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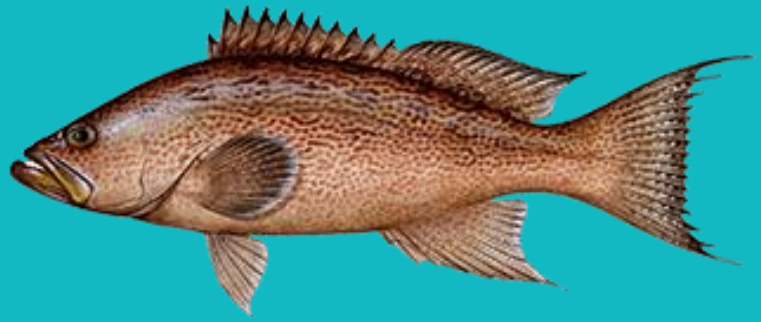
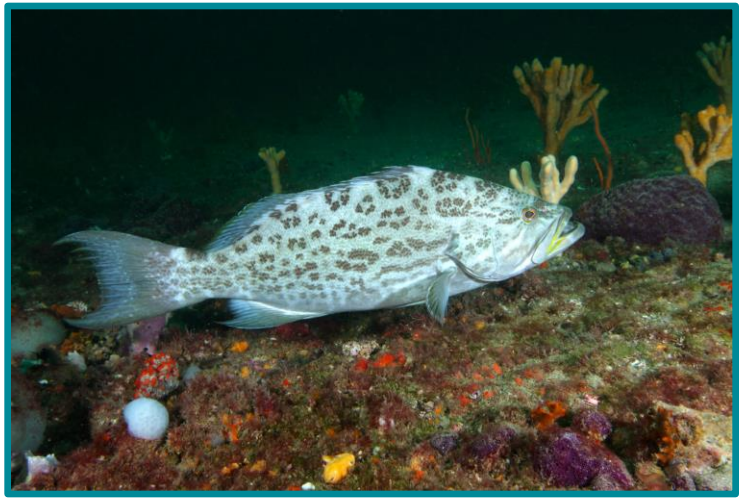
SEDAR 68 – U.S. South Atlantic Scamp



SSC Meeting
October 27th, 2021

Outline



Data Review
- Stock definition
- Life history
- Removals
- Compositions
- Indices of abundance

Catch-age model
- AW and RW base runs
- Diagnostics
- Sensitivities
- Uncertainty analysis

Review Workshop
- Requested analyses

Recommendations for Operational Assessment

Research Track Assessment

- Scamp represents first ever Research Track Assessment
- Research Track Assessments:
  - Not used for providing management advice
  - Does not rely on most recent data
    - Terminal Year for S68 2017

Timeline (altered due to Covid):

- June – Sept 2019 Stock ID Workshop
- April - Sept 2020 Data Workshop Webinars
  - Originally scheduled for March 16-20, 2020…
- Dec - May 2021 Assessment Webinars
- September 2021 Review Workshop

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Data Review

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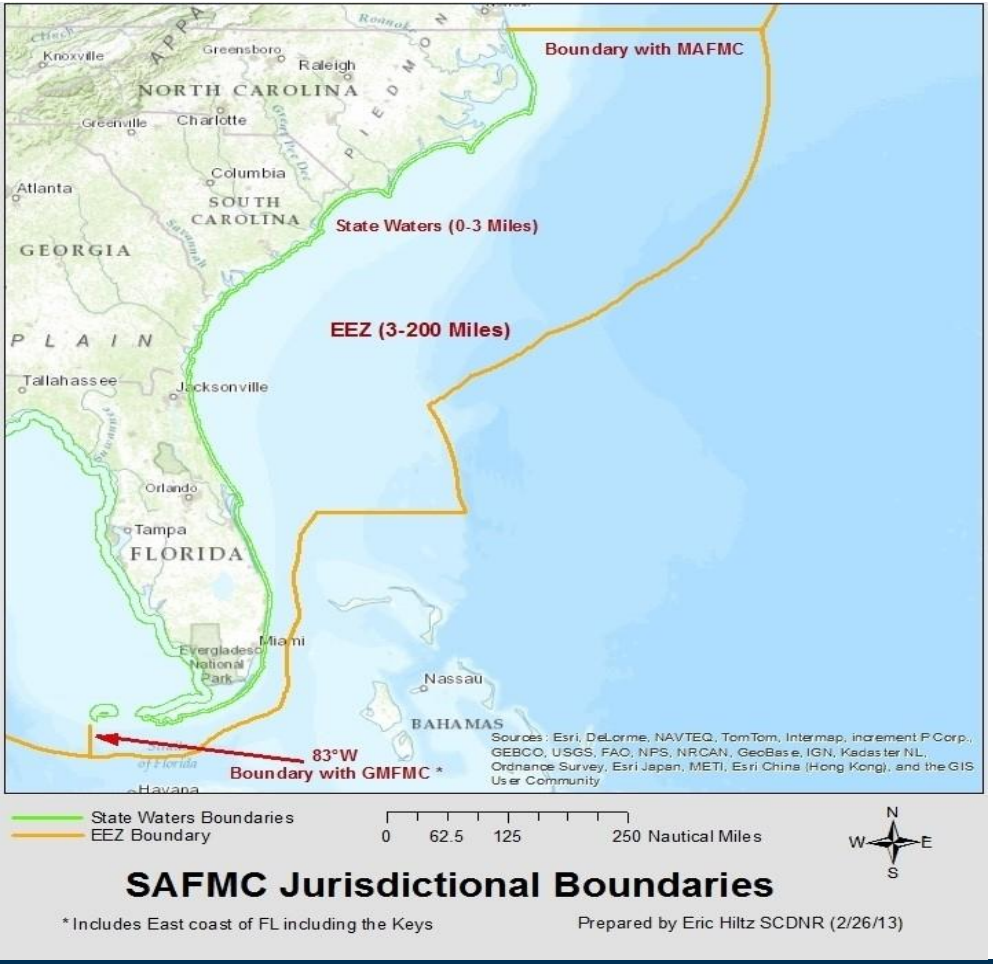
Stock/Management Boundary



- South Atlantic stock is separated from the GoM at council boundary line
- Boundary – U.S. Highway 1 in the Florida Keys
- Supported by Stock ID workshop
- GoM size limit =16”
  SA size limit = 20”

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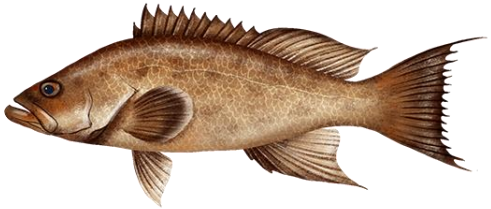
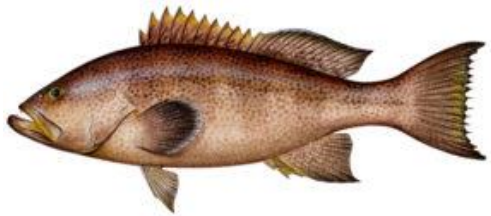
Stock ID Workshop

- Scamp and yellowmouth grouper difficult to identify between two species
  - Very similar morphometrics and life history characteristics
  - Differentiation seen in gill raker counts, lateral line scales, and pectoral fin rays
- Recommendation by Life History WG to combine all data (landings, indices, comps etc.) for two species
- Scamp and yellowmouth treated as scamp complex



Mycteroperca phenax



Mycteroperca interstitialis

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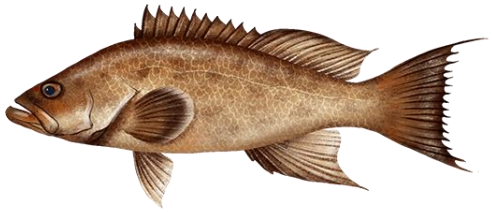
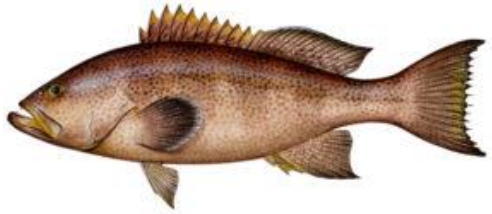
Assessment History

- SEDAR 68 first formal assessment of scamp and yellowmouth grouper under SEDAR
- Scamp landing and size frequency data from 1986-1996 in SA used in separable virtual population analysis
  - Spawning potential ratio estimated between 30-52% (Manooch et al, 1998)
- Localized, retrospective assessment conducted in Fl keys
  - Average length of exploitable phase from visual surveys (1979-1996)
  - Spawning potential ratios of 3% for scamp and 22% for yellowmouth (Ault et al, 1998)



Mycteroperca phenax



Mycteroperca interstitialis

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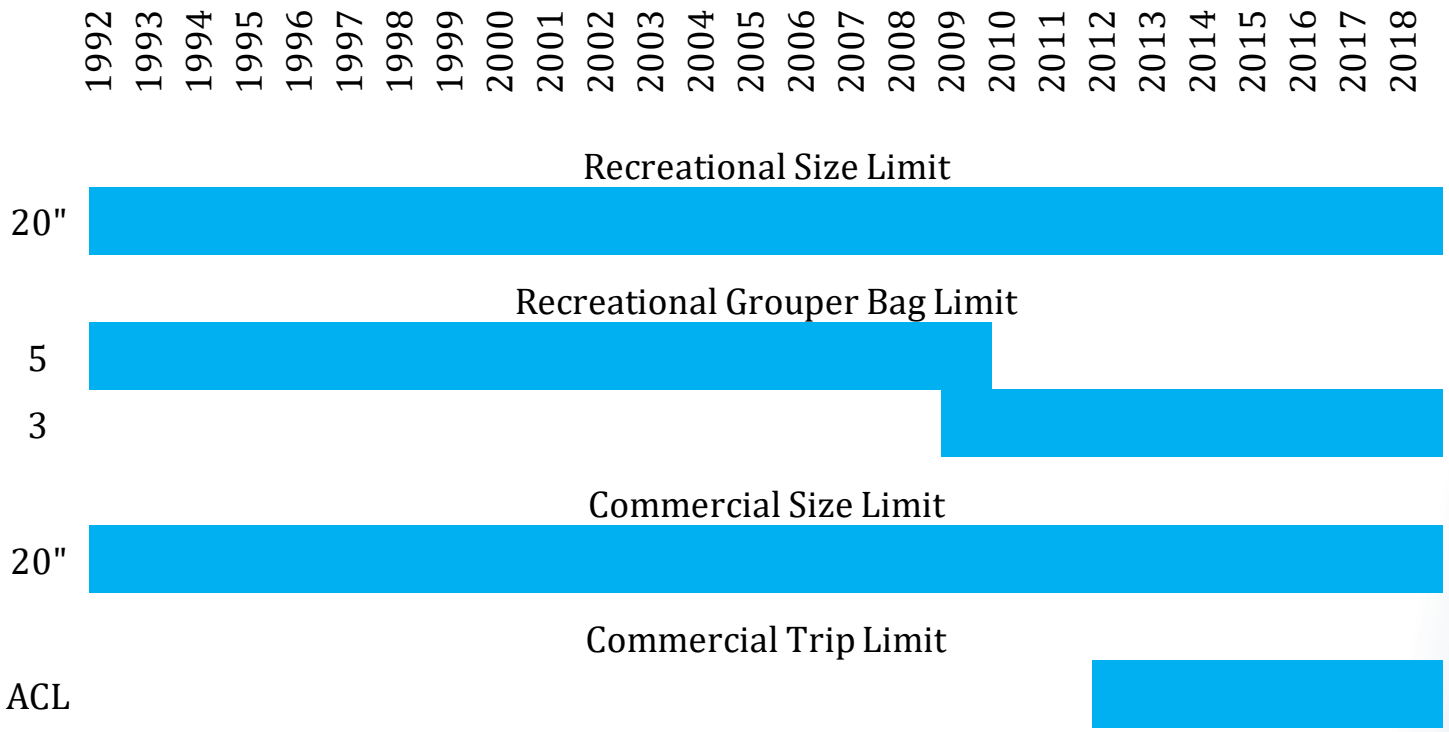
SA Management Regulations



- Seasonal (SWG) closure began 2010:
  Closed: Jan. 1 – Apr. 30th
  Open: May 1 – Dec. 31st

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Life History

- Age and Growth
- Maturity
- Sex Transition
- Natural Mortality
- Discard Mortality

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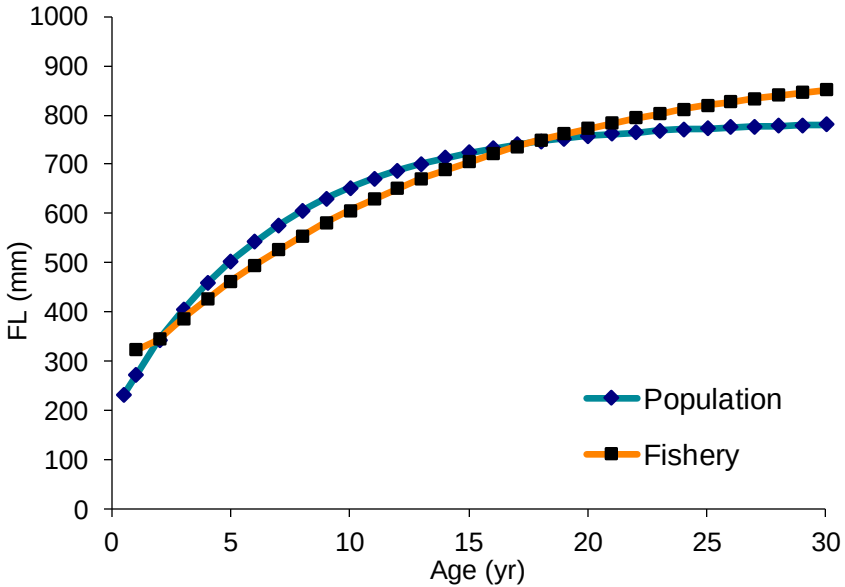
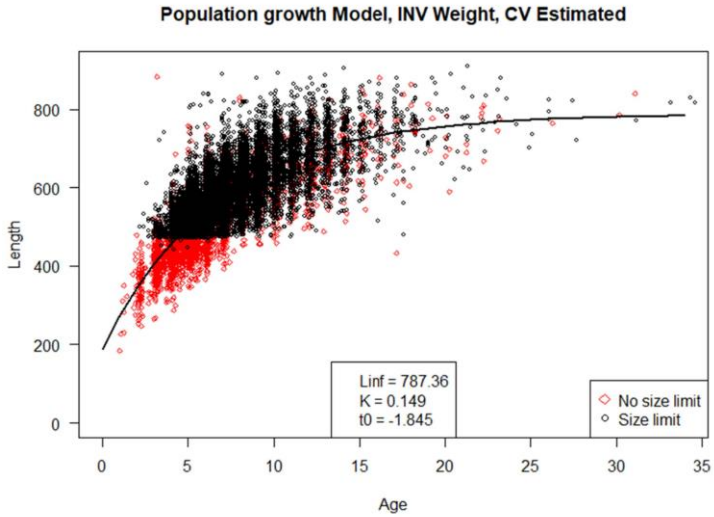
Age and Growth

	L_∞ (FL, mm)	K	t_0	C.V.
Population model (n= 16778)	787.36 ± 26.35	0.149 ± 0.027	-1.85 ± 0.711	0.1 ± 2.685e-005
Fisheries Post 1992 model (n= 13690)	919.06 ± 17.48	0.076 ± 0.0042	-5.19 ± 0.288	0.1 ± 7.168e-008
Females only model (n= 3568)	761.51 ± 79.21	0.128 ± 0.051	-2.53 ± 1.42	0.118 ± 0.0199
Males only model (n = 333)	765.62 ± 63.11	0.145 ± 0.093	-3.34 ± 4.57	0.1 ± 0.00003

- Recommended growth models from DW
- Fisheries model applied to landings starting in 1992





- Linf, K, t_0 fixed in BAM
- CV estimated in BAM

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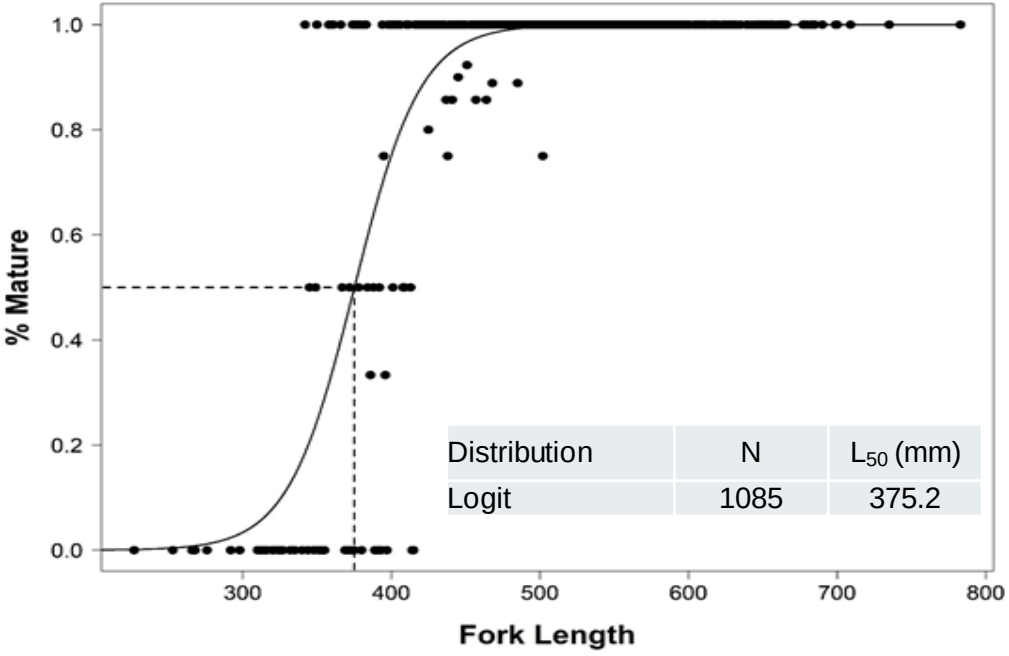
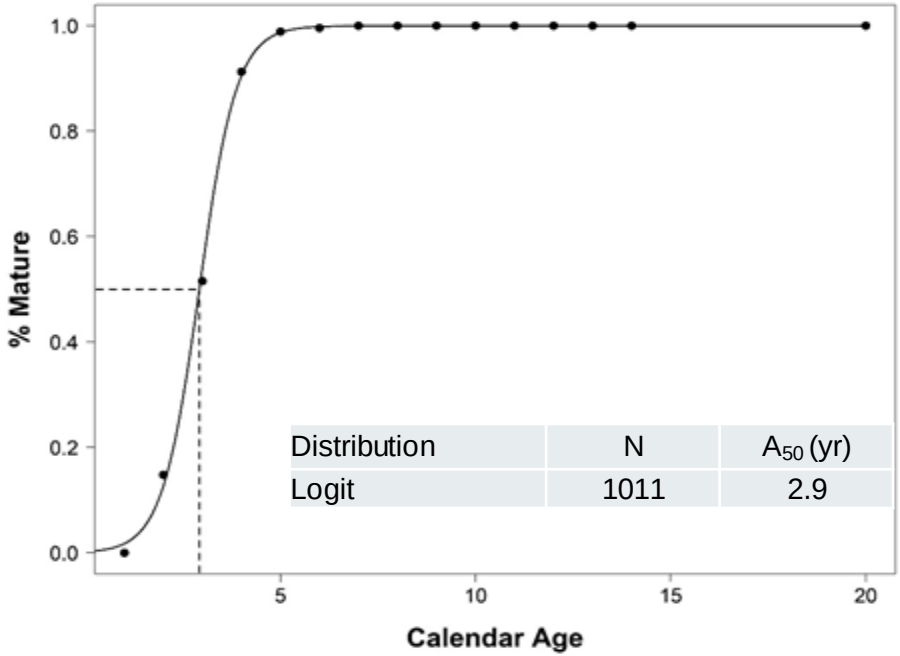
Maturity

- Best fit for female age at functional maturity South Atlantic Scamp/Yellowmouth during period of 1979-2017





- Spawning frequency and batch fecundity presented and discussed at DW
  - Total SSB recommended by LH WG so not applicable

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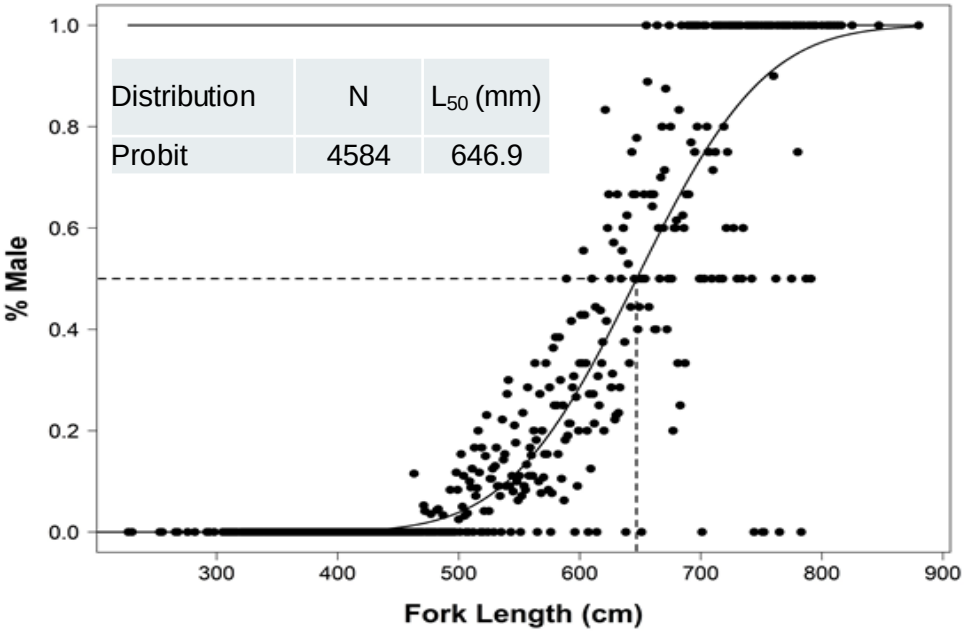
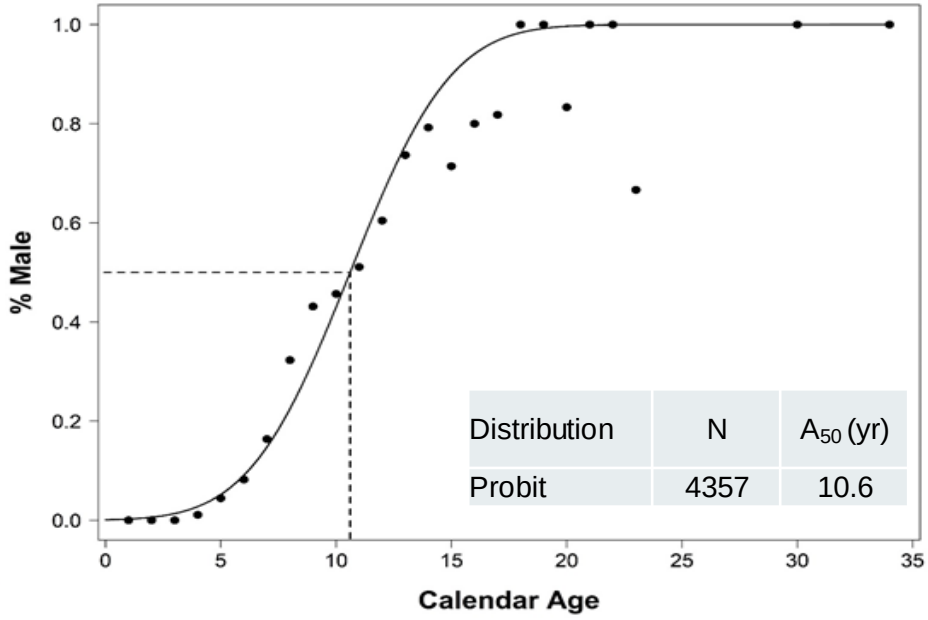
Sex Transition

- Best fit for female age at sex transition in S. Atlantic Scamp/Yellowmouth Grouper during the period 1979-2017.
- All females (i.e., juvenile and adult) were included, but specimens undergoing sex transition were omitted.





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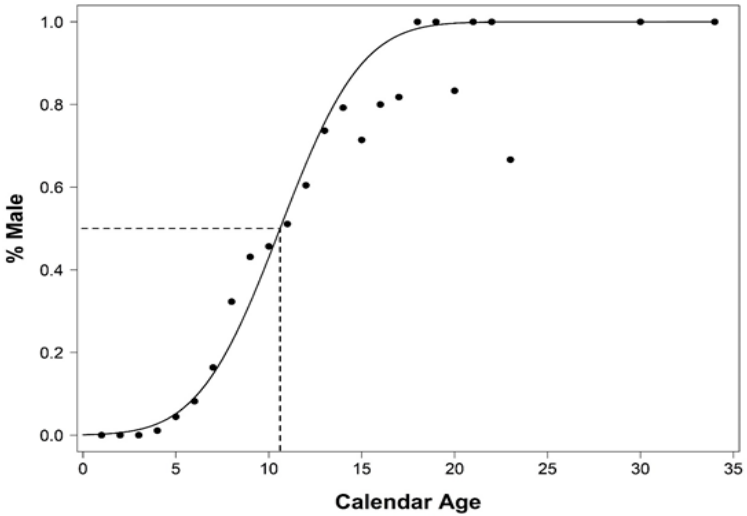
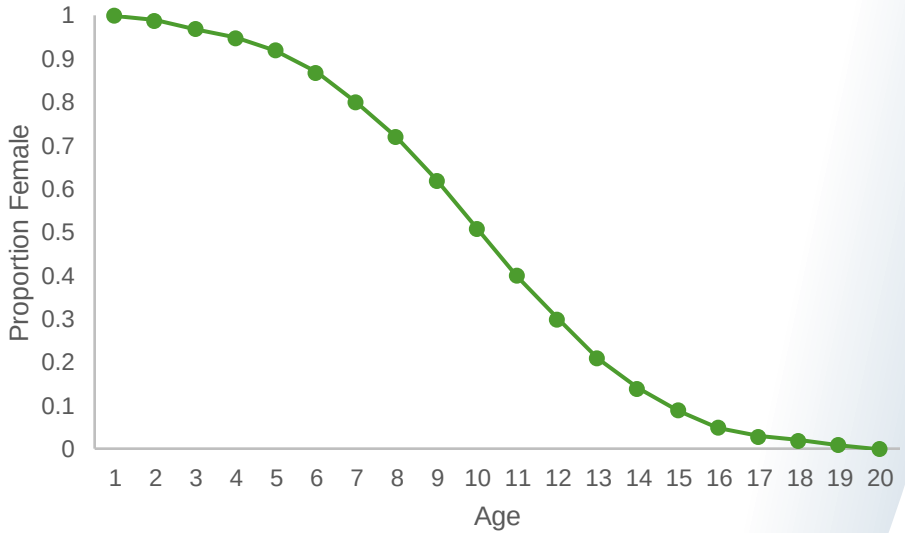
Hermaphroditism in BAM

- Proportion female at age included in data file as vector





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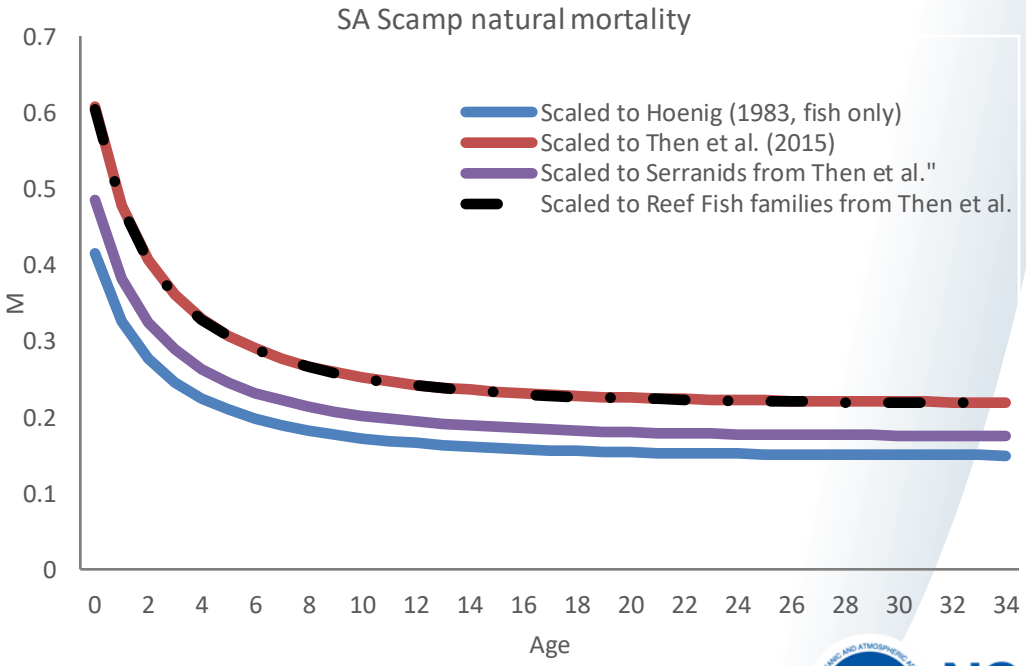
Natural Mortality

- Target M (M = 0.155) determined using Serranid only data from Then et al. (2015), a maximum age of 34, based on Lorenzen

Method	Target M
Hoenig (1983, fish only)	0.132
Then et al. (2015)	0.194
Scaled to Serranids	0.155
Scaled to reef fish families	0.193



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Discard Mortality

- Point estimate for total discard mortality found by combining immediate and delayed mortality

Region	Gear	Mean Depth (m)	Immediate – Not Vented	Immediate - Vented	Delayed Mortality	Total Discard Mortality
SA	VL	46.5	21% (17-25%)	16% (12-20%)	23% (15-34%)	39% (33-45%)

- Headboat:
  - Bootstrapped delayed mort. prediction at 30 m is 18% (7-33%)
  - Conditionally combining a 10% immediate and 18% delayed estimate results in point estimate of 26% (16-40%) for total mortality
- Methods used follow Pulver (2017) approach

Removals

- Fleet Definition
- Landings
- Discards
- Discard Mortality

Surveys

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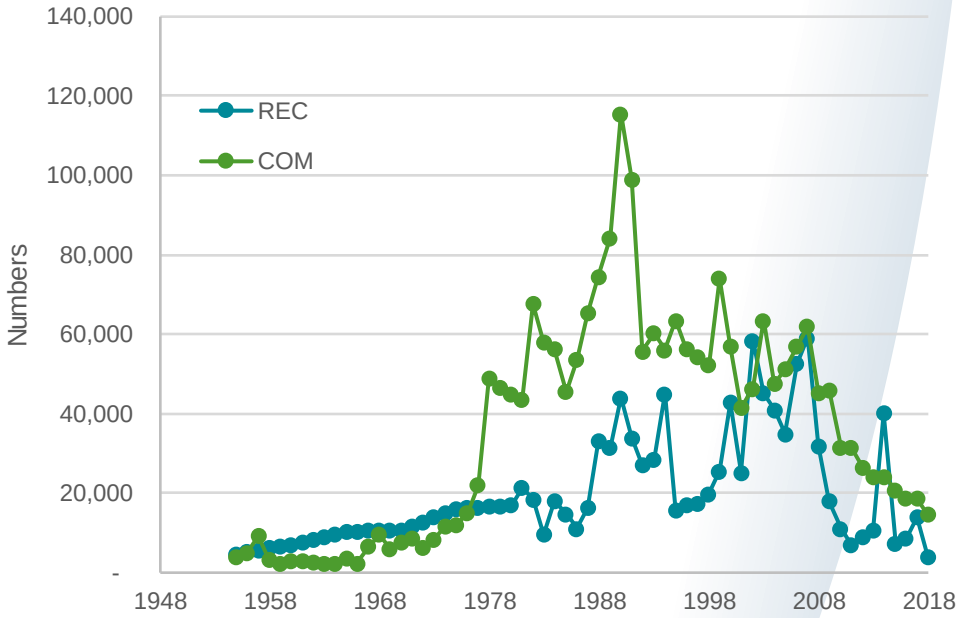
Data Overview

Data	Units	CV/SE	Length Comps	Age Comps
Commercial				
- Vertical Line	Num/WW		1984-2018 (weighted)	2004-2018 (weighted)
- Other	Num/WW		1984-2018 (nominal)	2006-2018 (nominal)
Recreational				
- Headboat	Num.			1979-2018
- MRIP	Num.	Num		2001-2007,'09-'11,'13,'17
Rec Single Fleet	Num/WW	Num.	1972-2018	
Discards				
- Comm. VL	Num.	Num.	2007-2016	
- Comm. LL			**2010, 2012, 2015**	
- Rec HB	Num.		2005-2017	
- Rec MRIP	Num.	Num		
Indices				
- Comm. VL	lb kept/angler hr	✓	Mirror Fleet	
- Rec HB	N kept/angler hr	✓	Mirror Fleet	
- CVT	Num. caught	✓	1990-2018	1990-2018
- Video	Num. obs.	✓	Mirror CVT	

Removals – fleet structure

- Commercial Fleet:
  - Handline, longline, spear/diving and other
- Recreational Fleet:
  - Marine Recreational Information Program (MRIP) – private and charter
  - Headboat



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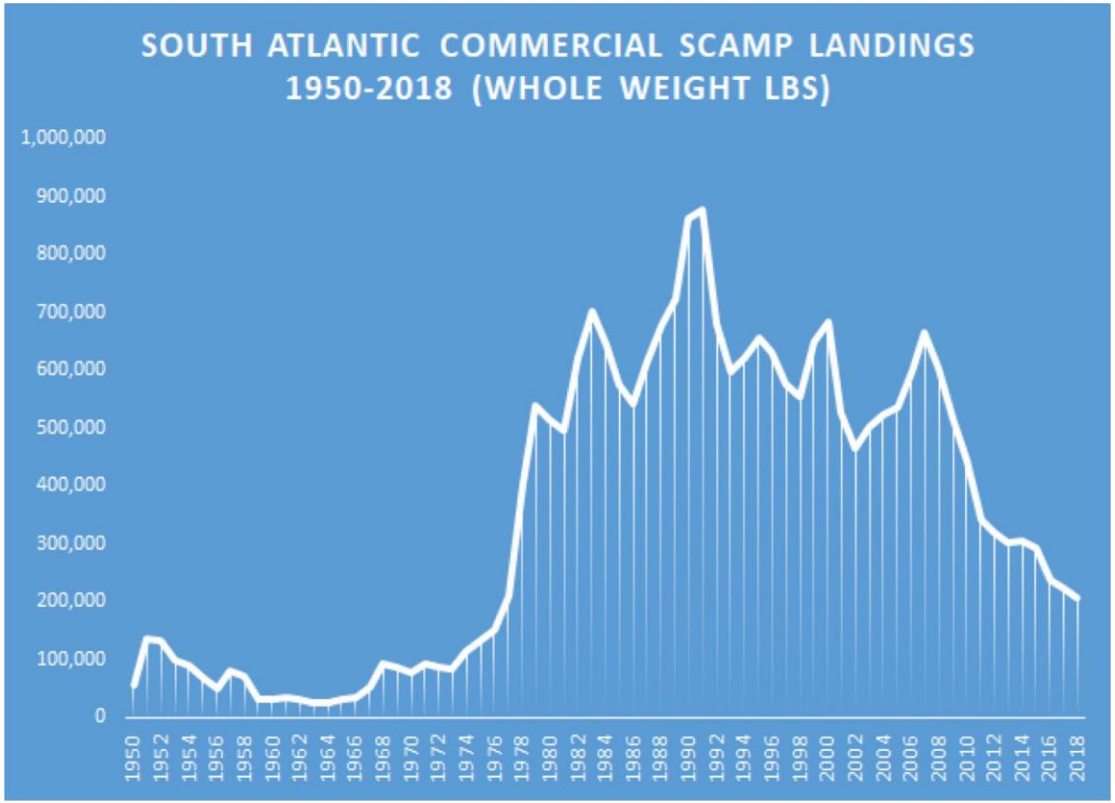
Commercial Landings

- Prior to 1980, all groupers reported as Unclassified groupers
- Proportioning required, consistent with previous SEDARs
  - Proportioned by year, state, and gear
  - Average proportions applied to grouper landings by state and year

$$\frac{Scamp\ and\ Yellowmouth\ grouper}{All\ Identified\ grouper\ species\ (excluding\ Warsaw\ and\ Goliath)}$$

- Landings reported in whole weights
- Underreporting likely highest earlier in time series
  - Landings collected annually from 1962-1977
  - Monthly landings collection start year varied by state

Commercial Landings



Commercial landings aggregated by:

- Handline (vertical line)
- Longline
- Spear/Diving
- Other

Landings data source:

- GA: ACCSP
- SC: 1950-2003: ACCSP
  2004-2018: SCDNR
- NC: NCDMF
- FL: 1950-1985 ACCSP
  1986-2018 FLTT

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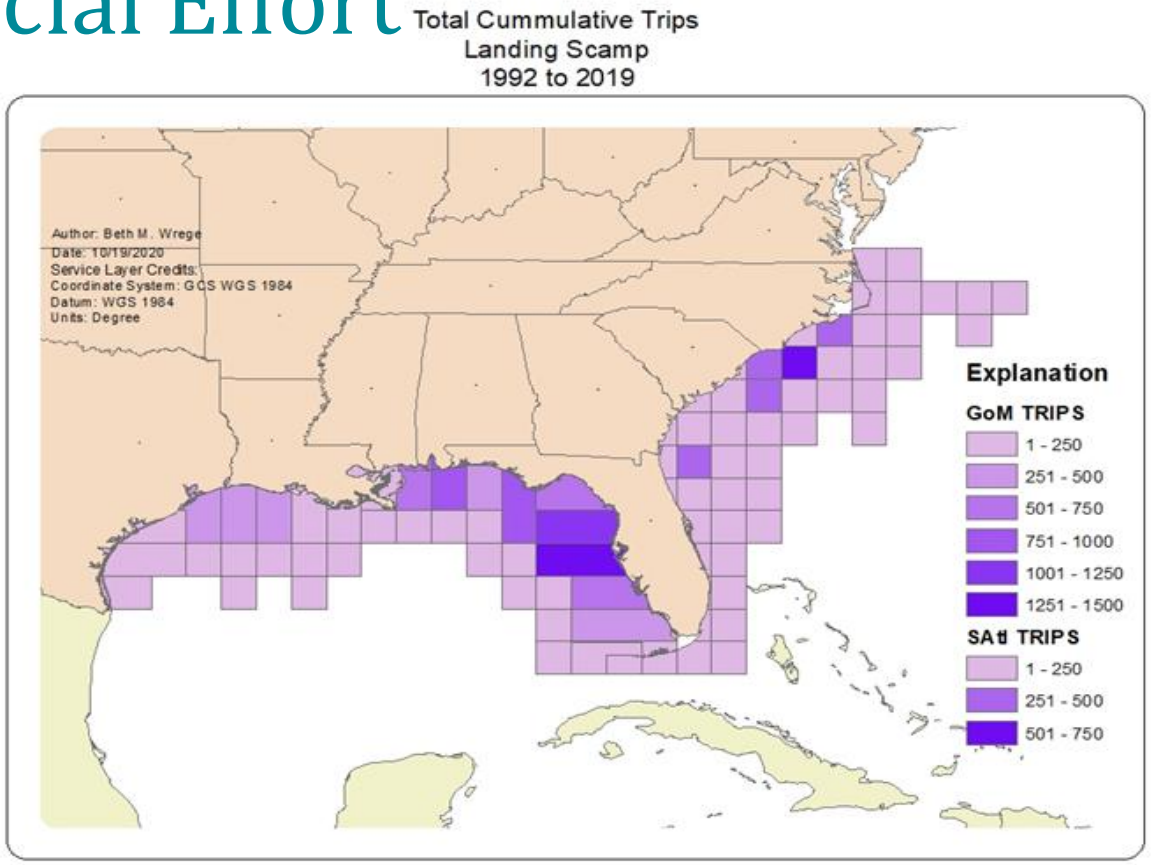
Commercial Effort



Coastal Fisheries Logbook Program

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Commercial Landings Uncertainty

- Consistent with previous assessments
- Estimates of reporting error, not CV

Year	NC	SC	GA	FL - Atl	Comments	South Atlantic
1950-1961	0.25	0.25	0.25	0.25	Annual state summaries, likely missed small scale dealers	
1962-1977	0.2	0.2	0.2	0.2	Annual state summaries, more inclusive General Canvas	
1978-1985	0.1	0.1	0.1	0.1	Monthly state summaries	
1986-1990	0.1	0.1	0.1	0.05	FL starts state trip ticket	
1991-1993	0.1	0.1	0.1	0.05		weighted average
1994-1995	0.05	0.1	0.1	0.05	NC starts state trip ticket	
1996-2000	0.05	0.1	0.1	0.05		
2001-2003	0.05	0.1	0.05	0.05	GA starts state trip ticket	
2004-2010	0.05	0.05	0.05	0.05	SC starts state trip ticket	
2011- present	0.05	0.05	0.05	0.05		

indicates break between upper and lower boundary in early years to upper boundary only in later years

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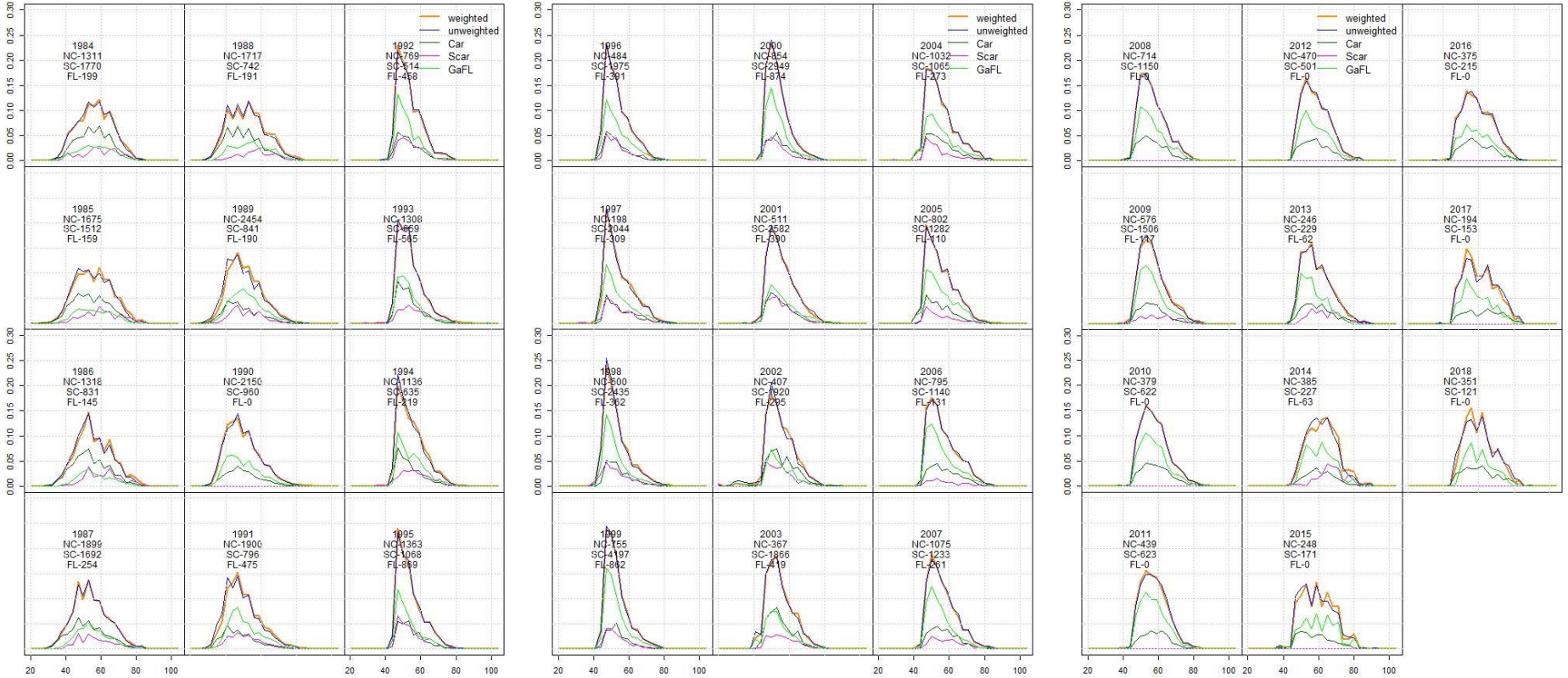
Commercial Length Composition across Years

- Comps provided: handline (VL) weighted and other gears (nominal)



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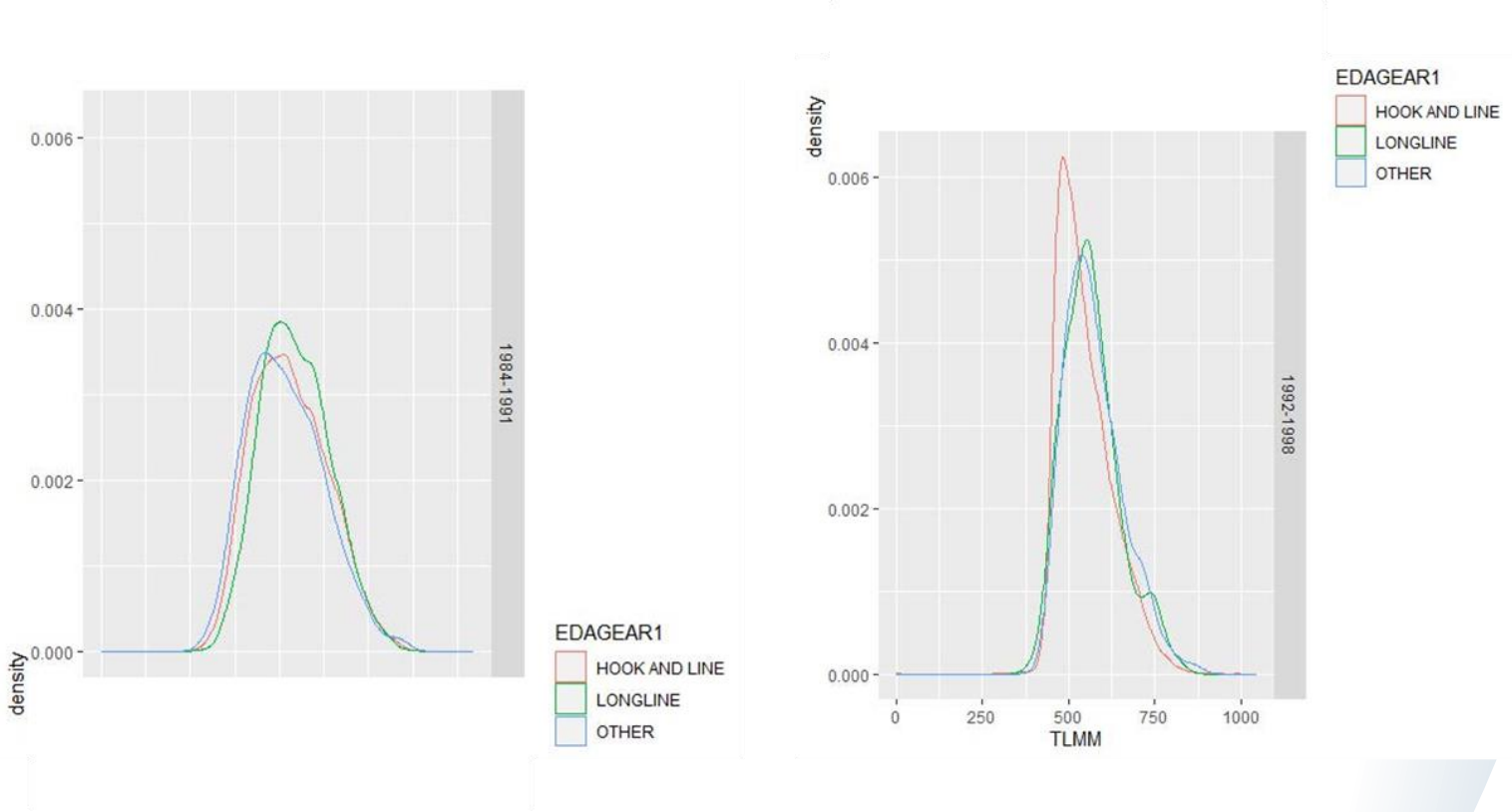
Commercial Length Composition all Years



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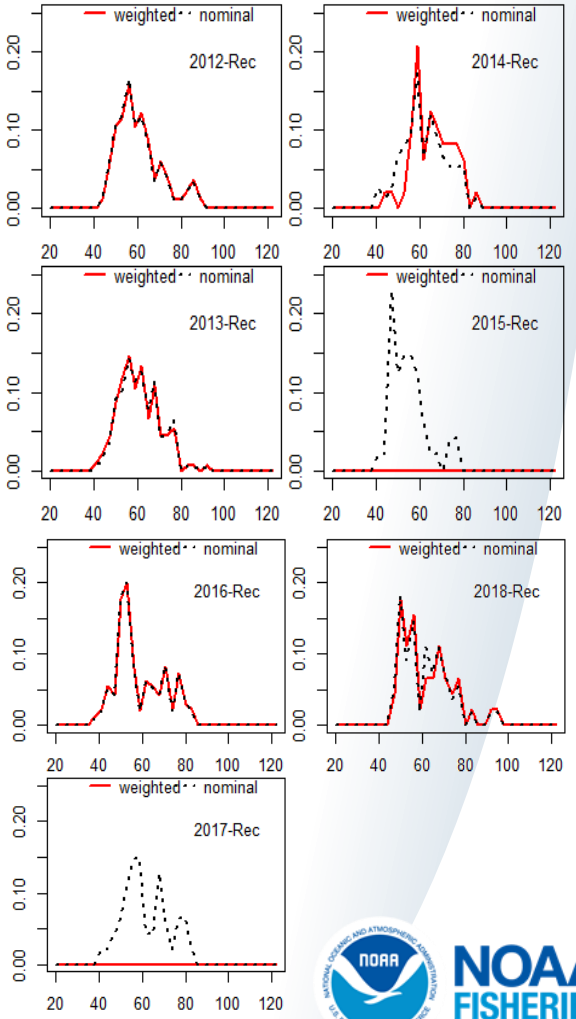
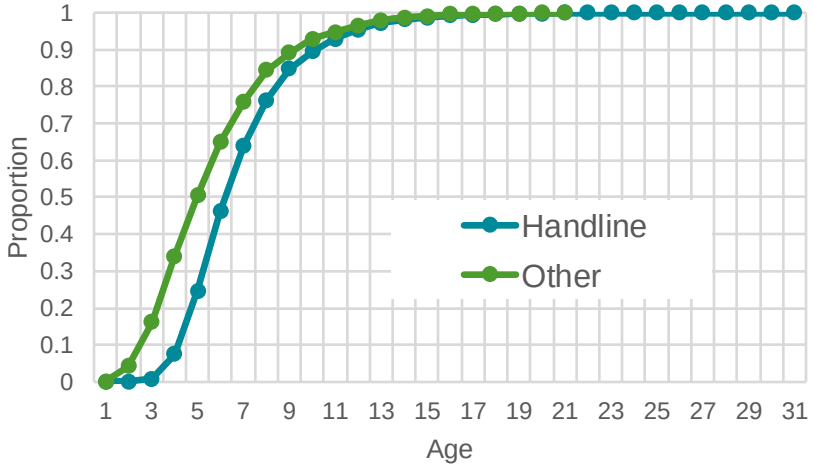
Compositions

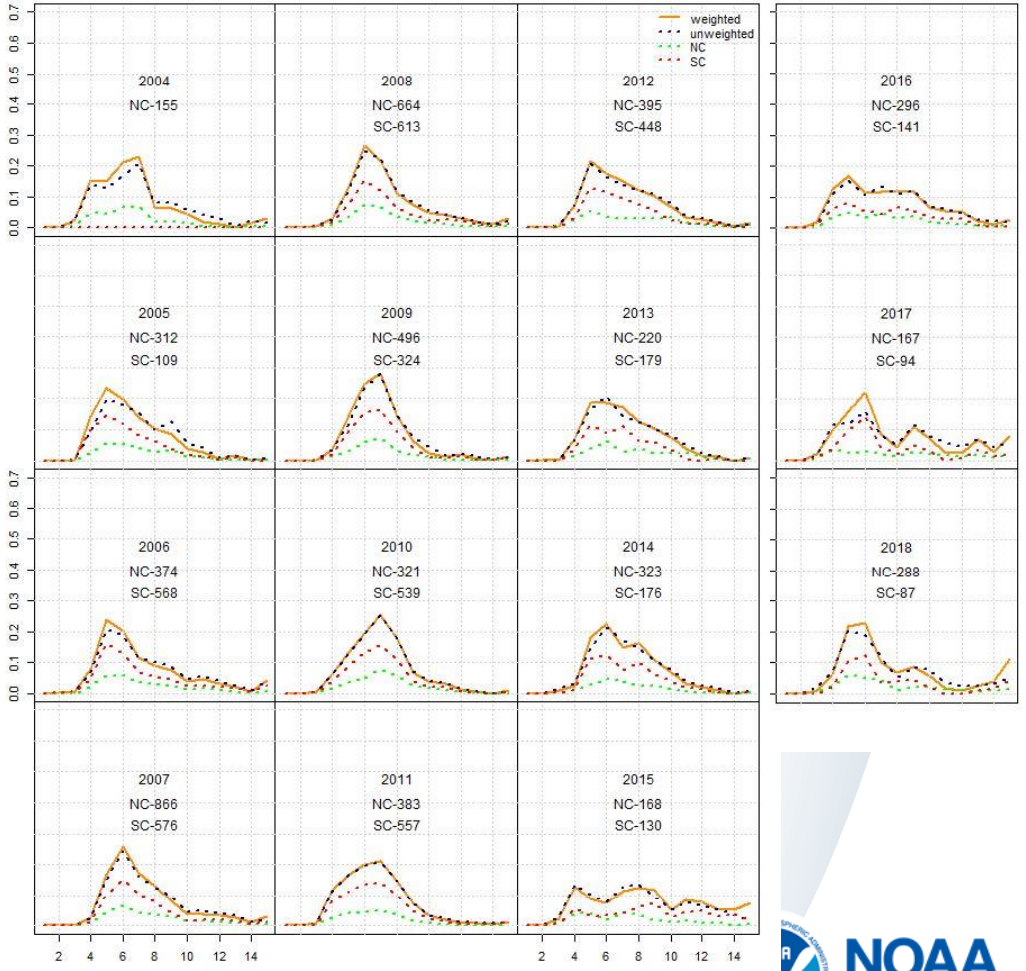
- Use a 30 fish minimum per year per state annually for length comps, and 10 fish per region annually for age comps.
  - These minimums prevent very small comp sample sizes to be scaled up by large landings.
- Dirichlet-multinomial used for likelihoods
  - Self-weighting
  - Allows for zeros in the data



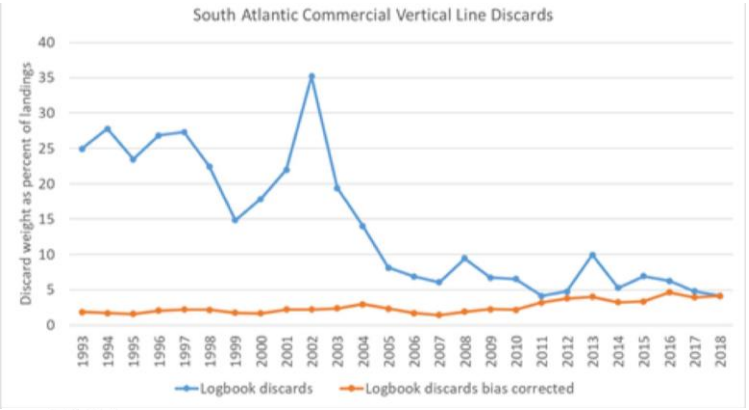
Commercial Age Composition all Years

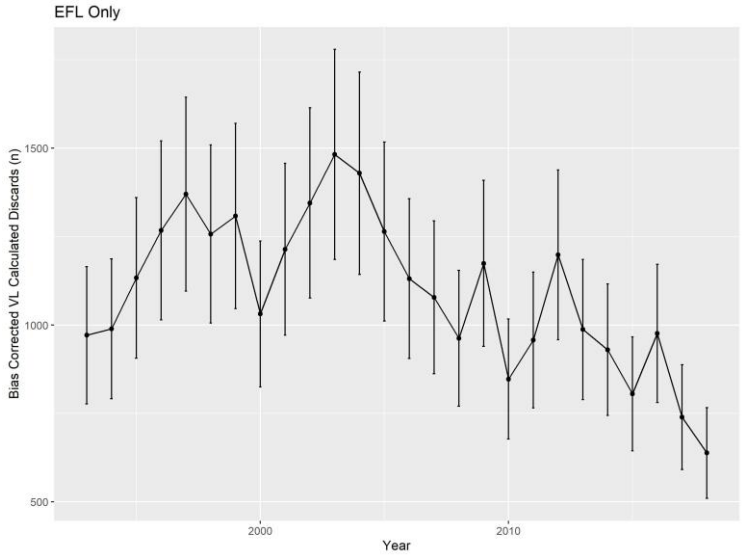
- Comps provided: handline (VL) weighted and other gears (nominal)
- 95% of age data occurs before 12yrs (handline and other)
- Plus group rec. at 15 yrs. (SEDAR68-DW-35)





Commercial Discards





- Data available from two datasets:
  - Discard logbook (rate data)
  - Coastal logbook (effort data)
- Observer data insufficient to calculate discards for SA
- Logbook discards generally higher than what observers report
- Logbook discards (blue) estimates and logbook discards using bias correction factor (orange)

$$SA\ Discards\ RFOP = GOM\ Discards\ RFOP \times \frac{SA\ Discards\ DLP}{GOM\ Discards\ DLP}$$

- Bias corrected VL discards and associated SE (numbers)
  - Only available for FL east coast
- Bottom LL < 80 fish/yr with correction factor
  - Considered negligible effect on stock assessment

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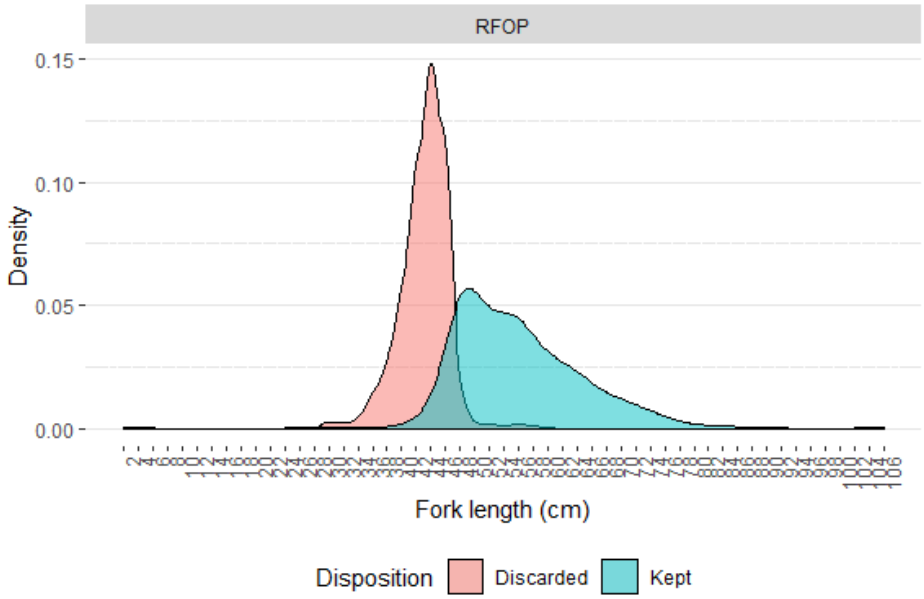
Commercial Discards Length Composition

Vertical Line	Discards		Kept	
Year	N	Trips	N	Trips
2007 - 2008	468	24	1,131	30
2009	33	4	220	7
2010 - 2011	26	6	250	12
2013 - 2015	7	5	246	13
2016	11	5	191	8



- LL discard length comps small sample size (4) (SEDAR68-DW-16)
- VL pooled for discard length composition

Recreational Landings

- SRHS (Headboat survey):
  - Landings for SEDAR 68 recommended to begin in 1981
    - Lack of full survey coverage prior to 1981
    - Uncertainty in species ID prior to 1981
- MRIP:
  - Began 1981
  - MRIP landings in Monroe allocated to SA region
  - Monroe County excluded from MRIP headboat mode (1981-1985)
  - General shore mode excluded

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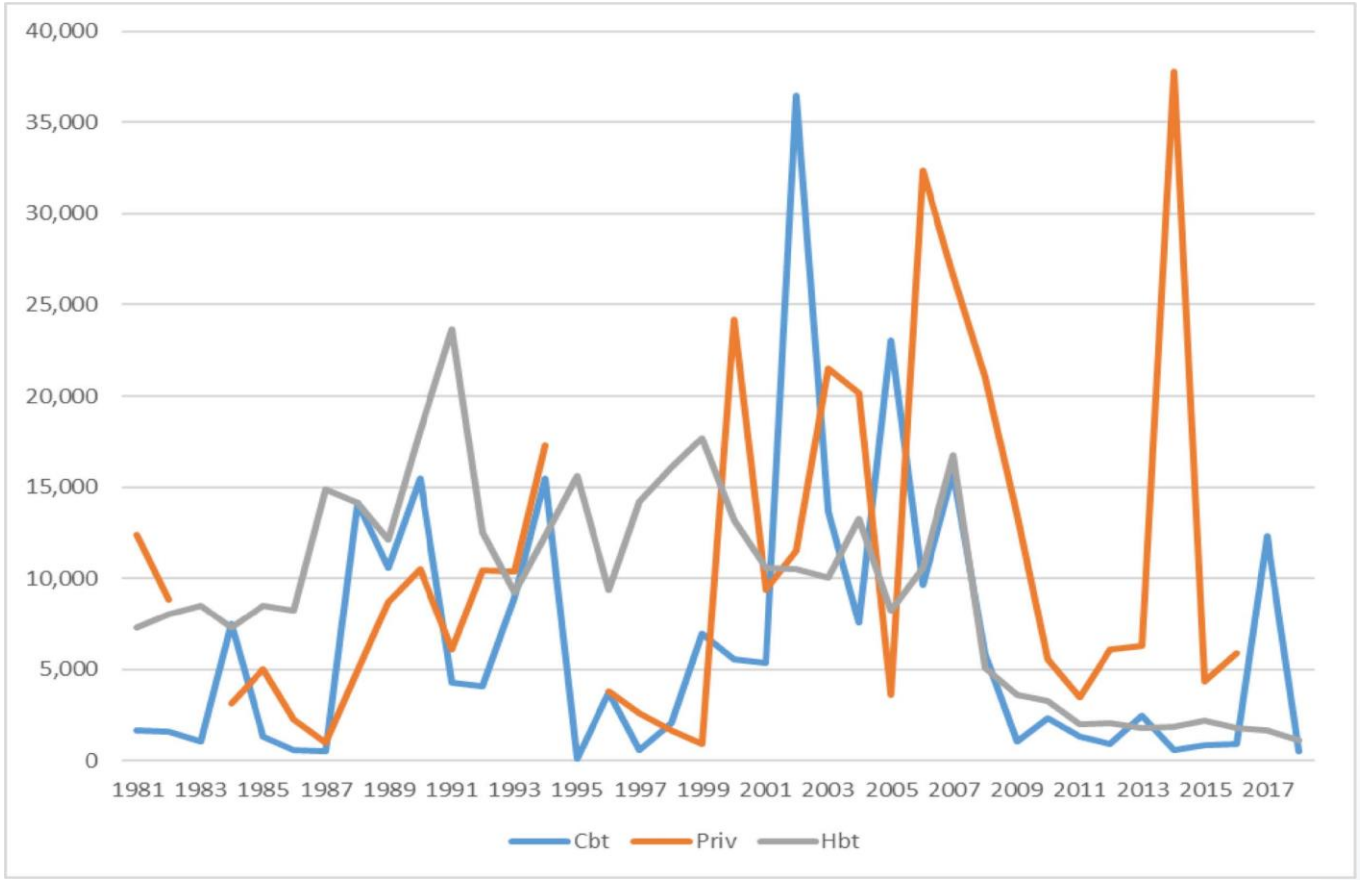
Recreational Landings



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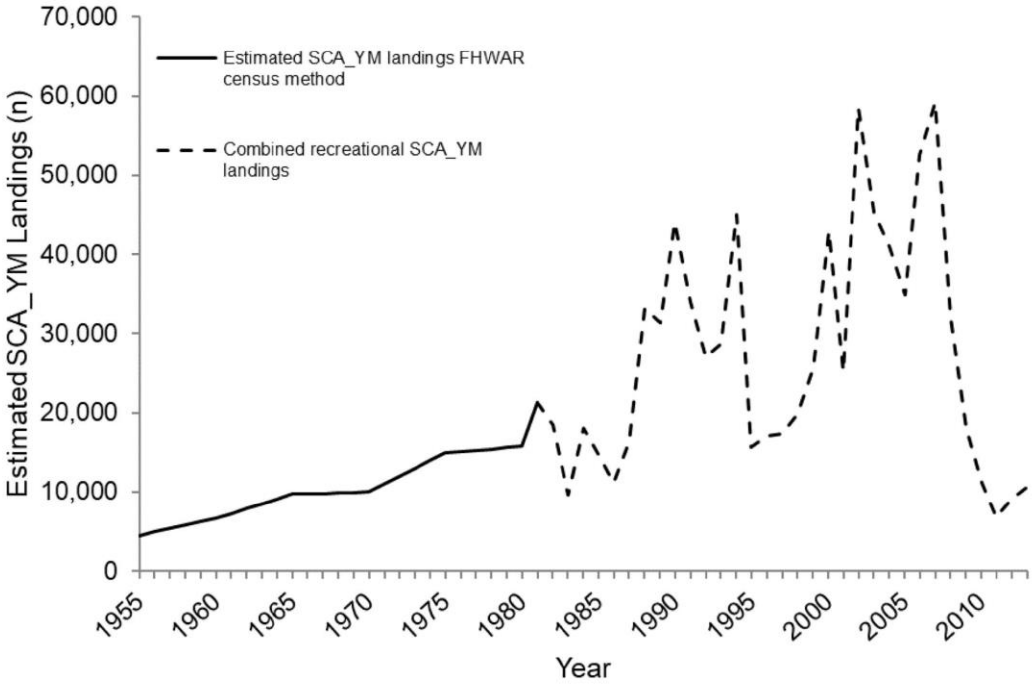
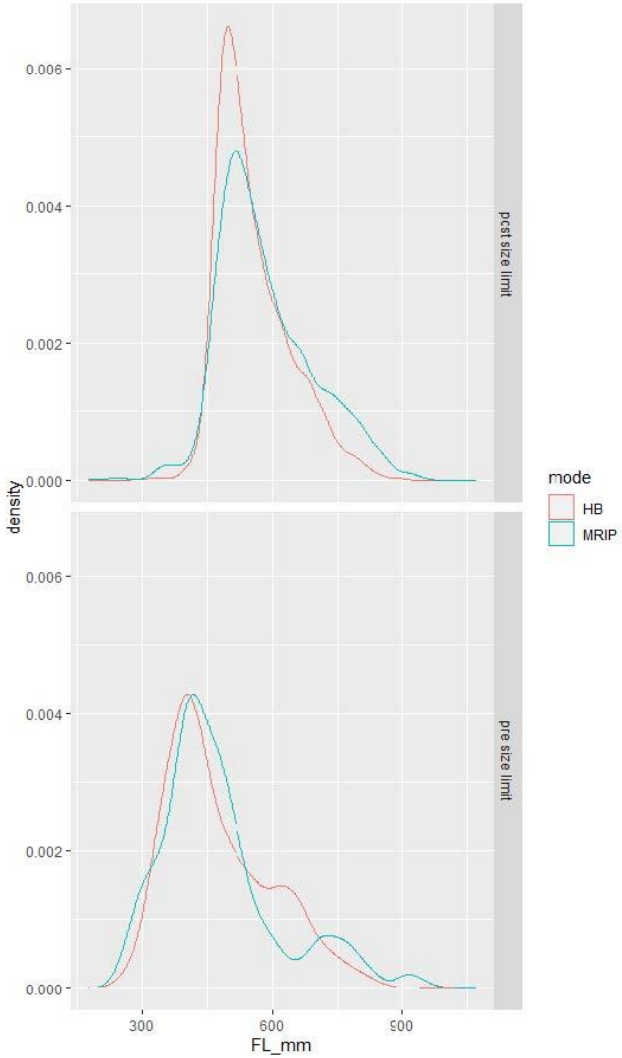
Recreational Historical Landings



- FHWAR (National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey)
- U.S. anglers and U.S. saltwater anglers - every 5 years since 1955
- Used to estimate recreational landings prior to 1981 (1955-1980)
- CV = 0.47
- Recommended for inclusion in SEDAR 68

Recreational Length Composition

- SRHS Total samples 11,912
  - Approx 37% landings
  - 87% of rec lengths
- MRIP Total samples 1,821
  - Approx 63% landings
  - 13% of rec lengths
- **Considerations**:
  - Similar densities between headboat and charter/private modes
  - SRHS sampling more intense
- **Recommendations from Rec WG**: Single recreational fleet



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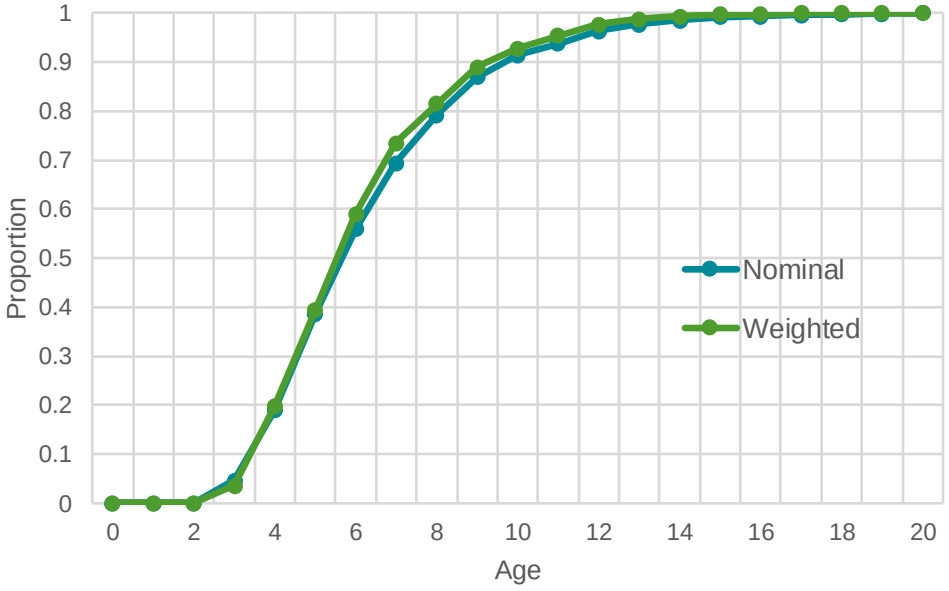
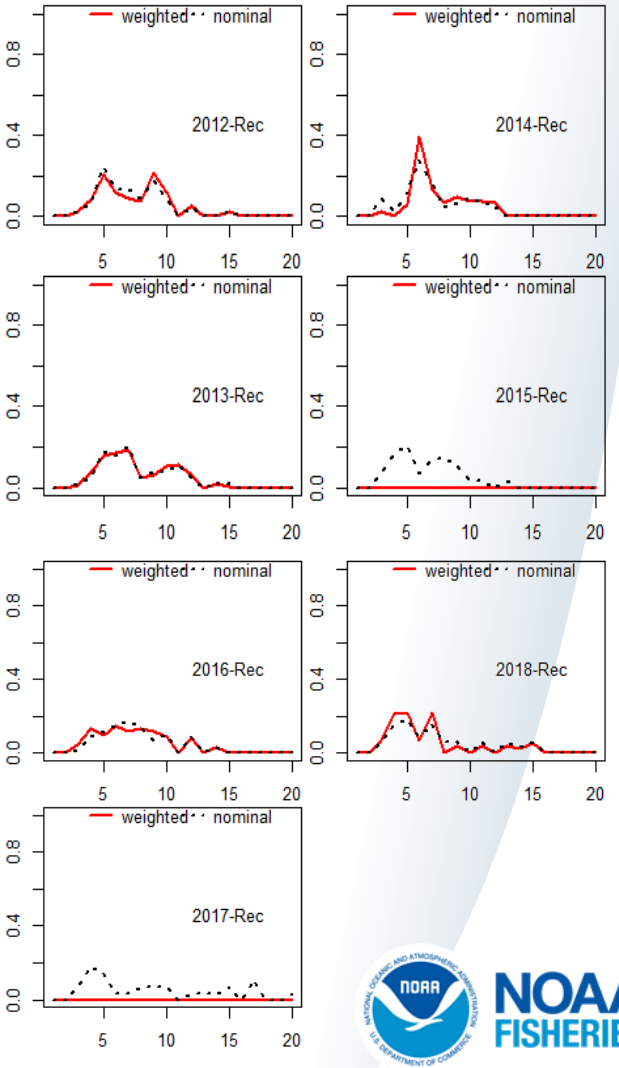
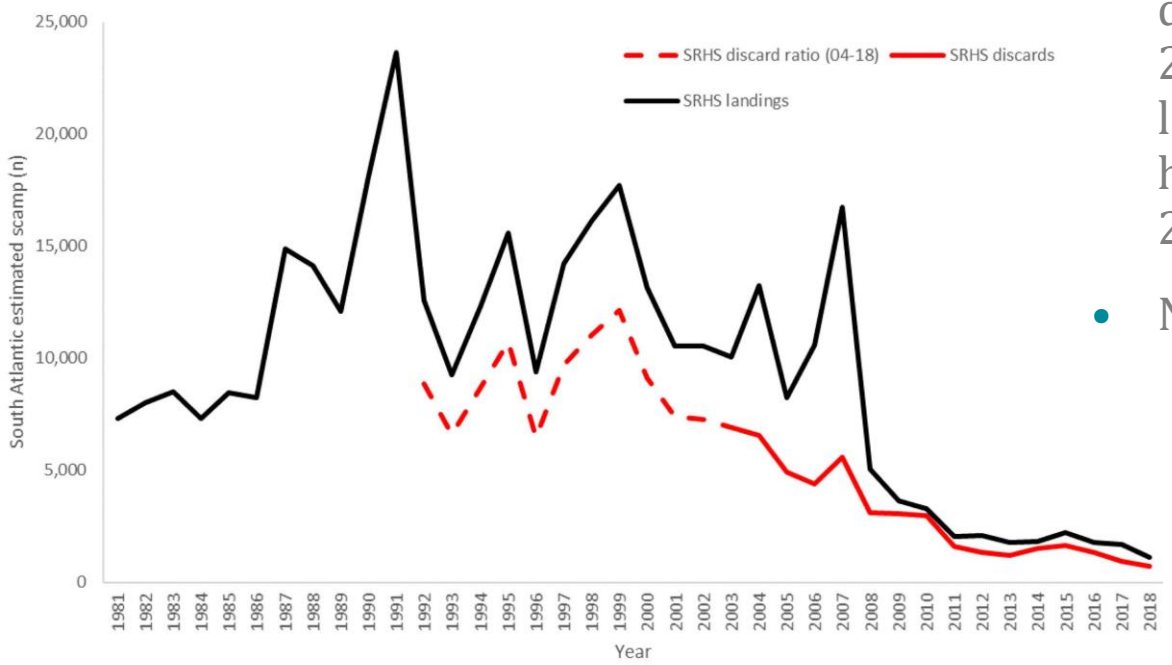
Recreational Age Comps

- 95% of age data occurs before 12yrs (weighted and nominal)





Recreational Discards Headboat



- Applied mean SRHS discard:landings ratio (2004-2018) to estimated headboat landings to estimate headboat discards prior to 2004
- No CVs provided

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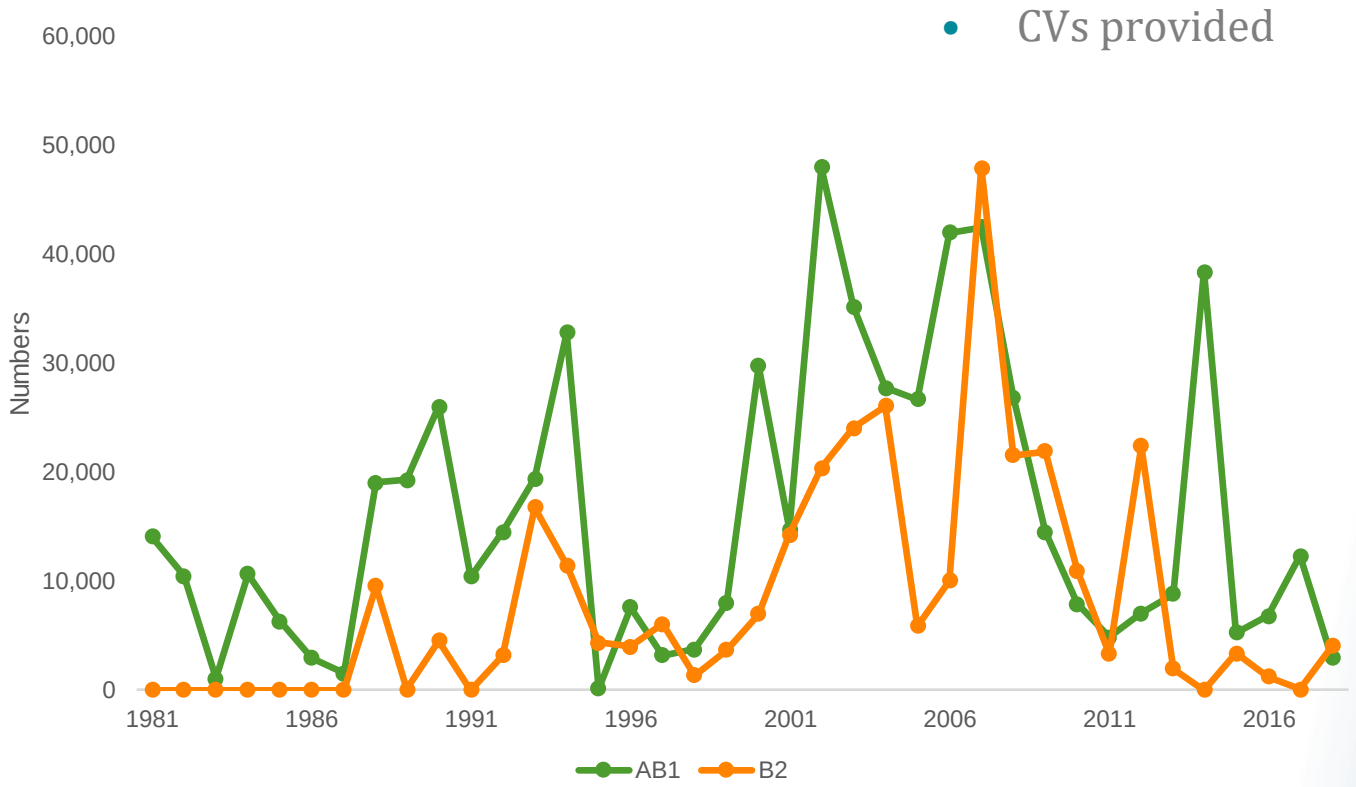
Recreational Discards MRIP



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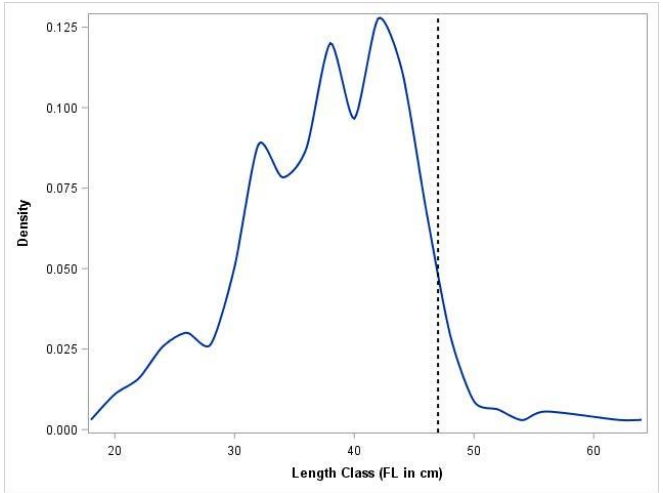
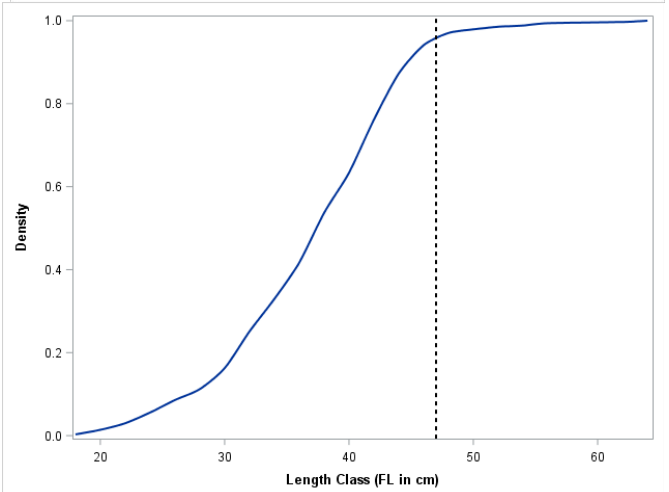
Recreational Length Comps Discards





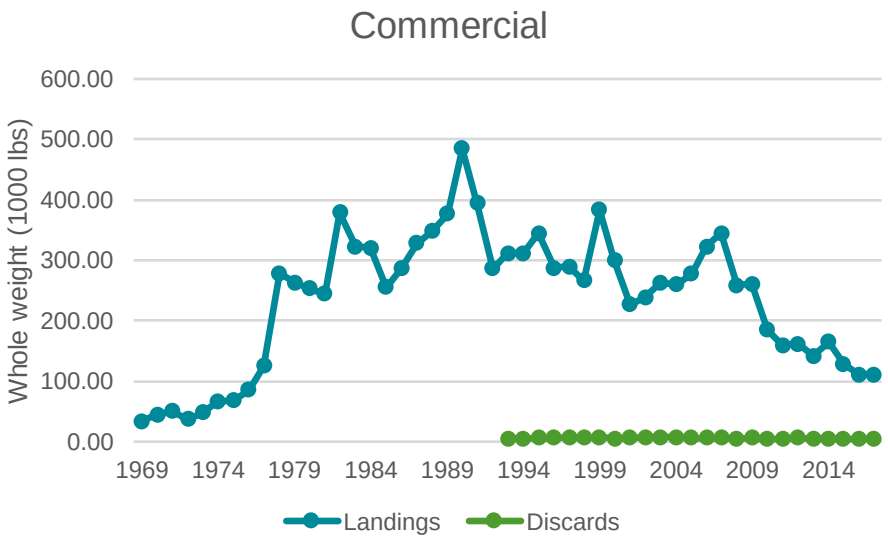
Recommendations:

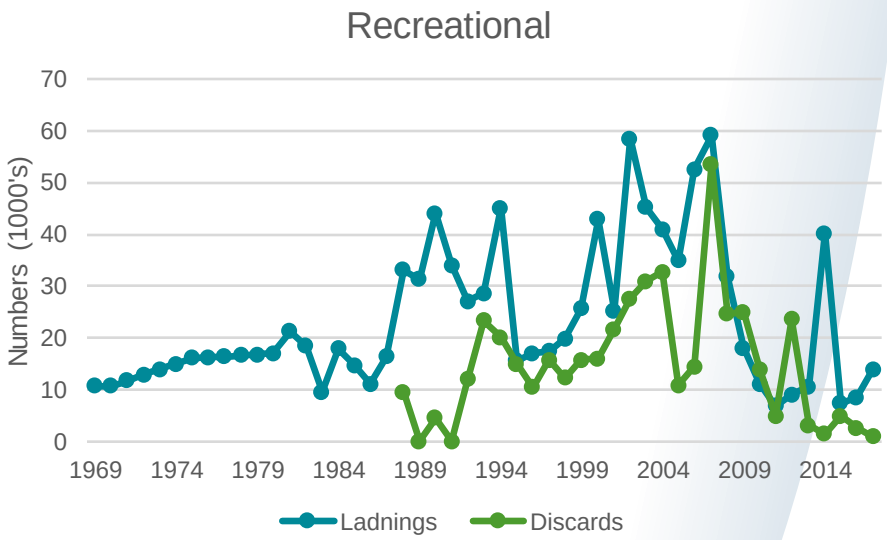
- Use headboat weighted length comp, when available to represent discard length frequencies
- Exclude Charter length comps (only represents Florida and has minimal samples)

SEDAR68-DW-23

Fishing Mode	Mean	Variance	N
Charter	34.72	87.57	5
Headboat	39.44	51.73	230

Total Removals





Chevron Trap Data

- Survey conducted by MARMAP until 2009 (Marine Resources, Monitoring and Assessment Program
- 2009 SEAMAP joined program (Southeast Area Monitoring and Assessment Program
- SEFIS created in 2010 (Southeast Fisheries Independent Survey)
- Partnership program currently referred to as SERFS (Southeast Reef Fish Survey)
- Sampling coverage increased, particularly into Florida
- Chevron traps baited and randomly deployed at live bottom stations
  - Located on continental shelf and shelf edge
  - Soaked for 90 min

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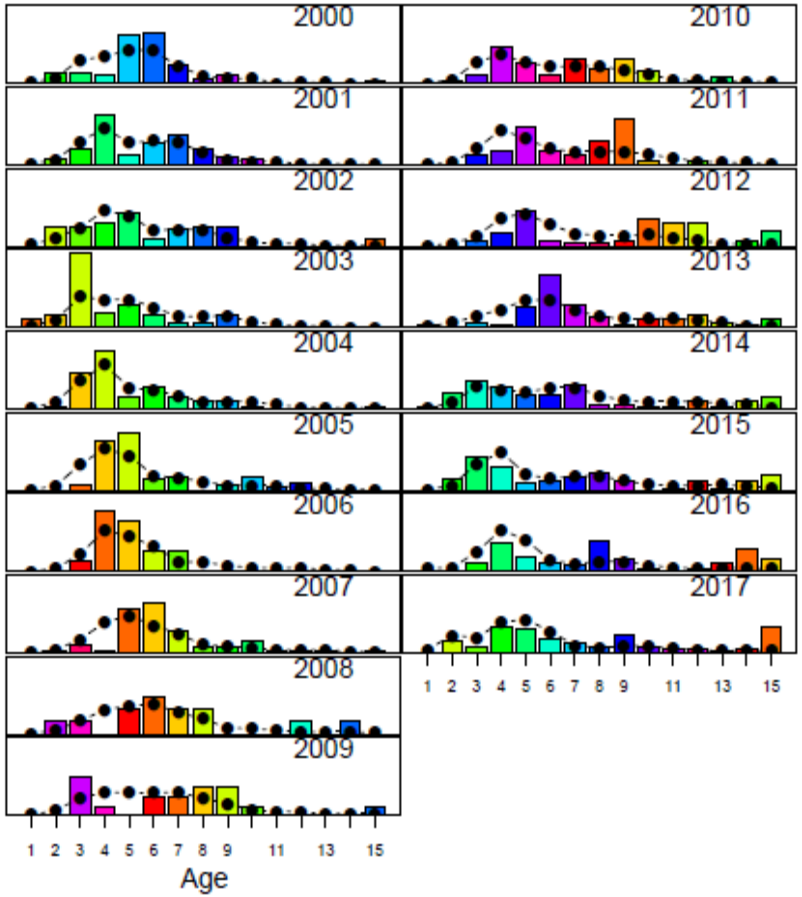
Chevron Trap Data



- Older fish appearing beginning around 2010
- Represent an increase in proportion of older fish relative to younger?

or

- Chevron traps sampling larger, older fish with SEFIS/SERFS formation in 2010?

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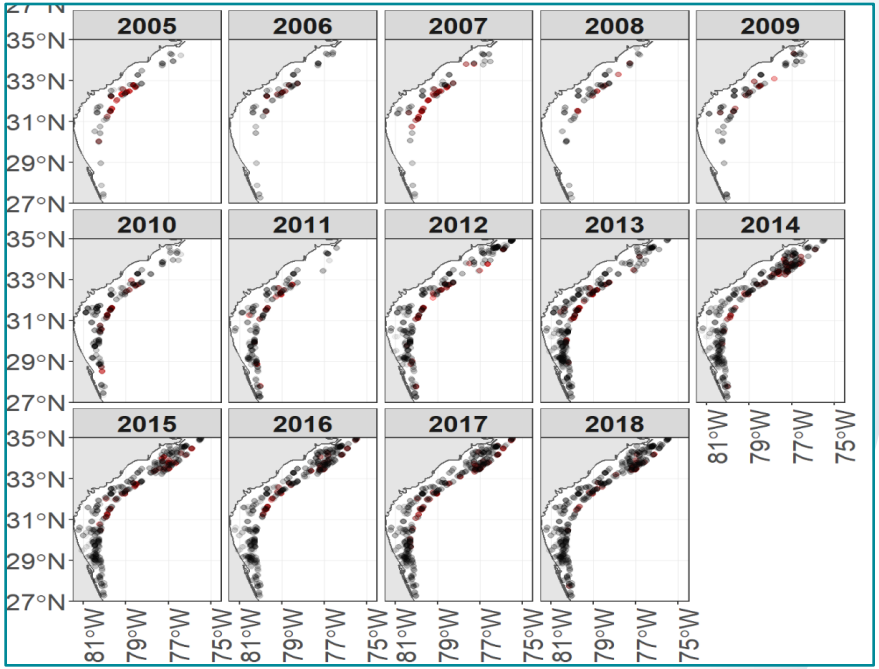
Chevron Trap Data

Year	Included Collections	Positive Collections	Proportion Positive	Total Fish
1990	313	32	0.1	63
1991	272	30	0.11	48
1992	288	29	0.1	49
1993	392	41	0.1	72
1994	387	71	0.18	127
1995	361	52	0.14	117
1996	361	41	0.11	69
1997	406	69	0.17	162
1998	426	51	0.12	120
1999	233	25	0.11	49
2000	298	43	0.14	60
2001	245	35	0.14	60
2002	244	25	0.1	37
2003	224	24	0.11	41
2004	282	36	0.13	54
2005	303	33	0.11	61
2006	297	10	0.03	15
2007	337	40	0.12	61
2008	303	10	0.03	13
2009	404	12	0.03	17
2010	725	31	0.04	47
2011	726	27	0.04	30
2012	1,174	42	0.04	58
2013	1,360	49	0.04	55
2014	1,472	53	0.04	72
2015	1,463	55	0.04	70
2016	1,484	41	0.03	51
2017	1,541	58	0.04	72
2018	1,736	29	0.02	39
Totals	18,057	1,094	0.06	1,789



SEDAR68-DW-04

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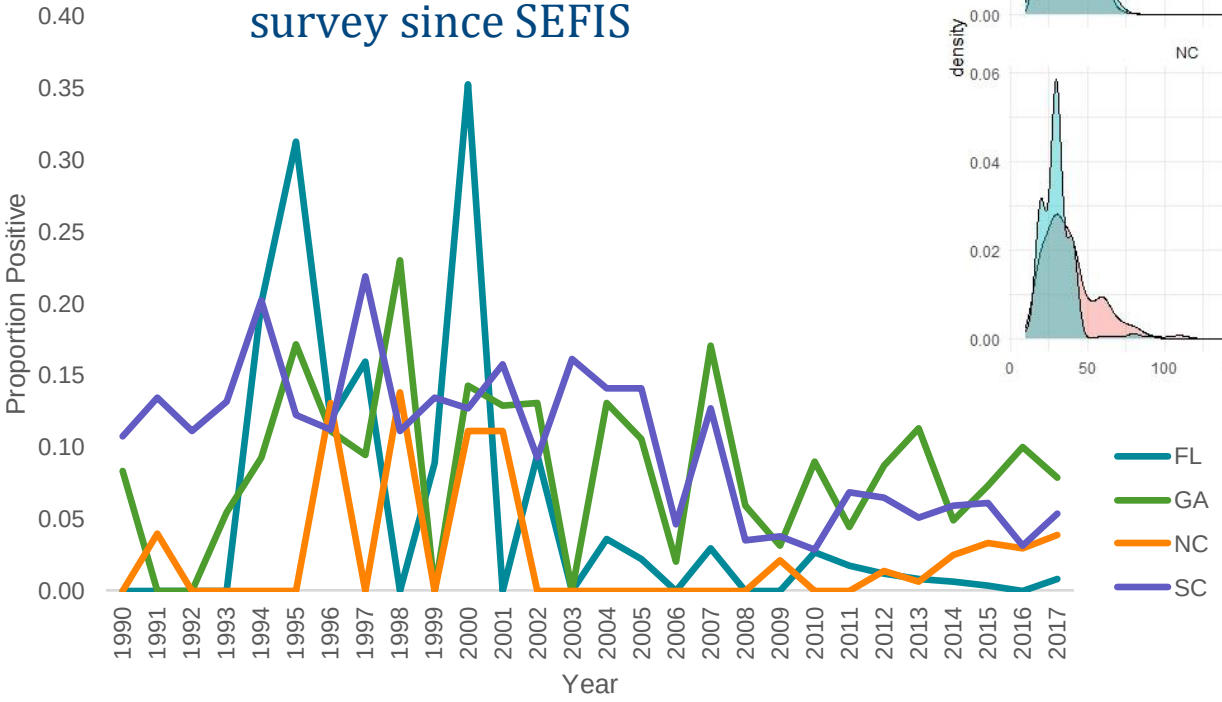
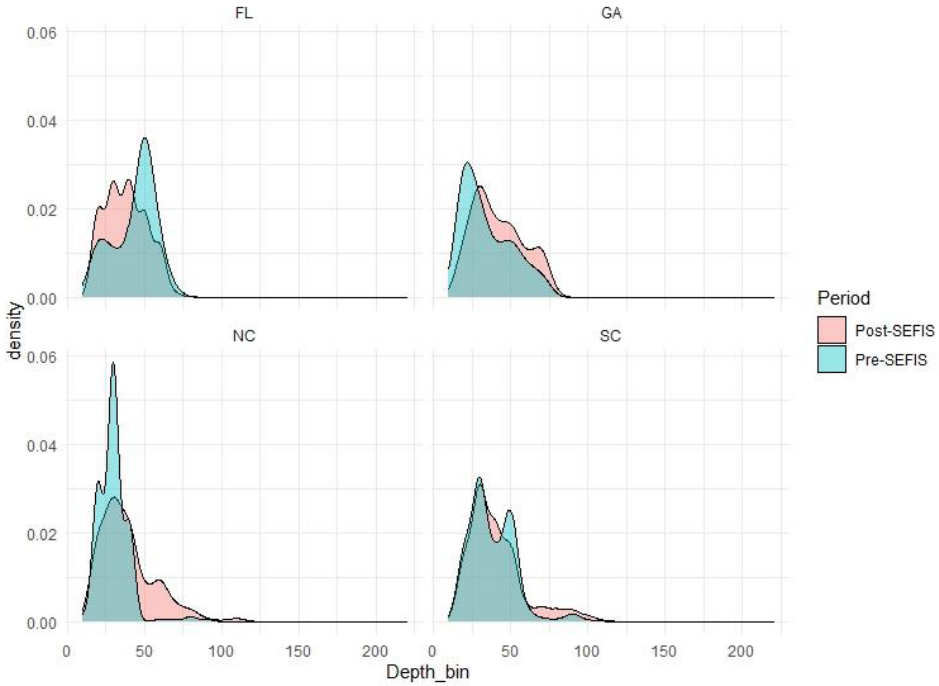
Chevron Trap Data

- PP increases for NC
  - NC: 10% of catch for survey since SEFIS





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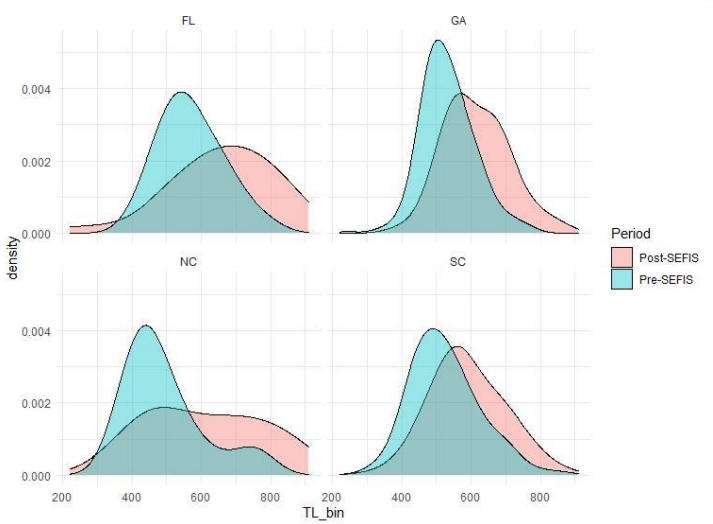
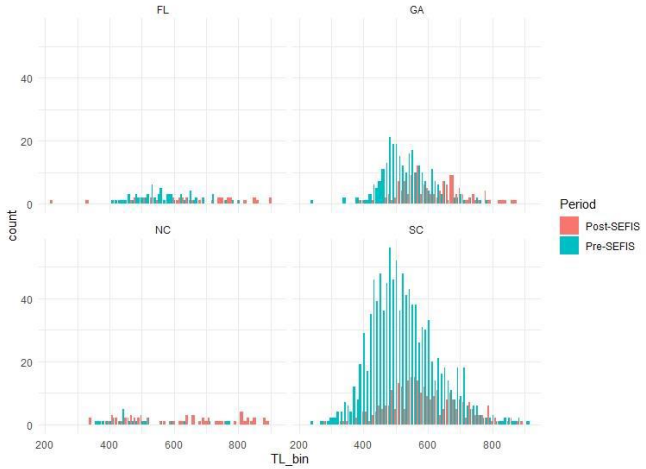
Chevron Trap Data

- Length of scamp caught in MARMAP/SERFS survey increased
- Capturing older fish in new sampling?
- Proportion of large fish increasing due to decline in smallest fish? (Bacheler & Ballenger, 2018)





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Indices of abundance

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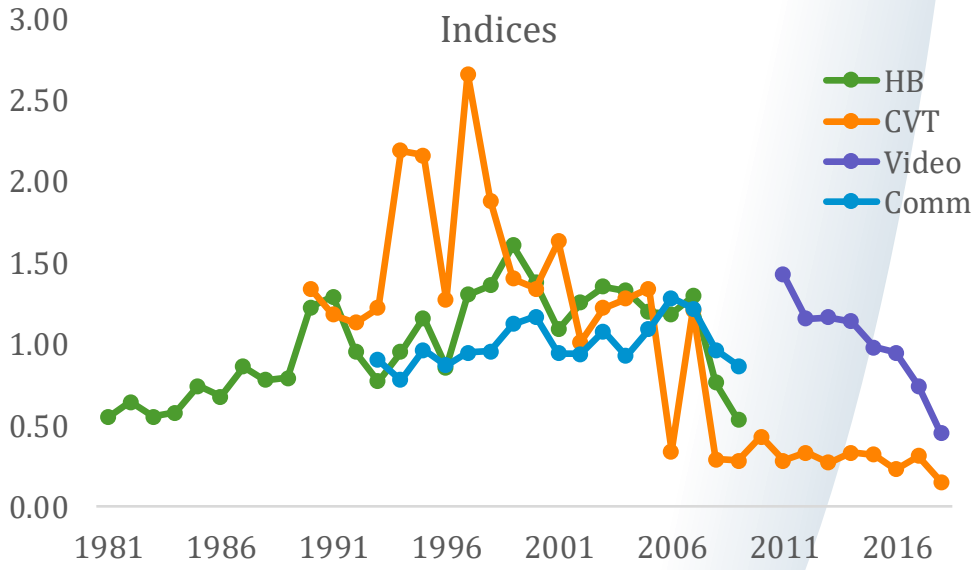
Indices of Abundance

- Four recommended for use at Data Workshop
  - Commercial handline
  - Recreational headboat
  - SERFS chevron trap survey
  - SERFS Video Index
- Standard errors for FD indices scaled to a common mean of 0.2
- Used provided errors for FI indices
- COM and REC available thru 2017.
- Truncated in 2009 due to management concerns for COM and REC
  - Management changes beginning in 2010 influence subsetting method for data (Stephens & MacCall)



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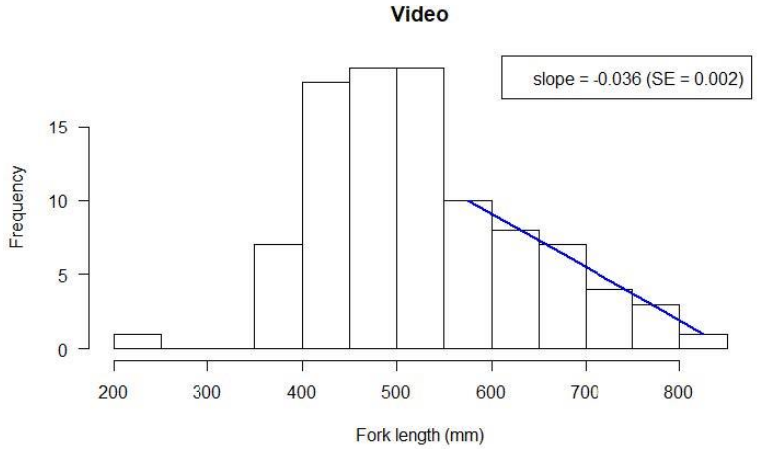
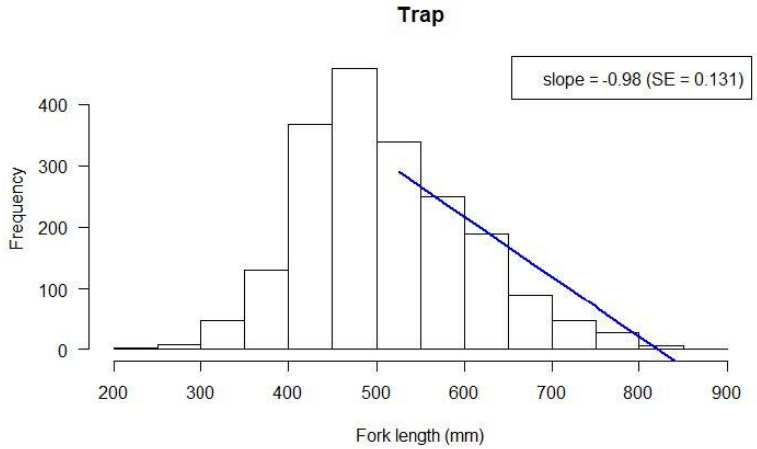
Indices





- IWG recommended separate SERFS trap and video indices initially
- Preliminary Recommendation from WG: Assume flat-top selectivity and borrow ascending limb from trap length information
- No comp data for video survey

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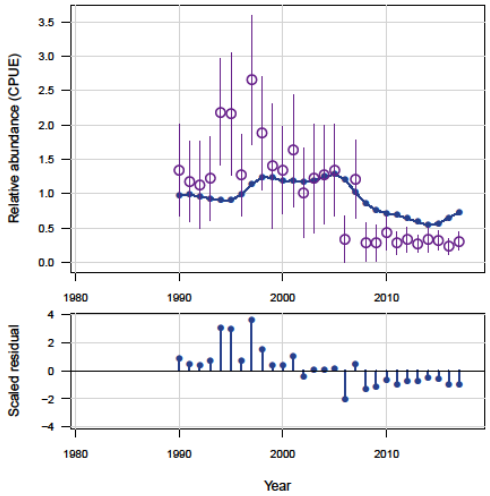
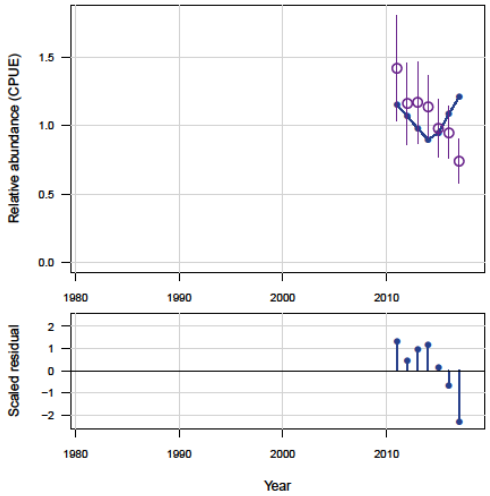
Indices of Abundance

- SERFS chevron trap survey and video index fit separately initially
  - Videos placed on top of traps, potential bias
  - No composition data associated with video index
  - Initial model runs showed a conflict between fitting the two indices
    - Alternately downweight or upweight the two (SDNR)





- Video and traps exhibited similar trend in abundance

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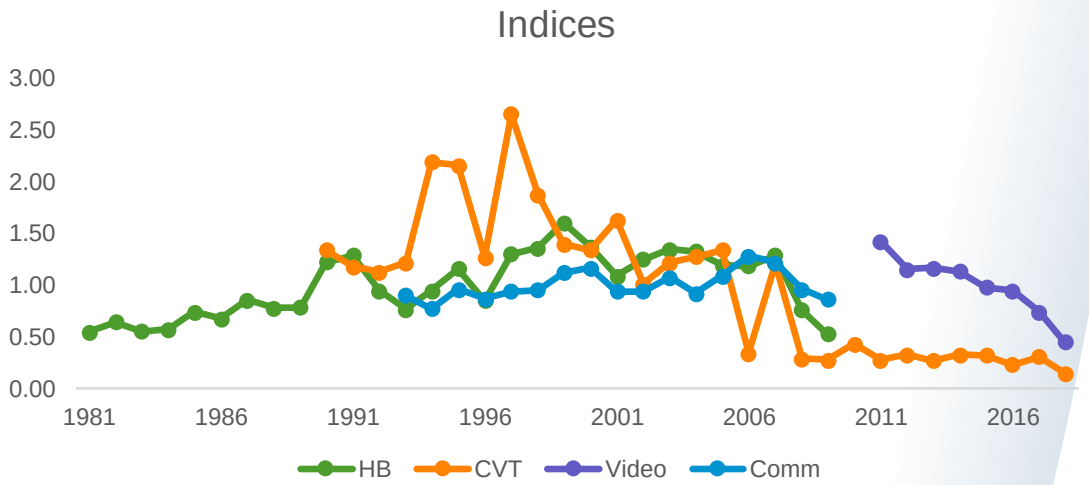
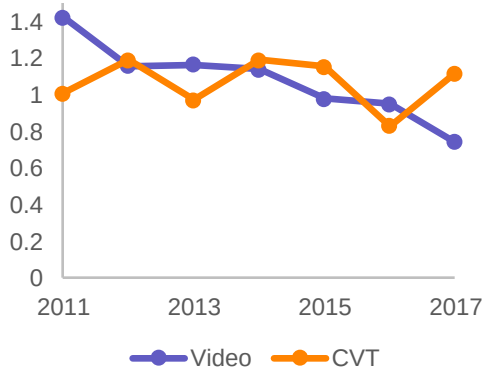
Indices of Abundance

- Re-scaled CVT to 2011-2017 average
- Minimal difference between VID and CVT trends





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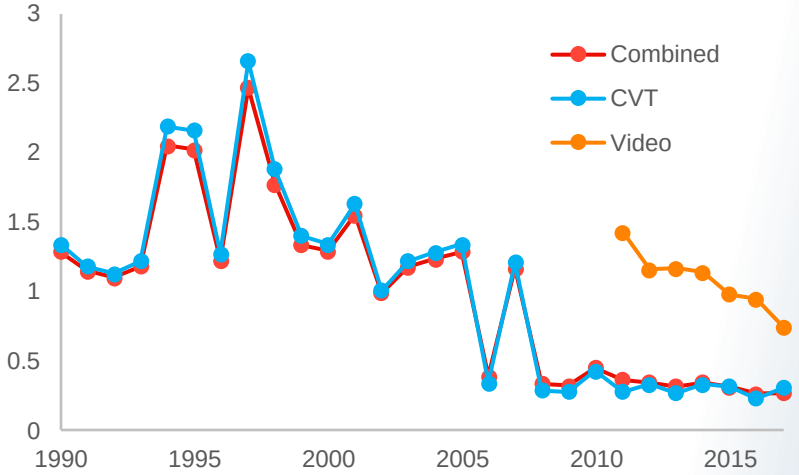
Indices of Abundance

- SERFS chevron trap survey and video index combined using Conn model averaging method (Conn, 2010)
  - hierarchical framework for analyzing multiple indices to estimate single time series of abundance



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Start Year

- Set at 1969:
  - Historical landings data available from 1955
  - Length comps began 1972 REC
  - Set at 3 years before start of REC comps
  - Did not end up using length comps from 1972-1977
  - 1978 earliest length comp year
  - Age comps begin 1990 (CVT)

Questions about the data?

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Outline

Data Review
- Stock definition
- Life history
- Removals
- Compositions
- Index of abundance

Catch-age model
- AW and RW base runs
- Diagnostics & model fits
- Sensitivities
- Uncertainty analysis

Review Workshop
- Requested analyses

Recommendations for Operational Assessment

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Catch-age model

- Beaufort Assessment Model (Williams and Shertzer, 2015).
- Start year: 1969
- 1 area, 1 season model
- Combined SSB
- von Bertalanffy growth (fixed)
- Lorenzen natural mortality (fixed)
- Beverton-Holt spawner-recruitment relationship
- Two time blocks for selectivities
    - block 1: 1969-1991
    - block 2: 1992-2017

Catch-age model configuration cont'd

- Iteratively reweight the likelihood component for the index in order to achieve standard deviations of the normalized residuals (SDNRs) of 1. (Francis 2011)
- Constant catchability.
- Age based selectivity
- Plus group for compositions set to 15.
- Ages 1-20 modeled, with 15+ as a plus group.
  - Based on the saturation of the life history parameters.

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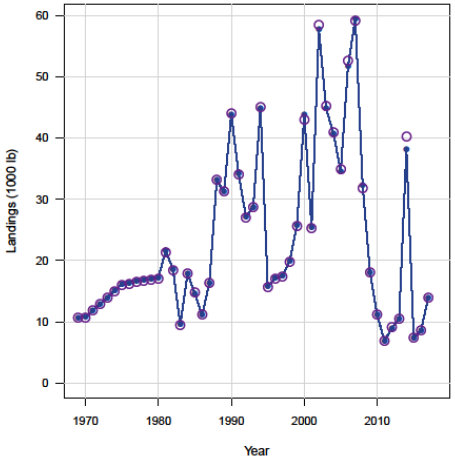
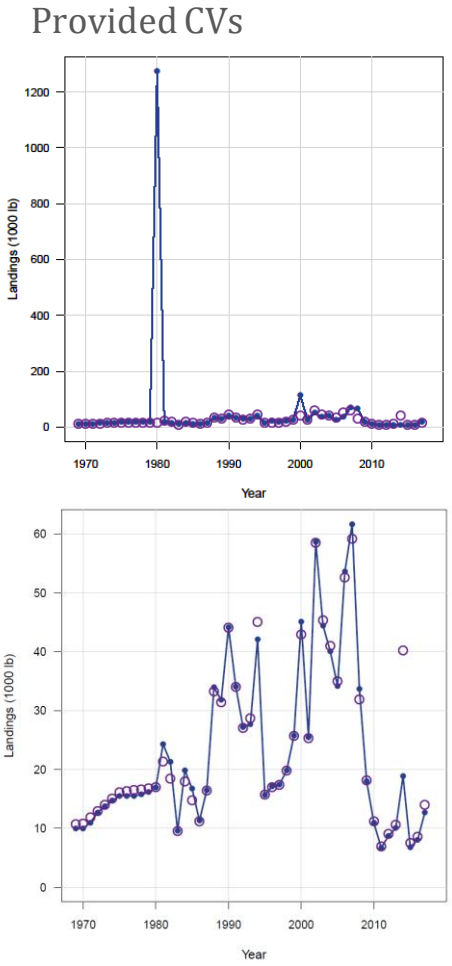
Recreational Landings CVs

- Provided CV's cause model to greatly overestimate landings in 1980
- Placeholder CVs of 0.05 used
- Once model further developed, provided year specific CV's used

CV = 0.05



Provided CVs



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Parameters estimated: 160

- Annual fishing mortality rates of each fleet (98 parameters)
- Average fishing mortality for each fleet (2 parameters)
- Selectivity parameters (10 parameters)
- Dirichlet-multinomial variance inflation factors (6 parameters)
- Catchability coefficient associated with the index (3 parameters)
- Recruitment parameters (3 parameters)
  - Sigma r, steepness and R0
- Annual recruitment deviations (36 parameters) - 1980-2015
- CV of size at age for the population and landings growth curves (2 parameters)

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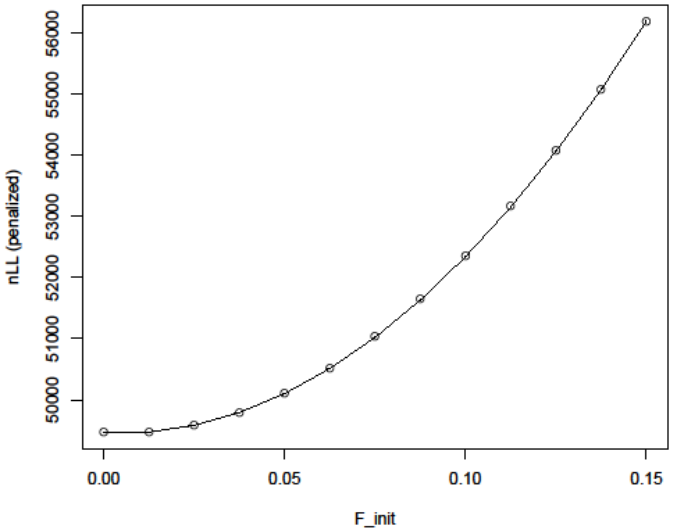
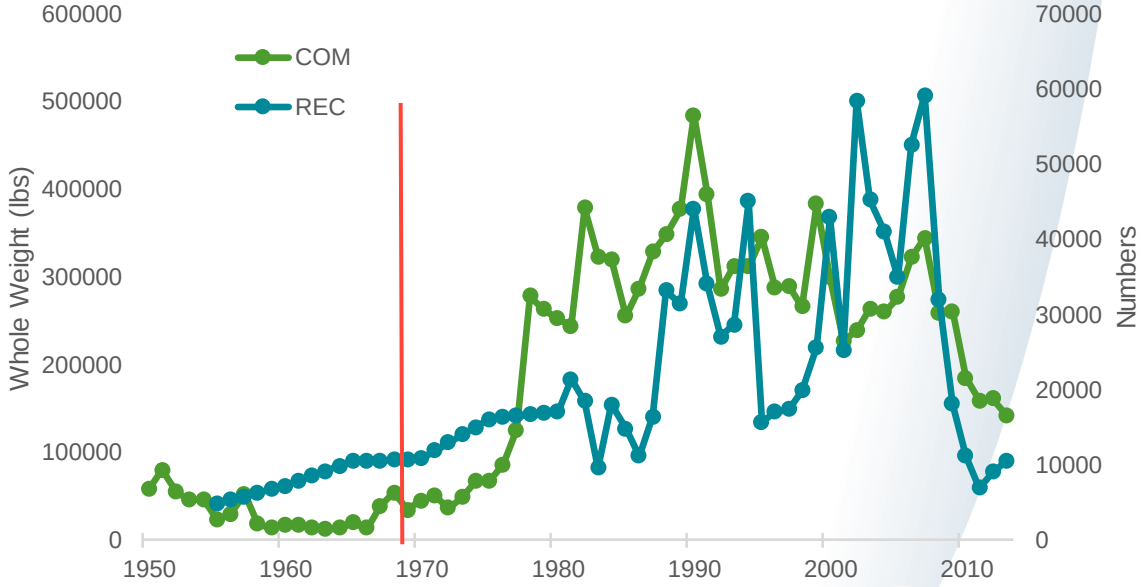
F Initial Likelihood Profile

- Attempted to estimate F init
- Hitting lower bound of 0.0
- Equilibrium age conditions at first year





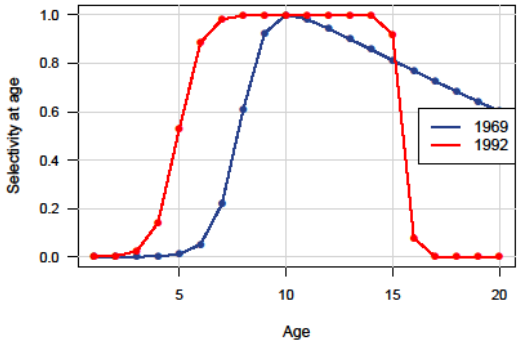
BAM likelihood components

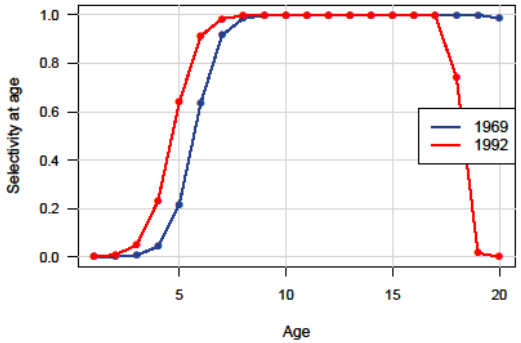
- Landings: Lognormal with assumed CV=0.05 COM and provided CVs for REC
- Index: Lognormal with annual CVs
  - Fishery dependent indices weighted to common SE
- Age Composition: Dirichlet multinomial with annual N = number of sampled fish
- Length Composition: Dirichlet multinomial with annual N = number of sampled trips
- Recruitment deviations: Lognormal with estimated variance of rec devs (sigma-R)

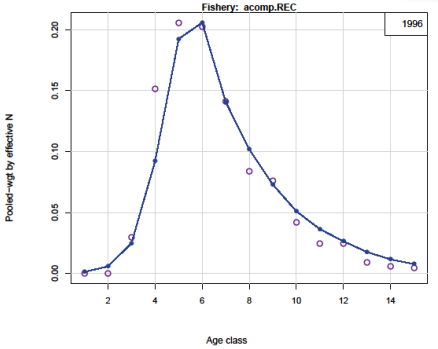
Selectivities

REC and COM both 2 parameter logistic

- One selectivity for each time block
- Dome shape (4 parameter) explored in Review Workshop
- Both fleets would not fit dome shaped and poor age comp fits

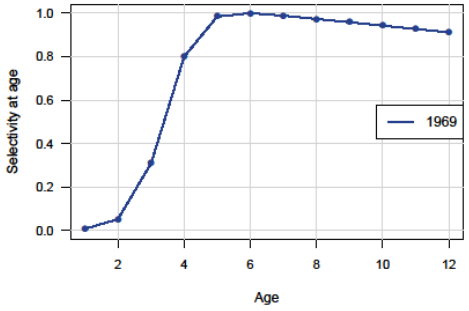






CVT 2 parameter logistic,

- Dome shaped attempted in AW
- A502 and descending slope hit bounds



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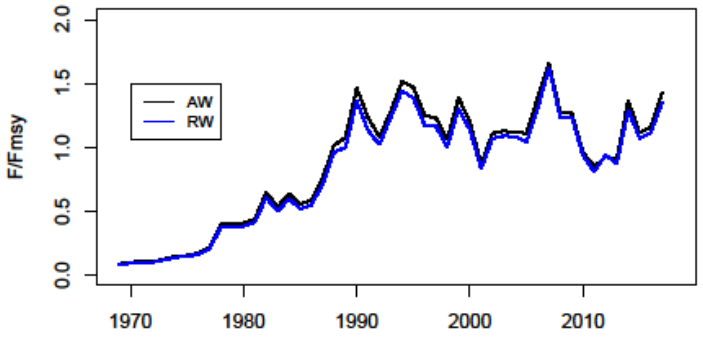
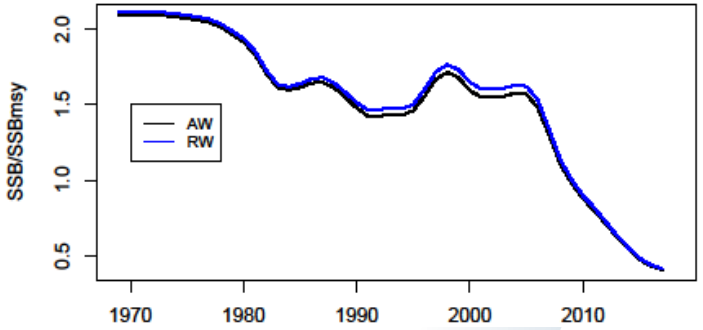
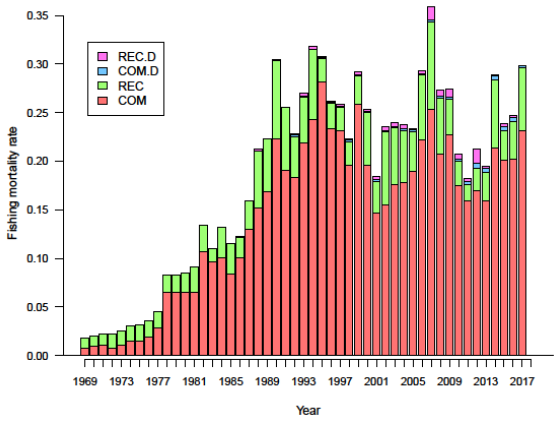
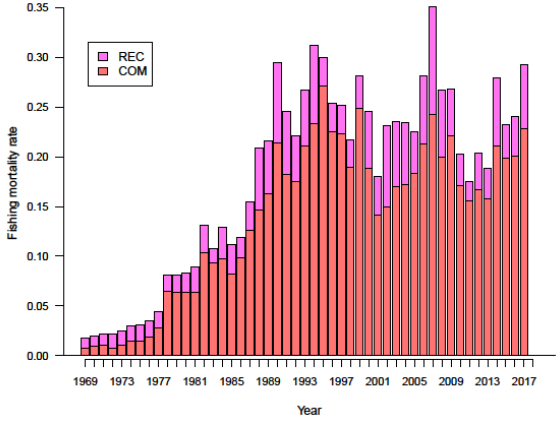
Review Workshop Base Model

- Assessment Webinar base run:
  - Included two separate discard fleets, one for COM and one for REC
  - Review Panel recommended combining dead discards with landings for COM and REC
    - Model parsimony
    - Currently no way to separate discard retention from landings in BAM





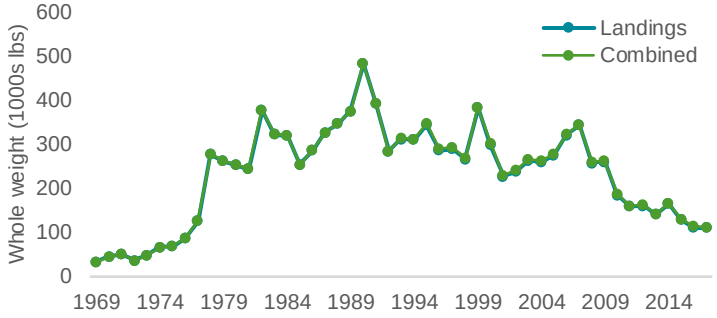


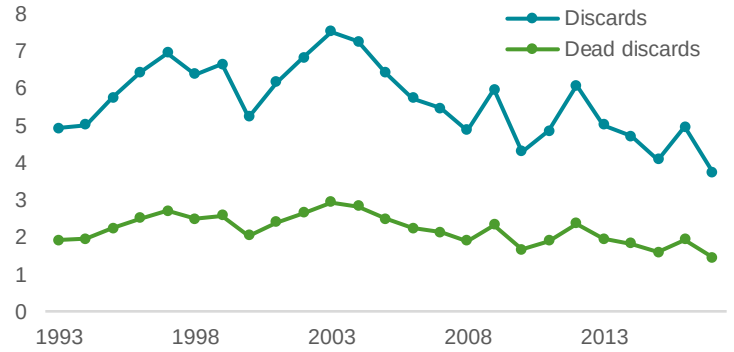


Review Workshop Base Model

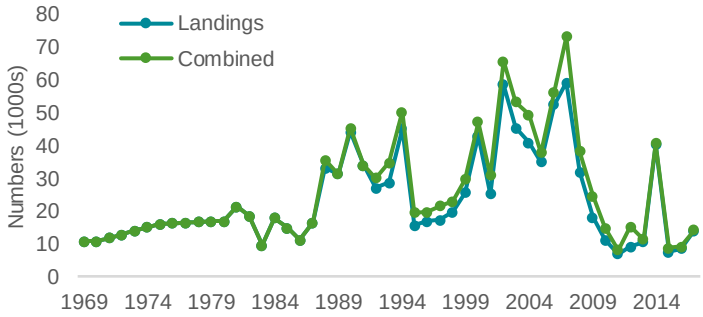
- Removed discards from model
- Added dead discards to landings
  - Applied discard mortality rate to discards (26% REC and 39% COM)

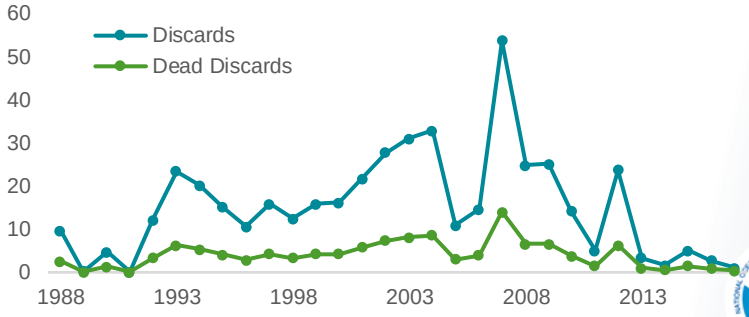
Commercial





Recreational





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Model Fits

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Landings

Review Workshop

Assessment Webinar

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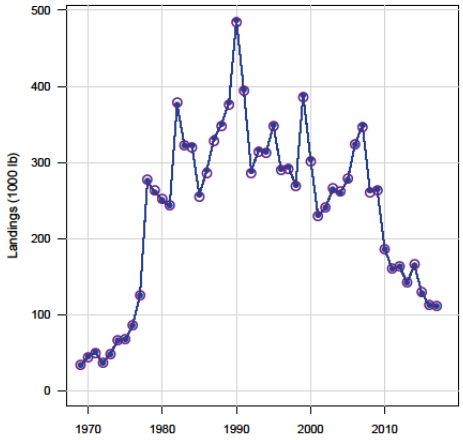

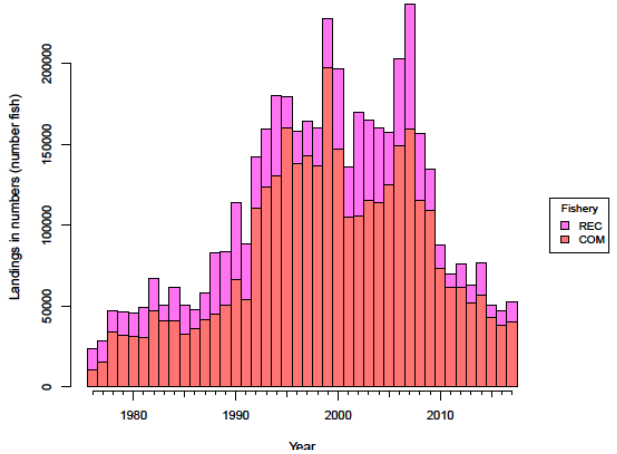

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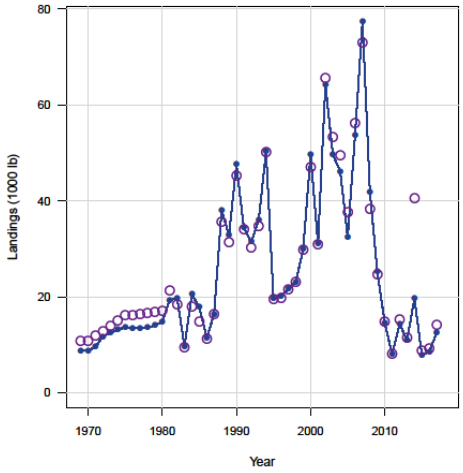

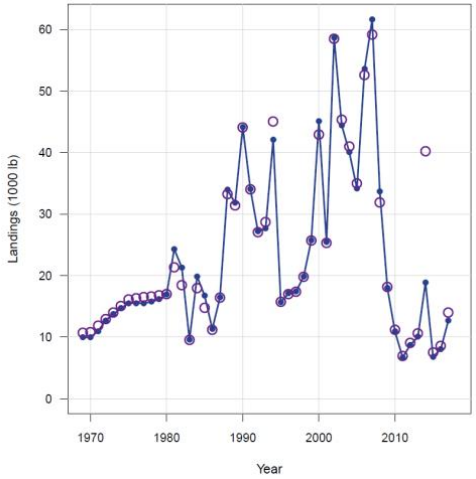

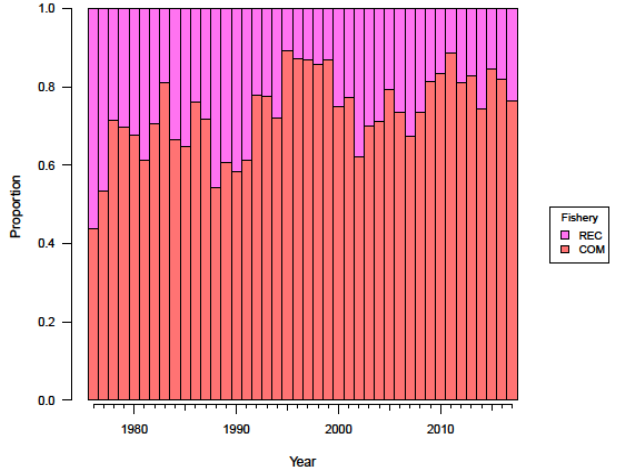

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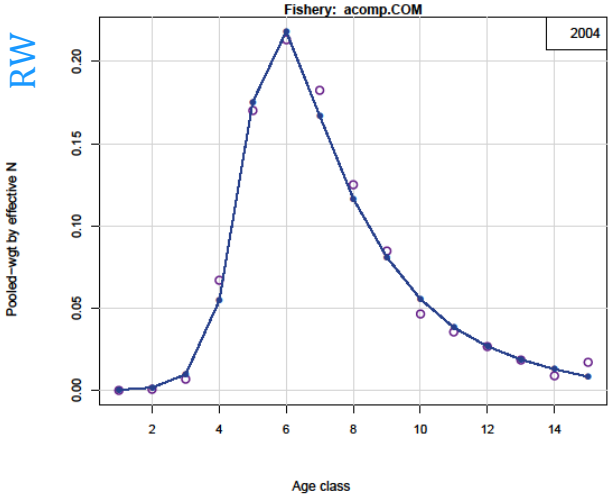
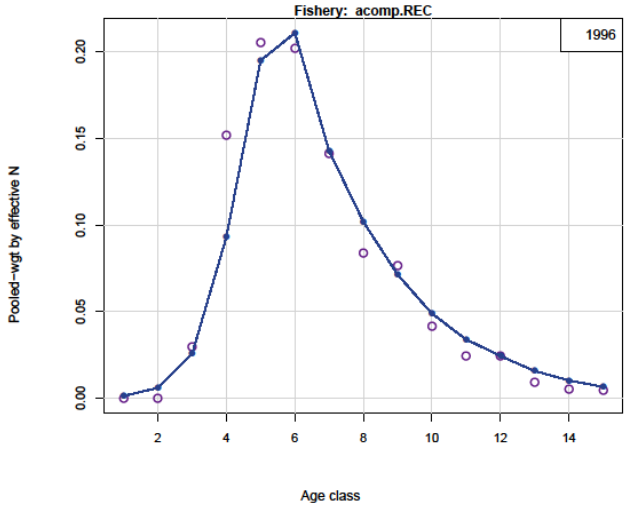
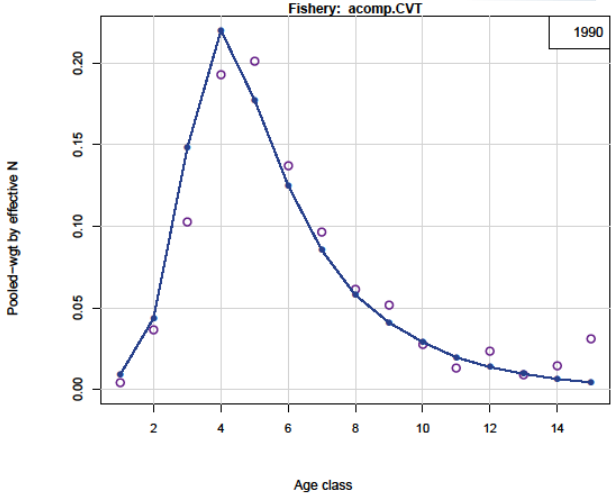
Age Comps

RW





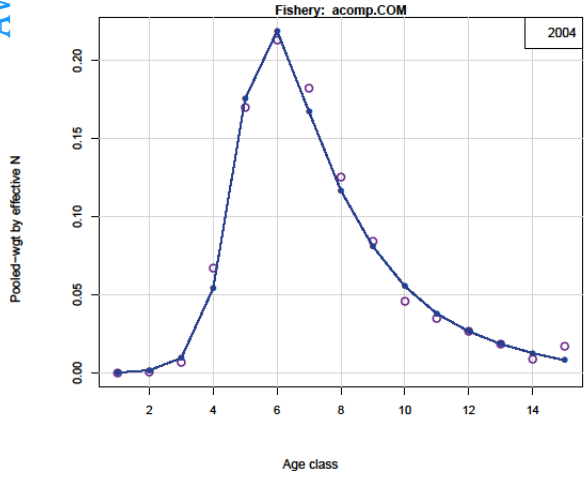


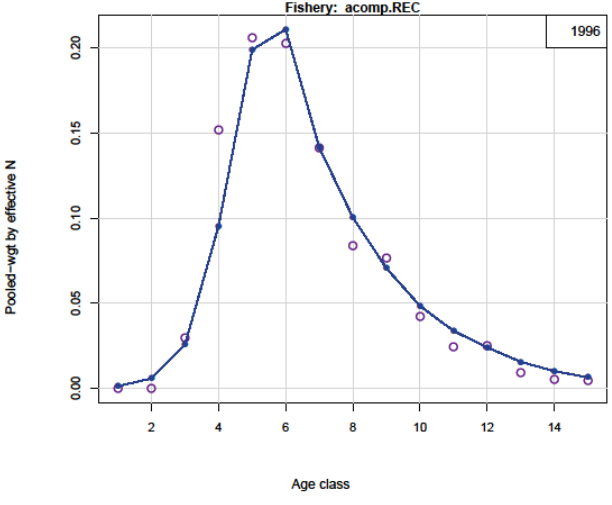
Commercial

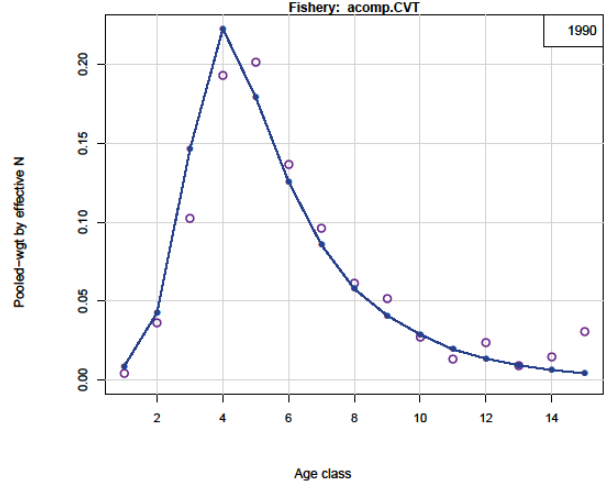
Recreational

Chevron Trap

AW

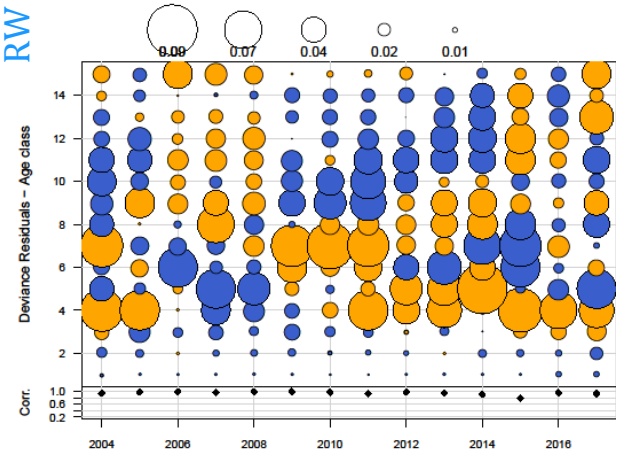


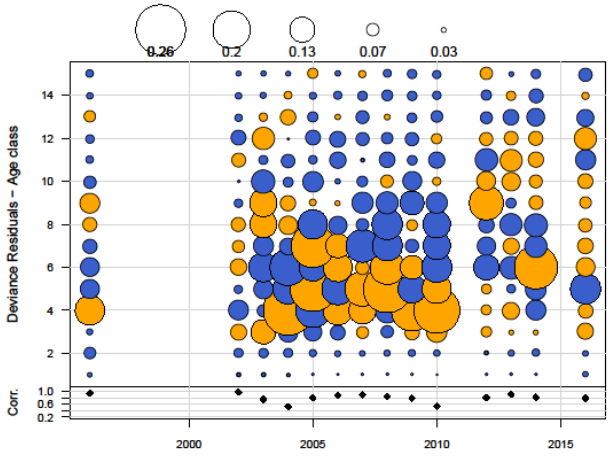


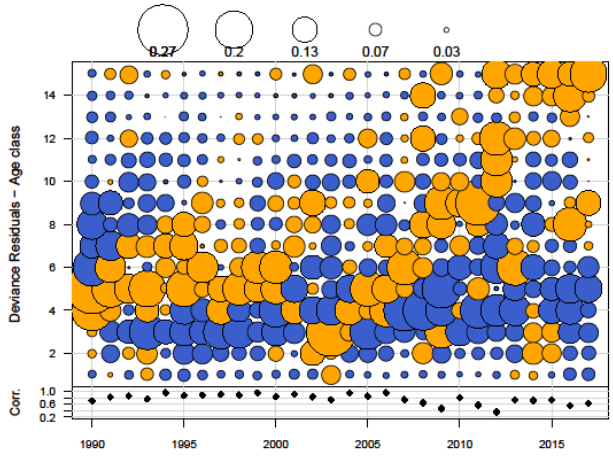


Age Comps

RW





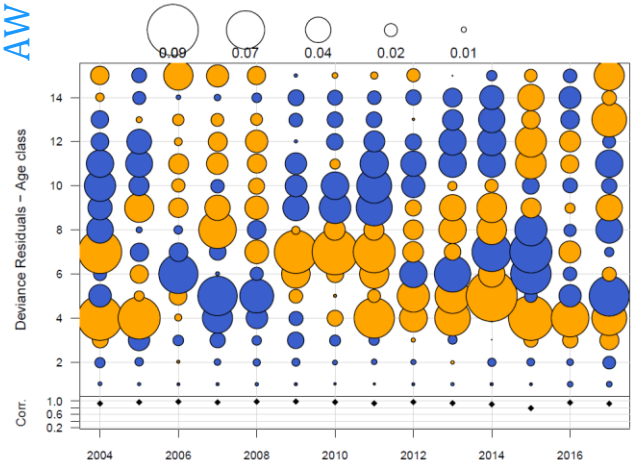


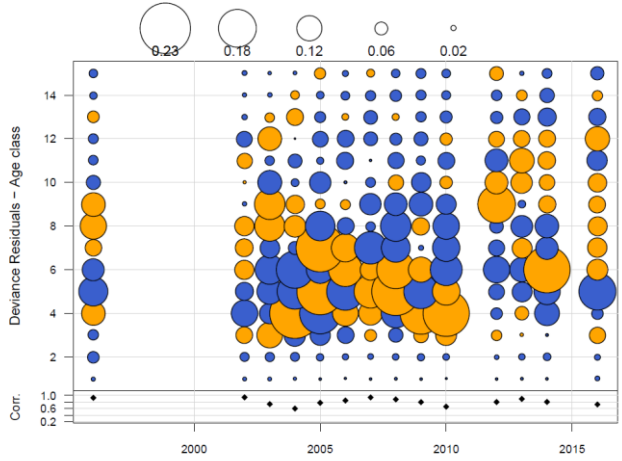
Commercial

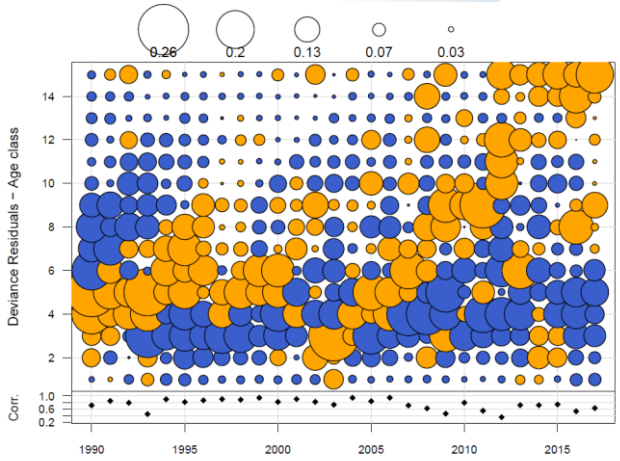
Recreational

Chevron Trap

AW

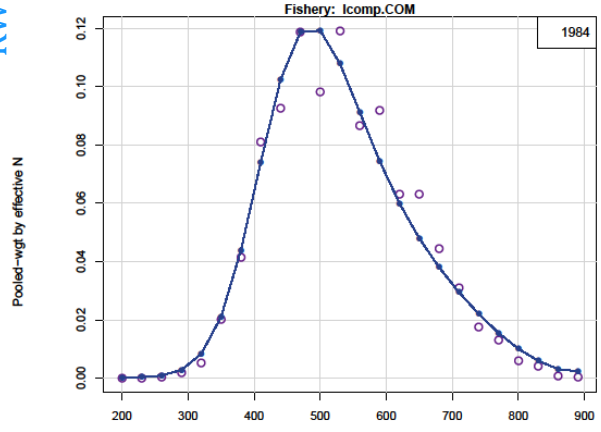


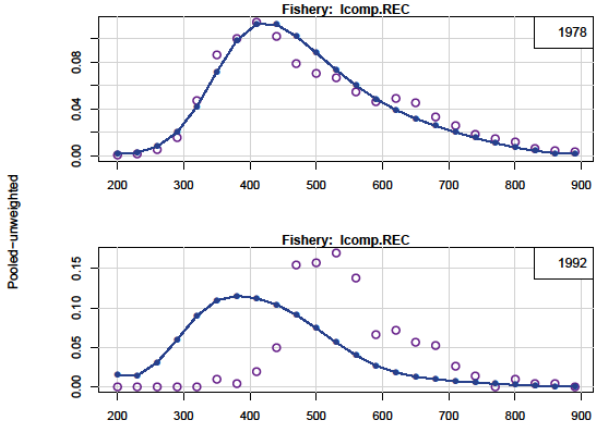


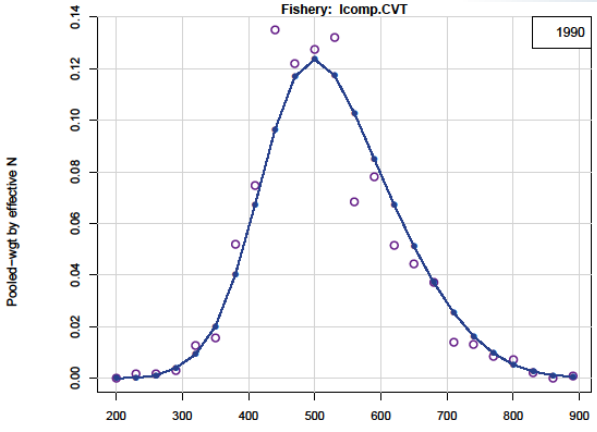


Length Comps

RW





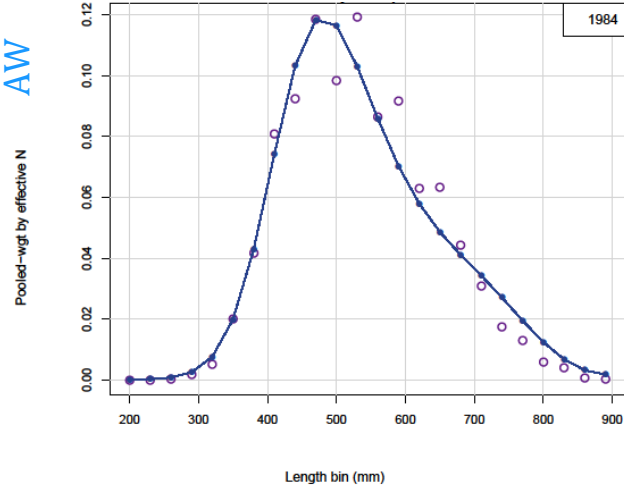


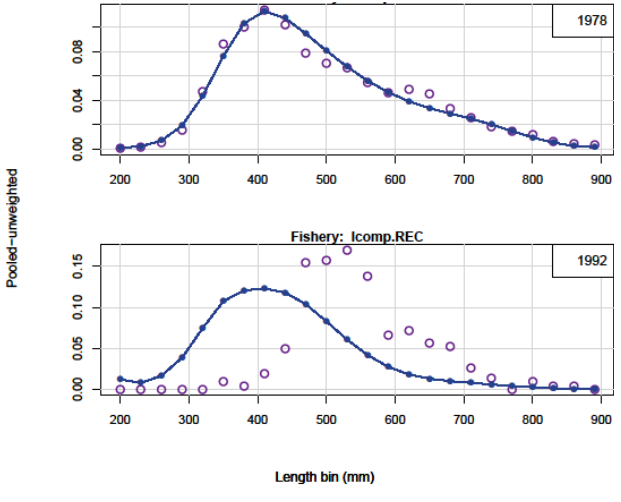
Commercial

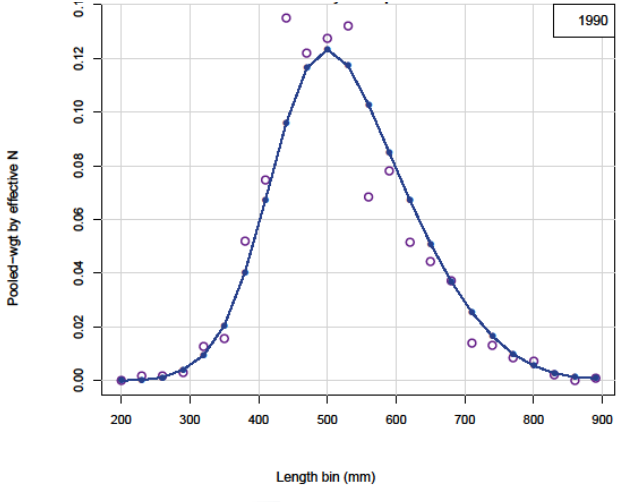
Recreational

Chevron Trap

AW

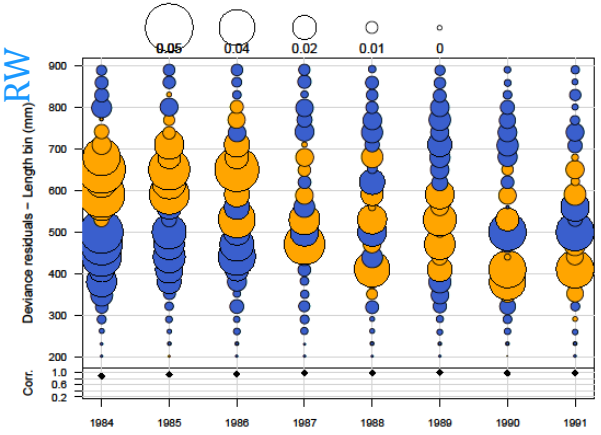


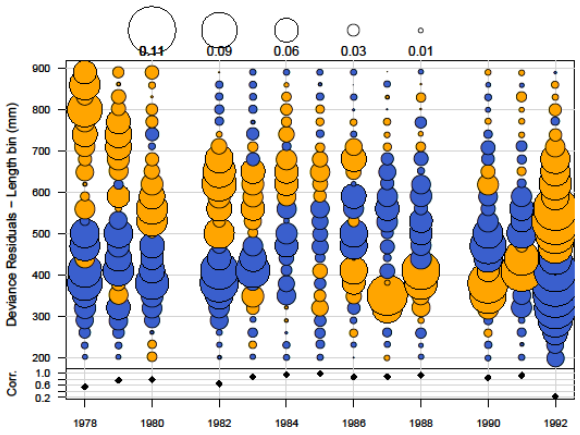


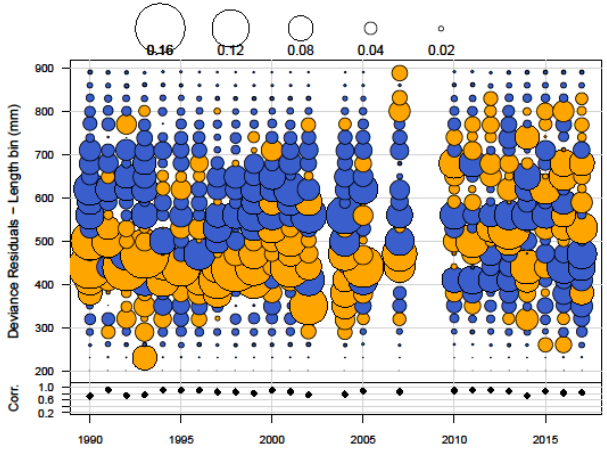


Length Comps

RW

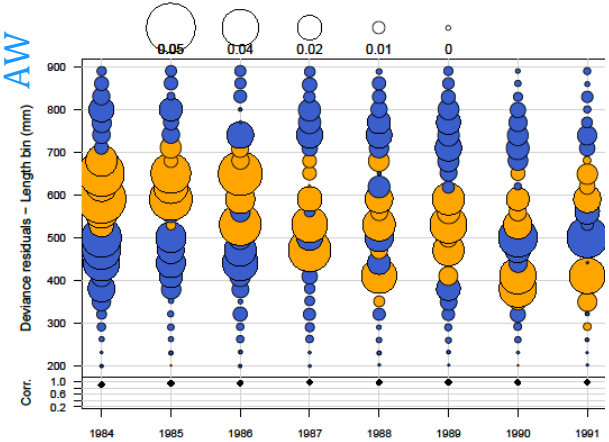




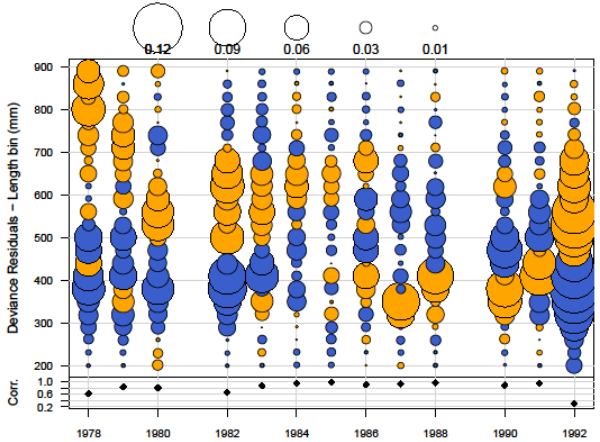


AW

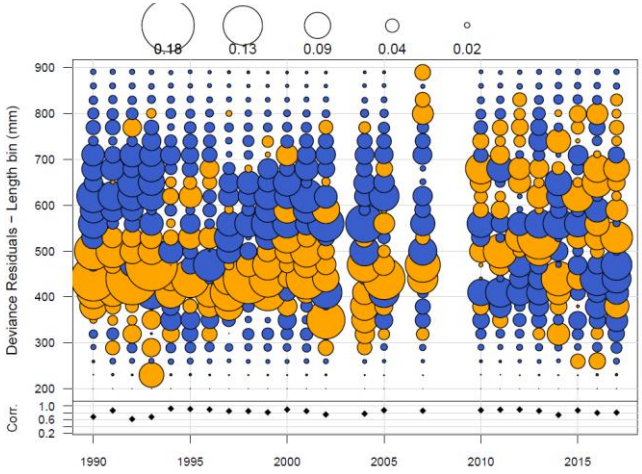
Commercial



Recreational



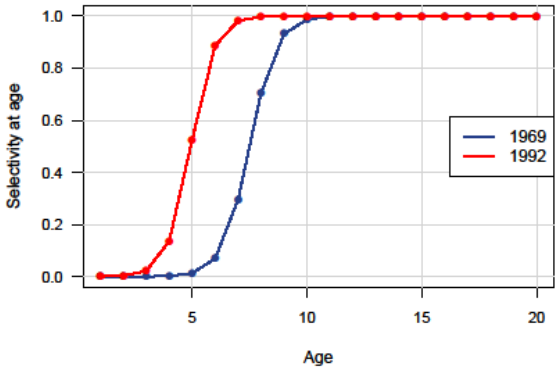
Chevron Trap



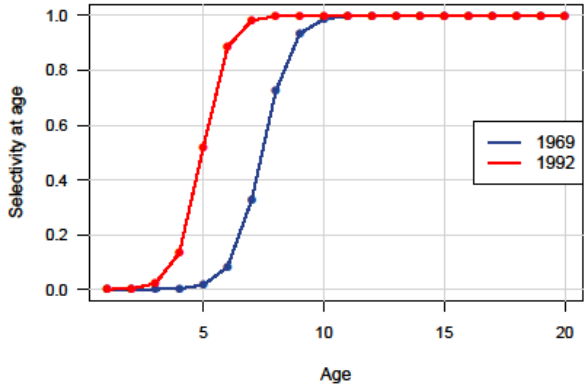
Selectivity

COM

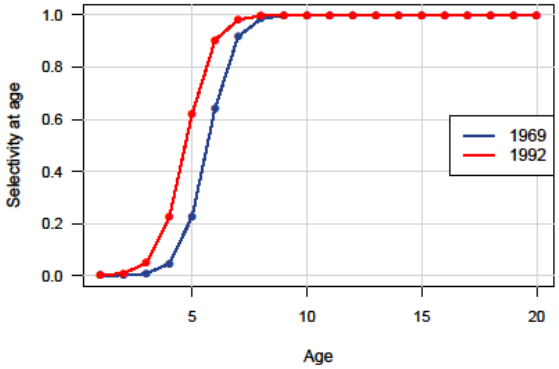
Review Workshop

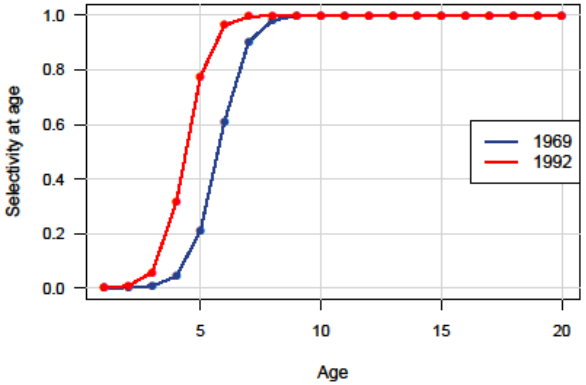


Assessment Webinar



REC

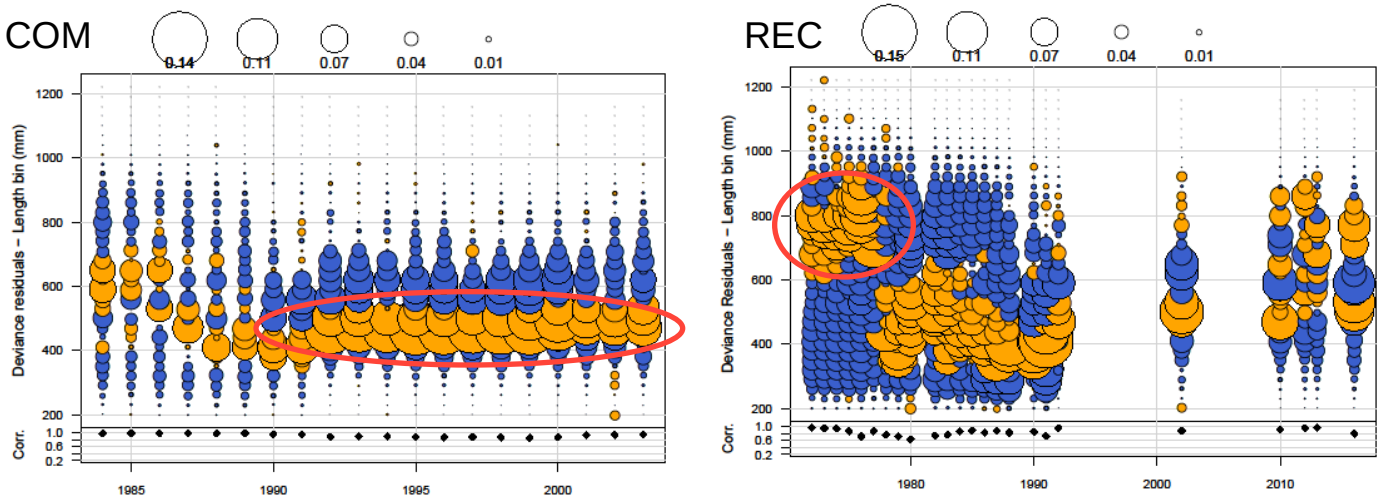




Parameters	RW	AW
selpar_A50_COM1	7.499	7.513
selpar_slope_COM1	1.733	1.733
selpar_A50_COM3	4.947	4.954
selpar_slope_COM3	1.948	1.951
selpar_A50_REC1	5.676	5.690
selpar_slope_REC1	1.815	1.805
selpar_A50_REC3	4.717	4.677
selpar_slope_REC3	1.744	1.784

Selectivity Assessment Webinar

- Mismatch between length and age comps
- Poor initial fits to early length comps
- Pulled all length comps where age comps available



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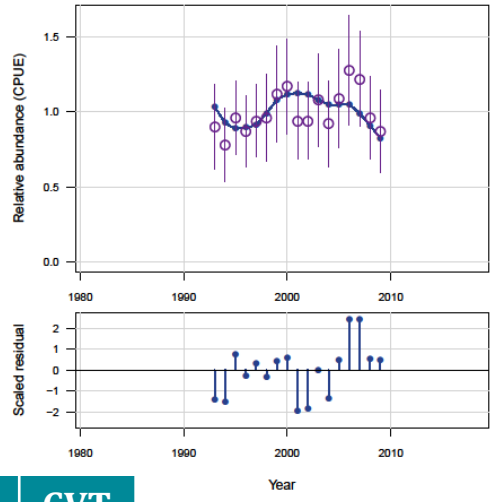
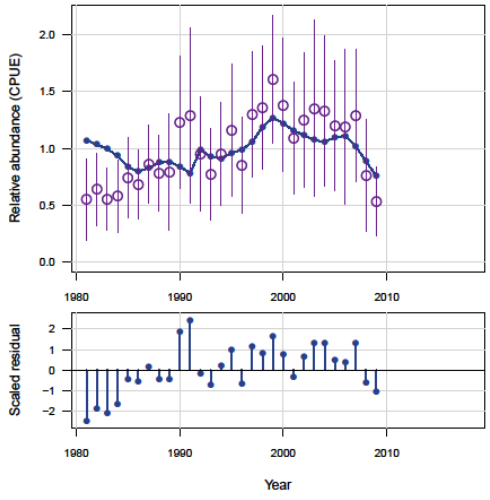
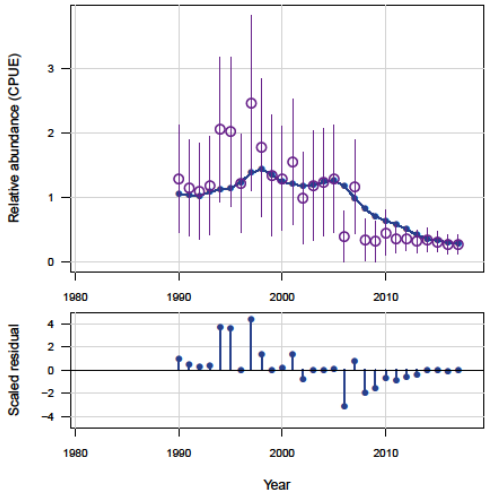
Indices

RW



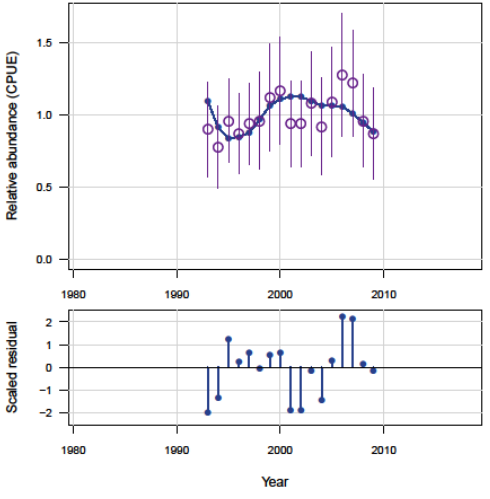


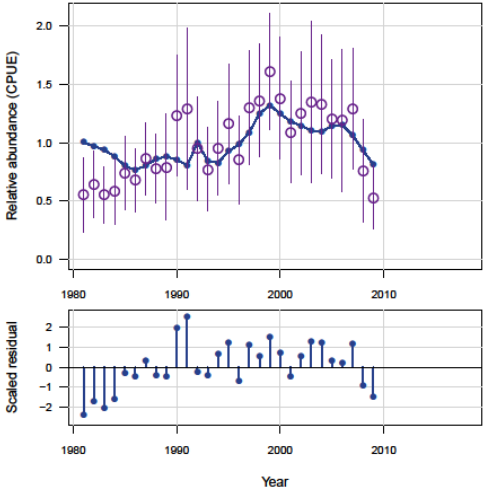


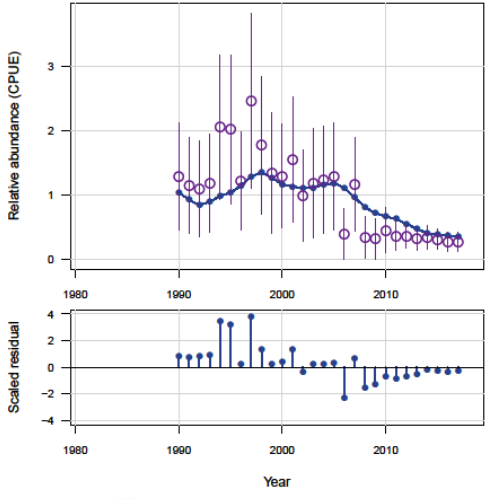
SDNR	COM	REC	CVT
Start	0.7	1.3	1.3
Final	0.9	1.1	1.1
Weight	**1.4**	**0.8**	**0.8**

Commercial **Recreational** **CVT/VID**

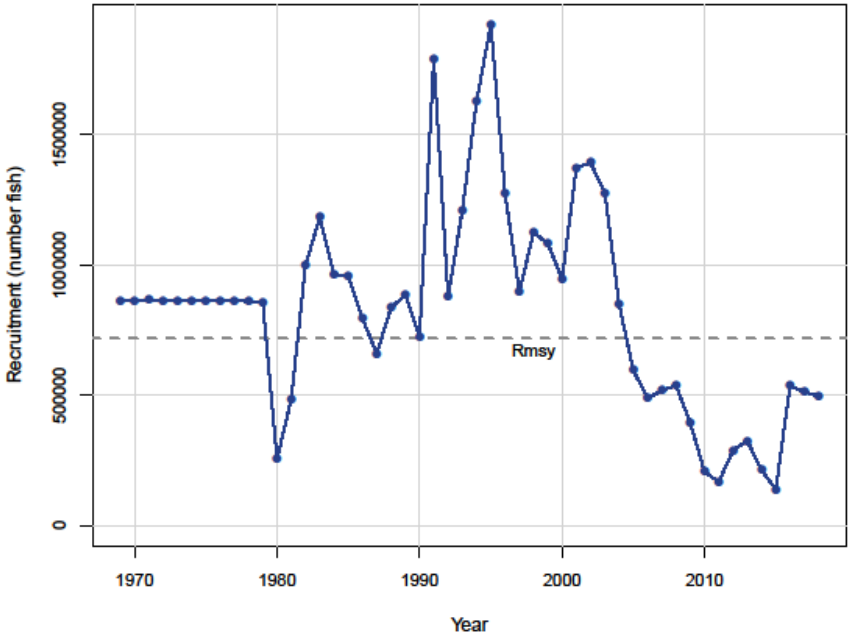
AW

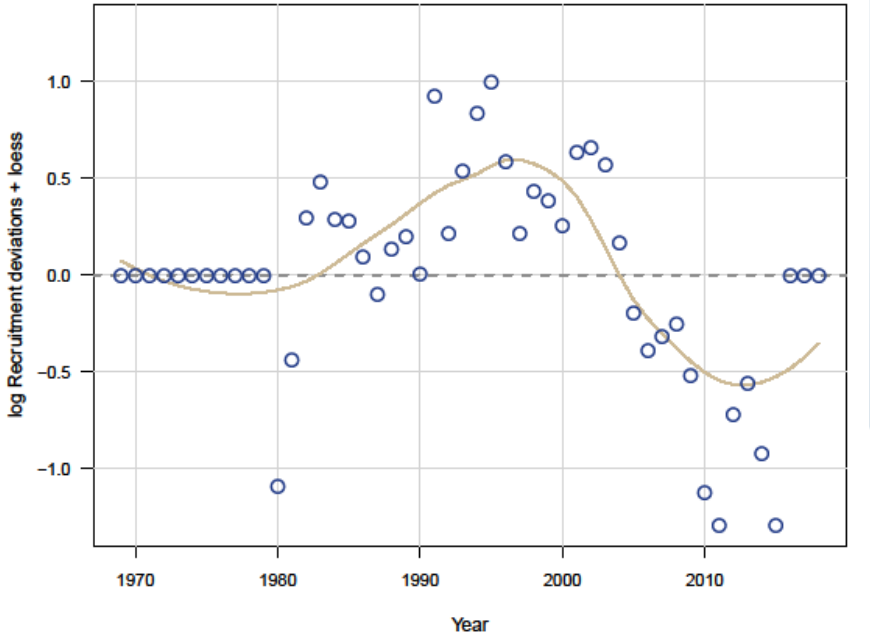






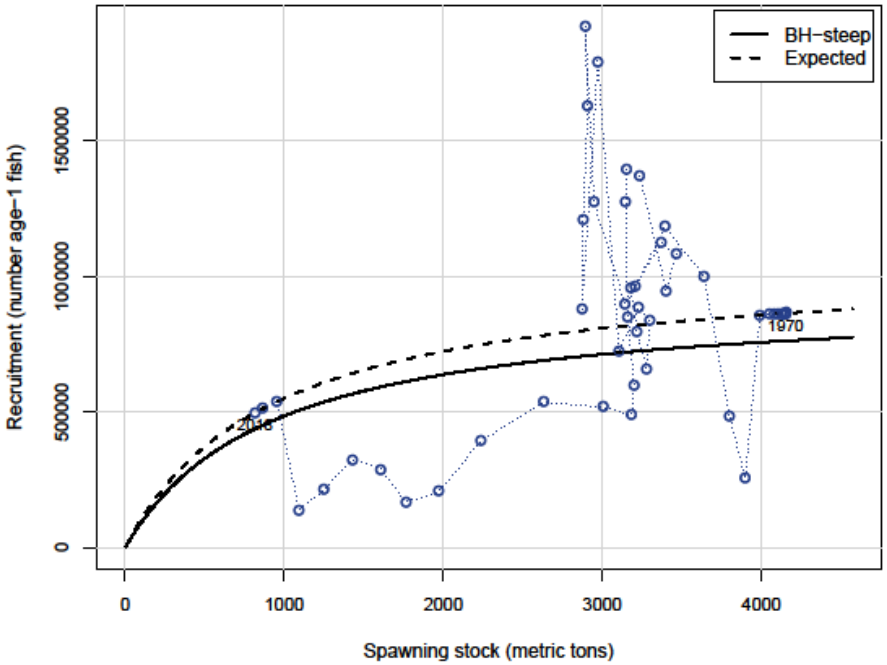
Recruitment

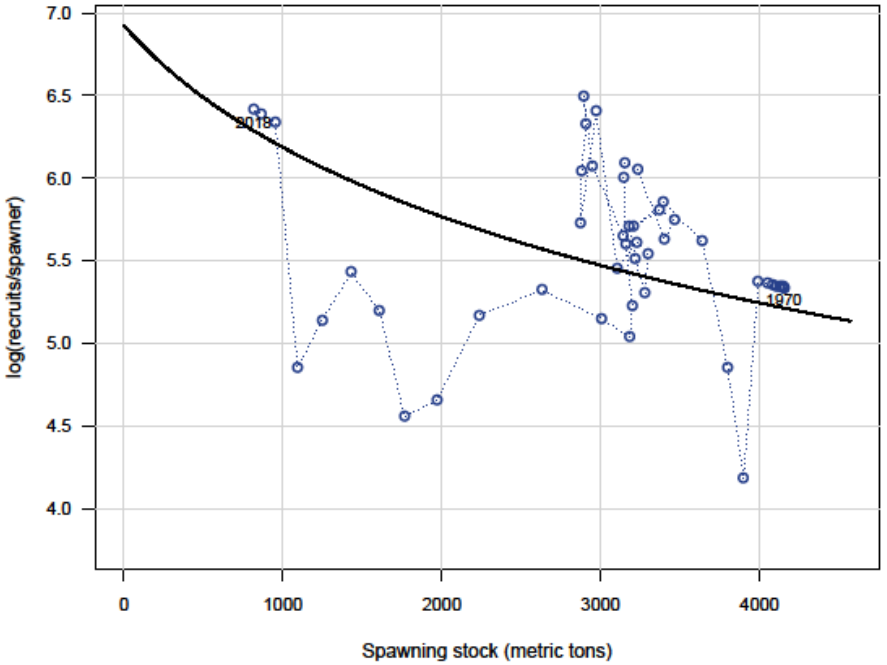




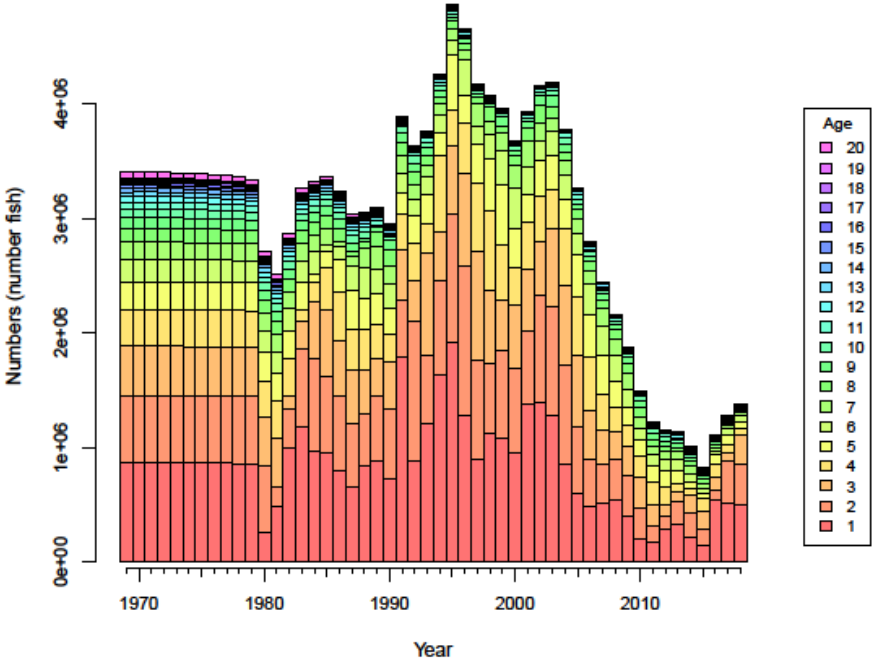
- 1980-2015 estimated

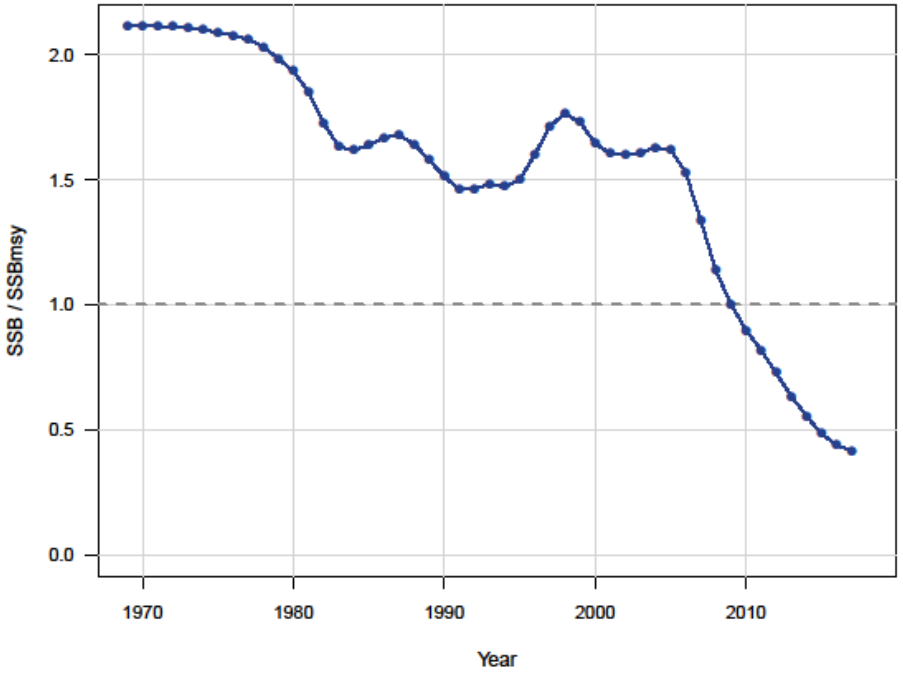
Recruitment



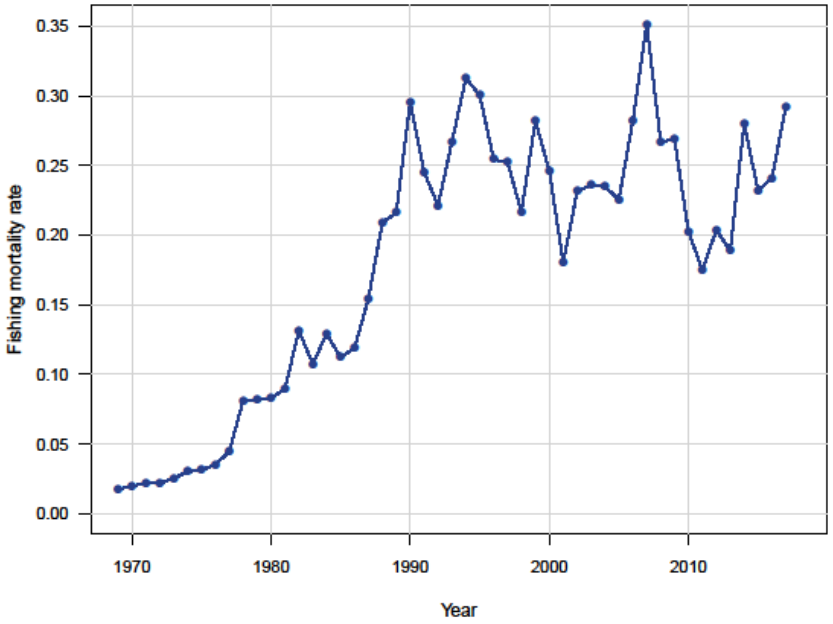


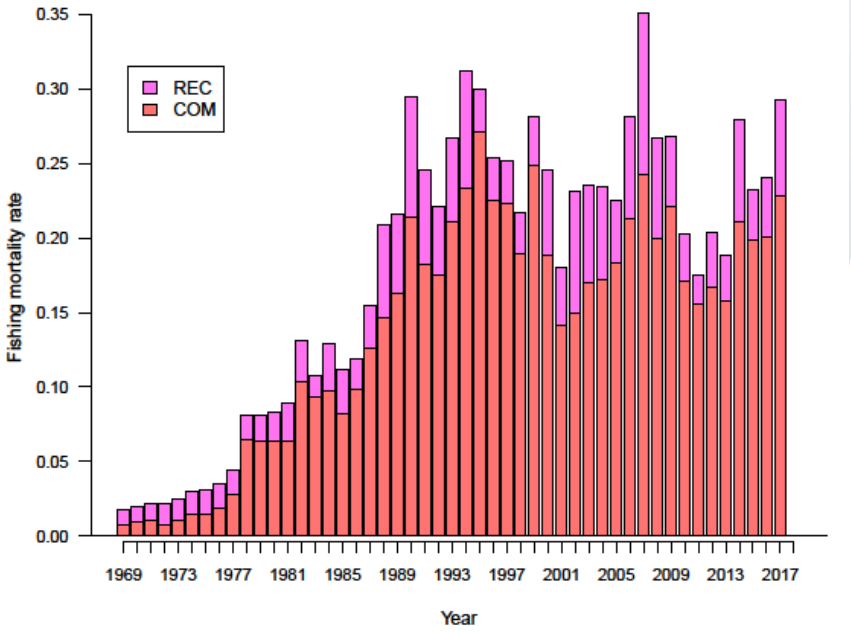
Numbers at age & SSB





Fishing Mortality

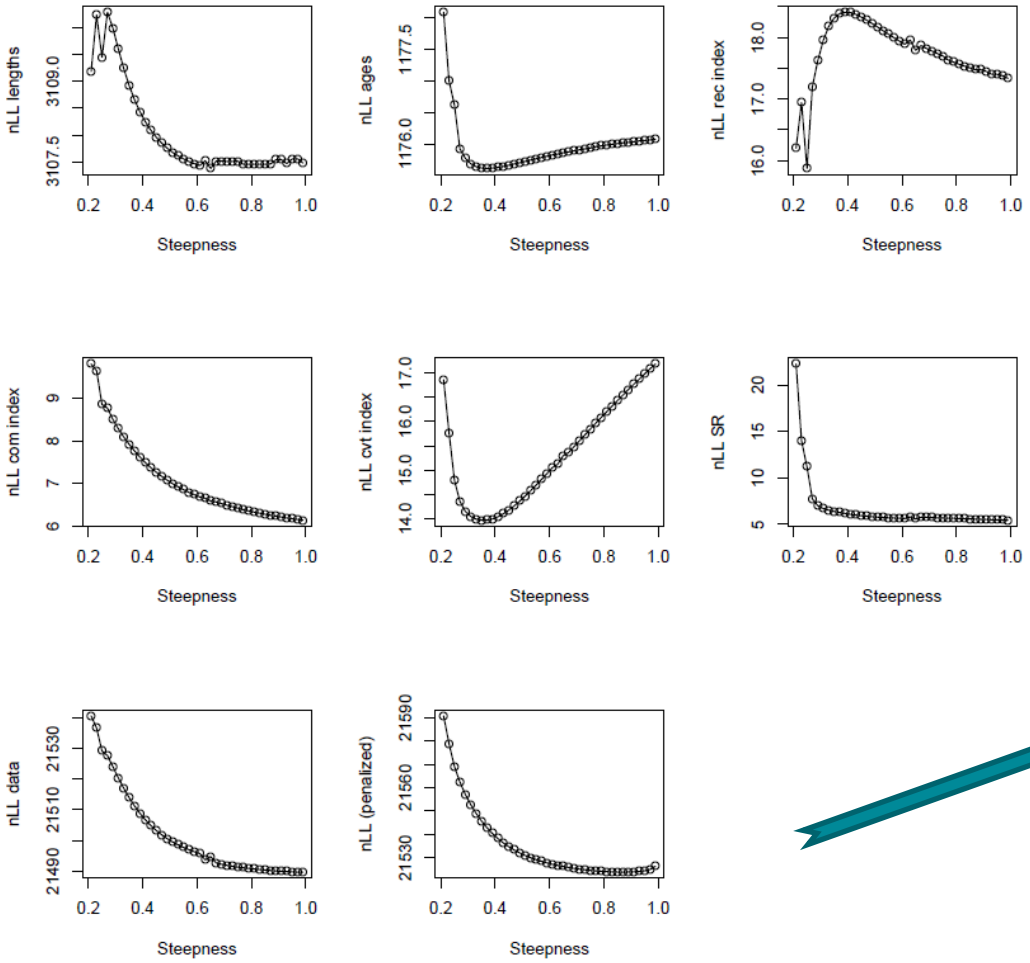




Steepness*

*from Assessment Webinar

Steepness Likelihood Profile



mu	var	prior	steepness
0.72	0.03	beta	0.86

- Likelihood profile with beta prior influence

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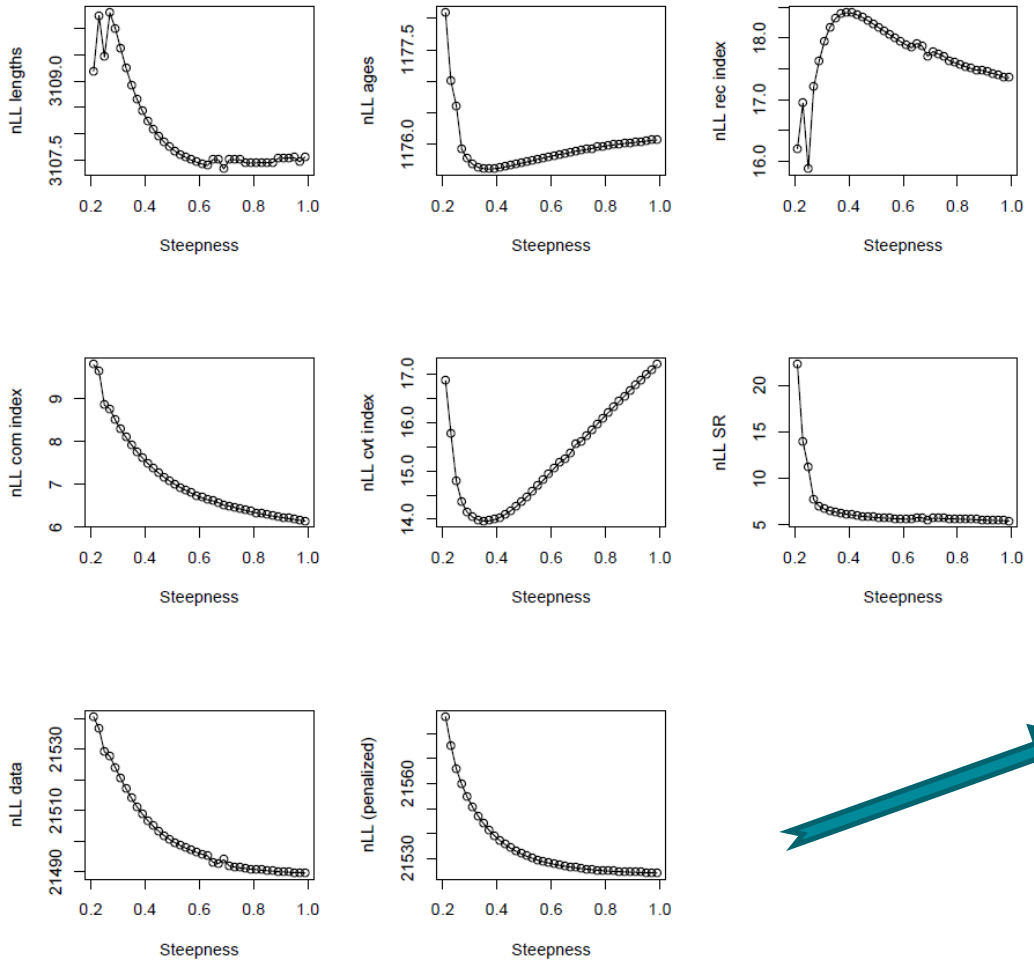
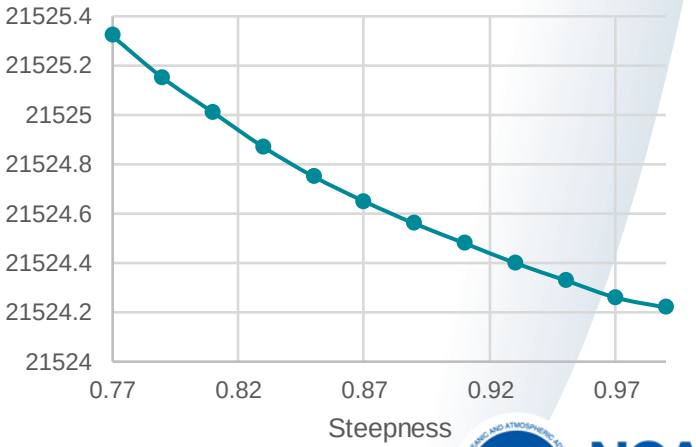
Steepness Likelihood Profile



mu	var	prior	steepness
0.72	0.03	none	0.99 (bound)

- Estimating N at age deviations
- Likelihood profile with no prior influence



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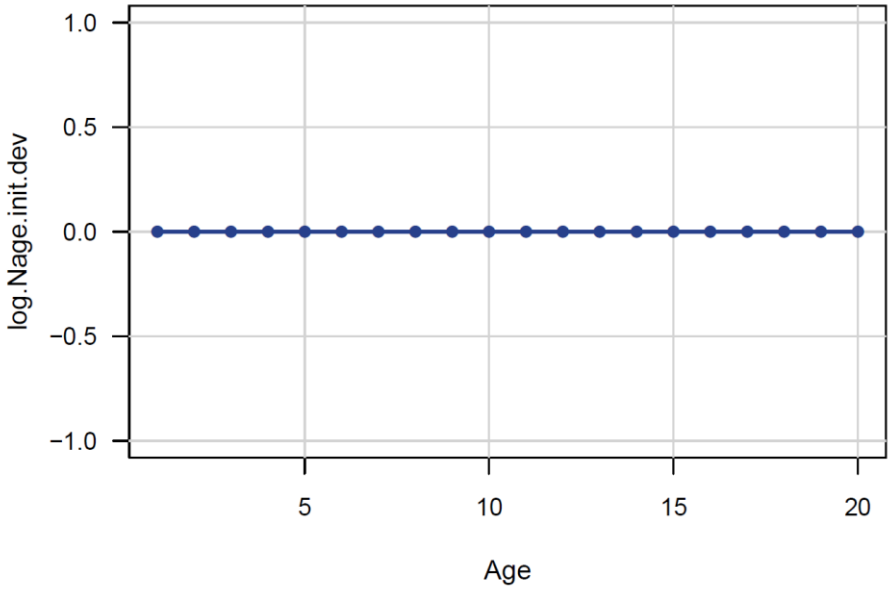
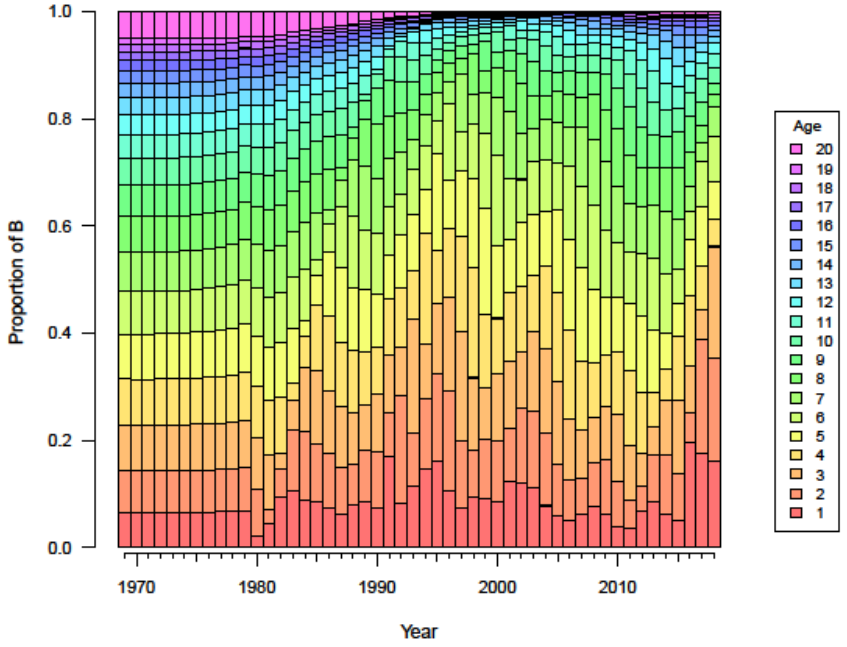
Steepness





- Model begins with equilibrium N at age
  - Conditioned on M and F init

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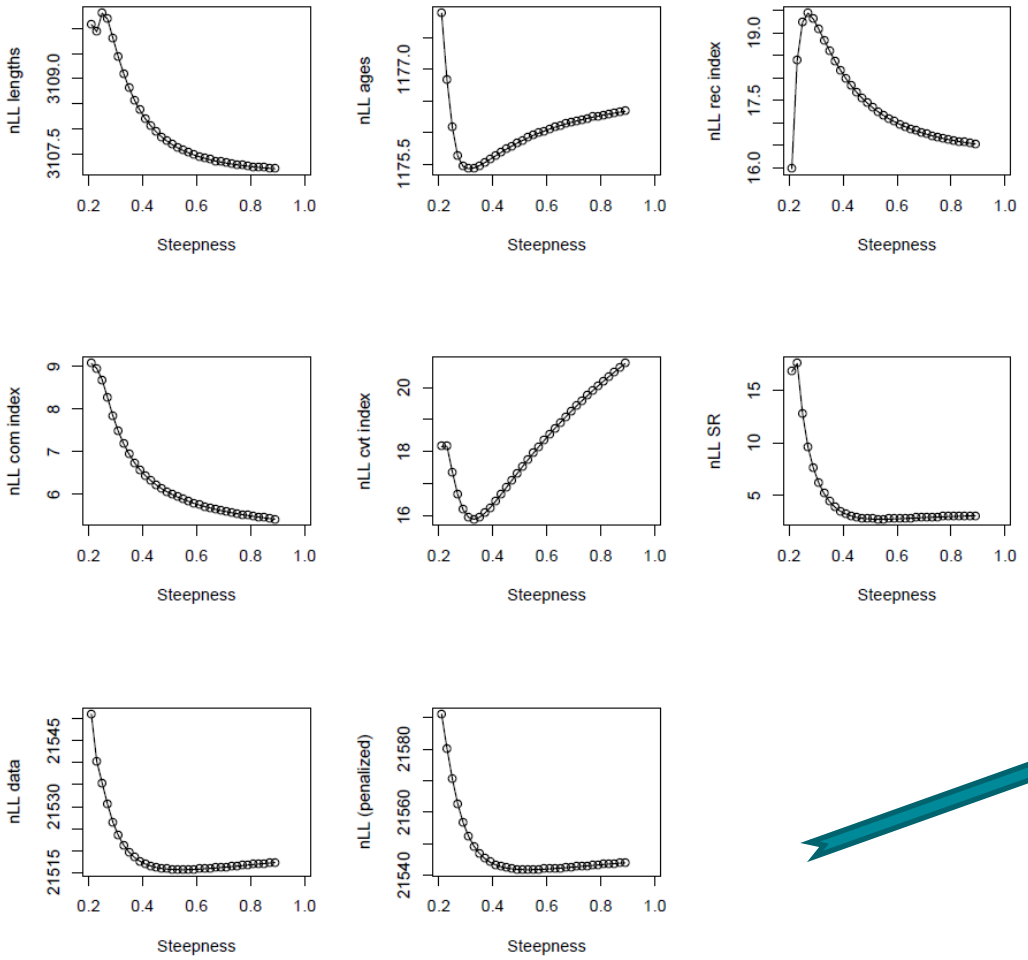
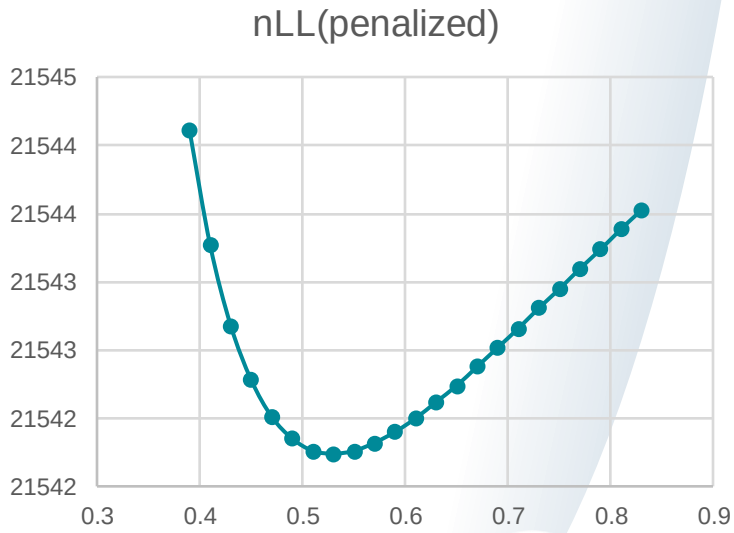
Steepness Likelihood Profile



name	value	std.dev
steep	0.57	0.11

- Likelihood profile with no prior influence
- SDNR on indices applied



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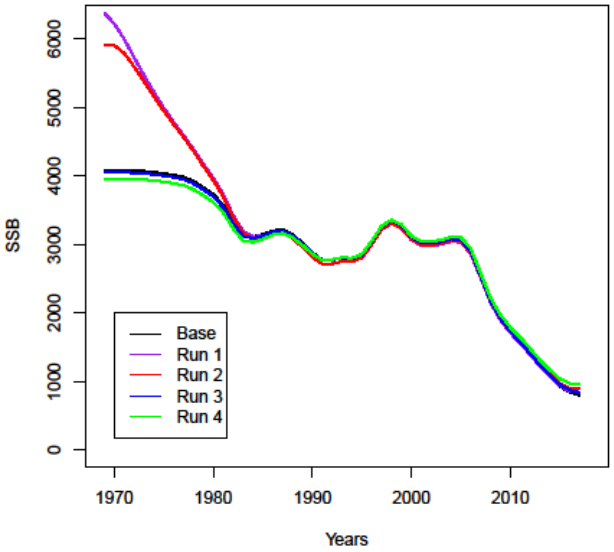
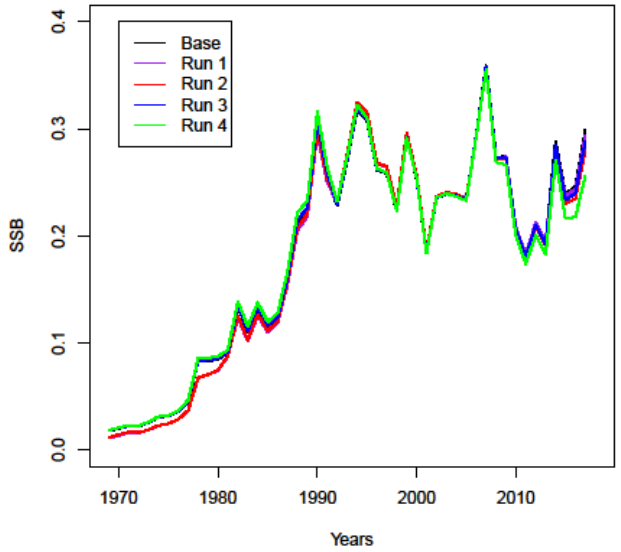
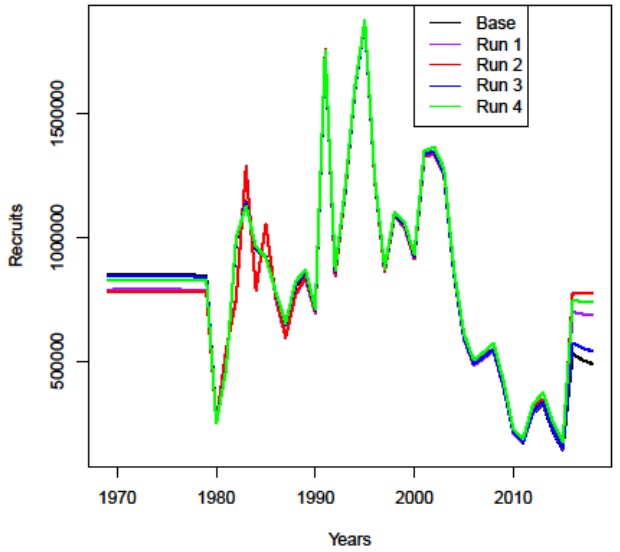
Steepness Sensitivity - AW

	Steepness	N age dev	Prior	Obj. Fun	Gradient
Base	0.57 - est.	Fixed	None	21,542	3.5E-04
Run 1	0.86 - est.	Est.	Beta	21,527	1.9E-04
Run 2	0.99 - est.	Est.	None	21,528	5.2E-04
Run 3	0.62 - est.	Fixed	Beta	21,540	7.4E-05
Run 4	0.86 - fix	Fixed	n/a	21,543	1.7E-04







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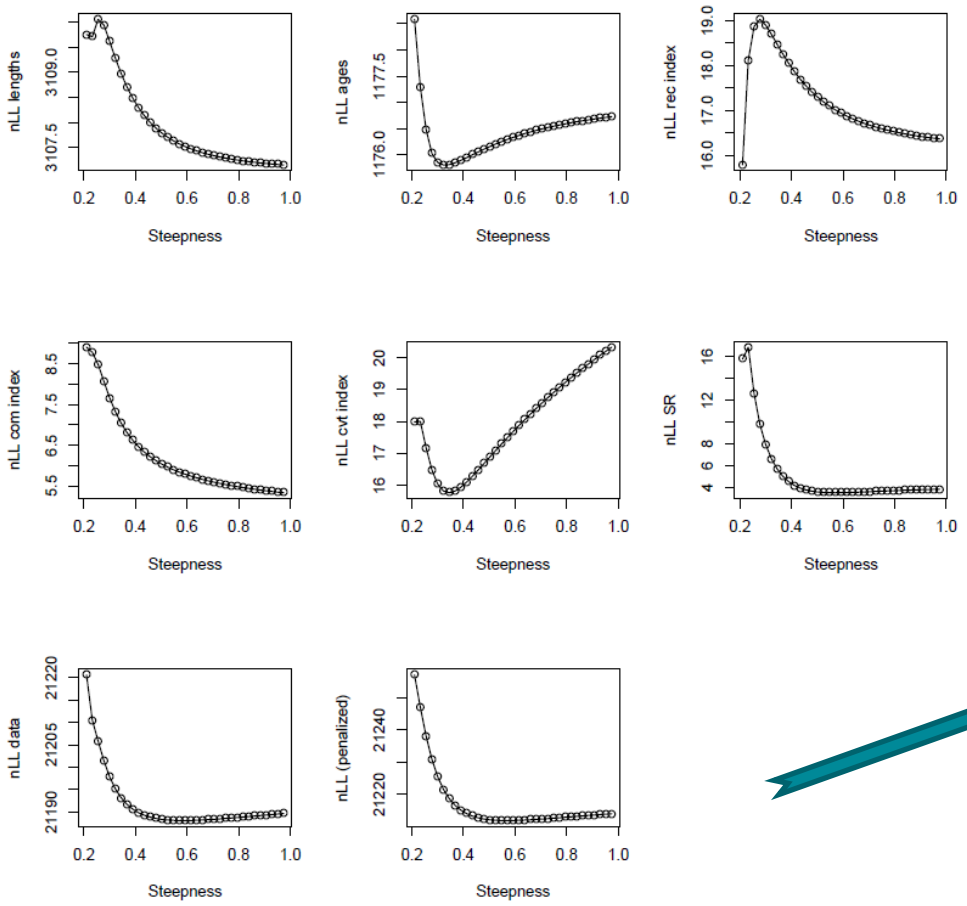
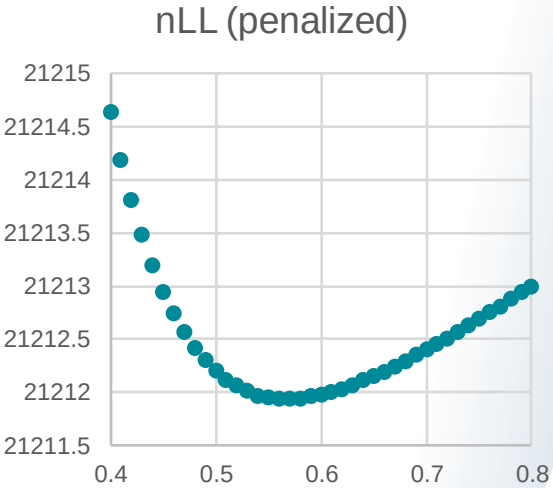
Steepness Likelihood Profile – RW



name	value	std.dev
steep	0.57	0.11



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Likelihood Profiles

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Likelihood profiling

- Steepness (shown previously)
- Sigma R
- R0

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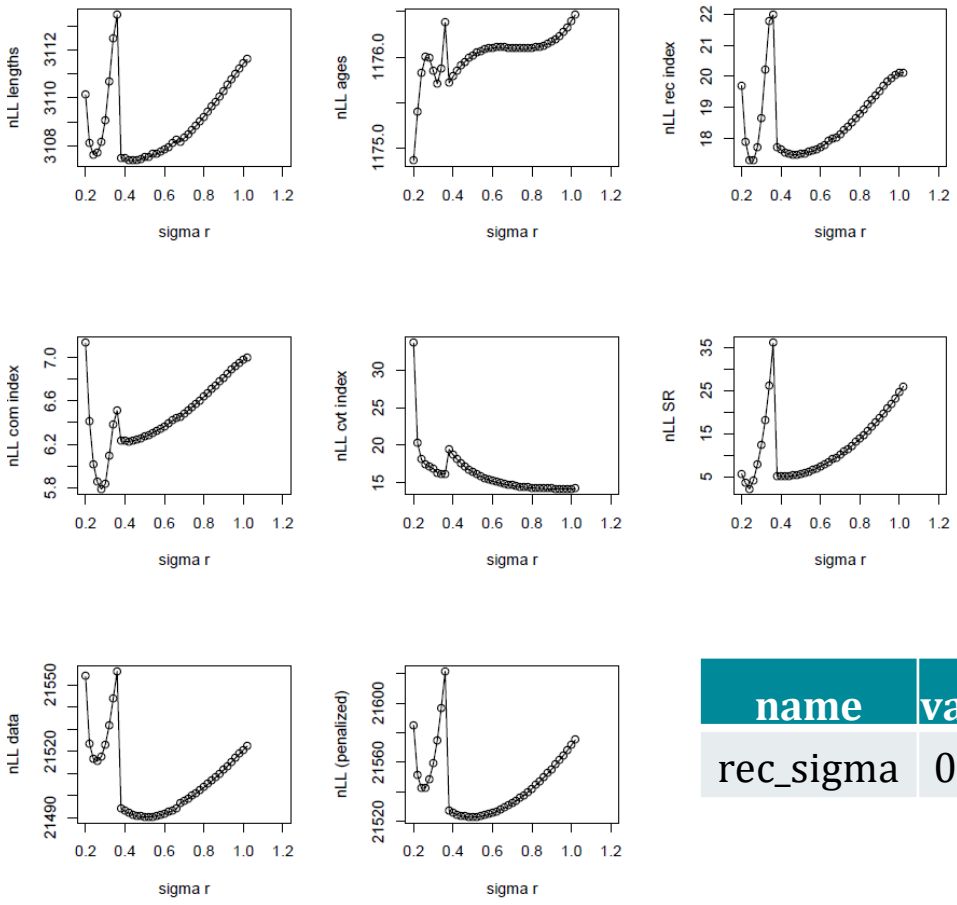
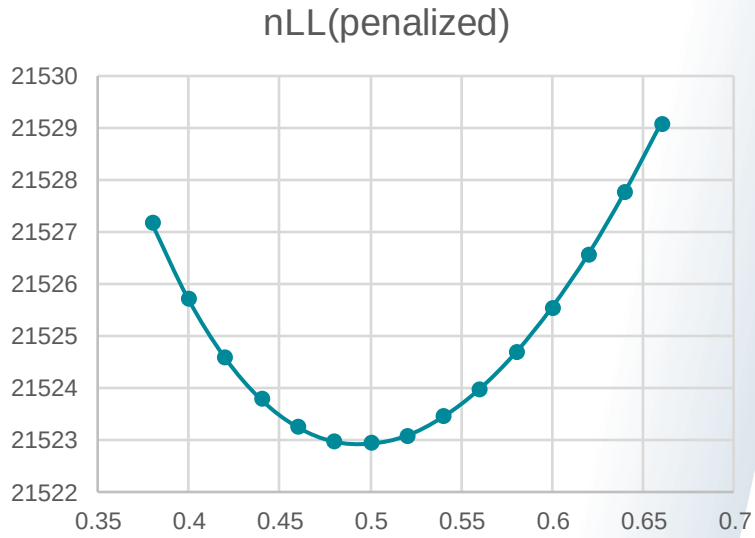
Sigma r Likelihood Profile





name	value	std.dev	prior	mean
rec_sigma	0.50	0.05	normal	0.1

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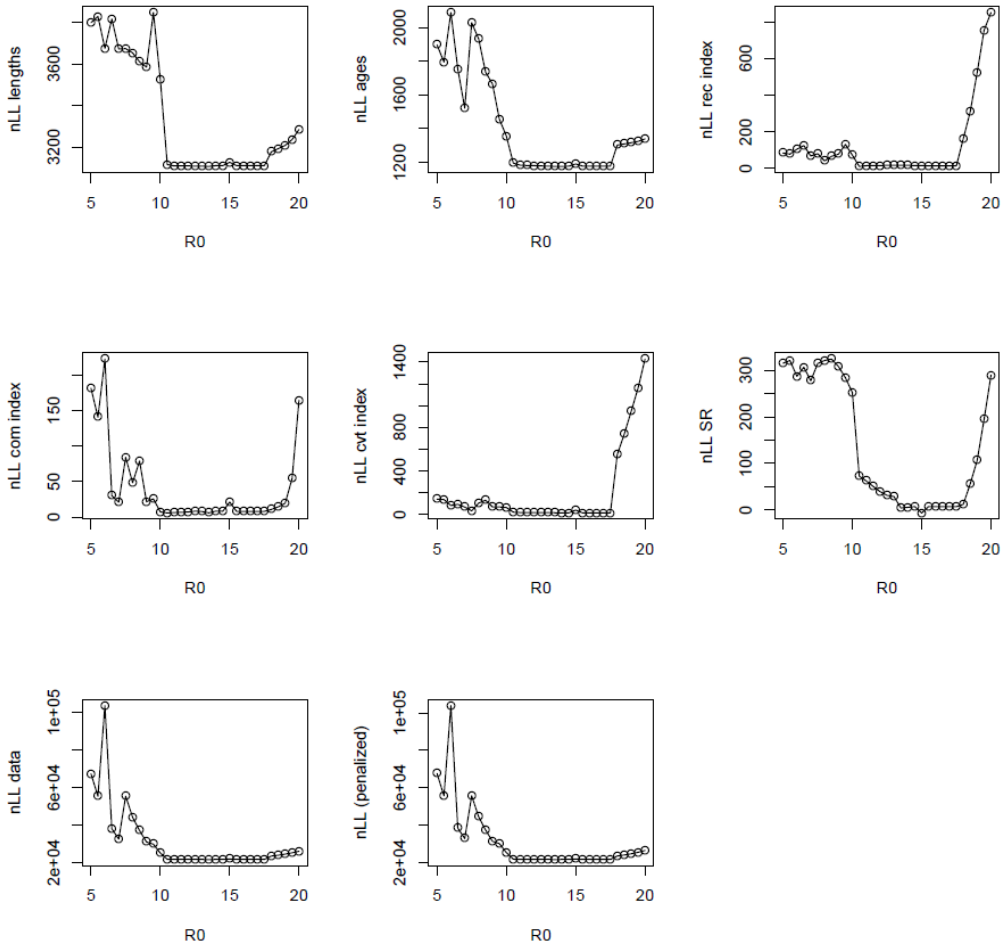
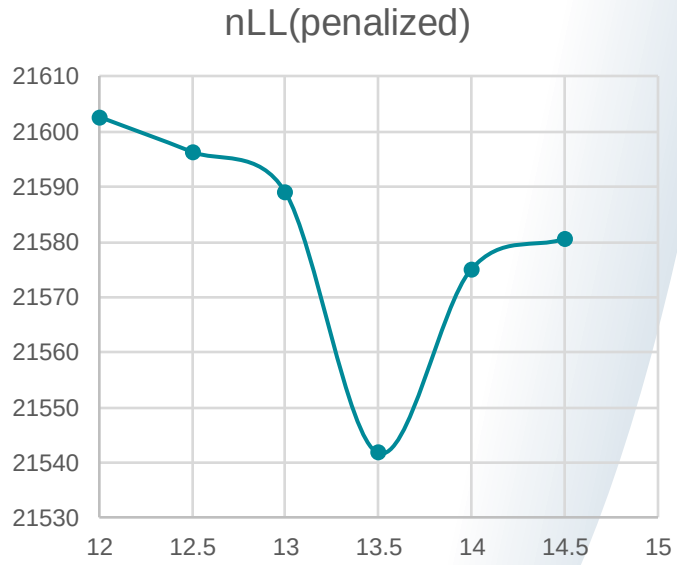
R0 Likelihood Profile



name	value	std.dev	prior	mean
log_R0	13.52	0.04	normal	12.9



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Jitter

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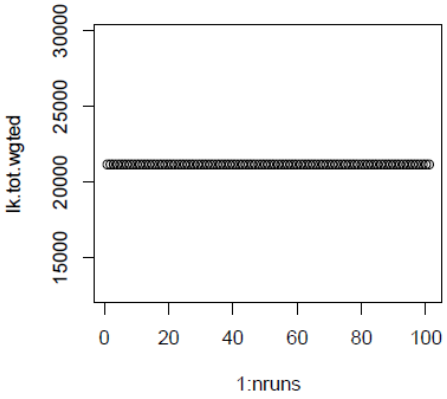
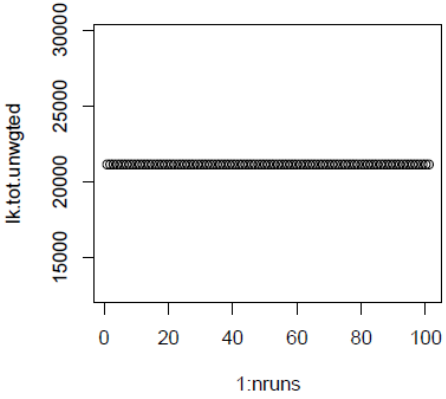
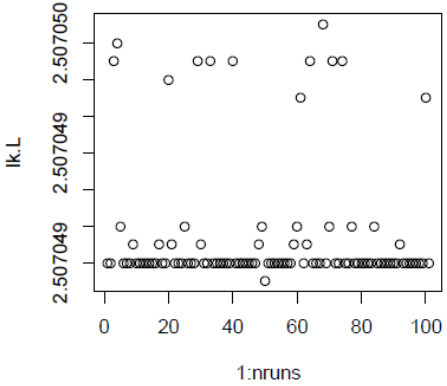
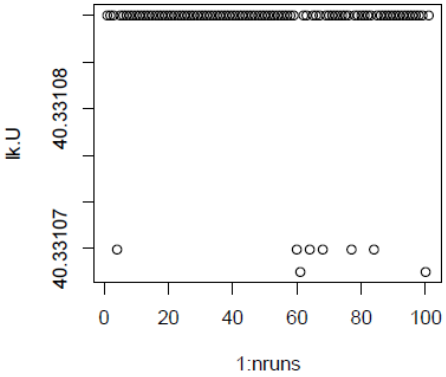
Starting Value Analysis (jitter)

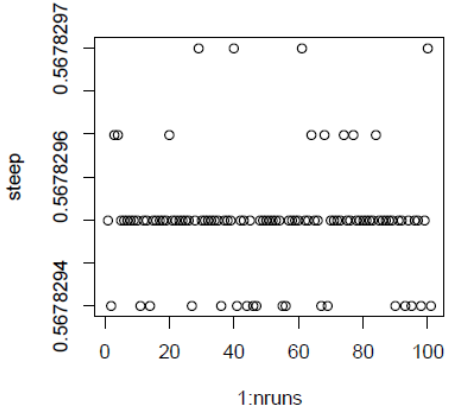




- 100 runs with 10% jitter applied to parameter starting values
- Run 101 base run







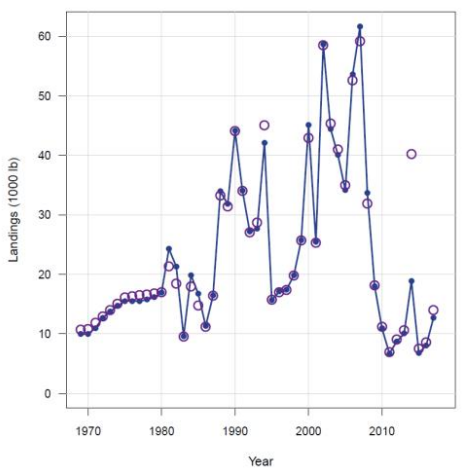
NOAA FISHERIES

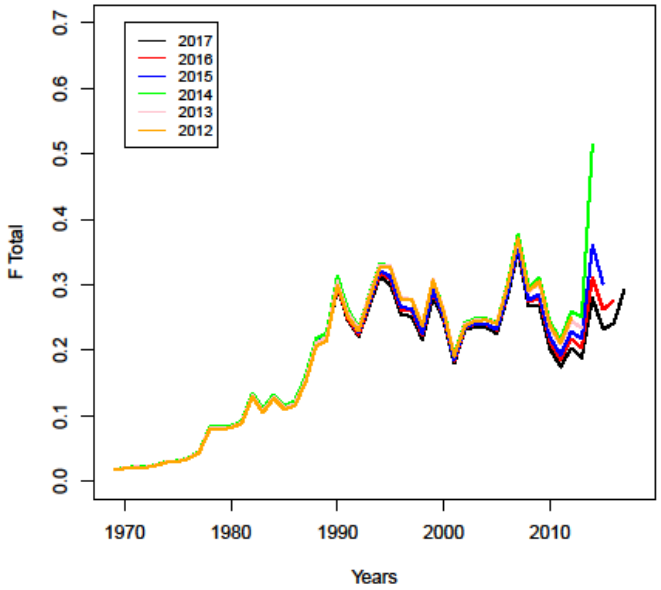
Sensitivity Runs: Review Workshop Base Model

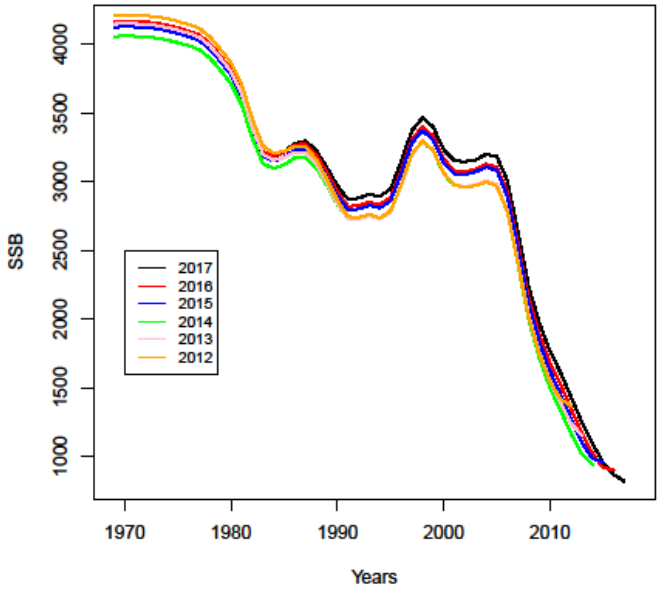
NOAA FISHERIES

Retrospective

Model	Steepness
RW Base - 2017	0.5698
2016	0.619
2015	0.762
2014	0.872
2013	0.846
2012	0.989





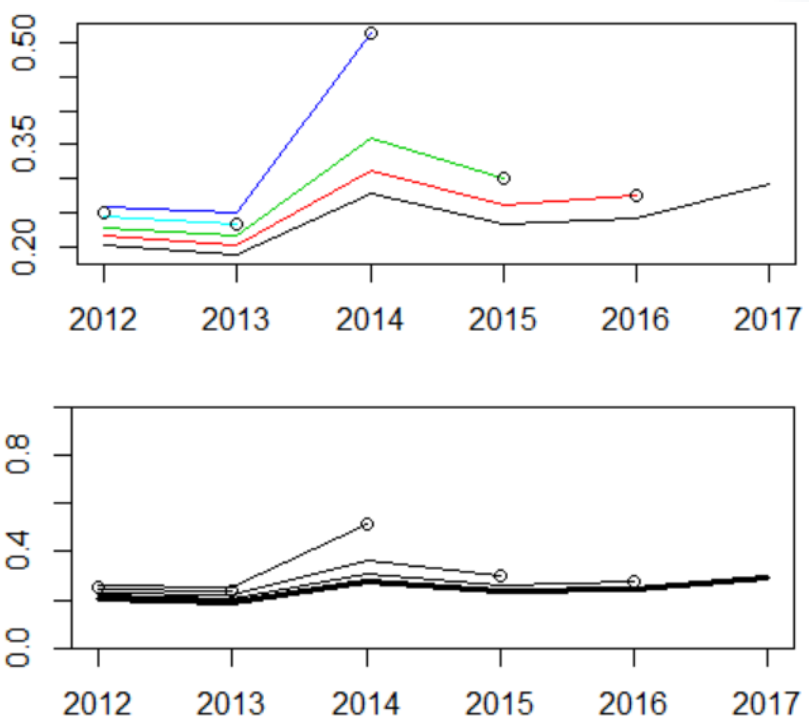


NOAA FISHERIES

Mohn's Rho - F

- 5 peels from 2017
- ρ = 0.351

	base	retro	relbias
2012	0.204	0.249	0.225
2013	0.189	0.234	0.242
2014	0.280	0.515	0.839
2015	0.232	0.302	0.300
2016	0.241	0.276	0.146

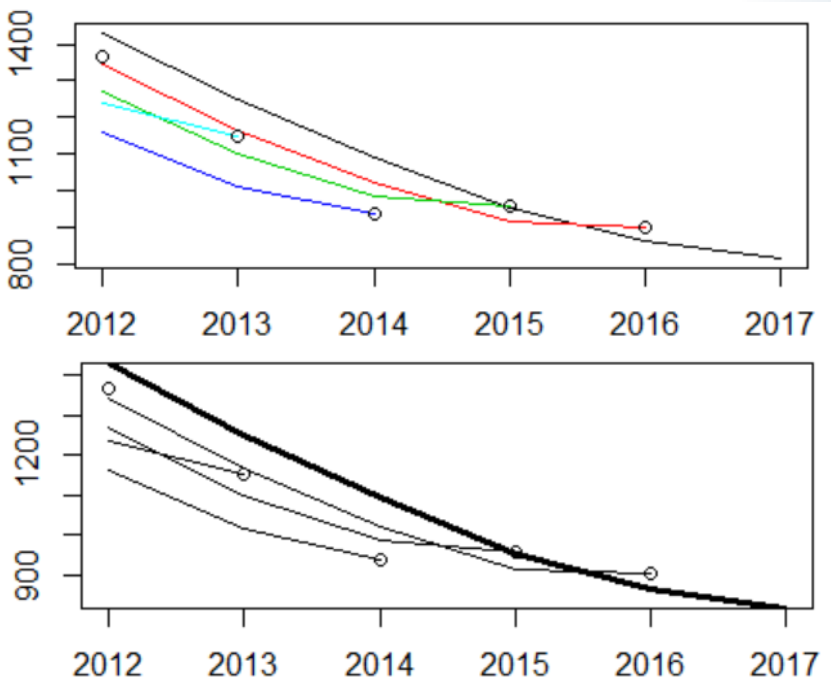


NOAA FISHERIES

Mohn's Rho - SSB

- 5 peels from 2017
- ρ = -0.044

	base	retro	relbias
2012	1,429.99	1,367.41	-0.044
2013	1,248.49	1,151.45	-0.078
2014	1,093.17	937.02	-0.143
2015	953.81	957.42	0.004
2016	865.76	901.04	0.041



NOAA FISHERIES

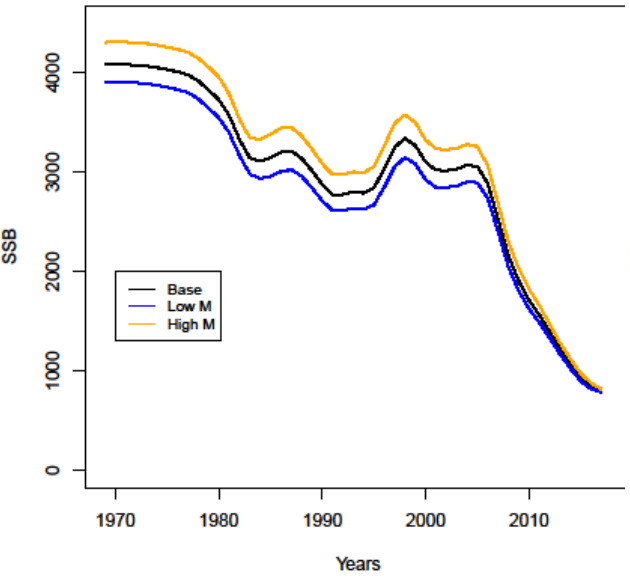
Sensitivity Runs: Assessment Webinar base run

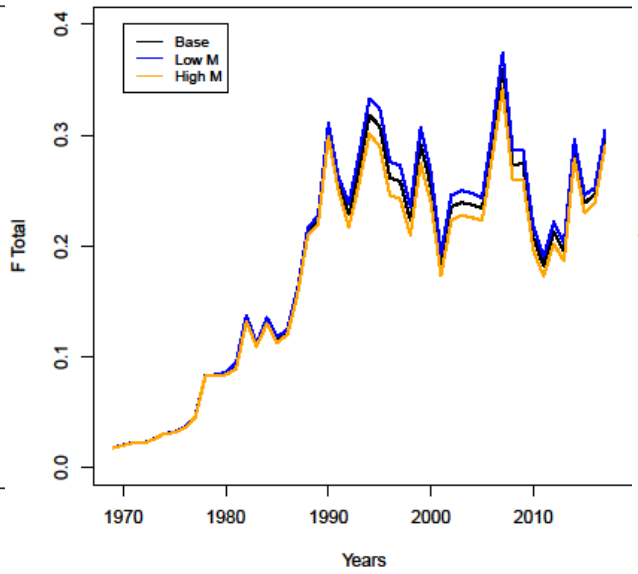
NOAA FISHERIES

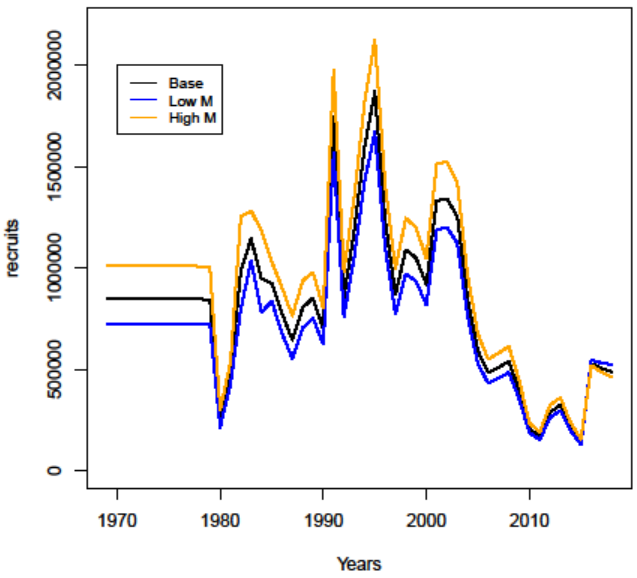
Low/High M

- Base: max age = 34 (0.155)
- Low M: max age =36 (0.147)
- High M: max age = 32 (0.164)

Model	Steepness
Base	0.57
Low M	0.71
High M	0.46

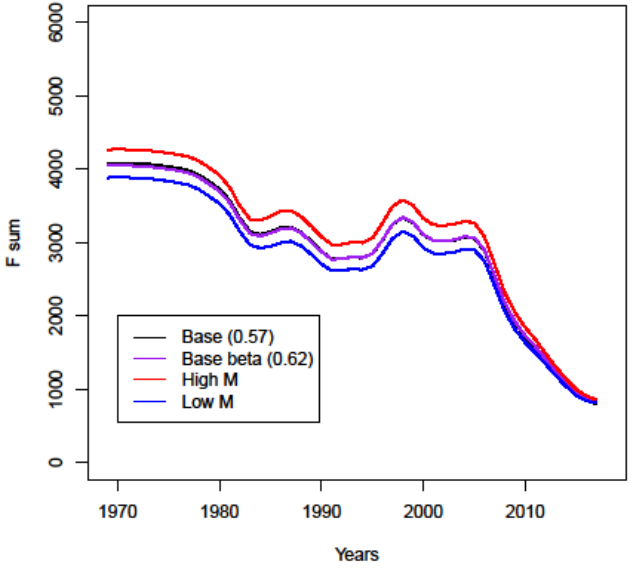


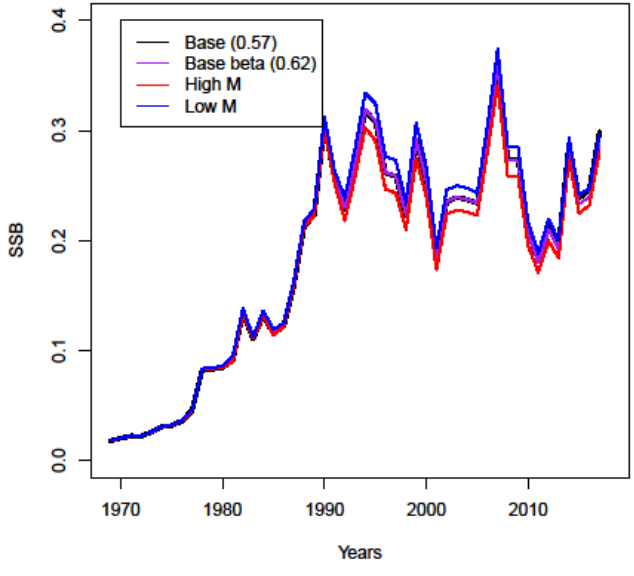


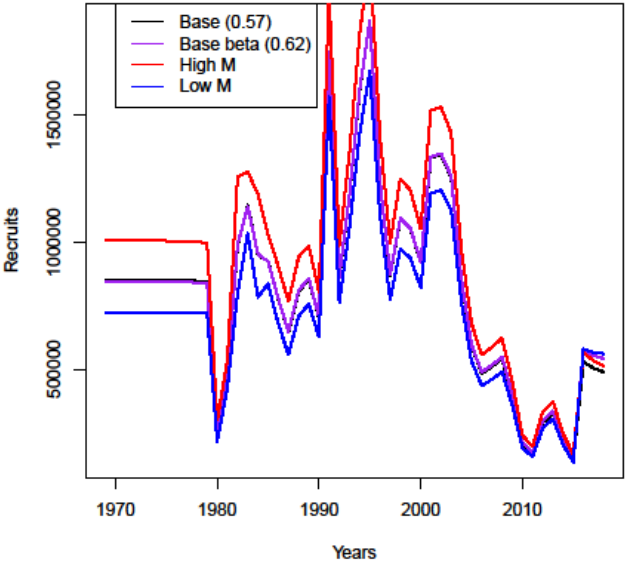


Steepness Sensitivity – Beta Prior

	Steepness	N age dev	Prior	Sigma r	R0
Base	0.57 (0.11)	Fixed	None	0.49 (0.04)	13.52 (0.04)
Base beta	0.62 (0.13)	Fixed	Beta	0.51 (0.05)	13.51 (0.04)
High M	0.49 (0.09)	Fixed	Beta	0.50 (0.05)	13.68 (0.04)
Low M	0.76 (0.15)	Fixed	Beta	0.50 (0.05)	13.36 (0.04)
Low M	0.71 (0.15)	Fixed	None	0.50 (0.04)	13.37 (0.04)
High M	0.46 (0.73)	Fixed	None	0.49 (0.05)	13.69 (0.04)



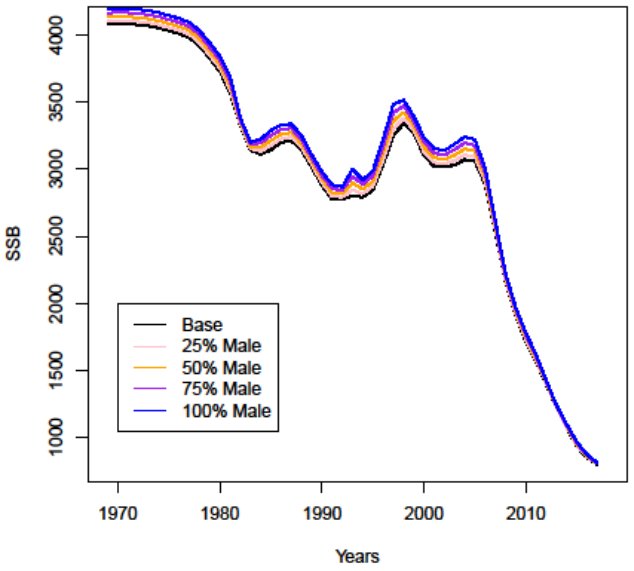


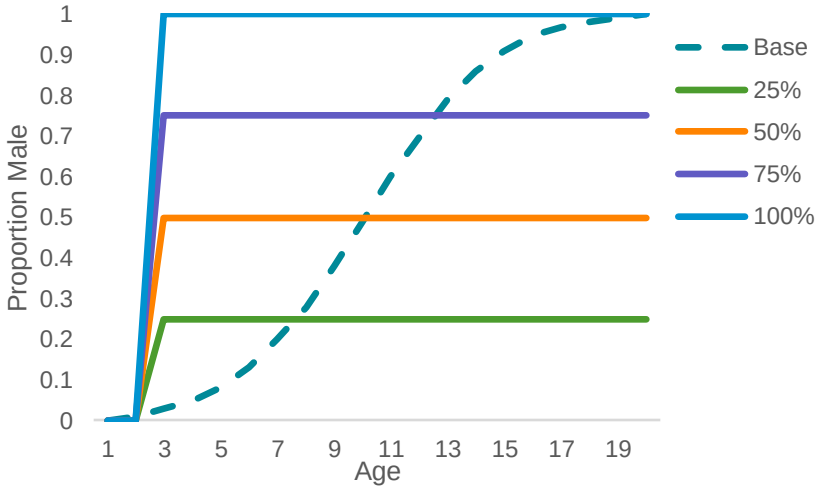


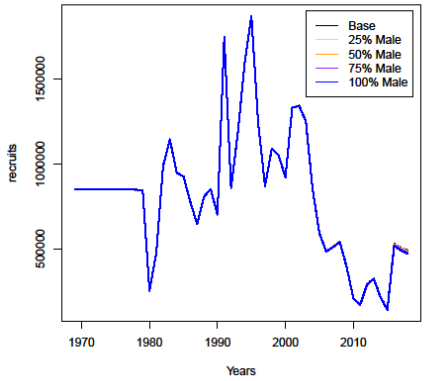
Male Contribution

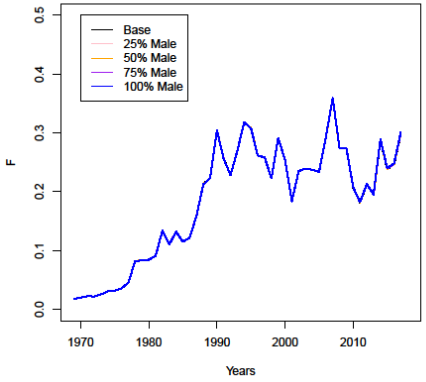
- 25%, 50%, 75% proportion male beginning at age 3 (100% female ages 1 and 2)

Model	Steepness
Base	0.569
25% male	0.566
50% male	0.561
75% male	0.556
100% male	0.551





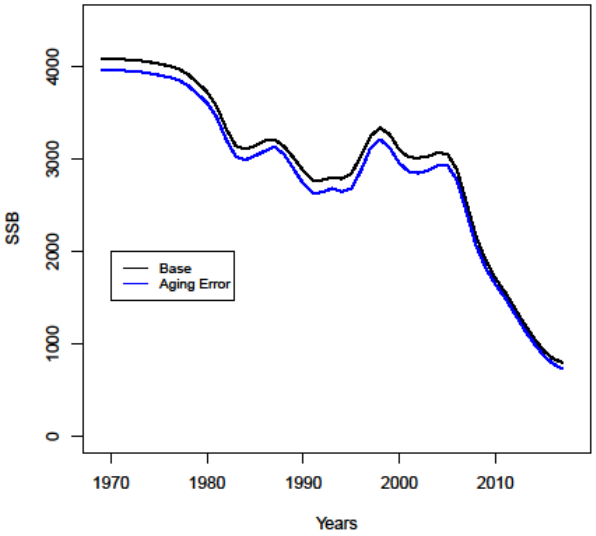


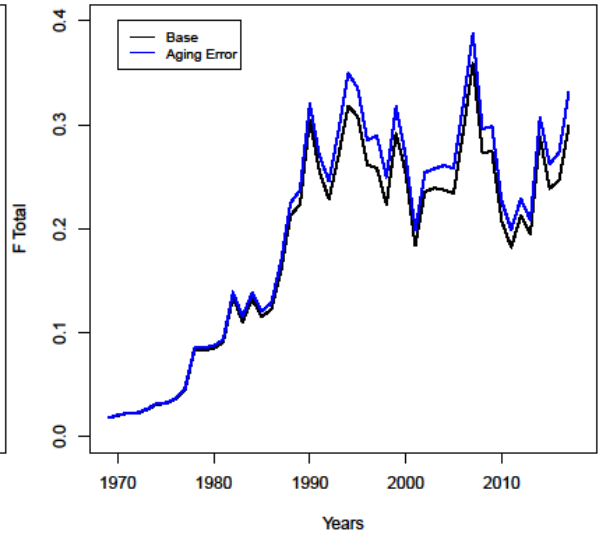


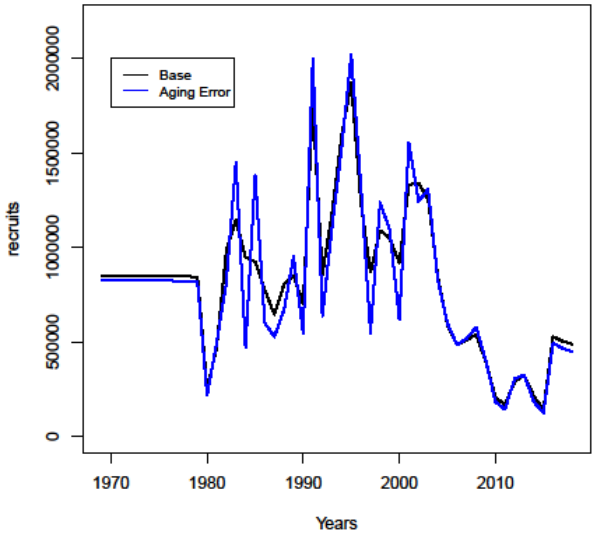
Aging error matrix

- Include aging error matrix in base run

Model	Steepness
Base	0.569
With aging err.	0.549







NOAA FISHERIES

MCBE

NOAA FISHERIES

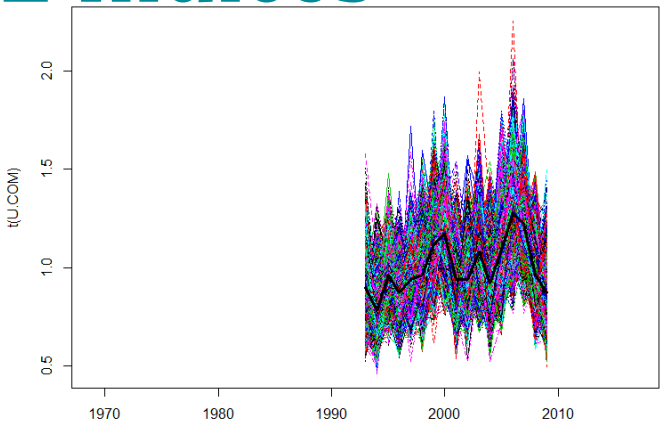
Monte Carlo Ensemble Modeling

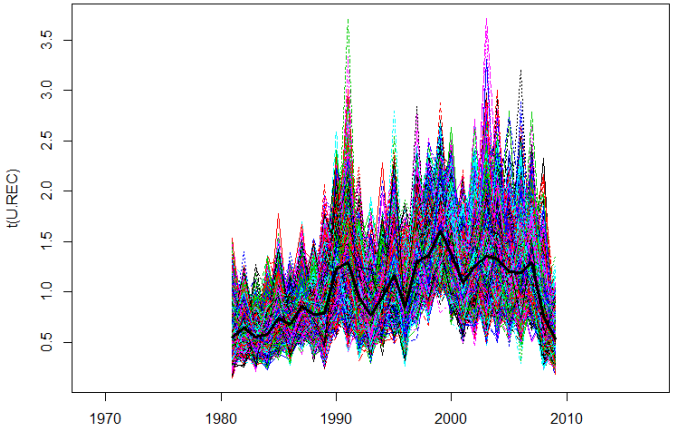
- Bootstrapping:
  - Indices
  - Landings and discards
  - Age and length comps
- Monte Carlo:
  - M: uniform draw from low to high maximum age (32-36 yrs)
- Runs culled from ensemble modeling when R0, Fmsy, steepness and R sigma hit upper bound
  - RW Base 4000 runs, 3903 retained
  - AW Base 4000 runs, 3934 retained

NOAA FISHERIES

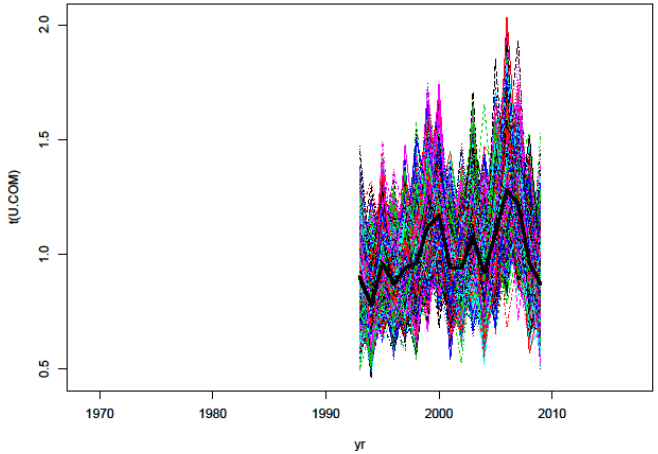
MCBE Indices

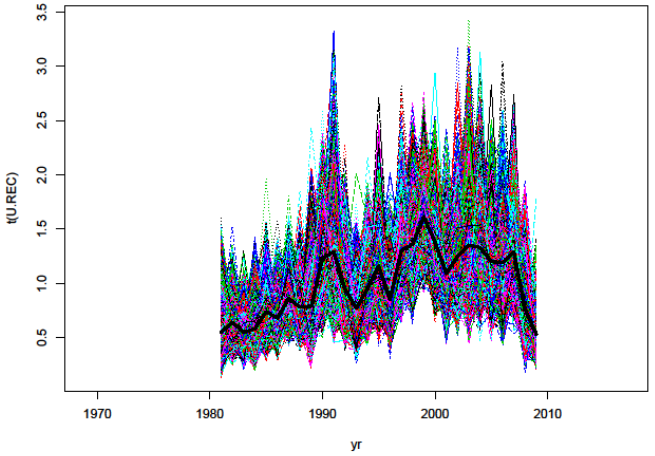
RW base





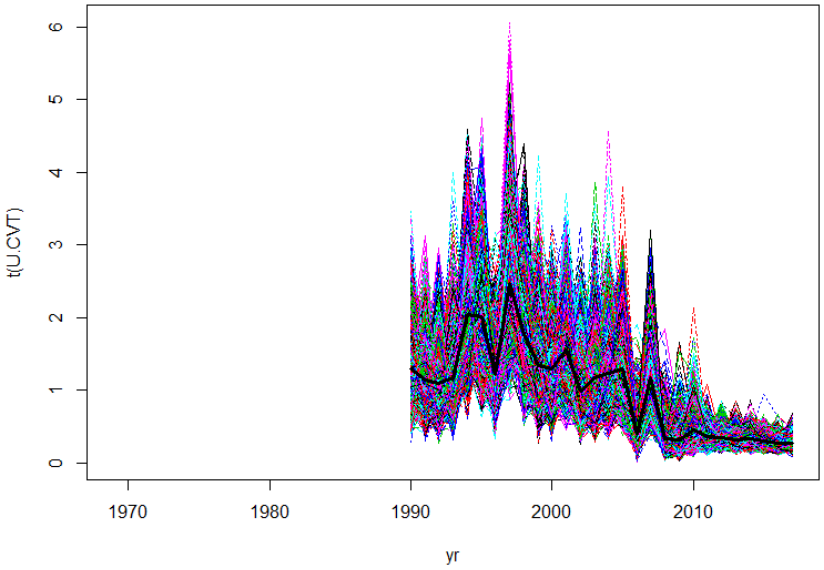
AW base



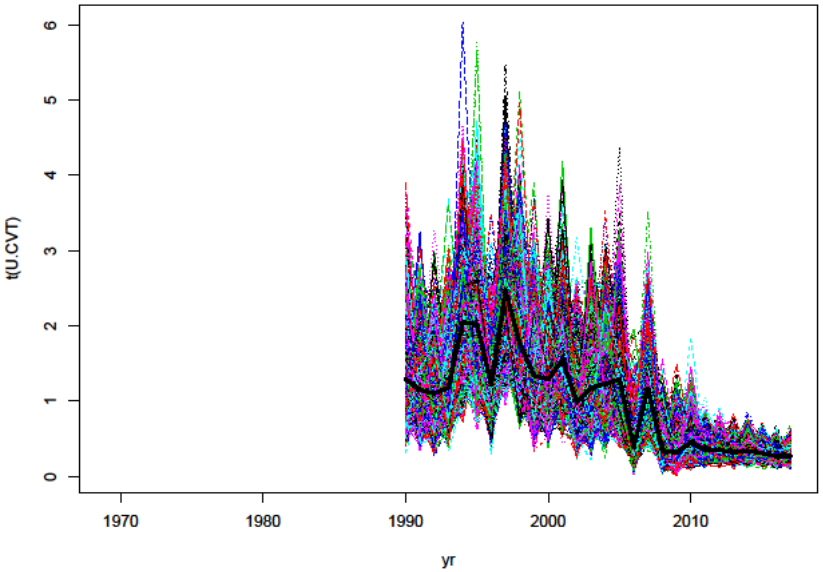


NOAA FISHERIES

RW base



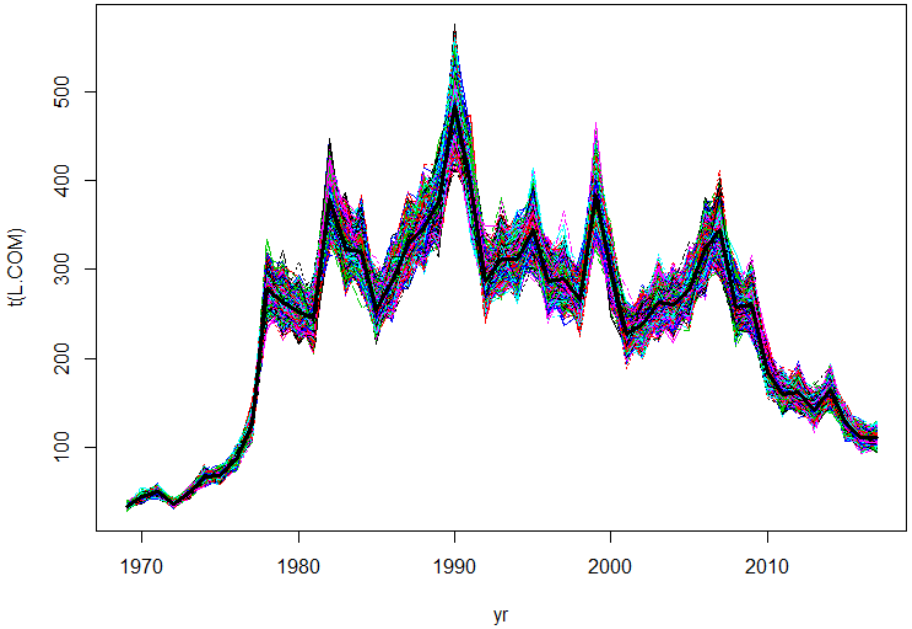
AW base



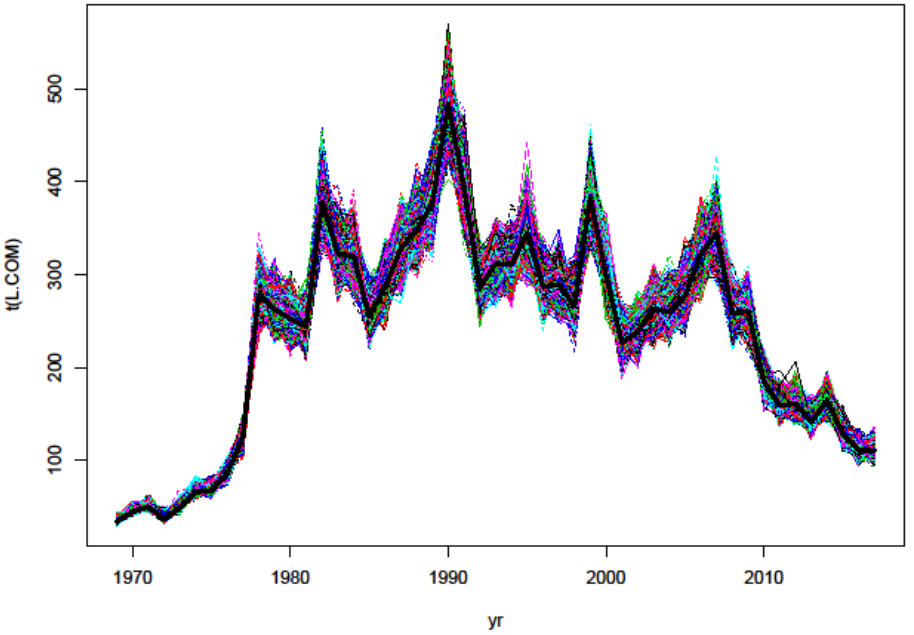
NOAA FISHERIES

MCBE Catches

RW base



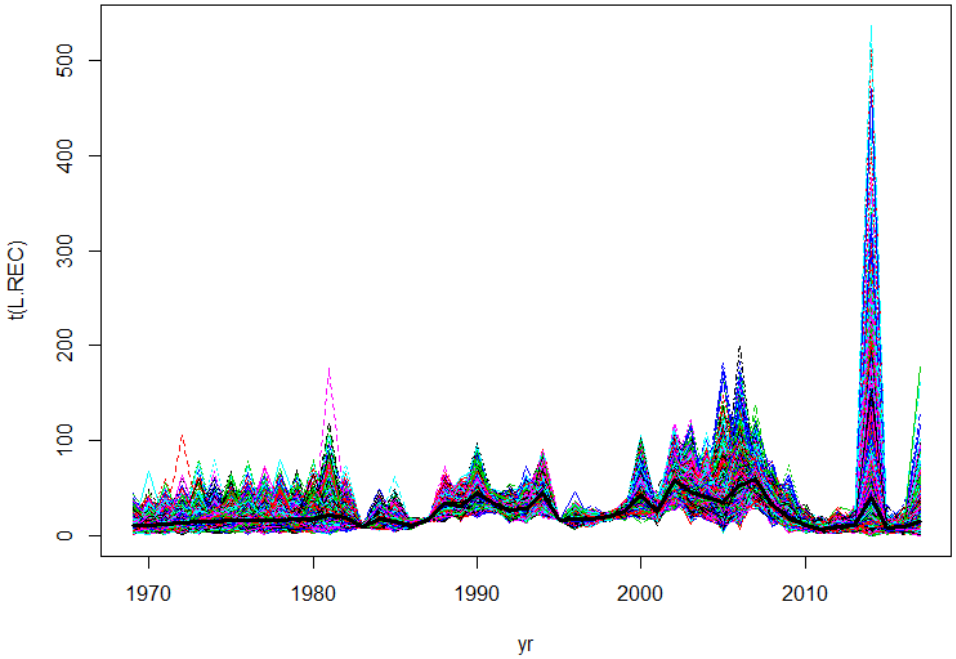
AW base



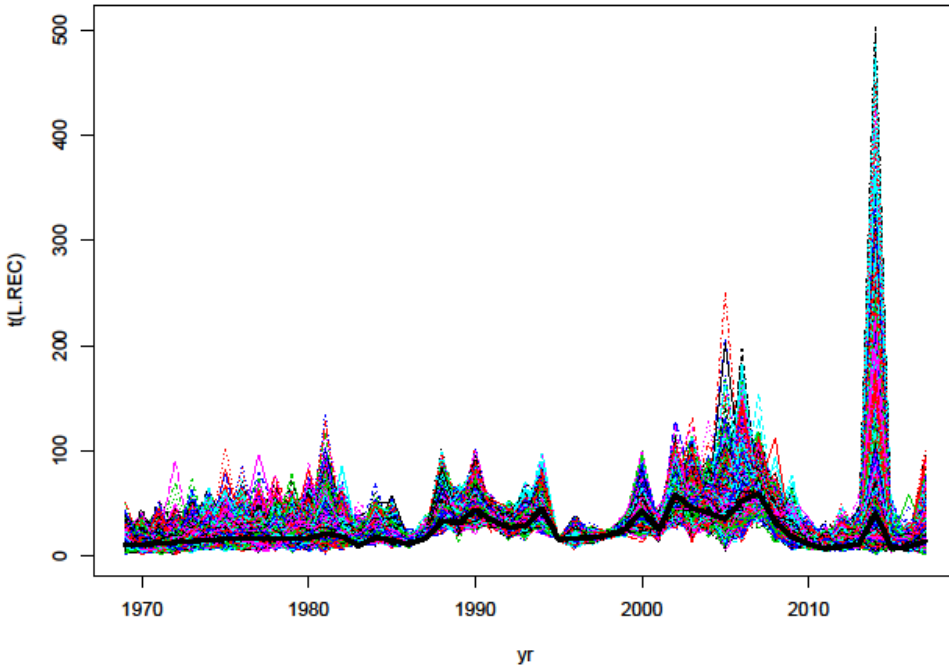
NOAA FISHERIES

MCBE Catches

RW base

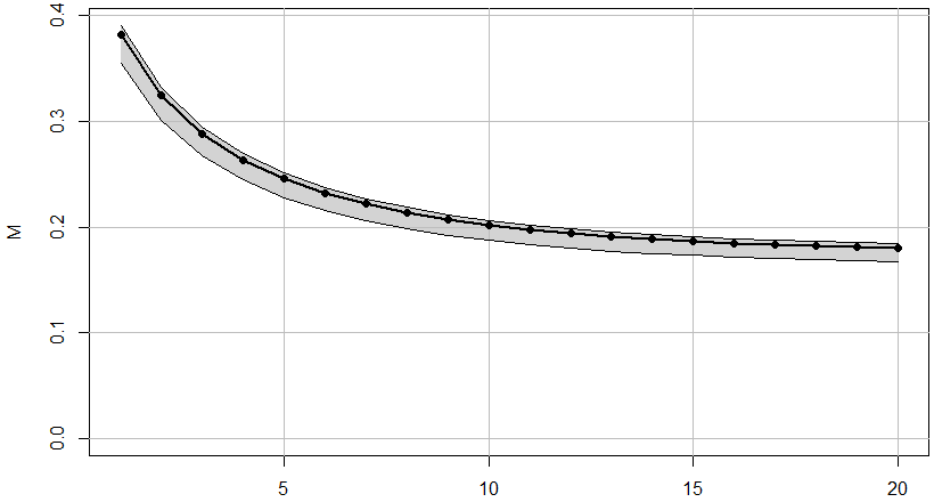


AW base

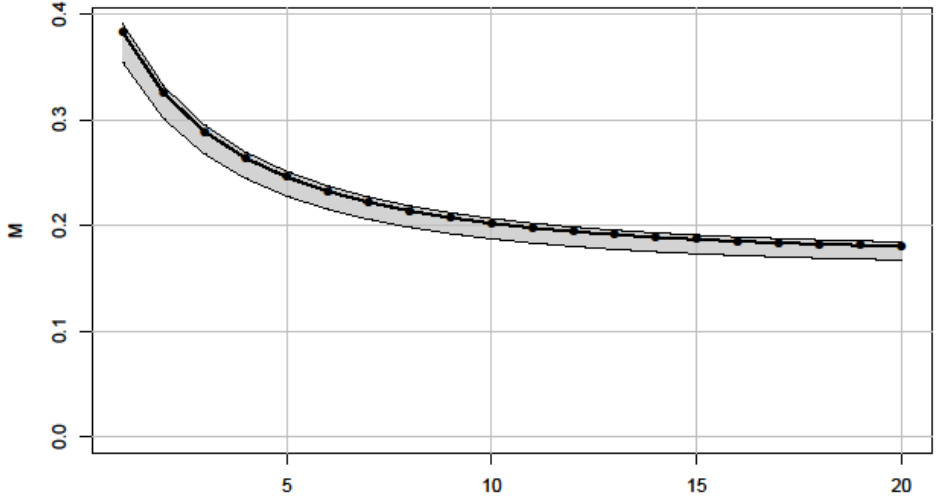


MCBE M

RW base

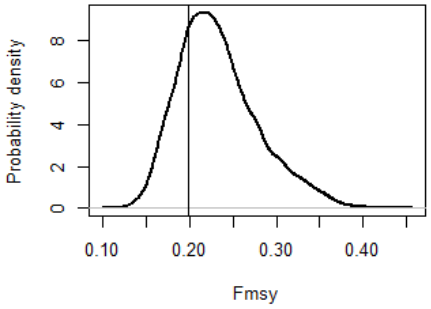


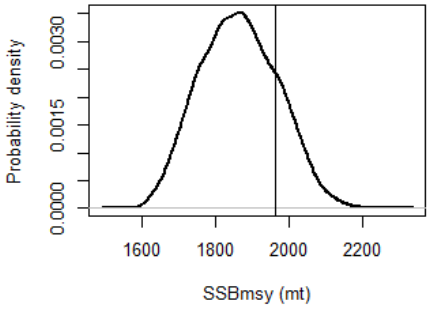
AW base

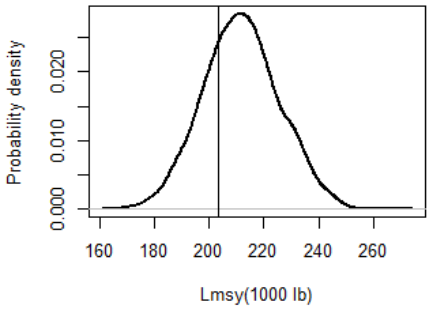


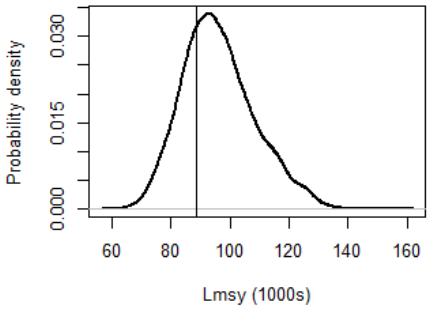
Parameters

RW base

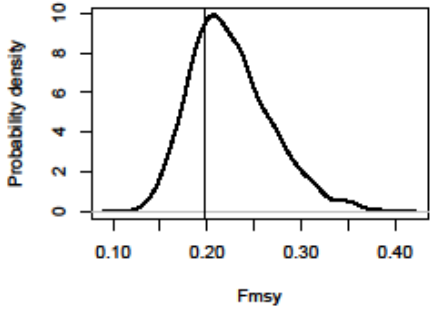


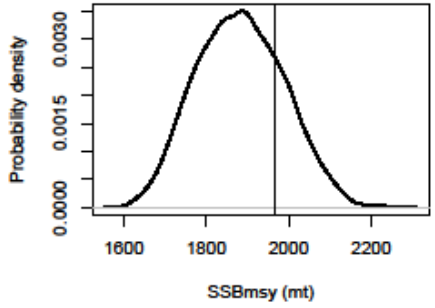


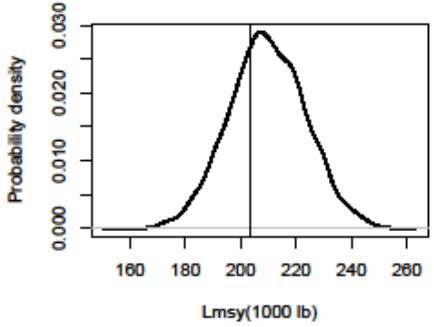


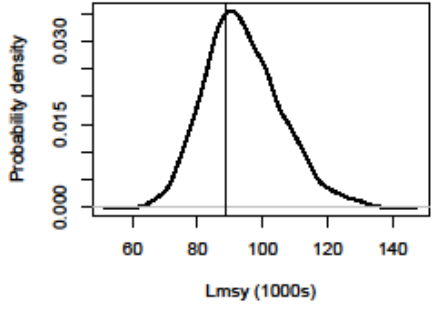


AW base



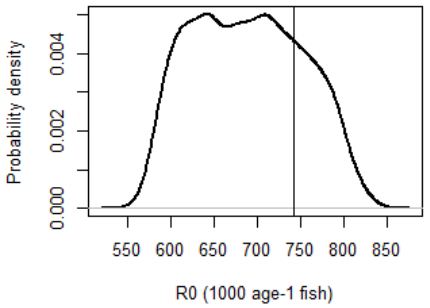


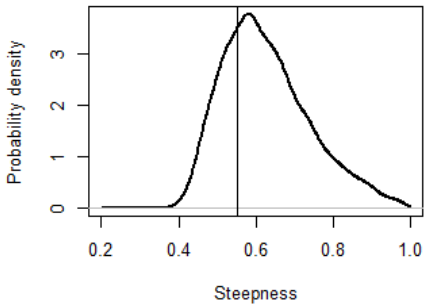


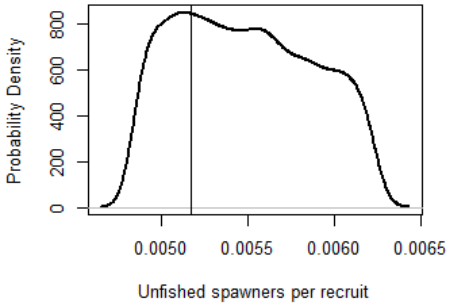


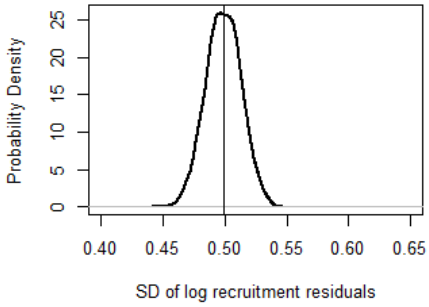
Parameters

RW base

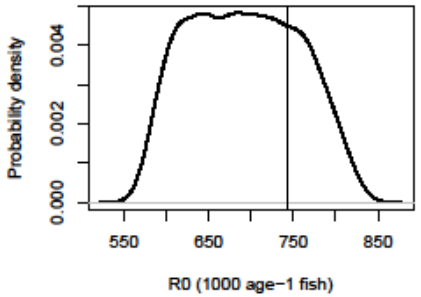


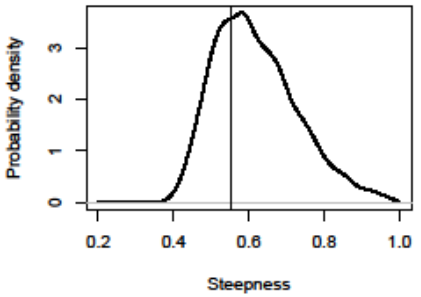


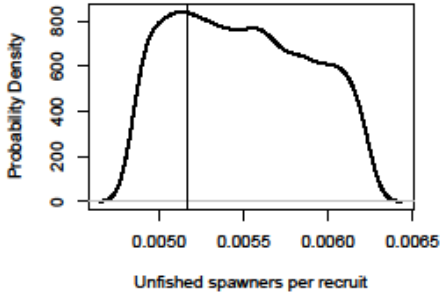


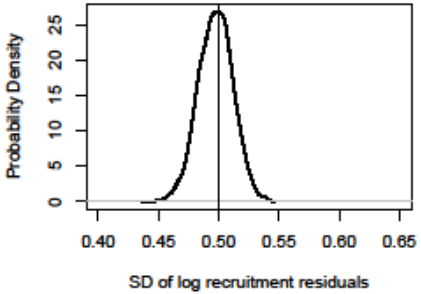


AW base





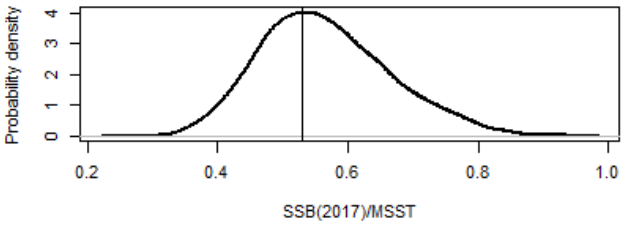


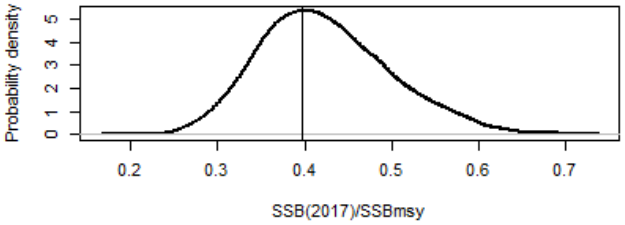


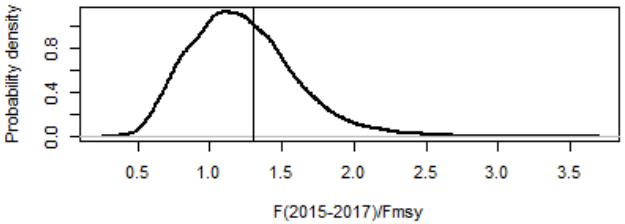
NOAA FISHERIES

Parameters

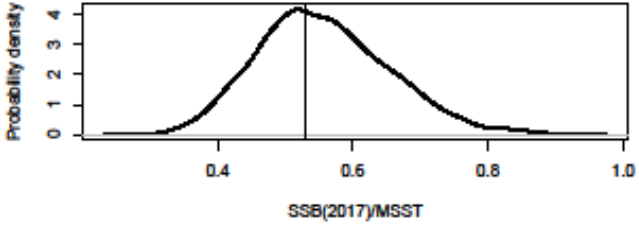
RW base

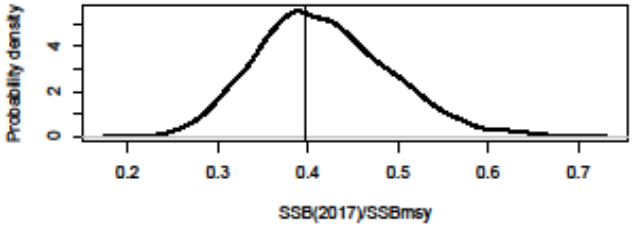


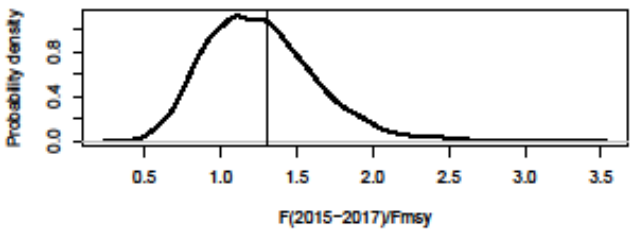




AW base



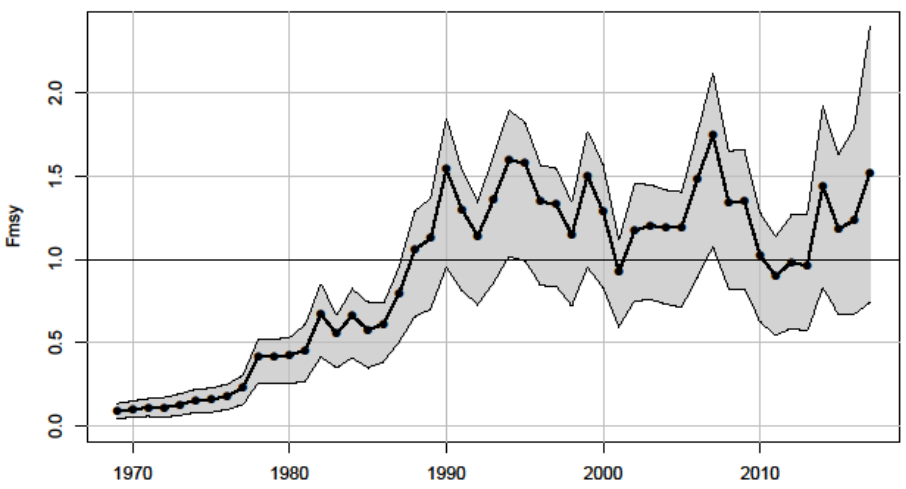




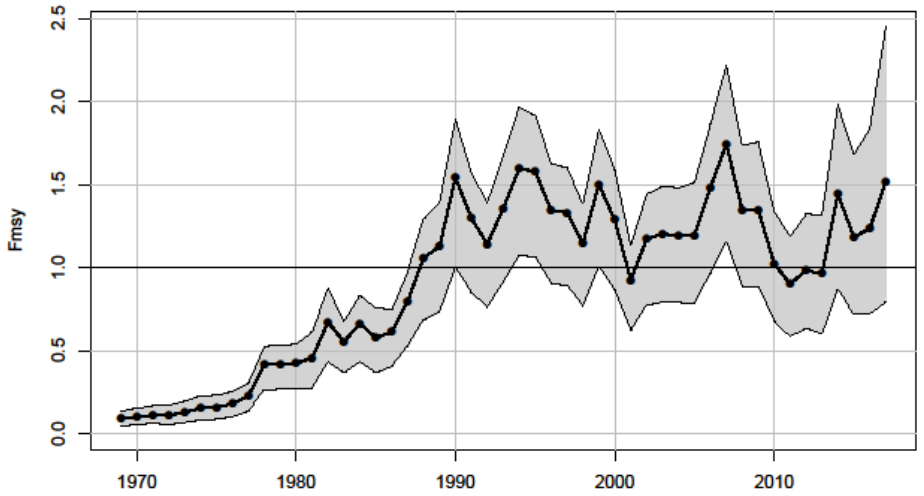
NOAA FISHERIES

Fishing Mortality

RW base

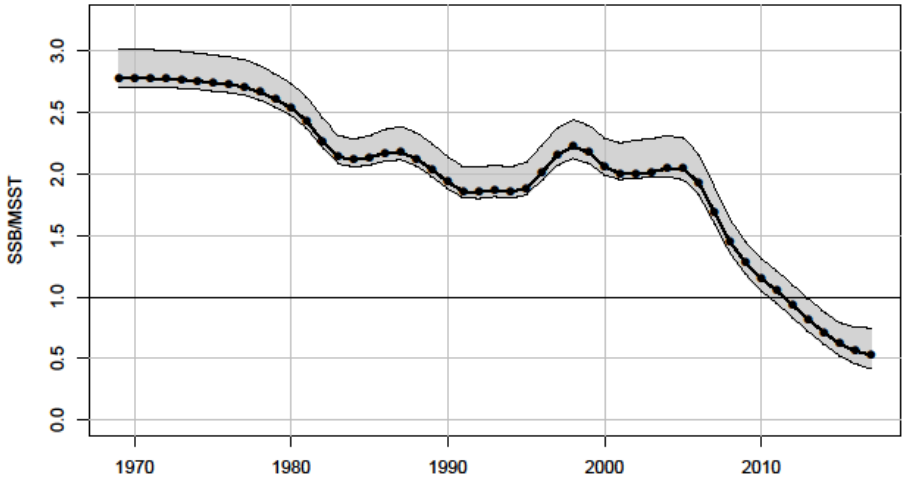


AW base

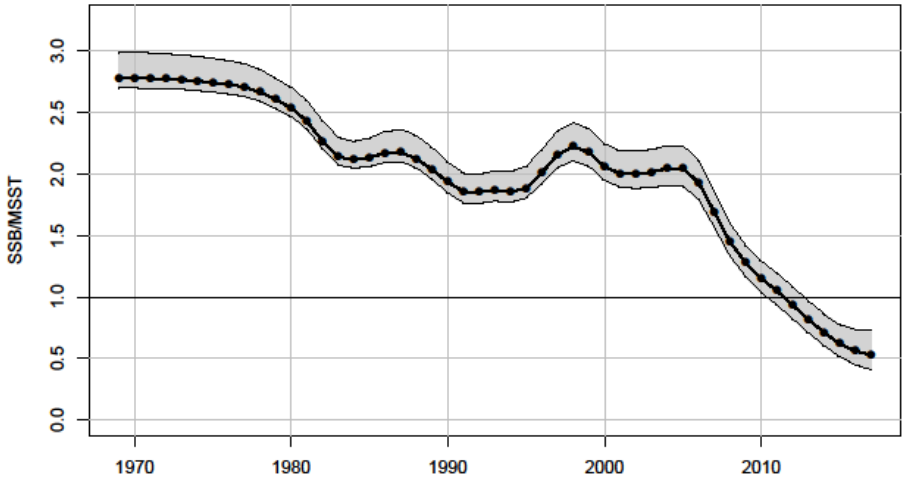


SSB

RW base



AW base



Review Workshop

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Outline

Data Review
- Stock definition
- Life history
- Removals
- Compositions
- Index of abundance

Catch-age model
- AW and RW base runs
- Diagnostics & model fits
- Sensitivities
- Uncertainty analysis

Review Workshop
- Requested analyses

Recommendations for Operational Assessment

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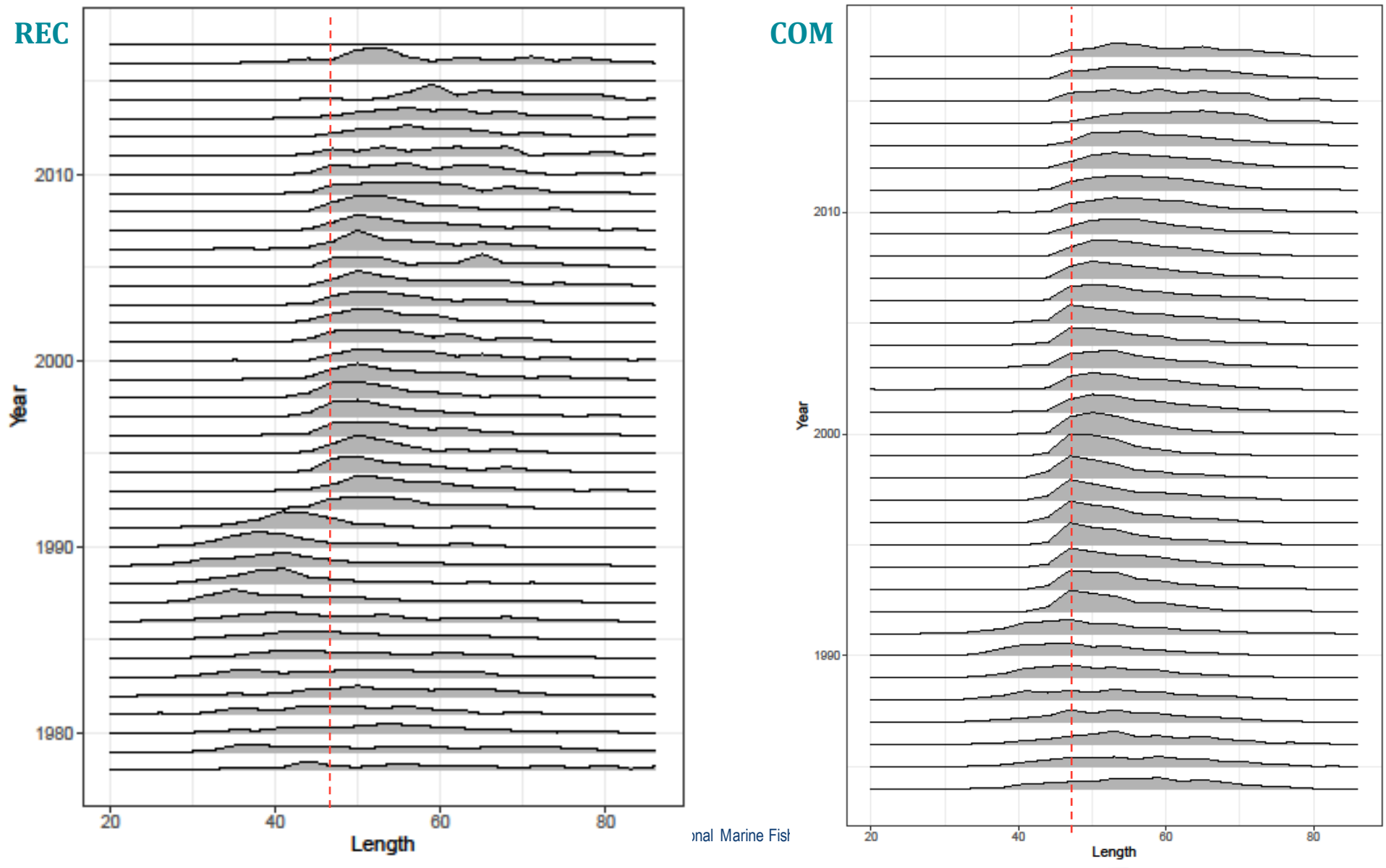
Requested analyses

- Selectivity mismatch between time blocks main issue discussed

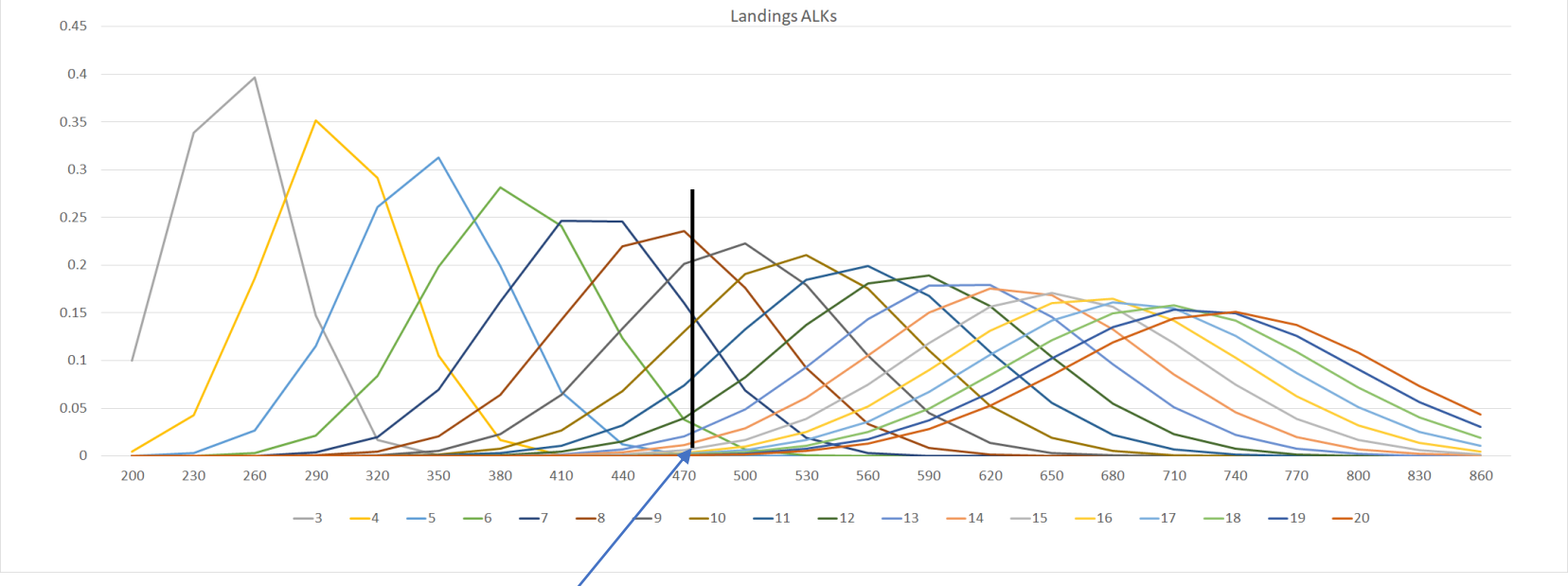
1. Combined dead discards with landings (accepted RW Base Model)
2. Dome shaped selectivity for REC and COM
3. Time blocks removed from Run 2
4. Time blocks removed from AW base run
5. Aging error matrix
   - No change to results
6. 6 time blocks on AW base run


REC
COM
Year
2010
2000
1990
1980
20
40
60
80
Length

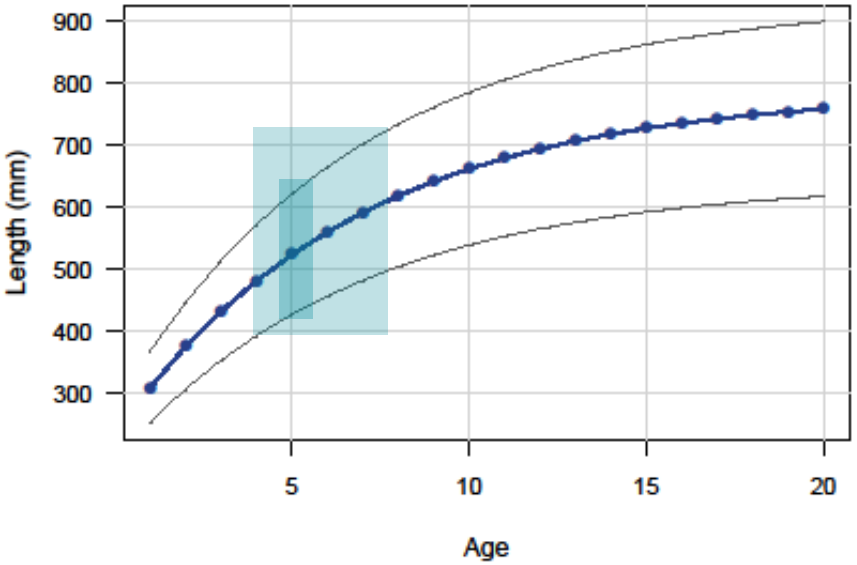
BAM Catch-age model

- Uses both length and age compositions to inform an age-based selectivity function for each fleet.
- Catch at age is calculated in numbers and then converted to lengths using the ALK for the landings.
- We evaluate the fit to the comps using the converted ages using the likelihood.
- Ages are the native units in BAM, so the length and age compositions have shown some conflicts when converting ages to lengths with broad distributions of sizes at age.

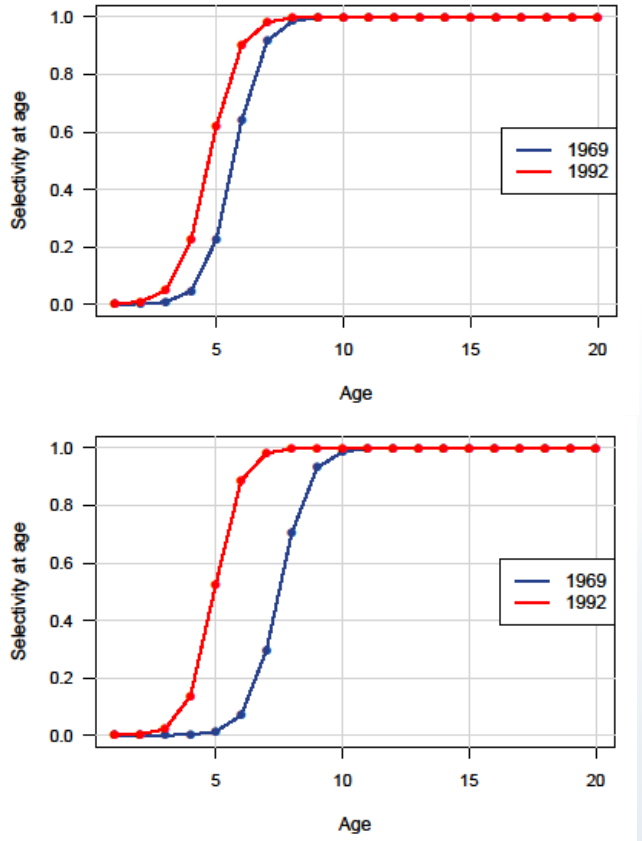
Landings ALK from BAM



Size limit
post 1992



Parameters	Combined
selpar_A50_COM1	7.50
selpar_A50_COM3	4.95
selpar_A50_REC1	5.68
selpar_A50_REC3	4.72



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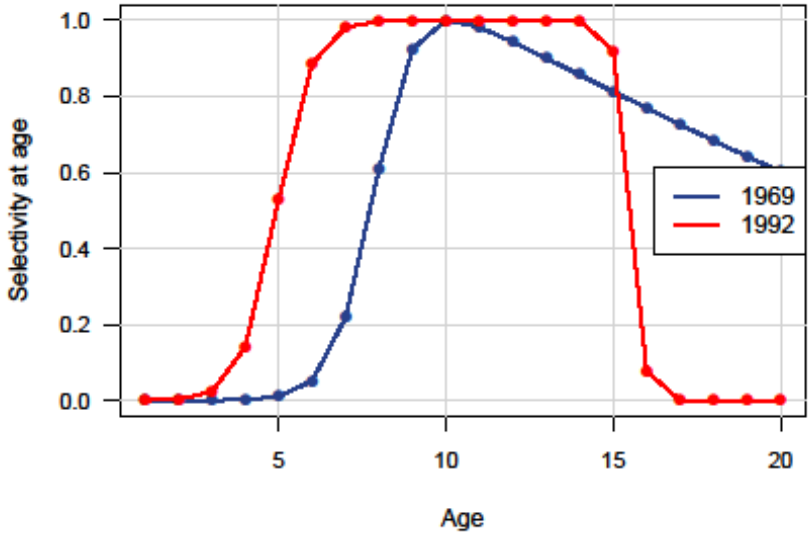
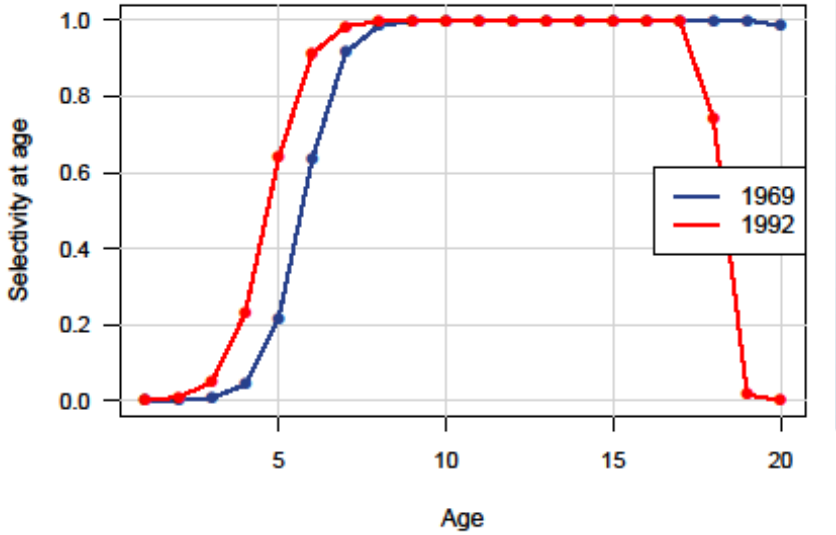
2. Dome shaped selectivity on fleets





- Not recommended by Review Panel

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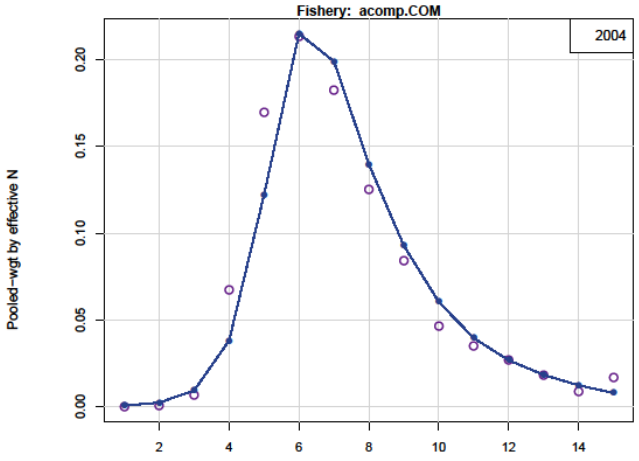
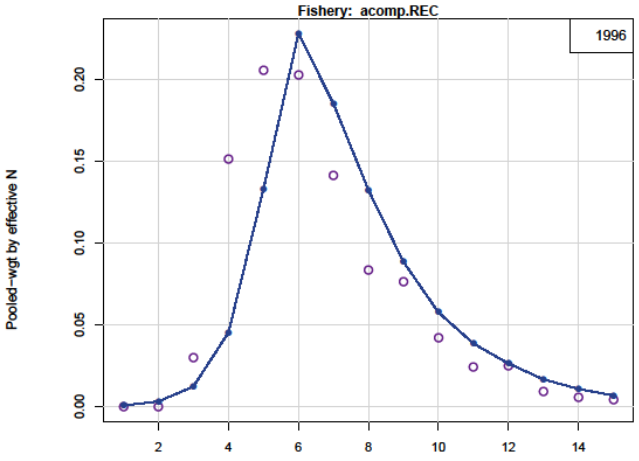
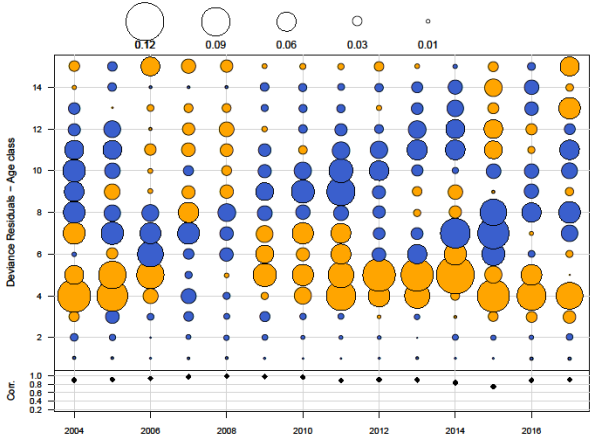
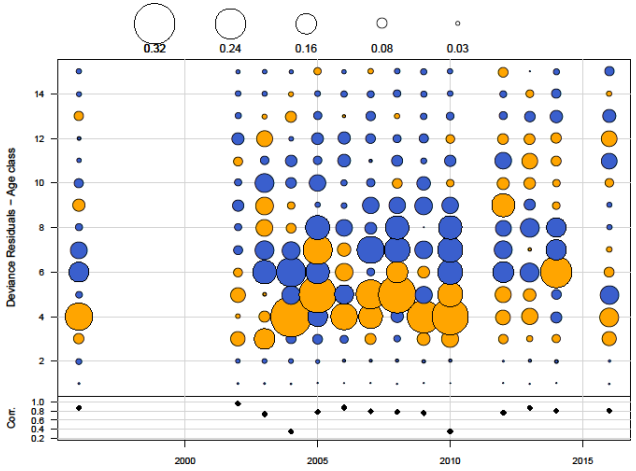
3. Dome shaped selectivity on fleets, no time blocks









- Not recommended by Review Panel
- Steepness 0.268

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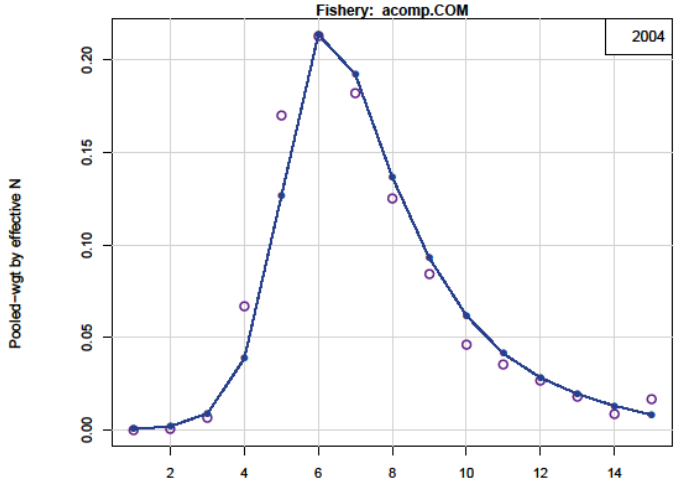
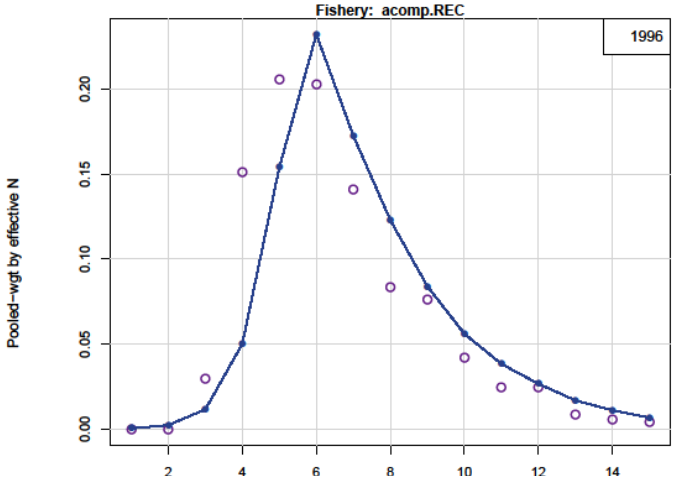
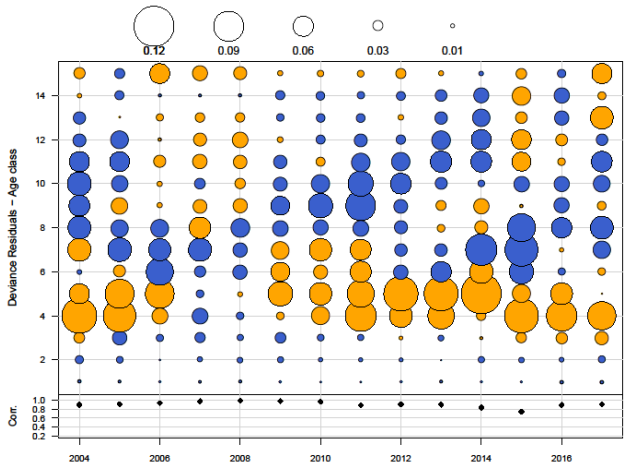
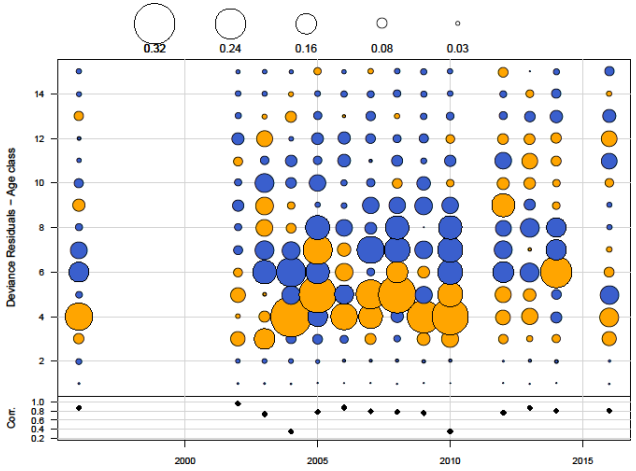
4. AW with no time blocks









- Not recommended by Review Panel
- Steepness 0.265

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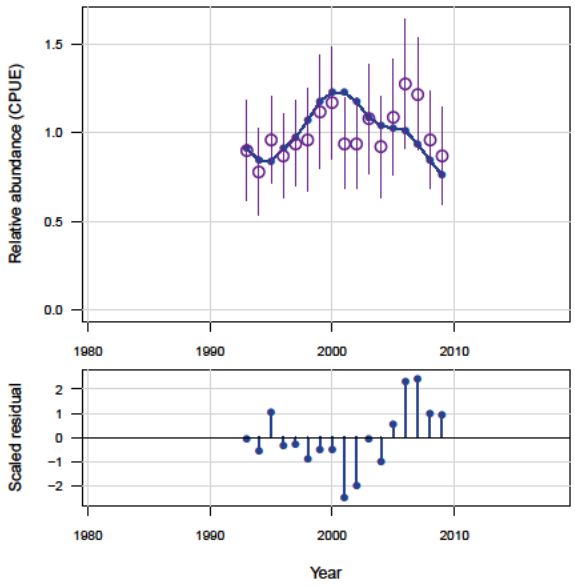
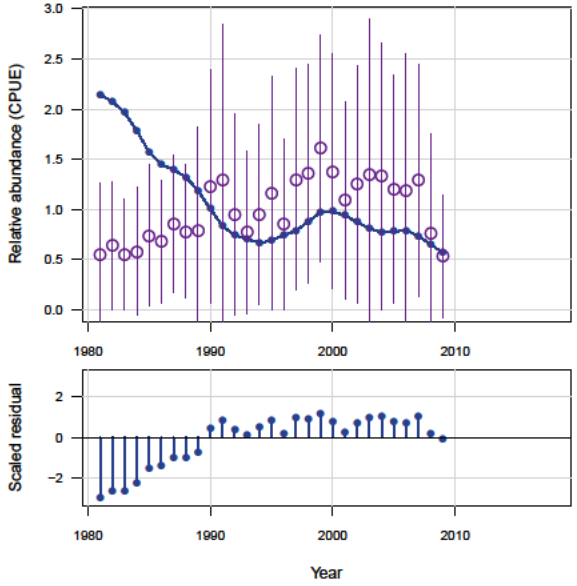
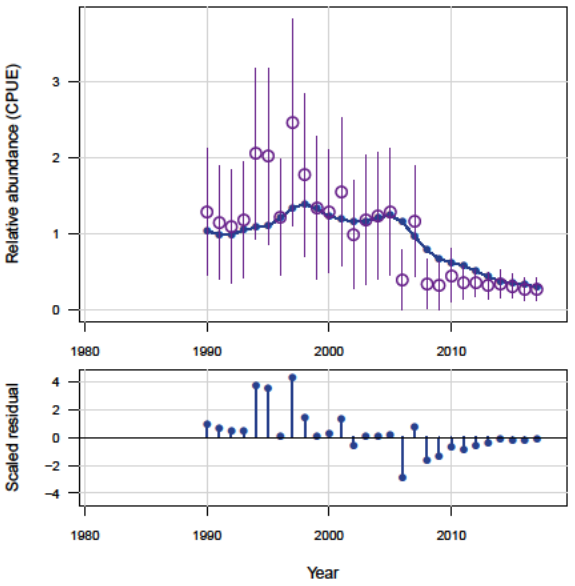
4. AW with no time blocks

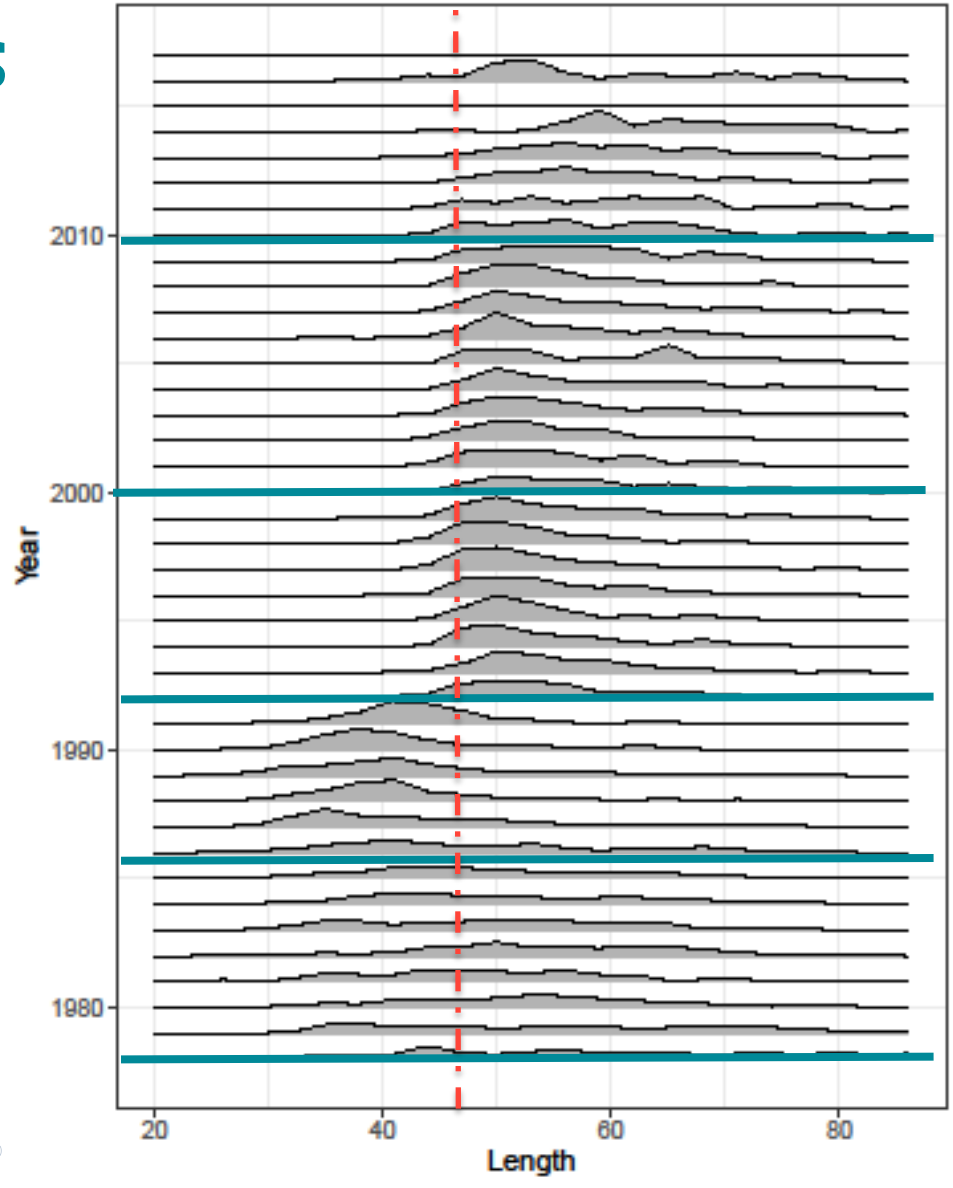






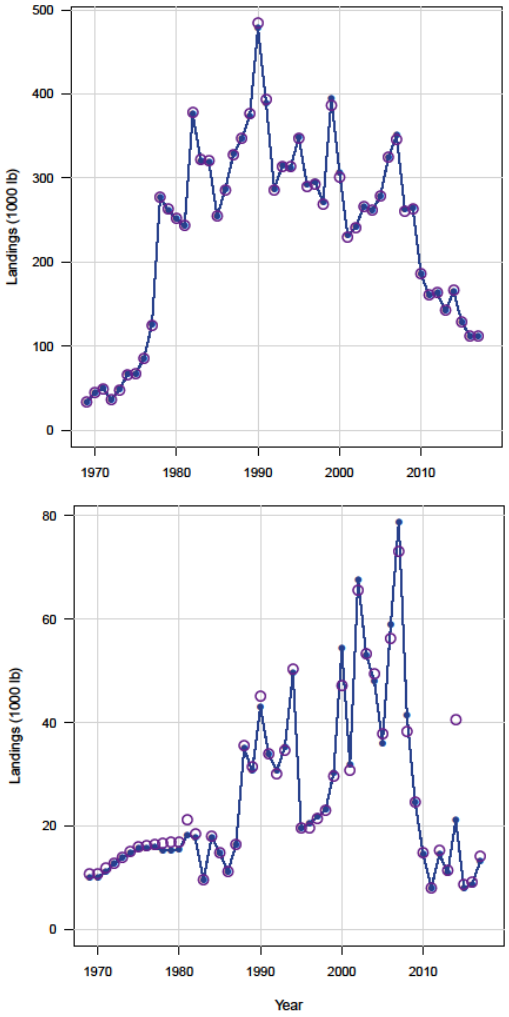
6. Increase time blocks

- Review Panel requested random walk on A50 selectivity parameter for COM and REC
- Not possible in time frame of RW
- Increased number of time blocks as proxy
- No management changes to justify time blocks
  - Likelihood analysis needed to determine best years to place blocks

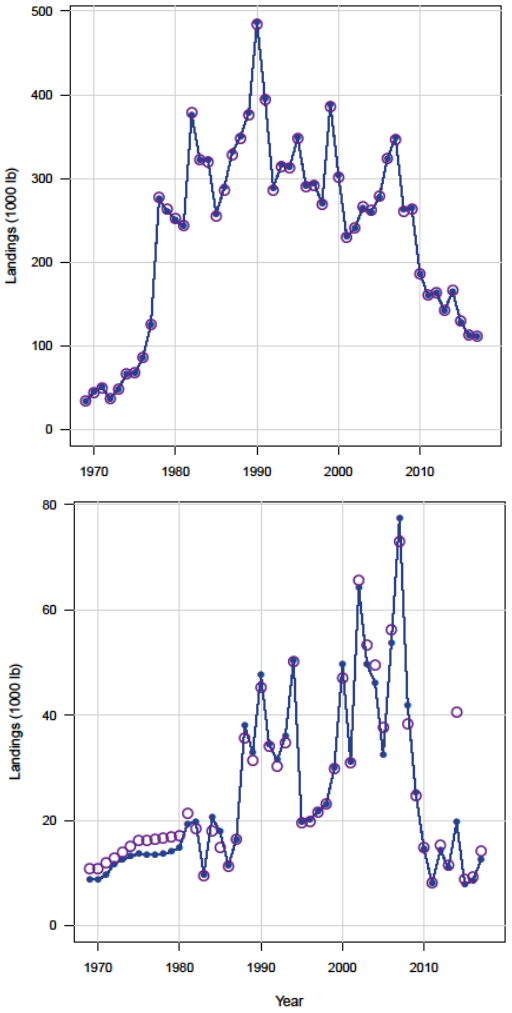


6. Increase time blocks

6 blocks



2 blocks



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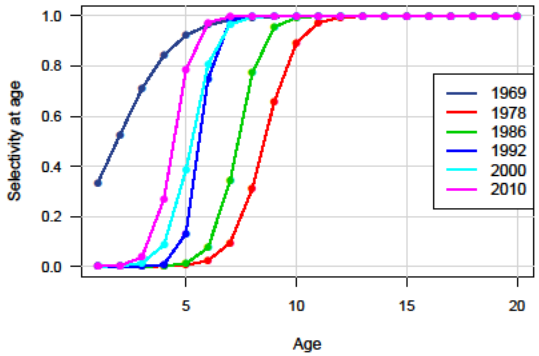
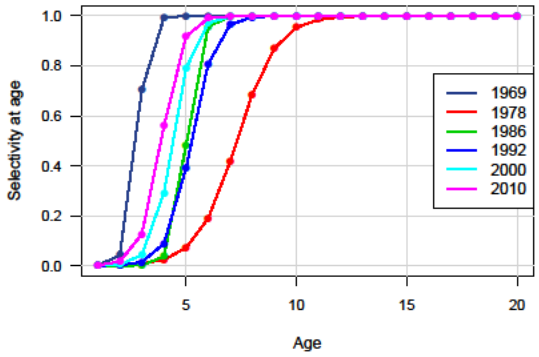
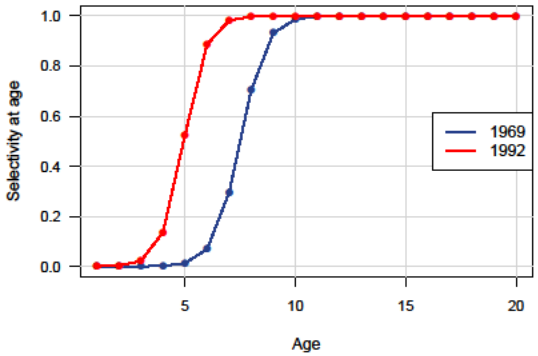
6. Increase time blocks

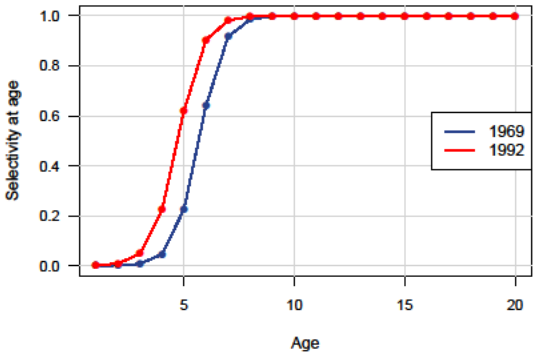
6 blocks



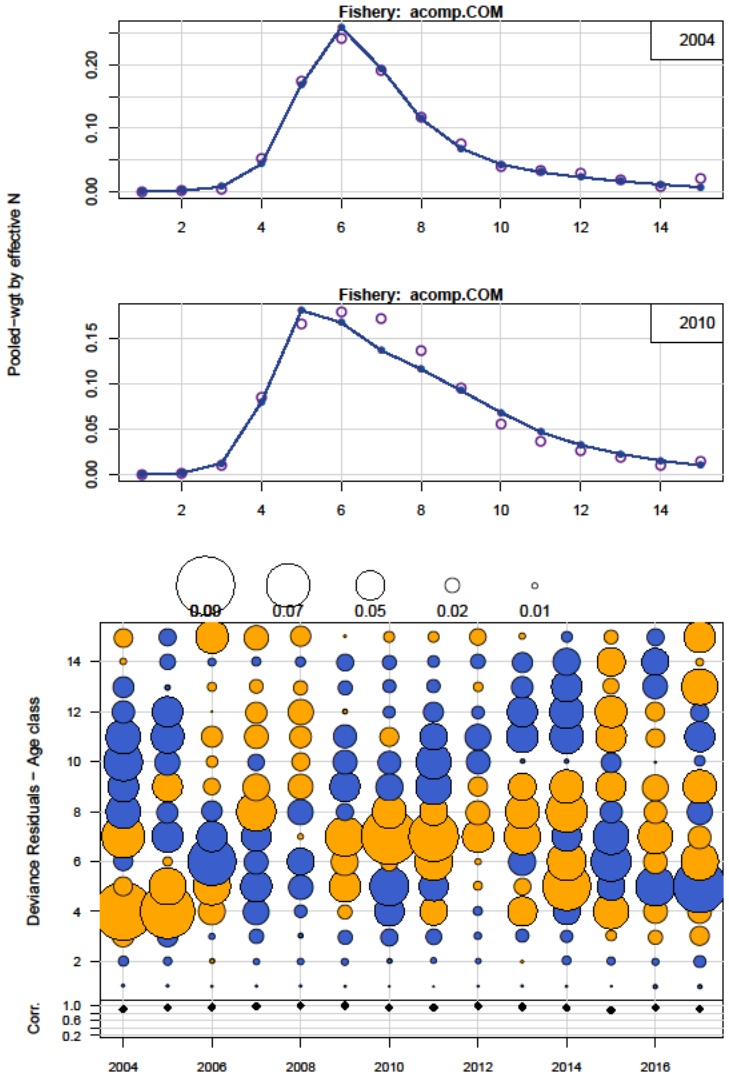


2 blocks

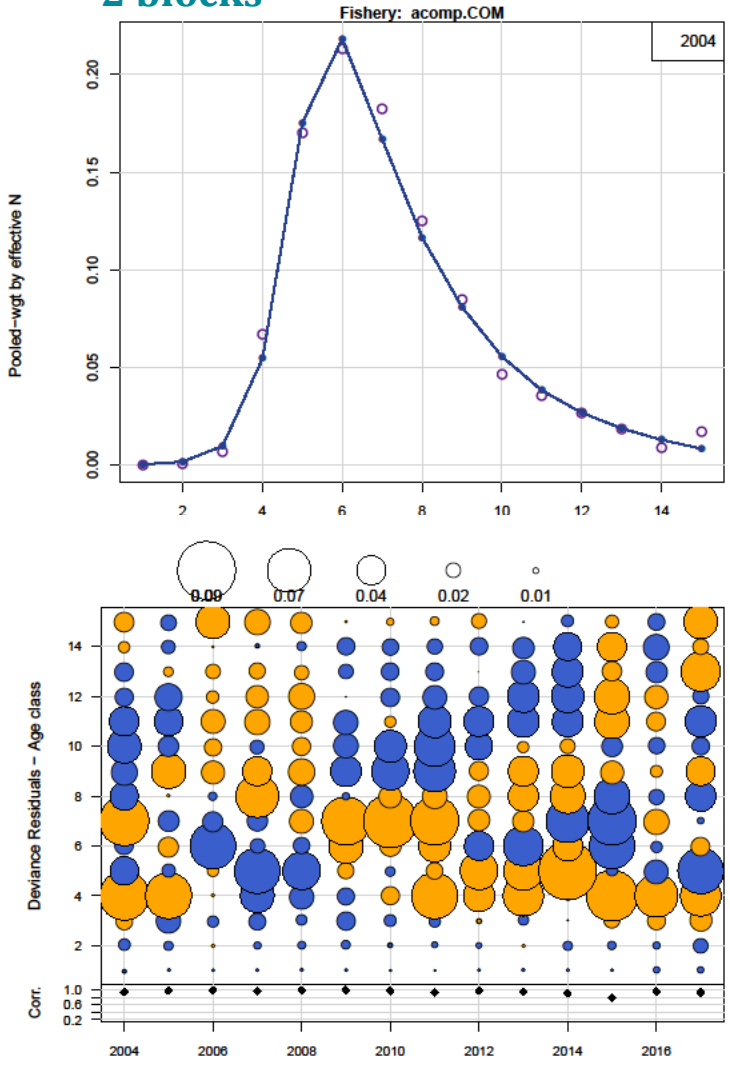




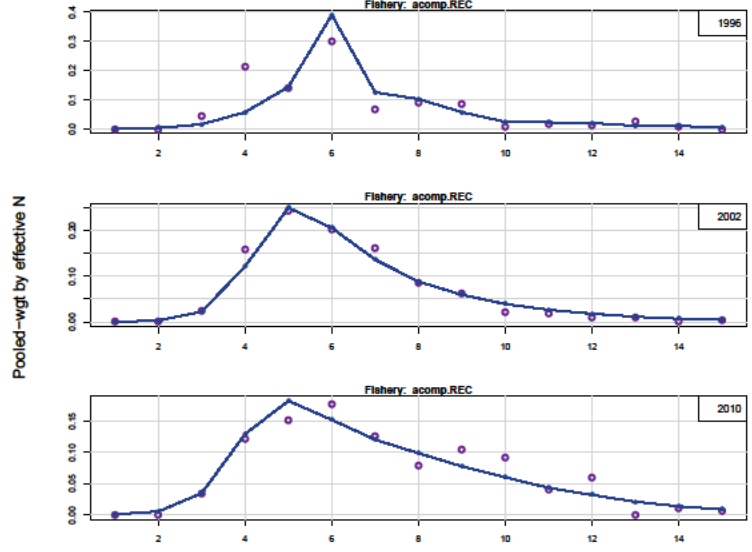
6 blocks

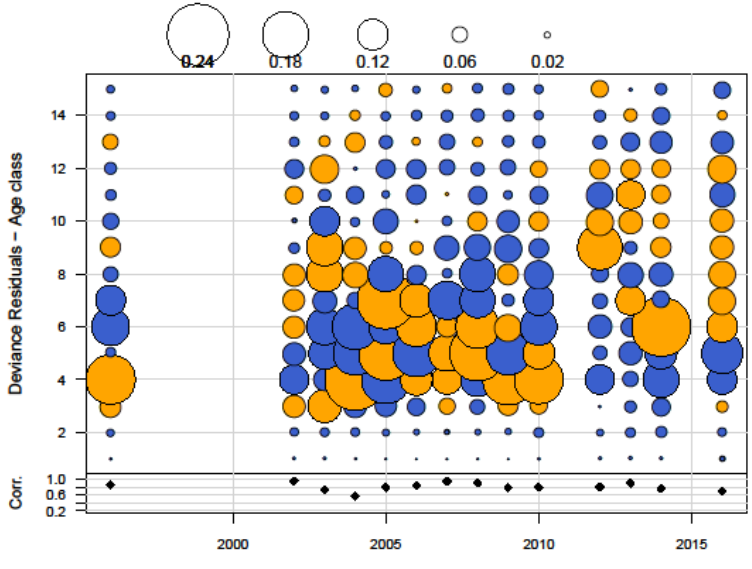


2 blocks

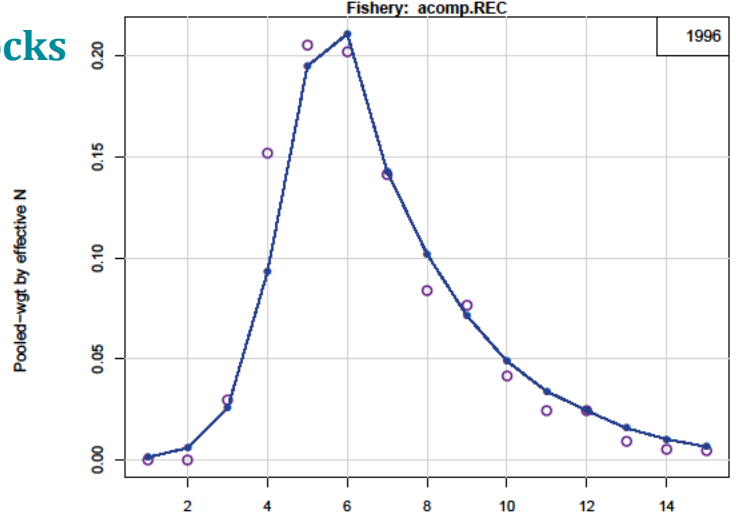


6 blocks

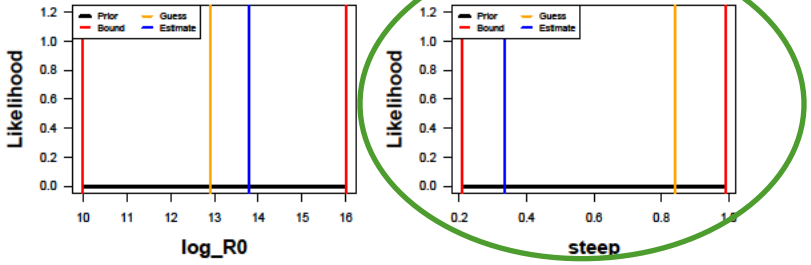


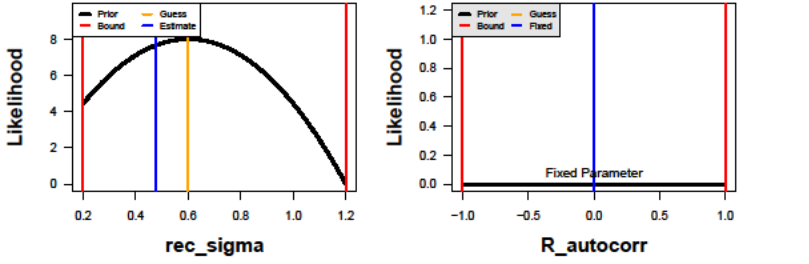


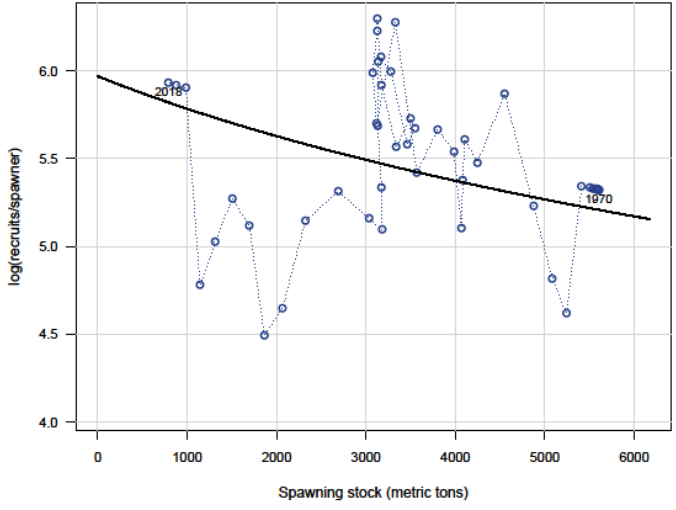
2 blocks



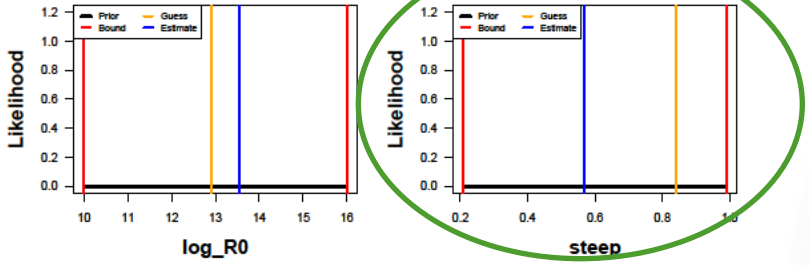
6 blocks

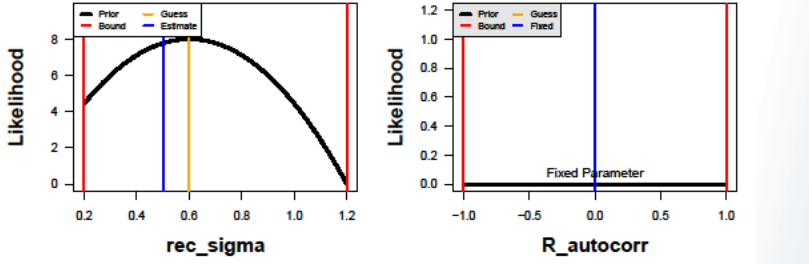


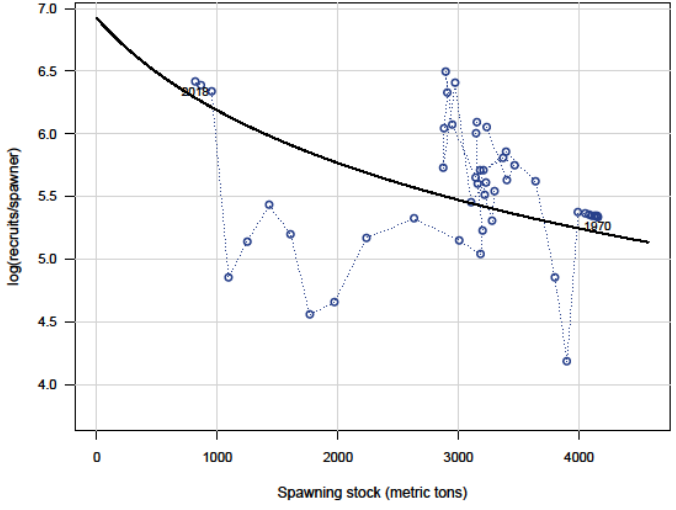




2 blocks







Recommendations for Operational Assessment

- Accepted RW Base Model:
  - Combine landings and discards into one removal stream for COM and REC
  - Retain two blocks
  - Logistic selectivity all fleets

- For operational assessment either:
  - Annual random walk on A50 selectivity parameter
  - Likelihood analysis on appropriate years for additional time blocks

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Questions?

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