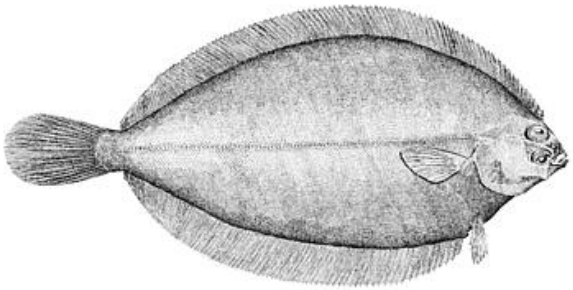
Witch Flounder (*Glyptocephalus cynoglossus*)

S.E. Wigley
NEFSC

Groundfish Operational Assessment Review Meeting
Woods Hole, MA
September 14-18, 2015



Witch Flounder

Background

Last assessed in 2012

VPA formulation was same as 2008 benchmark assessment

USA total catch (landings and discards for ages 3 to 11+) for 1982 to 2010

NEFSC Spring and Autumn survey indices (ages 3 to 11+) used to estimate stock sizes for ages 3 to 10.

Used a split survey time series (split between 1994 and 1995).

Retrospective pattern remained (retro present in 2008)

Witch flounder was overfished and overfishing occurred in 2010.

Witch Flounder

Changes for this assessment

Landings Updated 2010, added 2011 – 2014
LAA 1982 -2014

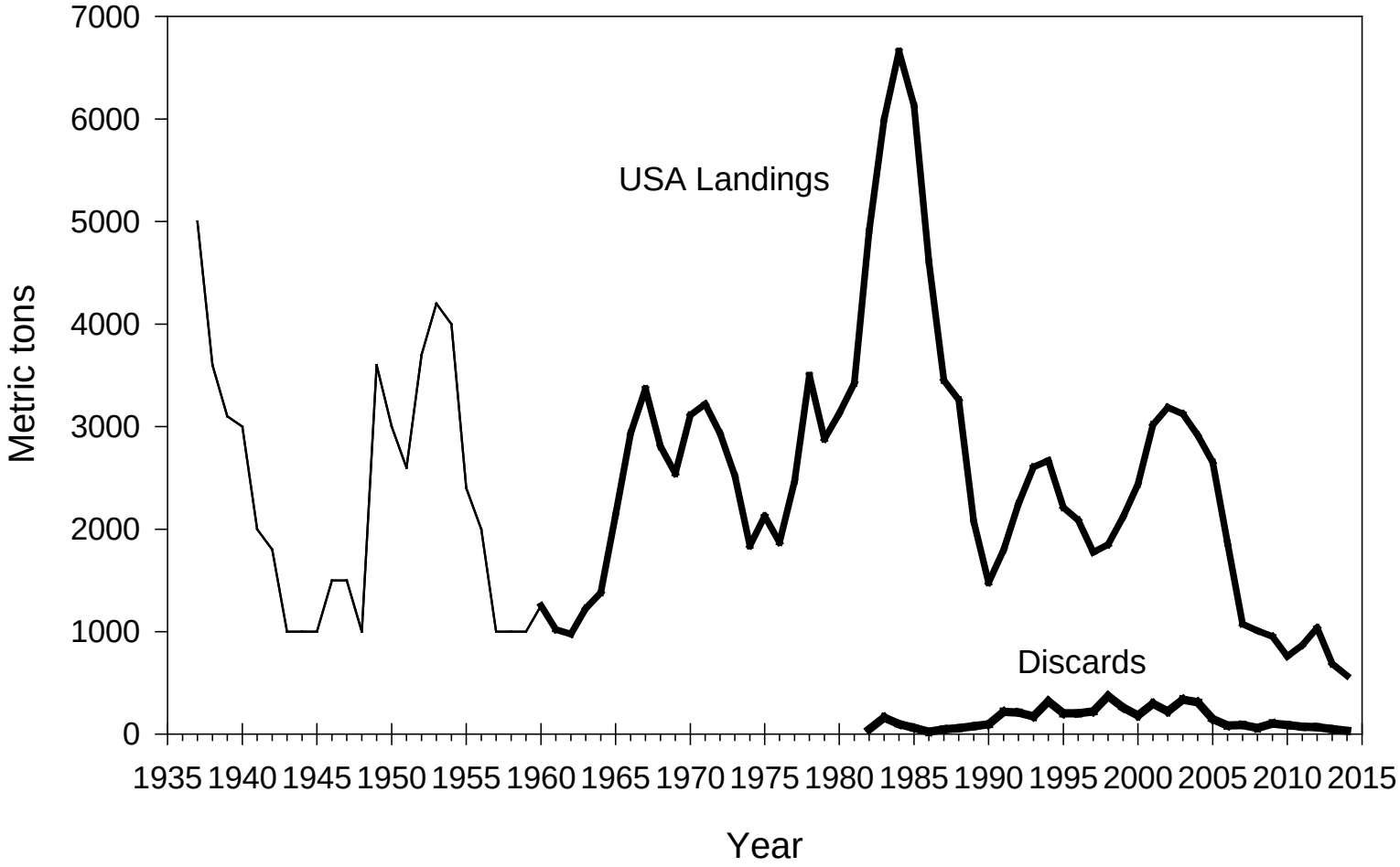
Discards Updated 1989 - 2010, added 2011 - 2014
DAA for large-mesh otter trawl fleet
DAA for northern shrimp trawl fleet
Discard weight from small-mesh otter trawl fleet

Total CAA = (LAA + DAA_{lmot} + DAA_{shr}) bump up by sm otter trawl discard wt

NEFSC Surveys: Updated Spring 2009 – 2011 and Autumn 2009-2010;
Added Spring 2012 – 2015 and Autumn 2011 – 2014
Used TOGA criteria for 2009 onward

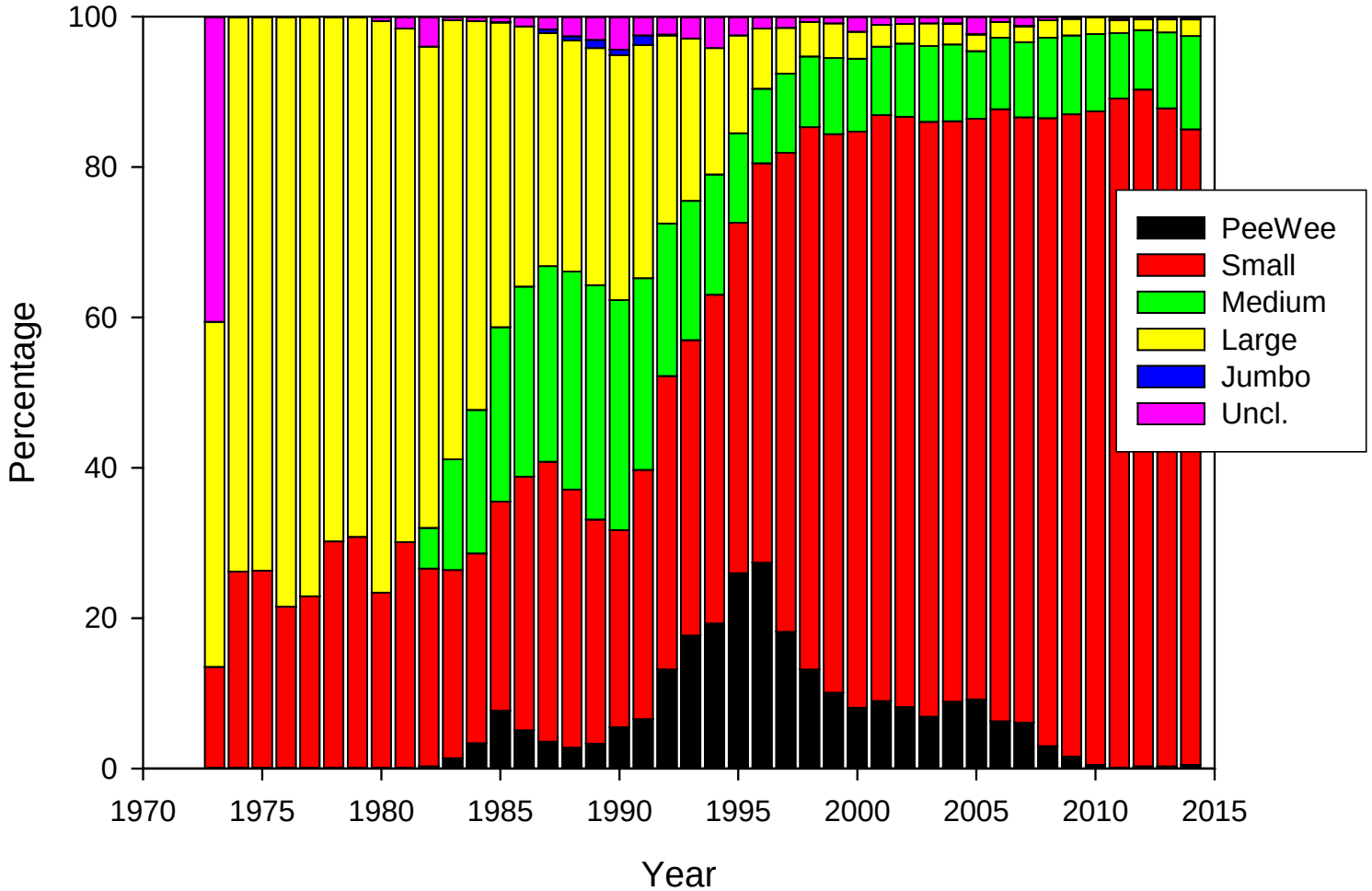
Maturity - annual ogives are based on NEFSC spring 5-yr pooled data for females through Spring 2015 (2013 maturity using 2011 – 2015 data)

Witch Flounder



1937-1959 provisional landings taken from Lange and Lux (1978)
Discards from 3 fleets: large-mesh otter trawl fishery, shrimp trawl fishery, and small-mesh otter trawl fishery (gillnet discards are negligible).

Witch Flounder

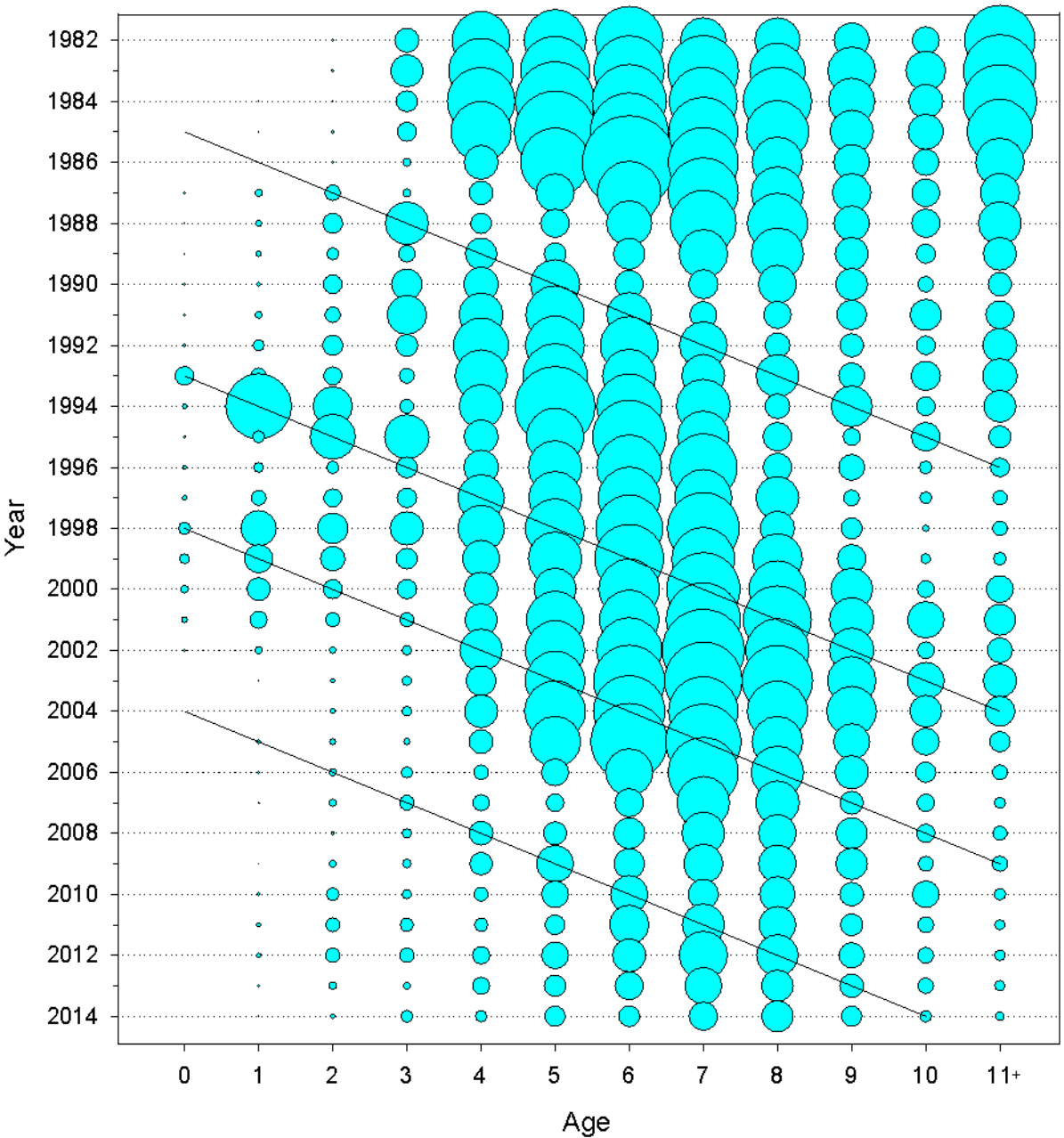


Smalls: 35 – ~47 cm ages 4 -10
Mediums: ~43 – ~53 cm ages 8-11+
Larges: ~48 – 60 cm ages 9-11+

Witch Flounder

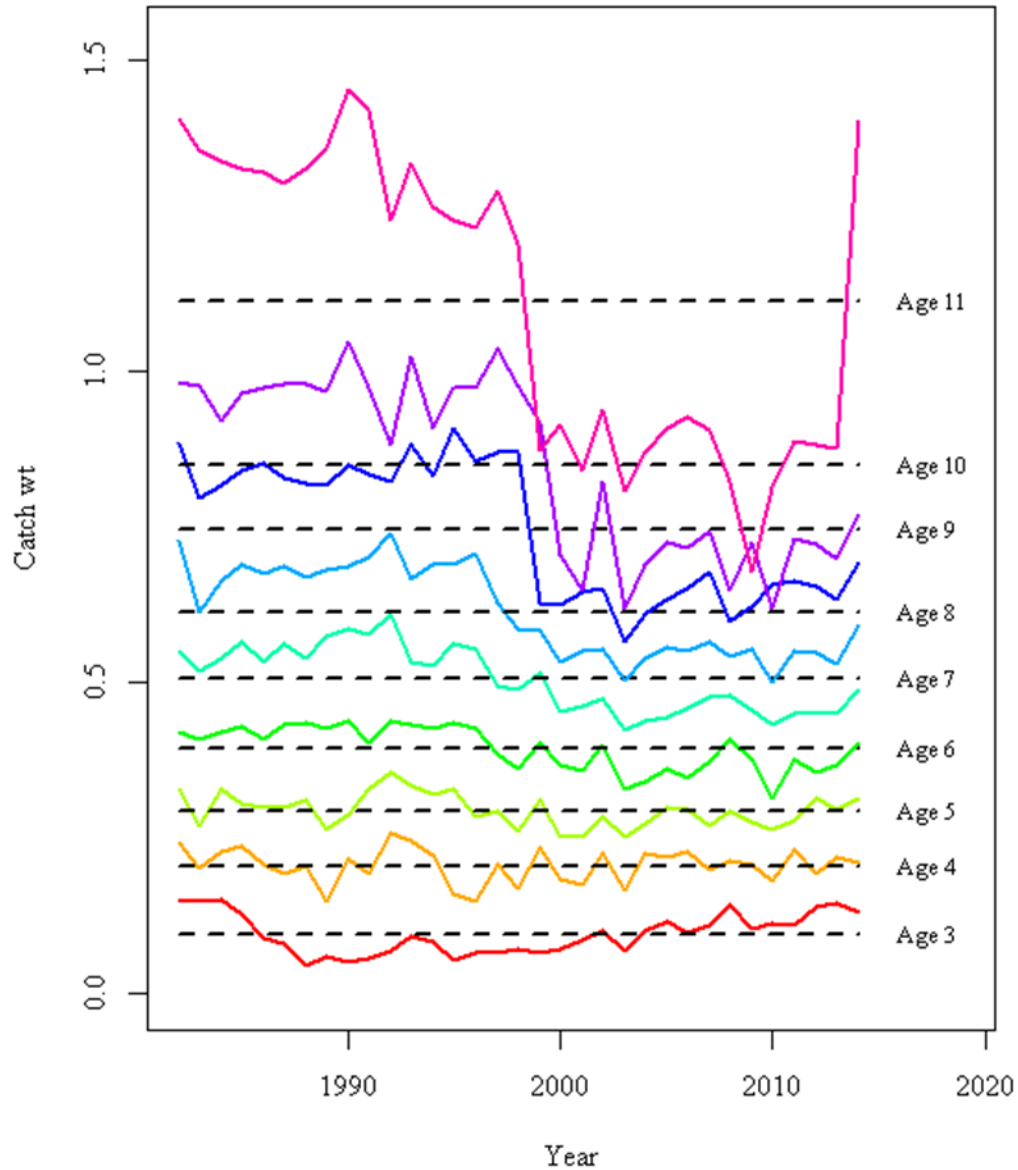
Figure K5. Witch flounder catch at age (in numbers), 1982-2014;

selected cohorts (1985, 1993, 1998, and 2004 year classes) are indicated with diagonal lines.

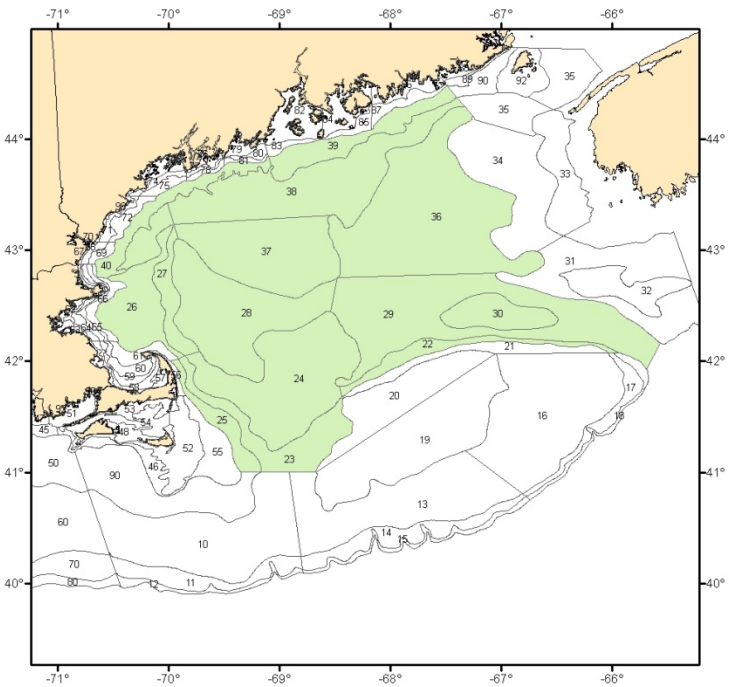


Witch Flounder

Figure K6. Witch flounder mean weight at age in the catch for ages 3 to 11+, 1982 -2014.



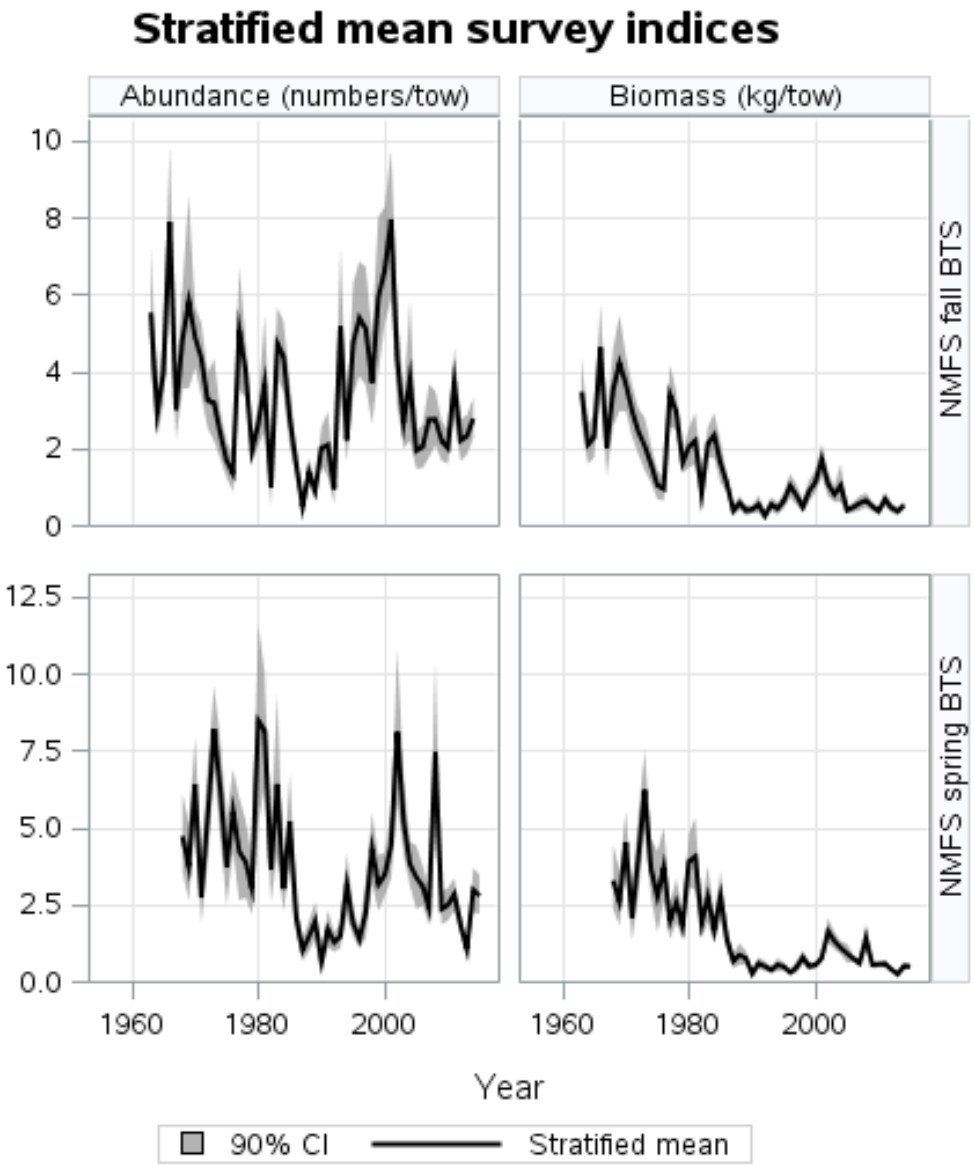
Witch Flounder



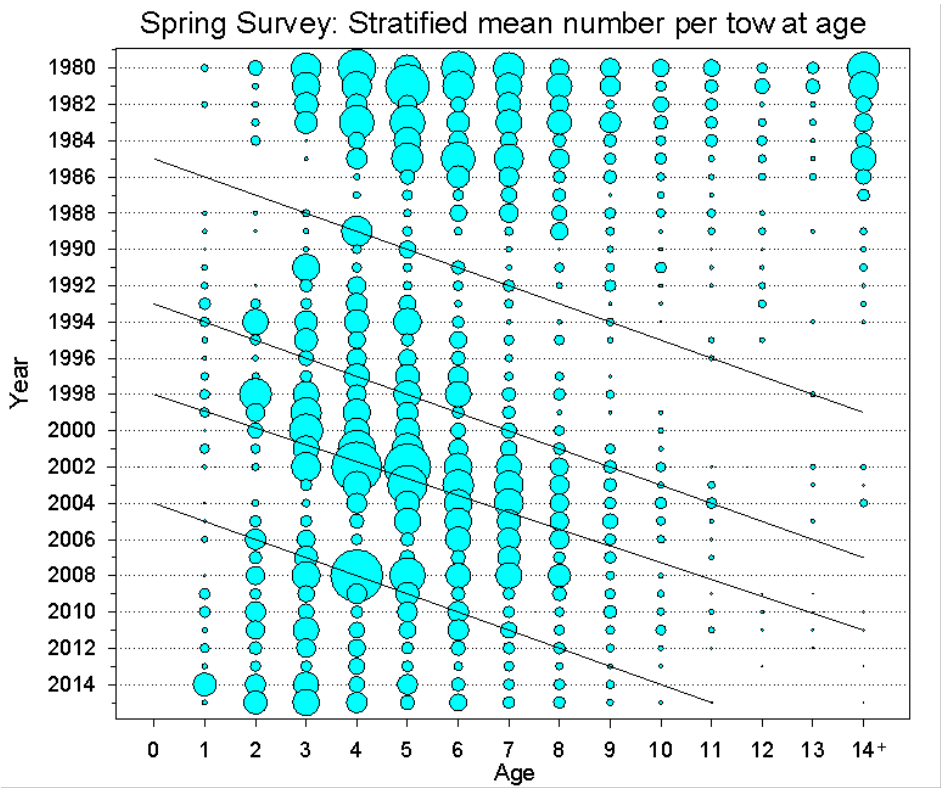
NEFSC bottom trawl survey
offshore strata 22-30, 36-40

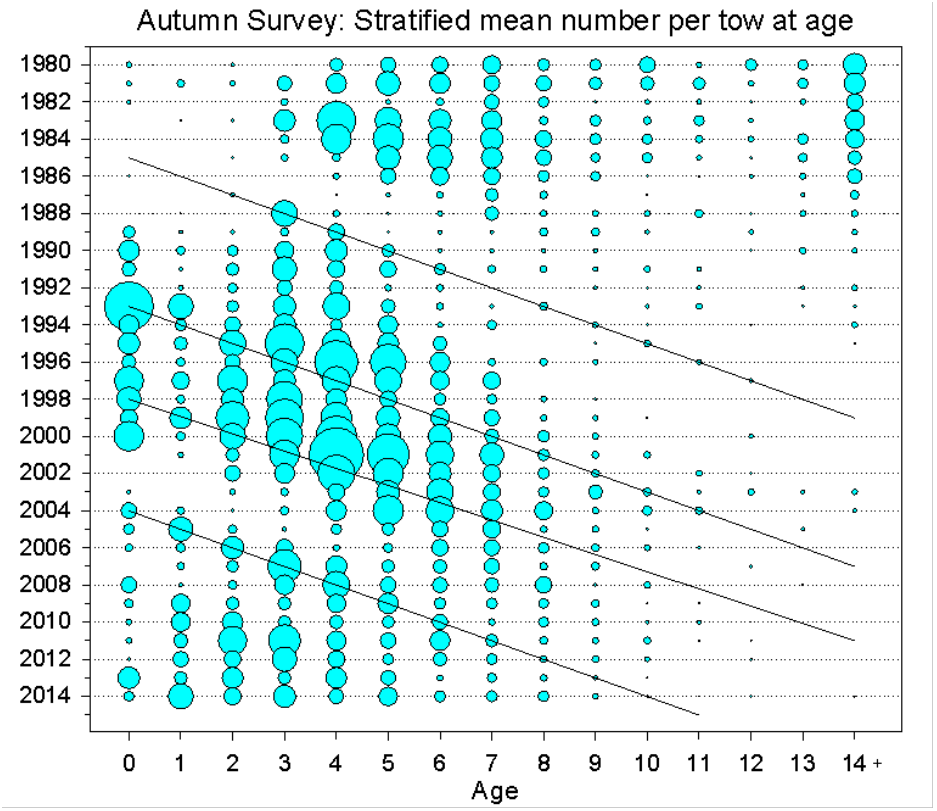
1963 to 2008
no significant survey conversion factors;

2009 onward
Significant vessel conversion factors
Constant CFs = 3.2572
Used TOGA haul criteria



Witch Flounder

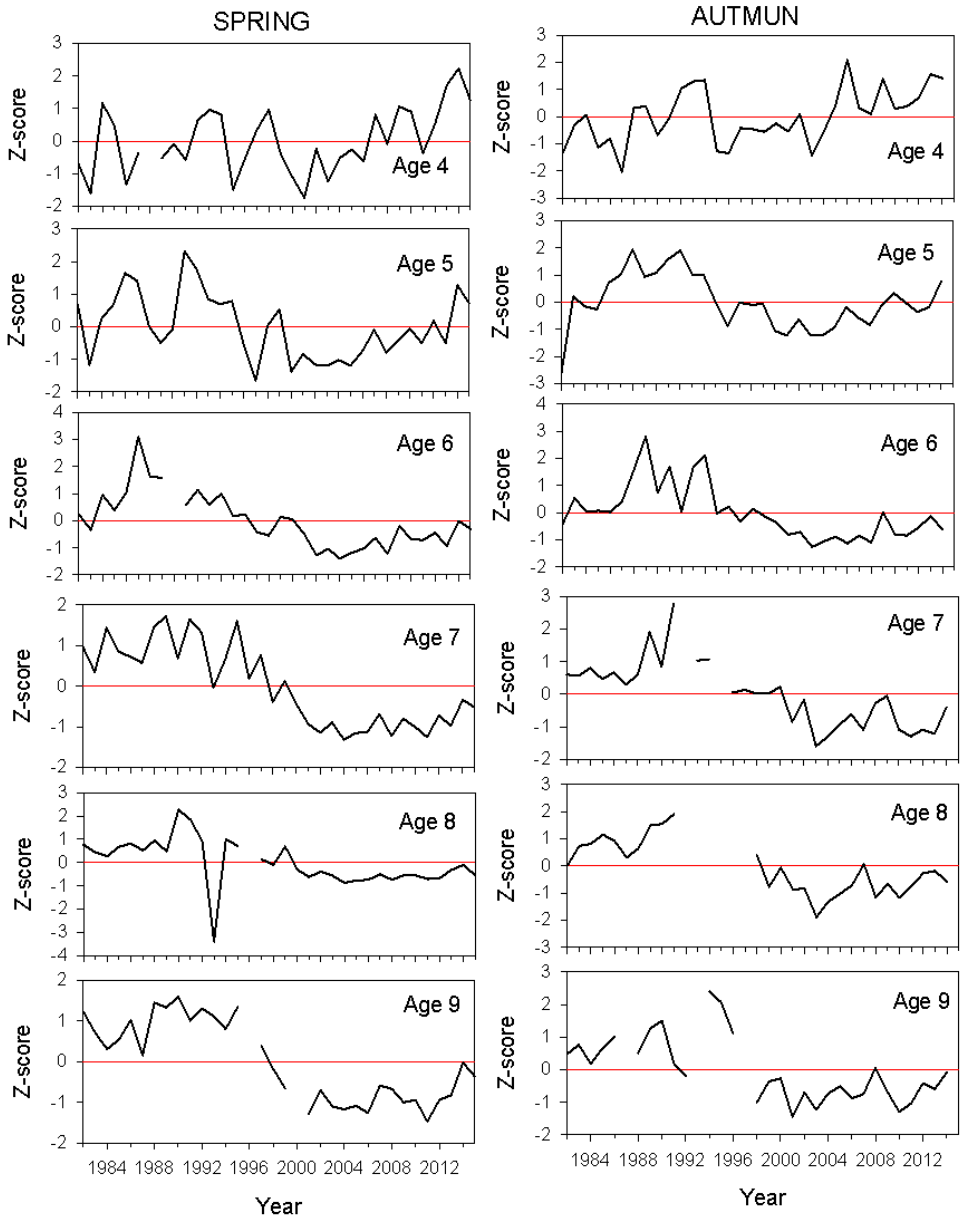




1985, 1993, 1998,and 2004 cohorts are identified by the diagonal lines

Witch Flounder

Trends in survey mean weights at age



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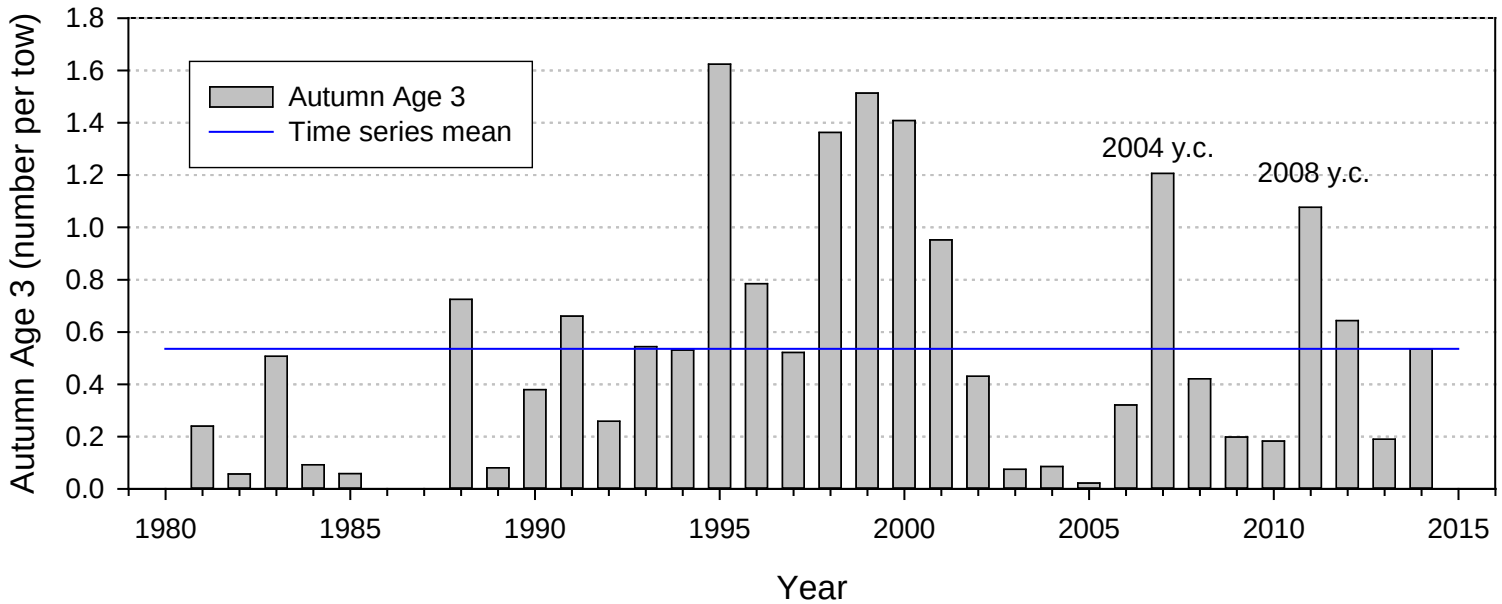

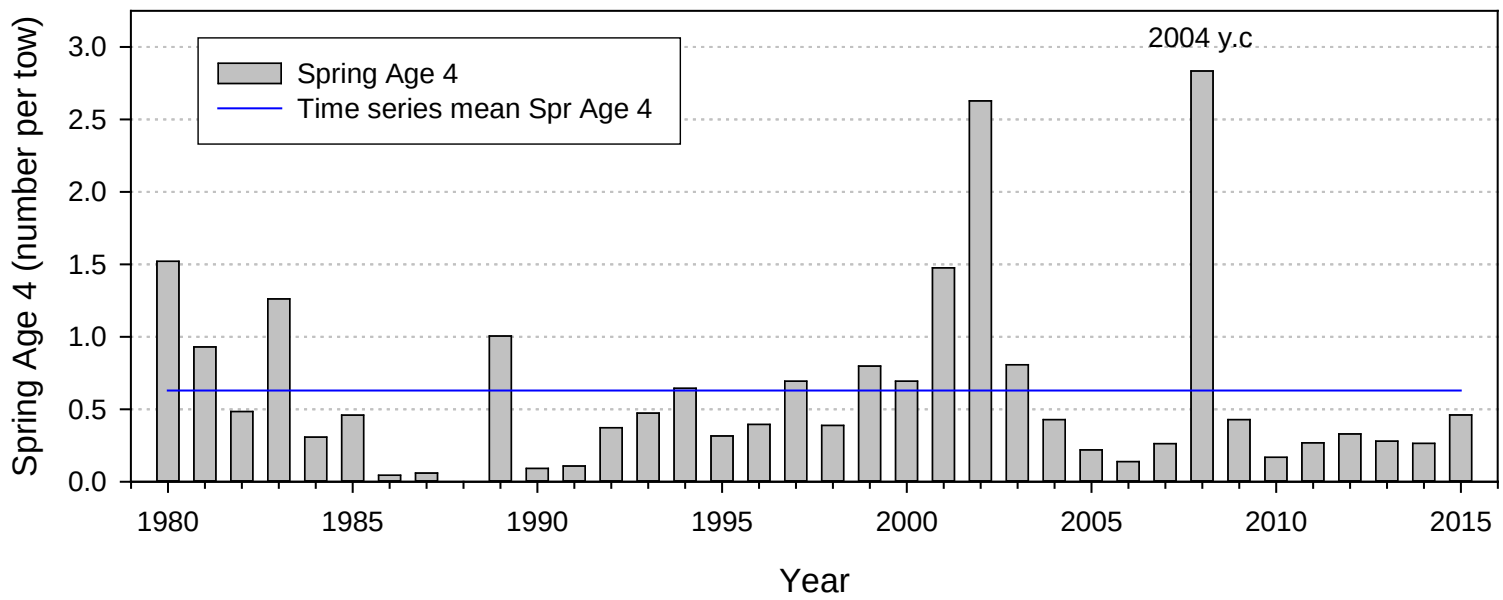

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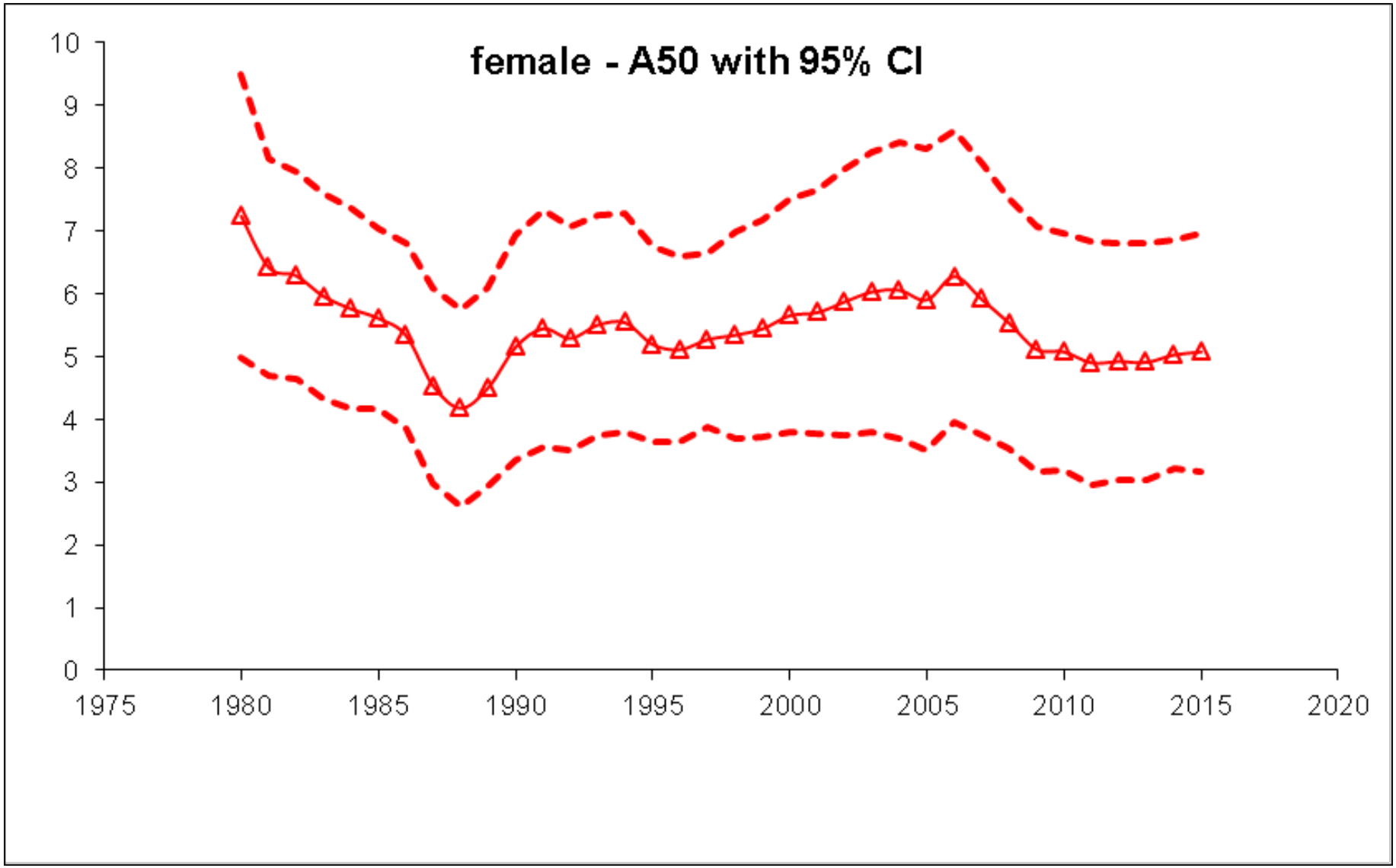


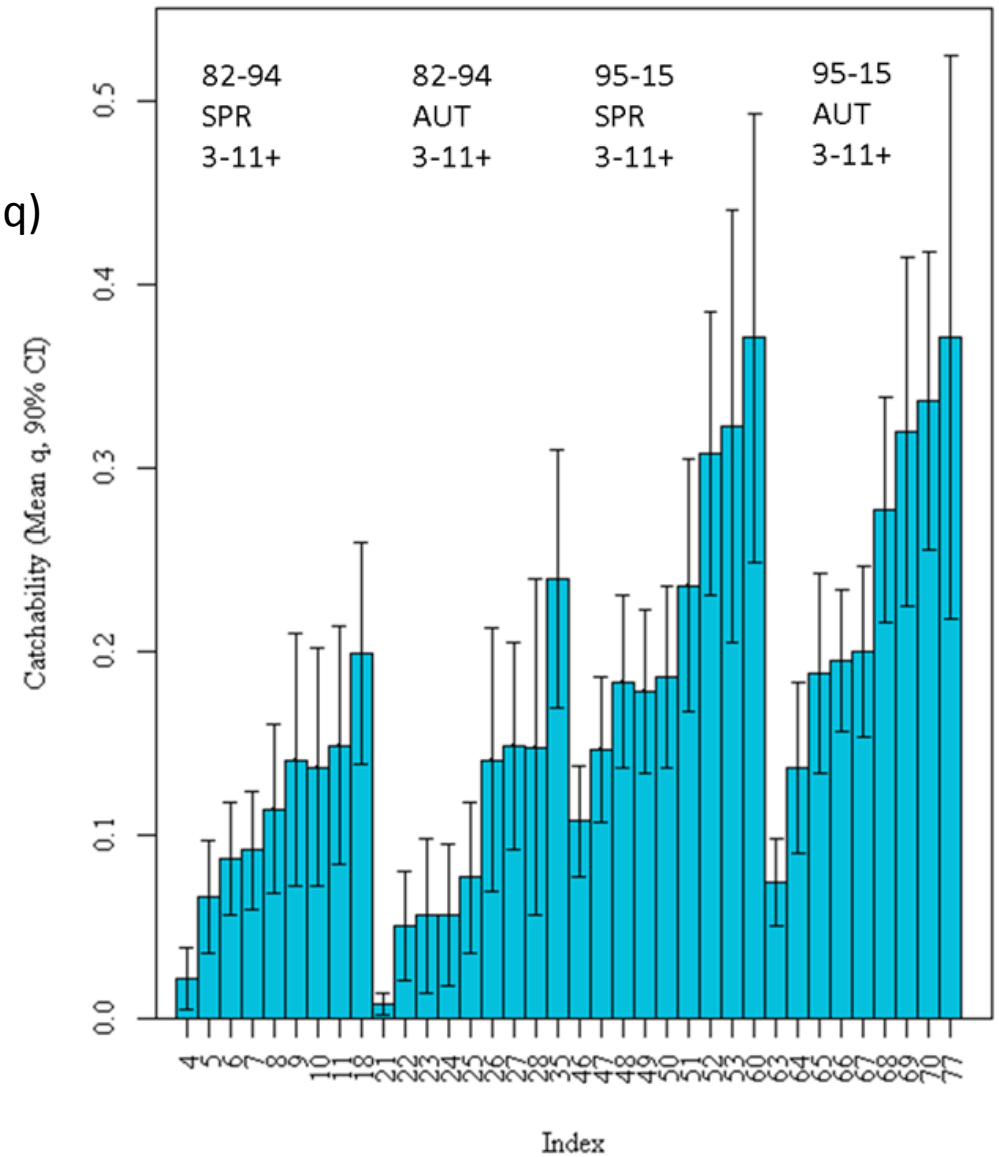
Witch Flounder

Bridge runs B, C, and D indicate
minor changes associated with updates thru 2010;

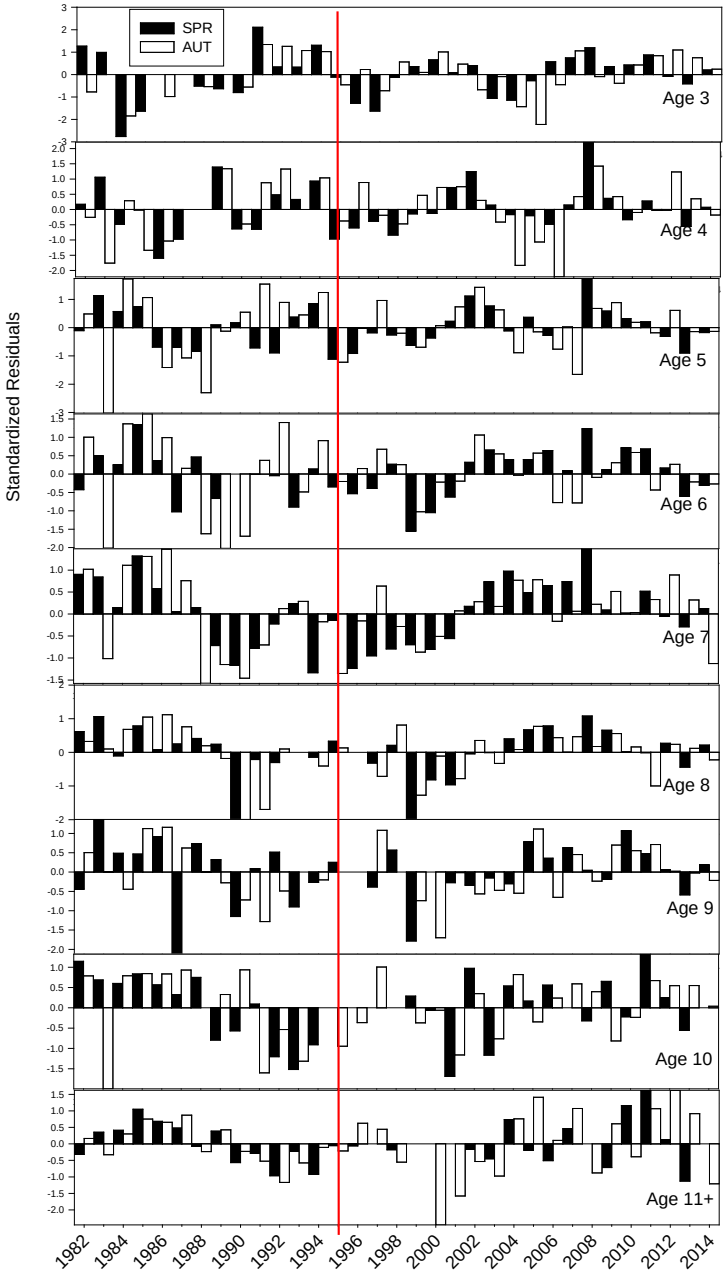
RUN	A	B	C	D	F	
	Update 2012 SPLIT RUN	Update 2015 SPLIT RUN	Update 2015 SPLIT RUN	Update 2015 SPLIT RUN	Update 2015 SPLIT RUN	
Software	**NFT VPA 3.1.1**	NFT VPA 3.4.5	NFT VPA 3.4.5	NFT VPA 3.4.5	NFT VPA 3.4.5	
Catch-At-Age	1982-2010 3-11+	1982-2010 3-11+	1982-2010 3-11+	1982-2010 3-11+	1982-2014 3-11+	
Est.Ages	3-10	3-10	3-10	3-10	3-10	
NMFS-s	3-11+	3-11+	3-11+	3-11+	3-11+	
NMFS-a	3-11+	3-11+	3-11+	3-11+	3-11+	
Residual Sum Sq.	348.4	348.4	348.108	348.478	388.609	
Mean Sq.Residual	0.6996	0.6996	0.6990	0.6998	0.6842	
N3 (cv)	16,044 (.61)	16,044 (.61)	16,494	16,603	10,991 (.60)	
N4 (cv)	4,380 (.44)	4,380 (.44)	4,476	4,504	8,699 (.43)	
N5 (cv)	2,855 (.36)	2,855 (.36)	2,956	2,973	2816 (.35)	
N6 (cv)	4,273 (.32)	4,273 (.32)	4,365	4,386	4,684	(.31)
N7 (cv)	5,887 (.30)	5,887 (.30)	5,948	5,973	2,596 (.31)	(.29)
N8 (cv)	1,427 (.32)	1,427 (.32)	1,456	1,462	870 (.34)	
N9 (cv)	418 (.42)	419 (.39)	431	432	509 (.39	
N10 (cv)	479 (.38)	476 (.39)	486	488	257 (.41)	
F 3	0.006	0.006	0.006	0.006	0.005	
F 4	0.021	0.021	0.020	0.020	0.015	
F 5	0.049	0.049	0.048	0.048	0.027	
F 6	0.068	0.068	0.067	0.067	0.051	
F 7	0.175	0.175	0.172	0.171	0.245	
F 8	0.635	0.633	0.620	0.619	0.463	
F 9	0.297	0.299	0.294	0.293	0.393	
F10	0.466	0.466	0.457	0.456	0.428	
F11+	0.466	0.466	0.457	0.456	0.428	
2010 Avg F 8-9	**0.47 (.20)**	0.466	0.457	0.456	0.671	
2010 SSB (mt)	**4,099 (.12)**	4,100	4,146	4,173	2,363	
2010Age 3 in yrt	**5,119**	5,120	5,231	5,265	3,229	
2014 Avg F 8-9					**0.428 (.19)**	
2014 SSB (mt)					**3,129 (.12)**	
2014 Age 3 in yrt					**10,160**	
Mohn's rho F8-9	-0.33				-0.38	
Mohn's rho SSB	0.61				0.51	
Mohn's rho Age 3	0.06				1.14	
Notes:	Accepted run	Bridge Run with software update	Bridge Run with softward and survey updates	Bridge Run with software, survey, and catch updates.		

Witch Flounder

Survey swept area catchabilities (q)

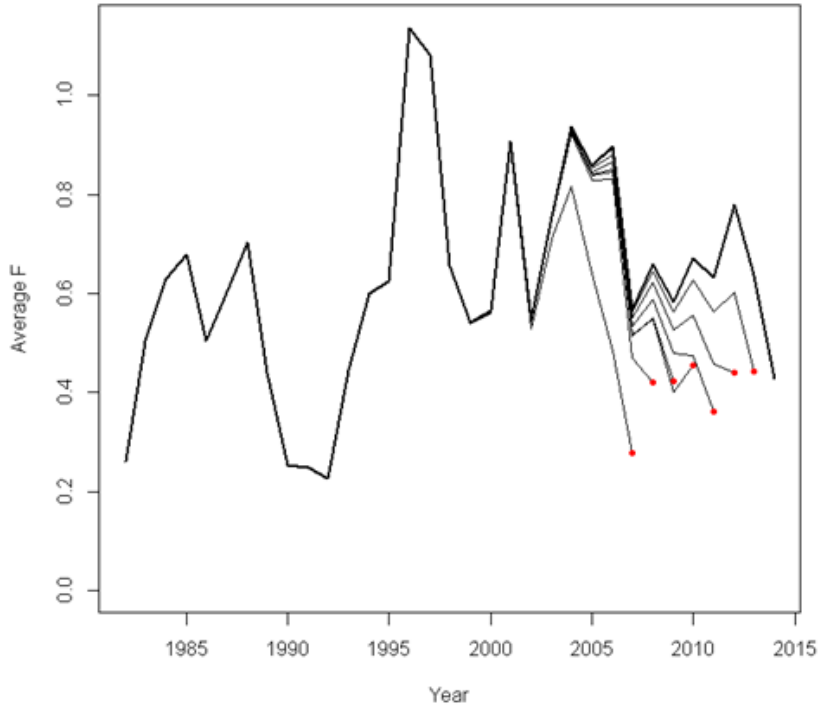


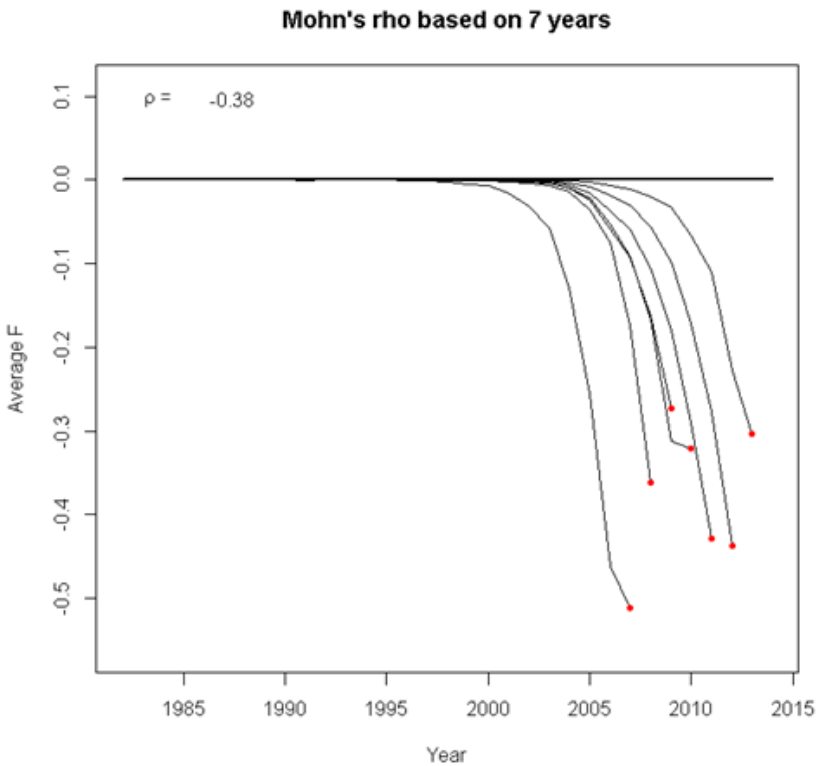
Witch Flounder



Witch Flounder

Pattern of underestimation for F

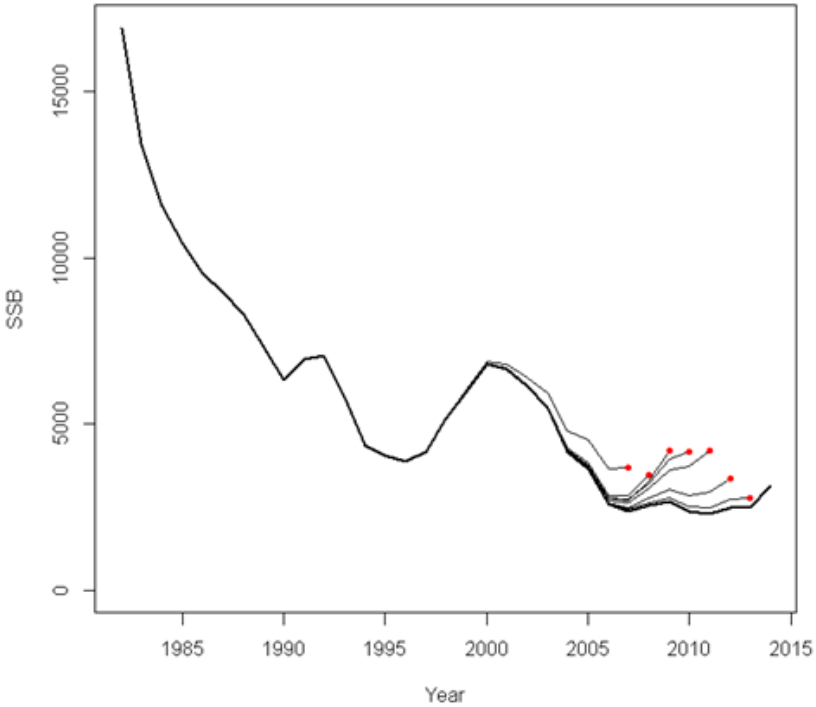


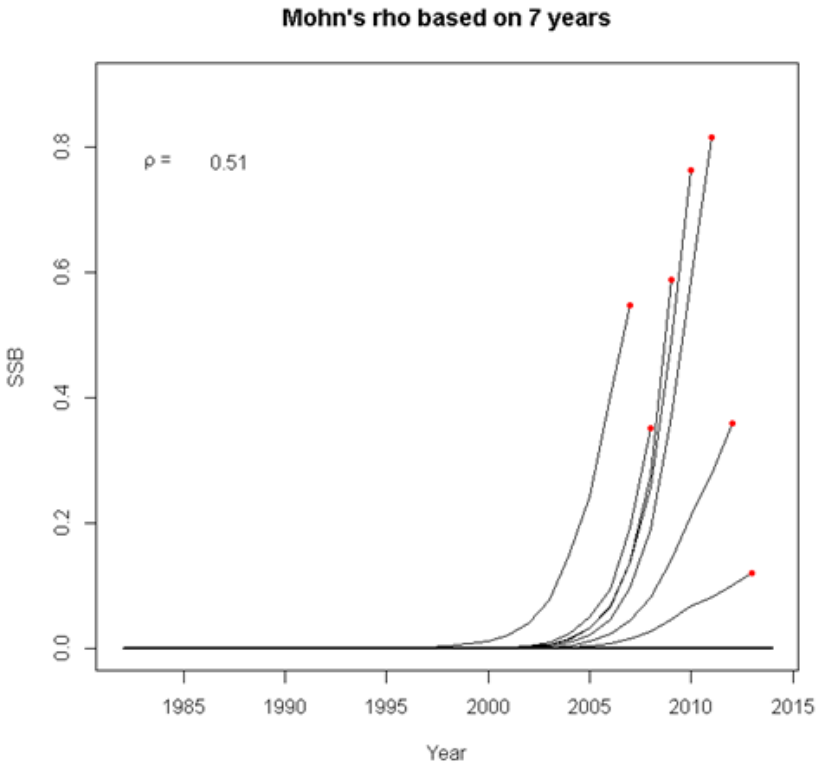


Mohn's rho values
-0.02 in 2008 GARM
-0.33 in 2012 Update
-0.38 in 2015 Update

Witch Flounder

Pattern of overestimation for SSB





Mohn's rho values
0.43 in 2008 GARM
0.61 in 2012 Update
0.51 in 2015 Update

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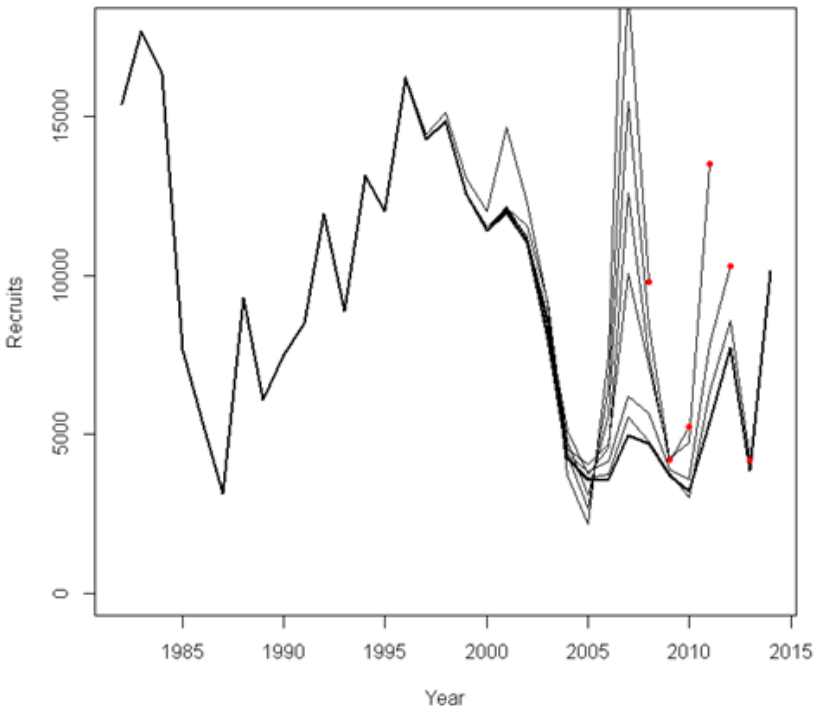
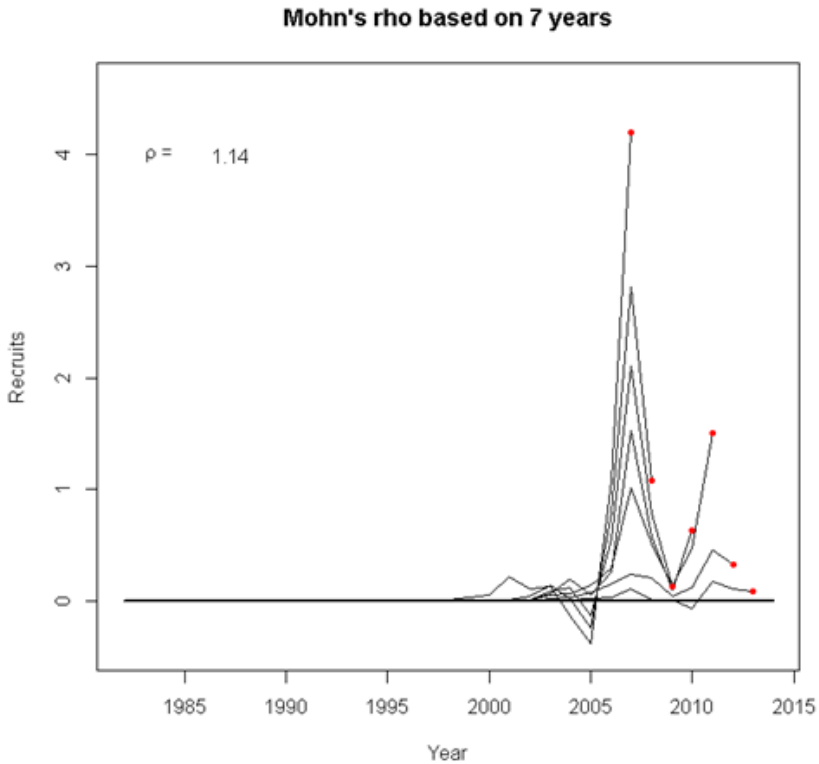
Pattern of overestimation for Age 3 Recruits

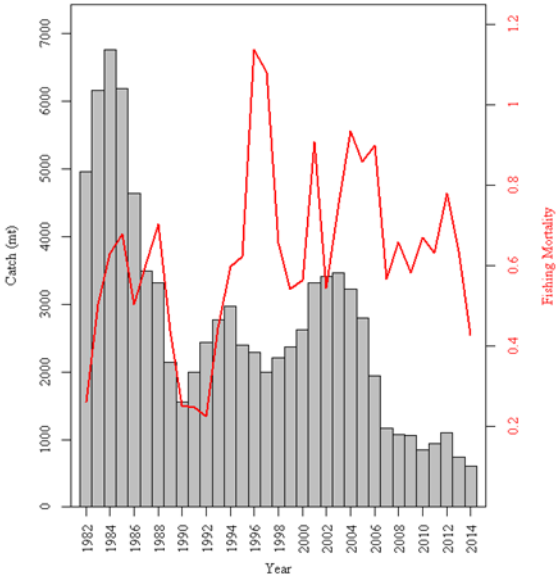


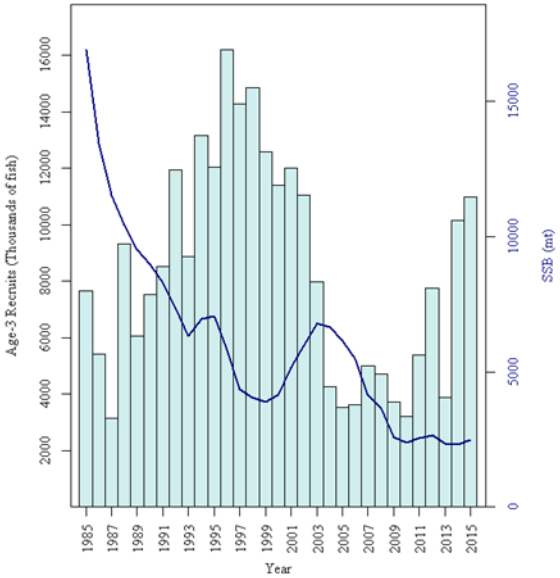


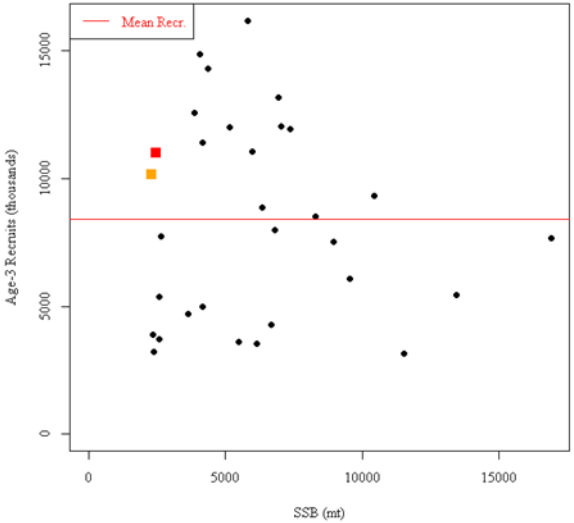
Mohn's rho values
-0.13 in 2008 GARM
0.06 in 2012 Update
1.14 in 2015 Update

Witch Flounder

Summary of VPA SPLIT RUN F results







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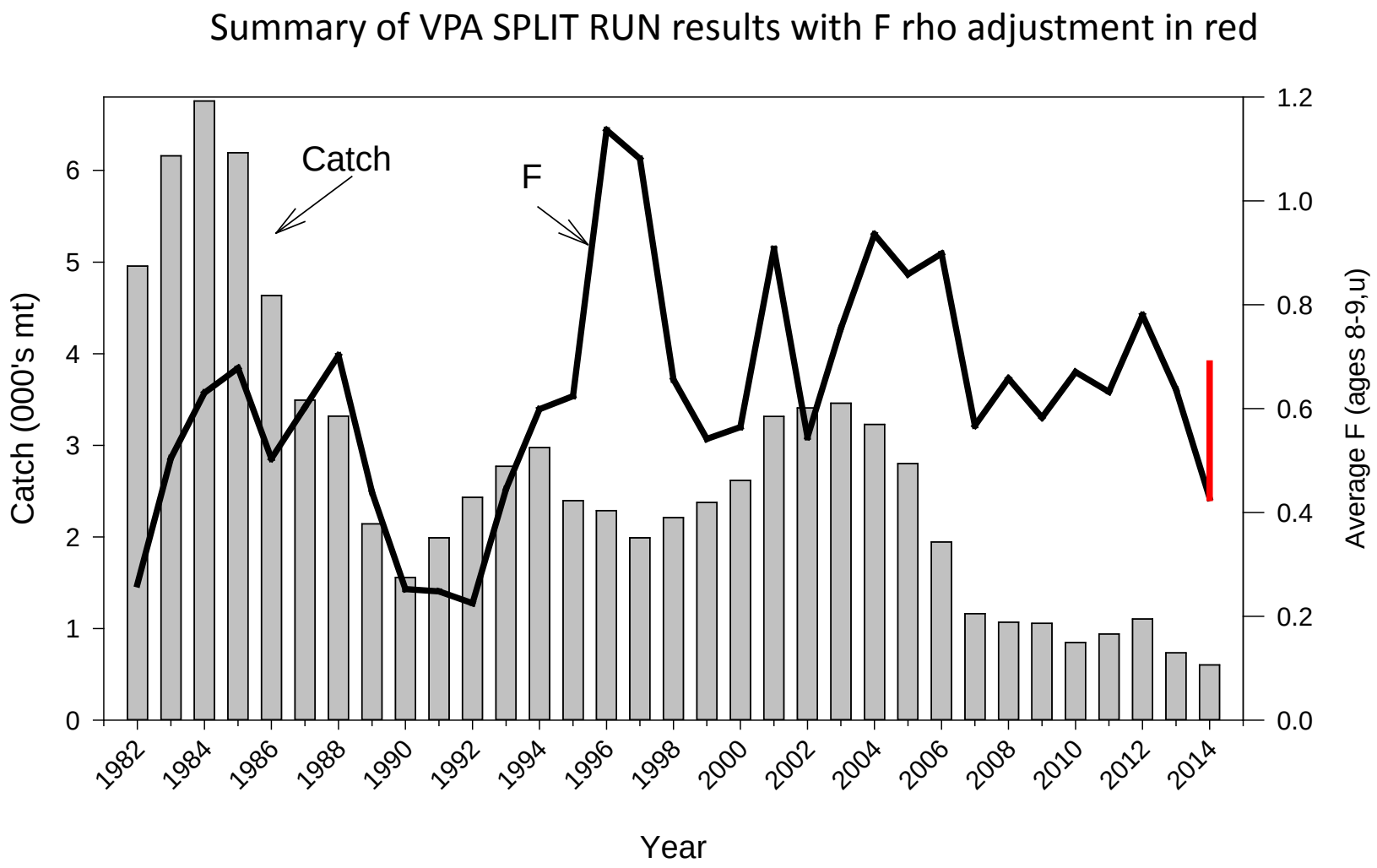

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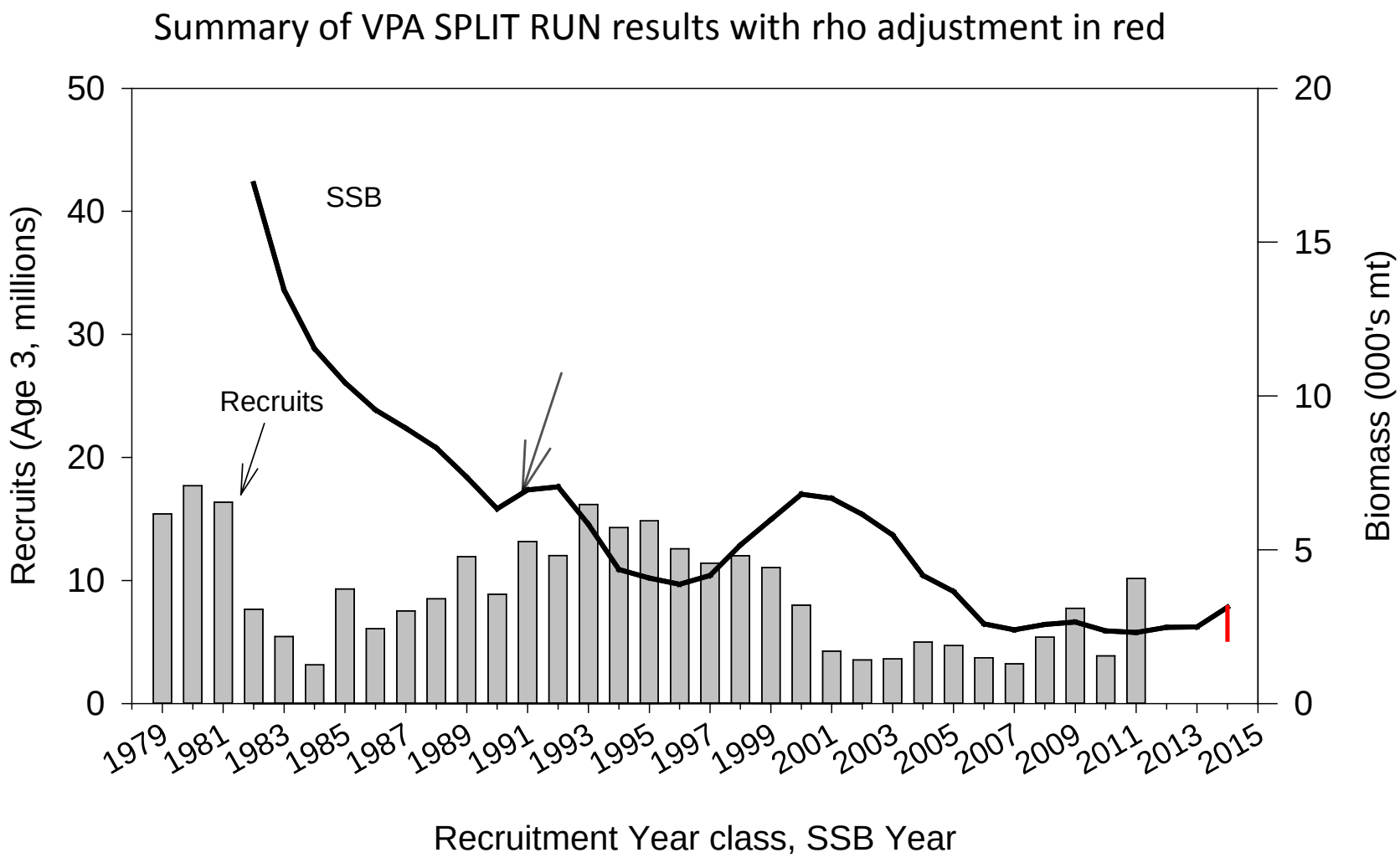
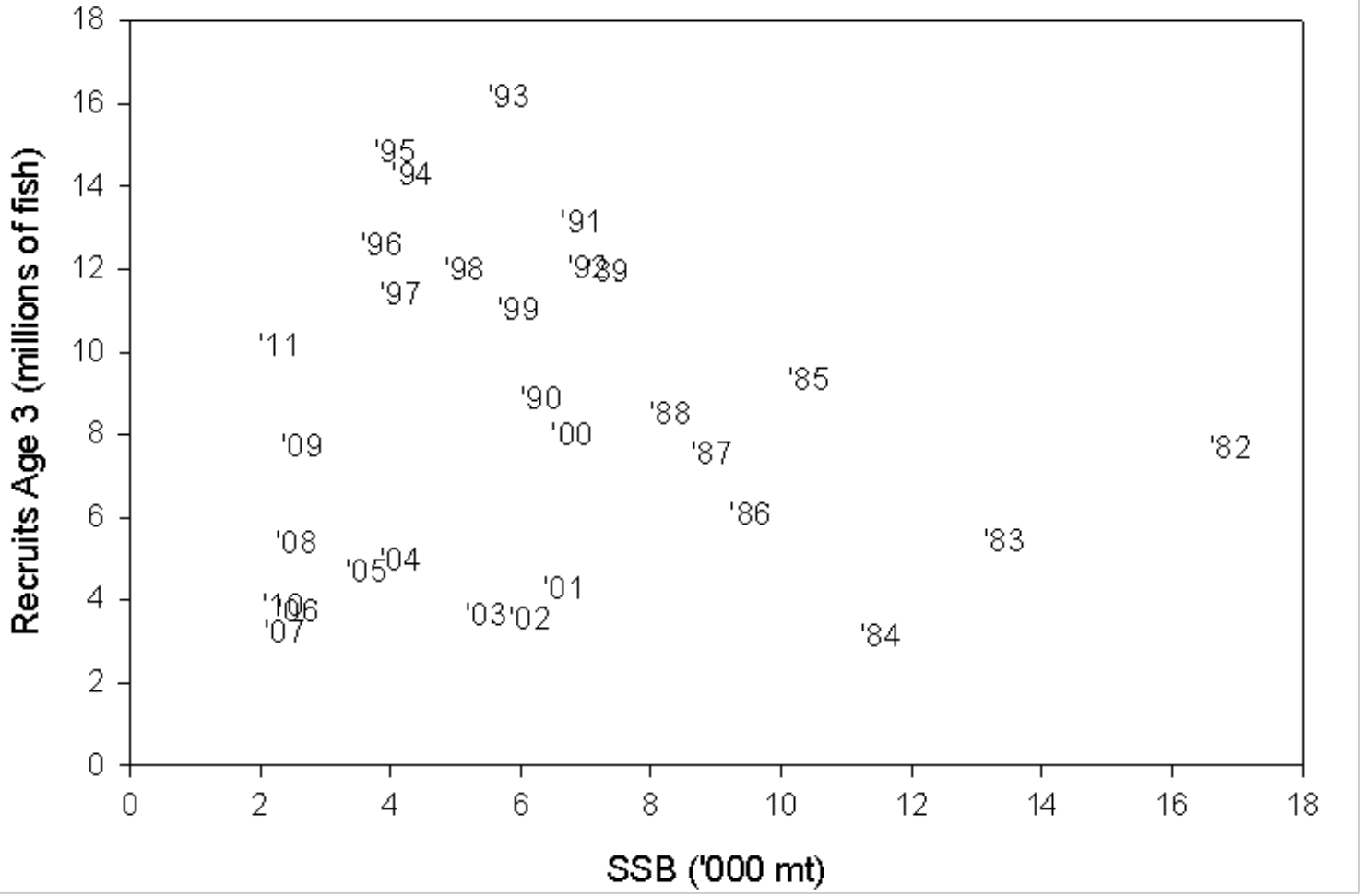


Witch Flounder

1982 to 2011 year classes



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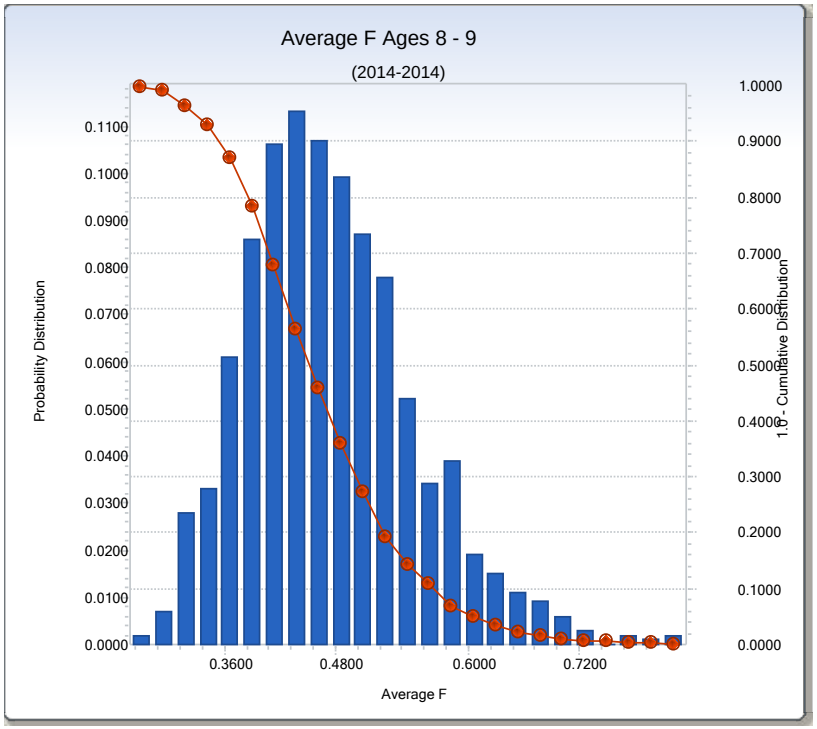

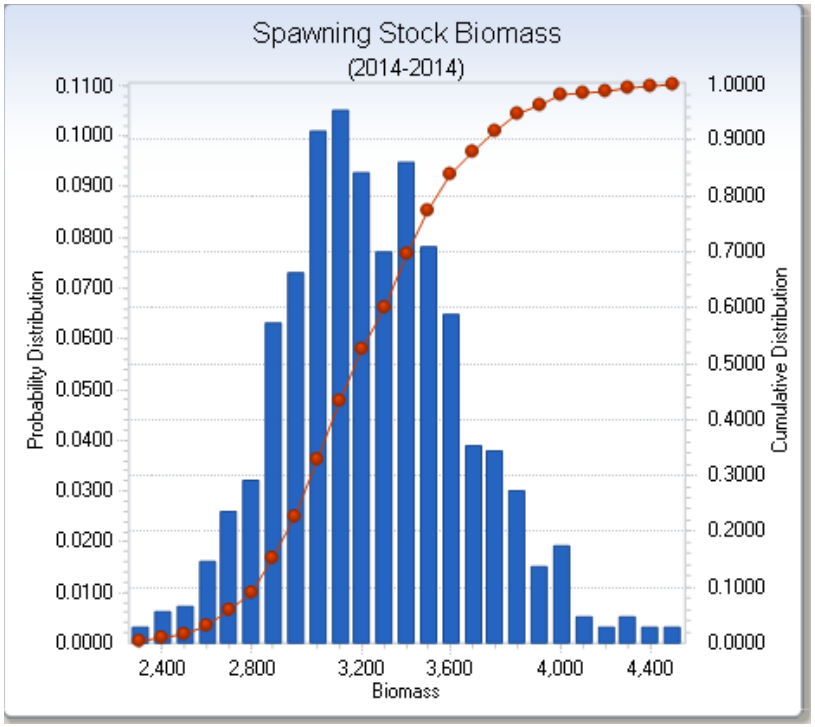

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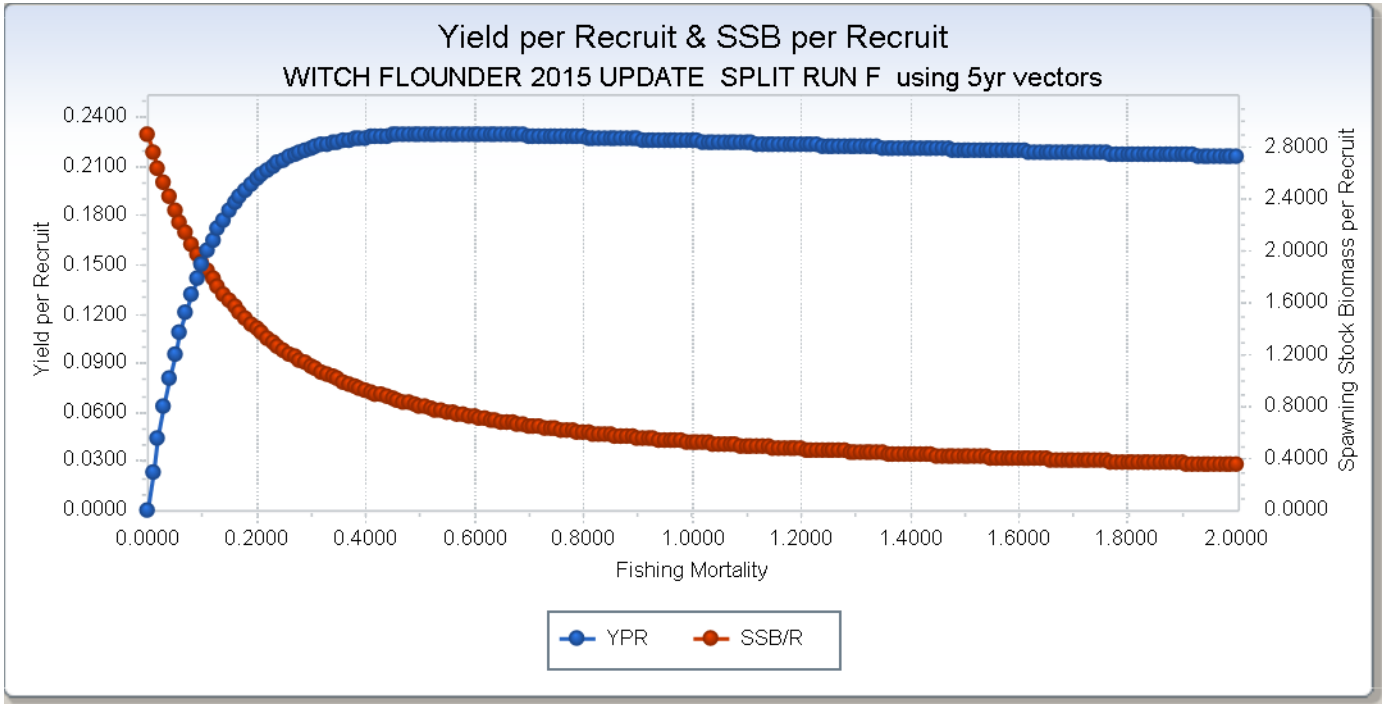


Age	F-Selectivity	Natural Mortality	Stock Wt	Catch Wt	Spawn Stock Wt	Maturity
3	0.012800	0.150000	0.098500	0.127550	0.127550	0.113000
4	0.032400	0.150000	0.158100	0.206160	0.206160	0.272700
5	0.090500	0.150000	0.245500	0.293300	0.293300	0.524800
6	0.427400	0.150000	0.321200	0.362630	0.362630	0.764800
7	0.568500	0.150000	0.402300	0.453750	0.453750	0.905400
8	1.000000	0.150000	0.493100	0.544030	0.544030	0.965700
9	1.000000	0.150000	0.594400	0.659350	0.659350	0.988100
10	1.000000	0.150000	0.675400	0.707830	0.707830	0.995900
11+	1.000000	0.150000	0.972600	0.972710	0.972710	1.000000

Ref Point	F	YPR	SSB/R	TSB/R	Mean Age	Mean GT	Exp Spawn
F-Zero	0.000000	0.000000	2.899451	3.186794	7.882307	9.638942	3.147706
F-01	0.218000	0.206741	1.336769	1.638491	5.990778	7.431849	2.439766
FMax	0.550000	0.229472	0.759443	1.065060	5.134684	6.264784	1.876916
F at 40% MSP	0.279100	0.218069	1.159855	1.462712	5.737072	7.098555	2.302500

Witch Flounder

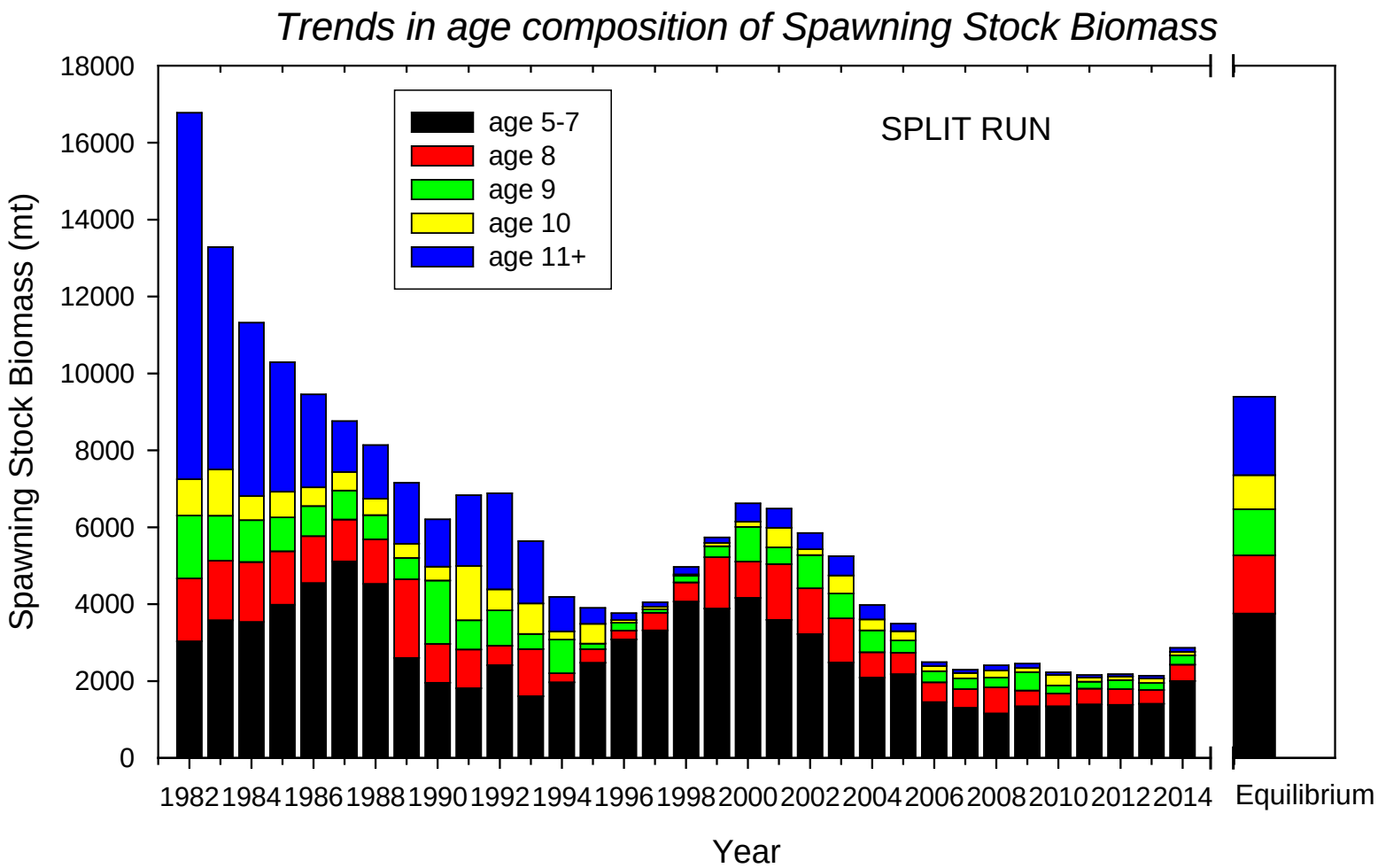
Biological Reference Points

	Fmsy F40%	Y/R (kg)	SSB/R (kg)	Mean Age 3 Recruitment (fish,millions)	Agepro Projections SSBmsy (mt)	Agepro Projections MSY (mt)
GARM 2008						
SPLIT RUN	0.20	0.1943	0.9346	11.1	11,447	2,352
Update 2012						
SPLIT RUN	0.27	0.2069	0.9970	10.0	10,051	2,075
Update 2015						
SPLIT RUN	0.279	0.2181	1.1599	9.0	9,473	1,957

AGEPRO (long-term stochastic) projections used:
- same 5-yr average vectors as Y/R and VPA;
- Recruitment: re-sampling from empirical cdf of the 1979 – 2010 year classes

Note: mean Age 3 recruitment values are not used in the calculation of SSBmsy or MSY estimates

Witch Flounder



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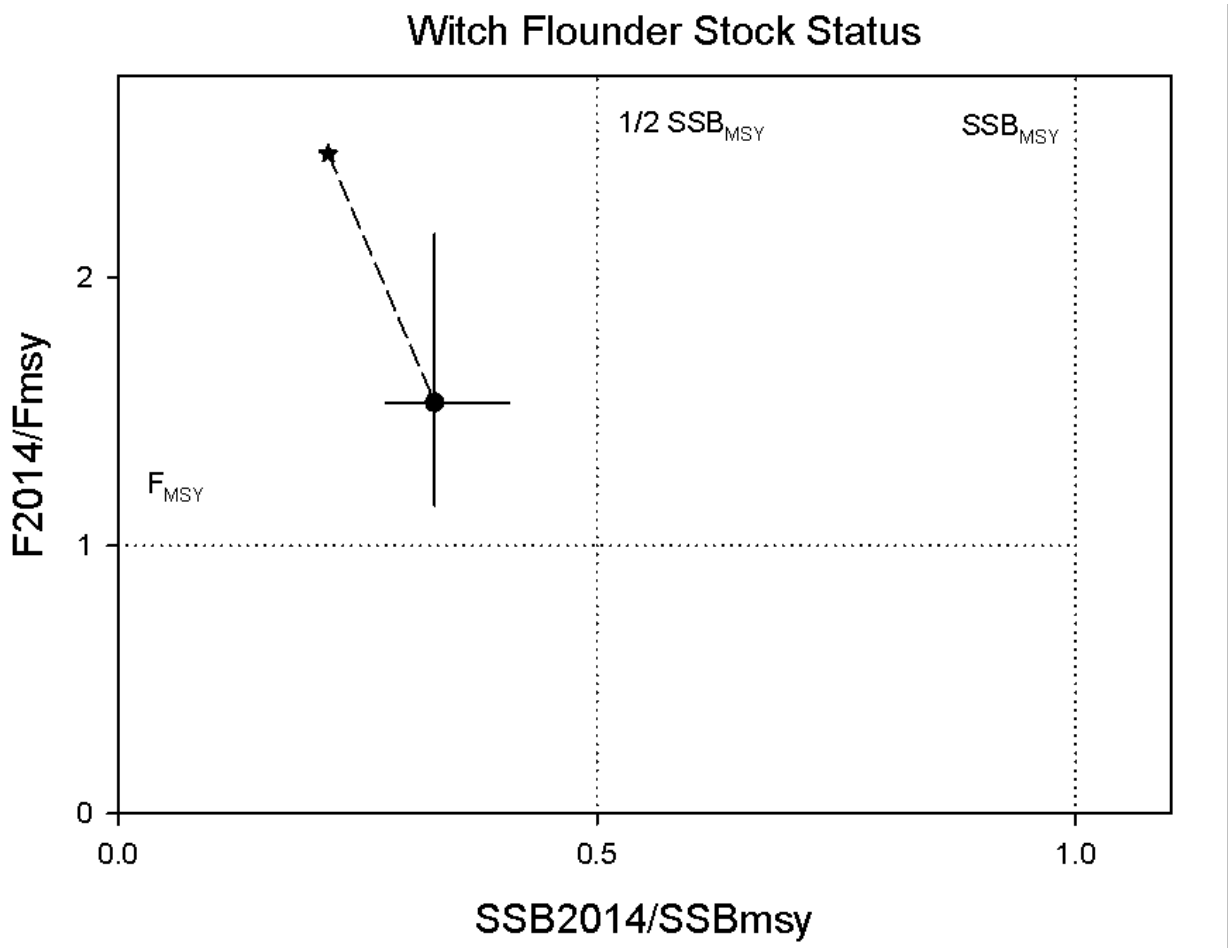
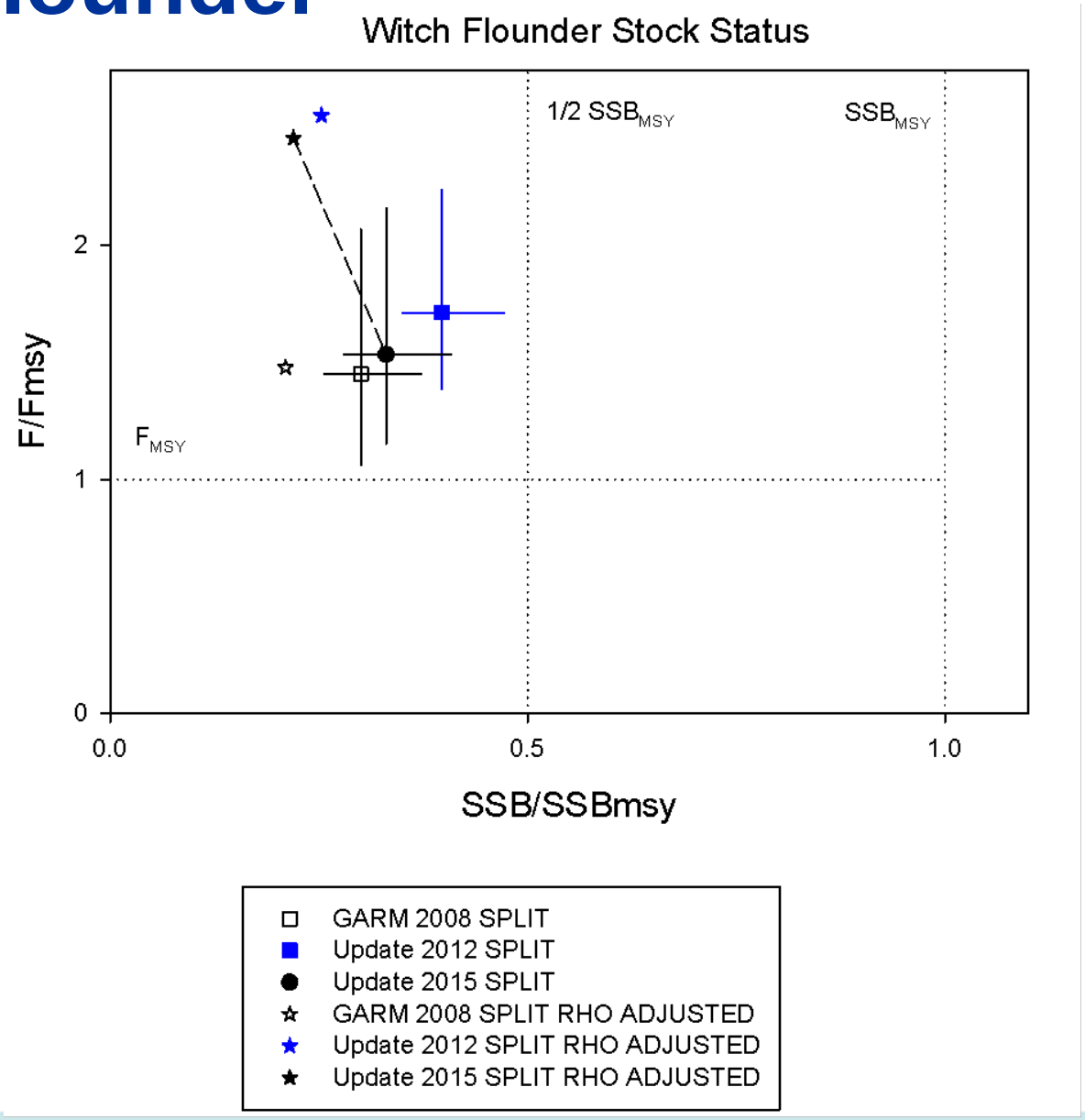


Rho adjusted estimates do not change stock status

Witch Flounder



Witch Flounder

Projection Recommendations

- Mean weights at age (catch and stock): 2010 – 2014
- Partial recruitment: 2010 – 2014
- Natural mortality: 0.15
- Maturity at age: 2013 vector (using 5-year pooled window of 2011-2015 NEFSC spring survey maturity at age data for females).
- AGEPRO projection using $F_{40\%}$, CDF of 1982 – 2013 empirical recruitment (1979 -2010 year classes).
- SSB retrospective adjustment (0.6638) applied to all ages.

Witch Flounder

Projections: 2015 catch estimated to be 637 mt

	Fmsy (0.279)
Catch (mt)	
Year	
2015	637
2016	513
2017	712
2018	879
Spawning Stock Biomass (mt)	
Year	
2015	2,556
2016	3,201
2017	4,143
2018	5,163

Forecast medians (50% probability level)

Witch Flounder

Summary Points

Catch is at time-series low; discards are estimated to be a minor component

Most survey indices are below their time-series average

Recruitment Age 3 in NEFSC surveys is at or below time-series average

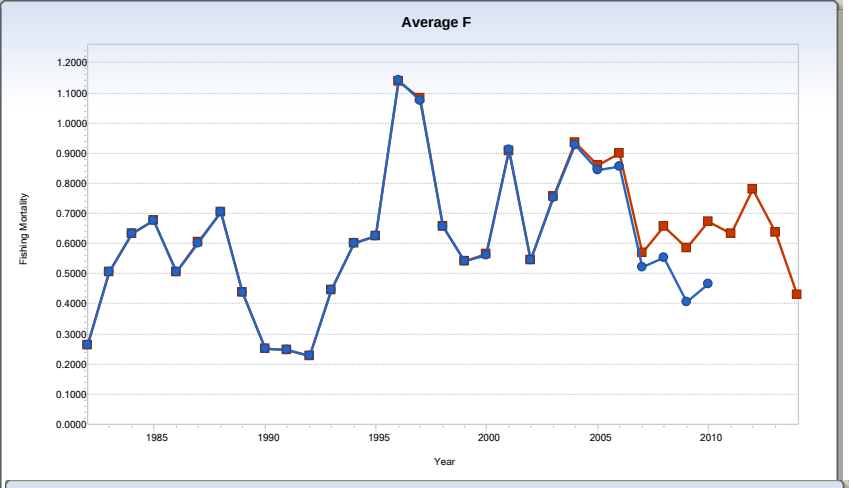
Truncation of age structure remains; mid-2000s and mid-2010s expansion did not continue (evident in commercial and survey)

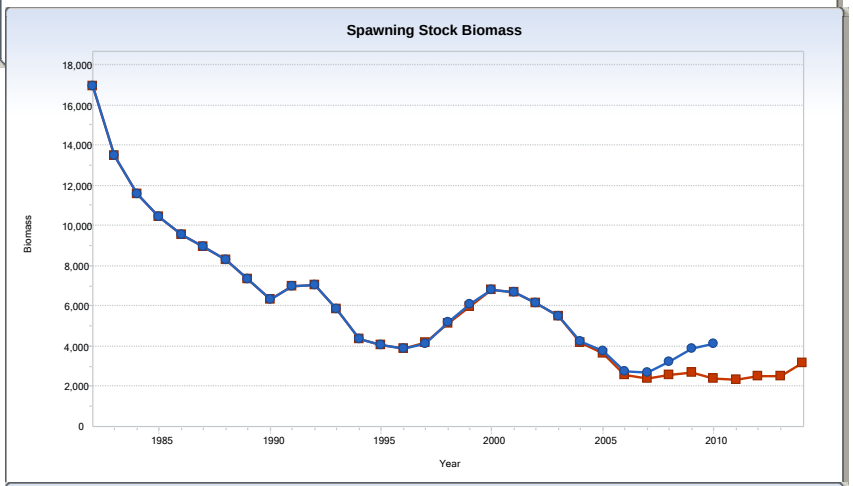
Retrospective pattern remains (important source of uncertainty)

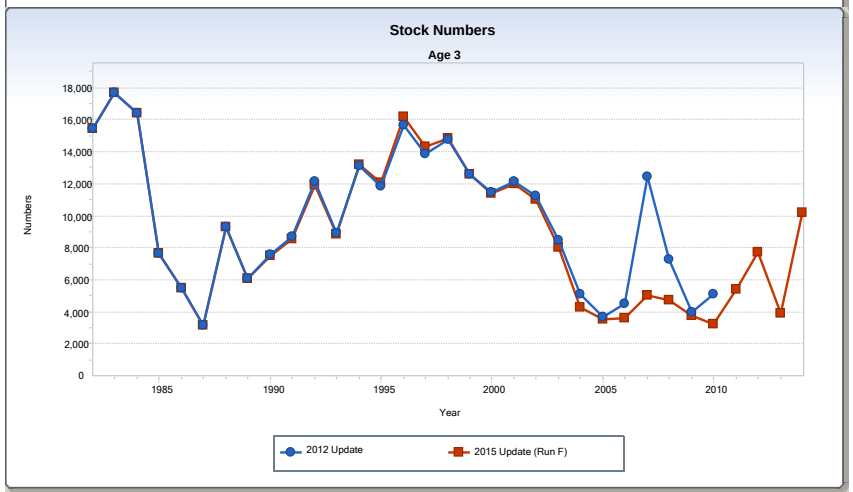
Projections for witch flounder appear to be optimistic

- the projected rho adjusted biomass from the last assessment was above the upper CI bound of the projected rho adjusted biomass estimated in this assessment

Back-pocket slides







Comparison of VPA Runs for F, SSB and Age 3

2015 Update SPLIT RUN red

	Pt estimate	Rho adjusted
F	0.428	0.687
SSB	3,129	2,077

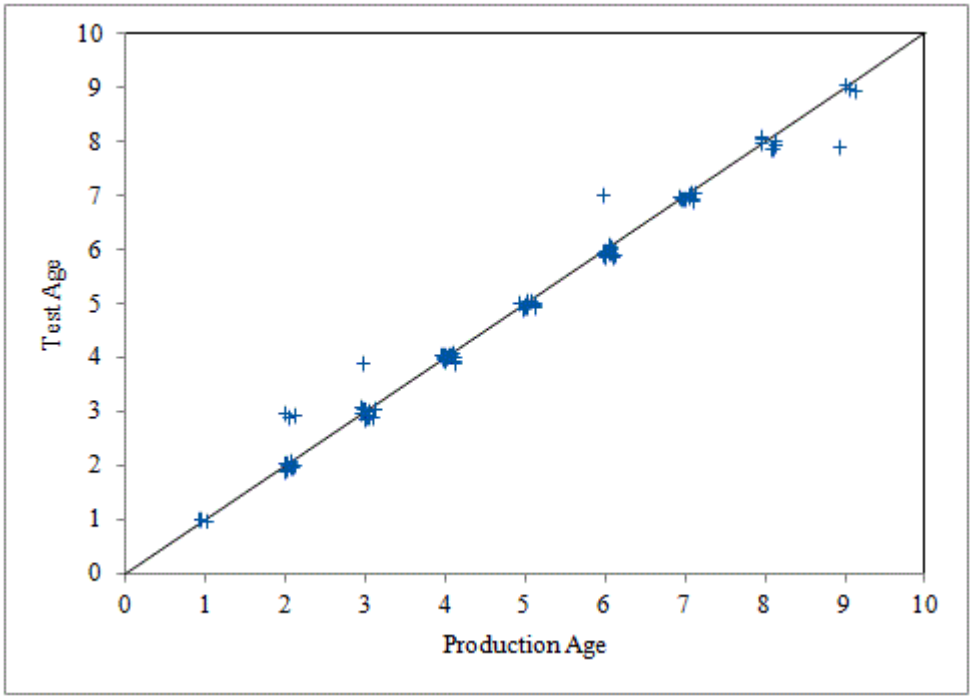
2012 Update SPLIT RUN blue

	Pt estimate	Rho adjusted
F	0.47	0.70
SSB	4,009	2,546

WITCH FLOUNDER AGE DATA since 2012 Update

Survey: percent agreement ranges between 85 to 94%
Commercial: percent agreement ranges 77 to 97%

Spring 2015
Sample size = 91 fish 93.4% agreement



Production Ageing QA/QC Estimates webpage
http://www.nefsc.noaa.gov/fbp/QA-QC/