SEDAR 68: Scamp and Yellowmouth Research Track assessment

NOAA FISHERIES
Southeast Fisheries Science Center

Life History Group Plenary #1

April 22, 2020

Recommendations from the LHG

- Meristics Conversions-Both Regions
- South Atlantic Reproduction
- South Atlantic Growth models

Meristics data: Scamp and Yellowmouth Grouper

- Data from many sources:

Fishery-Dependent	Fishery-Independent
TIPS	SERFS
Headboat Survey	FWRI FIM
MRIP	Dauphin Island study
GulfFin	Gulf Trap Survey
Observer Program	Gulf Longline Survey

Meristics data: South Atlantic Length-Length Conversions

- Recommending Merisitic equations be used as presented

Model: $Y = a + bX$	n	a	SE	b	SE	r^2	Units	range of Independent variable
FL = TL	1999	19.72	1.31	0.89	0	0.99	mm. mm	267 - 1003
TL = FL	1999	-15.01	1.51	1.11	0	0.99	mm. mm	252 - 898
TL = maxTL	152	-0.30	3.34	0.98	0	0.99	mm. mm	457 - 922
maxTL = TL	152	2.95	3.37	1.01	0	0.99	mm. mm	453 - 916
FL = maxTL	5213	23.03	0.70	0.88	0	0.99	mm. mm	193 - 922
maxTL = FL	5213	-20.42	0.83	1.13	0	0.99	mm. mm	184 - 847
FL = SL	5111	25.38	0.90	1.12	0	0.98	mm. mm	149 - 720
SL = FL	5111	-15.46	0.83	0.88	0	0.98	mm. mm	184 - 847
TL = SL	183	17.00	10.57	1.14	0.02	0.95	mm. mm	374 - 695
SL = TL	183	11.97	8.34	0.77	0.01	0.95	mm. mm	453 - 916
maxTL = SL	5321	5.90	1.18	1.26	0	0.98	mm. mm	149 - 750
SL = maxTL	5321	5.07	0.92	0.78	0	0.98	mm. mm	193 - 925

Meristics data: South Atlantic Weight-Length Conversions

- Recommending Merisitic equations be used as presented

Model: $Y = a + bX$	n	Power Equation: $Y = a(X)^b$	r^2	Units	range of Independent variable
Ln(WW) = Ln(FL)	17614	$WW = 7.03E\text{-}08(FL)^{2.75}$	0.92	kg, mm	178 - 1130
Ln(FL) = Ln(WW)	17614	$FL = 417.54(WW)^{0.34}$	0.92	kg, mm	0.083 - 20.98
Ln(WW) = Ln(TL)	2847	$WW = 2.78E\text{-}08(TL)^{2.87}$	0.91	kg, mm	183 - 1003
Ln(TL) = Ln(WW)	2847	$TL = 443.31(WW)^{0.32}$	0.91	kg, mm	0.10 - 11.00
Ln(WW) = Ln(maxTL)	4805	$WW = 1.21E\text{-}08(maxTL)^{3.00}$	0.95	kg, mm	193 - 922
Ln(maxTL) = Ln(WW)	4805	$maxTL = 451.20(WW)^{0.32}$	0.95	kg, mm	0.083 - 15.50
Ln(WW) = Ln(SL)	4749	$WW = 2.92E\text{-}08(SL)^{2.97}$	0.94	kg, mm	149 - 750
Ln(SL) = Ln(WW)	4749	$SL = 351.46(WW)^{0.32}$	0.94	kg, mm	0.083 - 15.50

Meristics data: GOM Length-Length Conversions

- Recommending Merisitic equations be used as presented

Model: $Y = a + bX$	n	a	SE	b	SE	r^2	Units	range of Independent variable
FL = TL	3205	17.74	0.95	0.89	0.00	0.99	mm. mm	167 - 976
TL = FL	3205	-12.88	1.09	1.11	0.00	0.99	mm. mm	160 - 944
TL = maxTL	520	-2.78	1.35	0.99	0.00	0.996	mm. mm	325 - 1001
maxTL = TL	520	4.63	1.36	1.01	0.00	0.996	mm. mm	312 - 976
FL = maxTL	2994	23.01	0.71	0.87	0.00	0.99	mm. mm	187 - 1001
maxTL = FL	2994	-22.75	0.85	1.14	0.00	0.99	mm. mm	178 - 944
FL = SL	3042	19.53	0.84	1.12	0.00	0.99	mm. mm	146 - 798
SL = FL	3042	-13.37	0.77	0.88	0.00	0.99	mm. mm	178 - 944
TL = SL	606	3.57	3.42	1.25	0.00	0.97	mm. mm	247 - 798
SL = TL	606	7.58	2.68	0.78	0.00	0.97	mm. mm	260 - 976
maxTL = SL	3258	-0.53	1.00	1.28	0.00	0.99	mm. mm	139 - 798
SL = maxTL	3258	4.82	0.77	0.77	0.00	0.99	mm. mm	175 - 1001

Meristics data: GOM Weight-Length Conversions

- Recommending Merisitic equations be used as presented

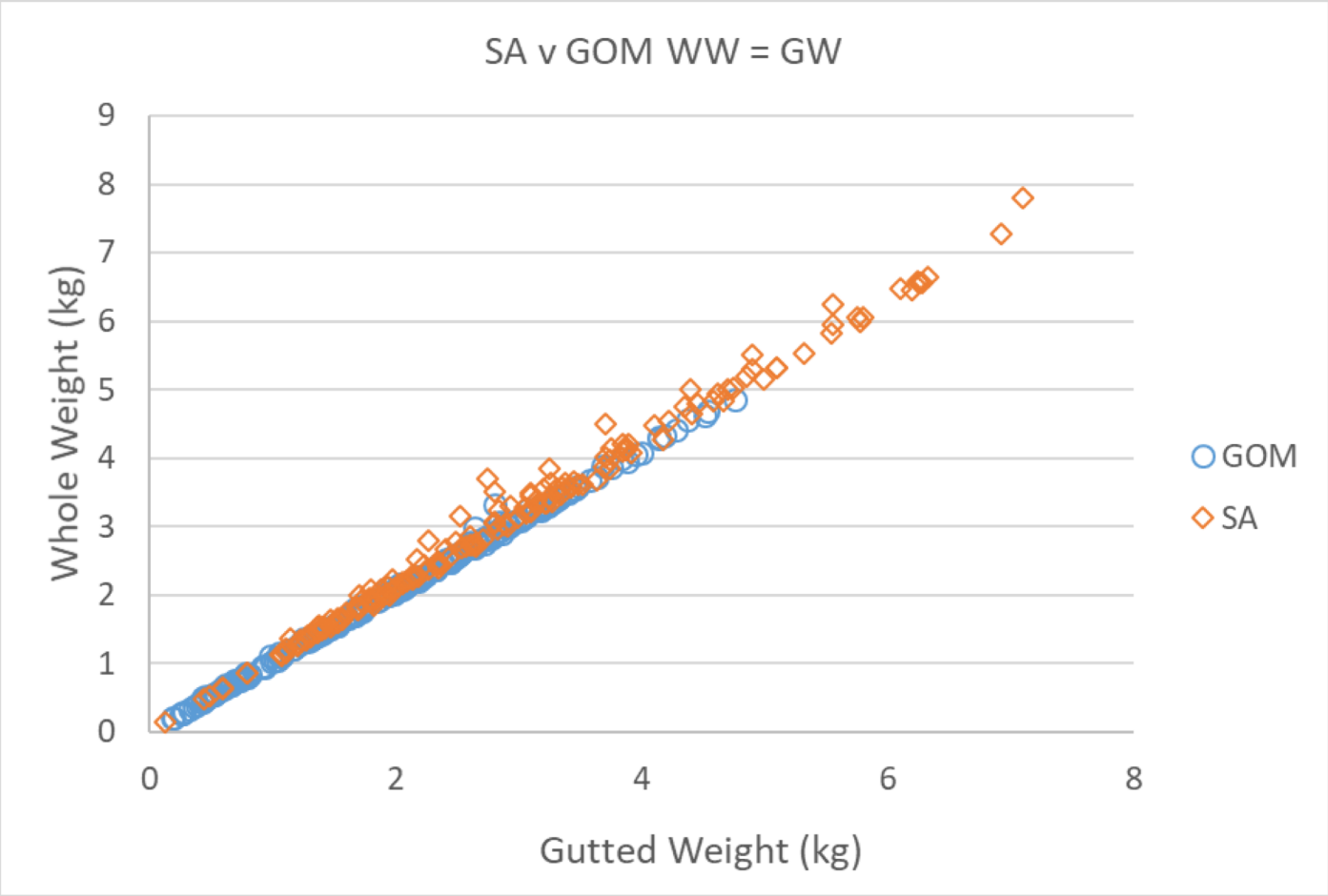
Model: $Y = a + bX$	n	Power Equation	r^2	Units	range of Independent variable
Ln(WW) = Ln(FL)	12660	$WW = 2.14E\text{-}08(FL)^{2.94}$	0.92	kg, mm	160 - 1240
Ln(FL) = Ln(WW)	12660	$FL = 417.17(WW)^{0.31}$	0.92	kg, mm	0.053 - 29.93
Ln(WW) = Ln(TL)	3059	$WW = 2.16E\text{-}08(TL)^{2.90}$	0.92	kg, mm	167 - 1176
Ln(TL) = Ln(WW)	3059	$TL = 447.87(WW)^{0.32}$	0.92	kg, mm	0.053 - 16.82
Ln(WW) = Ln(maxTL)	1972	$WW = 2.27E\text{-}08(maxTL)^{2.88}$	0.96	kg, mm	230 - 1001
Ln(maxTL) = Ln(WW)	1972	$maxTL = 455.54(WW)^{0.33}$	0.96	kg, mm	0.13 - 10.14
Ln(WW) = Ln(SL)	2092	$WW = 4.40E\text{-}08(SL)^{2.89}$	0.97	kg, mm	177 - 798
Ln(SL) = Ln(WW)	2092	$SL = 354.74(WW)^{0.33}$	0.97	kg, mm	0.13 - 10.14

Meristics data: South Atlantic and Gulf of Mexico

- Working group recommendation: Recommend using length-length and weight-Length Meristic conversions as presented

- ADT Recommendation:

South Atlantic and Gulf of Mexico
Whole Weight = Gutted Weight No intercept Relation



AREA	Slope	r^2
ALL N = 396	1.05	0.9987
SA N = 171	1.07	0.9985
GOM N = 225	1.03	0.9997

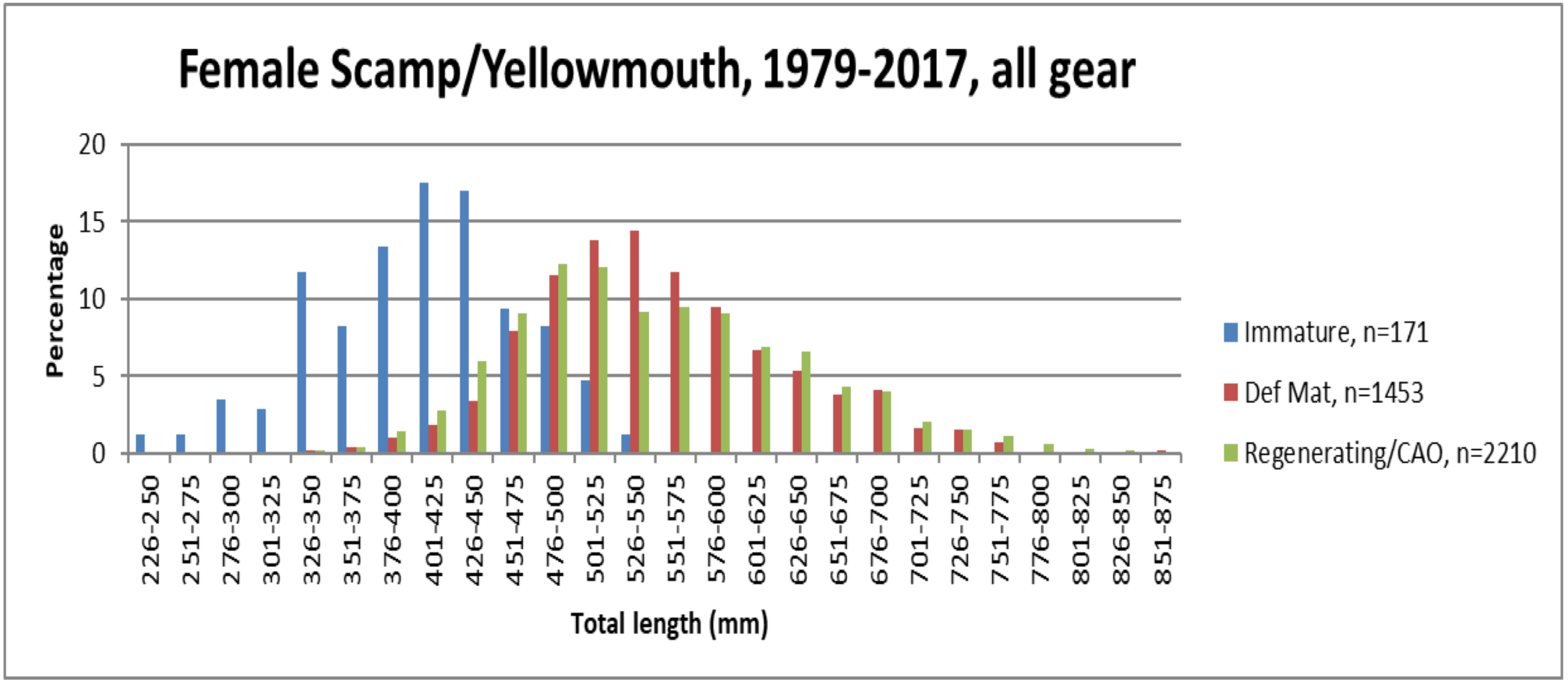
Meristics data: South Atlantic and Gulf of Mexico

- Whole Weight = Gutted Weight
  - SA - primarily fishery-independent data (few fishery-dependent)
  - GOM - fishery-dependent data
  - It's likely the fishery independent study was more thorough in extracting all of the guts, whereas fishery dependent likely left some remnants
  - Small sample sizes from both regions and SA had wider range of values.
  - **Working Group Recommend combining data to have one Whole Weight-Gutted Weight Conversion**
- **ADT Recommendation:**

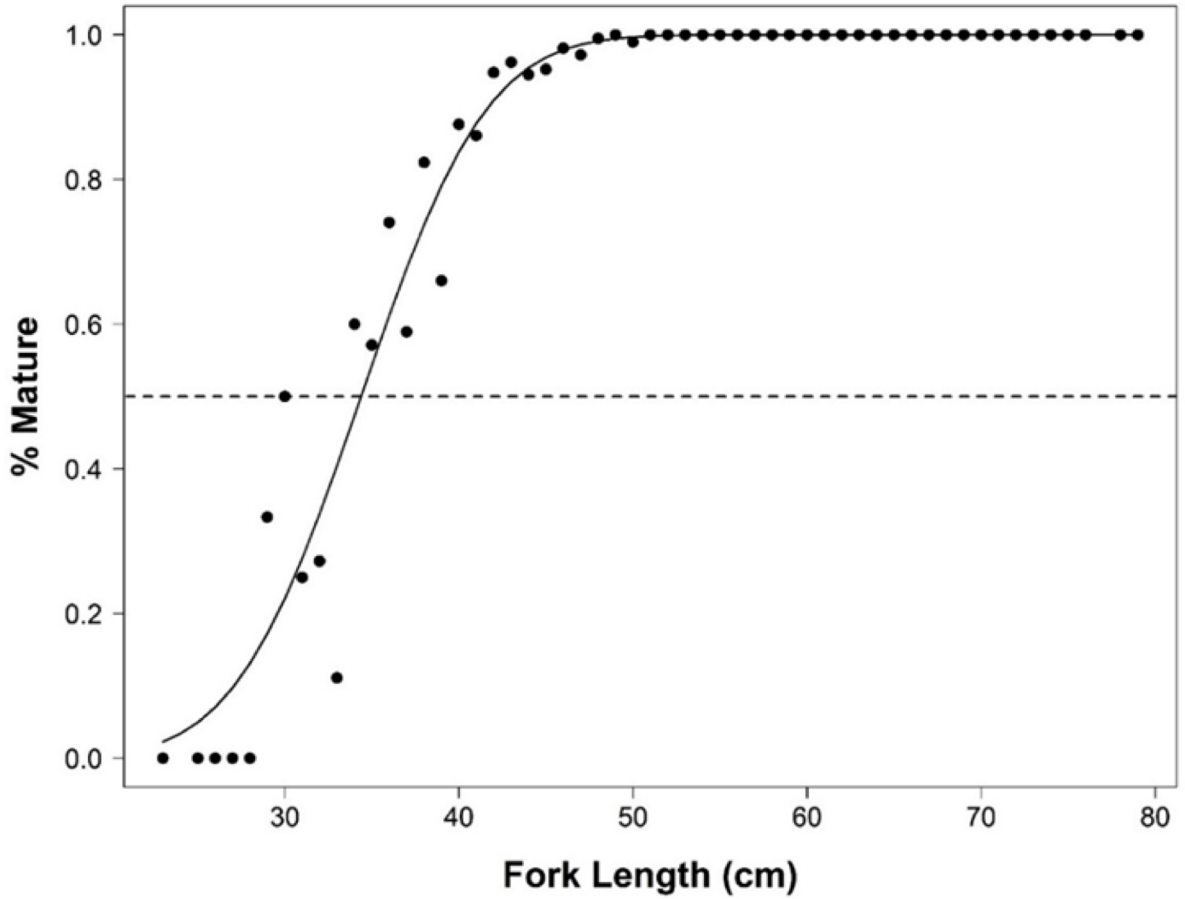
SA Scamp/Yellowmouth – Reproductive parameters

- Results presented in SEDAR68-DW-05
- Scamp (n=4,517) and Yellowmouth (n=27) with age and histological data
- Collection date: 1979-2017
- Sample composition
  - Fishery-independent (52%), fishery-dependent (41%)
  - Snapper reel (50%), chevron trap (40%)

Histology QA/QC – S. Atlantic

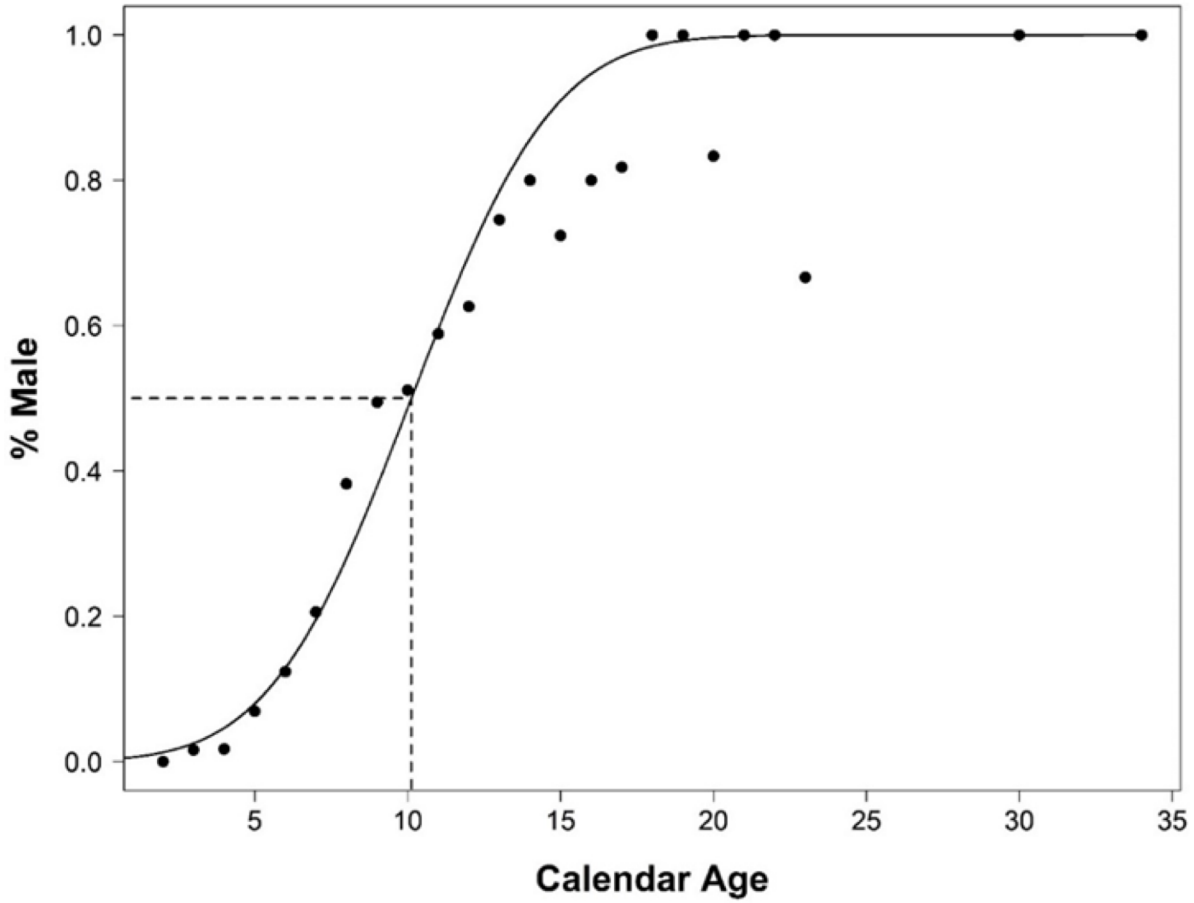


Scamp/Yellowmouth – size at maturity, S. Atlantic



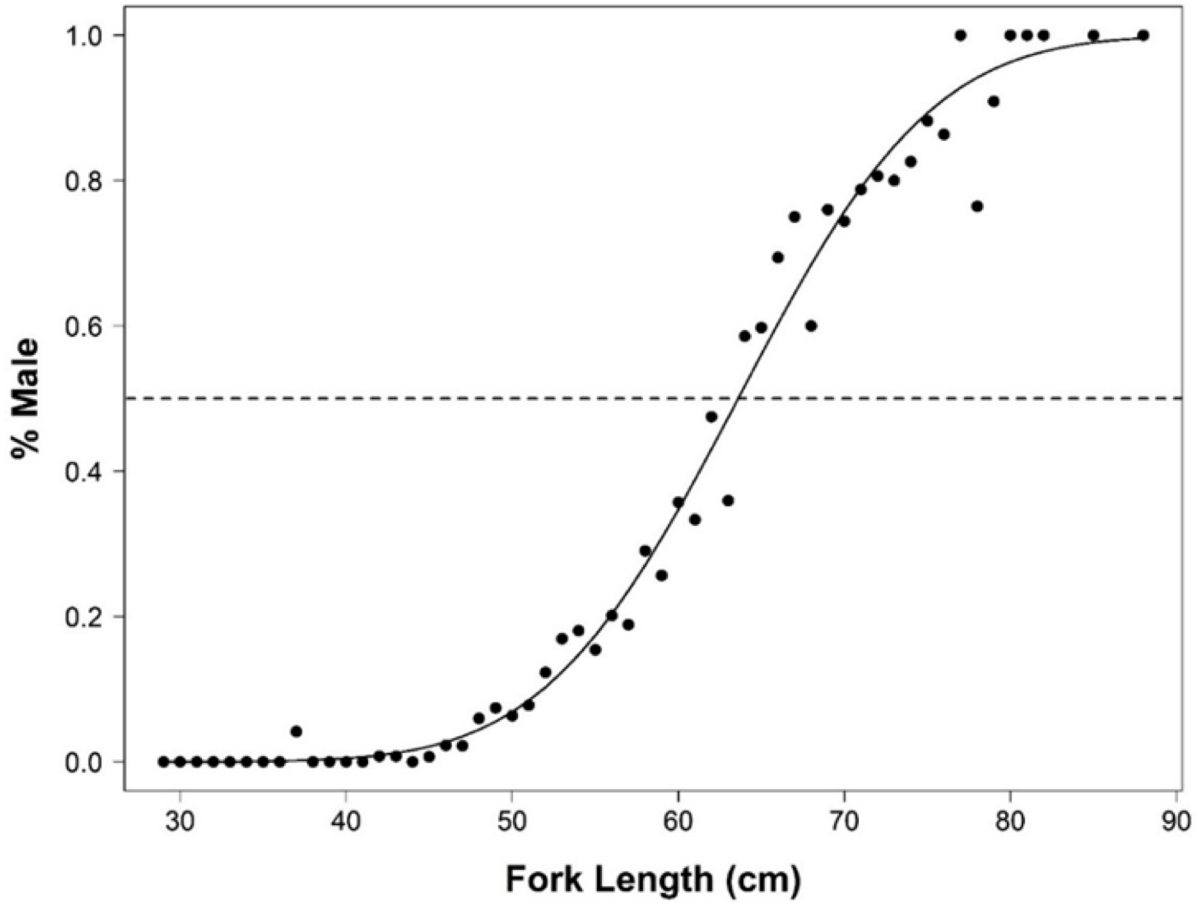
Distribution	N	L_{50} (mm)			Estimate	Std. Error	z value	Pr(>|z|)
Probit	3673	343.8		**(Intercept)**	-6.03989	0.437489	-13.81	<2e-16
				Fork Length	0.017569	0.001052	16.71	<2e-16

Scamp/Yellowmouth – age at sex transition, S. Atlantic



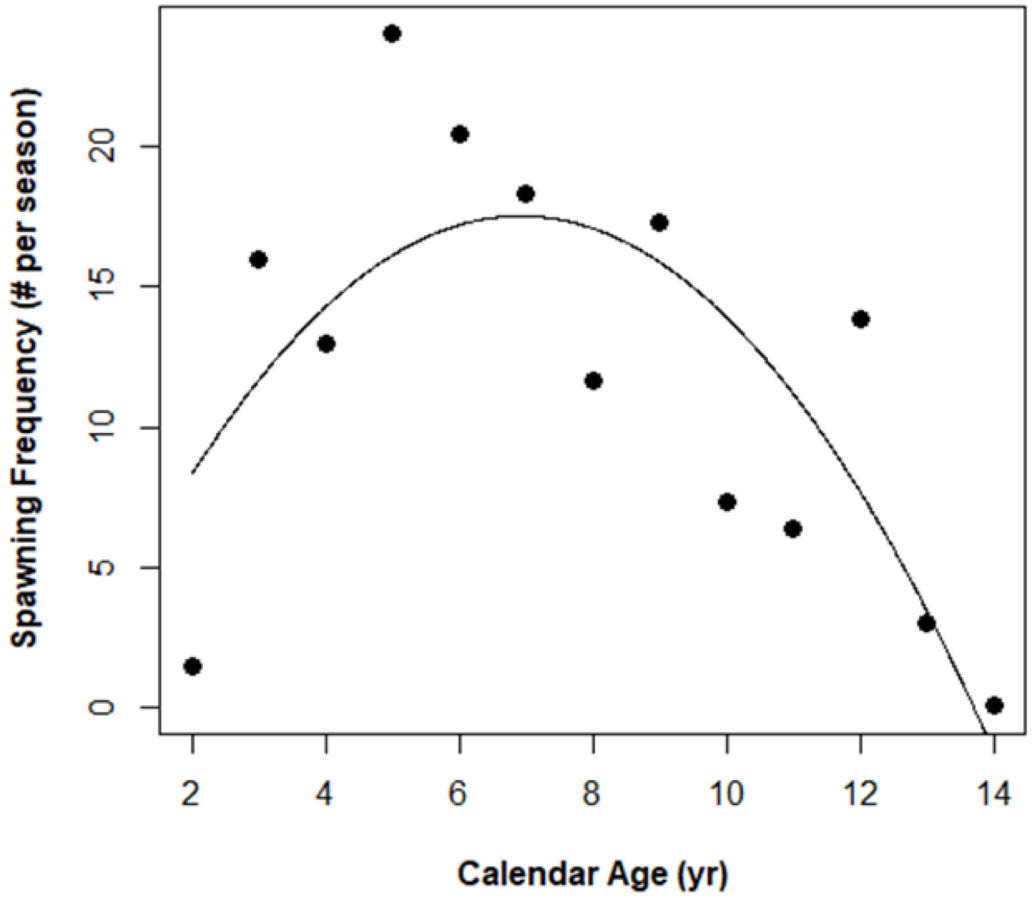
Distribution	N	A_{50} (yr)			Estimate	Std. Error	z value	Pr(>|z|)
Probit	**4246**	**10.1**		**(Intercept)**	**-2.77816**	**0.0744**	**-37.34**	**<2e-16**
				CalAge	**0.274544**	**0.009681**	**28.36**	**<2e-16**

Scamp/Yellowmouth – size at sex transition, S. Atlantic



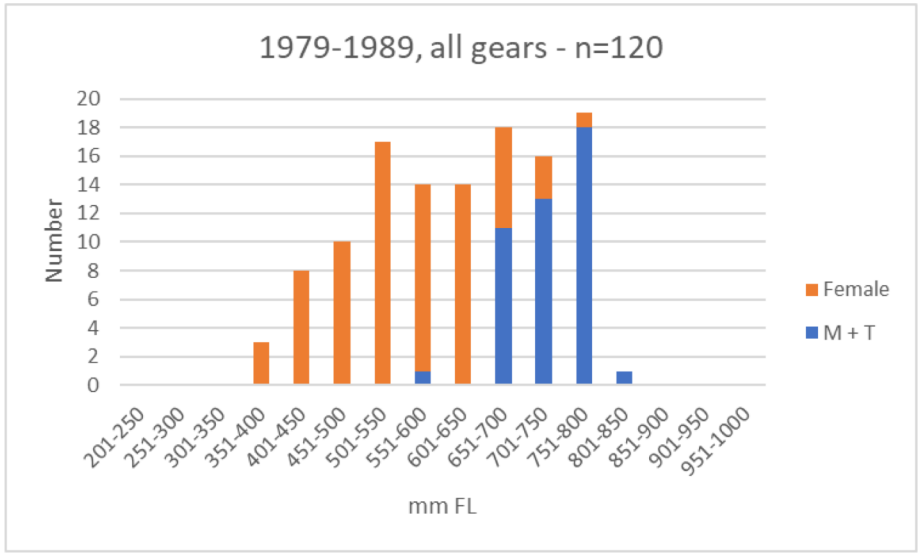
Distribution	N	L_{50} (mm)			Estimate	Std. Error	z value	Pr(>|z|)
Probit	4467	635.9		**(Intercept)**	-6.9406	0.195063	-35.58	<2e-16
				Fork Length	0.010914	0.000335	32.62	<2e-16

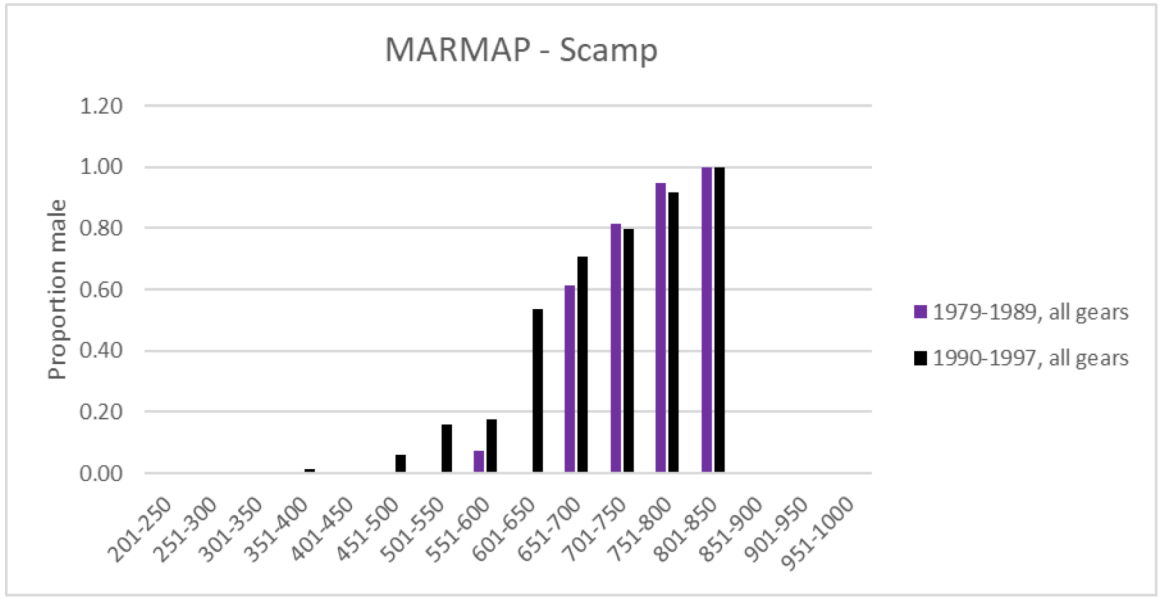
Scamp/Yellowmouth – spawning frequency, S. Atlantic

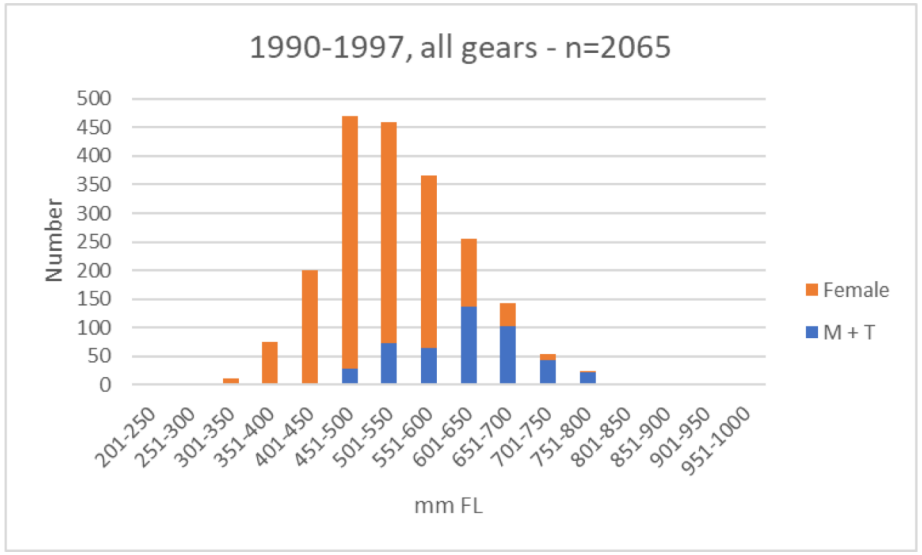


- N = 2,193
- No Age 1 females were adult, and ages 14-23 were pooled. Predicted value of SF for age 14+ was negative (-1.56), therefore observed value was provided.
- Second-order polynomial regression model
- $y = -0.694 + 5.269x - 0.381x^2$
- $R^2 = 0.516$, $p = 0.011$

Sex ratio – Harris et al. (2002)

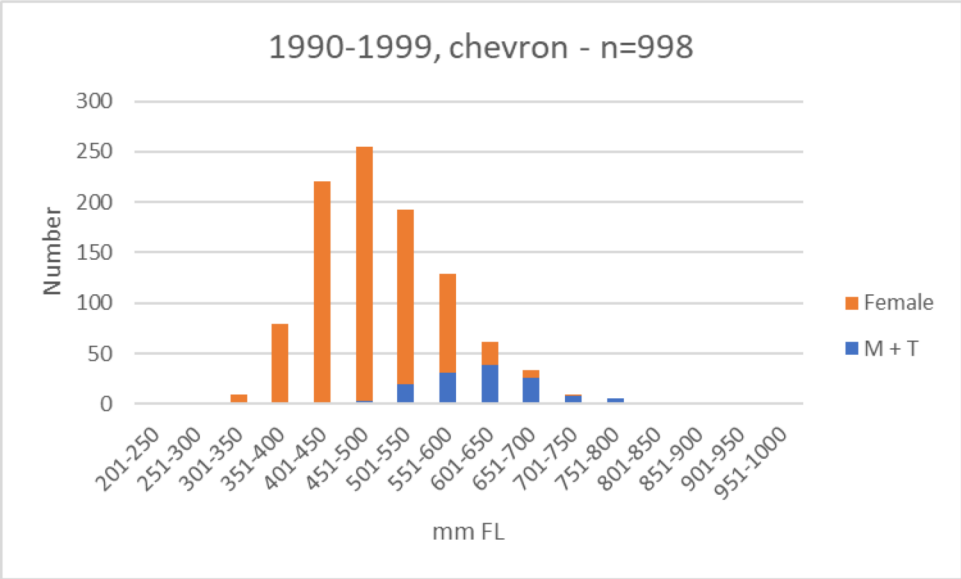


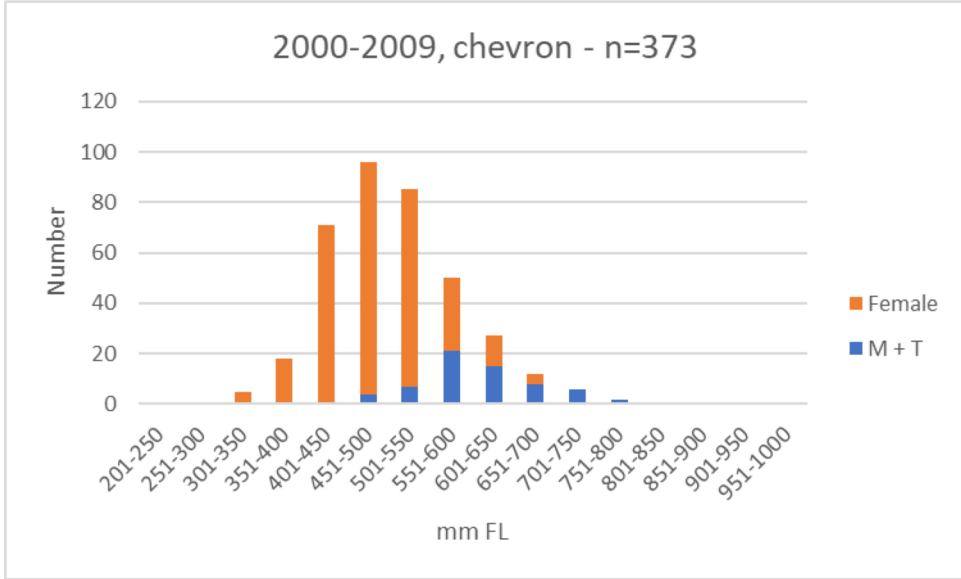


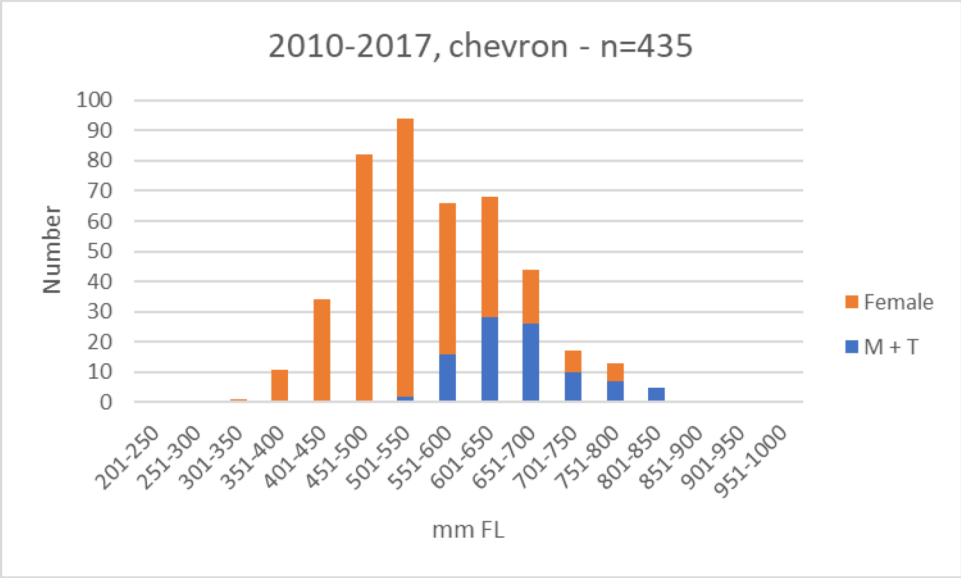


Proportion male
1980s: 0.37
1990s: 0.23

Sex ratio – SERFS chevron trap

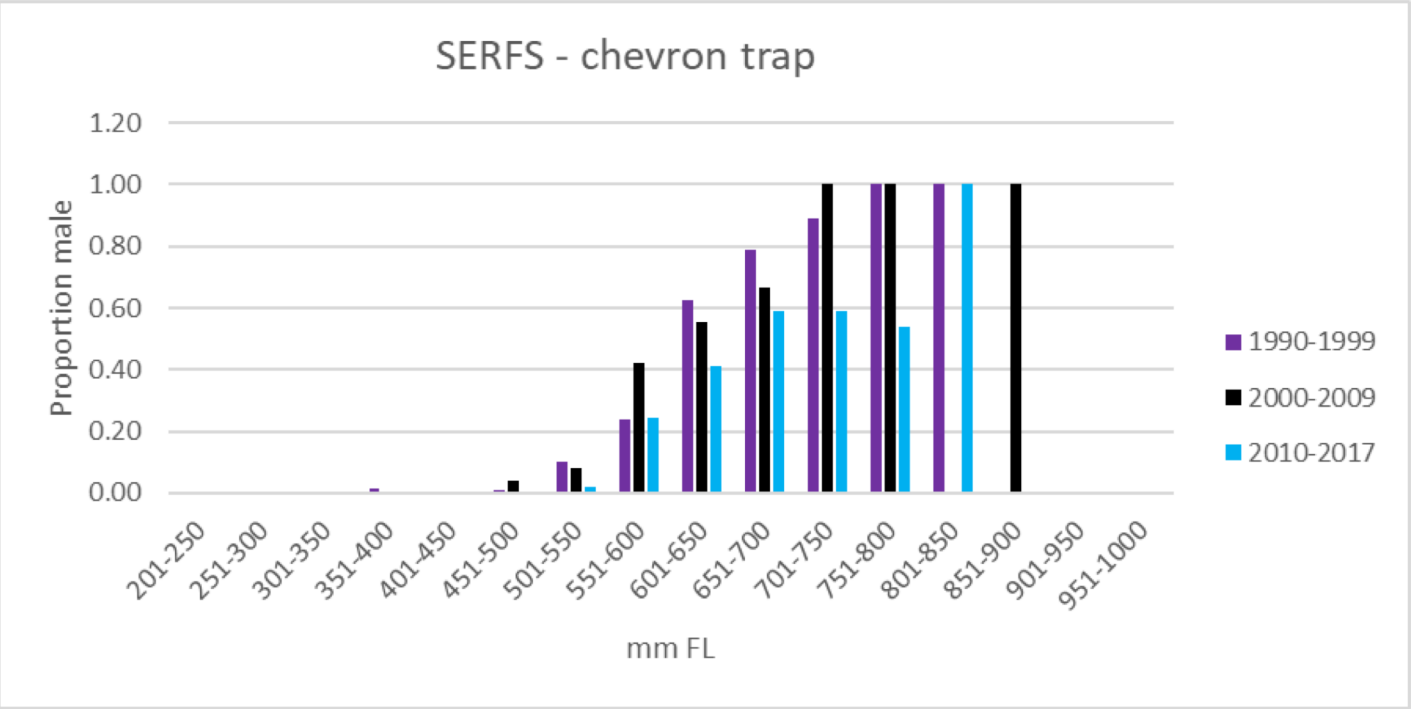






Proportion male
1990s: 0.13
2000s: 0.17
2010s: 0.22

Sex ratio – SERFS chevron trap



- 2010s - Only period with evidence of change (decrease) in prop. male within length interval
    - Further spatial analysis to be done

* No conclusive evidence of sperm limitation

Reproduction: South Atlantic

- Recommendations to Panel: Recommend SA reproduction as presented
  - Size at 50% Maturity (343.8 mm FL):
  - Age at 50% Sex Transition (10.1 years):
  - Size at 50% Sex Transition (635.9 mm):
  - Spawning Frequency (highest at calendar age 6-8):
  - Sperm Limitation: No conclusive evidence to be sperm limited

Still to review: Batch Fecundity, Age at 50% Maturity

- ADT Recommendation:

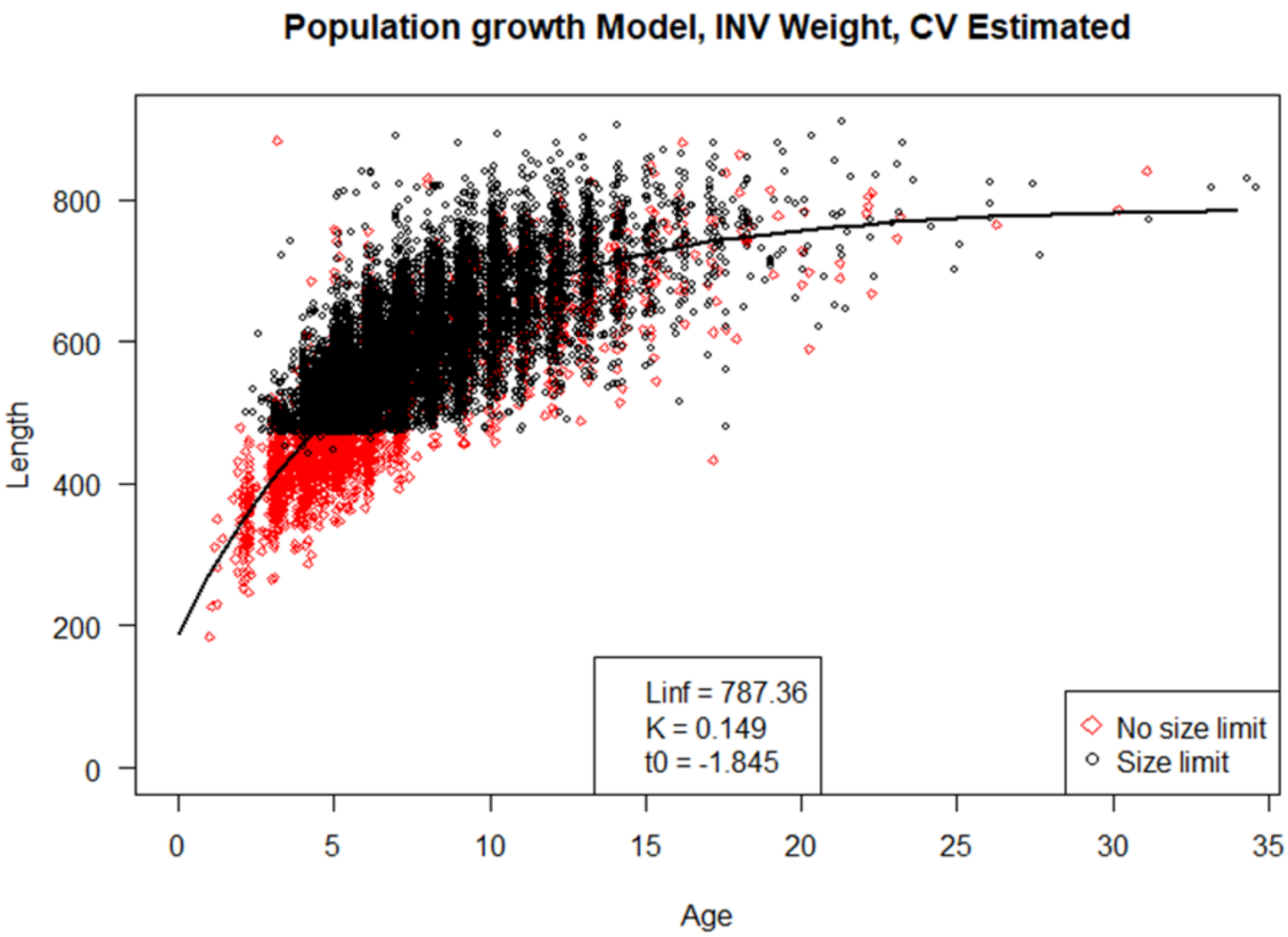
Growth Models: South Atlantic

- Models provided: Population, Fisheries, Pre92 and Post92 fisheries, and female only
- Fixing t_0 and a range of profiles on population model
- One Ageing error Matrix for both regions will be provided for assessment workshop

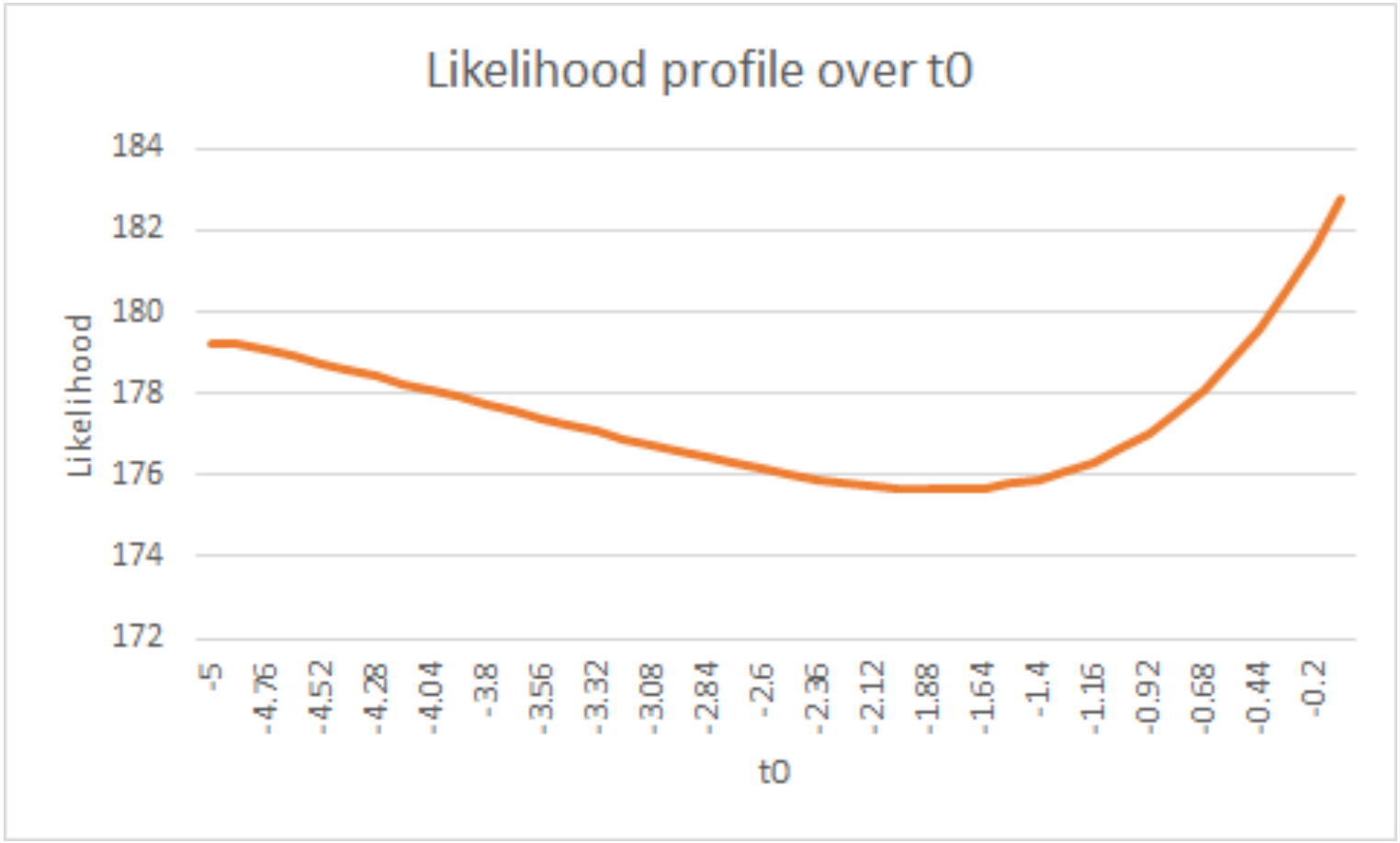
Growth Models: South Atlantic-Overview

	Linf	K	t0	C.V.
Population model (n= 16778)	787.36 ± 26.35	0.149 ± 0.027	-1.845 ± 0.711	0.1 ± 2.6815e-005
Fisheries model (n= 13811)	906.26 ± 15.81	0.0805 ± 0.00402	-5.56 ± 0.258	0.095 ± 5.7927e-004
Fisheries Pre 1992 model (n= 121)	743.52 ± 68.89	0.174 ± 0.0499	-0.817 ± 0.727	0.149 ± 9.7876e-003
Fisheries Post 1992 model (n= 13690)	819.06 ± 17.48	0.076 ± 0.0042	-5.19 ± 0.288	0.1 ± 7.1679e-008
Females only model (n= 3568)	761.51 ± 79.21	0.128 ± 0.051	-2.53 ± 1.42	0.118 ± 0.0199

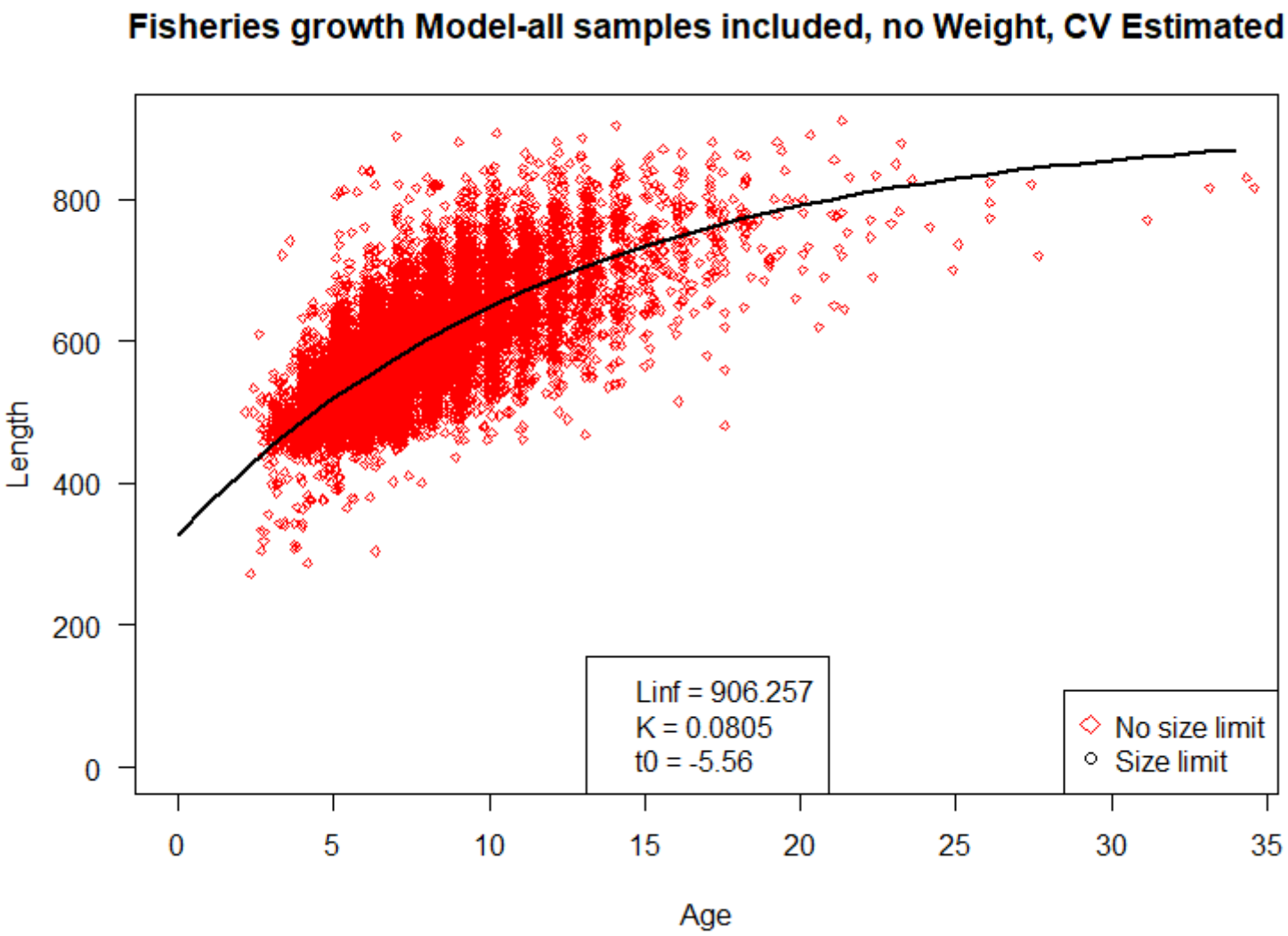
Growth Models: South Atlantic-Population Model



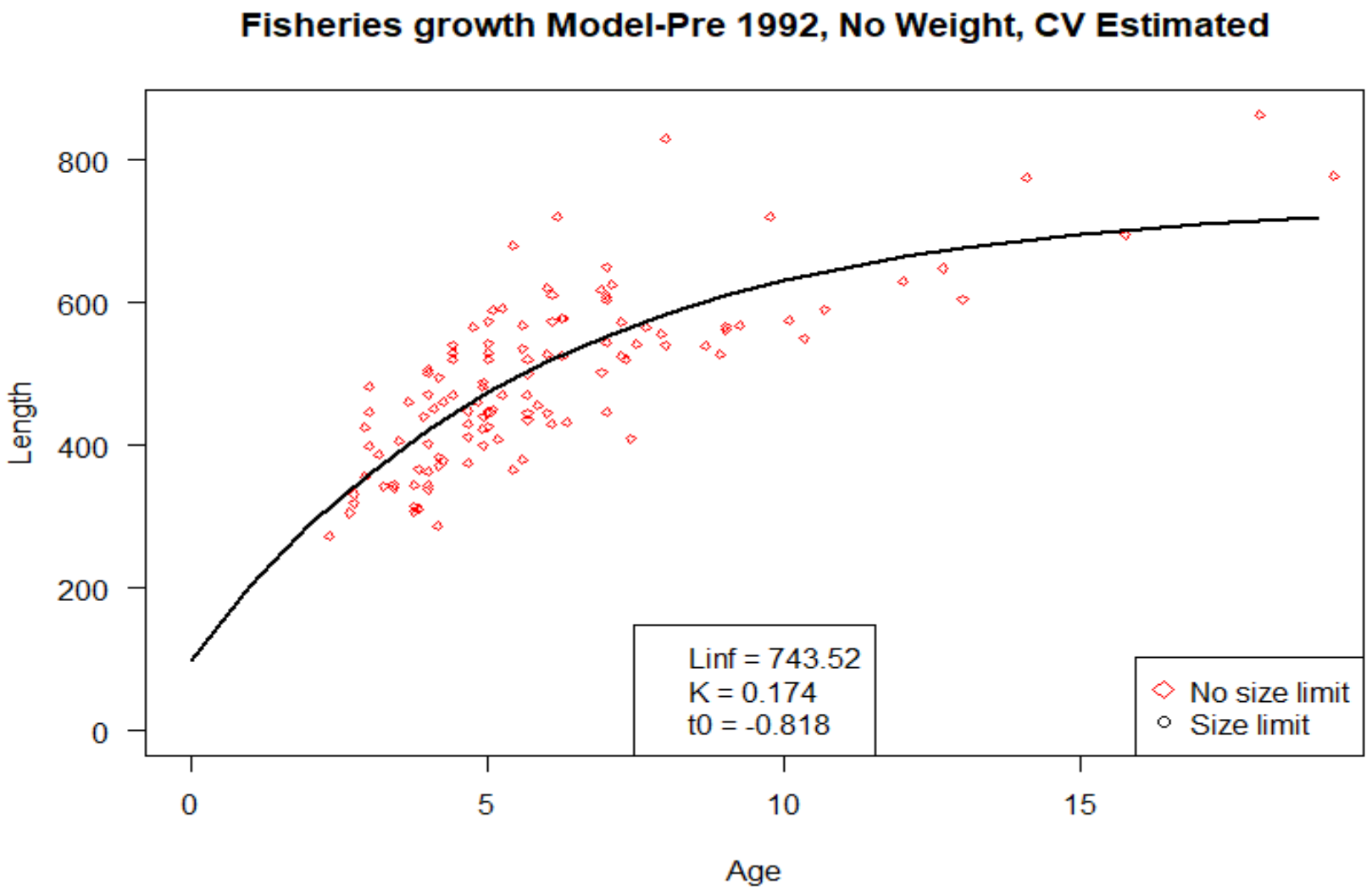
Population growth curve, model estimate is -1.84, which is the minimum of the likelihood.



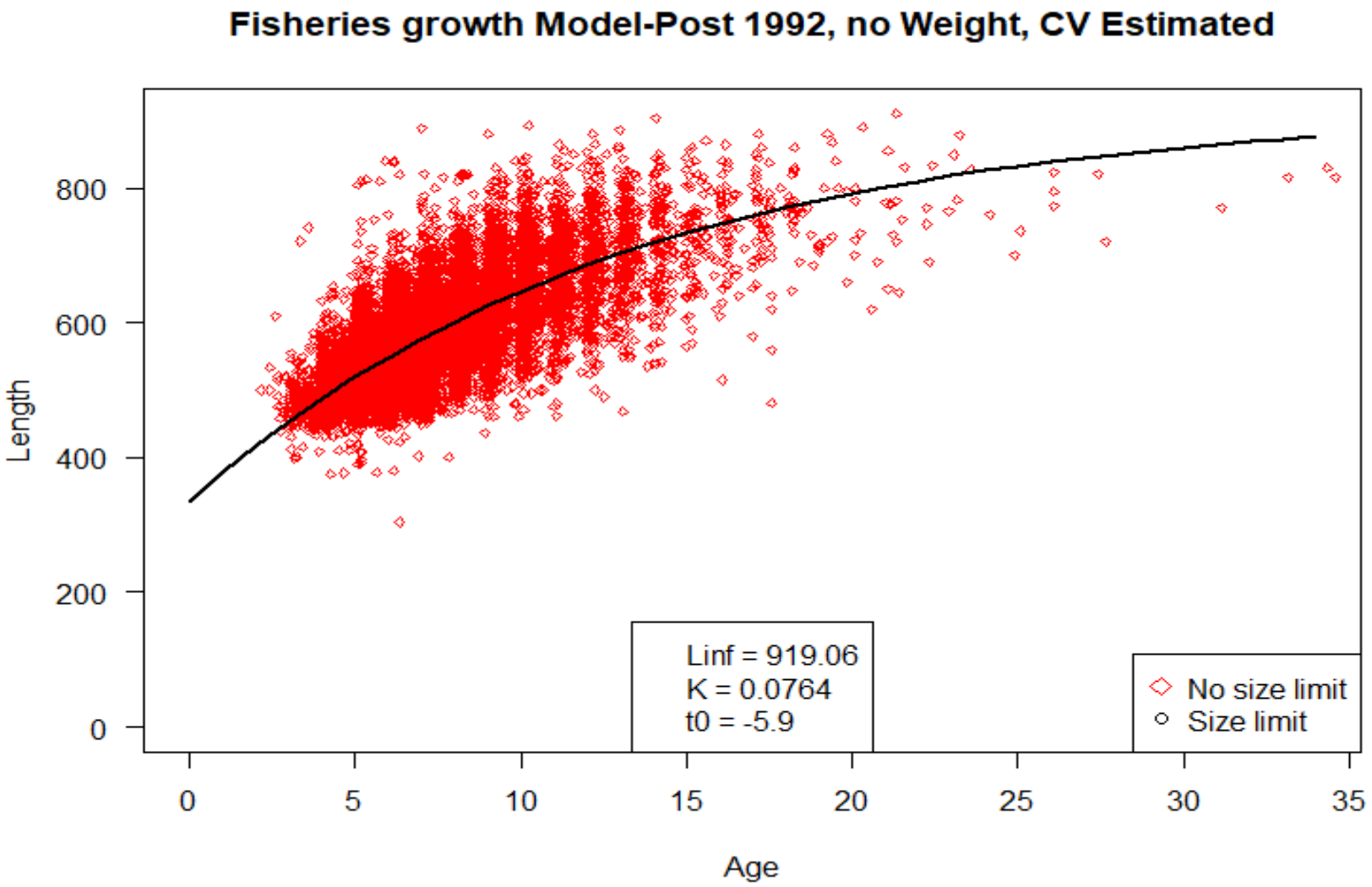
Growth Models: South Atlantic-Fisheries model



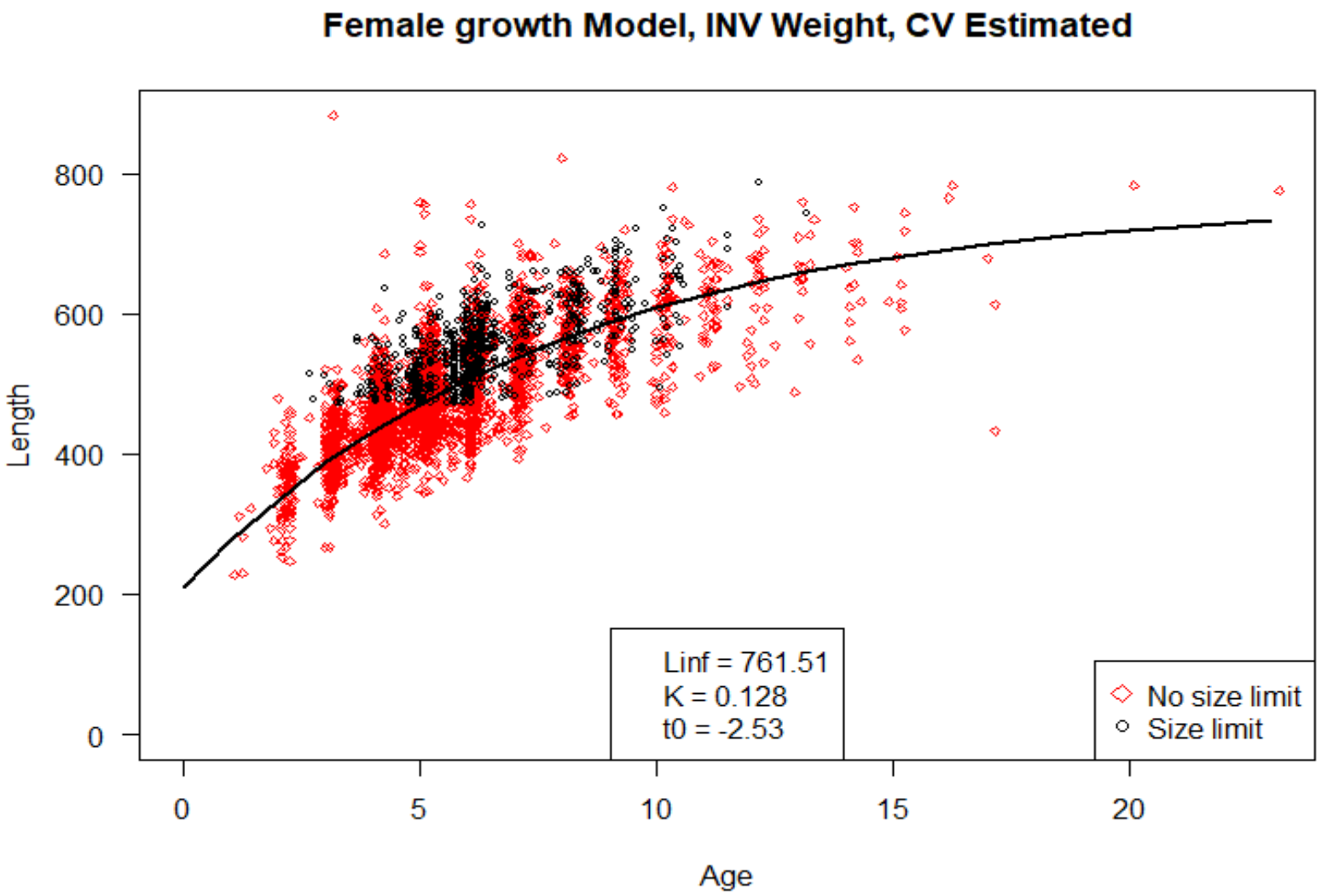
Growth Models: South Atlantic-Pre 1992



Growth Models: South Atlantic-Post 1992



Growth Models: South Atlantic-Females



Growth Models: South Atlantic

- LHG Recommendations: Recommend these as the best growth models for categories requested for South Atlantic

- ADT Recommendation:

To present at next Plenary

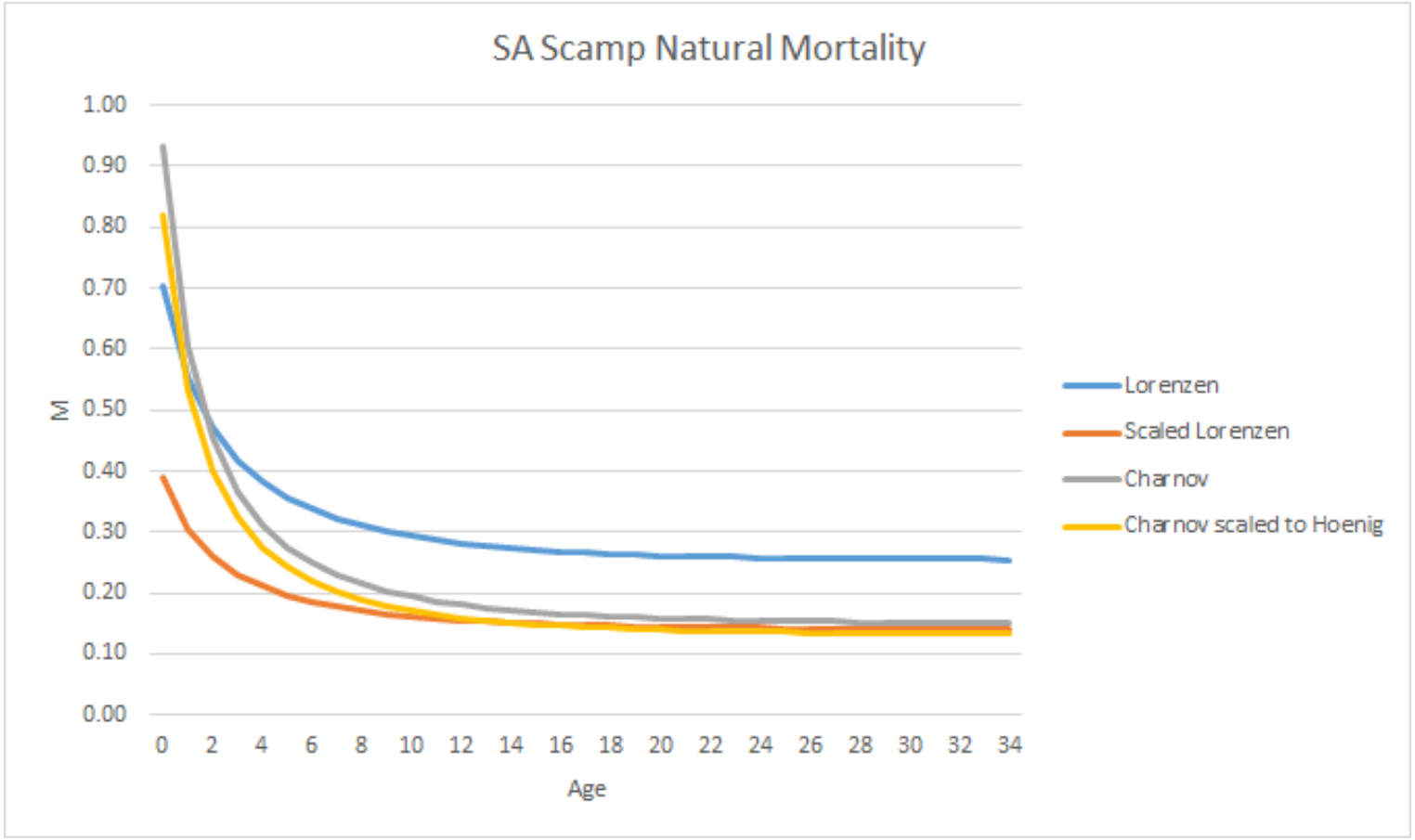
1. Reproduction
    1. South Atlantic- Age at maturity, Batch Fecundity
    2. Gulf of Mexico
2. Growth Models
    1. Gulf Of Mexico
3. Natural Mortality
    1. South Atlantic
    2. Gulf of Mexico
4. Research Recommendations

SA Scamp Natural Mortality

Lorenzen and Charnov scaled to Hewitt and Hoenig constant M estimate for a maximum age of 34 (0.124)

Recommended M: Charnov, due to the study including the Lorenzen data, and the issue with the weight at age limitation.

To discuss: whether to scale Charnov



Natural Mortality

- LHG Recommendations: Charnov scaled to Hewitt and Hoenig constant M estimate for a maximum age of 34 (0.124)

- ADT Recommendations: