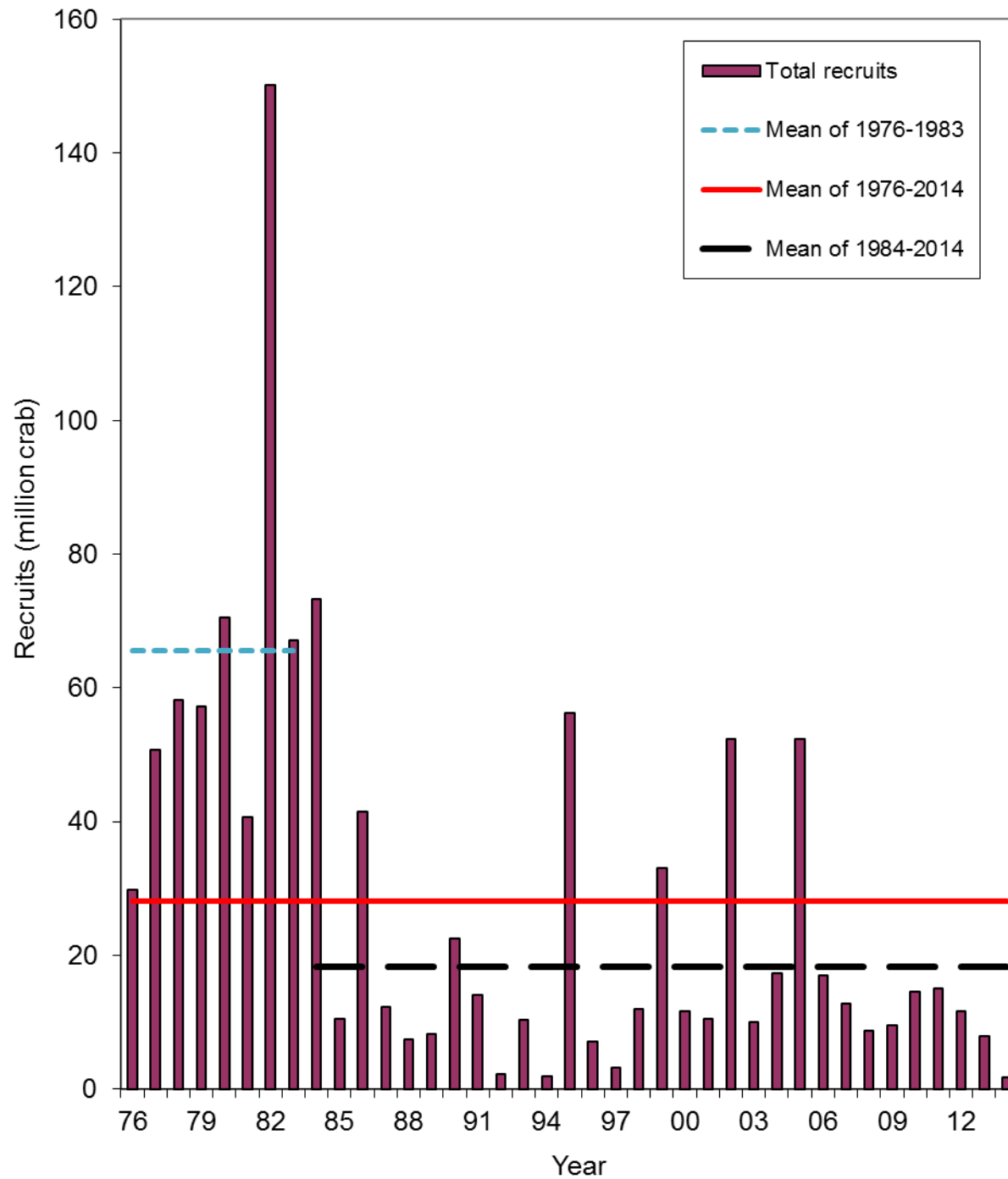


# Total recruitment, scenario 4nb, 2014 model results

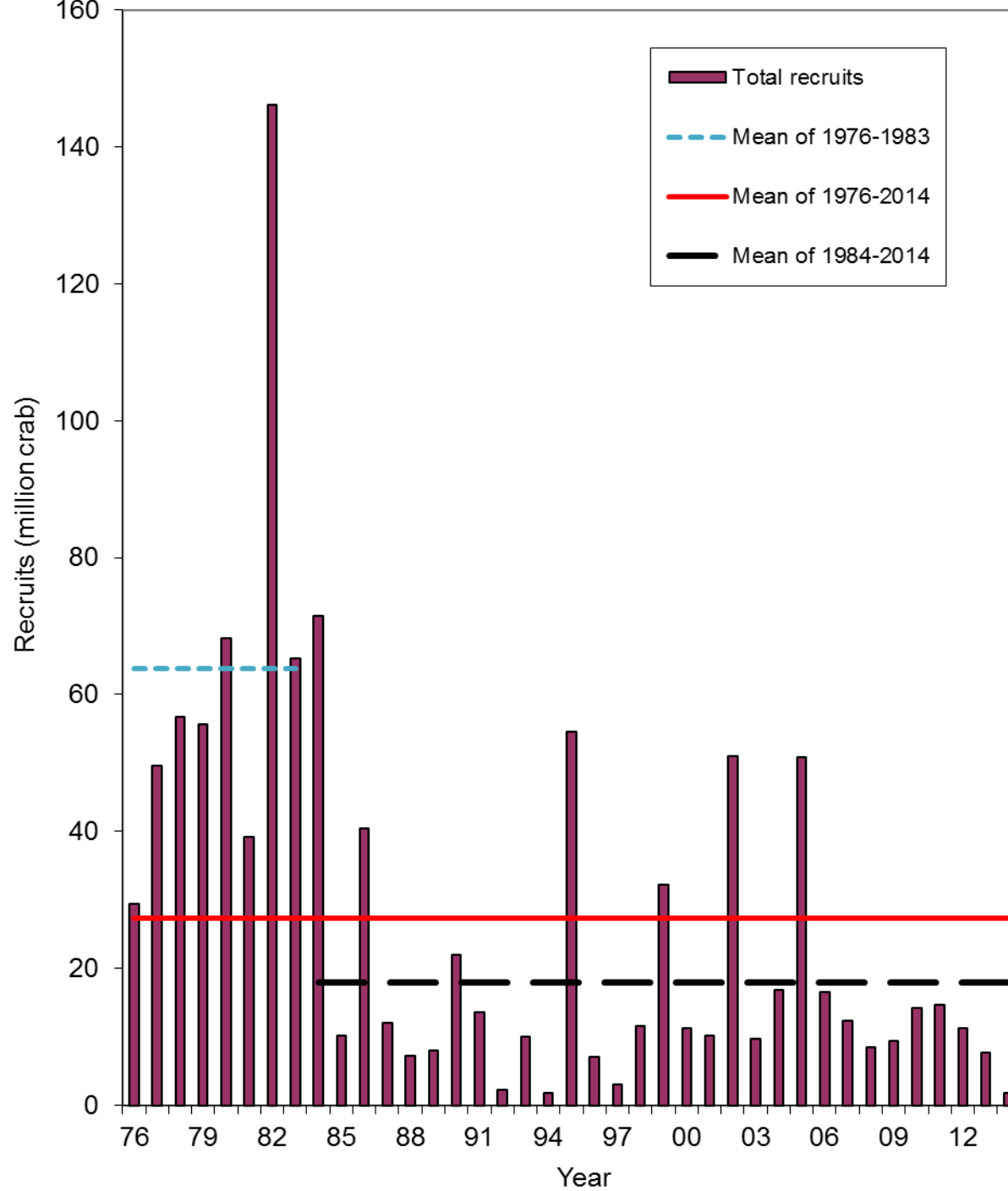




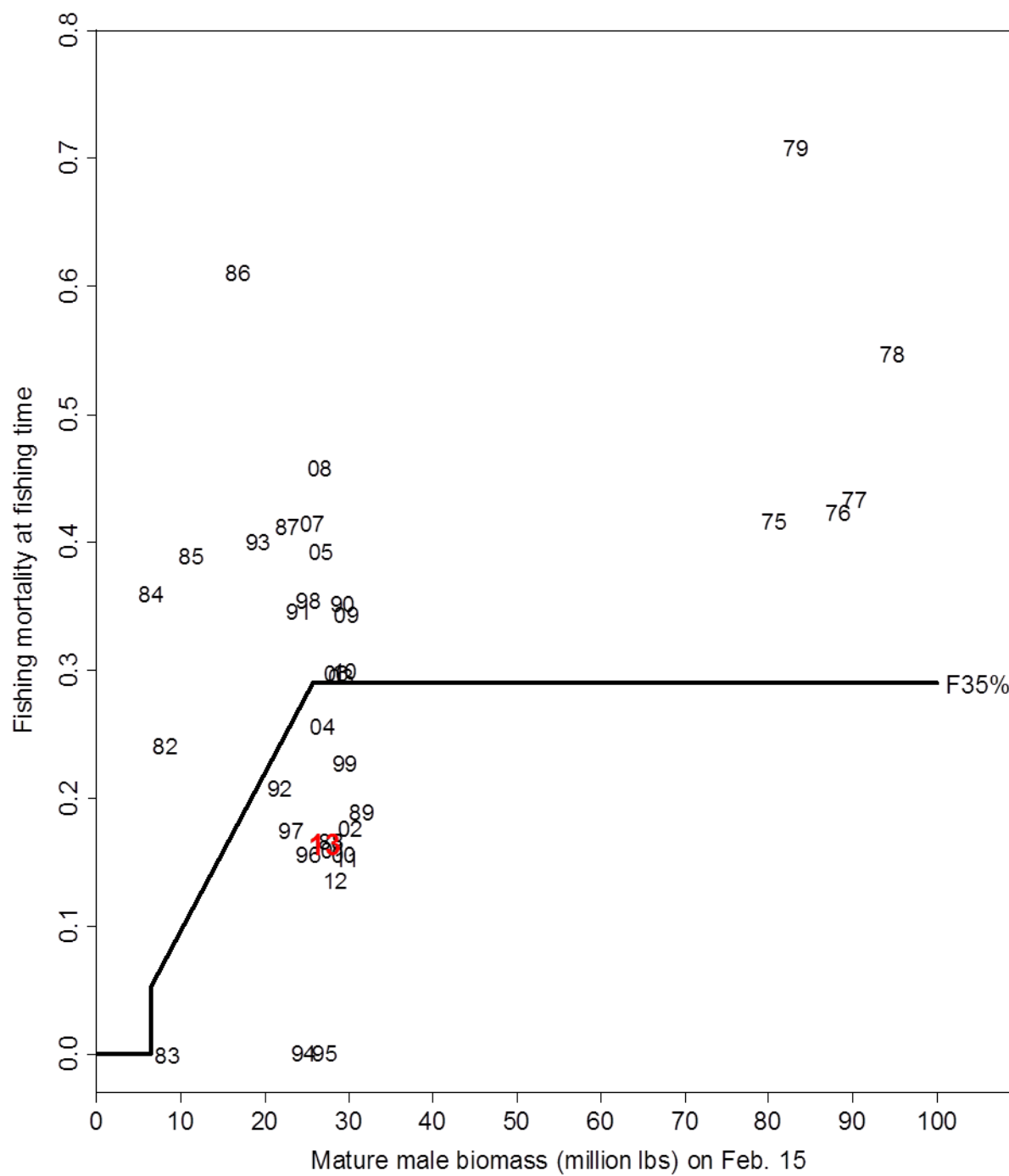
# Scenario 4na



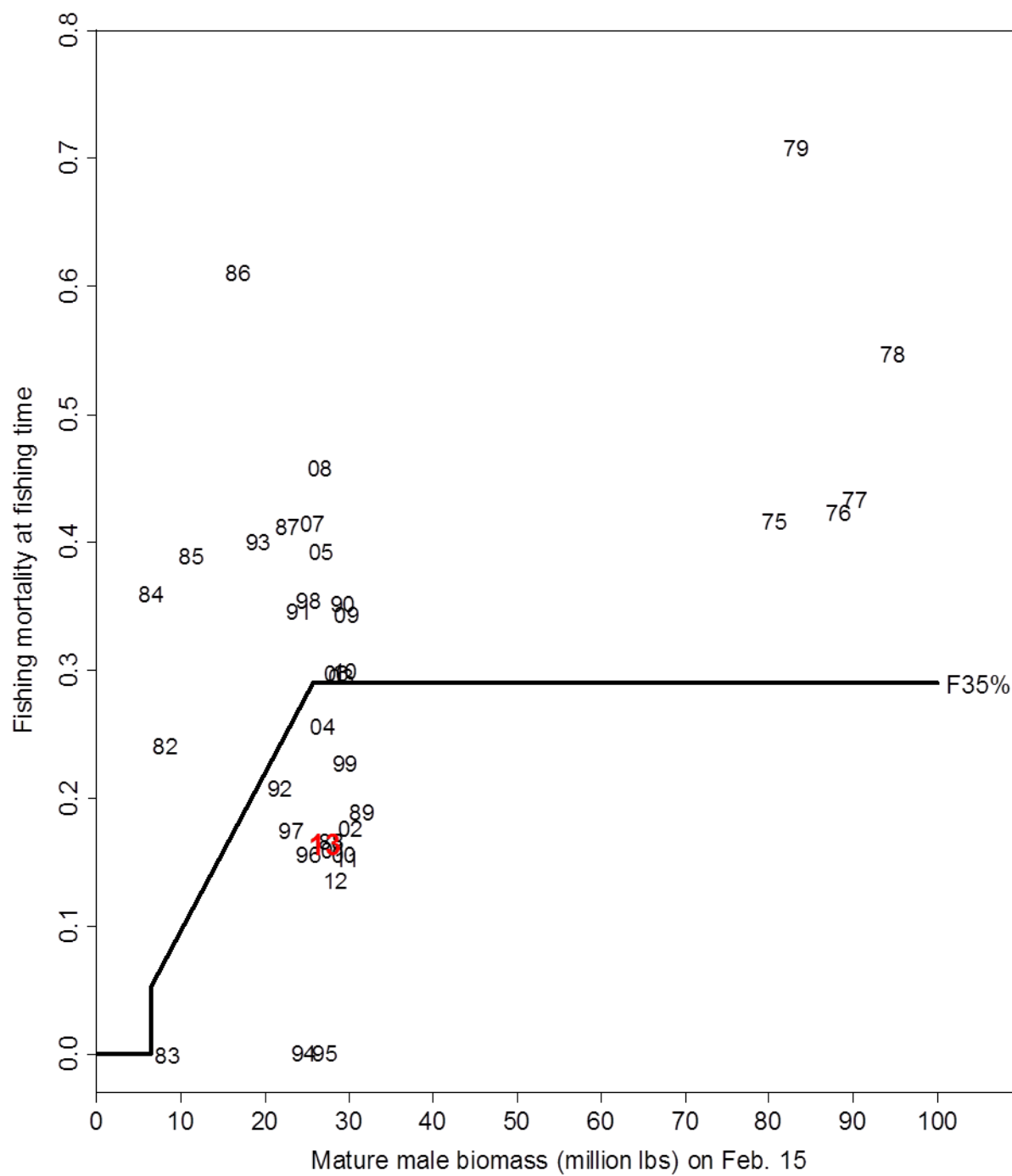
# Scenario 4nb



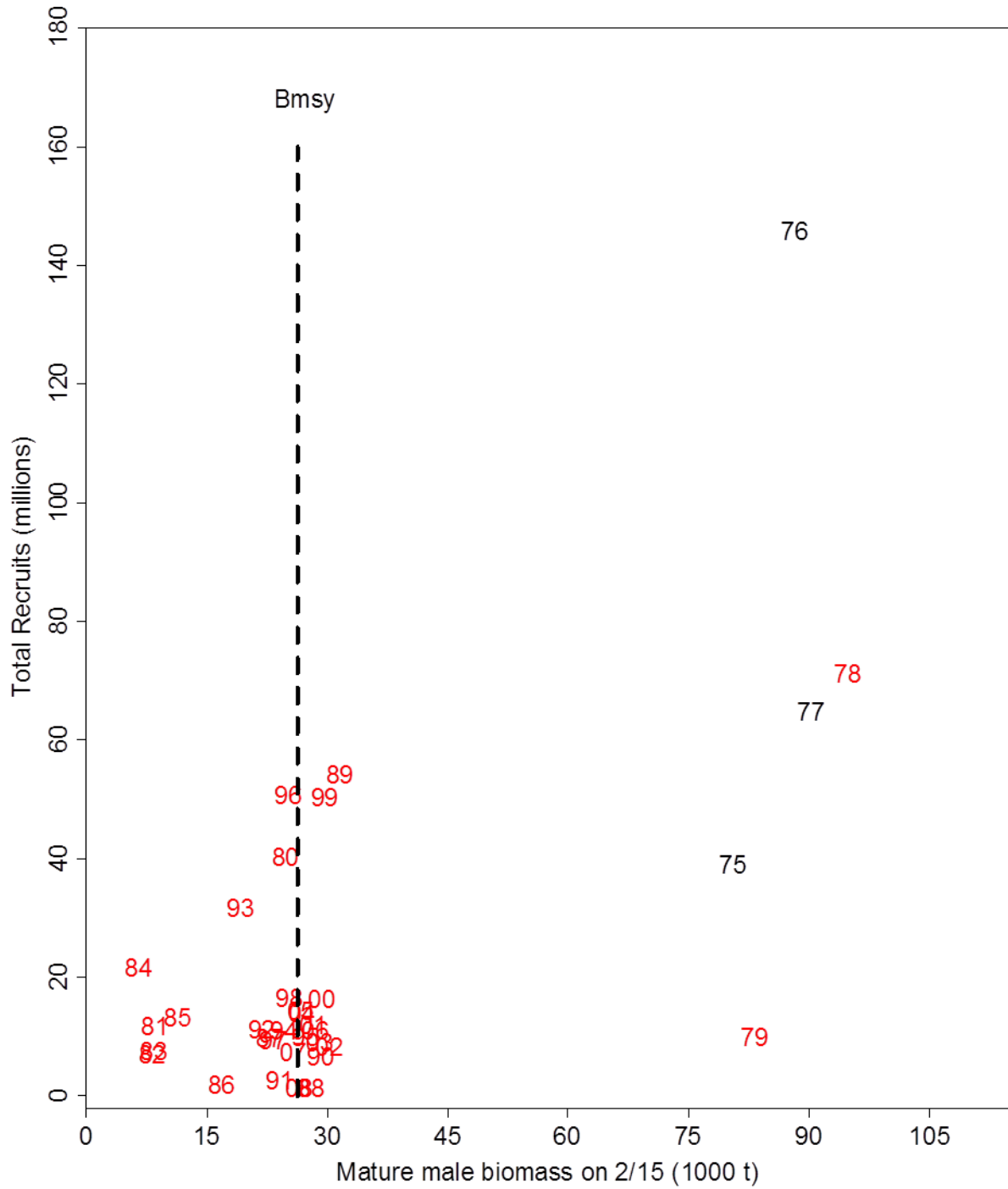
# Scenario 4na



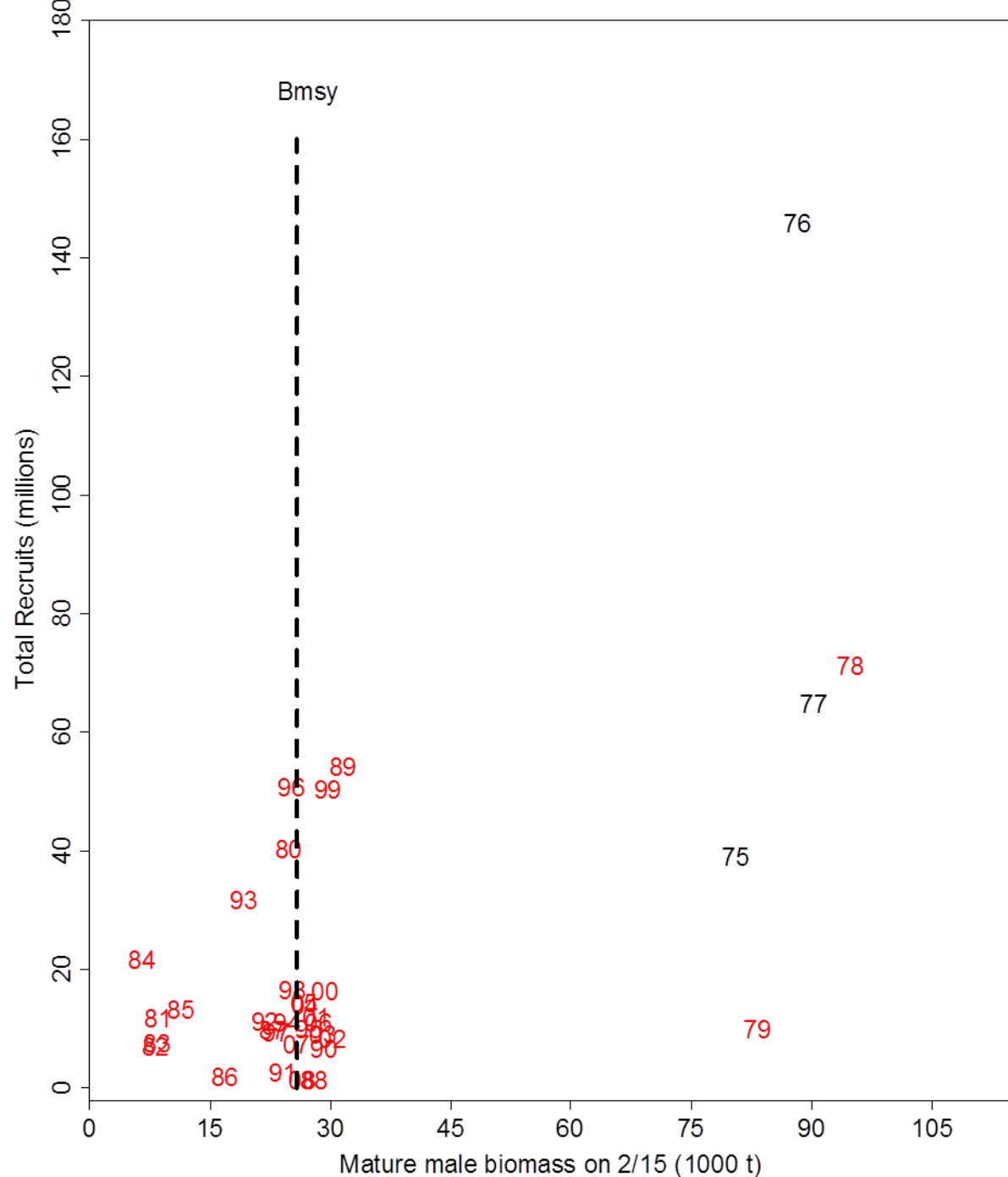
# Scenario 4nb



# Scenario 4na



# Scenario 4nb



Based on the  $B_{35\%}$  estimated from the average male recruitment during 1984-2014, the biological reference points and OFL:  
 (based on the 10% rule used last year,  $ABC = 0.9 \cdot OFL$ )

	Scenario 4na		Scenario 4nb		Scenario 4n7	
	1000t	Million lbs	1000t	Million lbs	1000t	Million lbs
$B_{35\%}$	26.313	58.010	25.703	56.665	27.953	61.627
$F_{35\%}$	0.29		0.29		0.29	
$MMB_{2014}$	25.735	56.736	24.687	54.443	20.407	44.990
$OFL_{2014}$	7.289	16.070	6.820	15.036	3.982	8.779
$ABC_{2014}$	6.560	14.463	6.138	13.532	3.584	7.901

## Status and catch specifications (1000 t):

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2010/11	13.63 <sup>A</sup>	32.64 <sup>A</sup>	6.73	6.76	7.71	10.66	N/A
2011/12	13.77 <sup>B</sup>	30.88 <sup>B</sup>	3.55	3.61	4.09	8.80	7.92
2012/13	13.19 <sup>C</sup>	29.05 <sup>C</sup>	3.56	3.62	3.90	7.96	7.17
2013/14 <sup>a</sup>	13.16 <sup>D</sup>	28.67 <sup>D</sup>	3.90	3.99	4.56	7.07	6.36
2014/15 <sup>a</sup>		25.73 <sup>D</sup>				7.29	6.56
2013/14 <sup>b</sup>	12.85 <sup>D</sup>	27.12 <sup>D</sup>	3.90	3.99	4.56	7.07	6.36
2014/15 <sup>b</sup>		24.69 <sup>D</sup>				6.82	6.14
2013/14 <sup>c</sup>	13.98 <sup>D</sup>	20.60 <sup>D</sup>	3.90	3.99	4.56	7.07	6.36
2014/15 <sup>c</sup>		20.41 <sup>D</sup>				3.98	3.58

a---Scenario 4na, b---Scenario 4nb, and c --- Scenario 4n7

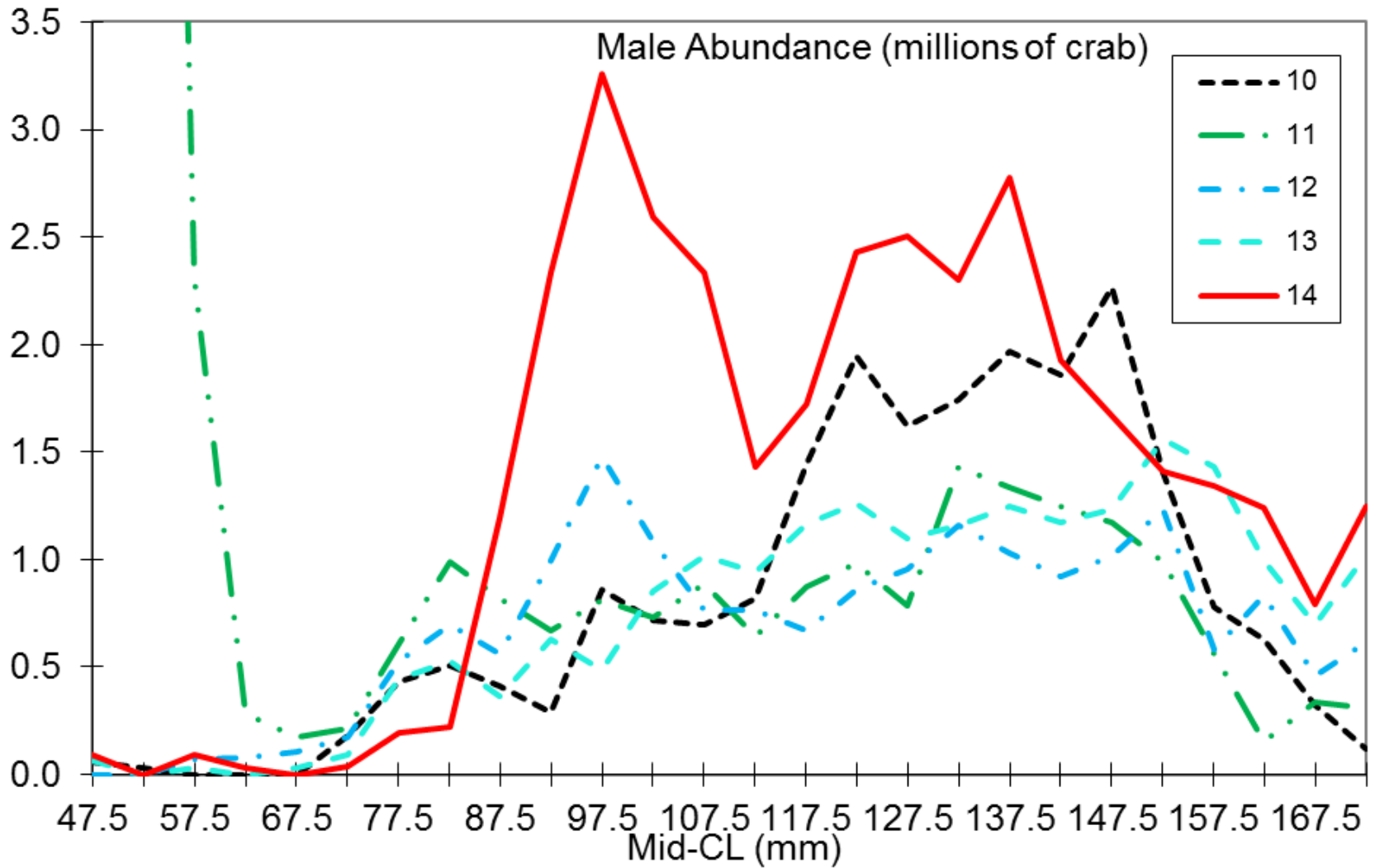


## Basis for the OFL: All table values are in 1000 t.

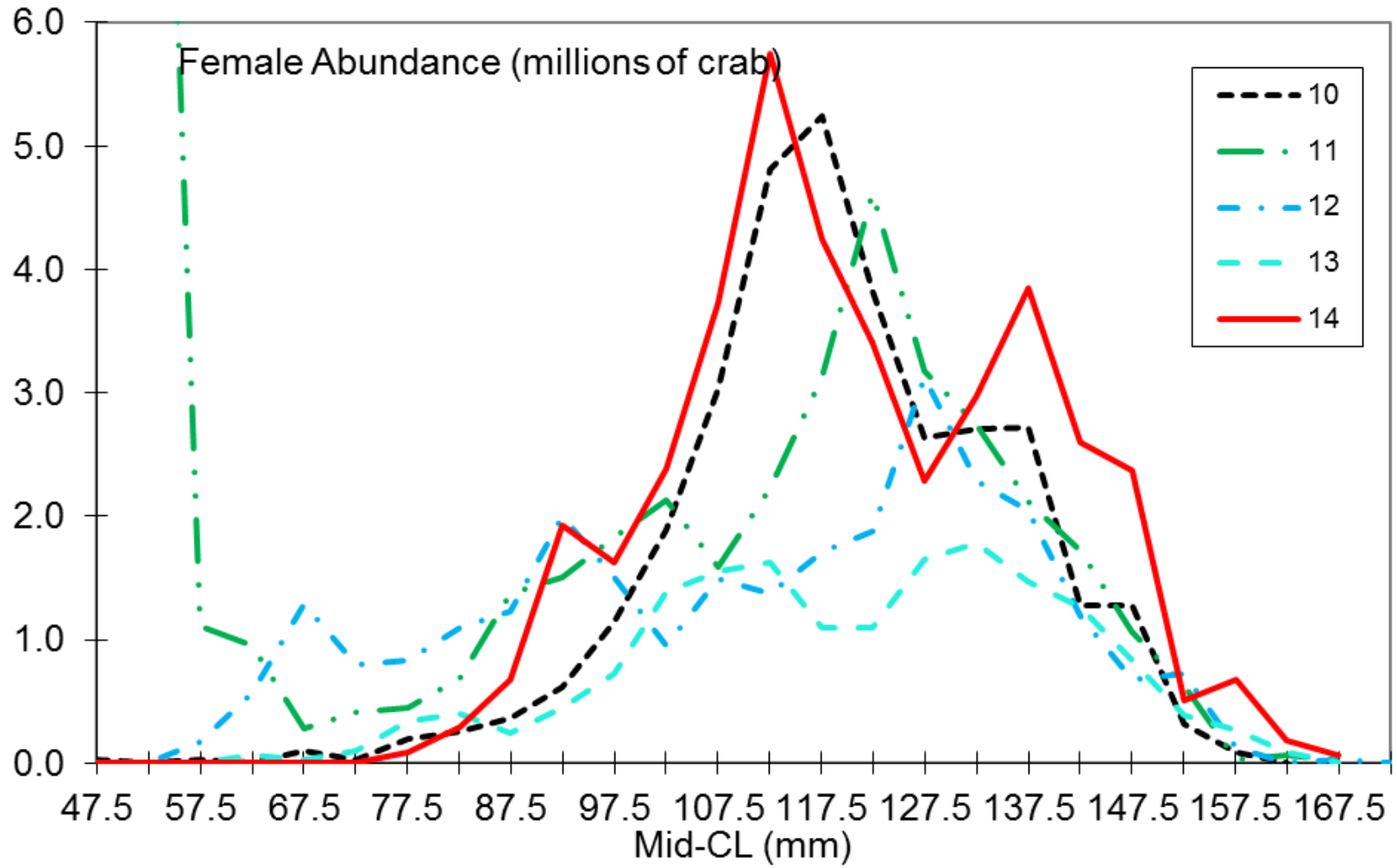
Year	Tier	$B_{MSY}$	Current MMB	$B/B_{MSY}$ (MMB)	$F_{OFL}$	Years to define $B_{MSY}$	Natural Mortality
2010/11	3a	28.4	37.7	1.33	0.32	1995-2010	0.18
2011/12	3a	27.3	29.8	1.09	0.32	1984-2011	0.18
2012/13	3b	27.5	26.3	0.96	0.31	1984-2012	0.18
2013/14	3b	26.4	25.0	0.95	0.27	1984-2013	0.18
2014/15 <sup>a</sup>	3b	26.3	25.7	0.98	0.28	1984-2014	0.18
2014/15 <sup>b</sup>	3b	25.7	24.7	0.96	0.28	1984-2014	0.18
2014/15 <sup>c</sup>	3b	28.0	20.4	0.73	0.20	1984-2014	0.18

a---Scenario 4na, b---Scenario 4nb, and c --- Scenario 4n7

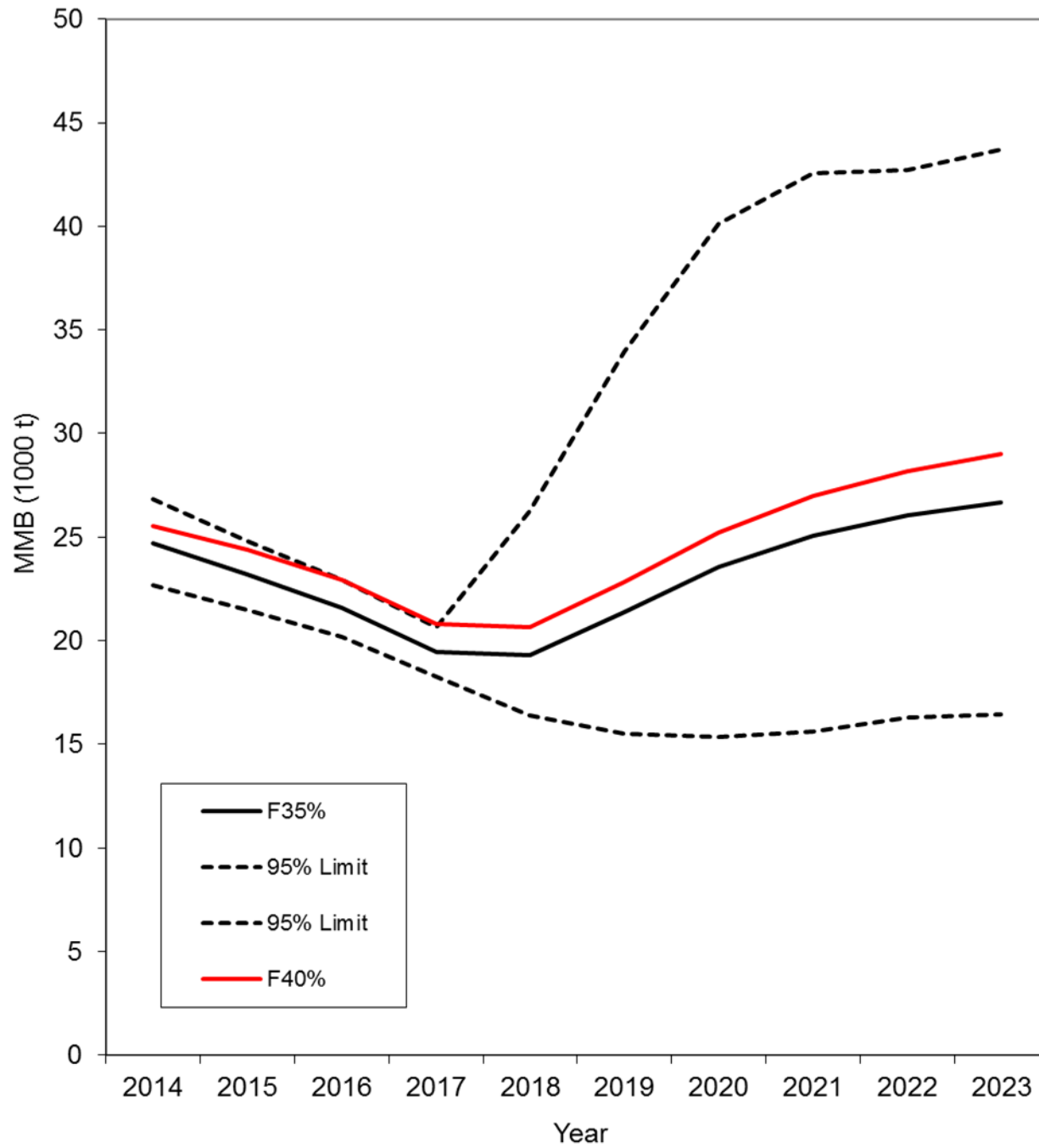
# Male area-swept abundance during 2010-2014



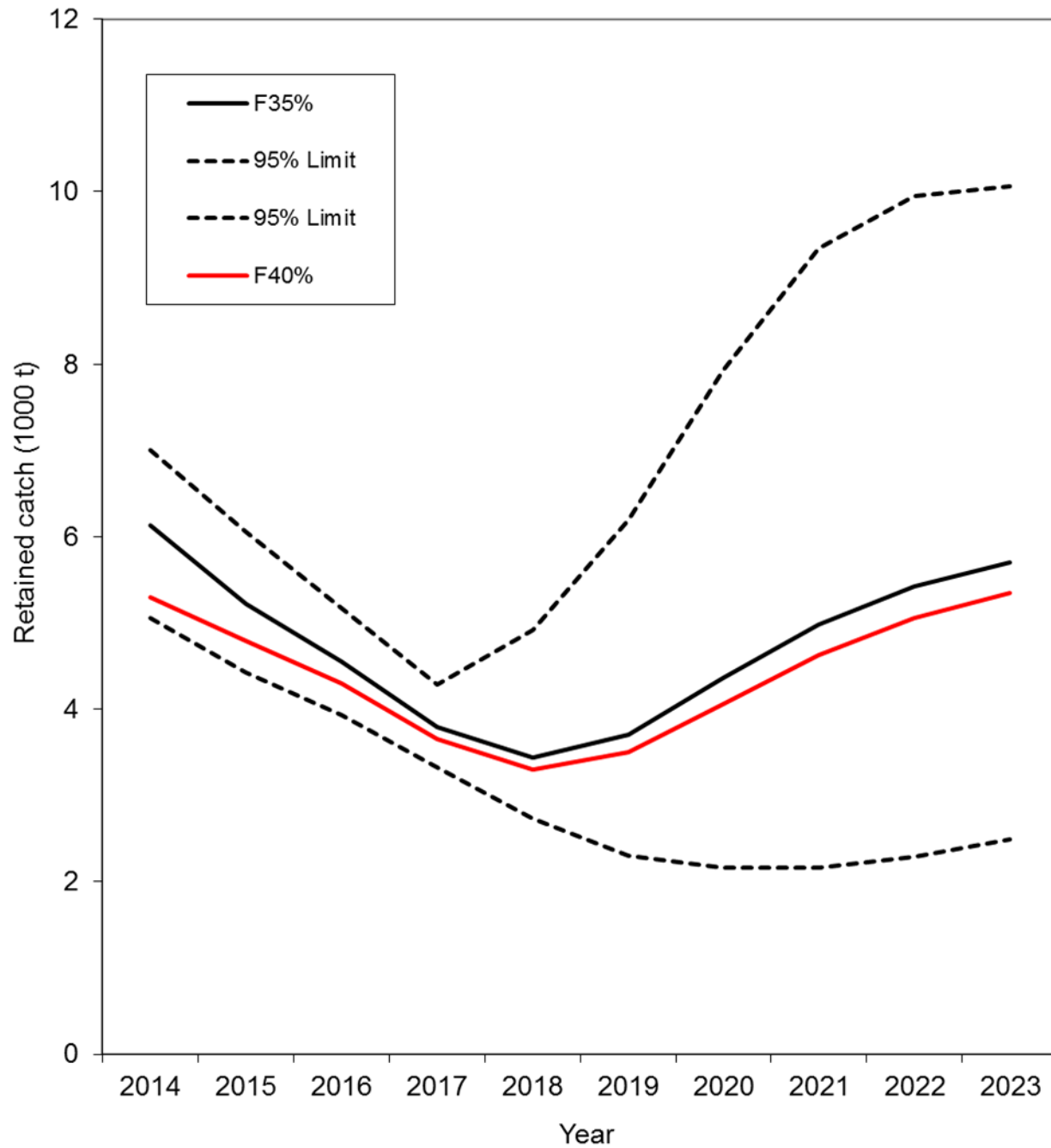
# Female area-swept abundance during 2010-2014



# Scenario 4nb

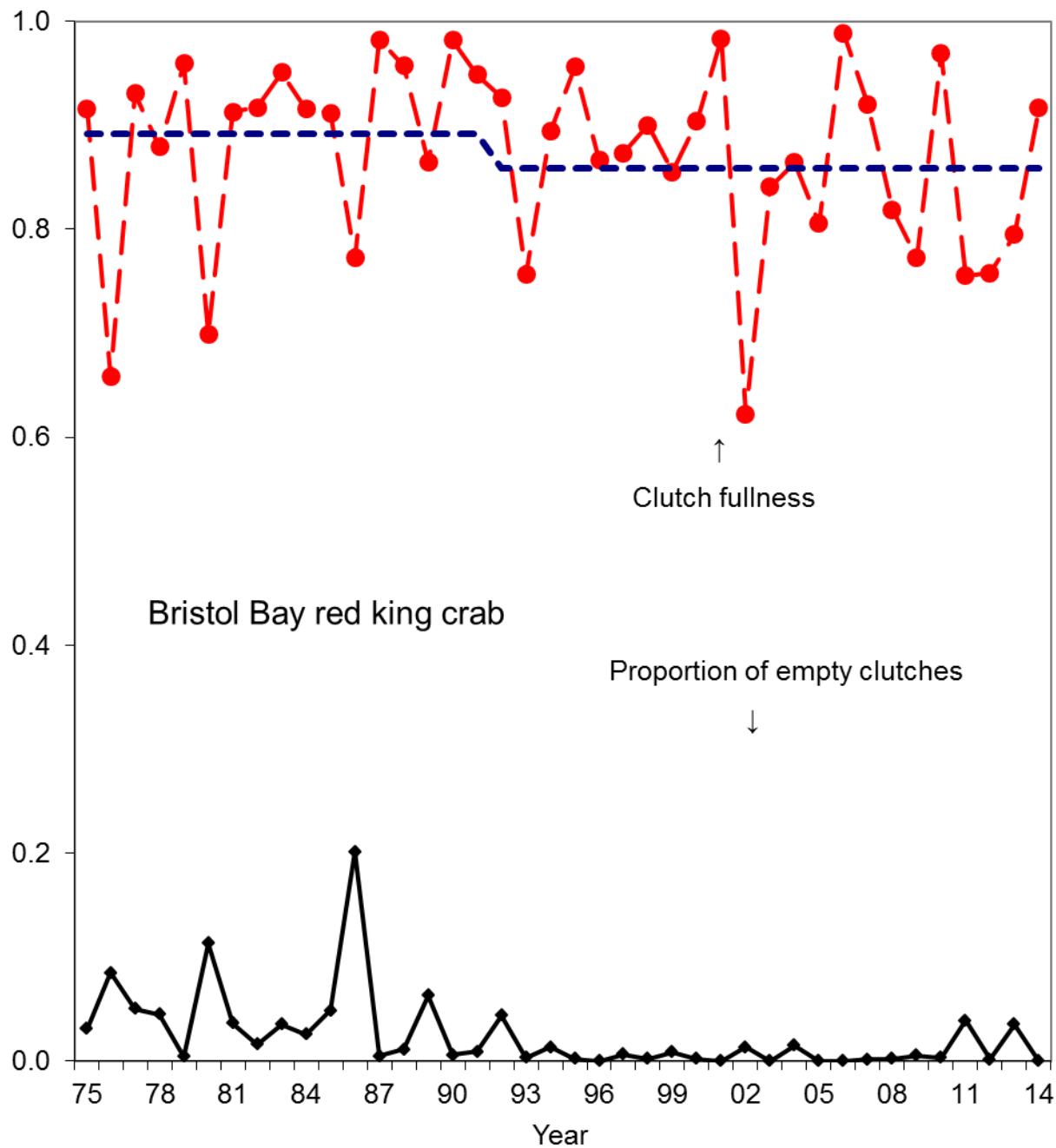


# Scenario 4nb



*Thanks*





Clutch fullness  
did not change  
much over time.



