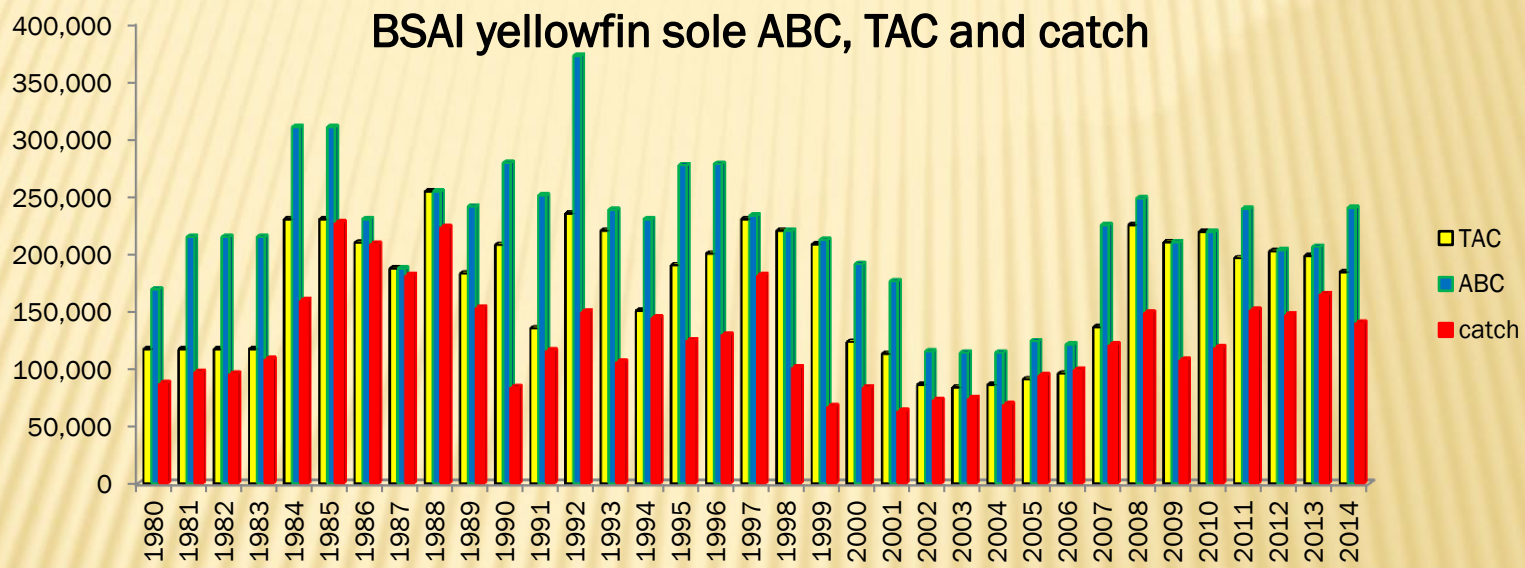
YELLOWFIN SOLE

BY

WILDERBUER, NICHOL AND IANELLI

CHANGES TO THE INPUT DATA

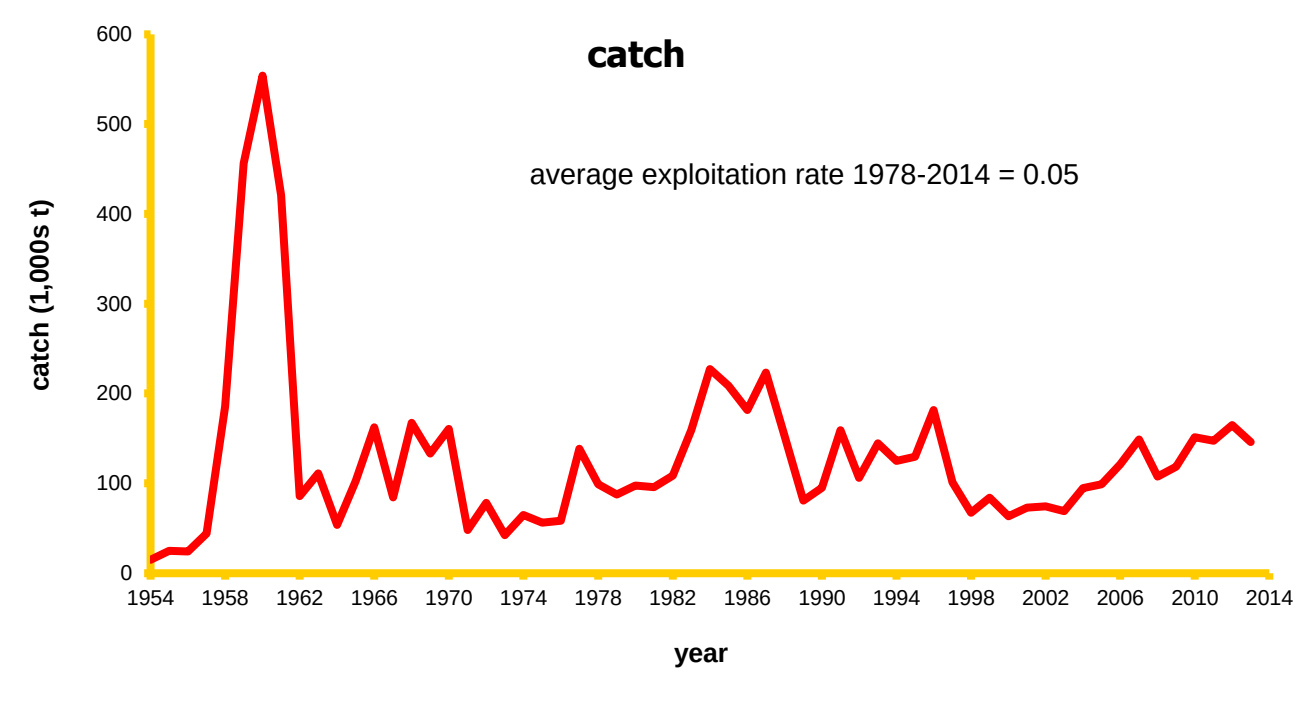
- 2013 fishery age composition.
- 2013 survey age composition.
- 2014 trawl survey biomass point estimate and standard error.
- Estimate of catch (t) made through the end of 2014.
- Estimate of retained and discarded portions of the 2013 catch.
- New maturity schedule


BSAI yellowfin sole ABC, TAC and catch
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
TAC
ABC
catch

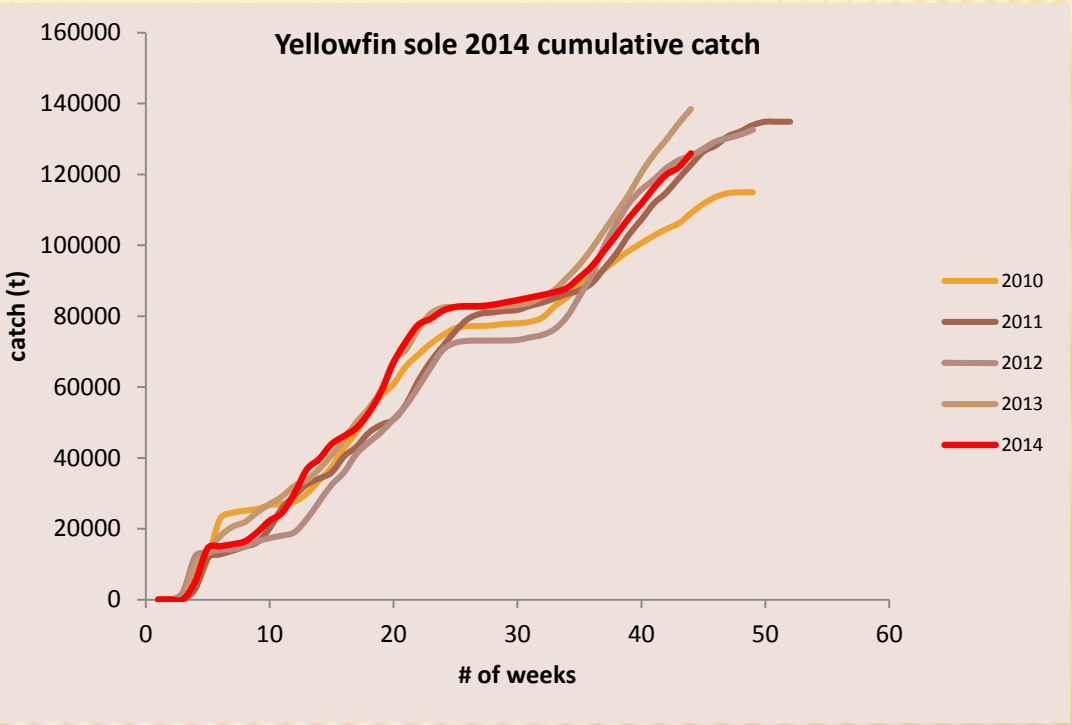
BSAI YELLOWFIN SOLE

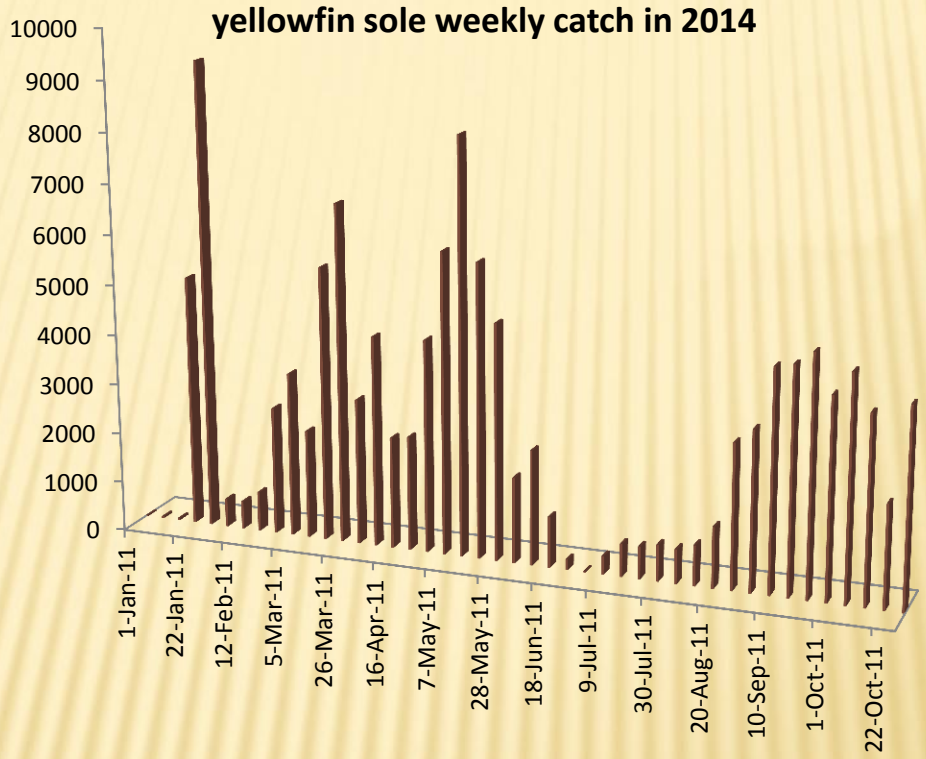
Quantity	As estimated or *specified last* year for: 2013	2014	As estimated or *recommended this* year for: 2015	2016
M (natural mortality rate)	0.12	0.12	0.12	0.12
Tier	1a	1a	1a	1a
Projected total (age 6+) biomass (t)	2,113,000	2,188,000	2,127,800	2,100,000
Female spawning biomass (t)	587,300			
Projected	581,100	594,800	644,200	648,600
B_0	989,800		989,800	
B_{MSY}	366,000		391,000	
F_{OFL}	0.123	0.123	0.125	0.125
$maxF_{ABC}$	0.113	0.113	0.117	0.117
F_{ABC}	0.113	0.113	0.117	0.117
OFL (t)	259,700	268,900	266,400	262,900
maxABC (t)	239,800	248,300	248,800	245,500
ABC (t)	239,800	248,300	248,800	245,500
Status	As determined *last* year for: 2012	2013	As determined *this* year for: 2013	2014
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

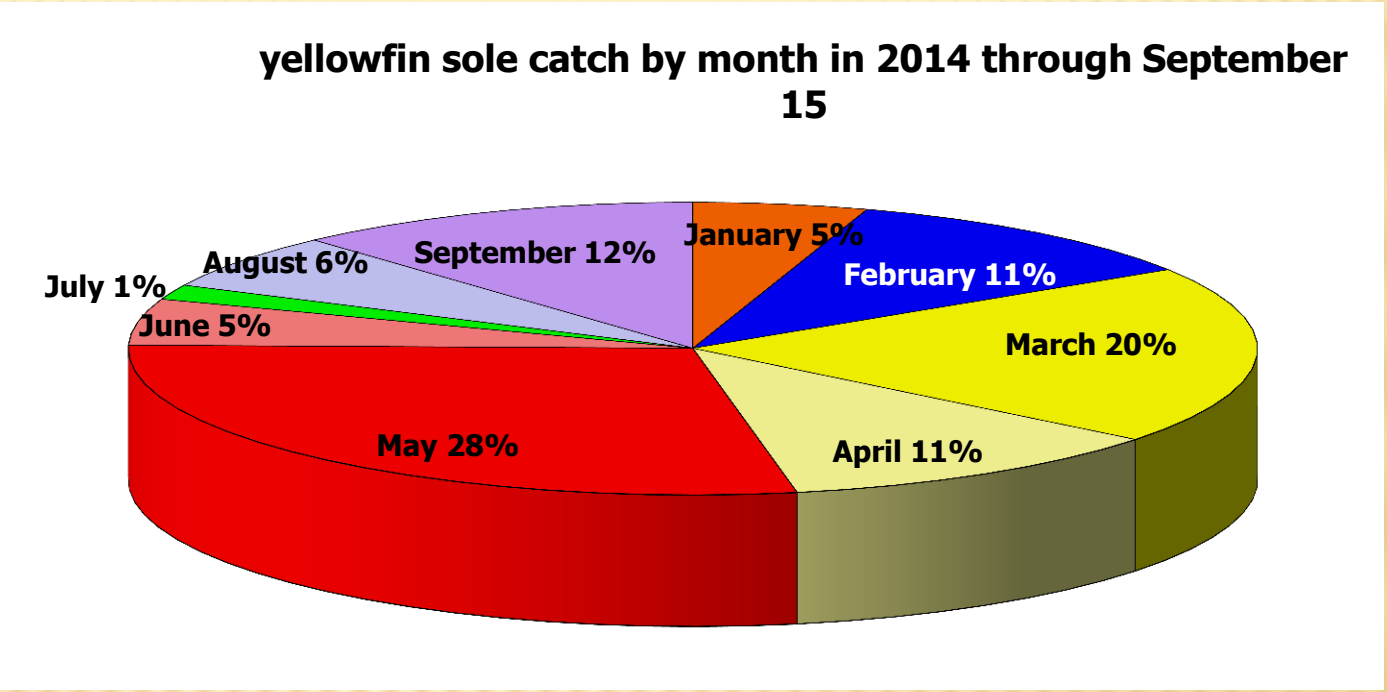
2014 CATCH = 140,000 T
AVERAGE 1978-2014 EXPLOITATION RATE = 0.05

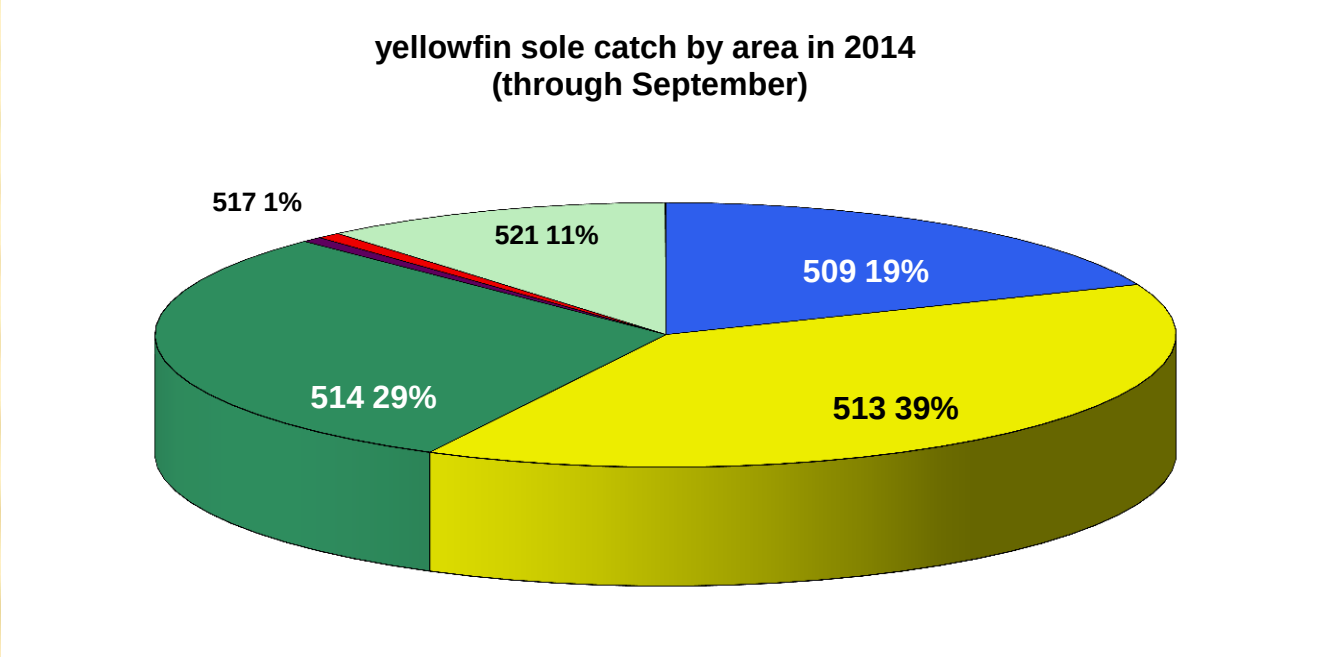


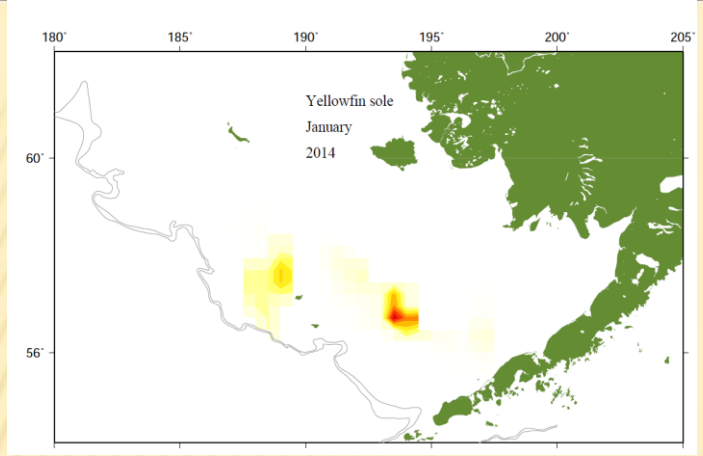
cumulative catch

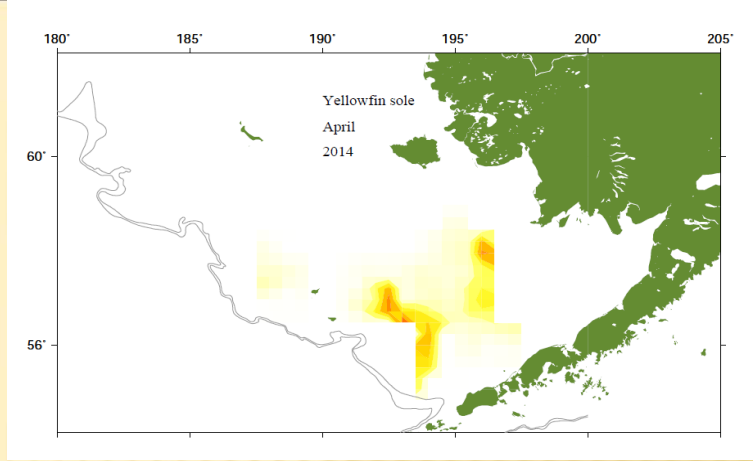


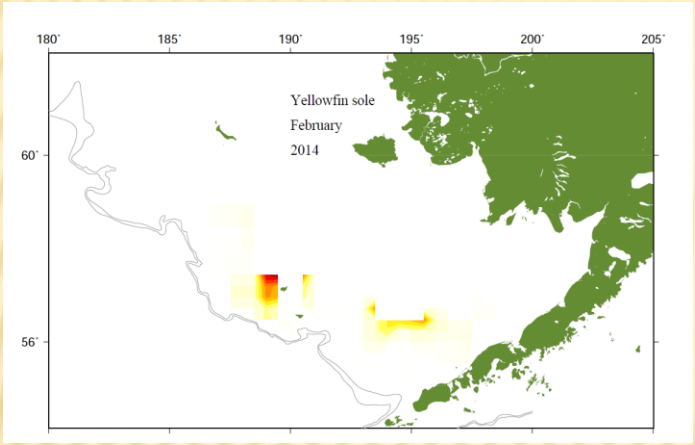

yellowfin sole weekly catch in 2014
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1-Jan-11
22-Jan-11
12-Feb-11
5-Mar-11
26-Mar-11
16-Apr-11
7-May-11
28-May-11
18-Jun-11
9-Jul-11
30-Jul-11
20-Aug-11
10-Sep-11
1-Oct-11
22-Oct-11

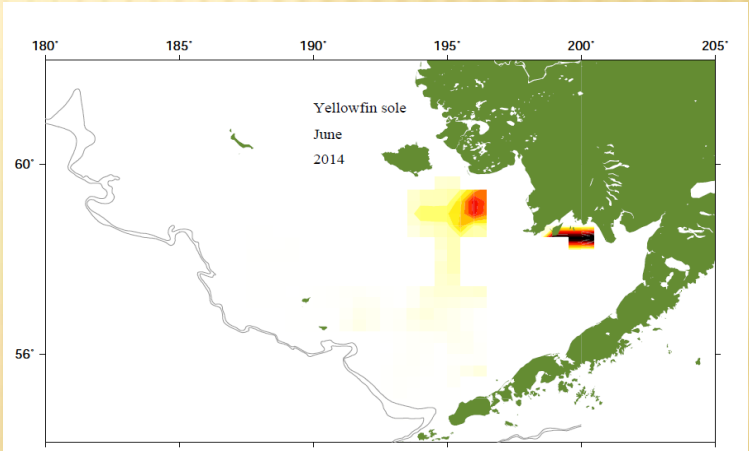

yellowfin sole catch by month in 2014 through September 15
January 5%
February 11%
March 20%
April 11%
May 28%
June 5%
July 1%
August 6%
September 12%

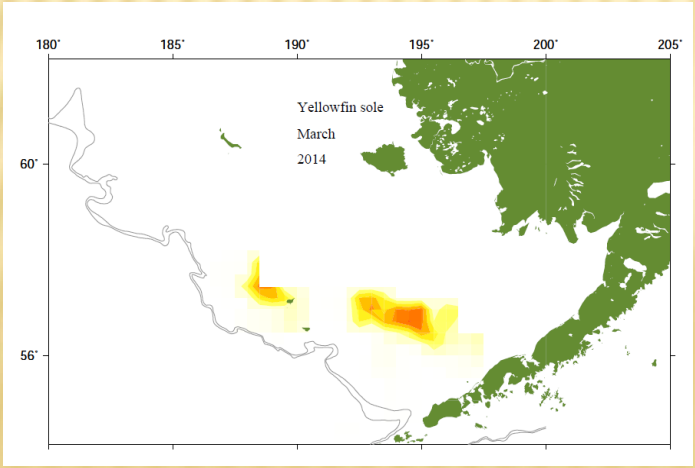

yellowfin sole catch by area in 2014
(through September)
517 1%
521 11%
509 19%
514 29%
513 39%

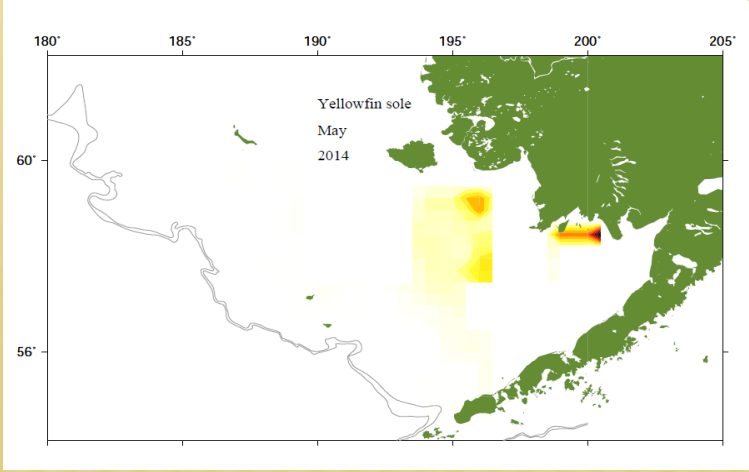

180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
January
2014

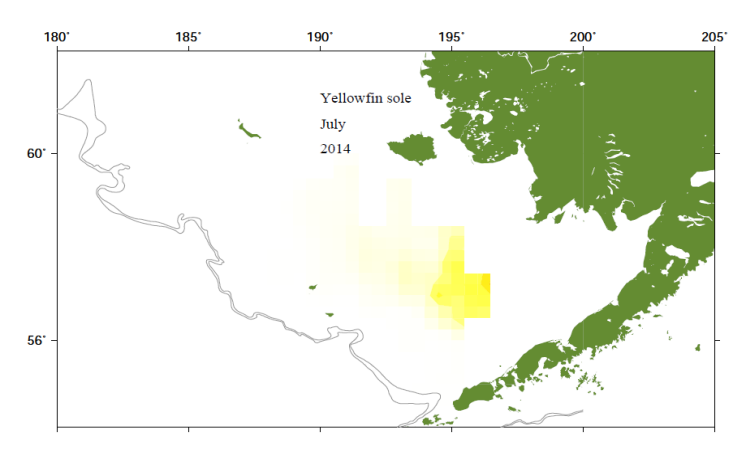

180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
April
2014

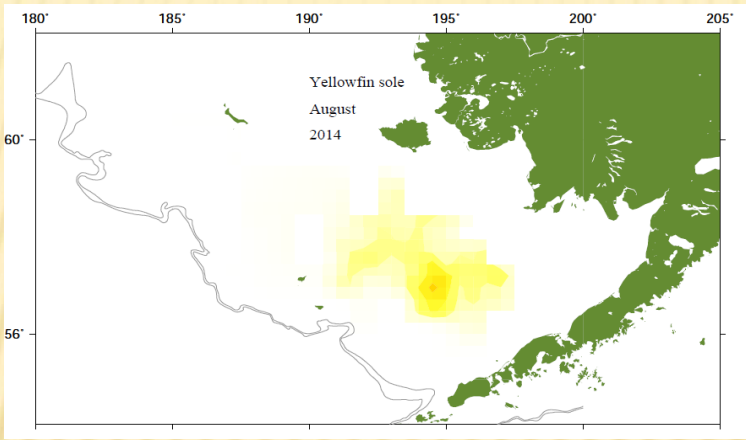

180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
February
2014

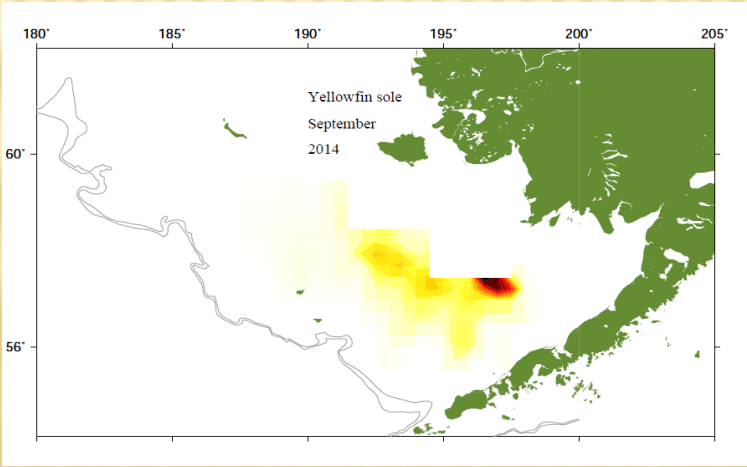

180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
June
2014


180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
March
2014

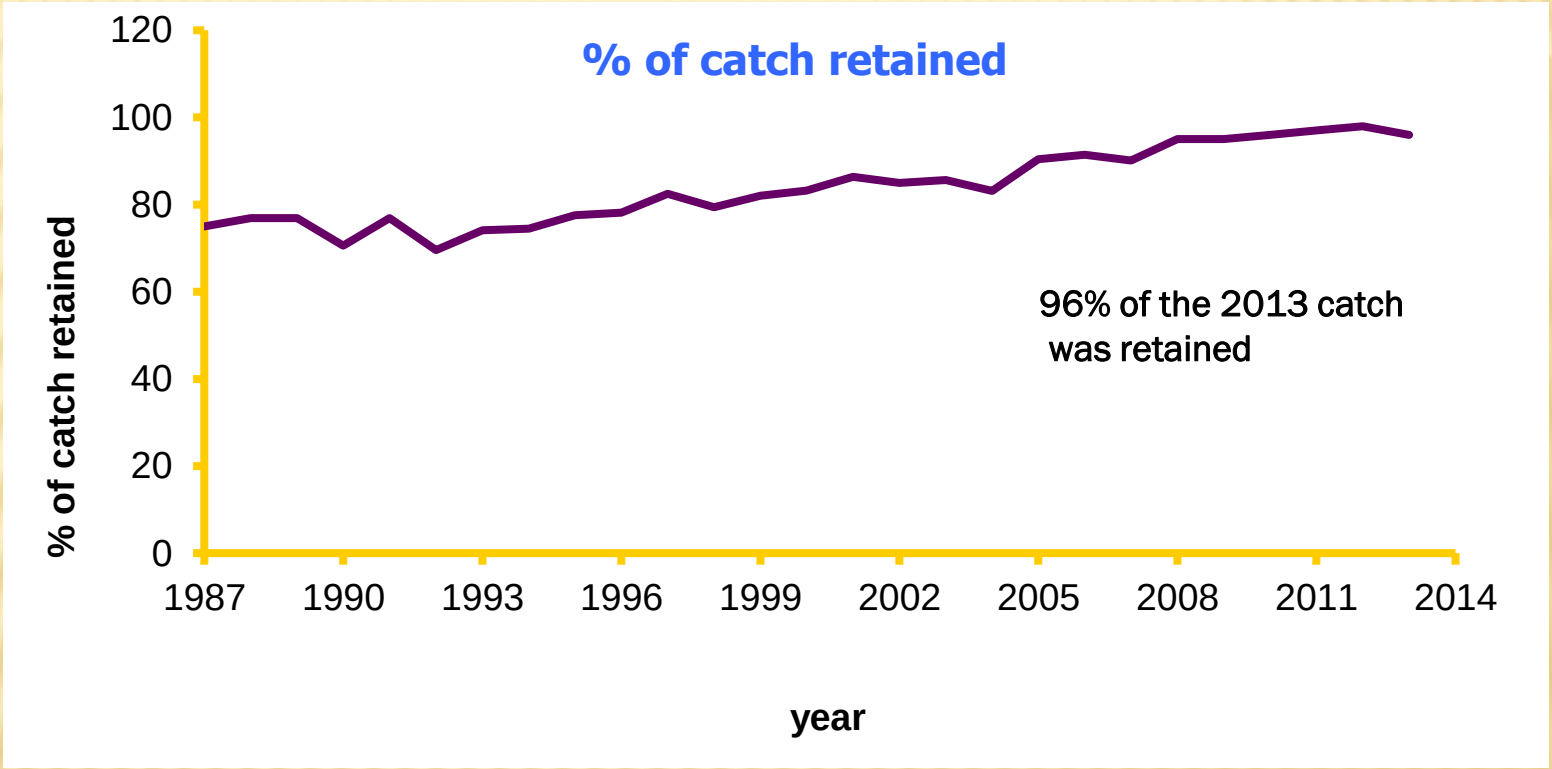

180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
May
2014


180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
July
2014

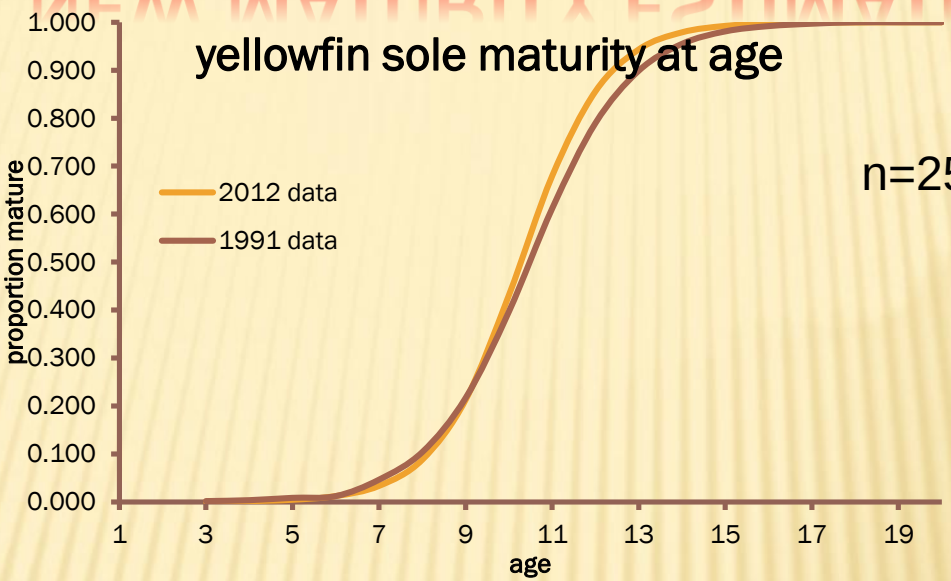

180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
August
2014


180°
185°
190°
195°
200°
205°
60°
56°
Yellowfin sole
September
2014

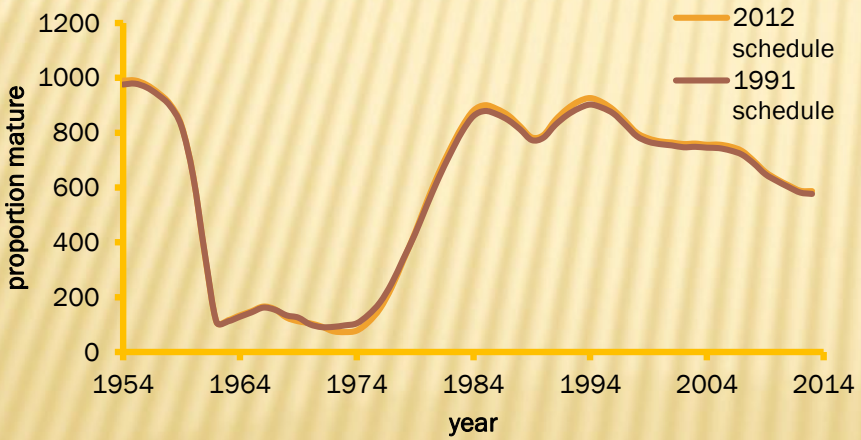
ANNUAL ESTIMATE OF RETAINED CATCH (%)



NEW MATURITY ESTIMATE



n=250

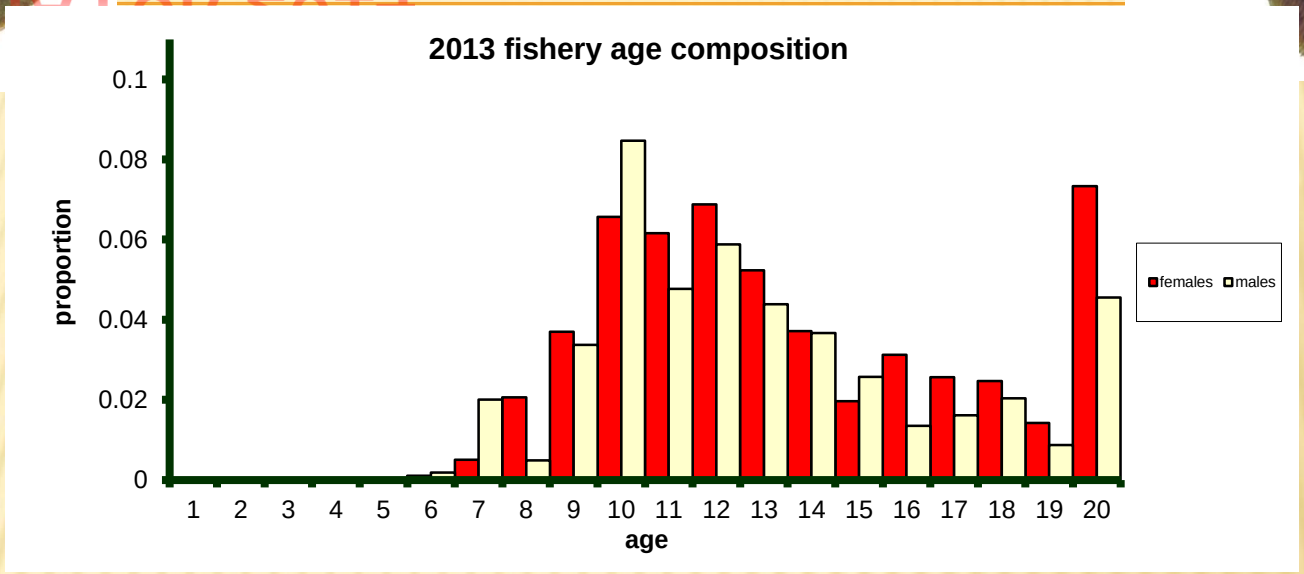


2% increase in estimated FSB in 2014

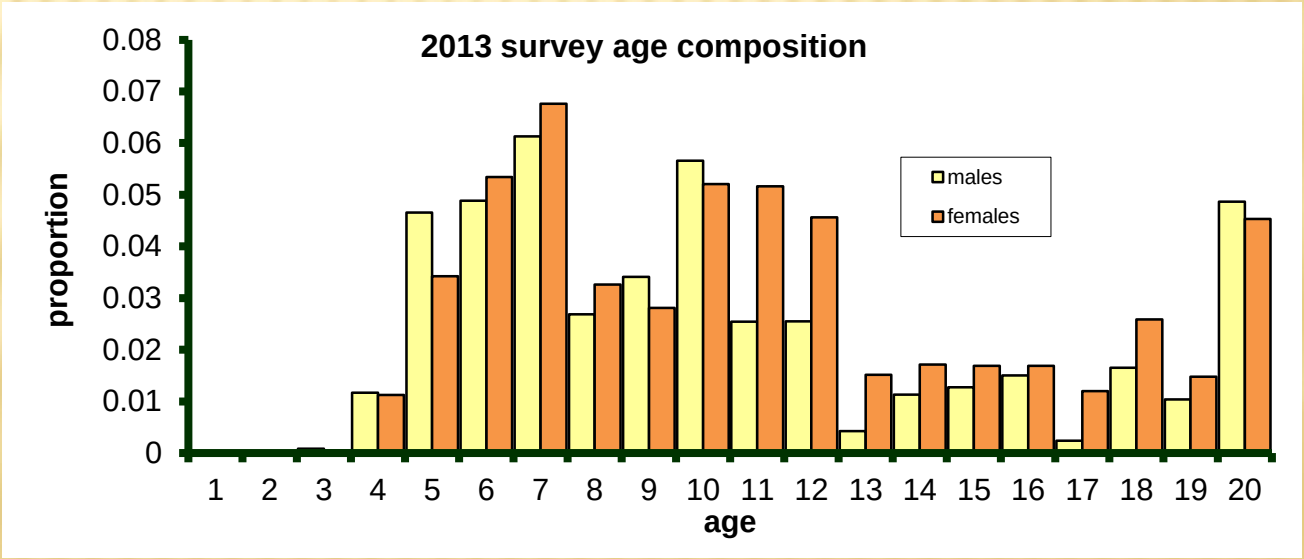
TenBrink and Wilderbuer. Updated maturity estimates for flatfishes (Pleuronectidae) in the eastern Bering Sea, with notes on histology and implications to fisheries management. Submitted to Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science.

NEW DATA FOR 2014

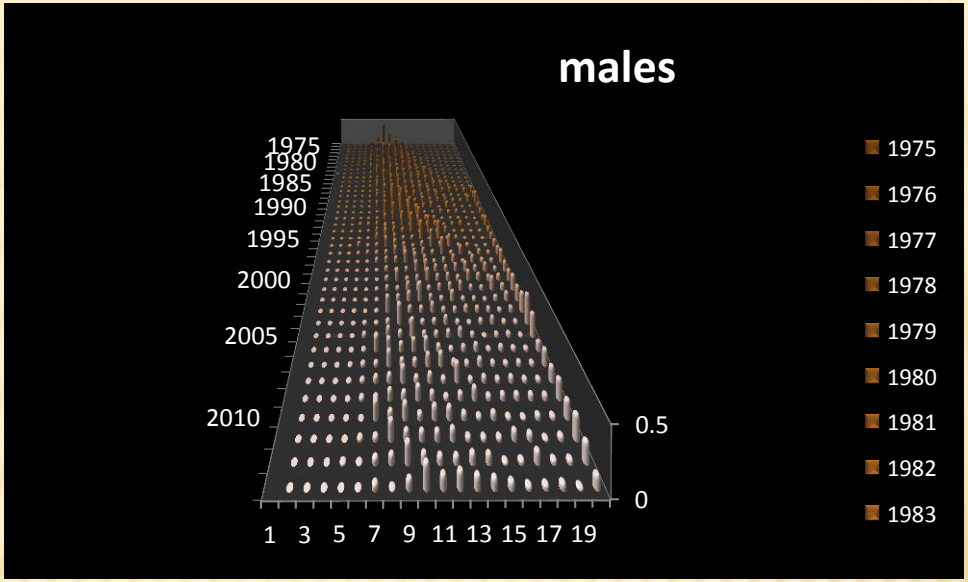
Avg. age = 12.2 years

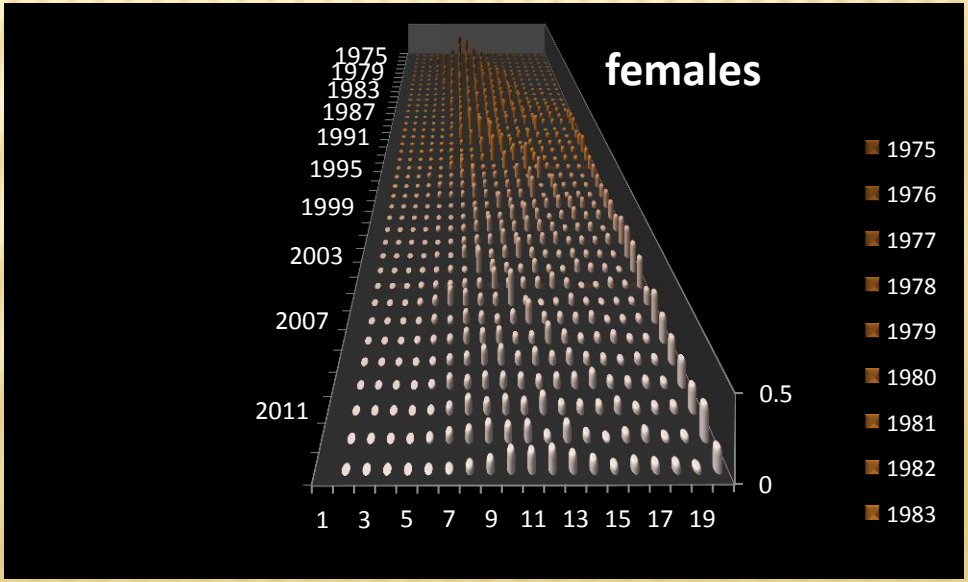


Model estimate of population Avg. age = 6.4 years

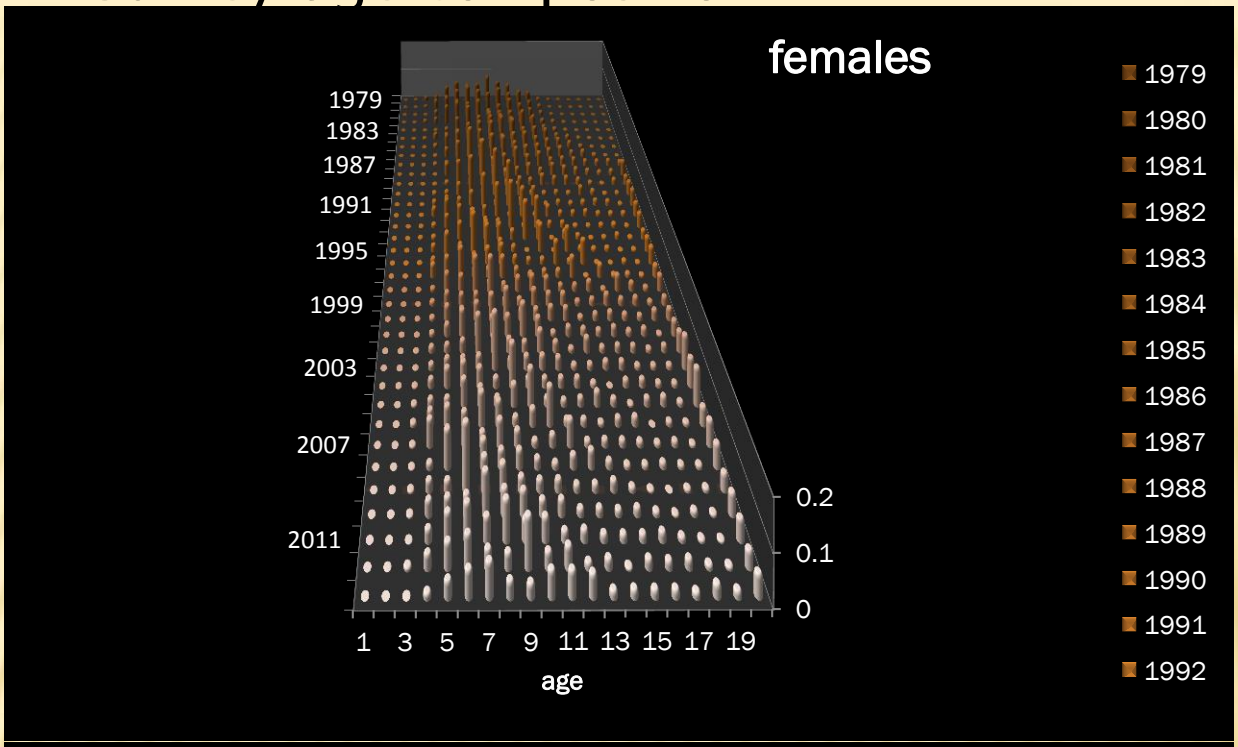


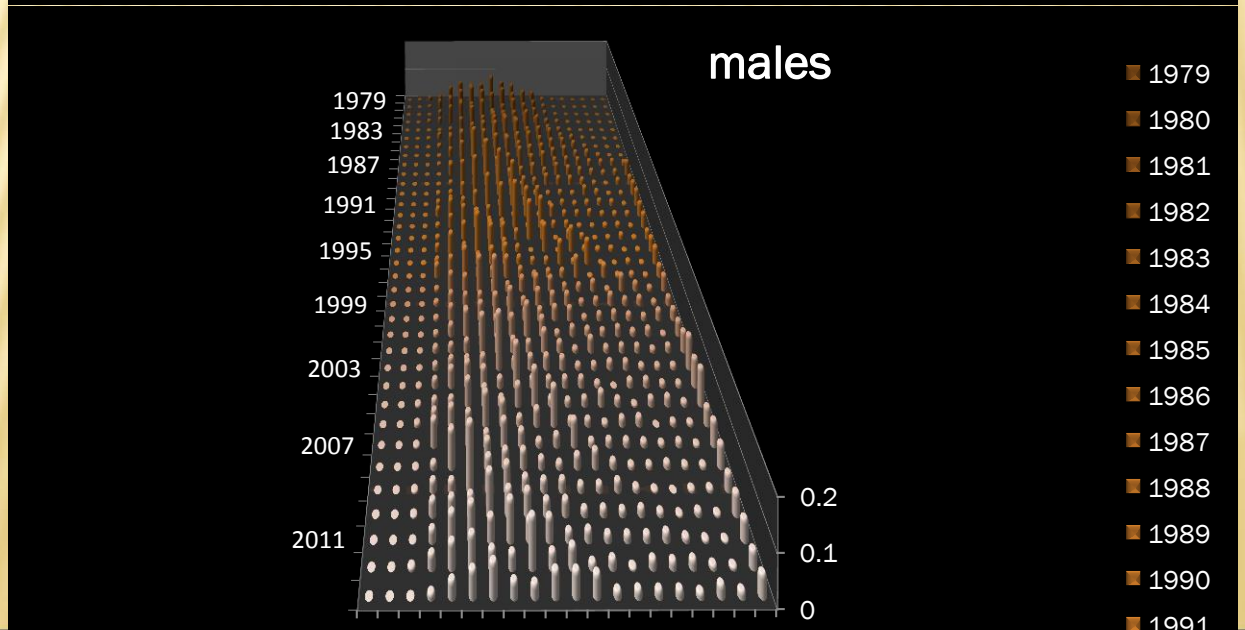
Fishery age composition



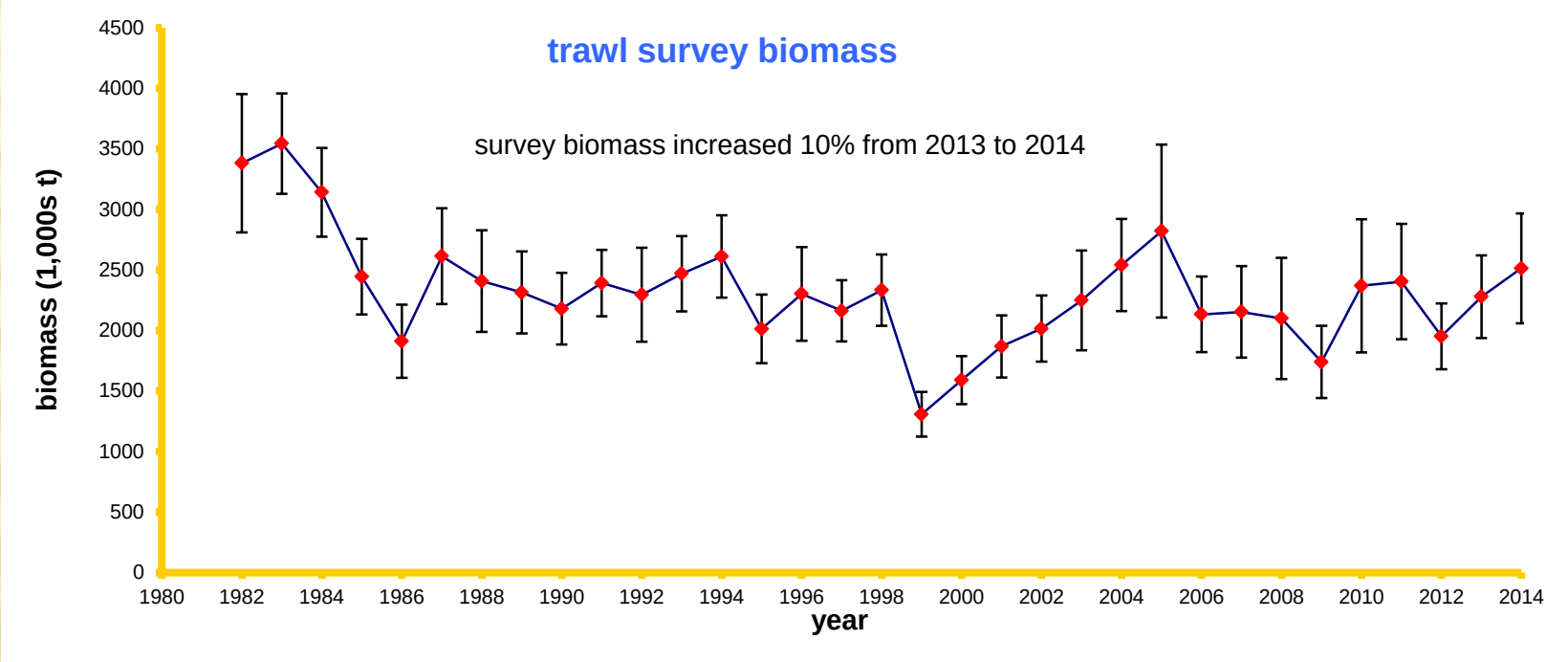


Survey age composition

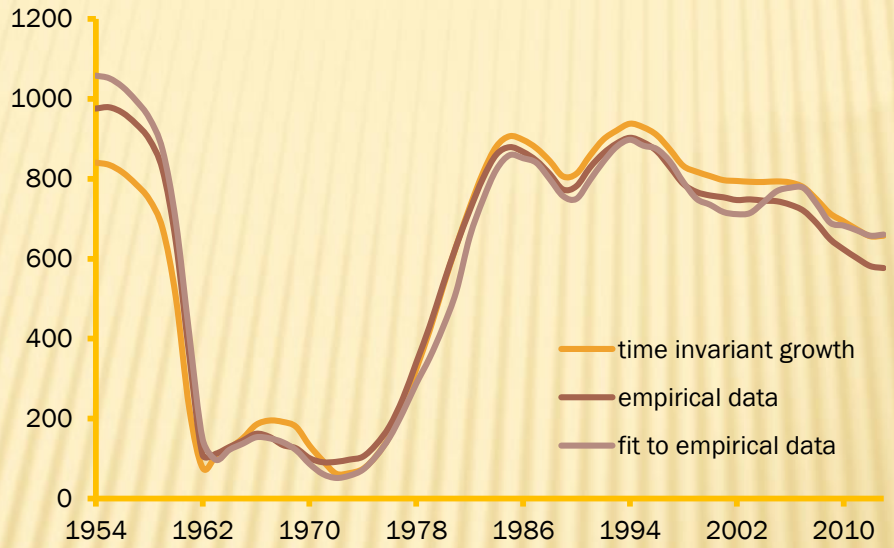




2014 SHELF SURVEY BIOMASS ESTIMATE = 2,512,250 T



Female spawning biomass from growth models



FLATFISH SPLIT-SEX MODEL

uses:

sex-specific estimates of fishery and survey age composition and weight at age, survey biomass

Gives:

Sex-specific estimates of population number, fishing mortality, selectivity, fishery and survey age composition.

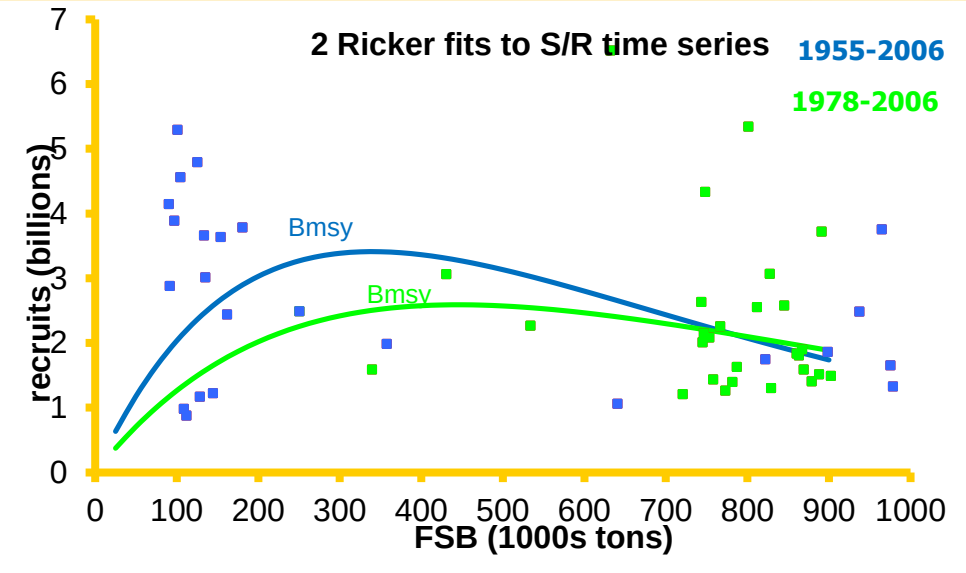
Allows for estimation of sex-specific natural mortality

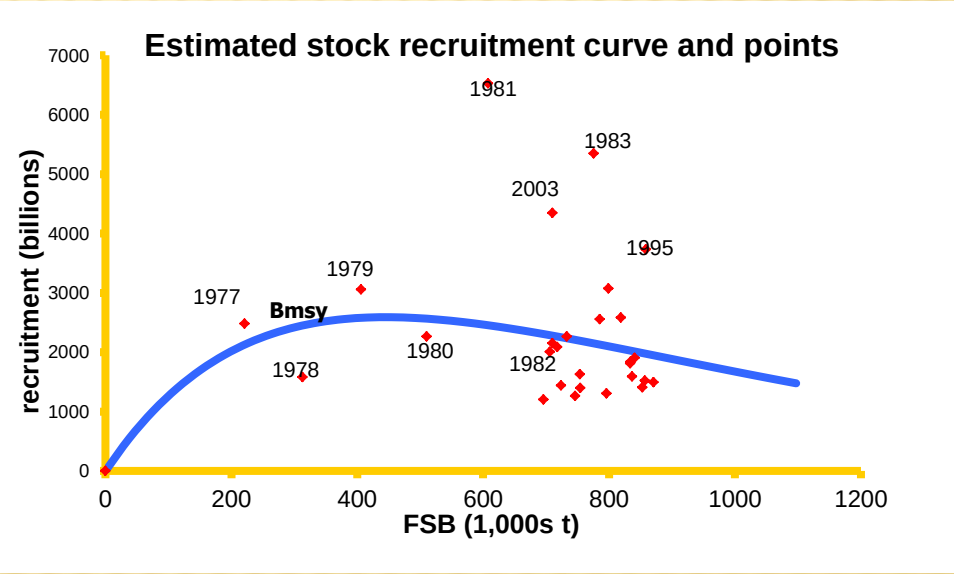
STOCK ASSESSMENT MODEL

- Data components include fishery and trawl survey age compositions and survey biomass and standard error
- Selectivity is fixed asymptotic for older fish
- Runs made with natural mortality fixed at 0.12 and estimated
- Ricker spawner-recruit curve estimated inside the model
- Fishery selectivity is estimated for each year and gender
- Catchability (q) is estimated for each year in the model by considering the relationship to annual bottom water temperature

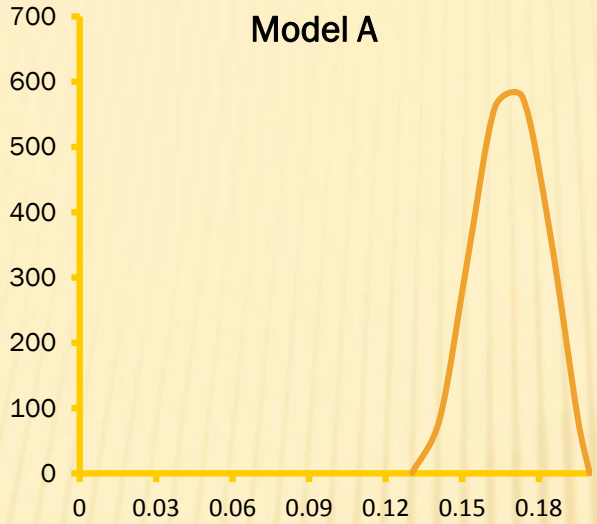
$$q = e^{\alpha + \beta T}$$

B_{msy} = 391,000 t

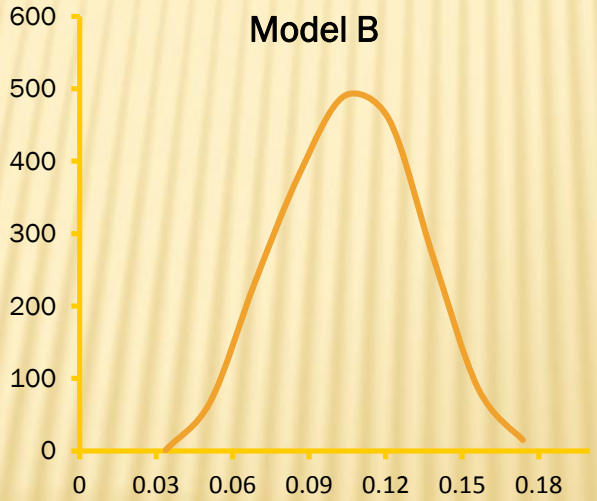




Distribution of pdf F_{msy} from mcmc runs

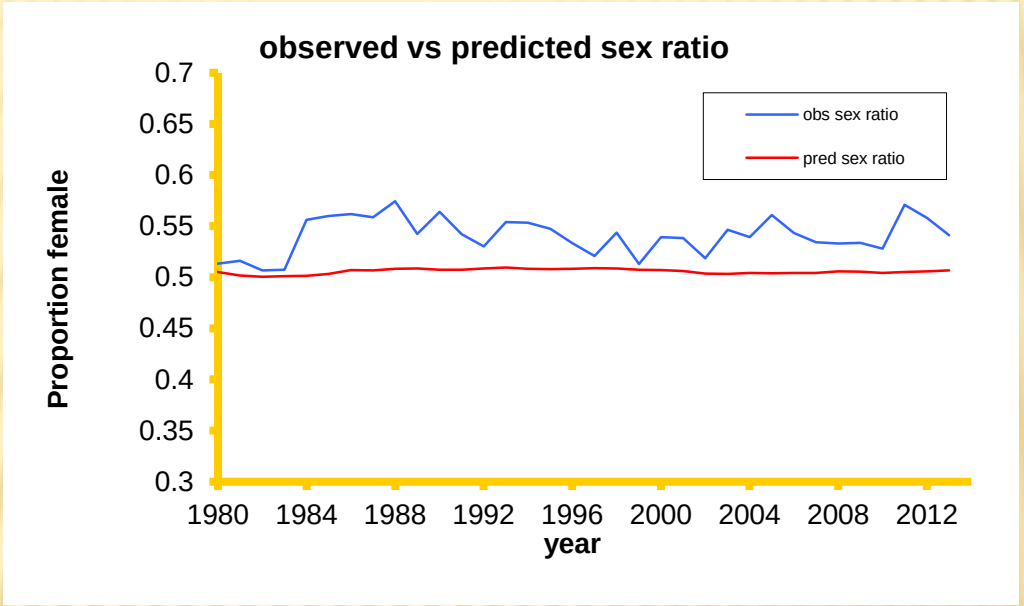


1955-2006

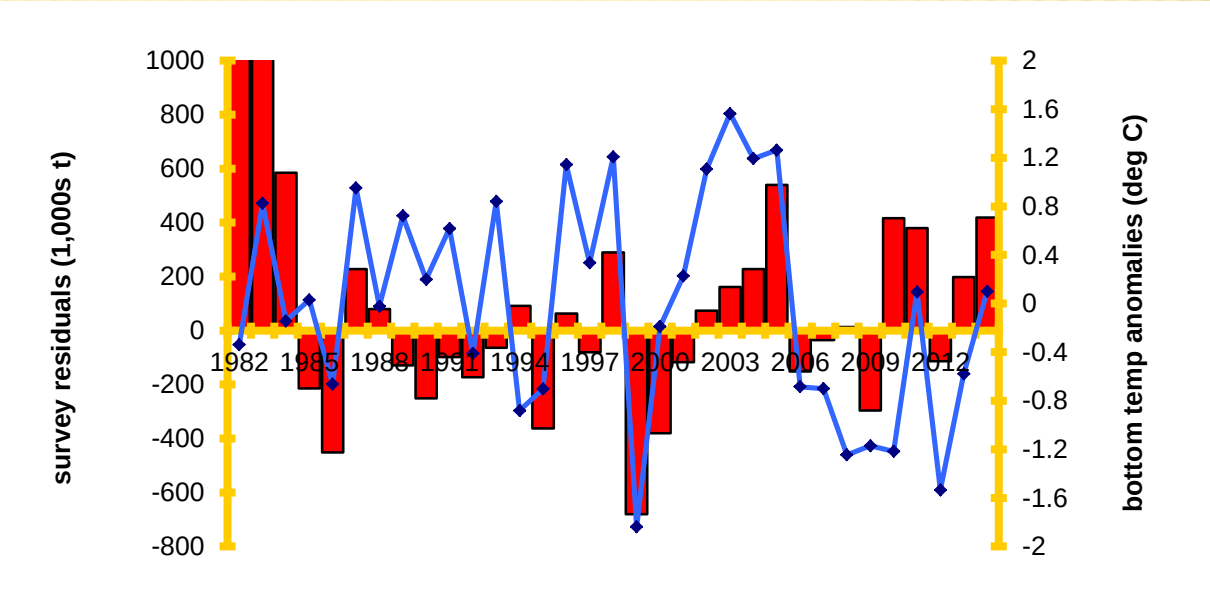


1978-2006

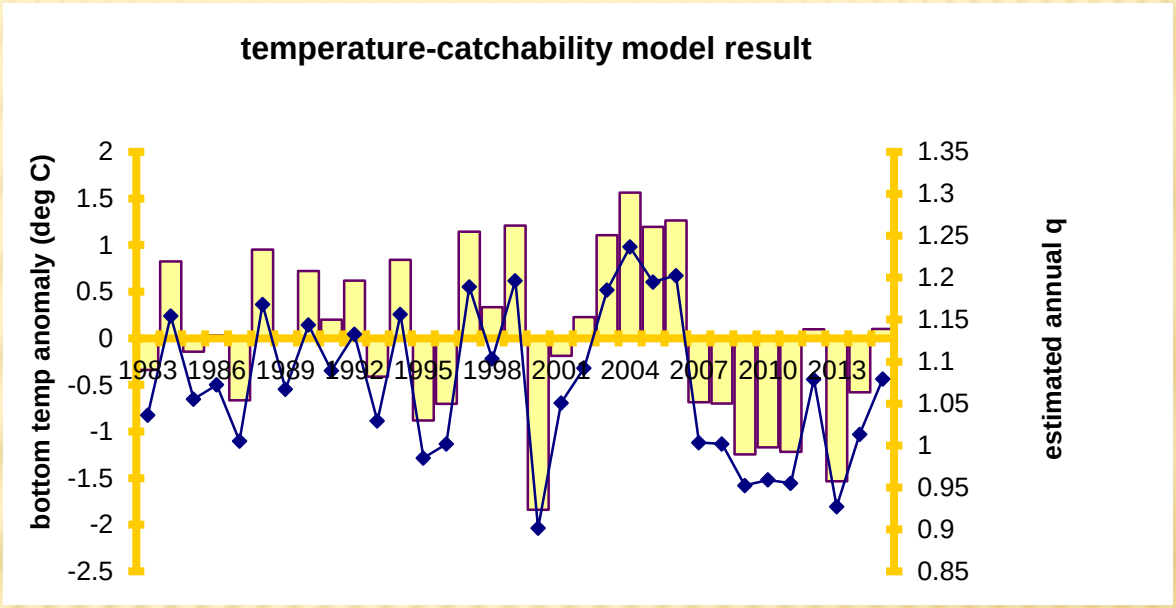
OBSERVED AND PREDICTED SEX RATIO



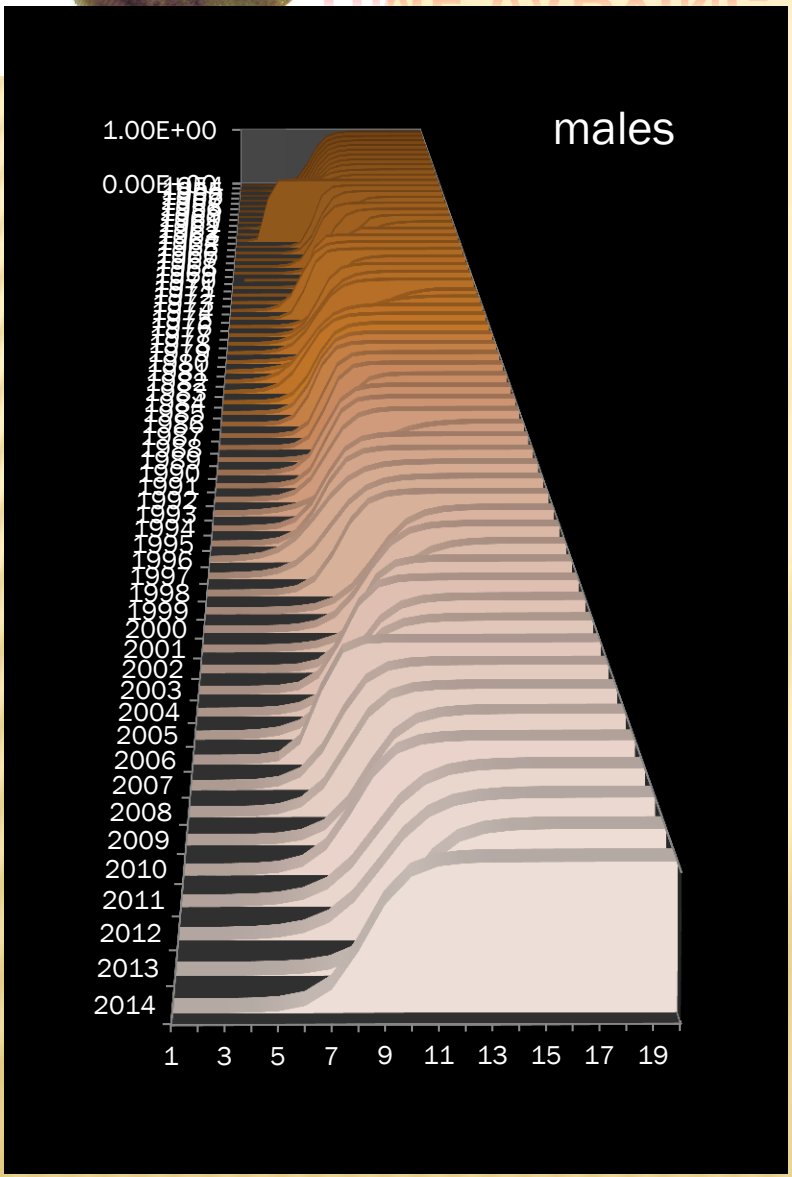
TRAWL SURVEY RESIDUALS (RED BARS) AND BOTTOM TEMPERATURE ANOMALIES (BLUE LINE)

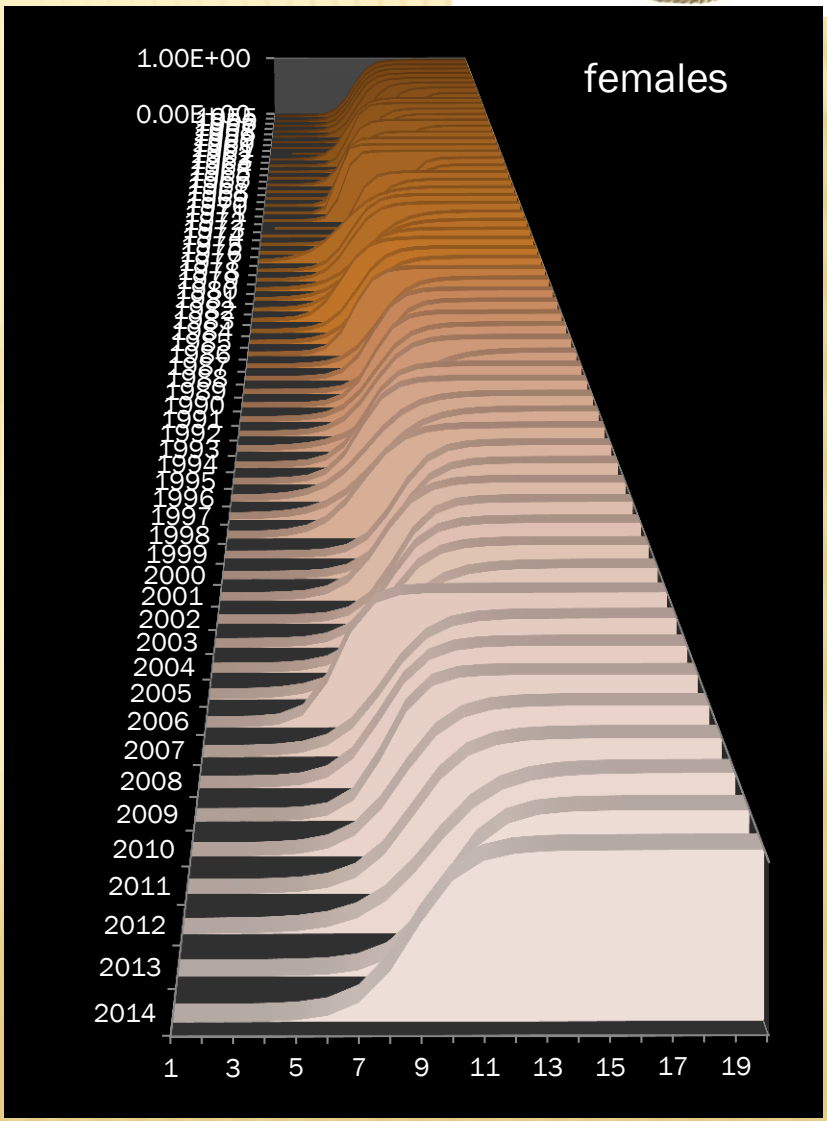


AVERAGE 1982-2013 Q = 1.104

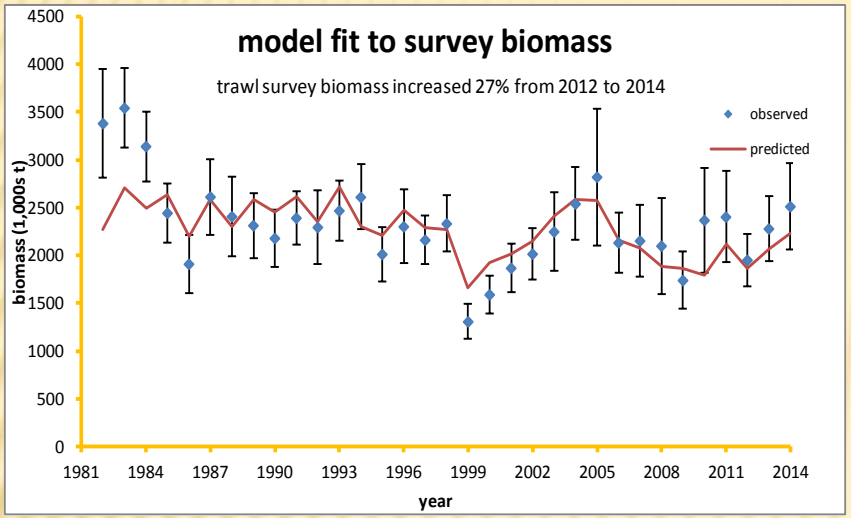


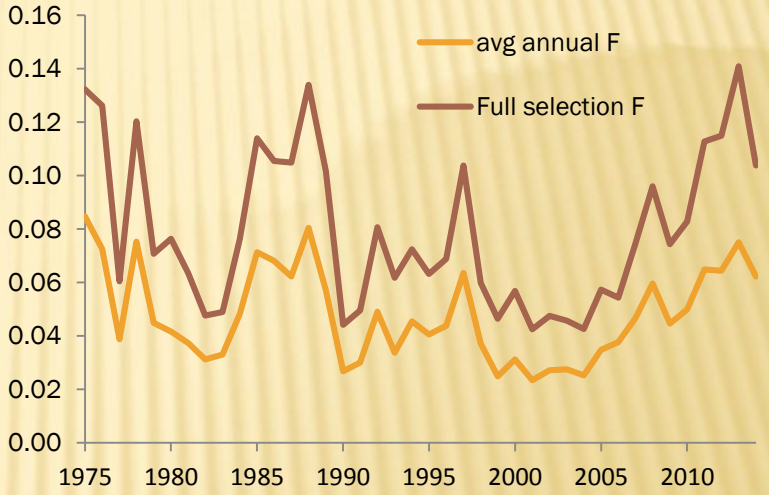
TIME-VARYING FISHERY SELECTIVITY

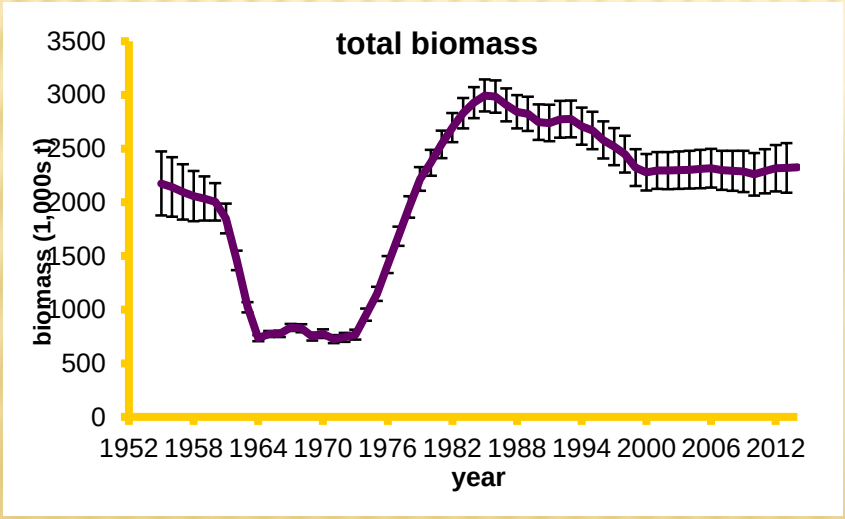


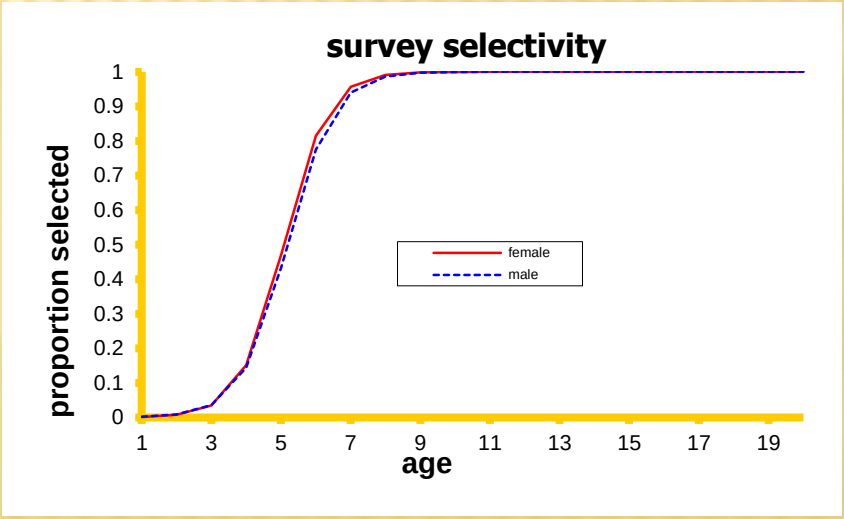


MODEL RESULTS

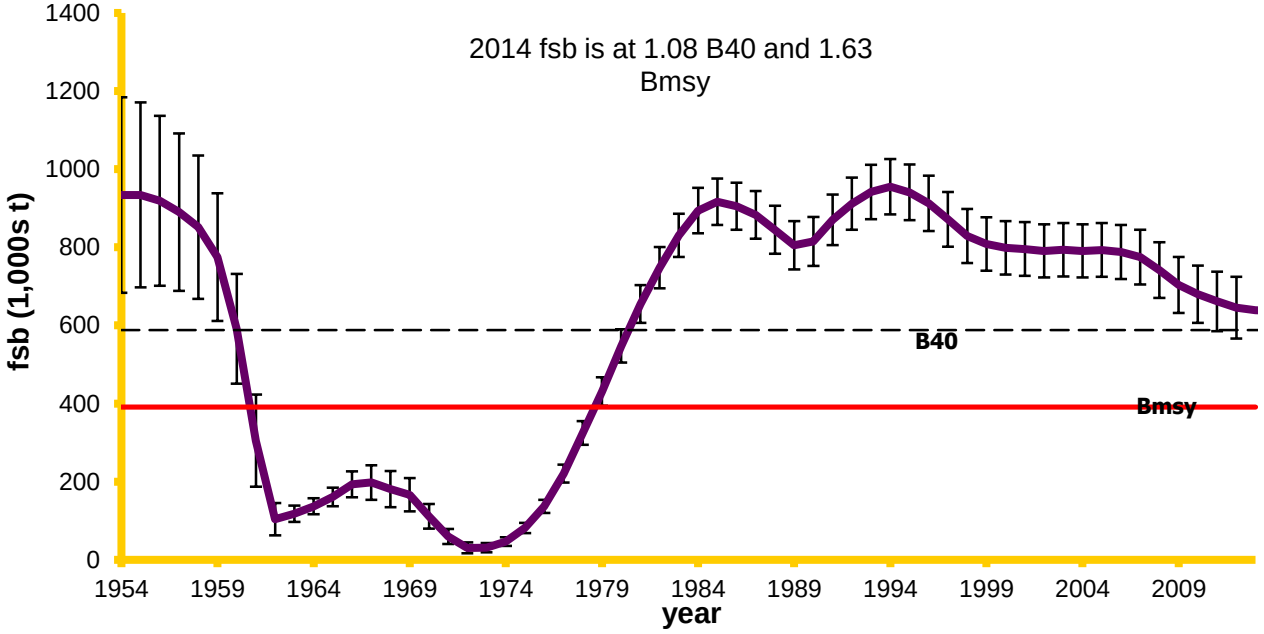




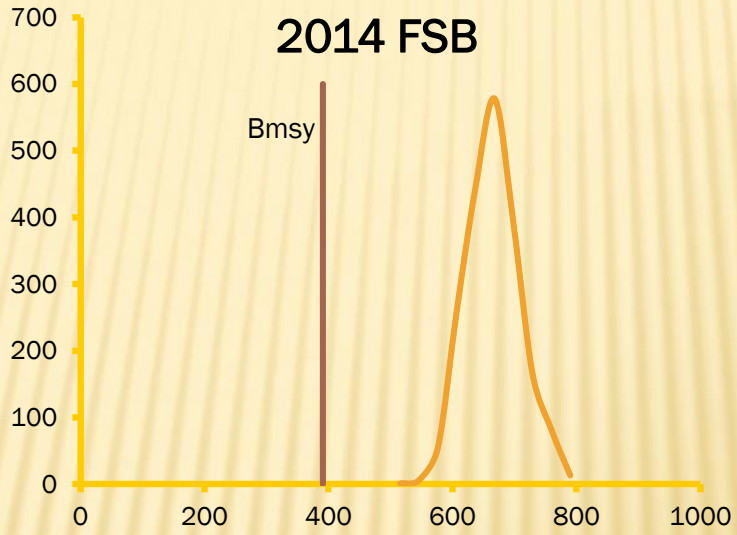


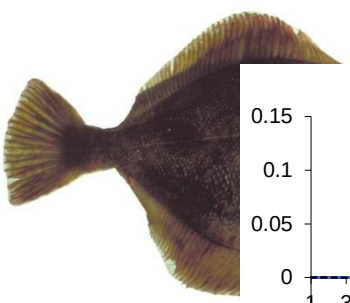


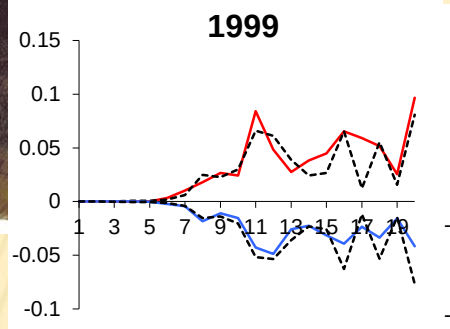
Female spawning biomass

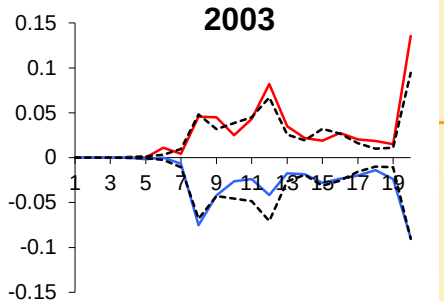


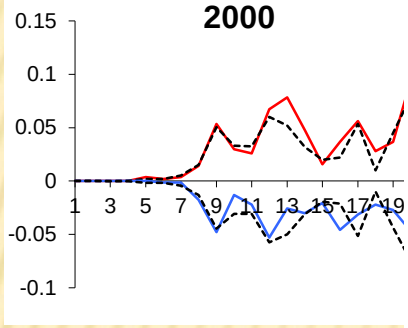
YELLOWFIN SOLE

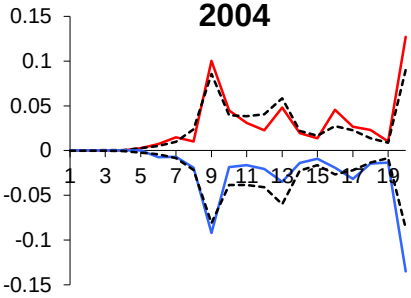


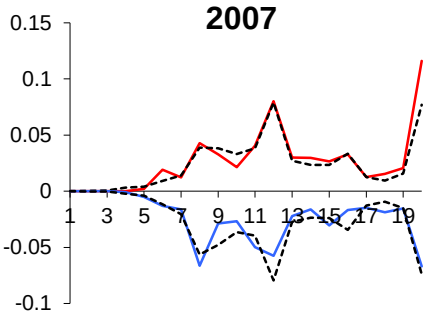


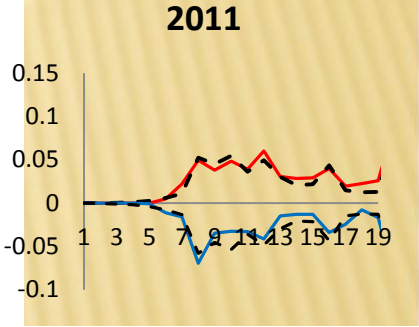

1999
0.15
0.1
0.05
0
-0.05
-0.1
1 3 5 7 9 11 13 15 17 19


2003
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1 3 5 7 9 11 13 15 17 19


2000
0.15
0.1
0.05
0
-0.05
-0.1
1 3 5 7 9 11 13 15 17 19


2004
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1 3 5 7 9 11 13 15 17 19


2007
0.15
0.1
0.05
0
-0.05
-0.1
1 3 5 7 9 11 13 15 17 19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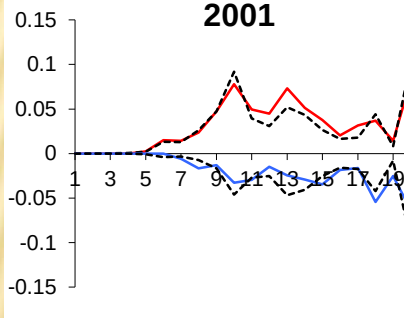
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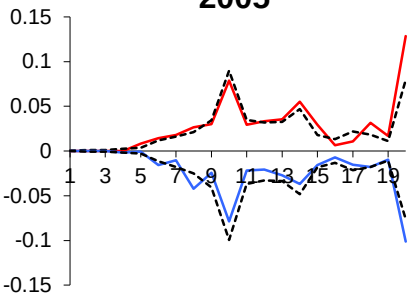
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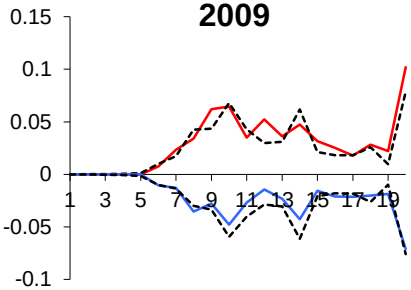
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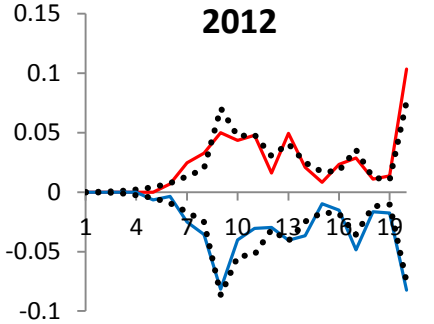
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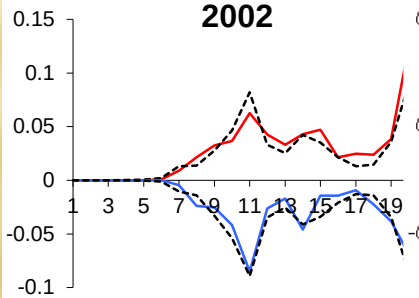
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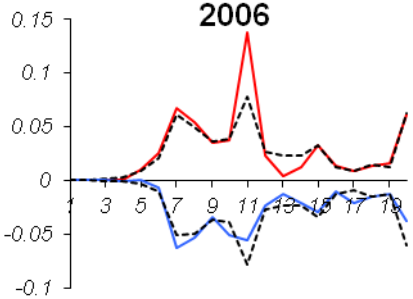
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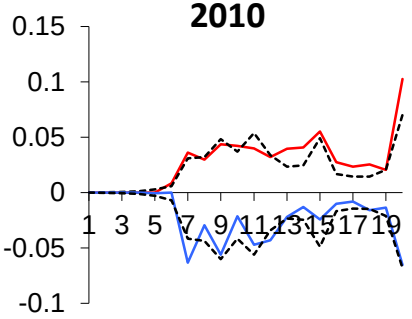
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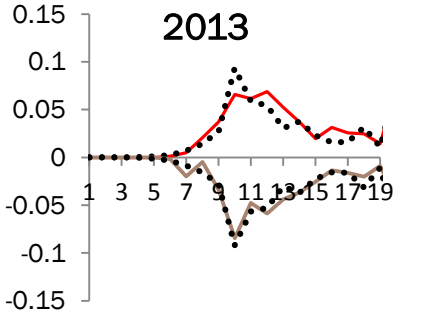
2013
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0
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-0.1
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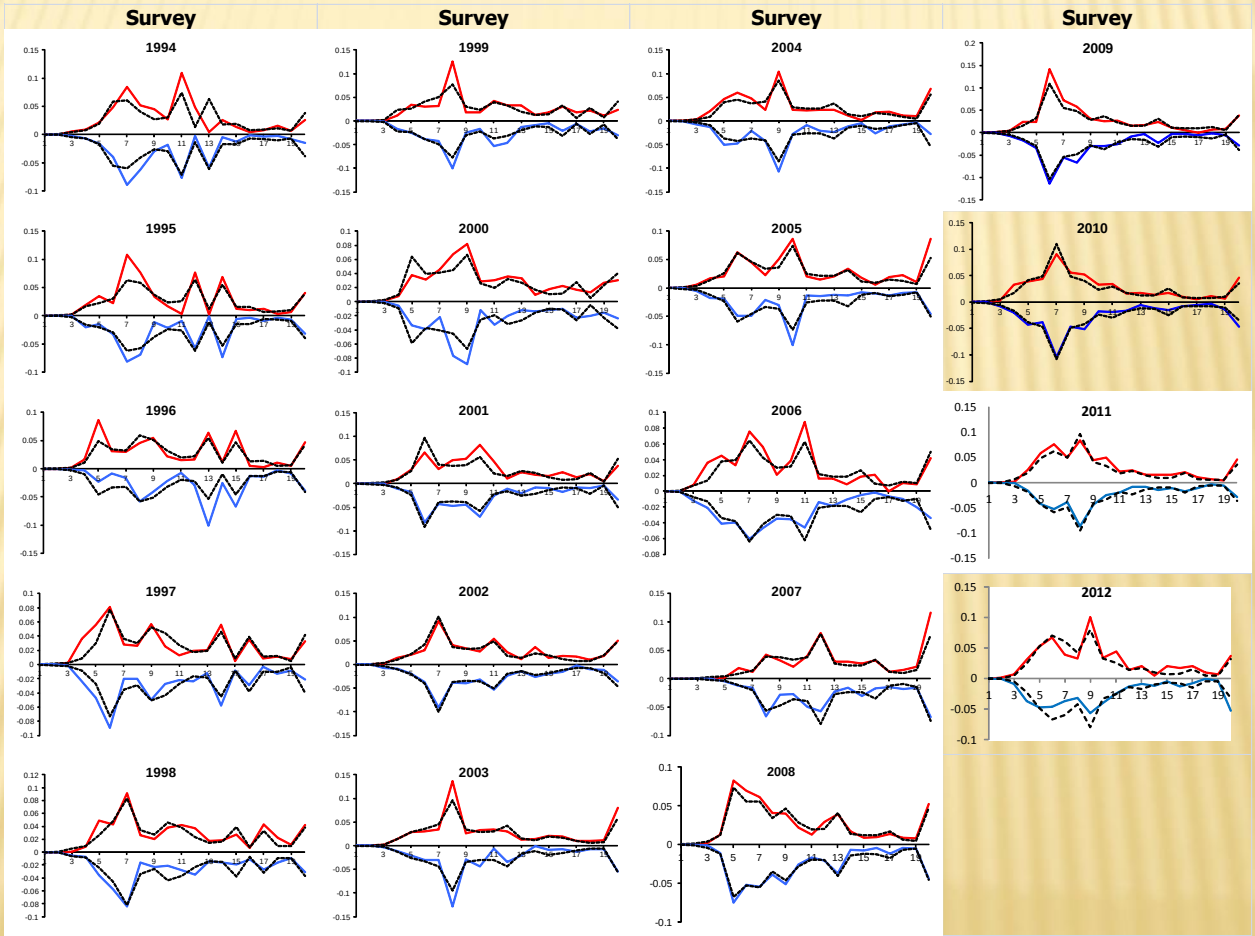
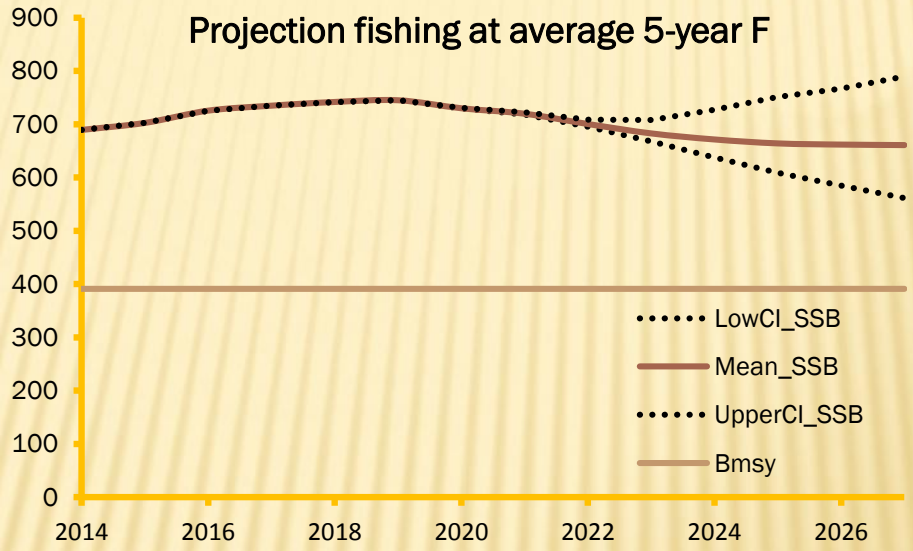
1 3 5 7 9 11 13 15 17 19

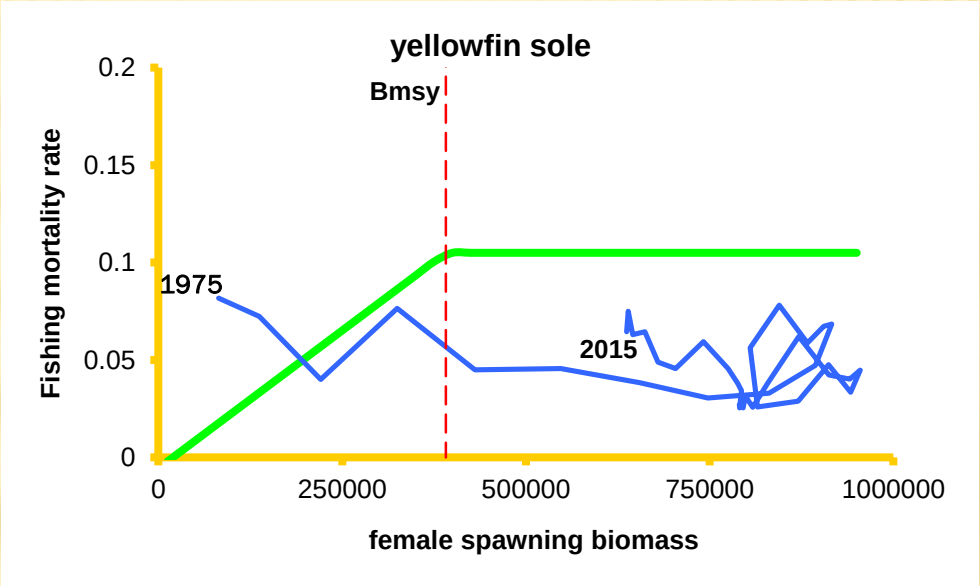
SURVEY AGE COMPOSITION



PROJECTED FEMALE SPAWNING BIOMASS



YELLOWFIN SOLE



YELLOWFIN SOLE

Tier 1 management

- 2014 ABC 239,800 t
- 2014 OFL 259,700 t
- $F_{ABC} = F_{harmonic} = 0.113$
- $F_{OFL} = F_{MSY} = 0.123$
- 2014 catch = 145,800 t

Tier 1 management

- 2015 ABC 248,800 t
- 2015 OFL 266,400 t
- $F_{ABC} = F_{harmonic} = 0.117$
- $F_{OFL} = F_{MSY} = 0.125$

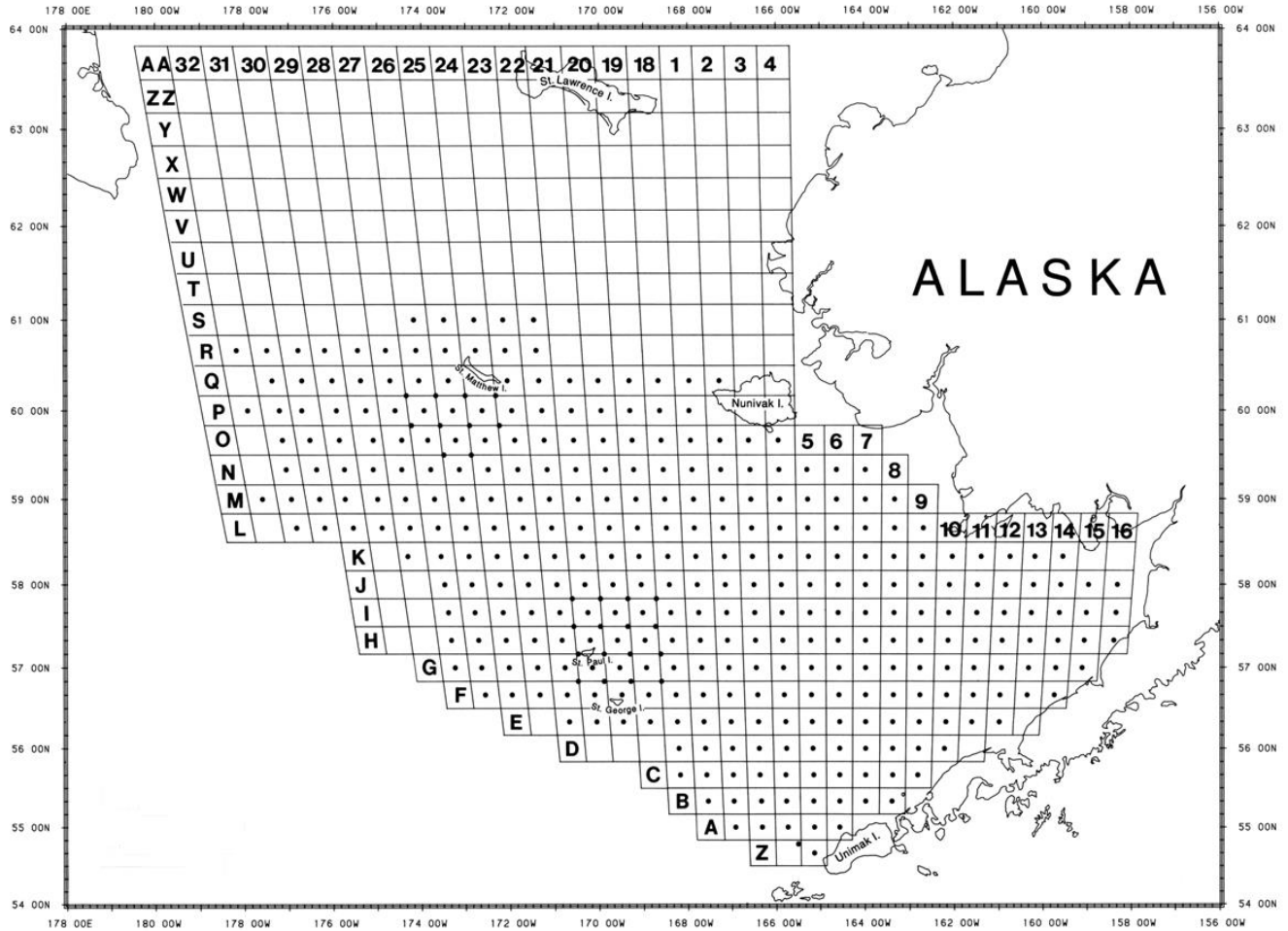


Figure 1. -- Eastern Bering Sea survey grid map of sampled stations.