Size and age information for Southeastern US Yellowtail Snapper, *Ocyurus chrysurus*, collected in association with fishery-dependent projects

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SEDAR96-WP-07

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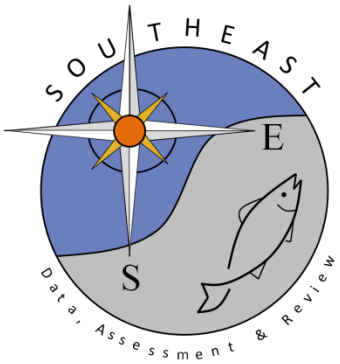

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Introduction:

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 to the age and length data provided to the Life History Group is described below. Because fish must be returned to anglers quickly during fishery-dependent surveys, priority was given to collecting the left otolith if both otoliths could not be removed.

Commercial Fishery Data

Trip Interview Program (TIP)

The commercial fishery is sampled via the NOAA Trip Interview Program (TIP) in which Florida participates. The primary focus of the TIP program is collecting random size frequency data and biological samples from commercial marine species. Samplers take information from harvested fish being offloaded from commercial fishing vessels. Length measurements include fork length and natural total length (mm). Weight measurements are whole weight or gutted weight (kg), dependent upon on the status of the fish upon landing. Typically, a single otolith is extracted below the operculum to retain filet integrity. Length and weight data are provided as part of a single federal dataset.

Recreational Fishery Data

At-Sea Observer Sampling of For-Hire Fisheries

In 2005, at-sea observer survey coverage started on headboats operating from the Gulf coast of Florida from the panhandle through the Florida Keys. The at-sea headboat survey was funded by the Gulf Fisheries Information Network (GulfFIN) continuously through 2008 and was discontinued in 2009. In June of 2009, the state of Florida secured alternative funds to continue

at-sea observer coverage in the northwest panhandle and central peninsula and expanded coverage to include charter boats in these regions. In 2010, sampling coverage in the Florida Keys was re-initiated for both headboat and charter vessels through the present, except for a sampling hiatus in 2014. During this time, representative at-sea observer data was only collected from charter vessels in the Florida Keys. Data from headboats and charter vessels in northwest and southwest Florida represented only a small subset of the for-hire fleet and may not be indicative of the entire fleet for that year. For the survey, both headboats and charter boats were randomly selected on a weekly basis throughout the year. Biological data was collected from harvested Yellowtail Snapper 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 of the dockside sampling conducted for the Southeast Regional Headboat Survey (SRHS).

State Reef Fish Survey of Recreational Fishers

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 Yellowtail Snapper, 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 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). From January 1st, 2024, to August 1st, 2024, RepBio experienced a funding gap. No biological samples were collected during this period.

Ageing Protocols:

Sagittal otoliths were removed from the head, cleaned, dried and stored in vials. The left otolith was processed for age determination unless it was broken through the core, in which case, the right was processed. The otolith core was marked with a pencil. Smaller otoliths were embedded in a 5:1.1 weighted ratio of araldite to hardener using the methods described in VanderKooy et al. (2020), while larger otoliths remained unembedded. The embedded resin blocks and whole otoliths were then mounted on card stock using hot glue. Processing of the otoliths was

completed on a four-bladed Buehler Isomet low-speed wafering saw, as described in VanderKooy et al. (2020). After processing, three transverse sections of approximately 400 μm thickness encompassing the core were mounted on a glass slide and covered with a chemical mounting medium.

Sectioned otoliths were examined on a stereo microscope using transmitted light. Ageing was conducted on the dorsal lobe of the otolith along an axis near the sulcal groove from the core to the edge. Each otolith was examined with at least two blind reads. When age estimates did not agree between reads, a third read was conducted to resolve the discrepancy.

Annual ages were calculated using annulus count (number of opaque zones), degree of marginal completion, average date of otolith increment deposition, and date of capture. This traditional method is based on a calendar year instead of time since spawning (VanderKooy et al. 2020). Carroll et al. (2019) indirectly validated annulus formation of Yellowtail Snapper using marginal increment analysis and determined peak opaque zone formation occurs in May and June. In the Florida Keys, spawning peaks during April to August but can occur year-round (McClellan and Cummings 1998; Collins and Finucane 1989). Using these criteria, age was advanced by one year if a large translucent zone was visible on the margin and the capture date was between January 1 and June 30. For all fish collected after June 30, age was assigned to be annulus count, since opaque zone formation is typically complete (Carroll et al. 2019). Calendar ages were converted to fractional, or monthly biological, ages by adding or subtracting the fraction of a year calculated between the assumed April 1 birth date and month of capture.

The FWRI Marine Fisheries Age and Growth Laboratory aged 8,263 otoliths for the Fishery Dependent Monitoring section in support of SEDAR96. Three individual readers contributed to ageing otoliths that were delivered following SEDAR64. Prior to ageing these samples, all staff read through an in-house reference set of Yellowtail Snapper otoliths 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. Quality control subsets were read each sampling year by all readers to estimate precision. Readers were assigned different portions of the collections for individual reading. The average percent error on all first and second reads was 0.72%, which is considered highly precise (Campana 2001); moreover, there was a 95% age agreement between all first and second reads, and a 97% agreement +/- 1

year. All age data provided for SEDAR96 included increment count, calendar age and fractional age; however, the summaries including ages in this report were based on adjusted calendar age.

Results:

Fishery-Dependent Results: Age and length composition

All fishery-dependent age data have been provided; what follows is a summary of the calendar ages and lengths of aged Yellowtail Snapper. Data are presented in two ways, as a single time unit and presented by individual collection year. Length and bag limits have remained stable since collections began with recreational length limit set at 12" TL.

Age data are summarized for a total of 28,794 individuals. All age samples were obtained from surveys of the recreational and commercial sector, including 1,300 samples from private recreational boat trips, 7,665 from charter trips, 11,009 from headboats, and 8,722 from commercial efforts (Table 1). Mean and standard deviation of length and age was very consistent among fleets (Table 1). Commercial vessels landed higher proportions of older fish whereas headboats landed younger fish (Figure 2).

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Table 1. Numbers of fish aged, mean (± SD) age, and length landed in Florida by fishing fleet (2015-2022) and total for all fleets combined.

Fishing Fleet	# Fish Age	Mean age (y)	Mean FL (mm)
CHARTER	7665	3.35 ± 1.72	302.98 ± 45.75
COMMERCIAL	8722	3.83 ± 2.25	320.85 ± 53.17
HEADBOAT	11009	2.73 ± 1.25	298.25 ± 39.87
PRIVATE	1300	3.39 ± 1.63	296.63 ± 45.61
SHORE	1	2	213.00
TOURNAMENT	11	5.73 ± 3.26	424.45 ± 74.78
UNKNOWN	86	3.21 ± 1.40	281.36 ± 26.16
TOTAL	28794	3.26 ± 1.81	306.28 ± 47.15

Table 2. Numbers of fish aged mean & SD age and length landed by fishing fleet by year 2015-2023. CB= Charter boat, CM= Commercial, HB= Headboat, PR= Private, SH= Shore, TRN= Tournament.

FLEET	YEAR	N	MEAN AGE (Y)	MEAN FL (mm)	SD AGE	SD FL (mm)
CB	2002	99	4.071	325.6597938	2.144	55.38969643
CB	2003	269	2.227	294.1821561	0.917	30.264017
CB	2004	464	2.416	286.5215517	0.9	27.73617549
CB	2005	361	2.41	293.6620499	0.819	33.97175175
CB	2006	273	2.337	275.7132353	0.699	33.06438047
CB	2007	2	2.5	297.5	0.707	17.67766953
CB	2008	76	4.789	322.5263158	1.948	61.87115078
CB	2009	543	4.287	315.5027624	2.506	56.40044859
CB	2010	686	3.108	306.4794721	1.589	43.55455021
CB	2011	354	2.963	306.713881	1.038	42.48048021
CB	2012	26	2.346	277.1923077	1.093	21.18493659
CB	2013	92	2.609	293.3369565	1.67	53.23373242
CB	2014	363	2.868	287.0082645	1.306	41.242946
CB	2015	527	3.194	293.8444023	1.531	41.36743546
CB	2016	341	2.853	290.2979351	1.249	38.33251083
CB	2017	674	3.656	307.6038576	1.718	45.00215002
CB	2018	1173	4.11	314.2463768	1.976	50.4416315
CB	2019	908	3.593	309.8237886	1.485	46.95198944
CB	2020	127	4.189	301.6771654	1.473	43.96479145
CB	2021	104	3.548	290.0192308	1.487	36.35877874
CB	2022	120	3.442	312.907563	1.527	46.43311056
CB	2023	83	3.928	312.9638554	1.765	48.95479393
CM	2001	8	3.375	280.25	1.061	9.91031209

CM	2002	60	4.4	327.1666667	1.729	27.15065731
CM	2003	121	4.471	316.4214876	2.037	49.76507344
CM	2004	119	4.824	323.7394958	2.25	54.58913752
CM	2005	298	4.03	311.6565657	1.573	38.91306013
CM	2006	115	4.426	324.8434783	1.777	42.95623871
CM	2007	81	3.988	326.275	1.972	43.00808726
CM	2008	328	4.713	336.9756098	3.067	58.58791467
CM	2009	158	3.81	302.6202532	2.519	49.28386612
CM	2010	279	4.308	337.8992806	1.754	54.63397007
CM	2011	462	4.528	340.3543478	2.332	61.42745055
CM	2012	681	3.753	328.8147059	2.034	55.41394173
CM	2013	788	3.084	310.6408629	1.814	42.81210038
CM	2014	985	2.613	293.6544715	1.221	40.53119468
CM	2015	1028	2.563	293.9319066	1.092	33.37455598
CM	2016	692	2.88	303.9205202	1.538	35.79699614
CM	2017	636	3.623	318.3820755	1.942	54.02667984
CM	2018	559	6.181	370.4525939	2.664	55.89375632
CM	2019	718	4.979	340.3607242	2.53	52.84145878
CM	2020	388	4.941	333.8376289	2.574	53.11454082
CM	2021	159	5.019	370.509434	2.268	60.30616694
CM	2022	42	4.357	358.4761905	2.283	65.86025046
CM	2023	17	3.706	316.4705882	0.92	57.86635211
HB	2003	1	1	260	.	.
HB	2004	394	2.487	299.7309645	0.883	37.46569193
HB	2005	447	2.725	308.611236	0.851	37.68258086
HB	2006	390	2.472	306.0777202	1.316	37.51846882
HB	2007	739	2.597	309.1008174	0.77	38.2557014
HB	2008	618	3.01	306.2236629	1.37	38.26473773
HB	2009	939	2.958	305.9786096	1.677	45.05088216
HB	2010	1189	2.827	300.1141167	1.343	37.35193662
HB	2011	839	2.846	305.9784946	1.449	40.16636475
HB	2012	181	2.923	307.2596685	0.778	35.49247147
HB	2013	487	2.177	298.5134021	0.752	37.83525519
HB	2014	756	2.282	296.2297477	0.601	33.59547473
HB	2015	578	2.427	295.9100346	0.9	37.43049762
HB	2016	1132	2.925	294.4854111	1.42	36.81321556
HB	2017	618	2.502	283.2601626	1.166	40.91300005
HB	2018	602	2.865	279.8702163	1.209	40.32711819
HB	2019	694	3.14	283.2590975	1.239	38.22657404
HB	2020	37	3.135	270.972973	1.11	38.50143323
HB	2021	139	2.568	297.4676259	1.269	45.81726498
HB	2022	125	2.504	295.24	1.168	40.37992954
HB	2023	104	2.856	302.2403846	1.787	54.98587554
PR	2002	2	3	274.5	1.414	2.121320344
PR	2003	2	3	355.5	2.828	106.773124
PR	2004	23	2.391	285.5652174	0.656	34.18908131
PR	2005	8	3.375	305.75	1.188	26.05899899
PR	2007	10	3.1	338.2	0.738	22.498395

PR	2008	17	4.294	301.5294118	2.687	53.55968359
PR	2009	7	2.857	325.1428571	0.378	30.03569305
PR	2010	78	3.167	324.2727273	1.362	48.58623272
PR	2011	34	4	309.6470588	1.073	84.34053713
PR	2012	1	2	310	.	.
PR	2014	14	3.214	292.3571429	1.369	37.02516222
PR	2016	7	3.429	350.2	1.397	33.89985251
PR	2017	130	3.462	297.6511628	1.595	40.87569785
PR	2018	142	3.655	292.7605634	1.668	34.98508894
PR	2019	225	3.902	298.2266667	1.922	55.57513576
PR	2020	74	3.797	297.6891892	1.752	36.0923191
PR	2021	150	3.173	294.1733333	1.553	39.27304977
PR	2022	172	3.14	293.6453488	1.484	43.37793698
PR	2023	204	2.877	284.2843137	1.339	37.41864803
SH	2023	1	2	213	.	.
TRN	2003	2	5	427	0	39.59797975
TRN	2005	1	14	540	.	.
TRN	2006	2	5.5	405.5	4.95	173.2411614
TRN	2011	2	5	442.5	0	30.40559159
TRN	2012	1	5	435	.	.
TRN	2017	2	3.5	392	0.707	48.08326112
TRN	2018	1	6	360	.	.
UN	2003	54	3.722	277.5925926	1.338	27.00280804
UN	2010	5	2	284.2	0	20.09228708
UN	2011	6	2.667	299.1666667	0.516	22.98187692
UN	2019	18	1.889	284.8333333	0.676	26.11794515
UN	2023	3	5	288	0	14.4222051

Figure 1. Age distribution by fishing fleet. N = total numbers of samples included in each box. CB= Charter boat, CM= Commercial, HB= Headboat, PR= Private, SH= Shore, TRN= Tournament.

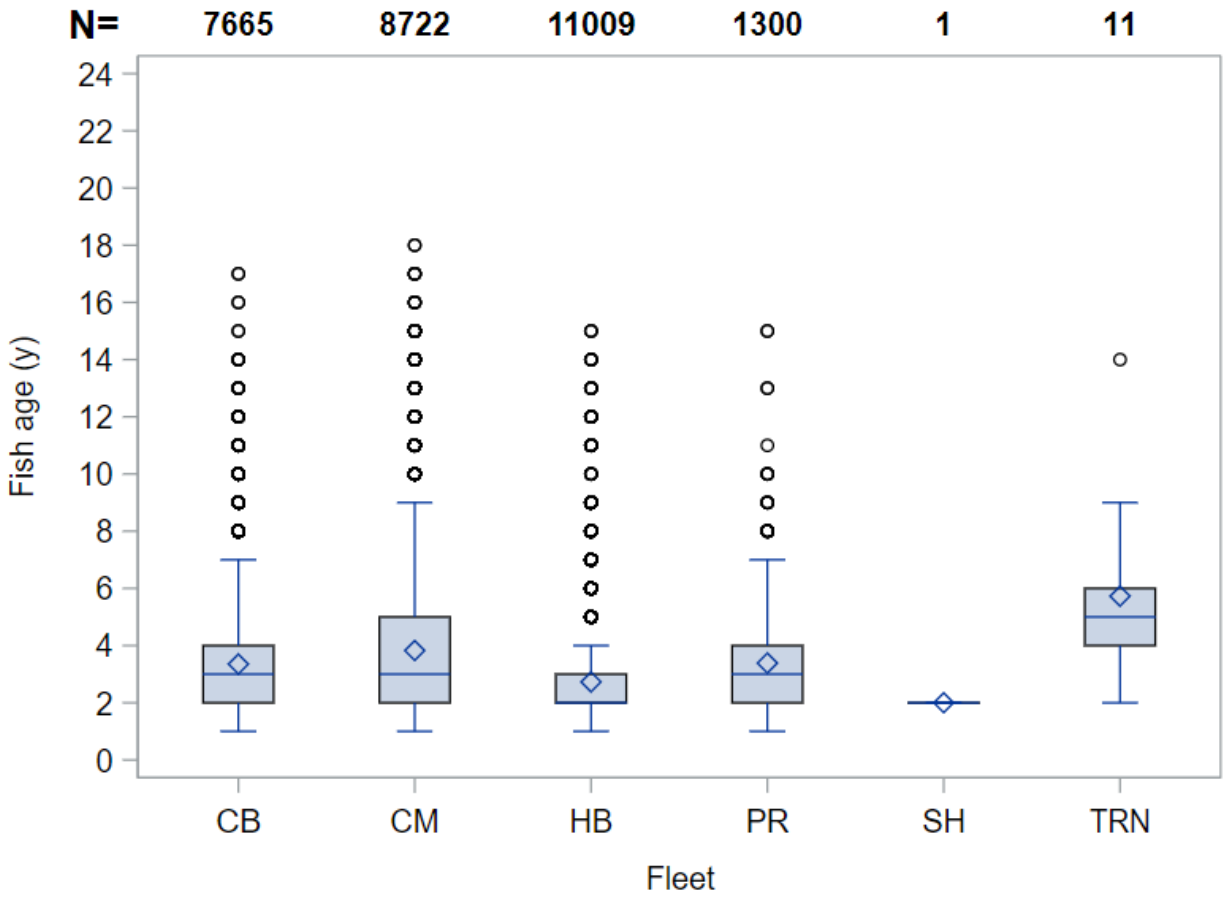
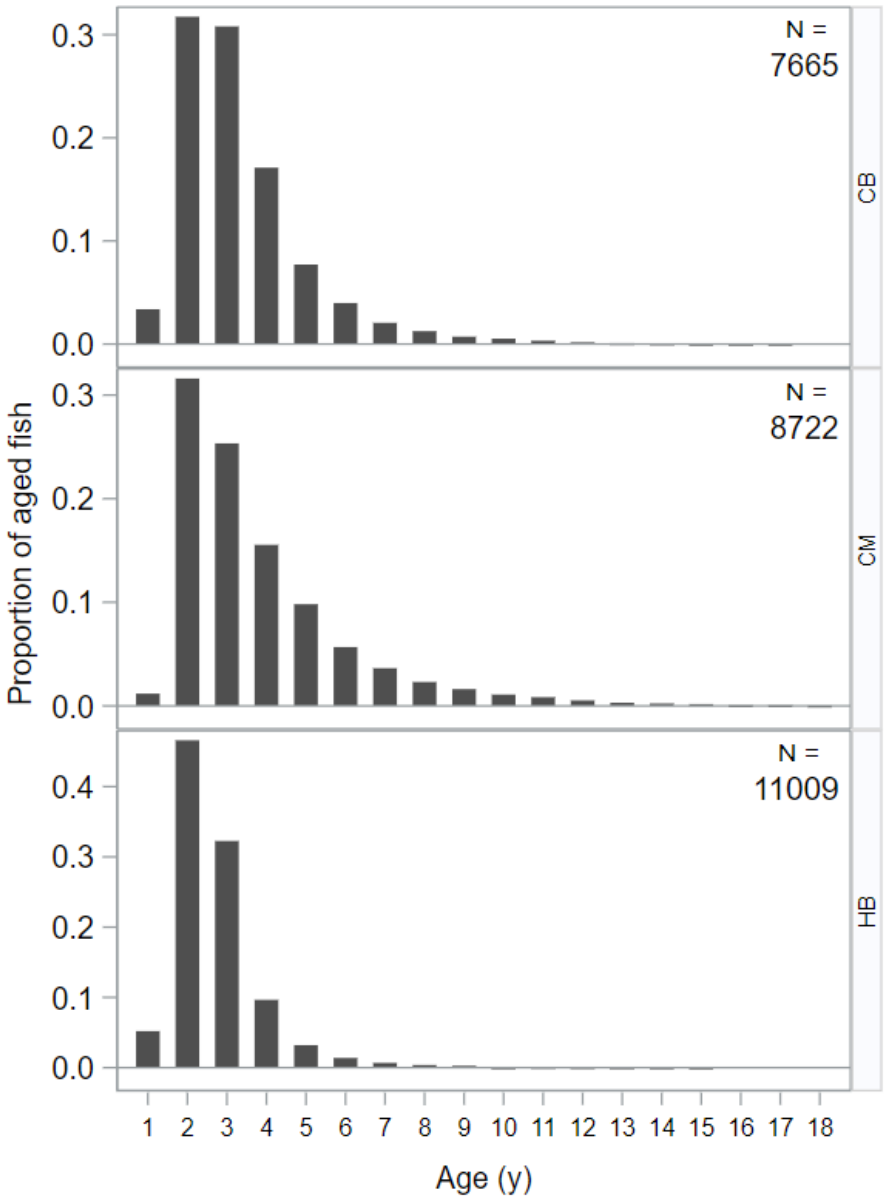


Figure 2. Proportional age distribution of Yellowtail Snapper by fleet. CB= Charter boat, CM= Commercial, HB= Headboat, PR= Private, SH= Shore, TRN= Tournament.



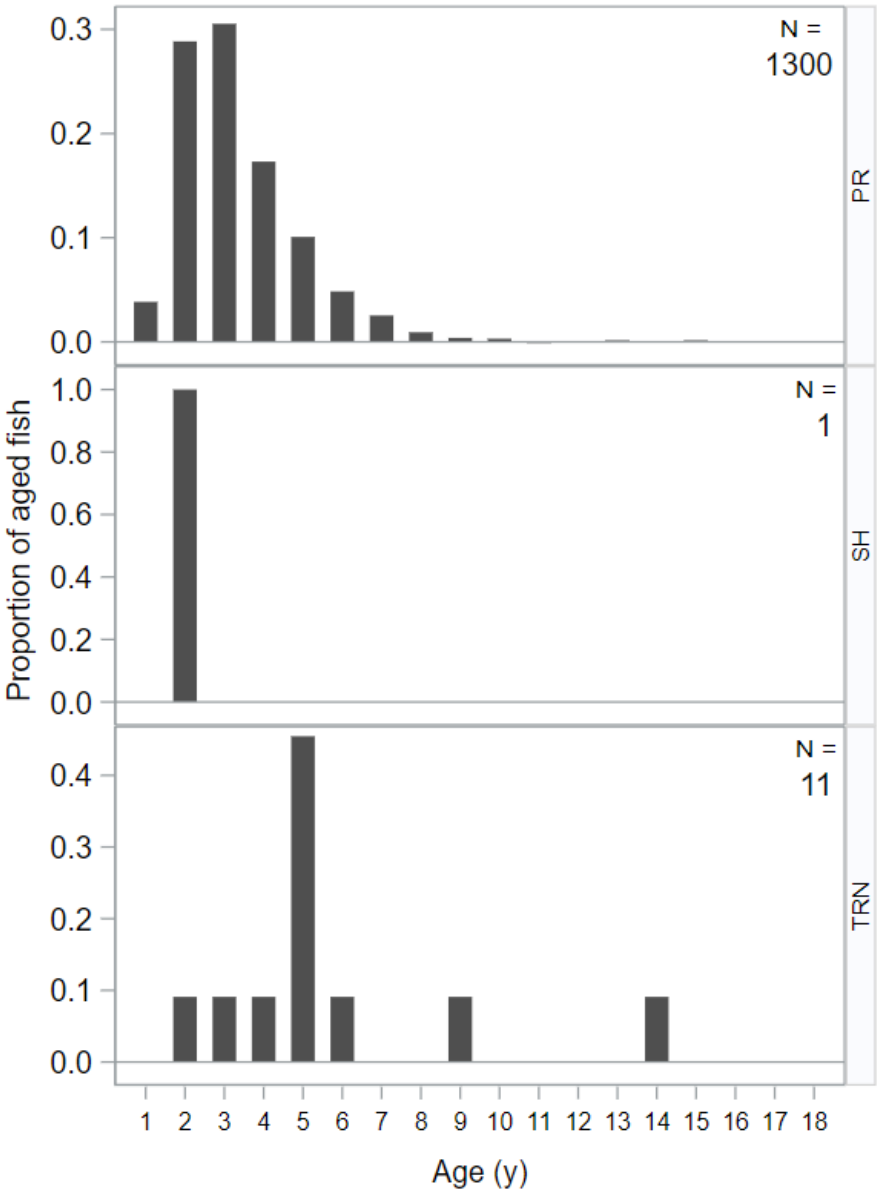
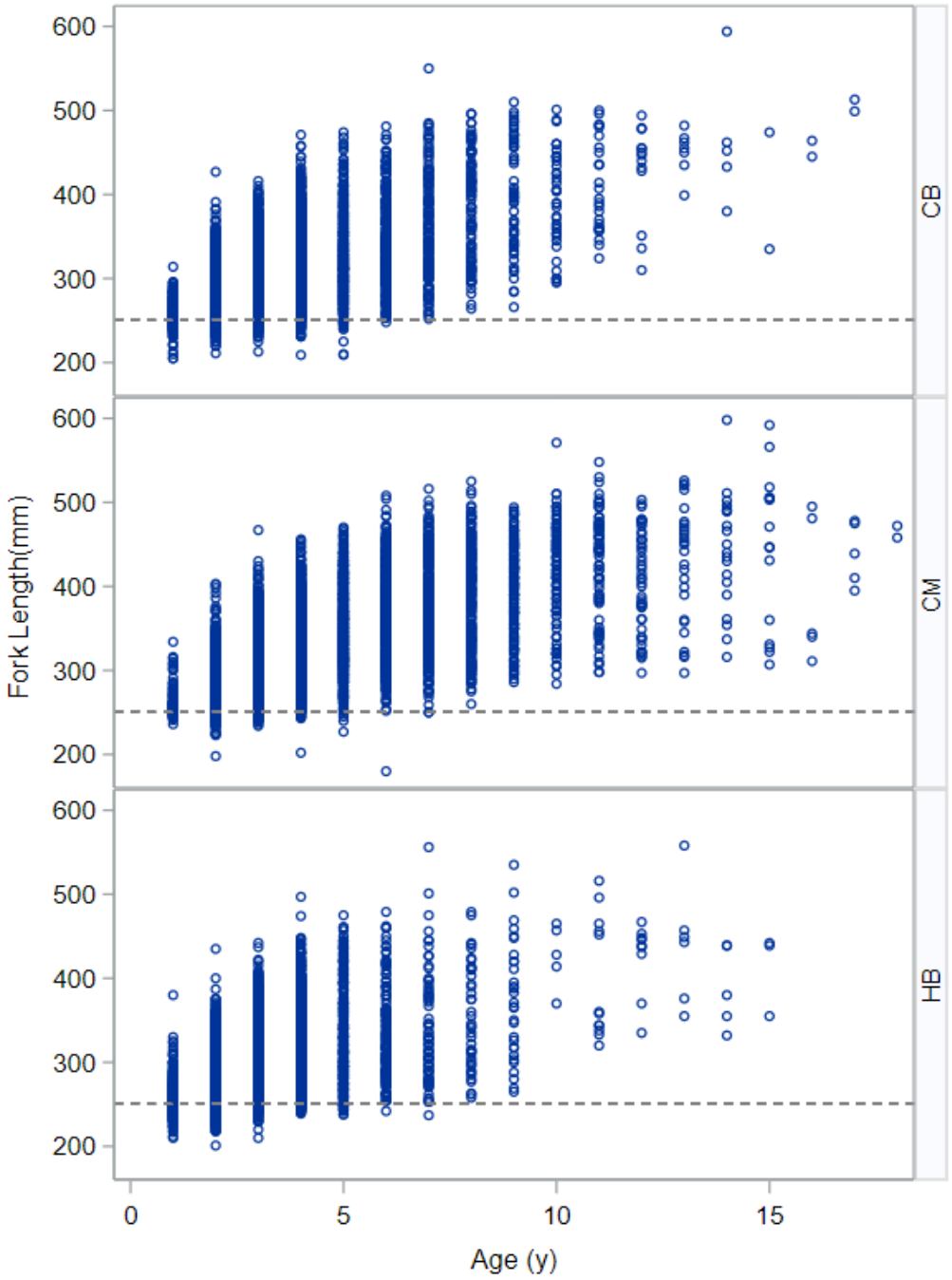
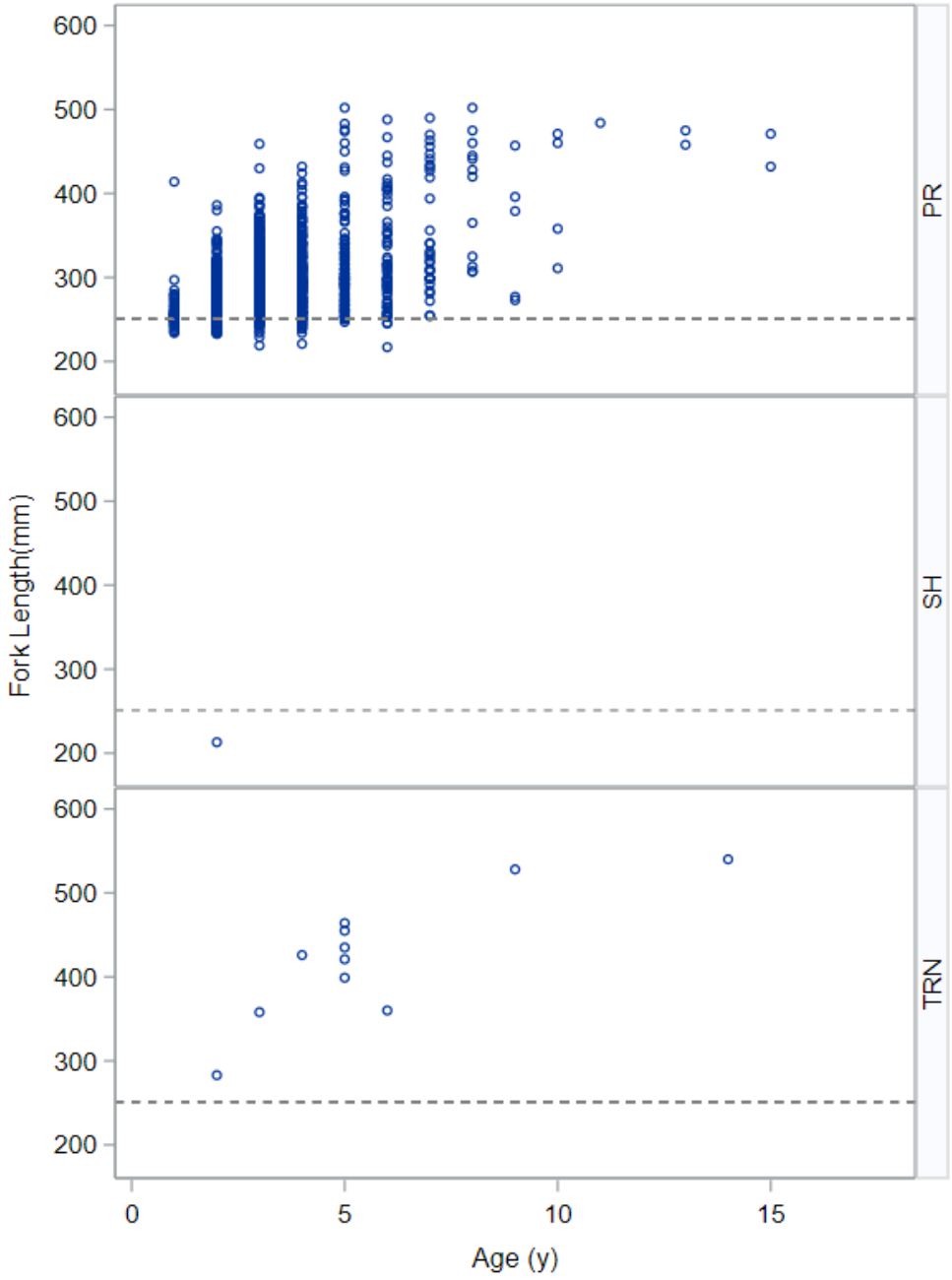

N =
1300
PR
N =
1
SH
N =
11
TRN
Proportion of aged fish
0.0
0.1
0.2
0.3
0.4
0.6
0.8
1.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Age (y)

Figure 3. Fork length as a function of age in each fleet. The dashed line represents 12" TL converted to FL using FL= 0.7473*TL+23.4645 (SEDAR 3, 2003) for recreational fleets, the minimum size since 1990. CB= Charter boat, CM= Commercial, HB= Headboat, PR= Private, SH= Shore, TRN= Tournament.




Fork Length(mm)
600
500
400
300
200
PR
SH
TRN
0
5
10
15
Age (y)