

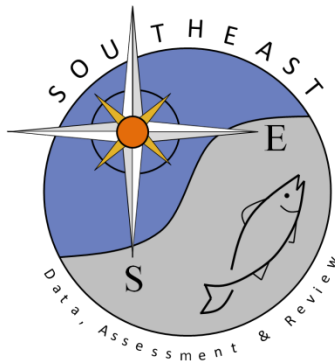
Length and age compositions of Gulf Gray Triggerfish, *Balistes capriscus*, collected in association with fishery-dependent projects

Maria McGirl, Jessica Carroll, and Bridget Cermak

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Maria McGirl, Jessica Carroll, and Bridget Cermak

Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute,

100 8th Avenue SE, St. Petersburg, FL 33701

Introduction

The Fishery-Dependent Monitoring subsection (FDM) of the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWRI) monitors commercial and recreational fishing in marine environments along the Florida coast in association with several fishery-dependent research and monitoring projects. FDM administers three federal surveys: the Marine Recreational Information Program (MRIP) and The Southeast Region Headboat Survey (SRHS) for the recreational sector, and the Trip Interview Program (TIP) for the commercial sector. Additionally, FDM conducts several unique surveys of recreational anglers that allow for the collection of supplemental biological data. Each fishery-dependent research or monitoring project that contributed age and length data to the Life History Group is detailed below. During these surveys, priority was given to collecting the left otolith when removing both otoliths was not feasible, to ensure the prompt return of fish to anglers.

Recreational Fishery Data

For-Hire At-Sea Observer Sampling

Gulf Coast of Florida

From 2005-2007, at-sea observer survey coverage on headboats operating from Alabama and the Gulf coast of Florida, from the panhandle through the Keys, was funded by the Gulf Fisheries Information Network (Gulf FIN). There was a gap in funding from January 2008 through May 2009. In June 2009, the state of Florida secured alternative funds to continue at-sea observer coverage in the northwest panhandle and central peninsula, including both the charter and headboat fleet. In 2014, coverage on headboats was limited to a small number of vessels participating in a pilot study for IFQ shares. Thus, data from this year are not considered

representative of the fishery as a whole. Since 2015, there has been consistent coverage of both charter and headboats from the panhandle through the Florida Keys.

South Atlantic coast of Florida

On the South Atlantic coast, at-sea headboat sampling has been conducted continuously since 2005 funded by the Atlantic Coast Cooperative Statistic Program (ACCSP), with this report including data collected between 2005 and 2024. At-sea sampling on Atlantic coast charter boats was funded with a 3-year MARFIN grant from 2013-2015, and there was a gap in funding from January 2016-May 2020. In July 2020, the state of Florida secured funds through the State Reef Fish Survey to expand coverage to east Florida, but trips were not observed through this funding until April 2021 due to the COVID-19 pandemic. There has been consistent coverage of charter boats since sampling coverage was re-initiated in April 2021.

Florida Keys (KEYS)

Headboat observer surveys were conducted in the Florida Keys from 2005 to 2007, funded by the Gulf Fisheries Information Network (GulfFIN) along with the Gulf coast. In 2010, headboat sampling coverage in the Florida Keys was re-initiated, along with the initiation of charter boat sampling. In 2014, representative at-sea observer data was only collected from charter vessels in the Florida Keys. Since 2015, there has been consistent coverage of both charter and headboats in the Florida Keys.

Collection Method

For the survey, both headboats and charter boats were randomly selected on a weekly basis throughout the year. Biological data was collected from harvested Gray Triggerfish dockside after observed trips, including midline length (mm), whole weight (kg), and whenever possible, a left otolith was extracted from sampled fish. Measurements and otoliths collected from observer coverage represent supplemental sampling separate from the dockside sampling conducted for the Southeast Regional Headboat Survey (SRHS).

State Reef Fish Survey

The State Reef Fish Survey (SRFS) has run continuously on the Florida Gulf coast since May 2015 when it was previously named Gulf Reef Fish Survey. Expanding state-wide in 2020, it was renamed to SRFS. This survey is a directed effort to collect data from offshore private recreational anglers who target reef fish species. Anglers wishing to harvest certain reef fish species, including Gray Triggerfish, on Florida's coast are required to have a State Reef Fish Angler designation on their fishing license. The State Reef Fish Survey is composed of two survey components: a mail-in survey and a dockside intercept survey. The mail-in survey is sent to randomly selected anglers with the State Reef Fish Angler designation to collect data on angler effort. The dockside intercept survey stations biologists at sampling sites to interview anglers on angler catches and fishing practices. Interview assignments are drawn from a subset of sampling sites known to have offshore fishing activity to intercept fishers that target reef fish. Data collected during dockside assignments include information regarding fishing depths, distances from shore while fishing for offshore species, number of harvested fish, and self-reported estimates of fish released during the fishing day. A subset of harvested fish are measured (fork length in mm) and weighed (in kilograms) during the survey.

Opportunistic Biological Sampling

Between 2000 and 2018 opportunistic biological sampling was conducted at angler intercept sites along the Gulf and Atlantic Coast of Florida, supported by a limited amount of funding from GulfFIN. Sampling assignments were conducted opportunistically to maximize the number of biological samples collected, primarily from busy charter landing sites. While the sampling sites were not selected using a randomized methodology, the fish sampled were not sampled in a biased manner. Biological sampling of intercepted fish included collection of length measurements (midline length in mm), whole weight (in kg) and collection of aging structures (otoliths or spines).

Representative Biological Sampling Program

The Representative Biological (RepBio) sampling program conducts supplemental biological sampling along the Gulf coast of the Florida peninsula (Escambia to Collier County) and the Florida Keys (Monroe). The survey began a pilot phase in 2018 and was fully implemented by 2019 along the entire Gulf coast of Florida. A randomized draw process is used to ensure

representative collection of biological samples, along with a species list that prioritizes collection of biological samples from data-poor, state-managed, and federally managed species when encountered. Interviews of recreational anglers are conducted at fishing access points identified via the MRIP Site Register and assigned via a weekly draw by sub-region. Biological sampling of harvested species includes collection of length measurements (midline length in mm), whole weight (in kg) and collection of aging structures (otoliths or spines). RepBio expanded to the Atlantic coast in November 2020. From January 1st, 2024, to August 1st, 2024, RepBio experienced a funding gap. No biological samples were collected during this period.

Ageing Protocols:

Gray triggerfish were aged using transverse sections of the first dorsal spine. Spines were removed from the fish, cleaned of excess tissue and stored dried in scintillation vials until processing. Three transverse sections (0.4–0.6 mm) were cut immediately distal of the condyle groove of each spine using a four-bladed Buehler Isomet low-speed wafering saw (VanderKooy et al., 2020; Potts et al., 2023). Sections were mounted on a glass slide and covered with a chemical mounting medium.

Spine sections were examined on a stereo microscope at 10–40x magnification using transmitted light. Ageing was conducted from the focus to the edge of each lobe, enumerating translucent zones as annuli. In spines, the narrow translucent zones represent a pattern of slower growth, and the wide opaque zones represent the pattern of slower growth (Potts et al., 2023). The margin of the spine was categorized as annulus either translucent or opaque at the edge (i.e. translucent zone on the edge or complete translucent zone with opaque growth on the edge). In all cases, the final age of the spine was equal to the annulus count, regardless of margin type. Further, Potts et al. (2023) determined that compacted growth zones on the edge potentially contributed to the underageing of older spines in previous assessments and recommended an updated ageing methodology for fish aged 5 or older. The Potts et al. (2023) protocol calls for increasing magnification of apparent wide translucent zones on the edge of fish aged 5 or

older to reveal and count any compacted growth zones. This protocol was conducted on all new reads, as well as any spine previously aged 5 or older for SEDAR assessment.

The FWRI Marine Fisheries Age and Growth Laboratory aged 2,789 spines for the Fishery Dependent Monitoring section in support of SEDAR100. A total of 710 spines were re-aged following the Potts et al. (2023) protocol because they were aged 5 years or older in previous assessments. Prior to conducting any ageing, staff reviewed training sets, including annotated images, particularly those from training conducted by J. Potts regarding the updated ageing protocol. Staff also aged the GSMFC traveling gray triggerfish reference set, representing a range of age classes, seasons, sexes and collection locations (Campana, 2001) to calibrate ageing technique, particularly identification and interpretation of the first annulus and margin type. The average percent error (APE) on all first and second quality control reads was 5.56%, and the APE for the GSMFC reference set for the 2024 rotation was 10.96% against reference ages. Both of these APE values are considered acceptably precise, particularly given the difficulty of ageing this species.

Results

Fishery-Dependent Results: Age and length composition

All fishery-dependent age data have been provided to the Life History Workgroup. From 2015–2024, age and length data for 3,428 Gulf Gray Triggerfish were collected across all recreational fleets in Florida’s waters (Table 2). More than half of the aged fish came from the Charter sector (59%), followed by the Private sector at 21%, and Headboats at 20% (Table 1).

Across the three fleets the mean age and fork length did not vary greatly (Figure 1). The Private sector generally sampled larger and older fish, where the lowest mean age was 5.63 ± 1.93 years and 412.56 ± 53.35 mm. The oldest Gray Triggerfish sampled was the Charter fleet, aged at 16 years (Figure 3). The next oldest were two 15-year-old individuals, collected from the Charter and Private fleets (Figure 4 & 5) In total, 58 fish were aged at over 10 years old between the three fleets (Figure 1). Figure 2 shows the proportional age

distribution across all years for each fleet, indicating that age 4 was the most frequent in all three fleets. Length as a function of age for each fleet is presented in Figure 6.

Literature Cited:

- Campana, S. 2001. Accuracy, precision and quality control in age determination, including a review of the use and abuse of age validation methods. *J Fish Biol* 59(2):197-242.
- Potts, J.C., Rogers, W.D., Rezek, T.C. and Rezek, A.R., 2023. Validation of annual growth zone formation in gray triggerfish *Balistes capriscus* dorsal spines, vertebrae, and otoliths. *Fisheries Research* 268:106809
- VanderKooy, S., J. Carroll, S. Elzey, J. Gilmore, and J. Kipp. 2020. A Practical Handbook for Determining the Ages of Gulf of Mexico and Atlantic Coast Fishes. Pages 294 *in*. Gulf States Marine Fisheries Commission and Atlantic States Marine Fisheries Commission, Ocean Springs, MS.

Table 1. Number of aged fish, mean age and length (\pm SD) by fleet.

Fishing Fleet	# Fish	Mean Age (y)	Mean FL (mm)
Charter	2015	5.37 \pm 1.95	407.46 \pm 43.39
Headboat	702	5.36 \pm 1.86	397.42 \pm 40.04
Private	711	5.63 \pm 1.93	412.56 \pm 53.35
TOTAL	3428	5.34 \pm 1.93	406.45 \pm 45.26

Table 2. Number of aged fish, mean age and length (\pm SD) by fleet and year.

	# Fish	Mean Age (y)	Mean FL (mm)	SD Age	SD FL
Charter					
2016	706	4.97	394.42	1.91	44.05
2017	80	4.32	398.46	1.68	34.87
2018	380	5.28	413.81	1.63	33.94
2019	164	5.93	422.68	1.88	40.06
2020	104	5.39	405.72	2.02	34.90
2021	171	6.30	421.04	2.24	54.27
2022	194	5.80	416.09	2.04	45.95
2023	136	5.55	409.79	1.66	40.81
2024	80	5.83	418.63	2.18	41.12
Headboat					
2016	343	5.07	381.04	1.73	35.58
2018	195	4.99	407.68	1.42	31.43
2019	36	5.81	417.94	1.47	31.80
2020	2	5.00	422.00	1.41	32.53
2021	7	6.57	403.29	2.07	27.96
2022	40	6.15	421.63	2.20	49.85
2023	43	6.70	418.00	2.60	49.29
2024	36	6.86	422.89	2.14	43.02
Private					
2015	3	4.00	339.33	0.00	16.80
2016	113	5.18	397.56	2.02	49.53
2017	113	4.13	390.97	1.47	41.40
2018	135	5.28	420.61	1.52	49.14
2019	54	5.83	436.27	1.90	58.28
2020	51	5.48	435.86	2.38	57.93
2021	58	5.60	430.16	2.12	59.12
2022	85	5.58	413.85	2.02	53.68
2023	59	5.41	413.24	2.13	55.98
2024	40	5.55	405.60	1.62	46.03

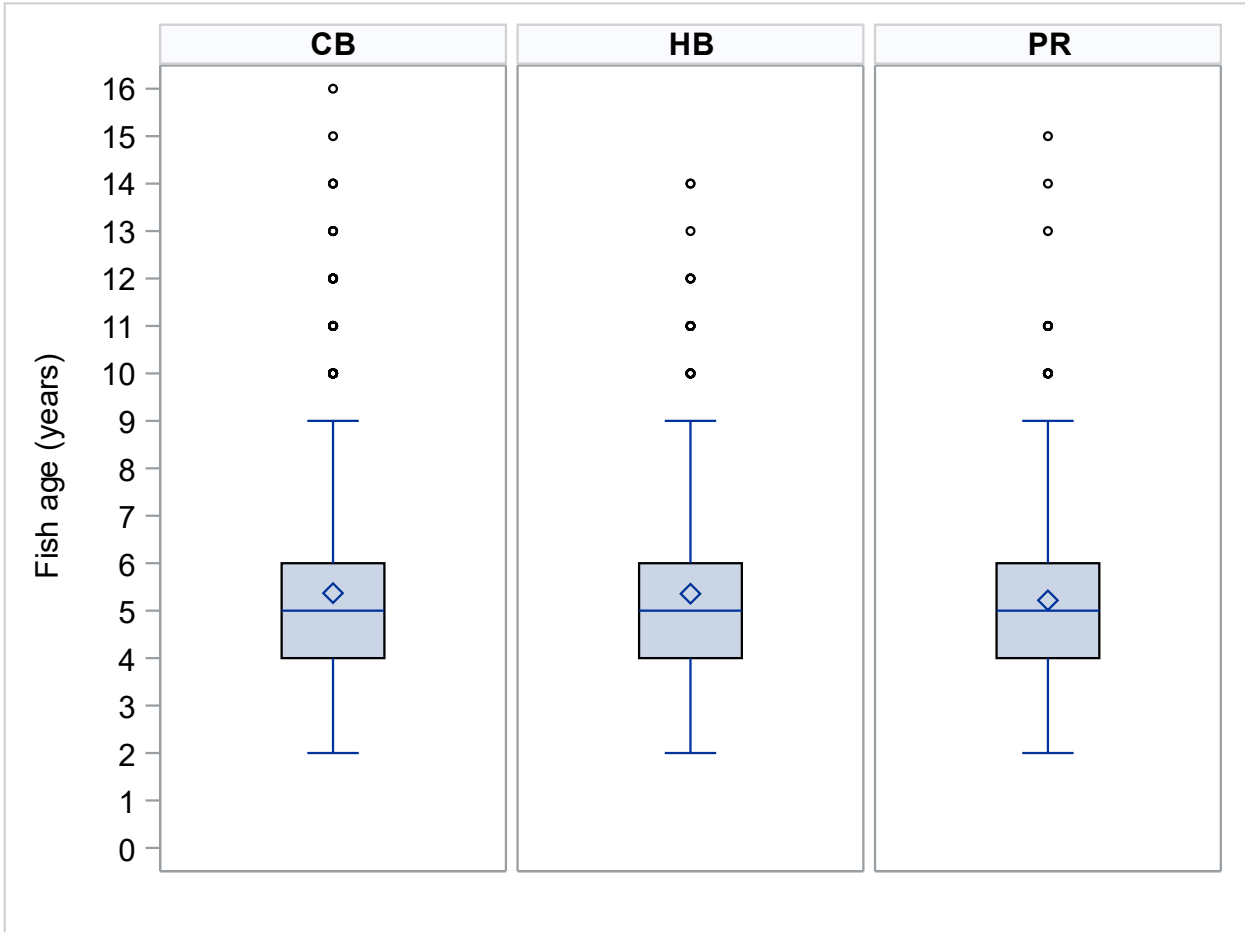


Figure 1. Age distribution by fishing fleet. CB= Charter, HB=Headboat, and PR= Private.

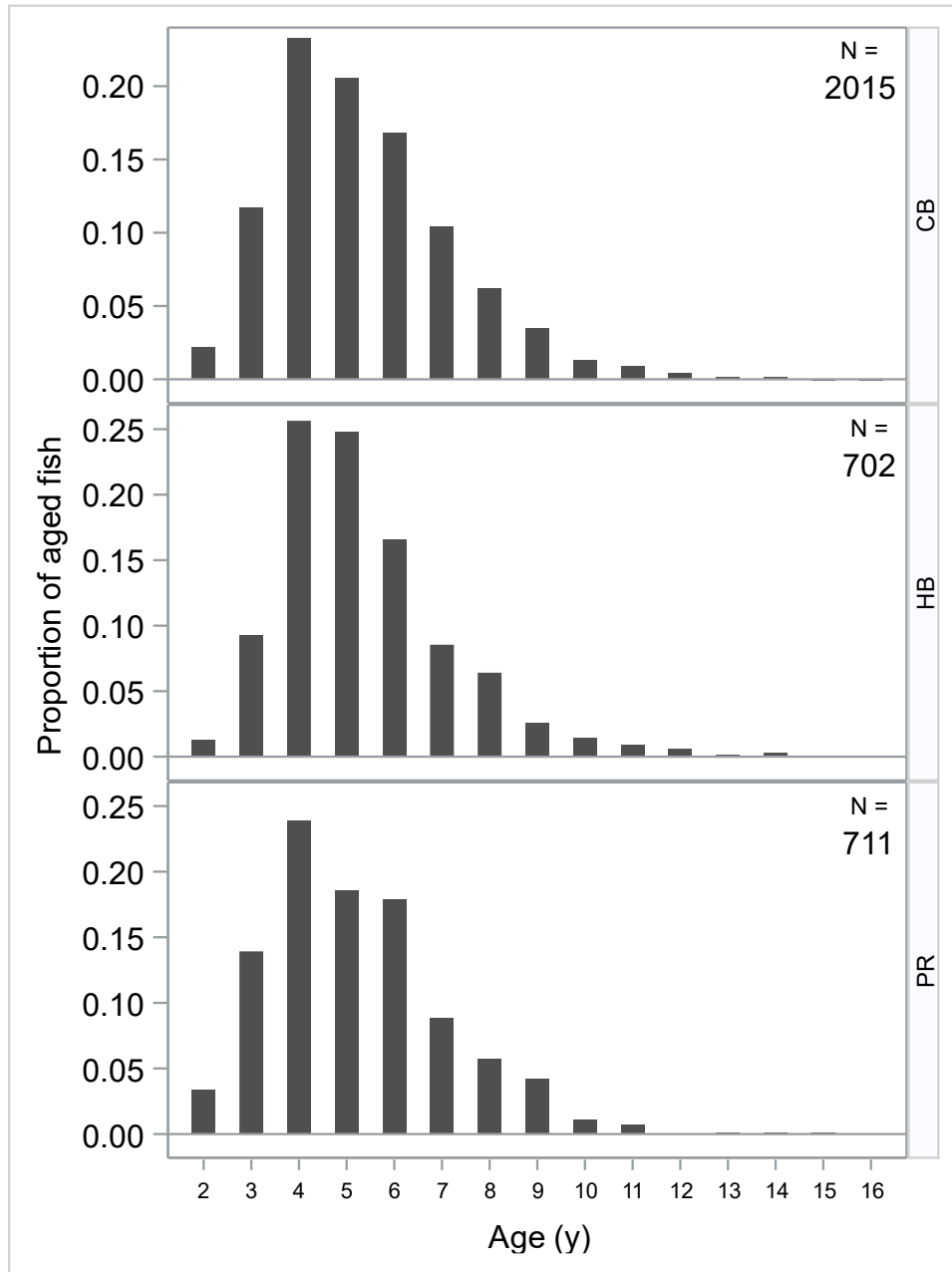


Figure 2. Age distribution of fish across entire time series in each fishery. CB= Charter, HB= Headboat, and PR= Private.

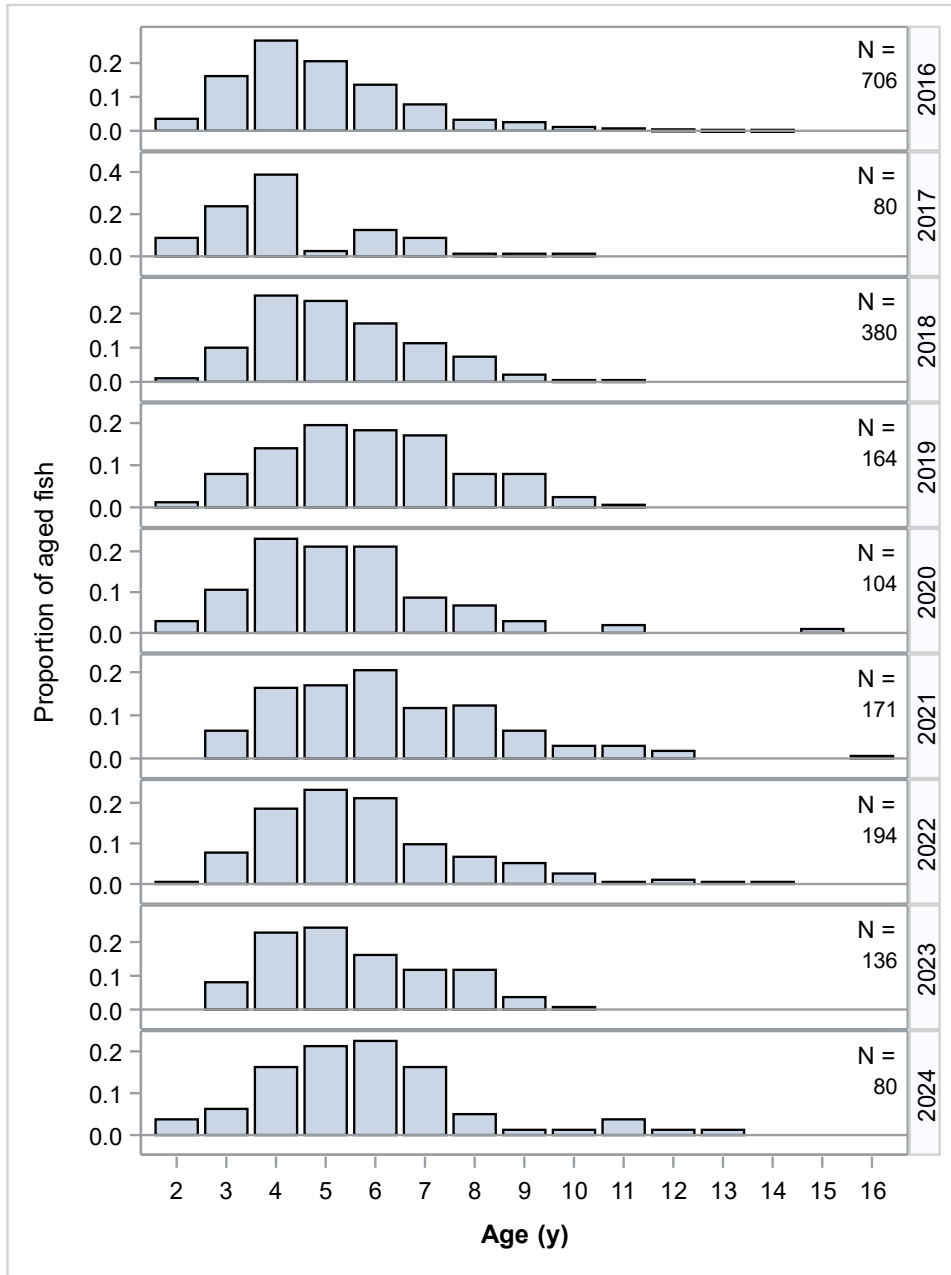


Figure 3. Proportion of total fish aged by year of the **Charter Fleet**.

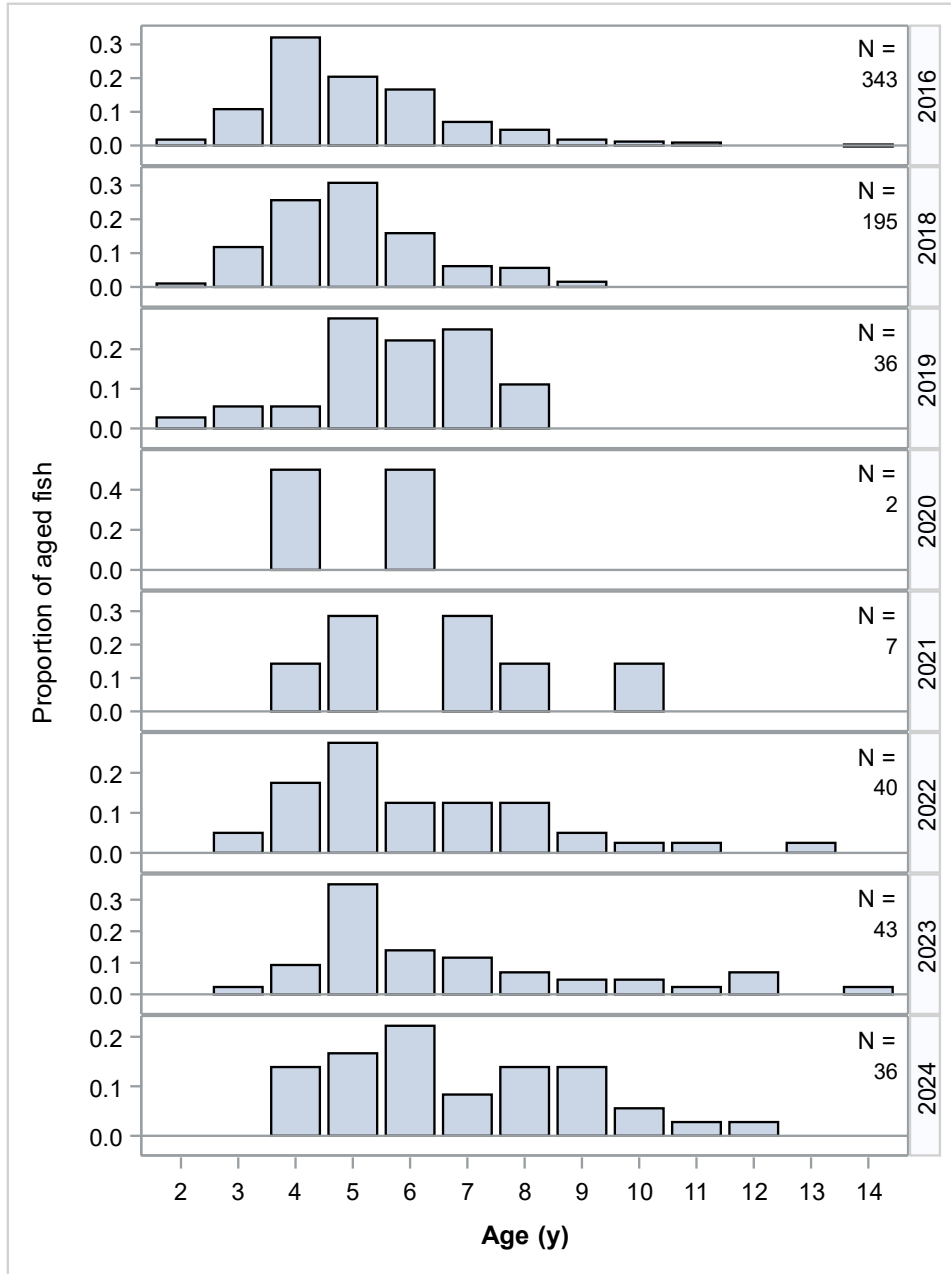


Figure 4. Proportion of total fish aged by year of the **Headboat** Fleet.

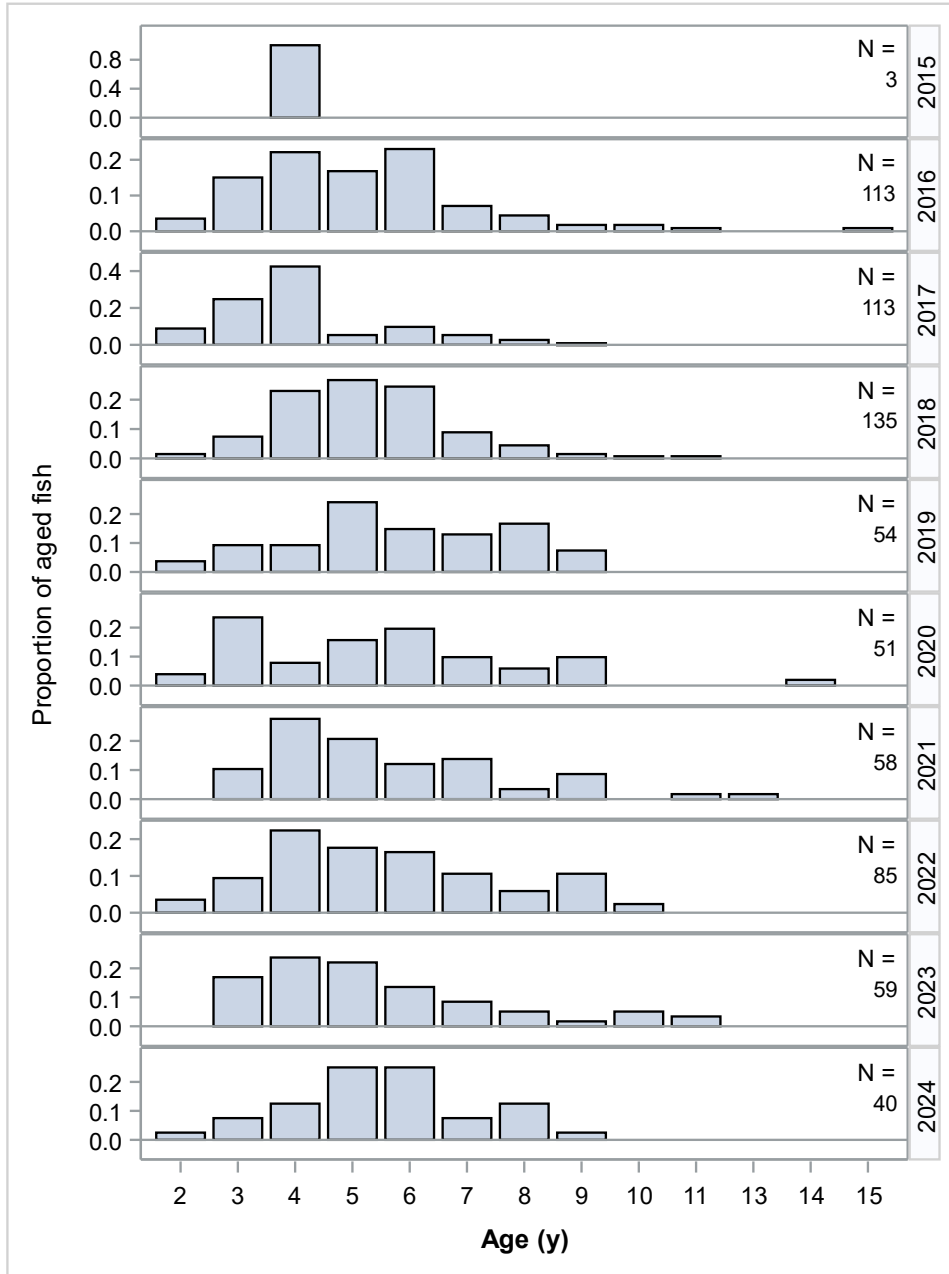


Figure 5. Proportion of total fish aged by year of the **Private** Fleet.

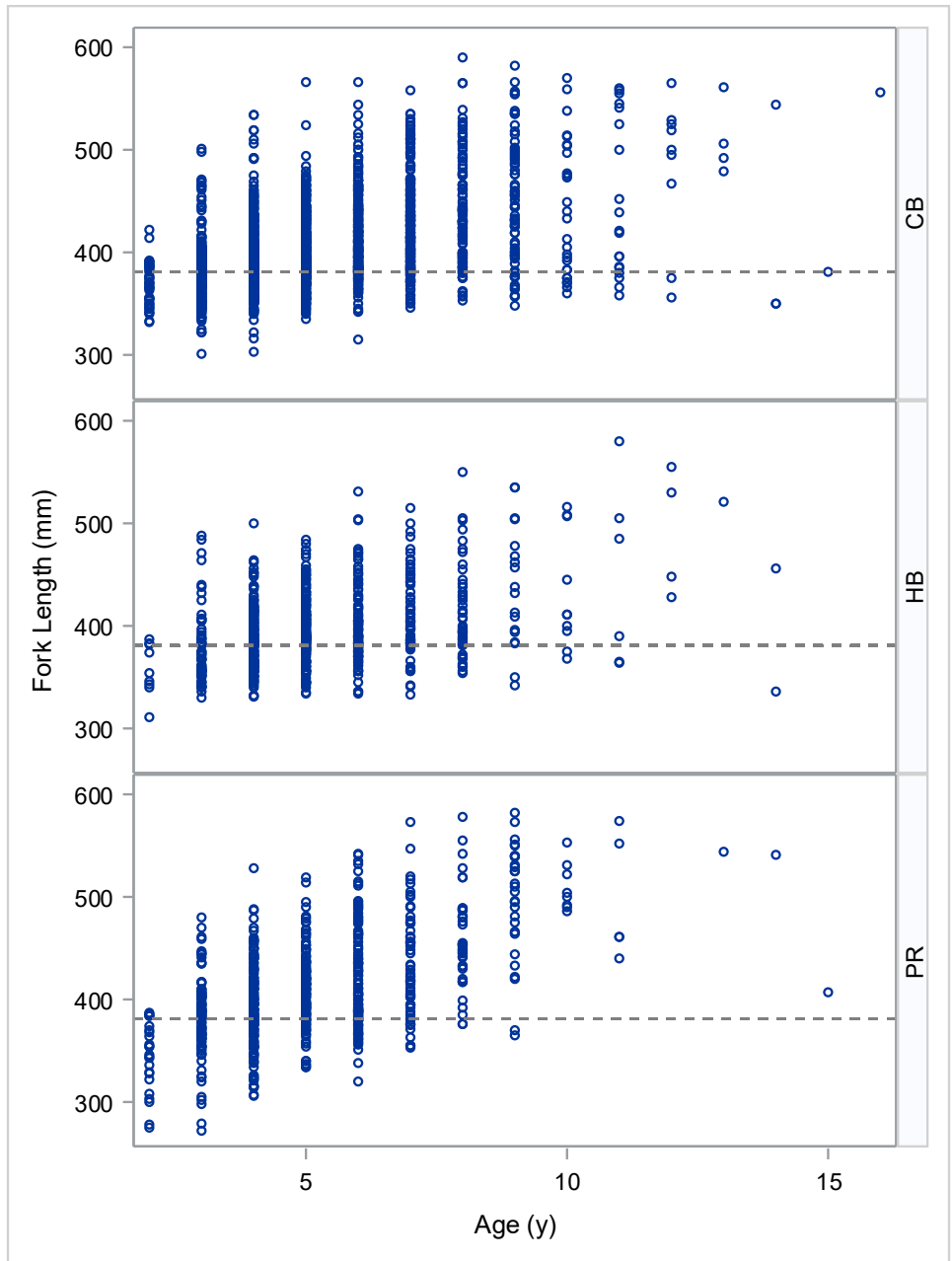


Figure 6. Fork Length (FL) as a function of age in each fleet. Reference line represents the 15" FL regulation. CB= Charter, HB= Headboat, and PR= Private.