

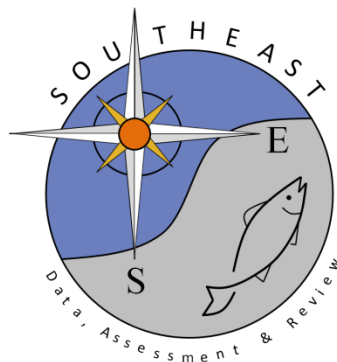
A Review of Gray Triggerfish (*Balistes capriscus*) Age-length Data in the Gulf of America, 1999-2024

Ashley Pacicco, Steve Garner, Ryan Nichols

SEDAR100-DW-14

14 August 2025

Updated: 18 February 2026



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Please cite this document as:

Pacicco, Ashley, Steve Garner, Ryan Nichols. 2025. A Review of Gray Triggerfish (*Balistes capriscus*) Age-length Data in the Gulf of America, 1999-2024. SEDAR100-DW-14. SEDAR, North Charleston, SC. 23 pp.

A Review of Gray Triggerfish (*Balistes capriscus*) Age-length Data in
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I. Introduction

This report describes the age-length data submitted by the National Marine Fisheries Service (NMFS) Panama City Lab and external data providers to the Gulf of America (GOA; formerly the Gulf of Mexico) Southeast Data Assessment and Review (SEDAR) 100 assessment (SEDAR 100) for gray triggerfish, *Balistes caprisкус*, for the years 1999 to 2024. Of the $n = 20,544$ available records, $n = 19,407$ had an estimated age; spines deemed unreadable were not included in this total. The dataset is comprised of historical data submitted from previous assessments (SEDAR 43, 2015; SEDAR 62, 2019), which included years 1999-2017 ($n = 13,188$ total records, $n = 12,533$ records with ages) in addition to new data for the years 2018 to 2024 ($n = 7,356$ total records, $n = 6,874$ records with ages). Metadata submitted for SEDAR100 (1999-2024) follow the SEDAR Best Practices Template developed in December 2022.

The objectives of this report are to: 1) summarize dorsal spine collection by fishery, mode, and gear, 2) describe how updated final length and weight values were derived, 3) describe age determination protocols, 4) length and age distributions, and 5) estimates of precision.

II. Methods

A. Dorsal spine collection

Data providers for SEDAR 100 included both federal (NMFS Panama City Age, Growth and Reproduction database (AGR), NMFS Panama City Biological Sample Database (BSD)), and state agencies (Florida Fish and Wildlife Research Institute (FWRI), Fisheries Independent Monitoring (FWRI-FIM), Gulf States Marine Fisheries Commission, Fisheries Information Network (GulfFIN), and Dauphin Island Sea Lab/ University of South Alabama/ (DISL_USA) (Table 1). Spines were collected from 1999 to 2024 (no ages were provided for 2001) from fishery-dependent (FD), fishery-independent (FI), or unknown fishing sectors (UN) (Table 2). Commercial (COM) samples were provided by several sampling programs including The Alliance Project (ALLIANCE), Cooperative Research Project (CRP),

NMFS Galveston Observer Program (GOP), FIN-BIOSTAT, NMFS Shark Bottom Longline Observer Program (SBLOP), and the Trip Interview Program (TIP). Commercial fishing gear listed in the data field titled “Gear_Group_Code” included handline (HL), bottom longline (LL), vertical longline (VL), spear (SP), or was listed as unknown (UN).

Recreational (REC) sampling programs included CRP, DISL_USA, FIN-BIOSTAT, Headboat Observer (FWRI-OBS), FIN-OBS, Gulf Coast Research Lab (GCRL), Gulf Reef Fish Survey (GRFS), Beaufort Headboat Survey (HB), Marine Recreational Fishing Statistics Survey (MRFSS), NMFS, Panama City (PCLAB), Recreational Fisheries Information Network (RECFIN), Southeast Region Headboat Survey (SRHS), Representative Biological Sampling Program (REPPIO), State Reef Fish Survey (SERFS), previously known as the Gulf Recreational Fishing Survey (GRFS), and TIP.

Recreational fishing modes included charterboat (CB), headboat (HB), private vessels (PR), and tournament (TRN). Recreational fishing gear was comprised of HL, SP, and UN. All TRN fish were caught by SP.

Fishery-independent (FI) samples were collected by personnel participating in scientific surveys (SS) under the following sampling programs: DISL_USA, Expanded Annual Stock Assessment (EASA), FWRI, FWRI-FIM, NMFS Pascagoula Mississippi (MSLAB), NMFS Panama City Laboratory (PCLAB), and the University of West Florida (UWF). Gear types included neuston net (NEU), HL, VL, trap (TR), trawl (TW), and UN. Fish caught by NEU were described as juvenile gray triggerfish collected from sargassum community sampling in 1999-2000, 2002, and 2010-2011 and provided by DISL_USA.

B. Deriving values for Gulf gray triggerfish length, weight, and sex

Length was recorded as fork length (FL; mm), natural total length (NTL; mm), maximum total length (MTL; mm), and/or standard length (SL; mm). Since FL is the preferred length for gray triggerfish (Allman et al. 2019, SEDAR 43), observed FL values were directly transposed to final FL when available. If an observed fork length (FL, mm) was not recorded, the reported length was converted to fork length

following the morphometric conversions outlined in SEDAR 43 (SEDAR 2015). FLs were converted from observed lengths using the following hierarchy: 1) observed natural TL, 2) observed maximum TL; 3) observed standard length SL. In SEDAR 62, FL was converted from natural TL or maximum TL using the equations from SEDAR 43 (Allman et al. 2019). Observed whole weight (WWt, g) values were transposed to final weight if available. If an observed WWt was not recorded, it was converted from final FL following the morphometric equation outlined in SEDAR 43 (SEDAR, 2015). Only n = 9 records did not have any final length or weight values.

In the compiled age and length dataset submitted to SEDAR 100, predictive length and weight followed the conversion equations outlined in SEDAR 43 (SEDAR, 2015). Updated meristic equations were developed during SEDAR 100 given the length of time that has passed since SEDAR 43, in addition to increased sample sizes (Table 3). At the time of this working paper, no decision has been made if these updated conversions will be used for SEDAR 100, or if the ones established in SEDAR 43 will be retained.

When a microscopic (“Histo_Sex”) sex was available, it was prioritized as the final sex. When a histo sex was not provided, macroscopic (“Macro_Sex”) was identified as the final sex. The agreement between macro and histo sex determinations for male and female observations (n = 560) was 100%, supporting the reliability of macroscopic observations.

C. Descriptions of dorsal spine processing and ageing protocols

Dorsal spines were processed following the methods outlined in Allman et al. (2018). In addition to annuli count, margin code (opaque or translucent) and readability code (good, fair, difficult, poor processing, or unreadable), were assigned to each dorsal spine age reading (Allman et al. 2018). Opaque zones representing faster growth are relatively wide while slow growth periods are narrow and appear translucent under transmitted light. Fish collected from January to June with no visible translucent zones (i.e., age-0) were advanced to a calendar age of 1, fish caught from July to December and had a final FL \geq

160 mm were also advanced to age-1, and fish < 160 mm were not advanced (Allman et al. 2019). Otherwise, annuli count equaled calendar age. Fractional age was calculated using an established birthdate of July 1, which corresponded to the peak spawning date of gray triggerfish in the GOA (Allman et al. 2018; Kelly-Stormer et al. 2017). Each spine was aged independently of fish length and date of capture.

In SEDAR 62, all dorsal spine ages were deemed unreliable and excluded from the assessment, as evidence presented by Patterson et al. (2019) indicated that spine ages were significantly less than otolith-derived age estimates. More recently, Potts et al. (2023) confirmed that dorsal spine sections significantly underestimated ages, specifically for fish aged 5 years and older, largely due to previously unidentified compacted annuli along the dorsal spine margins in older fish. To address this issue, Potts et al. (2023) developed an updated aging protocol which was formally accepted during the SEDAR 82 South Atlantic gray triggerfish assessment (SEDAR 82; SEDAR 2024). Results from eye lens bomb radiocarbon (^{14}C) data validated that the new dorsal spine ageing method developed by Potts et al. (2023) was not underestimating otolith-based ages (Chamberlin et al. 2024). Following the recommendation from Potts et al. (2023) and Chamberlin et al. (2024), all historical samples (i.e., collected from 1999-2017) aged 5 years and older were re-aged, and new age data (i.e., samples collected from 2018 to 2024) were read using the updated protocol. All ages submitted for SEDAR 100 adhere to the updated aging protocol. Fish historically aged 0 to 4 were not deemed necessary to re-age (Chamberlin et al. 2024).

Gray triggerfish ages provided by the NMFS Panama City Lab (Data Providers: AGR and BSD) were aged by Ashley Pacicco (AP) or Robert Allman (RA). DISL_USA sent all of their historical gray triggerfish aged 5 years and older (1999-2017) to the Panama City lab for re-ageing (n= ~ 300 samples). Additional historical samples provided by GulfFIN (n~ 300 samples) were also sent to Panama City for re-ageing. Panama City personnel re-aged those samples due to changes in data provider personnel and/or insufficient time to become adequately familiar with the new ageing protocol before the assessment deadline.

D. Reader precision

The gray triggerfish reference set (n=115 dorsal spine sections) was re-aged by Jennifer Potts (JP) and Walt Rogers (WR), both considered expert readers, using the new ageing protocol and then distributed sequentially among all gray triggerfish data providers. Given that gray triggerfish are considered a difficult species to age, an average percent error (APE) of < 10% was required before production ageing could begin (Allman et al 2019). Panama City lab personnel compared the updated spine ages following Potts et al. (2023) to the historical spine ages for n= 2,919 fish from 2003-2017. This exercise was completed to quantify and compare the differences between the two protocols. Bias plots and estimates of precision were calculated using the Fisheries Stock Analysis (FSA) package in R studio (Ogle et al. 2022).

III. Results and Discussion

A. Dorsal spine collection

The majority of the aged samples were collected from gray triggerfish landed in Florida (57.82%), followed by Louisiana (18.72%), Alabama (15.38%), Texas (1.88%), and Mississippi (0.43%) (Table 4). A total of 1,121 samples (5.78%) were reported with no state landed (NL), which were FI samples collected via SS (sampling program= FWRI-FIM; data provider=FWRI). Spines were sampled primarily from the REC (47.95%) or COM (31.69%) fishery, followed by FI (20.32%), and UN sources (0.04%) (Table 5). The majority of samples were collected from fish caught with HL (81.69%), followed by trap (TR; 6.45%), and LL (4.61%).

B. Size and age distributions

Length frequency distributions of aged fish showed that gray triggerfish were sampled from the full age range of juvenile to adult life stages (Figure 1). Final fork length (FL, mm) ranged from 41-660 mm, with a majority of lengths ranging from 340-440 mm (56.52%). Mean FL (\pm SD) was similar across

fisheries, with FI samples having the smallest and COM having the largest mean FL (311.48 ± 110.28 , and 433.03 ± 60.28), respectively (Table 5).

Gray triggerfish ages (years, yr) ranged from 0-16 years, with a majority of ages ranging from 3-6 yr (67.47%; Figure 2). Age-4 was the most frequently observed age (23.19%), followed by age-3 (18.67%). Overall, age-at-length was highly variable across all age classes after age-0 (Figure 3). The earliest years of data (1999-2000, and 2002) contained only age-0 or age-1 fish, but sample sizes were low (Figure 4). No ages samples were collected in 2001. The rest of the time series (2003-2024) showed a similar age-at-length distribution. Gray triggerfish sampled from FI sources were the youngest on average ($3.24 \text{ yr} \pm 1.96$), while samples from the COM fishery had the oldest mean age ($5.64 \text{ yr} \pm 2.27$) (Table 5). Specifically, fish caught with NEU gear (FI, fishing mode= SS) had the lowest mean age ($0.02 \text{ yr} \pm 0.13$), while individuals caught by bottom LL (fishing mode=CM) had the highest mean age of $7.03 \text{ yr} \pm 2.35$ (Table 6).

Final whole weight (WWt, g) ranged from 0.251-6,238 g. The smallest mean WWt was observed from gray triggerfish landed by FI surveys (927.46 ± 850.45), while the COM fishery recorded the highest mean WWt ($1,865.53 \pm 773.13$) (Table 5). Fish caught with NEU gear had the lowest mean WWt of $8.10 (\pm 10.55)$. The highest mean WWt was observed in the REC fishery collected with SP (fishing mode = charterboat) at $2,850 \text{ g} (\pm 1,433.09)$. However, the sample size for that fishery and gear combination was very low ($n=4$) (Table 6).

Mean age, FL, and WWt were comparable between sexes, although females ($n = 5,241$) outnumbered males ($n = 3,559$), a pattern also reported by Allman et al. (2018). For females, mean age was $4.42 (\pm 2.09)$, mean FL was $360.61 (\pm 730.37)$, and mean WWt was $1,190.17 (\pm 730.37)$. Males had a slightly lower mean age of $4.28 (\pm 1.81)$, but a slightly higher mean FL (381.77 ± 68.94), and WWt ($1,336.85 \pm 707.23$). Evidence of sexually dimorphic growth was reported in Allman et al. (2018). However, a gray triggerfish combined sex-growth model was recommended in both SEDAR 43 and SEDAR 62.

C. Reader precision

All readers who contributed ages for SEDAR 100 read the updated gray triggerfish reference set and had an acceptable APE of < 10%. The APE between AP and RA compared to the reference ages was 9.64%. No bias was observed in any age class between AP and RA (Figure 5).

There was a significant difference in bias between the new vs. historical spine age for fish aged 5 through 10 (Figure 6). This was expected, given the findings of Potts et al. (2023) and Chamberlin et al. (2024). No significant difference was observed for fish aged 11 through 14 likely due to low sample sizes, and considering that those age classes were already near maximum age. The historical spine age vs. the new spine age agreed 27.64% of the time (n=826 overlap reads) (Table 7). The most common difference was that the new spine age reading was one year older than the historical age (27.38%, n=818 overlap reads). The largest difference in new vs historical spine ages was 9 yr (n=1), which was attributed to multiple annuli stacked on the edge of the spine section that were missed using the previous ageing protocol. These findings were similar to the findings of Chamberlin et al. (2024), where it was reported that spines aged with the historical protocol resulted in age estimates with a median negative bias of 1.72 years.

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Tables

Table 1. Number of gray triggerfish (final) age samples (n =19,407) collected from the Gulf of America from 1999 to 2024 by data provider. Black line indicates the terminal year for SEDAR 62 (i.e., 2017). No age samples were collected from 2001.

YEAR	FWRI	GulfFIN	AGR	BSD	USA/DISL
1999	0	0	0	0	2
2000	0	0	0	0	3
2002	0	0	0	0	60
2003	0	0	149	0	0
2004	0	0	167	0	0
2005	0	0	269	0	0
2006	11	0	259	0	0
2007	28	296	206	0	0
2008	0	191	424	0	0
2009	0	173	574	0	0
2010	81	27	331	0	55
2011	48	191	227	187	66
2012	91	126	407	298	17
2013	42	131	495	495	29
2014	76	7	232	405	26
2015	125	6	148	775	57
2016	164	1354	433	664	599
2017	126	192	57	594	337
2018	116	691	254	757	0
2019	30	287	126	803	0
2020	4	261	109	290	0
2021	16	347	82	83	0
2022	116	344	74	491	0
2023	15	306	280	440	0
2024	32	162	0	358	0
Total (n)	1121	5092	5303	6640	1251
%	5.78	26.24	27.33	34.21	6.45

Table 2. Number of gray triggerfish (final) age samples collected from the Gulf of America from 1999 to 2024 by sampling program. No age samples were collected from 2001.

YEAR	ALLIANCE	CRP	DISL_USA	EASA	FIN-BIOSTAT	FIN-OBS	FWRI	FWRI-FIM	FWRI-OBS	GCRL	GOP	GRFS
1999	0	0	2	0	0	0	0	0	0	0	0	0
2000	0	0	3	0	0	0	0	0	0	0	0	0
2002	0	0	60	0	0	0	0	0	0	0	0	0
2003	0	14	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	9	0	0	0	4	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	11	0	0	0	0
2007	0	0	0	0	296	1	0	28	0	0	0	0
2008	0	0	0	0	191	0	31	0	0	0	0	0
2009	0	0	0	0	173	0	178	0	13	9	0	0
2010	5	0	55	0	27	0	10	81	1	0	0	0
2011	0	0	66	11	191	0	0	48	0	0	3	0
2012	0	0	17	0	126	0	5	91	0	0	3	0
2013	0	0	29	0	131	0	0	42	0	0	3	0
2014	0	0	26	0	7	0	0	76	0	0	2	0
2015	0	0	57	0	3	0	0	125	0	0	0	1
2016	0	0	599	0	226	0	0	164	162	0	0	35
2017	0	0	337	0	0	0	0	126	0	0	0	30
2018	0	0	0	0	2	0	0	116	124	0	0	93
2019	0	0	0	0	41	0	0	30	110	0	3	53
2020	0	0	0	0	105	0	0	4	2	0	0	28
2021	0	0	0	0	147	0	0	16	0	0	6	0
2022	0	0	0	0	43	0	0	116	118	0	0	0
2023	0	0	0	0	69	0	0	15	93	0	0	0
2024	0	0	0	0	8	0	0	32	91	0	0	0
Total (n)	5	23	1251	11	1786	5	224	1121	714	9	20	240

Table 2. Continued...

YEAR	HB	MRFSS	MSLAB	PCLAB	RECFIN	REPPIO	SBLOP	SERFS	SRHS	TIP	UWF	
1999	0	0	0	0	0	0	0	0	0	0	0	
2000	0	0	0	0	0	0	0	0	0	0	0	
2002	0	0	0	0	0	0	0	0	0	0	0	
2003	2	5	0	13	29	0	0	0	0	86	0	
2004	3	10	0	59	57	0	0	0	0	38	0	
2005	0	0	0	81	57	0	0	0	0	118	0	
2006	0	0	0	118	77	0	0	0	0	64	0	
2007	6	3	0	88	45	0	0	0	0	63	0	
2008	6	16	8	106	186	0	0	0	0	71	0	
2009	45	0	8	113	164	0	0	0	0	42	2	
2010	49	0	75	48	99	0	0	0	0	27	17	
2011	20	3	32	79	77	0	2	0	0	187	0	
2012	68	0	54	272	1	0	4	0	0	298	0	
2013	262	0	7	52	171	0	0	0	0	495	0	
2014	81	0	10	57	82	0	0	0	0	405	0	
2015	23	0	52	73	2	0	0	0	0	775	0	
2016	275	0	0	158	931	0	0	0	0	664	0	
2017	0	0	0	57	162	0	0	0	0	594	0	
2018	0	0	15	239	472	0	0	0	330	427	0	
2019	0	0	1	122	0	83	0	0	277	526	0	
2020	0	0	0	109	0	113	0	13	55	235	0	
2021	0	0	0	76	0	161	0	39	24	59	0	
2022	0	0	0	74	0	121	0	62	199	292	0	
2023	6	0	67	213	0	90	0	48	127	313	0	
2024	0	0	0	0	0	25	0	38	137	221	0	
Total (n)	846	37	329	2207	2612	593	6	200	1149	6000	19	19407

Table 3. Meristic regressions for gray triggerfish (1999-2024) from the Gulf of America. Data is combined from all data sources, both fishery dependent and independent, and includes data without ages if length and/or weight information was provided. Length Type: Max_TL- Maximum total length, FL- Fork length, Nat_TL – Natural total length, SL- Standard length. Weight Type: GWt- Gutted weight when "Condition Type" = "Gutted-head on", WWt- Whole weight. Units: length (mm) and weight (g). Linear and nonlinear regressions were calculated using R (lm and nls functions, respectively).

Conversion	Equation	Statistic	N	Data Range
Max_TL to FL	$FL = \text{Max_TL} * 0.788 + 23.541$	$r^2 = 0.9591$	6,322	Max_TL: 16-753; FL: 65-617
Nat_TL to FL	$FL = \text{Nat_TL} * 0.792 + 33.477$	$r^2 = 0.9164$	3,710	Nat_TL: 50-718; FL: 78-617
SL to FL	$FL = \text{SL} * 1.144 + 13.531$	$r^2 = 0.9850$	5,015	SL: 51-590 ; FL: 68-617
Max_TL to WWt	$WWt = 2.681 * 10^{-05} * (\text{Max_TL}^{2.884})$	RSE = 274.9	5,123	Max_TL: 16-743; WWt: 10-5,300
Nat_TL to WWt	$WWt = 4.211 * 10^{-05} * (\text{Nat_TL}^{2.827})$	RSE = 275.6	3,654	Nat_TL: 22-718; WWt: 0.251-5,840
FL to WWt	$WWt = 1.450 * 10^{-05} * (\text{FL}^{3.070})$	RSE = 175.4	11,332	FL: 61-617; WWt: 6-5,840
SL to WWt	$WWt = 8.607 * 10^{-05} * (\text{SL}^{2.855})$	RSE = 199.1	4,192	SL: 17-590; WWt: 0.251-5,300
FL to GWt	$GWt = 2.938 * 10^{-05} * (\text{FL}^{2.950})$	RSE = 193.5	2,196	FL: 275- 625; GWt: 454-4,763

Table 4. Number of gray triggerfish (final) age samples collected from the Gulf of America from 1999 to 2024 by state landed (Alabama, AL; Florida, FL; Louisiana, LA; Mississippi, MS; Not Landed, NL; or Texas, TX). No age samples were collected from 2001. NL refers to fishery independent samples collected by FWRI-FIM sampling programs conducted in FL

Year	AL	FL	LA	MS	NL	TX	
1999	0	0	0	2	0	0	
2000	0	0	0	3	0	0	
2002	0	0	0	60	0	0	
2003	0	149	0	0	0	0	
2004	0	167	0	0	0	0	
2005	0	268	0	0	0	1	
2006	0	259	0	0	11	0	
2007	46	203	180	4	28	69	
2008	30	410	169	1	0	5	
2009	53	543	98	7	0	46	
2010	114	241	23	0	81	35	
2011	198	365	77	0	48	31	
2012	133	387	280	0	91	48	
2013	205	552	356	0	42	37	
2014	75	290	293	0	76	12	
2015	67	369	522	0	125	28	
2016	964	1662	423	0	164	1	
2017	337	461	378	0	126	4	
2018	134	1380	180	0	116	8	
2019	101	968	143	1	30	3	
2020	126	409	122	0	4	3	
2021	163	321	26	0	16	2	
2022	100	674	134	0	116	1	
2023	102	736	153	5	15	30	
2024	36	408	76	0	32	0	
Total (n)	2984	11222	3633	83	1121	364	19407
%	15.38	57.82	18.72	0.43	5.78	1.88	100

Table 5. Mean and standard deviation (SD) of gray triggerfish Final Age (yr), Length (FL, mm), and Weight (whole, g) samples collected from the Gulf of America from 1999 to 2024 by fishery (commercial, COM; fishery independent, FI; recreational, REC; or unknown, UN).

Fishery	n	mean Age	SD Age	mean FL	SD FL	mean WW	SD WW
COM	6151	5.64	2.27	433.03	60.28	1865.53	773.13
FI	3944	3.24	1.96	311.48	110.28	927.46	850.45
REC	9305	4.91	1.91	394.11	51.95	1422.50	611.49
UN	7	4.71	1.80	392.00	31.58	1331.13	370.53

Table 6. Mean and standard deviation (SD) of gray triggerfish Final Age (yr), Length (FL, mm), and Weight (whole, g) samples collected from the Gulf of America from 1999 to 2024 by gear group code (handline, HL; bottom longline, LL; neuston net, NEU; spear, SP; trap, TR; trawl, TW; unknown, UN; vertical longline, VL) and mode (charterboat, CB; commercial, CM; headboat, HB; private, PR; scientific survey, SS; tournament, TRN; or unknown, UN).

Gear	Mode	n	mean Age	SD Age	mean FL	SD FL	mean WW	SD WW
HL	CB	5189	4.94	1.95	391.74	51.89	1410.88	606.01
HL	CM	5136	5.42	2.18	425.42	55.86	1758.53	691.79
HL	HB	3025	4.86	1.81	400.50	44.20	1446.98	562.27
HL	PR	1011	4.89	1.88	385.98	66.47	1396.26	711.65
HL	SS	1493	4.02	1.75	387.41	74.41	1458.47	873.66
LL	CM	895	7.03	2.35	484.09	57.72	2562.96	842.06
NEU	SS	116	0.02	0.13	77.13	22.20	8.10	10.55
SP	CB	4	5.00	2.00	491.50	85.03	2850.00	1433.09
SP	CM	34	3.79	2.03	385.21	46.54	1291.16	423.82
SP	PR	55	5.60	2.35	403.88	87.55	1701.25	1057.27
SP	SS	33	1.64	1.17	209.58	59.28	274.07	215.65
SP	TRN	11	3.82	1.17	402.73	52.36	421.67	517.85
SP	UN	2	4.00	0.00	379.50	40.31	1328.95	553.03
TR	SS	1251	3.51	1.60	305.34	52.97	696.85	362.44
TW	SS	874	1.76	1.50	198.09	76.73	253.11	332.96
UN	CM	81	4.95	1.82	368.09	49.06	1142.14	541.43
UN	PR	10	4.40	2.32	407.80	68.49	1701.65	1017.96
UN	SS	1	1.00	NA	152.00	NA	109.00	NA
UN	UN	5	5.00	2.12	397.00	31.31	1332.00	359.82
VL	CM	5	5.80	2.77	480.80	74.63	2550.82	1142.06
VL	SS	176	4.53	2.11	447.66	74.68	2136.69	1053.92

Table 7. The difference in overlap reads between the new spine age following Potts et al. (2023) and the historical age.

New - Historical Spine Age	n	% Difference
-2	47	1.57
-1	303	10.14
0	826	27.64
1	818	27.38
2	519	17.37
3	290	9.71
4	118	3.95
5	45	1.51
6	17	0.57
7	2	0.07
8	2	0.07
9	1	0.03
Total (n)	2,988	100

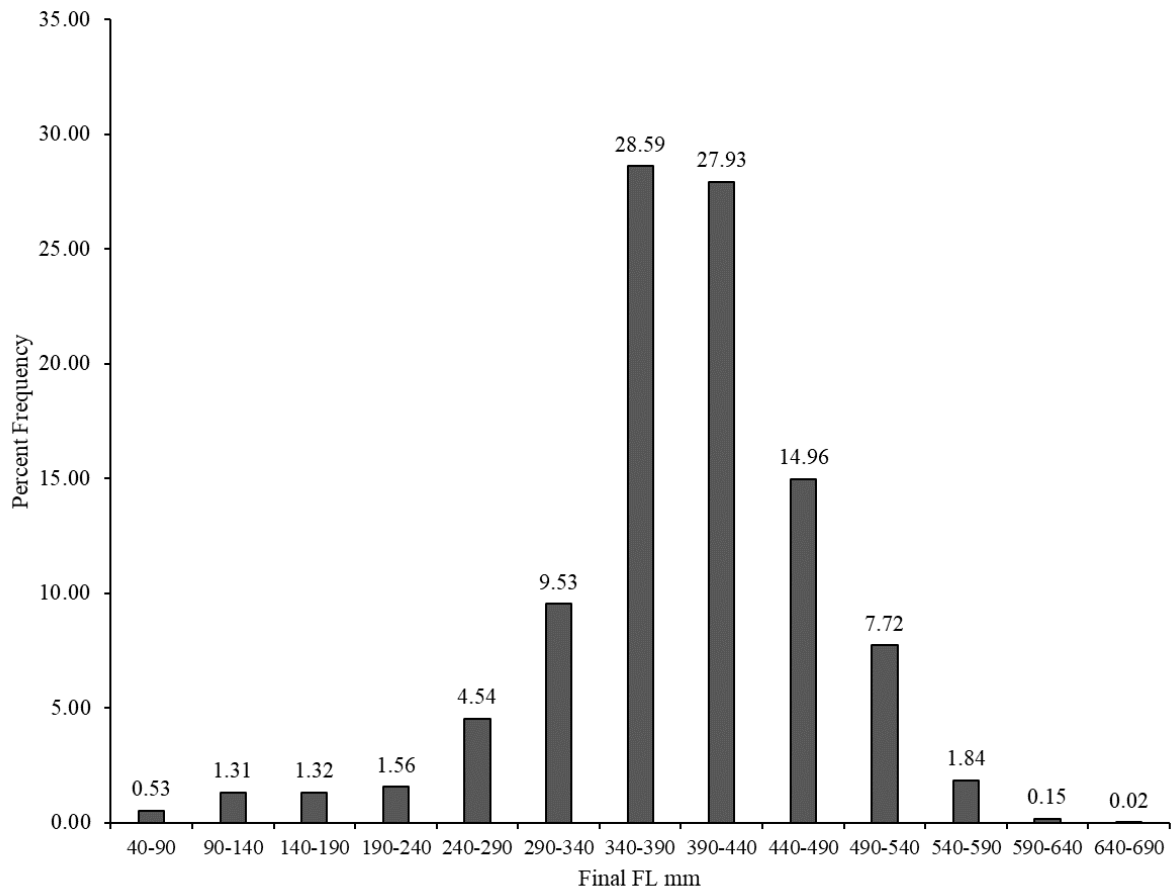


Figure 1. Percent frequency of final fork length (FL, mm) submitted by all data providers for Gulf gray triggerfish for SEDAR 100 (n=19,407).

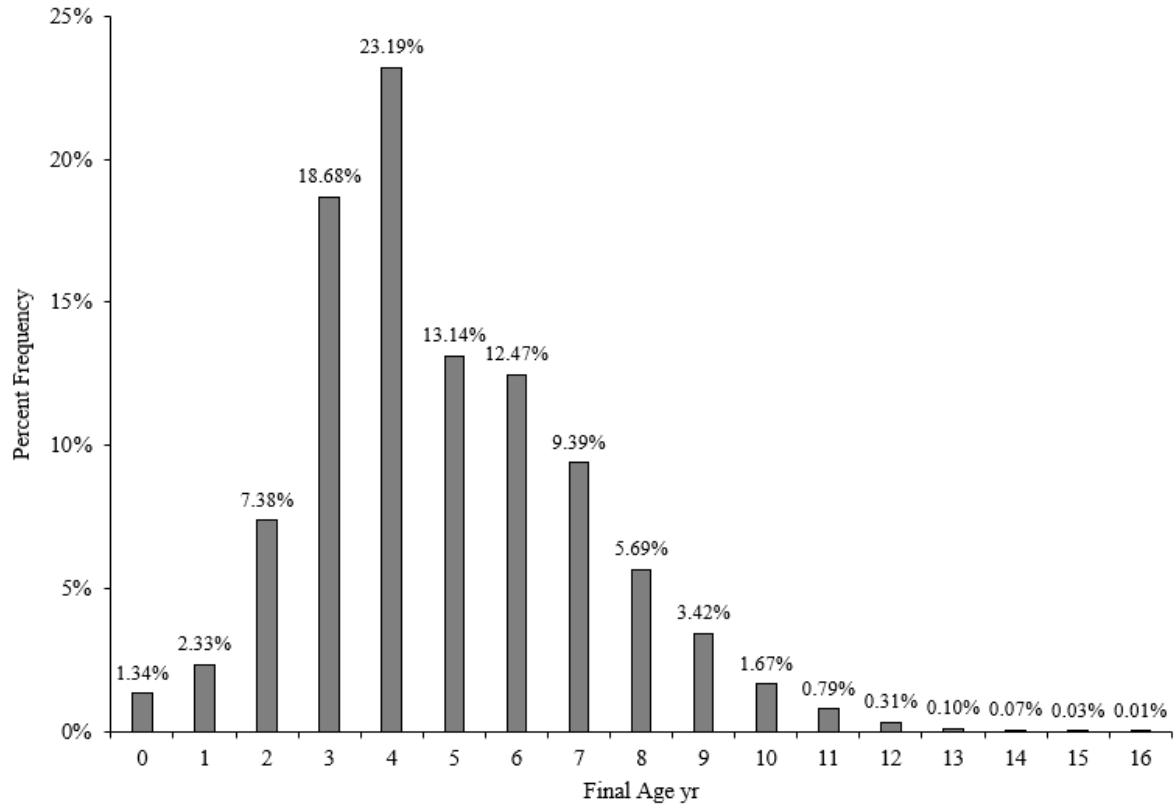


Figure 2. Percent frequency of final ages (yr) submitted by all data providers for Gulf gray triggerfish for SEDAR 100 (n=19,399).

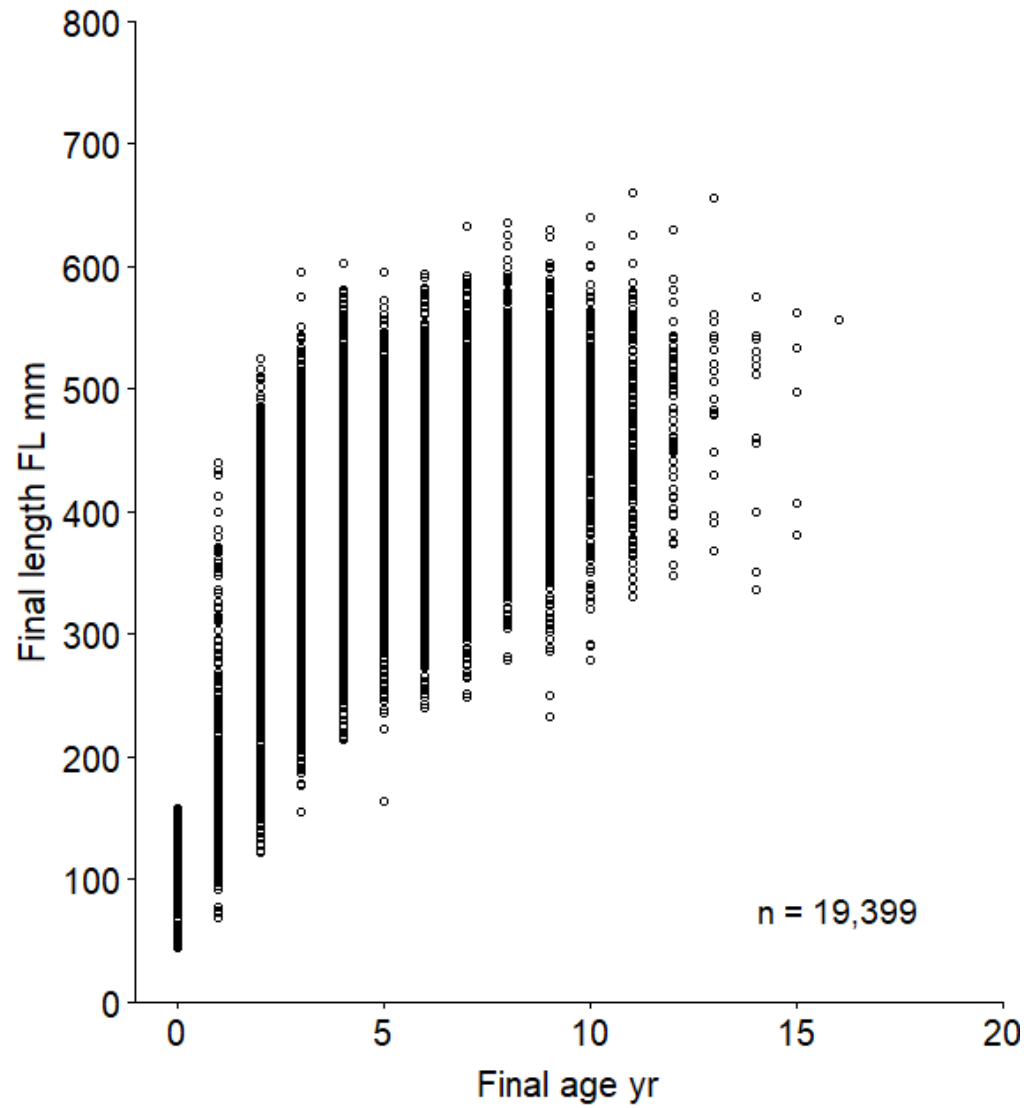


Figure 3. Scatterplot of final age (yr) versus final length (FL mm) for gray triggerfish age samples collected from the Gulf of America from 1999 to 2024. No age samples were collected in 2001.

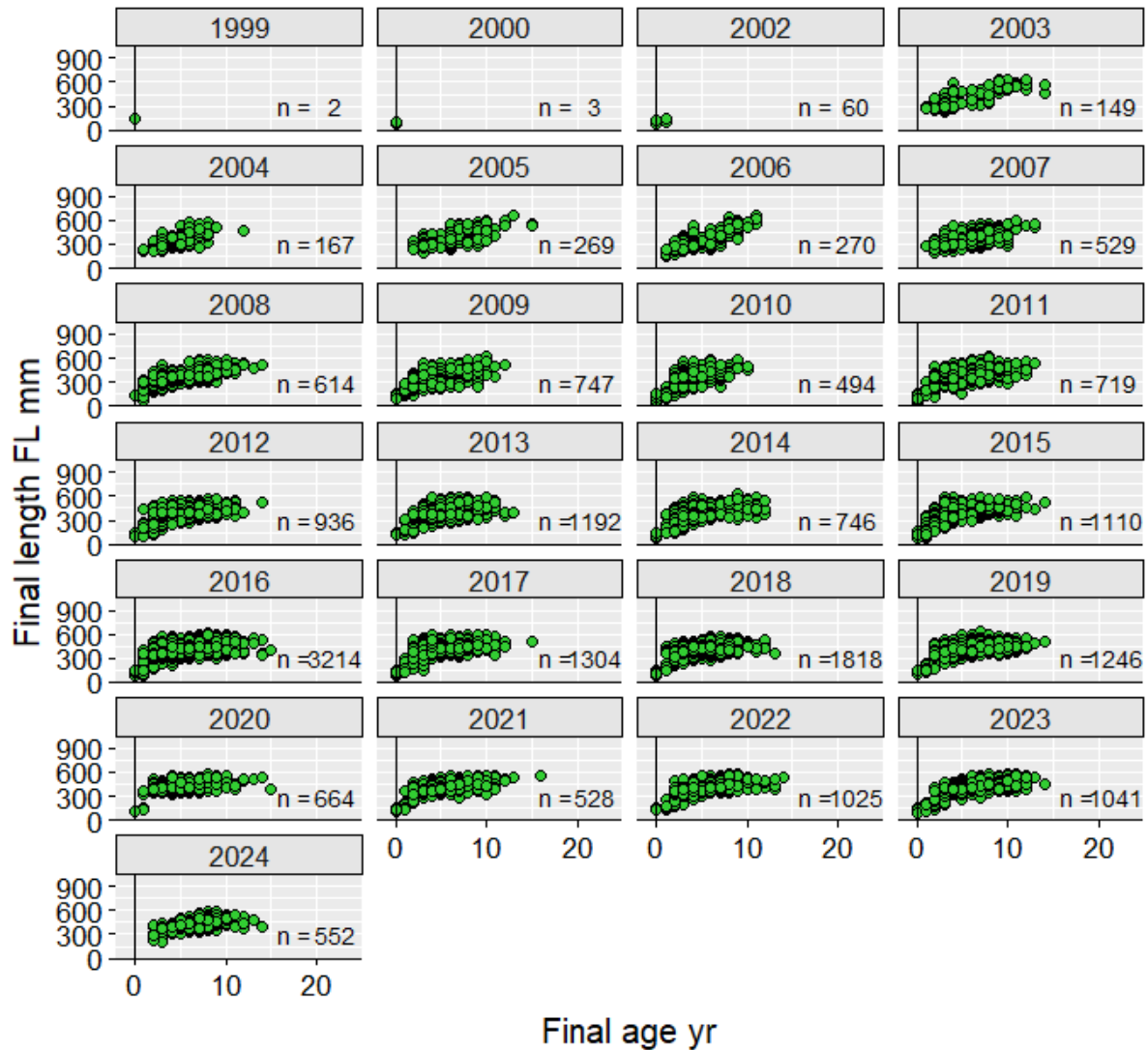


Figure 4. Scatterplots of final age (yr) by final length (FL mm) for gray triggerfish samples collected from the Gulf of America from 1999 to 2024. No age samples were collected from 2001. The number of observations is shown at the bottom right of each panel.

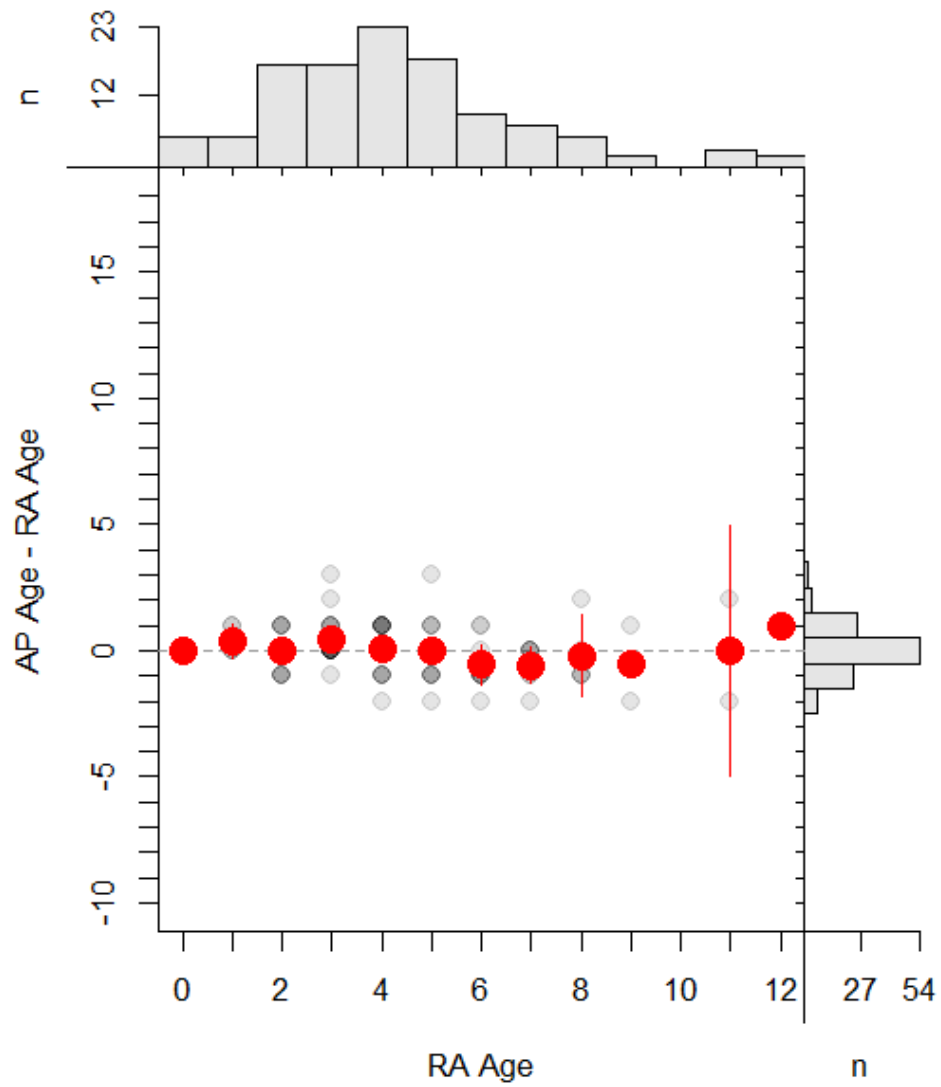


Figure 5. Bias plot between Panama City age reader Ashley Pacicco (AP) and Robert Allman (RA) for the gray triggerfish reference set following the updated ageing protocol by Potts et al. (2023).

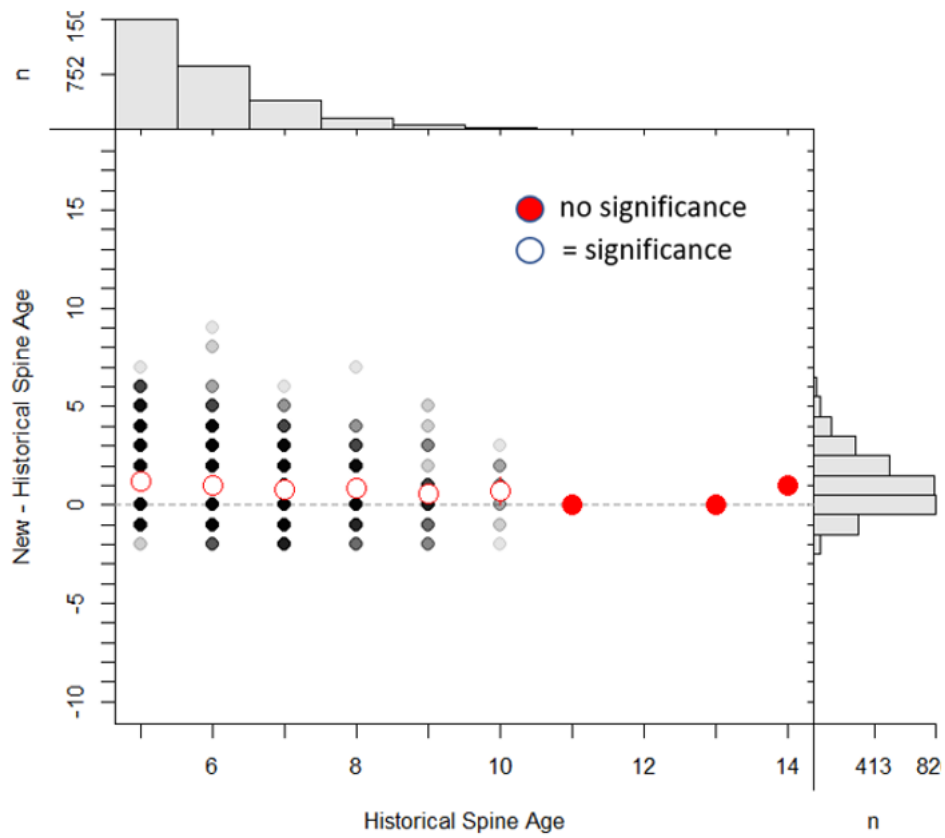


Figure 6. Bias plot between Panama City overlap reads of the new spine ages following Potts et al. (2023) and the historical ages (n=2,988 overlap reads).