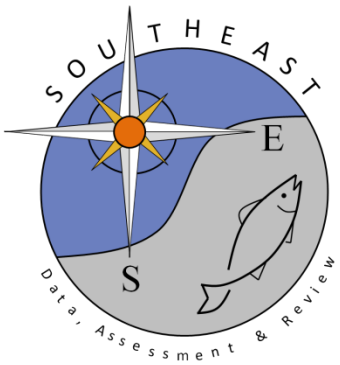
Summary of preliminary age, length, and reproduction data for U.S. Gulf of Mexico scamp, *Mycteroperca phenax*, submitted for SEDAR68

Veronica Beech, Laura Thornton, Beverly Barnett

SEDAR68-DW-20

3 March 2020



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March 2, 2020

Introduction

This report documents preliminary data provided by the National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center, Panama City Laboratory for U.S. Gulf of Mexico (GOM) scamp, *Mycteroperca phenax*, SEDAR68. This is a brief summary of the age and length data for GOM submitted for 2020 SEDAR68 Research Track assessment by data provider, year, mode and gear, sampling program, and state landed. Reproductive data are provided for the GOM by source and gear, histological sex by fork length (FL mm) and age, female maturity assigned by FL mm, and female spawning by age.

Methods

Age and Growth Samples

Age and length data (N = 48,817) were provided for scamp by the NMFS, Southeast Fisheries Science Center, Panama City Laboratory for 2020 SEDAR68 Research Track assessment for the GOM. Age and length data were exported from the Age, Growth, and Reproduction database and from the Biological Sampling Database (Tables 1, 2). Data were submitted using the SEDAR Best Practices Template (SEDAR 2015). The submitted data were accompanied with a metadata description (see Appendix).

Reproduction Samples

Histological data (N = 4,103) were provided by the NMFS, Panama City Laboratory for reproductive samples collected from the U.S. Gulf of Mexico from 1972 to 2017 (Figure 1). Recently, histological reading methodology has changed to adapt to standardized methods, which now include reproductive phases described in Brown-Peterson et al. 2011. Female age (A50) and size (L50) at maturity were determined by retaining records from January and June. A50 and L50 were also analyzed for fish collected during all months for comparison. Females with oocytes in the cortical alveolar (CA) stage and all stages past the CA stage were scored mature (Brown-Peterson et al. 2011). Regenerating individuals with strong indicators of prior spawning were included in the mature category. If maturity could not be clearly discerned, maturity was not assigned and not included in the A50 and L50 analyses. Logistic functions were fit in Microsoft EXCEL using XLSTAT software.

Results and Discussion

There were 11,469 otoliths aged for 2020 SEDAR68 for years 1972 through 2017, where Stock ID was assigned as Gulf of Mexico (Table 3). All ages were provided by the NMFS, Panama City Laboratory. The majority of the age-length data (84.9%) were intercepted by the commercial fishery and sampled by the Trip Interview Program port agents (Tables 4, 5). The majority of scamp (84.4%) were landed in Florida (Table 6). Ages for years 2003 – 2012 were not available in time for the SEDAR68 data workshop but will be provided for the operational assessment.

Reproductive samples were collected throughout all months where 63% were female, 1% transitional, and 36% male (Figure 2). Reproductive samples were spatially segmented utilizing the NMFS Statistical Shrimp grids 1-21 (Figure 3). Histological samples were collected from fishery dependent and fishery independent sources using a variety of gear types (Table 7). Reproductive seasonality for female individuals (Figure 4) was consistent with a previous publication for the GOM

(Lombardi-Carlson et al. 2012). Actively spawning fish were observed between the months of February to June. A single individual was actively spawning in July. The smallest female with spawning markers had a fork length of 281 mm and the largest had a fork length of 833 mm. Analysis of histological sex by fork length and calendar age indicate that there were overlaps in size and age between the female, transitioning, and male individuals (Tables 8, 9; Figure 5). By age 20, all fish appear to have transitioned to males (Table 9). Tabulations are provided for female maturity at size (Table 10; Figure 6), female maturity at age (Table 11; Figure 7), and number of spawning by size (Table 12) and age (Table 13). Proportion of female by age was calculated as an A50 of 10.8 years (Figure 8).

Table 1. List of scamp age-length data provided for SEDAR68.

Data Provider Abbreviation	Data Provider Description
NMFS Panama City – AGR	National Marine Fisheries Service, Panama City Laboratory: Age, Growth and Reproduction database
NMFS Panama City – BSD	National Marine Fisheries Service, Panama City Laboratory: Biological Sampling Database

Table 2. List of scamp age and length data provided for SEDAR68, where Stock ID = Gulf of Mexico.

SEDAR	Data Provided	Terminal Year	Data Provider Abbreviation	Number of Records Submitted
SEDAR68	1972 – 1973 1977 – 1982 1986 – 2017	2017	NMFS Panama City – AGR	28,235
SEDAR68	2011 – 2017	2017	NMFS Panama City – BSD	20,582

Table 3. Number of scamp otoliths aged for SEDAR68 by year and data provider, where Stock ID = Gulf of Mexico.

Year	NMFS Panama City – AGR	NMFS Panama City – BSD	Total
1972	6		6
1973	7		7
1977	36		36
1978	23		23
1979	203		203
1980	139		139
1981	114		114
1986	29		29
1987	7		7
1988	12		12
1989	19		19
1990	3		3
1991	246		246
1992	169		169
1993	346		346
1994	232		232
1995	201		201
1996	240		240
1997	101		101
1998	120		120
1999	169		169
2000	209		209
2001	1,127		1,127
2002	1,685		1,685
2013	345	943	1,288
2014	211	1,070	1,281
2015	113	1,045	1,158
2016	67	999	1,066
2017	58	1,175	1,233
Total	6,237	5,232	11,469
Percent	54.4%	45.6%	100%

Table 4. Number of scamp otoliths aged for SEDAR68 by data provider, mode and gear, where Stock ID = Gulf of Mexico.

Data Provider	CM HL	CM LL	CM SP	CM TR	CM VLL	CP HL	CP SP	HB HL	PR HL	PR SP	SS HL	SS LL	SS SP	SS TR	SS UNK	TRN HL	TRN SP	TRN UNK	TOTAL
NMFS PC –AGR	2,073	2,491		2		756	1	583	29	5	99	29	7	54	1	4	3	100	6,237
NMFS PC – BSD	2,476	2,534	154		3	4		58											5,232
Total	4,549	5,025	154	2	3	760	1	641	29	5	99	29	7	54	1	7	3	100	11,469
Percent	39.7%	43.8%	1.3%	0.0%	0.0%	6.6%	0.0%	5.6%	0.3%	0.0%	0.9%	0.3%	0.1%	0.5%	0.0%	0.1%	0.0%	0.9%	100%

Table 5. Number of scamp otoliths aged for SEDAR68 by data provider and sampling program, where Stock ID = Gulf of Mexico.

Data Provider	CO-OP	FWRI	GOP	SRH	MRFSS	MSLAB	PCLAB	RECFIN	TIP	USGS	Total
NMFS PC – AGR	16	446	216	453	7	114	382	210	4,372	21	6,237
NMFS PC – BSD				17					5,215		5,232
Total	16	446	216	470	7	114	382	210	9,587	21	11,469
Percent	0.1%	3.9%	1.9%	4.1%	0.1%	1.0%	3.3%	1.8%	83.6%	0.2%	100.0%

Table 6. Number of scamp otoliths aged for SEDAR 68 by data provider and state landed, where Stock ID = Gulf of Mexico.

Data Provider	AL	FL	LA	MS	TX	UNK	Total
NMFS PC – AGR	68	5,487	494	30	157	1	6,237
NMFS PC – BSD	132	4,191	792	1	116		5,232
Total	200	9,678	1,286	31	273	1	11,469
Percent	1.7%	84.4%	11.2%	0.3%	2.4%	0.0%	100.0%

Table 7. Source of histology samples by source and gear type, where Stock ID = Gulf of Mexico.

Commercial	Hand-Line	1,692
	Long-Line	1,054
	Spear	1
	Trap	1
Recreational	Charter Party (Hand-Line)	537
	Charter Party (Spear)	1
	CharterParty (Unassigned)	1
	Headboat (Hand-line)	209
	Private (Hand-line)	22
	Private (Spear)	6
	Private (Unassigned)	15
	Tournament (Hand-line)	1
	Tournament (Spear)	1
Scientific	Hand-Line	129
	Long-Line	39
	Spear	17
	Trap	78
	Unassigned	7
Unassigned	Hand-Line	1
	Spear	1
	Unassigned	290
Total		4,103

Table 8. Histological sex by size, where Stock ID = Gulf of Mexico.

Final FL (mm)	Female	Transitional	Males	Total
150-199	2			2
200-249	17		1	18
250-299	51		1	52
300-349	90			90
350-399	331	1	6	338
400-449	429	8	34	471
450-499	479	12	101	592
500-549	439	10	240	689
550-599	262	8	346	616
600-649	93	3	296	392
650-699	28		115	143
700-749	11		62	73
750-799	4		10	14
800-849	2		8	10
850-899	1		1	2
Totals	2,239	42	1221	3,502

Table 9. Histological sex by age, where Stock ID = Gulf of Mexico.

Calendar Age	Female	Transitional	Male	Grand Total
1	4			4
2	41			41
3	124		2	126
4	119	4	7	130
5	155	3	20	178
6	165	3	43	211
7	114	2	34	150
8	116		59	175
9	119	2	70	191
10	111	1	86	198
11	84	4	72	160
12	54	1	87	142
13	33	1	57	91
14	20	1	45	66
15	7	1	33	41
16	1		29	30
17	7		15	22
18	1		10	11
19	2		5	7
20			6	6
21			8	8
22			3	3
23			3	3
24			1	1
25			1	1
28			1	1
29			1	1
30			1	1
Total	1,277	23	699	1,999

Table 10. Female maturity assigned by size, where Stock ID = Gulf of Mexico.

Final FL mm	0	1	Total
150-199	1		1
200-249	12	4	16
250-299	36	15	51
300-349	55	32	87
350-399	154	169	323
400-449	54	370	424
450-499	9	467	476
500-549	2	437	439
550-599	2	259	261
600-649		93	93
650-699		28	28
700-749		9	9
750-799		4	4
800-849		2	2
850-899		1	1
Total	325	1,890	2,215

Table 11. Female maturity assigned by age, where Stock ID = Gulf of Mexico.

Calendar Age	0	1	Total
1	4		4
2	31	9	40
3	79	43	122
4	44	71	115
5	23	127	150
6	8	157	165
7	3	110	113
8	2	114	116
9		117	117
10	1	110	111
11		84	84
12		54	54
13		33	33
14		20	20
15		7	7
16		1	1
17		7	7
18		1	1
19		2	2
Total	195	1,067	1,262

Table 12. Female spawning by size (females with and without spawning markers), where Stock ID = Gulf of Mexico.

Final FL (mm)	No	Yes	Total
200-249	5		5
250-299	10	1	11
300-349	18	4	22
350-399	88	30	118
400-449	158	81	239
450-499	185	123	308
500-549	172	117	289
550-599	96	59	155
600-649	31	34	65
650-699	10	9	19
700-749	4	2	6
750-799	4		4
800-849		2	2
850-899	1		1
Total	782	462	1,244

Table 13. Female spawning by age (females with and without spawning markers), where Stock ID = Gulf of Mexico.

Calendar Age	No	Yes	Total
2	4		4
3	19	10	29
4	30	17	47
5	46	33	79
6	68	41	109
7	36	32	68
8	42	30	72
9	42	33	75
10	44	27	71
11	34	21	55
12	24	11	35
13	17	6	23
14	12	6	18
15	5	1	6
17	4		4
19	1	1	2
Total	428	269	697

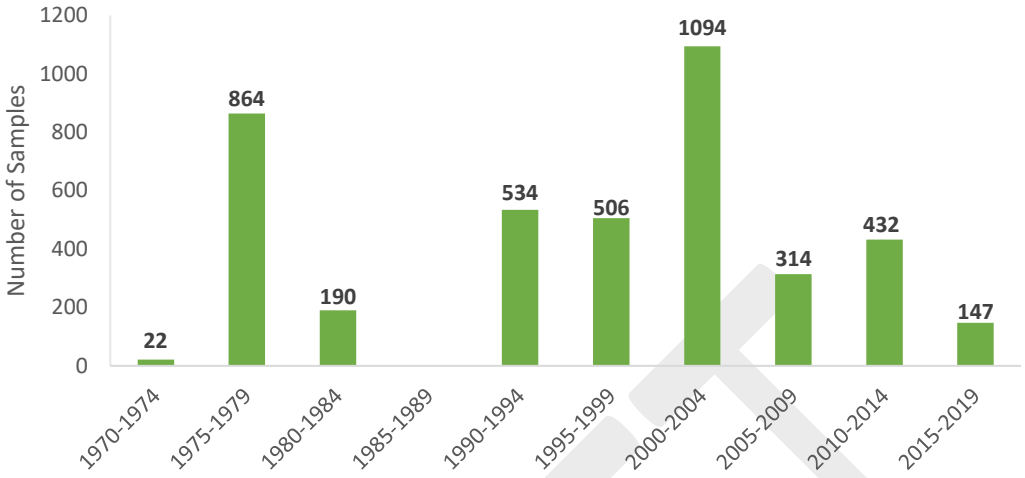


Figure 1. Histological samples by year.

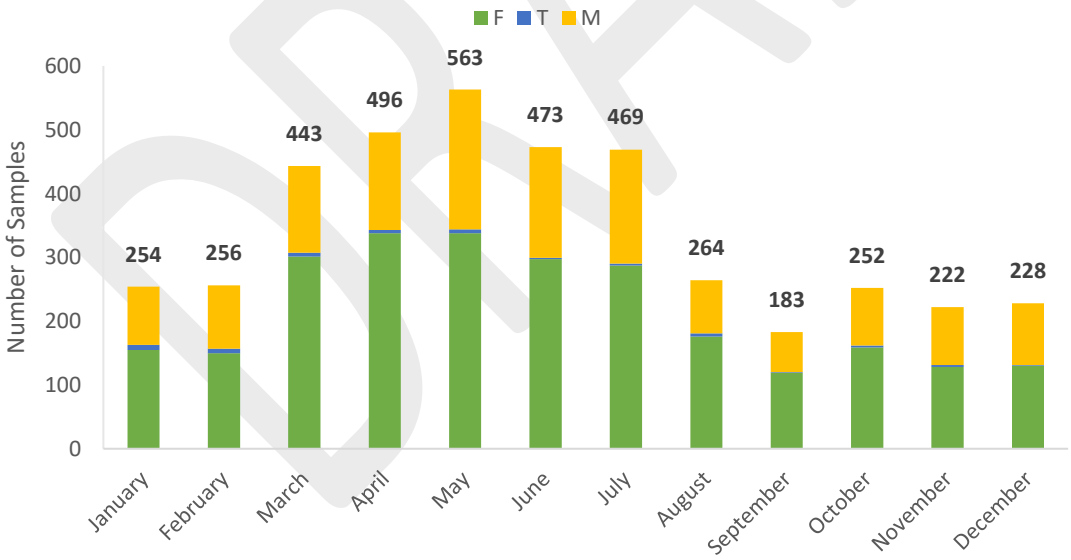


Figure 2. Histological samples by month.

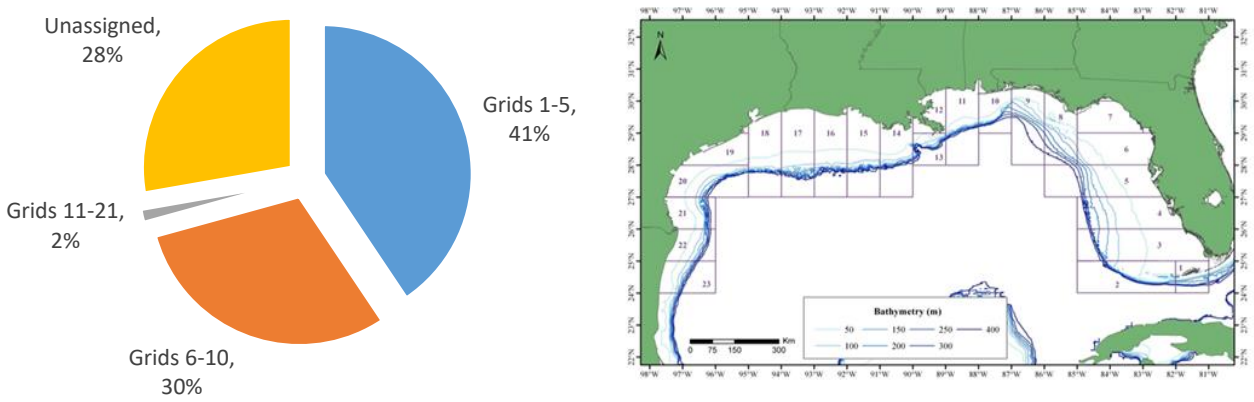


Figure 3.Histological samples by NMFS Statistical Shrimp Grid

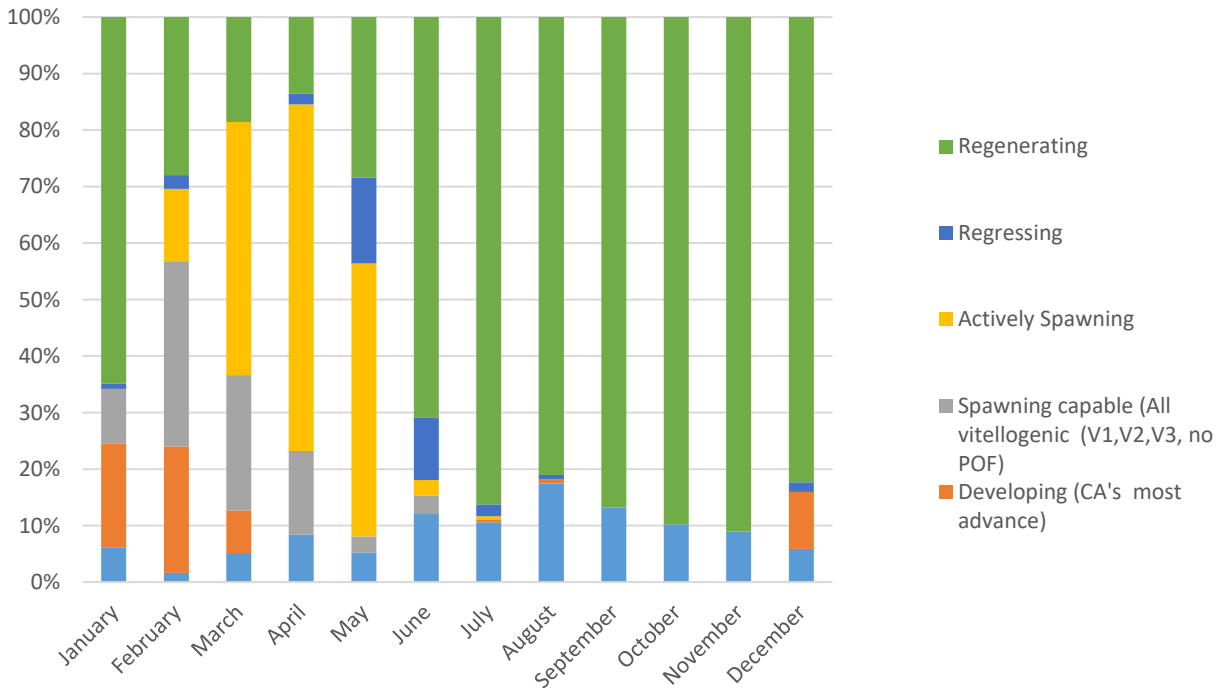
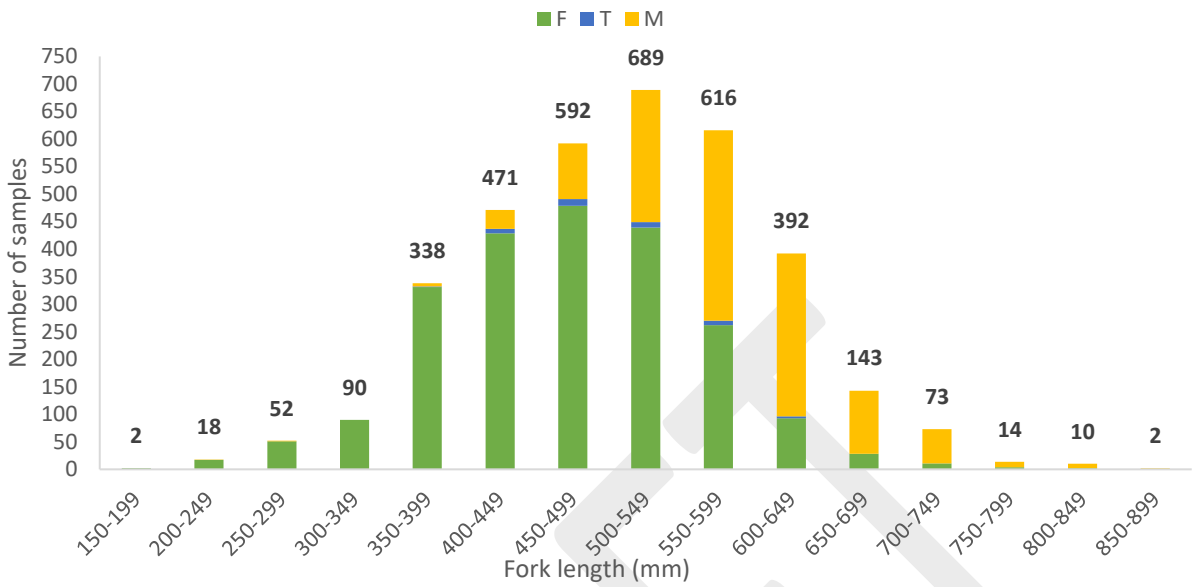


Figure 4. Seasonality of female reproductive phases, with some modifications to account for historical samples. N=1,823. Remaining samples are not included in this figure since they were read using other histological reading methods and were not comparable to the new classifications (Brown-Peterson et al. 2011).

A.



B.

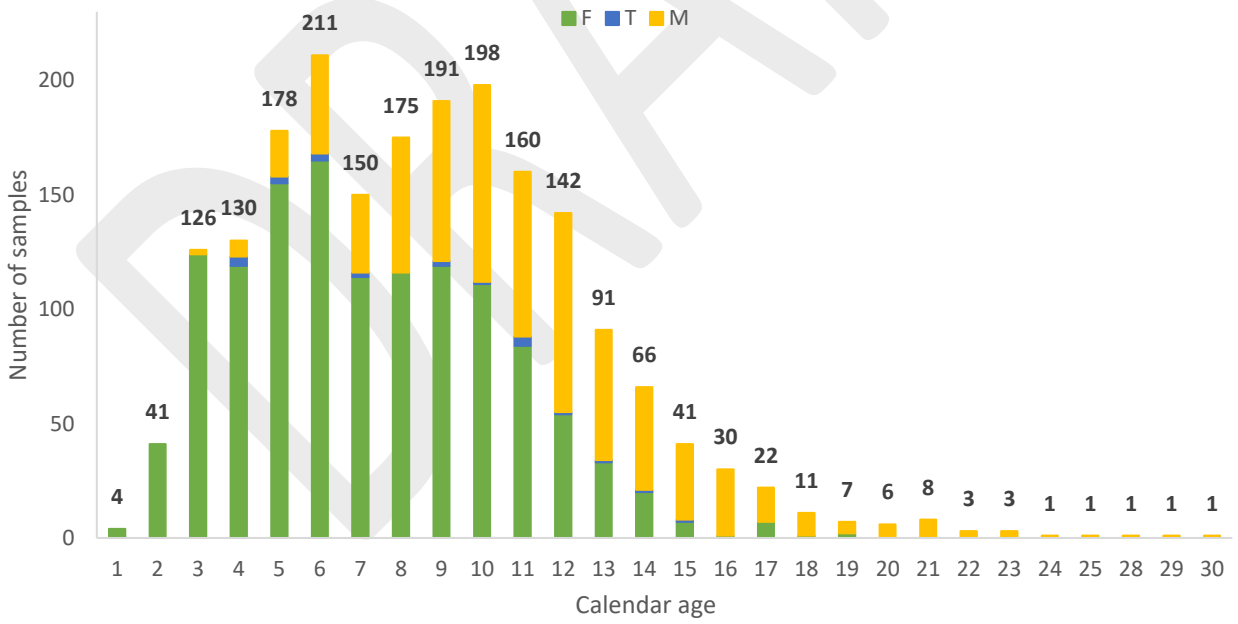
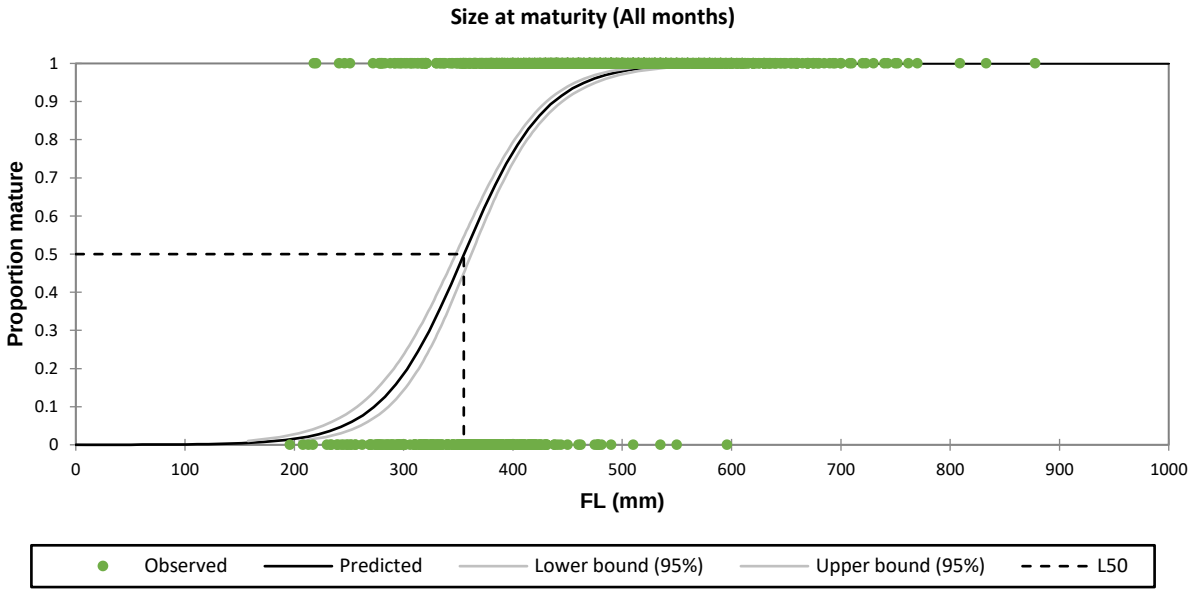


Figure 5. A) Histological sex by size (FL mm) *N* = 3,502, and B) calendar age *N* = 1,999

A.



B.

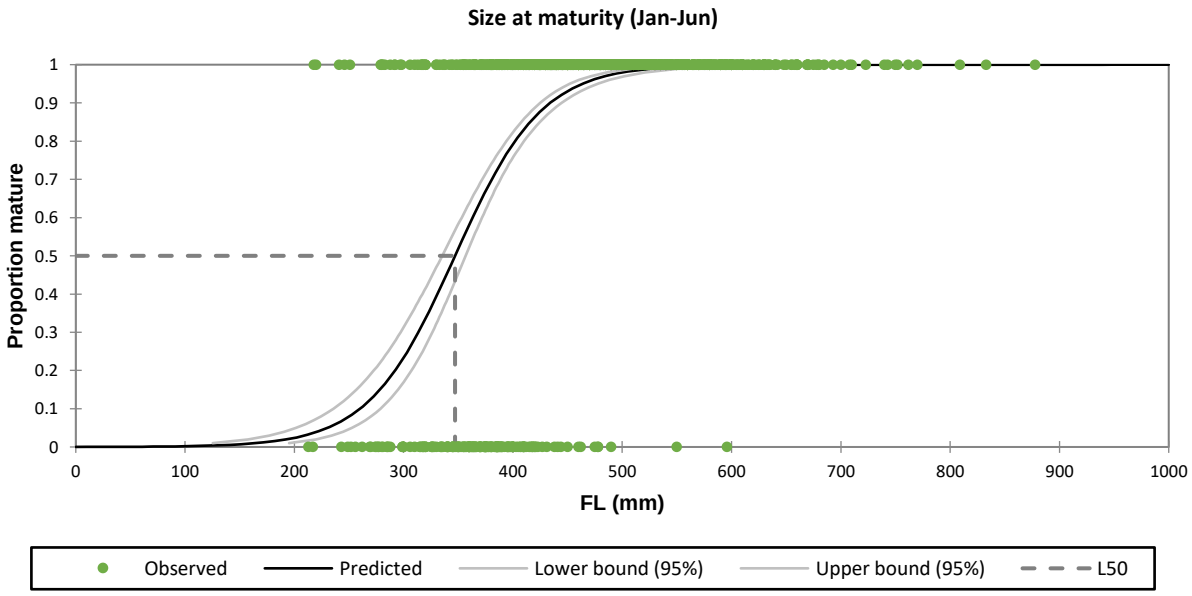
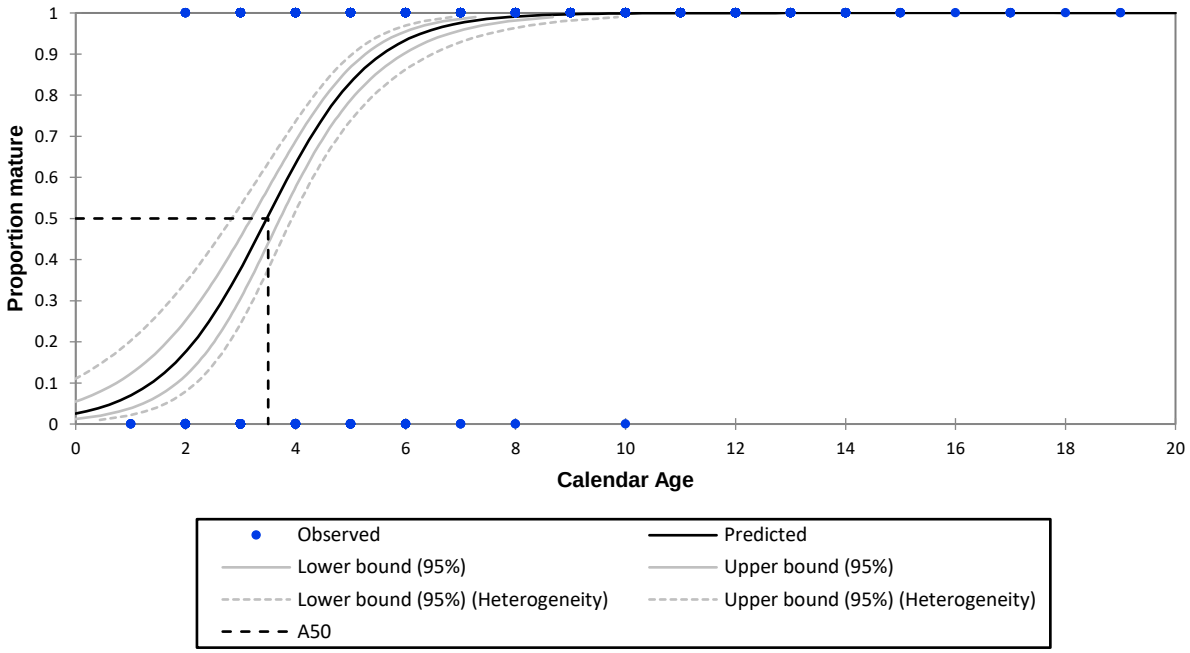


Figure 6. A) Female L50 for samples collected throughout all months (L50=355 FL mm), and B) female size at maturity for samples collected between January and June (L50=347 FL mm).

A.



B.

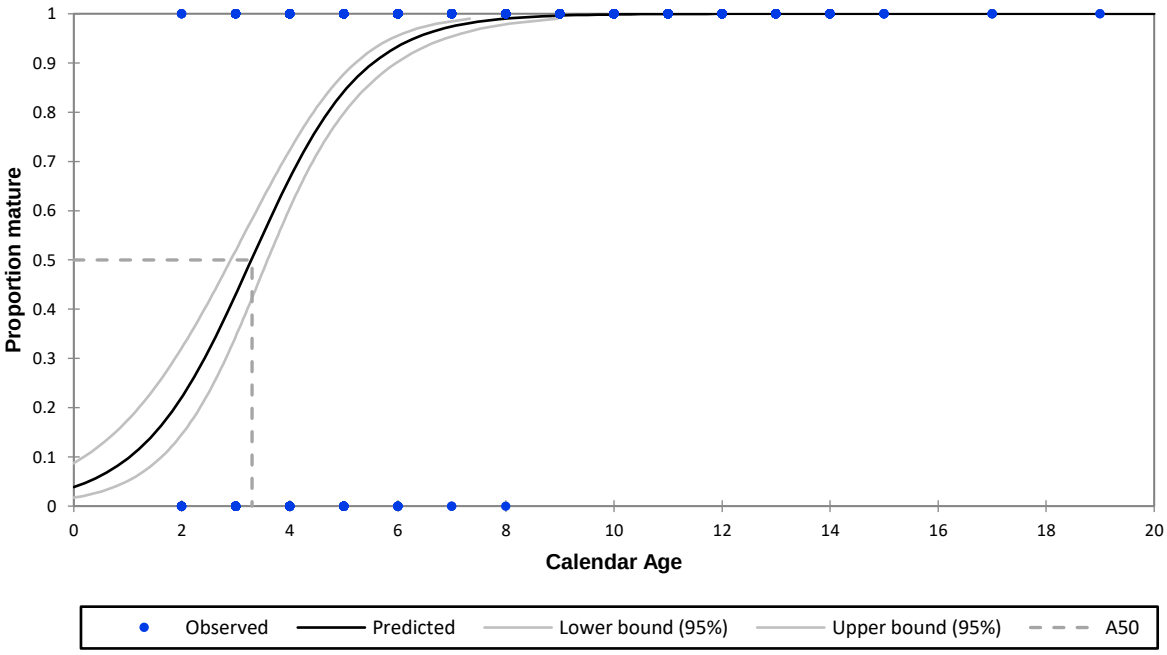


Figure 7. A) Female age at maturity for all months (A50=3.5 years), and B) Female age at maturity for January to June (A50=3.3 years), where Stock ID = Gulf of Mexico.

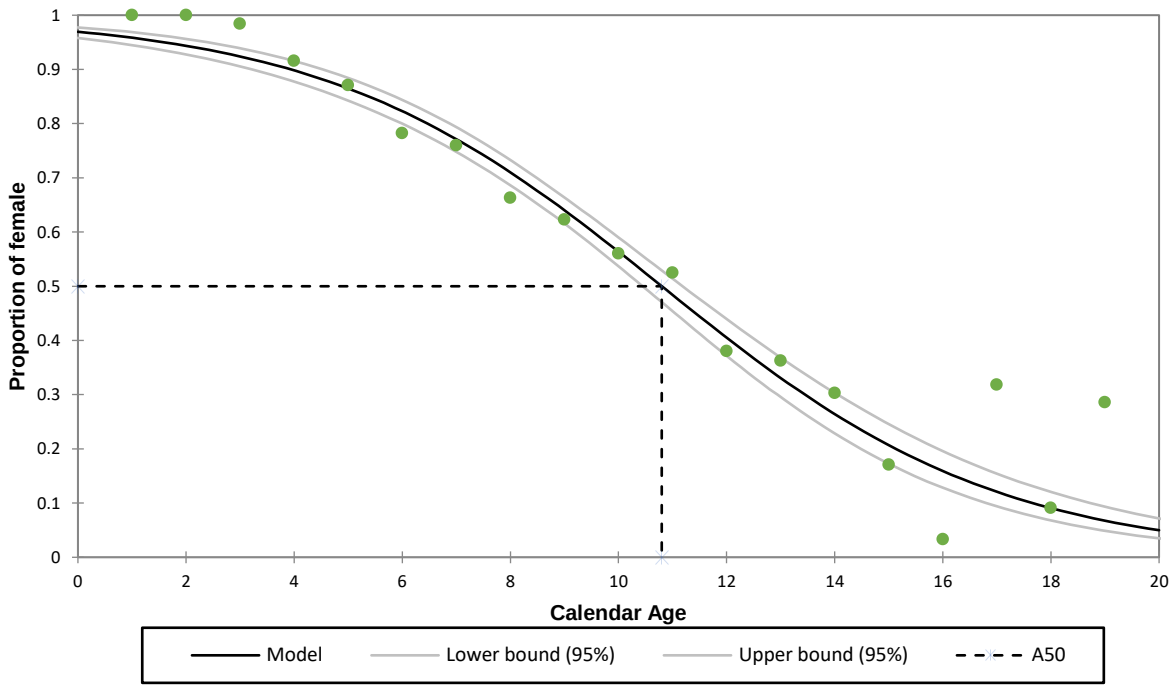


Figure 8. Proportion of female by age. A50 = 10.8 years. Logistic regression, logit model (sum binary), proportion female = 1 / (1 + exp(-(3.456 – 0.320 * Calendar Age))). Shown with 95% confidence intervals. *N* = 1,999.

References

Brown-Peterson, N.J., D.M. Wyanski, F. Saborido-Rey, B.J. Macewicz and S.K. Lowerre-Barbieri. 2011. A standardized terminology for describing reproductive development in fishes. *Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science* 3:1, 52-70.

Lombardi-Carlson, L.A., M. Cook, H. Lyon, B. Barnett, and L. Bullock. 2012. A description of age, growth, and reproductive life history traits of scamps from the Northern Gulf of Mexico. *Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science* 4, 129-144.

Appendix. SEDAR Best Practices standardized data template, fields and definitions. Scamp 2020SEDAR68.
Key Updated February 2020.

Field	Data Provided	Definitions and Codes
Unique_Record_Num	Yes	S68_SCA_00000; Unique number per record (1 – 48974)
SEDAR_Nbr	Yes	2020SEDAR68
SEDAR_Date_Submitted	Yes	Feb-2020
Stock_ID	Yes	Stock identification (e.g., Gulf of Mexico, n = 48,817; South Atlantic, n = 120). Boundary between Gulf of Mexico and South Atlantic – N and S of US route 1 in Florida Keys. If Monroe County without Grid or Headboat Area or if County_Landed is blank, Stock ID = Is Null (n = 37 records)
Data_Provider	Yes	Name of Source providing the dataset to SEDAR 1. NMFS Panama City–AGR 2. NMFS Panama City–BSD
Species	Yes	*Mycteroperca phenax*
Fishing_Mode	Yes	Vessel type listed for fishery-dependent and fishery-independent samples identified to the trip level CM – Commercial CP – Charter Party or Charter Boat HB – head boat PR – private vessel PR-EFP – private vessel with Exempted Fishing Permit SS – scientific survey TRN – tournament
Fishery	Yes	COM – Commercial FI – Fishery-Independent REC – Recreational UNK – Unknown or is blank
Source	Yes	Program that collected a sample ALLIANCE – Gulf Fisherman's Alliance CO-OP – Cooperative Fishing Effort Samples CO-OP_Ward – Cooperative with Will Ward EASA – Expanded Annual Stock Assessment FWRI – Florida Fish and Wildlife Conservation Commission, Florida Wildlife Research Institute GOP – Galveston Observer Program HB - Southeast Region Headboat Survey (AGR) LADWF – Louisiana Department of Wildlife and Fisheries MRFSS – Marine Recreational Fishery Statistics Survey MSLAB -NMFS Pascagoula, MS PCLAB - NMFS Panama City, FL RECFIN - Recreational Fisheries Information Network SBLOP – Shark Bottom Longline Observer Program SRH – Southeast Region Headboat Survey (BSD)

Field	Data Provided	Definitions and Codes
		TIP - Trip Interview Program USGS – United States Geological Survey UTMSI – University of Texas, Marine Science Institute
Sampling_Unit_ID	Yes	Interview # - identifies a trip within a Source Unique codes specific to source
Specimen_ID	Yes	Unique identifier for an individual fish within an interview
Barcode	Yes	Unique identifier for an individual fish
Catch_Month	Yes	Month sample collected
Catch_Day	Yes	Day sample collected
Catch_Year	Yes	Year sample collected
State_Landed	Yes	State abbreviations state collected: AL, EF, FL, GA, LA, MS, NC, SC, TX, UNK (Unknown)
County_Landed	Yes	Fishery-dependent data (COM, REC) - county landed. Fishery-independent data, reflect a specific sampling site.
Headboat_Area	Yes	Headboat Area assigned by the Source = SRHS.
NMFS_Statistical_Grid	Yes	Shrimp statistical grid including sub-areas, specific TIP
Latitude	Yes	Latitude of where fish was caught.
Longitude	Yes	Longitude of where fish was caught.
Gear_Code	Yes	Numeric or Alphabetic Gear Code number see TIP Gear Codes for TIP data (NMFS Panama City) see GulfFIN Gear Codes for TIP, MRFSS, RECFIN data
Gear_Name	Yes	Text description of the Gear Code see TIP Gear Codes for TIP data (NMFS Panama City) see GulfFIN Gear Codes for TIP, MRFSS, RECFIN data
Gear_Group_Code	Yes	Collapsed grouping of the Gear Code (ex: HL, LL, etc.) HL – Hand-Line HL-EFP – Hand-line with Exempted Fishing Permit LL – Long-line SP – Spears TR – Trap TRW – Trawl UA – Unknown/Not coded VLL – Vertical Longline
Depth_m	Yes	Approximate depth fish caught
Jurisdictional_Waters	No	Refers to water body jurisdiction (State, Federal, Unknown)
Distance_from_Shore	Yes	Record the distance from shore where the fish was caught.
Sample_Bias_Type	Yes	Record if the sample was collected using a bias method. Historical field for Source = TIP No Bias R or Random – random

Field	Data Provided	Definitions and Codes
		S – selected (size, effort, and/or other bias type) Unknown
Smallest_Length_Unit	Yes	Record smallest length unit used in measurement (mm)
Observed_Maximum_TL_mm	Yes	Measured maximum total length (tail pinched), n = 2,574
Observed_Natural_TL_mm	Yes	Measured natural total length (tail not pinched), n = 354
Observed_FL_mm	Yes	Measured fork length, n = 47,241
Observed_SL_mm	Yes	Measured standard length, n = 3,005
Predicted_Maximum_TL_mm	No	
Predicted_Natural_TL_mm	No	
Predicted_FL_mm	No	Fork length to be predicted from either natural total length, maximum total length, or standard length regressions that will be calculated during SEDAR 68 Data Workshop
Predicted_SL_mm	No	
Final_MaxTL_mm	No	
Final_FL_mm	Incomplete	Final length column for analysis, will include both predicted and observed fork lengths once conversion equations are available; Observed_FL_MM currently included in data file n = 47,241. Records without Final_Fork_Length n = 1,733
Whole_Weight_g	Yes	Measured whole weight
Gutted_Weight_g	Yes	Measured gutted weight
Gutted_Weight_Type	Yes	Description of gutted weight recorded. GUTTED – HEAD OFF GUTTED – HEAD ON HARD ROUND (WHOLE) UNGRADED UNKNOWN
Predicted_Whole_Weight_g	No	Whole weight predicted from either fork length, natural or maximum total length, or standard length.
Final_Whole_Weight_g	Incomplete	Final weight column for analysis, will include both predicted and observed whole weights once conversion equations are available; Whole_Weight_G currently included in data file n = 4,780. Records without Final_Whole_Weight_G n = 44,194
Duplicate_Length	Yes	Yes or No: Refers to whether the age and/or length are recorded in another data set. NMFS Panama City: Yes – Sources: TIP, HB/SRH, FWRI, GHC-IFQ; MRFSS, RECFIN, CO-OP-Ward (exception: W.Ward reported in TIP, see collection comments), SRH No – Sources: Alliance, CO-OP (see above comment), EASA, GOP, MSLAB, PCLAB, SBLOP, USGS, UTMSI

Field	Data Provided	Definitions and Codes
Number_of_Annuli	Yes	Reader(s) consensus of annuli count
Edge_Type	Yes	Reader(s) consensus of edge type NMFS Panama City (AGR and BSD) Codes Description 2_PC opaque zone on edge, no growth after last opaque zone 4_PC transclucent zone forming, new growth 1/3 to 2/3 of growth after last opaque zone 6_PC translcuent zone forming, greater than 2/3 of growth after last opaque zone
Calendar_Age	Yes	Edge Types: 2_PC, 4_PC, 6_PC If capture date < July 1 and Edge = 6_PC, Calendar_Age = # of annuli + 1; else, Calendar_Age = # of Annuli
Fractional_Age	Yes	Fractional age assigned to an individual fish based on the fraction of a year between capture date and peak spawning date (April 15th).
Sub_Sampled	Yes	Y=subsampled Specific to NMFS Panama City-AGR and NMFS Panama City-BSD from 2004-2017 and only pertains to Commercial records. Sub-sampling based on the proportion of commercial landings by year, gear, and NMFS statistical grid.
Macro_Sex	Yes	Sex identified by field sampler based on macroscopic appearance of gonad: D – did not attempt F - female I or IM - immature M – male T– Transitional N – no gonad U – unknown
Histo_Sex	Yes	Sex assigned after histology reading of gonad tissue: F – female, M – male, T – transitional, E-early transitional (Ask Skyler)
Secondary_Sex	No	Does not apply to gonochoristic species
Repro_Phase	Yes	Reference document (Brown-Peterson 2011); see table in Lowerre-Barbieri et al. 2015.
Macro_Maturity	No	Maturity based on macroscopic reading of reproductive tissue; Mature or Immature based on appearance of yolked (VTG) oocytes.
Histo_Maturity	Yes	Maturity based on histology reading; Mature based on CA + oocytes.
Spawner	Yes	Yes: refers only to mature fish with spawning markers; leave blank if immature fish
Batch_Fecundity_Estimate	Yes	# of oocytes in a batch for an individual specimen

Field	Data Provided	Definitions and Codes
Gonad_Weight_Fresh_g	Yes	Fresh weight of gonad
Gonad_Weight_Formalin_g	Yes	Weight of gonad preserved in formalin
Gonad_Weight_Frozen_g	Yes	Frozen gonad weight
Outlier and Notes	Yes	Identify records with age, length, weight, or otolith weight not fitting normal pattern of relationships between meristic combinations for all data providers. Some data providers removed outliers prior to data submission.
Additional Fields not in SEDAR Template (these are subject to change given species specific fields)		
Samples	Yes	G = Gonad O = Otolith L = Lengths S = Spines
NMFS_PC_Collection_Comments	Yes	Any specific information unique to the trip or an individual, specific to data provider: NMFS Panama City_BSD and _AGR
BSD/AGR_Start_Depth_m	Yes	Specific to data provider: NMFS Panama City_BSD and _AGR
BSD/AGR_End_Depth_m	Yes	Specific to data provider: NMFS Panama City_BSD and _AGR
Sample_Method_Type	No	Specific to the Sample Method used by TIP (manual v.7). The sample method can indicate if there was a bias (sampling not random) during the time of sampling. See field IS_RANDOM Random: AT-SEA UNSORTED, LANDED UNSORTED, LANDED SORTED. Non-random: AS AVAILABLE, QUOTA SAMPLING.