Life History Contributions in Support of the SEDAR 59 Asssessment of South Atlantic Greater Amberjack by MARMAP, SERFS, and the SEFSC

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SEDAR59-WP02

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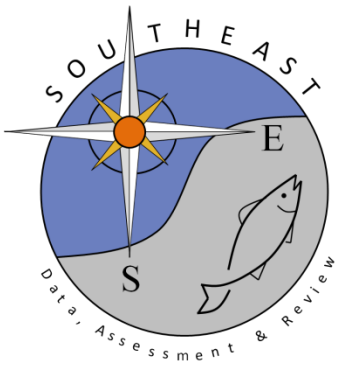
*Please see addendum for correction to text in initial submission.



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Addendum added January, 2019

Summary

Fishery-dependent and independent data for Greater Amberjack, *Seriola dumerili*, continued to be collected by the Marine Resources Monitoring Assessment and Prediction (MARMAP) program and the Southeast Area Monitoring and Assessment Program, South Atlantic (SEAMAP-SA) at the South Carolina Department of Natural Resources (SCDNR) and the Southeast Fisheries Independent Survey (SEFIS) at the Southeast Fisheries Science Center (SEFSC), Beaufort, since SEDAR 15. Fishery-dependent samples for life history were collected via MARMAP's port sampling efforts or special projects, mostly via hook and line efforts. Fishery-independent samples for life history were collected via MARMAP's reef fish survey efforts, primarily from 2000 to 2009, and then by the collaborative Southeast Reef Fish Survey (consisting of MARMAP, SEAMAP-SA, and SEFIS) from 2010 to 2017. In addition, fishery-dependent samples were collected through various efforts at the SEFSC, Beaufort. Life history data from MARMAP and SERFS were provided to the SEFSC aging lab in Beaufort, NC, for growth rates and meristics. The SEFSC aging lab provided reproductive data to MARMAP personnel to be combined with MARMAP and SERFS data. Here, we provide reproductive analyses from all data sources outlined above and length and age compositions for chevron traps only. See Table 1 for a breakdown of available samples.

Length and Age Compositions

Collection: Standardized chevron traps used by MARMAP since 1990 and SERFS since 2010. For sampling details see (Smart et al., 2015). No index is provided for the chevron trap due to the low frequency of positive samples per year. Compositions are provided to potentially support the use of the SERFS video index.

Lengths: For all Greater Amberjack captured in chevron traps, identification was confirmed and each fish measured for fork length or total length (to the nearest cm prior to 2008 and to the nearest mm since 2008). Since 2012, all fish were measured for total length and converted to fork length (cm) by a conversion developed by MARMAP in 2011 (Ballenger et al., 2012). Length compositions were calculated as number of fish per centered 1-cm length bin per year and percent per centered 1-cm length bin per year (Table 2).

Ages: Since 2000, all Greater Amberjack captured in chevron traps have been processed for life history. This includes individual measurements (e.g. weight and fork length), removal of otoliths, and removal of gonads.

Otoliths were embedded and sectioned following standard protocols and assigned increment counts and edge codes by two readers independently (Smart et al., 2015). Calendar ages were determined from consensus ages via the rule that if the edge code was 3 or 4 and month of capture was January to August (before Sept. 1), then calendar age was increment count + 1. For all other edge codes and months, the calendar age was increment count. Edge codes are difficult to assign for individuals with increment count 0, therefore, for fish captured January through April and measuring less than 400 mm FL, calendar age was increment count, regardless of edge type. Age compositions were calculated as number of fish per 1-year calendar age bin per year and percent per 1-year calendar age bin per year (Table 3).

Reproductive Parameters

Sex Ratios: Greater Amberjack sampled by MARMAP or SERFS were examined either macroscopically or histologically to determine sex via standard procedures (Smart et al., 2015). SEFSC provided sex for fishery-dependent fish determined macroscopically. Sex ratios were determined for all fish for which sex was available and for each 10-cm length bin (centered on the integer) and 1-year calendar age bin as available. A series of chi-squared tests were conducted. There was no difference in the overall or length-/age-specific sex ratios to suggest using anything but a 1:1 sex ratio (Table 4). *Recommended Sex Ratio: 1:1 M:F.*

Maturity: Greater Amberjack maturity was determined from histologically examined fish collected by MARMAP and SERFS. Length and age at maturity were determined using a variety of models (Logit, Probit, Clog Log, and Cauchy) and the best fit model was determined by comparing AIC values (Akaike, 1973). Best fit female length at maturity was determined by the Logit model (Table 5) and best fit male length at maturity by the Clog Log model (Table 6). Best fit female age at maturity was determined by the Probit model (Table 7) and best fit male age at maturity by the Logit model (Table 8). *Recommended Female Length and Age at Maturity: 74 cm FL and 1 year, respectively. Recommended Male Length and Age at Maturity: 67 cm FL and -0.2 year, respectively (Figs. 1 and 2).*

Spawning Fraction: New samples did not impact the recommendations of SEDAR 15 and as such the recommendation is to use those same values derived from Harris et al. 2007 as were used in SEDAR 15.

Fecundity: No new samples were available and as such no new recommendation since SEDAR 15 is available.

Literature Cited

Akaike, H. 1973. Information theory and an extension of the maximum likelihood principle. Pages 267-281 in B. N. Petran, and F. Csaaki, editors. International symposium on information theory, 2nd edition.

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Table 1. Sample availability for reproductive analyses and length and age compositions by source, FI= fishery-independent, FD= fishery-dependent, and UNK= unknown origin.

Year	FI	FD	UNK
1992	4	0	0
1993	0	25	0
1994	0	7	0
1995	0	1	0
1996	0	2	0
1997	0	0	0
1998	0	37	0
1999	0	83	0
2000	20	304	0
2001	12	418	9
2002	7	1327	1
2003	5	1207	0
2004	0	439	0
2005	0	369	0
2006	1	192	0
2007	2	37	0
2008	0	48	0
2009	0	82	0
2010	18	80	0
2011	7	97	0
2012	11	88	0
2013	15	98	0
2014	26	213	0
2015	28	109	0
2016	26	68	0
2017	13	113	0
Total	**195**	**5444**	**10**

Table 2. Length compositions in A) number of fish per 1-cm centered length bin (FL) and B) percent of fish. Deployments refers to traps that collected Greater Amberjack.

A) Number of Fish

FL (cm)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2006	2007	2010	2011	2012	2013	2014	2015	2016	2017	Total
23	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
27	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	
31	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
32	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	
33	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
36	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
39	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
40	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
43	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
51	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	
52	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
53	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
56	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	
57	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
58	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
59	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	
64	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	
65	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	
66	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	
69	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
70	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
73	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
74	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	
80	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	0	
82	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
84	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	

87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	
88	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
90	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
91	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
93	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
94	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
96	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
98	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
101	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
104	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
107	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
113	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
118	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Fish	3	8	12	1	5	5	3	2	2	1	4	4	2	2	11	6	8	16	10	105
Deployments	3	7	9	1	4	5	3	2	2	1	3	4	2	2	9	5	8	13	8	91

B) Percent of Fish

FL (cm)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2006	2007	2010	2011	2012	2013	2014	2015	2016	2017	Total
23	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
26	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
27	0.0	12.5	8.3	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
28	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	
31	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
33	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
34	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
36	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
39	0.0	12.5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
40	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
43	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	

51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	
52	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
53	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
56	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	12.5	0.0	0.0	
57	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	10.0	
58	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
59	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	16.7	0.0	0.0	0.0	
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	6.3	0.0	
64	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	
65	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	6.3	0.0	
66	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	12.5	0.0	0.0	
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	6.3	0.0	
69	33.3	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	
70	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
73	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
74	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	10.0	
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	10.0	
80	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	12.5	0.0	
82	0.0	0.0	8.3	0.0	0.0	20.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
84	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	
85	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	6.3	0.0	
88	0.0	0.0	8.3	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	10.0	
89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	
90	0.0	0.0	0.0	0.0	40.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
91	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
93	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	
95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	

96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	
97	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
98	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	
99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
104	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	
106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	
107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
113	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
118	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
149	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	
Fish	3	8	12	1	5	5	3	2	2	1	4	4	2	2	11	6	8	16	10	105
Deployments	3	7	9	1	4	5	3	2	2	1	3	4	2	2	9	5	8	13	8	91

Table 2. Length compositions in number of fish per 1-cm centered length bin (FL). Deployments refers to traps that collected Greater Amberjack that were aged.

A) Number of Fish

Year	2000	2001	2002	2010	2011	2012	2013	2014	2015	2016	2017	Total
0	0	0	0	0	0	0	0	0	0	0	0	
1	2	2	1	0	0	2	5	2	3	2	1	
2	0	3	0	0	0	0	3	0	2	6	2	
3	0	0	0	1	0	0	0	0	3	1	2	
4	0	0	0	1	2	0	0	0	0	0	2	
5	0	0	0	0	0	0	0	0	0	1	1	
6	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	0	0	
Fish	2	5	1	2	2	2	8	2	8	10	8	50
Deployments	2	5	1	2	2	2	8	2	8	9	6	47

B) Percent of Fish

Year	2000	2001	2002	2010	2011	2012	2013	2014	2015	2016	2017	Total
0	0	0	0	0	0	0	0	0	0	0	0	
1	100	40	100	0	0	100	62.5	100	37.5	20	12.5	
2	0	60	0	0	0	0	37.5	0	25	60	25	
3	0	0	0	50	0	0	0	0	37.5	10	25	
4	0	0	0	50	100	0	0	0	0	0	25	
5	0	0	0	0	0	0	0	0	0	10	12.5	
6	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	0	0	
Fish	2	5	1	2	2	2	8	2	8	10	8	50
Deployments	2	5	1	2	2	2	8	2	8	9	6	47

Table 4. Sample sizes and results of Chi-squared analyses for sex ratio by A) overall, B) length (cm), and C) calendar age (yr).

A) Overall	Male	Female	Total	Chi2	P-value
	2087	2332	4419	0.0031	0.930

B) Length	Male	Female	Total	Chi2	P-value
10	0	0	0		
20	0	0	0		
30	2	1	3	0.1111	0.739
40	10	9	19	0.0028	0.956
50	15	19	34	0.0138	0.906
60	21	28	49	0.0204	0.888
70	134	178	312	0.0199	0.888
80	386	333	719	0.0054	0.944
90	575	495	1070	0.0056	0.938
100	670	601	1271	0.0029	0.956
110	227	418	645	0.0877	0.767
120	33	163	196	0.4399	0.507
130+	3	72	75	0.8464	0.358

C) CalAge	Male	Female	Total	Chi2	P-value
0	6	7	13	0.0059	0.938
1	98	113	211	0.0051	0.944
2	393	511	904	0.0170	0.896
3	525	515	1040	0.0001	1.000
4	384	388	772	0.0001	1.000
5	161	184	345	0.0044	0.950
6	72	93	165	0.0162	0.899
7	25	49	74	0.1052	0.746
8	12	27	39	0.1479	0.700
9	10	10	20	0.0000	1.000
10+	11	11	22	0.0000	1.000

Table 5. Best fit female length at maturity (Logit)

Length (cm)	# Immature	# Mature	# Total	Obs. % Mature	Pred % Mature
35	1	0	1	0	6.96557E-07
36	1	0	1	0	1.00605E-06
37	2	0	2	0	1.45306E-06
39	1	0	1	0	3.03119E-06
44	2	0	2	0	1.90514E-05
45	1	0	1	0	2.75161E-05
46	3	0	3	0	3.97417E-05
47	1	0	1	0	5.73988E-05
49	1	0	1	0	0.00011973
51	0	1	1	1	0.000249733
53	1	1	2	0.5	0.000520819
56	2	0	2	0	0.00156756
57	3	0	3	0	0.002262486
58	1	0	1	0	0.003264478
60	2	0	2	0	0.006785864
62	2	0	2	0	0.01405221
63	1	0	1	0	0.020169989
64	2	1	3	0.333333	0.02887321
66	5	0	5	0	0.058400149
67	1	0	1	0	0.082215292
68	10	0	10	0	0.114560498
69	5	0	5	0	0.157447933
70	7	4	11	0.363636	0.212537016
71	1	0	1	0	0.280484468
72	10	3	13	0.230769	0.360217717
73	4	0	4	0	0.448488691
74	3	1	4	0.25	0.540128895
75	4	3	7	0.428571	0.62913366
76	2	7	9	0.777778	0.710156129
77	3	5	8	0.625	0.779676623
78	1	8	9	0.888889	0.836364527
79	0	9	9	1	0.880698744
80	2	13	15	0.866667	0.914252841
81	0	23	23	1	0.939023081
82	0	23	23	1	0.956974554
83	1	18	19	0.947368	0.969811057
84	0	26	26	1	0.978902262
85	0	19	19	1	0.985297215
86	0	40	40	1	0.989774038

87	0	26	26	1	0.992897547
88	0	31	31	1	0.995071735
89	0	20	20	1	0.996582655
90	0	28	28	1	0.997631456
91	0	18	18	1	0.998358905
92	0	34	34	1	0.998863187
93	0	25	25	1	0.999212634
94	0	35	35	1	0.999454723
95	0	28	28	1	0.999622405
96	0	40	40	1	0.999738536
97	0	28	28	1	0.999818956
98	0	34	34	1	0.999874645
99	0	25	25	1	0.999913205
100	0	40	40	1	0.999939904
101	0	26	26	1	0.999958391
102	0	45	45	1	0.999971191
103	0	22	22	1	0.999980053
104	0	42	42	1	0.99998619
105	0	31	31	1	0.999990438
106	0	32	32	1	0.99999338
107	0	30	30	1	0.999995416
108	0	25	25	1	0.999996826
109	0	18	18	1	0.999997803
110	0	39	39	1	0.999998479
111	0	24	24	1	0.999998947
112	0	41	41	1	0.999999271
113	0	27	27	1	0.999999495
114	0	25	25	1	0.99999965
115	0	14	14	1	0.999999758
116	0	23	23	1	0.999999832
117	0	8	8	1	0.999999884
118	0	19	19	1	0.99999992
119	0	9	9	1	0.999999944
120	0	13	13	1	0.999999961
121	0	17	17	1	0.999999973
122	0	13	13	1	0.999999982
123	0	4	4	1	0.999999987
124	0	10	10	1	0.999999991
125	0	8	8	1	0.999999994
126	0	8	8	1	0.999999996
127	0	3	3	1	0.999999997
128	0	7	7	1	0.999999998
129	0	5	5	1	0.999999999

130	0	8	8	1	0.999999999
131	0	1	1	1	0.999999999
132	0	4	4	1	1
133	0	1	1	1	1
134	0	3	3	1	1
137	0	1	1	1	1
139	0	1	1	1	1
140	0	2	2	1	1
144	0	1	1	1	1

Table 6. Best fit male length at maturity (Clog Log)

Length (cm)	# Immature	# Mature	# Total	Obs. % Mature	Pred % Mature
27	1	0	1	0.00	0.002
35	1	0	1	0.00	0.006
38	3	0	3	0.00	0.010
43	1	0	1	0.00	0.022
46	0	1	1	1.00	0.035
50	1	0	1	0.00	0.065
51	1	0	1	0.00	0.076
52	0	1	1	1.00	0.089
54	1	0	1	0.00	0.120
56	1	0	1	0.00	0.160
58	1	0	1	0.00	0.213
60	1	0	1	0.00	0.280
61	4	0	4	0.00	0.319
62	1	0	1	0.00	0.362
64	1	1	2	0.50	0.460
65	1	1	2	0.50	0.514
66	2	1	3	0.33	0.570
67	0	1	1	1.00	0.628
68	3	5	8	0.63	0.686
69	2	3	5	0.60	0.742
70	1	8	9	0.89	0.796
71	0	5	5	1.00	0.844
72	0	2	2	1.00	0.887
73	0	10	10	1.00	0.922
74	1	14	15	0.93	0.949
75	0	4	4	1.00	0.970
76	1	11	12	0.92	0.983
77	0	12	12	1.00	0.992
78	0	22	22	1.00	0.996
79	0	17	17	1.00	0.999
80	0	28	28	1.00	1.000
81	0	20	20	1.00	1.000
82	0	35	35	1.00	1.000
83	0	22	22	1.00	1.000
84	0	36	36	1.00	1.000
85	0	21	21	1.00	1.000
86	0	38	38	1.00	1.000
87	0	27	27	1.00	1.000
88	0	25	25	1.00	1.000

89	0	21	21	1.00	1.000
90	0	32	32	1.00	1.000
91	0	21	21	1.00	1.000
92	0	24	24	1.00	1.000
93	0	34	34	1.00	1.000
94	0	40	40	1.00	1.000
95	0	32	32	1.00	1.000
96	0	53	53	1.00	1.000
97	0	38	38	1.00	1.000
98	0	41	41	1.00	1.000
99	0	26	26	1.00	1.000
100	0	50	50	1.00	1.000
101	0	25	25	1.00	1.000
102	0	31	31	1.00	1.000
103	0	35	35	1.00	1.000
104	0	37	37	1.00	1.000
105	0	21	21	1.00	1.000
106	0	28	28	1.00	1.000
107	0	10	10	1.00	1.000
108	0	26	26	1.00	1.000
109	0	11	11	1.00	1.000
110	0	18	18	1.00	1.000
111	0	3	3	1.00	1.000
112	0	11	11	1.00	1.000
113	0	3	3	1.00	1.000
114	0	8	8	1.00	1.000
115	0	5	5	1.00	1.000
116	0	4	4	1.00	1.000
117	0	2	2	1.00	1.000
118	0	3	3	1.00	1.000
119	0	1	1	1.00	1.000
120	0	1	1	1.00	1.000
122	0	2	2	1.00	1.000
123	0	1	1	1.00	1.000
131	0	2	2	1.00	1.000

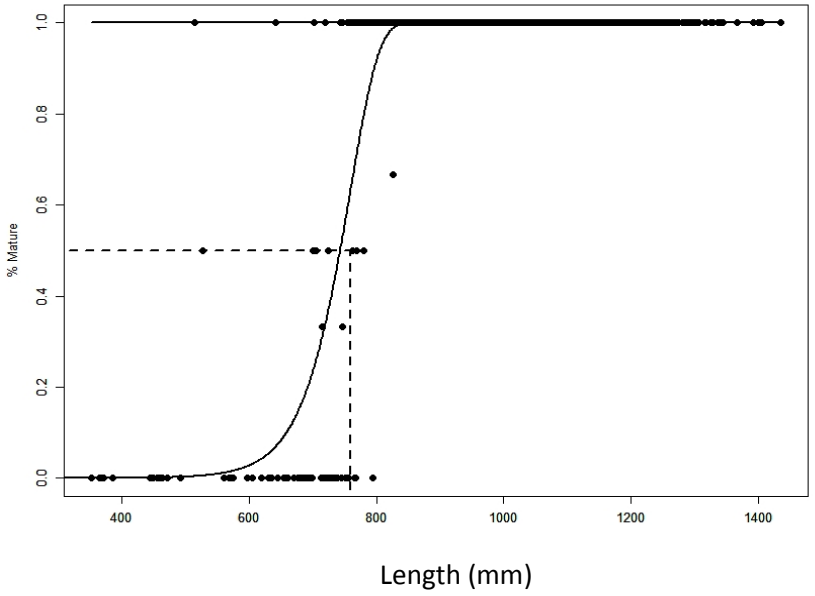
Table 7. Best fit female age at maturity (Probit).

Calendar Age	# Immature	# Mature	# Total	Obs. % Mature	Pred % Mature
0	2	1	3	0.333333	0.136775
1	33	35	68	0.514706	0.526617
2	30	241	271	0.889299	0.890363
3	2	262	264	0.992424	0.991579
4	0	193	193	1	0.999809
5	0	96	96	1	0.999999
6	0	35	35	1	1
7	0	24	24	1	1
8	0	16	16	1	1
9	0	6	6	1	1
10	0	4	4	1	1
11	0	1	1	1	1

Table 8. Best fit male age at maturity (Logit)

Calendar Age	# Immature	# Mature	# Total	Obs. % Mature	Pred % Mature
0	0	3	3	1	0.594036
1	13	57	70	0.814286	0.85142
2	9	226	235	0.961702	0.95734
3	2	257	259	0.992278	0.988749
4	1	140	141	0.992908	0.997103
5	0	41	41	1	0.999259
6	0	15	15	1	0.999811
7	0	10	10	1	0.999952
8	0	4	4	1	0.999988
9	0	5	5	1	0.999997
10	0	1	1	1	0.999999
11	0	2	2	1	1
12	0	1	1	1	1
13	0	1	1	1	1
14	0	0	0	NA	1
15	0	1	1	1	1

Figures



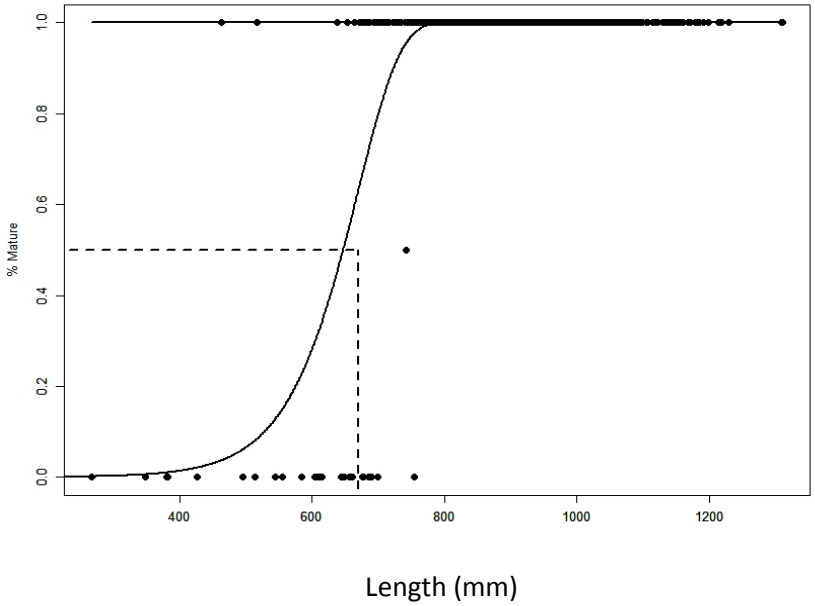


Figure 1. Length at Maturity for female (top) and male (bottom) South Atlantic Greater Amberjack derived from histologically examined fish.

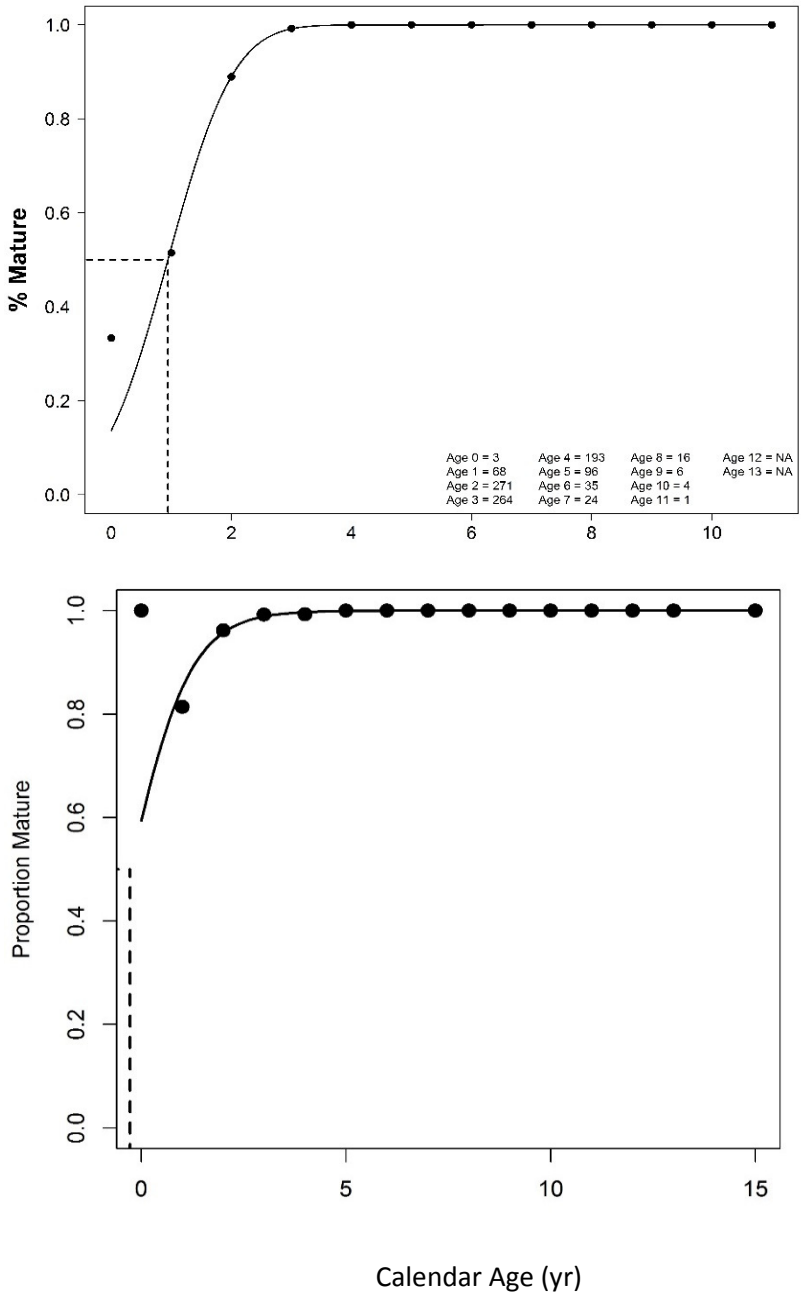


Figure 2. Age at Maturity for female (top) and male (bottom) South Atlantic Greater Amberjack derived from histologically examined fish.

Addendum

During review of recommended parameters in conjunction with the Assessment Scoping call on December 14, 2018, we determined that an error had led to the inclusion of an incorrect length at 50% maturity for female Greater Amberjack and model type in the text of this document (pg. 2). The female length at 50% maturity determined by the Clog Log model and recommended for use in SEDAR 59 is 76 cm FL. The legend for Table 5 should read "Best fit female length at maturity (Clog Log)". Values in Table 5 are correct. In addition to the error noted for female length at 50% maturity, a reviewer noted that the year attributed to Harris et al. in the Literature Cited should be 2007, not 2017 (pg. 3).