Gulf of America King Mackerel (*Scomberomorus cavalla*) length and age compositions from the U.S. recreational fishery

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SEDAR99-WP-11

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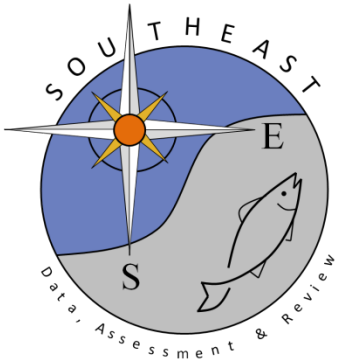

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Introduction

This document provides nominal and weighted length and age compositions, conditional age-at-length (CAAL), and mean length-at-age (MLAA) of recreational landings, in U.S. waters, for the SEDAR 99 Gulf of America King Mackerel (*Scomberomorus cavalla*) assessment. Gulf King Mackerel is managed using fishing year (FY; July-June) and analyses were conducted using fishing year instead of calendar year.

Data Description

Compositions in this document only include biological samples from King Mackerel harvested in U.S. waters from the Texas/Mexico border and eastward to the west coast of Florida at the Collier/Monroe county line. Biological samples from the winter mixing zone (Florida Keys and Atlantic side of the Dry Tortugas) were not included because biological samples cannot be split 50/50 as is done for the landings. A total of 88,540 lengths from 16 sampling programs (Tables 1 and 2) were included in the nominal and weighted length compositions and 17,278 ages from 12 programs (Table 1 and 3) were included in the nominal and weighted age compositions, CAAL, and MLAA analyses. FY2024 is considered an incomplete year because data from Jan-June 2025 was not available for all data sources.

The sampling programs contributing the largest numbers of length and/or age samples are described below.

Marine Recreational Information Program (MRIP)

MRIP (formally known as the Marine Recreational Fishing Statistics Survey, MRFSS) began in March 1981. In the Gulf of America, the MRIP survey is conducted in FL, AL, and MS. MRIP was also conducted in LA from 1981-2013. The access point angler survey (APAIS) component of MRIP collects information on recreational catch and fishing trip characteristics, including fish lengths and weights, from anglers at public marine fishing access sites. In the Gulf of America, APAIS samples recreational fishers from private, shore, and charterboat modes. APAIS sampling was temporarily suspending during Wave 2 in 2020 because of the COVID pandemic. APAIS sampling resumed in all states by August 2020 (Wave 4), however, sampling of fish lengths and

weights were reduced due to social distancing guidelines and field officer safety protocols (NMFS OST 2023). For intercepted angler trips where both fish length and weight are missing, MRIP uses hot and cold-deck imputation to impute lengths (NMFS OST 2023). Imputed lengths were excluded from length composition analyses. MRIP provided 26,436 King Mackerel lengths. MRIP dockside samplers do not collect age structures from intercepted fish.

Texas Parks and Wildlife Department Sportfish Monitoring Program (TPWD)

TPWD is a dockside-intercept survey that samples private and charterboat anglers in TX marine waters and began in May 1983. The TX coast is stratified into eight bay systems (Sabine Lake, Galveston Bay, Matagorda Bay, San Antonio Bay, Aransas Bay, Corpus Christi Bay, Upper Laguna Madre, and Lower Laguna Madre) and five Gulf of America strata. Sites are selected randomly based on proportional probability of expected fishing pressure. Within sites, sampling assignments are assigned to ensure that the samples are distributed across seasons (e.g. high-use and low-use) and day type (e.g. weekend, weekday). During the dockside interview, the maximum total lengths from up to 6 individuals per species (from a priority list) are recorded (Nuttall and Matter 2020). TPWD provided lengths from 26,348 King Mackerel. TPWD dockside samplers do not collect aging structures from intercepted fish.

Southeast Region Headboat Survey (SRHS)

The SRHS program estimates landings and effort for headboat vessels. In the Gulf of America, the SRHS program began in 1986 and extends from Monroe County, FL to South Padre Island, TX (Cheshire et al. 2023). Biological samples (e.g. length, weight, and age structures) are collected as part of the SRHS dockside intercept sampling program (DISP) component of the SRHS program (Fitzpatrick et al. 2017). DISP sampling was temporarily suspended in March 2020 due to the COVID pandemic and no biological samples were collected. DISP biological sampling resumed in July 2021 once NMFS/SEFSC approved safety measures were approved (Cheshire et al. 2023). SRHS sampled 16,358 Gray Triggerfish for length and of those fish, 774 were also sampled for age.

FIN-BIOSTAT

FIN-BIOSTAT sampling began in 2001 and the program is administered by the Gulf State Marine Fisheries Commission (GSMFC) through GulfFIN. All recreational fishing modes are sampled through FIN-BIOSTAT (Bray, pers com 2024). FIN-BIOSTAT is conducted in every Gulf state, however, in FL it is called RECFIN from 2001-2018 and RepBio from 2018-2024 (Bray and Cermak, pers com 2023). From TX-AL, 5,589 Gray Triggerfish were sampled for length and of those 4,238 were also sampled for age. RECFIN provided length samples for 3,602 King Mackerel and of those samples 2,431 were also sampled for age. RECFIN sampling assignments were not conducted using a randomized methodology and instead aim to maximize the number of biological samples collected. Although nonrandom, sampling is considered unbiased. A pilot phase for RepBio was initiated in 2018 and was fully implemented in 2019. Fishing access points identified from the MRIP Site Register are assigned weekly, by subregion, using a randomized draw process (Cermak, pers com 2023). RepBio provided 391 samples for length and 325 samples for age compositions.

Trip Information Program (TIP)

The Trip Interview Program (TIP) is part of the State-Federal Cooperative Statistic Program and began in the 1980s. The primary focus of TIP is to collect detailed biological information from commercial fisheries. TIP samplers collect biological samples (e.g. otoliths, gonads) dockside while the catch is being offloaded or at a dealer site. TIP samples are collected randomly from stratified areas (Beggerly et al. 2025). While TIP is designed to sample commercial fisheries, during the 1990s and early 2000s, TIP samplers would collect samples from recreational charter and headboat vessels when commercial vessels were not available. (Barnett, pers comm). TIP sampled 3,585 King Mackerel for length and age from recreational vessels.

Stock and Fleet Structure

Two recreational fleets, Gen Rec (GR) and Headboat (HB) are defined for SEDAR 99. The GR fleet is comprised of charter (CB), private (PR), and shore (SH) modes. The HB fleet only includes the headboat mode.

For SEDAR 99, compositions were requested with all sexes (female, male, and sex unknown) combined and sex-specific compositions when sex was known. The sex-specific compositions were requested for a continuity run with SEDAR 38U. Sex is not recorded for the majority of length (Table 4) and age (Table 5) samples and the sample sizes where sex is known is limited.

Changes from SEDAR 38U

Improvements in data provision, facilitated by the Life History Template, allowed unique records (n=16,292) in the age data to be added to the length-only data and included in the length compositions. These additional samples were not included in the length compositions for SEDAR 38U.

Morphometric Conversions

Natural total length (NTL), maximum total length (MTL), and standard length (SL) were converted to fork length (FL) using the same conversion equations that were provided in Tables 2.14.8 and 2.14.9 of the SEDAR 38 Assessment Process report. The conversion equations (in cm) used are:

Total Length (TL) unspecified (both NTL and MTL) to Fork Length:

$$FL = -4.28 + 0.963 * NTL$$

Standard Length (SL) to Fork Length:

$$FL = 0.663 + 1.051 * SL$$

Nominal and Weighted Length Compositions

Nominal length compositions were developed for SEDAR 99. Fish were assigned to 5 cm bins with bins ranging from 20 - 160 cm with the 160 cm bin representing a plus group. The label represents the floor of the bin. It is not recommended to use a length composition where there are not a minimum of 30 fish from at least 10 trips per stratum.

When sample sizes are sufficient, nominal length distributions are fairly similar for the all sex combined and sex-specific compositions for the GR (Figure 1) and HB (Figure 2) fleets. In the early part of the time series, female King Mackerel do have a slightly broader length distribution and the larger fish tend to be females. The nominal length distributions of King Mackerel sampled from the HB fleet often skews larger than the nominal length distributions of fish sampled from the GR fleet (Figure 3).

Weighted length compositions were also developed for SEDAR 99. Fishery-dependent sampling is typically opportunistic and sampled lengths may not be representative of the true landings composition of recreational King Mackerel in the Gulf. Possible sampling bias in the collection of length samples is typically removed by weighting the length compositions with the associated landings at the finest spatial and temporal scale available without losing data. The weighting subregions were defined as West (TX and LA) and East (MS to the west coast of FL; including mixing zone landings). For weighted length compositions, it is not recommend to use a composition that does not have a minimum of 30 fish from at least 10 trips per weighting substratum (e.g. West, East). Sample sizes per weighting substratum are provided in Table 6. For the GR fleet, the length distribution for fish in the West weighting subregion is larger than the length distribution from the East weighting subregion (Figure 4). While the same is true for the HB fleet, the differences are not as pronounced (Figure 5).

The differences between the sex combined and sex-specific weighted length compositions are minimal for the GR fleet (Figure 6). For the HB fleet, only 11 years had sufficient sample sizes for sex combined and both (male and female) sex-specific compositions. The HB female weighted length compositions do skew slightly larger than the male and sex-combined compositions (Figure 7). Weighting had minimal impacts on the length distributions on fish sampled from the GR (Figure 8) and HB (Figure 9) fleet. For the sex-combined compositions, the weighted length compositions were also compared by fleet. The HB fleet appears to be retaining larger fish than the GR fleet and the annual modes for the HB weighted length distributions are typically larger than the GR fleet (Figure 10).

Comparison of Length and Age Data

The distribution of length samples (sex-combined), included in the length compositions (length-only) and samples with both length and ages included in the age compositions are shown in Figure 11 for the GR fleet and Figure 12 for the HB fleet. There is strong overlap between the length distribution of data included in the length compositions and in the age compositions for the GR fleet from FY1999-FY2013 (Figure 11). For the remaining years, the distribution of the length composition data skews slightly larger than the lengths from the age compositions. When sample sizes are sufficient ($n > 30$) for the HB fleet, there is generally good agreement between the length distributions of data used in the length and age compositions (Figure 12).

Nominal and Weighted Age Compositions

King Mackerel ages ranged from 0-23 years old, with 75% of fish being between 0-7 years old. Nominal and weighted age composition analyses were conducted using age bins ranging from 0-12, with 12 being a plus group. Separate age compositions were provided for each fleet with the sexes combined and when the sex was known. For age compositions, it is recommended to exclude strata where there are not a minimum of 10 fish from 10 trips.

A comparison of nominal age compositions for the GR and HB fleets, by sex, are shown in Figures 13 and 14, respectively. For the GR fleet, there are several years where the nominal age distributions for the sex combined and sex-specific compositions are similar. There are years with more noticeable differences and the male age distributions skew larger than the sex-combined and female nominal age distributions (Figure 12). Sample sizes are generally low for the HB fleet (Table 5) and this creates a lot of noise in the nominal age compositions (Figure 14). For years with sufficient sample sizes, there is no clear pattern. Some years the distributions are fairly similar, while some years the female skew older, while the males skew older in other years. Bubble plots (sex combined) for each fleet are shown in Figures 15 and 16. The nominal age distribution for fish sampled from the HB fleet skews larger than the nominal age distribution of fish sampled from the GR fleet (Figure 17).

The age compositions are weighted to account for potential sampling biases associated with fishery-dependent data. The weighting method is adapted from Chih (2009) and a reweighting factor (RW) was estimated within year *i* and length bin *j* and corrects the composition of the age data to more closely represent the final length composition of landings. For each fleet and sex (combined, male, female) combination, the reweighting factor $RW_{i,j}$ is calculated as

$$RW_{i,j} = \frac{LC_{i,j}}{a_{i,j}/a_i}$$

where $LC_{i,j}$ is the length composition from the length-only data, $a_{i,j}$ is the number of age samples in year *i* and length bin *j*, and a_i are the total number of age samples in year *i*. With this method, if there were age samples in $a_{i,j}$ not represented in $LC_{i,j}$ they are down-weighted to zero and effectively dropped from further analysis. The final weighted age compositions, for each fleet and region, were estimated as

$$AC_{i,k} = \sum_j \left(RW_{i,j} * \frac{a_{i,j,k}}{a_i} \right)$$

where all length bins *j* within age class *k w*ere summed and then rescaled to sum to 1 across each year.

Weighted age distributions for the GR fleet are fairly similar between the sex combined and sex-specific compositions, but the males do skew older in some years compared to the sex combined and female compositions (Figure 18). Sex-specific weighted age compositions are not available for the majority of years for the HB fleet (Figure 19) because of insufficient length (Table 4) and age (Table 5) sizes. Weighted age bubble plots (sex-combined) are shown in in Figure 20 for the GR fleet and Figure 21 for the HB fleet.

The nominal and weighted age distributions are generally similar for the combined sex GR (Figure 22) and HB (Figure 23) fleets. However, there are a few years were the differences are more noticeable. For example, for the GR fleet in FY 2006 and FY 2007, the weighting procedure down-weighted the importance of older fish.

When comparing the weighted age distribution of fish sampled from the GR and HB fleets (sex combined), the fish from the HB fleet are generally older than fish from the GR fleet (Figure 24).

Conditional Age-at-Length

Conditional age-at-length (CAAL) is the proportion of fish, at age, in a given length bin. When data are sufficient (i.e. wide spread of ages and lengths represented), CAAL is considered to be more informative than length and age compositions because it can be used to directly estimate the length-at-age process and the variability in length-at-age (Taylor and Methot 2013; Piner et al. 2016; Lee et al. 2019). Another benefit of CAAL is that it avoids double use of fish for both age and length compositions, especially when age compositions are weighted by the length compositions.

CAAL is calculated as

$$CAAL_{i,j,k} = \frac{a_{i,j,k}}{a_{i,j}}$$

where $a_{i,j,k}$ is the number of age samples in year *i*, length bin *j*, and age class *k* and $a_{i,j}$ is the number of age samples in year *i* and length bin *j*.

Fleet and sex-specific CAAL are shown in Figures 25-30. The GR fleet has more age samples than the HB fleet and a wider spread of lengths and ages is observed for the GR fleet.

Mean Length-at-Age

Mean length-at-age (MLAA) is the average length for each age and is calculated as

$$MLAA_{i,k} = \frac{\sum L_{i,k}}{a_{i,k}}$$

where *L* are lengths , *a* is the number of associated sample sizes, *i* is year, and *k* is age class. MLAA are provided to aide in model diagnostics and is presented in Figures 31-36.

Data Adequacy and Availability

Tables 7 and 8 summarize the adequacy of data avaialable for composition analyses for the GR and HB fleets, respectively. For each data product (e.g. nominal length compositions, weighted age compositions) the fishing year is color-coded either gray, red, yellow, or green. Gray indicates data are not available for that fishing year. Fishing years in red indicate the samples

sizes were not sufficient for that data product. For weighted age compositions, fishing year is also shaded as red if the corresponding weighted length composition did not have sufficient sample sizes. For the terminal fishing year, yellow was used to indicate sample sizes were sufficient, but samples for the entire fishing year were not available (e.g. samples for January-June 2025 are not yet available). For nominal and weighted age compositions yellow was also used to indicate that minimum size sample size thresholds were met, however, most or all samples were from one region in the Gulf (e.g. only from the East; Table 9). Yellow was also used for CAAL to indicate sample sizes were sufficient and CAAL should be considered in the model. Green was used to indicate minimum sample size thresholds were met.

For both fleets, sex-specific data is very limited. There are a small number of years with sufficient samples for sex-specific weighted length and age compositions for the GR fleet (Table 7). There are no years with sufficient data for the HB fleet (Table 8).

Using the combined sex data, the GR fleet does not have many fishing years with data adequacy and availability issues. The main issue is a lack of age samples in the West in the 1990s and 2010s (Table 9). There are differences in the length distributions of King Mackerel sampled in the Eastern and Western Gulf (Figure 4) so having age samples from both regions would have been preferred.

Data for the HB fleet are very limited, even using the combined sex data (Table 8). Sample sizes are sufficient most years for nominal and weighted length compositions. The age data are more limited and has fewer years where sample sizes met the minimum thresholds. In the 1980s, sample sizes are sufficient, however all of the age samples are from the West and there are no age samples in the East.

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Tables

Table 1: Number of recreational fish and trips sampled for length and age by each data source.

	Length		Age	
Sampling Program	Number of Fish	Number of Trips	Number of Fish	Number of Trips
CO-OP	53	6	53	6
FIN-BIOSTAT	5,589	1,505	4,238	1,141
FWRI-OBS	571	266	484	199
HB	1	1	0	0
LA BIO	23	13	0	0
LA Creel	20	14	0	0
LADWF	4	2	4	2
MRFSS	0	0	435	140
MRIP	26,436	9,329	0	0
PCLAB	4,737	1,187	4,211	1,057
RECFIN	3,602	2,549	2,431	821
REPBIO	391	177	325	133
SRFS	125	94	41	32
SRHS	16,358	3,896	774	339
TIP	3,585	595	3,585	595
TPWD	26,348	9,325	0	0
UN	697	221	697	221

Table 2: Annual (fishing year) number of fish sampled for length by each data source.

FYear	CO-OP	FIN-BIOSTAT	FWRI-OBS	HB	LA BIO	LA Creel	LADWF	MRIP	PCLAB	RECFIN	REPBIO	SRFS	SRHS	TIP	TPWD	UN
1980	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	49	0	0	0	0	0	0	41	0
1983	0	0	0	0	0	0	0	79	0	0	0	0	0	0	490	0
1984	0	0	0	0	0	0	0	73	0	0	0	0	0	0	826	0
1985	0	0	0	0	0	0	0	76	0	0	0	0	85	0	731	0
1986	0	0	0	0	0	0	0	452	163	0	0	0	247	0	479	69
1987	0	0	0	0	0	0	0	353	10	0	0	0	288	0	466	44
1988	0	0	0	0	0	0	0	235	39	0	0	0	274	0	373	176
1989	0	0	0	0	0	0	0	209	314	0	0	0	440	0	388	258
1990	0	0	0	0	0	0	0	189	67	0	0	0	101	420	398	149
1991	0	0	0	0	0	0	0	319	0	0	0	0	355	818	867	1
1992	0	0	0	0	0	0	0	333	0	0	0	0	563	459	612	0
1993	0	0	0	0	0	0	0	372	0	0	0	0	478	266	641	0
1994	0	0	0	0	0	0	0	292	0	0	0	0	642	320	587	0
1995	0	0	0	0	0	0	0	176	0	0	0	0	696	273	1,253	0
1996	0	0	0	0	0	0	0	245	0	0	0	0	575	515	1,023	0
1997	0	0	0	0	0	0	0	684	0	0	0	0	341	156	1,148	0
1998	0	0	0	0	0	0	0	1,013	0	0	0	0	280	127	916	0
1999	0	0	0	0	0	0	0	1,934	0	0	0	0	405	145	813	0
2000	0	0	0	0	0	0	0	2,149	97	0	0	0	264	0	740	0
2001	0	90	0	0	0	0	0	1,631	140	73	0	0	201	53	493	0

FYear	CO-OP	FIN-BIOSTAT	FWRI-OBS	HB	LA BIO	LA Creel	LADWF	MRIP	PCLAB	RECFIN	REPBIO	SRFS	SRHS	TIP	TPWD	UN
2002	0	295	0	0	0	0	0	1,326	375	135	0	0	289	12	735	0
2003	0	253	0	0	0	0	0	987	265	106	0	0	161	0	517	0
2004	0	397	0	0	0	0	4	1,017	51	146	0	0	250	0	613	0
2005	26	297	0	0	0	0	0	664	201	229	0	0	243	0	928	0
2006	27	427	0	0	0	0	0	1,235	193	150	0	0	229	0	912	0
2007	0	486	0	0	0	0	0	815	105	44	0	0	141	0	434	0
2008	0	447	0	0	0	0	0	681	285	26	0	0	96	0	682	0
2009	0	367	32	0	0	0	0	931	146	504	0	0	96	0	617	0
2010	0	313	3	0	0	0	0	545	97	311	0	0	91	19	221	0
2011	0	677	0	0	0	0	0	763	276	173	0	0	155	0	644	0
2012	0	425	0	0	0	0	0	735	162	118	0	0	1,297	0	439	0
2013	0	336	0	0	0	3	0	638	226	263	0	0	939	0	458	0
2014	0	221	18	1	7	4	0	1,007	408	402	0	19	1,404	0	551	0
2015	0	91	104	0	3	0	0	693	217	586	0	15	906	0	703	0
2016	0	170	179	0	7	1	0	1,028	337	245	0	21	1,194	0	611	0
2017	0	3	79	0	2	0	0	505	296	77	0	33	839	0	1,016	0
2018	0	32	79	0	0	10	0	361	267	14	38	11	878	2	976	0
2019	0	89	31	0	0	1	0	227	0	0	57	7	487	0	627	0
2020	0	120	1	0	0	0	0	433	0	0	196	4	0	0	406	0
2021	0	18	6	0	0	0	0	265	0	0	51	11	284	0	421	0
2022	0	11	11	0	4	0	0	113	0	0	37	1	51	0	179	0
2023	0	20	24	0	0	0	0	260	0	0	1	0	47	0	303	0
2024	0	4	4	0	0	1	0	175	0	0	11	3	46	0	70	0
2025	0	0	0	0	0	0	0	59	0	0	0	0	0	0	0	0

Table 3: Annual (fishing year) number of fish sampled for age by each data source.

FYear	PCLAB	UN	TIP	MRFSS	SRHS	FIN-BIOSTAT	RECFIN	LADWF	CO-OP	FWRI-OBS	SRFS	REPBIO
1986	163	69	0	0	0	0	0	0	0	0	0	0
1987	10	44	0	0	0	0	0	0	0	0	0	0
1988	39	176	0	0	0	0	0	0	0	0	0	0
1989	314	258	0	0	0	0	0	0	0	0	0	0
1990	67	149	420	0	0	0	0	0	0	0	0	0
1991	0	1	818	0	0	0	0	0	0	0	0	0
1992	0	0	459	0	0	0	0	0	0	0	0	0
1993	0	0	266	0	0	0	0	0	0	0	0	0
1994	0	0	320	0	0	0	0	0	0	0	0	0
1995	0	0	273	0	0	0	0	0	0	0	0	0
1996	0	0	515	0	0	0	0	0	0	0	0	0
1997	0	0	156	0	0	0	0	0	0	0	0	0
1998	0	0	127	22	1	0	0	0	0	0	0	0
1999	0	0	145	60	0	0	0	0	0	0	0	0
2000	97	0	0	5	0	0	0	0	0	0	0	0
2001	140	0	53	11	0	74	9	0	0	0	0	0
2002	375	0	12	164	15	184	10	0	0	0	0	0
2003	265	0	0	58	5	190	0	0	0	0	0	0
2004	51	0	0	20	34	320	102	4	0	0	0	0
2005	201	0	0	1	4	253	125	0	26	0	0	0
2006	193	0	0	19	2	298	68	0	27	0	0	0
2007	105	0	0	14	1	387	40	0	0	0	0	0
2008	285	0	0	25	1	268	16	0	0	0	0	0
2009	146	0	0	15	5	311	367	0	0	0	0	0

FYear	PCLAB	UN	TIP	MRFSS	SRHS	FIN-BIOSTAT	RECFIN	LADWF	CO-OP	FWRI-OBS	SRFS	REPBIO
2010	97	0	19	13	1	265	275	0	0	0	0	0
2011	276	0	0	7	12	545	106	0	0	0	0	0
2012	126	0	0	1	200	303	52	0	0	0	0	0
2013	110	0	0	0	130	296	129	0	0	0	0	0
2014	254	0	0	0	54	51	214	0	0	14	5	0
2015	148	0	0	0	59	81	583	0	0	99	7	0
2016	272	0	0	0	30	165	244	0	0	163	6	0
2017	249	0	0	0	41	3	77	0	0	69	7	0
2018	228	0	2	0	91	26	14	0	0	79	6	27
2019	0	0	0	0	65	85	0	0	0	31	4	49
2020	0	0	0	0	0	106	0	0	0	1	2	185
2021	0	0	0	0	18	18	0	0	0	6	1	21
2022	0	0	0	0	2	9	0	0	0	11	0	32
2023	0	0	0	0	1	0	0	0	0	10	0	1
2024	0	0	0	0	2	0	0	0	0	1	3	10

Table 4: Annual (fishing year) number of fish and trips sampled for length from the Gen Rec and Headboat fleets by sex (U=unknown sex, F=female, and M=male). Values in red do not meet the minimum recommended sample size of 30 fish or 10 trips per strata.

	Gen Rec						Headboat					
	Number of Fish			Number of Trips			Number of Fish			Number of Trips		
FYear	U	F	M	U	F	M	U	F	M	U	F	M
1980	46	0	0	9	0	0	2	0	0	2	0	0
1981	43	0	0	33	0	0	19	0	0	5	0	0
1982	89	0	0	48	0	0	1	0	0	1	0	0
1983	554	0	0	174	0	0	15	0	0	8	0	0
1984	899	0	0	314	0	0	0	0	0	0	0	0
1985	807	0	0	287	0	0	68	2	15	23	2	5
1986	942	131	48	367	21	16	209	43	37	61	26	22
1987	819	18	7	342	6	2	157	92	68	63	32	37
1988	610	31	13	266	9	3	270	94	79	77	36	31
1989	620	272	142	270	74	58	439	81	55	93	38	29
1990	593	372	164	237	89	57	101	57	37	48	23	14
1991	1,186	311	229	404	91	76	355	173	106	111	35	30
1992	949	259	115	344	54	39	516	68	60	122	25	25
1993	1,015	102	36	391	36	22	433	81	90	116	32	39
1994	879	160	90	349	49	42	607	58	47	140	28	23
1995	1,431	175	95	508	34	25	676	11	10	147	10	8
1996	1,269	369	132	463	44	33	573	11	4	96	3	1
1997	1,833	104	45	617	17	17	335	7	5	115	7	4
1998	1,930	87	31	687	19	16	279	6	3	122	1	3
1999	2,747	102	41	836	28	17	405	1	1	162	1	1
2000	2,889	70	15	911	6	5	264	3	9	116	1	1

	Gen Rec						Headboat					
	Number of Fish			Number of Trips			Number of Fish			Number of Trips		
FYear	U	F	M	U	F	M	U	F	M	U	F	M
2001	2,171	197	102	712	69	51	197	4	10	90	2	6
2002	2,154	451	238	691	214	122	271	28	25	141	14	12
2003	1,600	338	182	573	163	99	148	11	10	70	9	6
2004	1,684	368	169	618	123	72	205	37	15	47	12	8
2005	1,609	483	248	580	195	127	238	6	4	44	6	4
2006	2,178	459	290	692	195	138	227	11	8	62	7	4
2007	1,252	377	255	455	119	84	140	1	0	35	1	0
2008	1,382	490	245	461	121	76	94	4	2	41	4	2
2009	1,579	688	315	519	481	196	87	15	9	36	14	7
2010	791	473	242	317	307	124	89	5	0	17	5	0
2011	1,438	697	387	488	285	166	127	19	20	31	12	12
2012	1,199	452	225	477	202	122	779	289	232	167	128	113
2013	1,152	496	270	416	248	152	678	144	123	124	72	52
2014	1,602	699	327	579	406	219	1,302	51	61	189	33	28
2015	1,427	607	350	587	258	177	835	61	38	177	33	29
2016	1,667	606	299	531	255	161	1,141	36	44	168	24	30
2017	1,552	272	155	521	135	83	778	47	46	118	34	32
2018	1,375	229	155	490	120	76	770	73	66	129	40	42
2019	882	121	35	326	65	27	409	48	31	75	25	20
2020	853	202	104	302	95	46	0	1	0	0	1	0
2021	695	53	18	259	32	18	261	17	12	55	13	9
2022	299	46	10	149	28	7	48	4	0	28	3	0
2023	563	31	13	243	16	10	43	3	2	25	3	2

	Gen Rec						Headboat					
	Number of Fish			Number of Trips			Number of Fish			Number of Trips		
FYear	U	F	M	U	F	M	U	F	M	U	F	M
2024	246	11	9	145	8	7	42	1	5	20	1	3
2025	59	0	0	30	0	0	0	0	0	0	0	0

Table 5: Annual (fishing year) number of fish and trips sampled for age from the Gen Rec and Headboat fleets by sex (U=unknown sex, F=female, and M=male). Values in red do not meet the minimum recommended sample size of 10 fish or 10 trips per strata.

	Gen Rec						Headboat					
	Number of Fish			Number of Trips			Number of Fish			Number of Trips		
FYear	U	F	M	U	F	M	U	F	M	U	F	M
1980	46	0	0	9	0	0	2	0	0	2	0	0
1981	43	0	0	33	0	0	19	0	0	5	0	0
1982	89	0	0	48	0	0	1	0	0	1	0	0
1983	554	0	0	174	0	0	15	0	0	8	0	0
1984	899	0	0	314	0	0	0	0	0	0	0	0
1985	807	0	0	287	0	0	68	2	15	23	2	5
1986	942	131	48	367	21	16	209	43	37	61	26	22
1987	819	18	7	342	6	2	157	92	68	63	32	37
1988	610	31	13	266	9	3	270	94	79	77	36	31
1989	620	272	142	270	74	58	439	81	55	93	38	29
1990	593	372	164	237	89	57	101	57	37	48	23	14
1991	1,186	311	229	404	91	76	355	173	106	111	35	30
1992	949	259	115	344	54	39	516	68	60	122	25	25
1993	1,015	102	36	391	36	22	433	81	90	116	32	39
1994	879	160	90	349	49	42	607	58	47	140	28	23
1995	1,431	175	95	508	34	25	676	11	10	147	10	8
1996	1,269	369	132	463	44	33	573	11	4	96	3	1
1997	1,833	104	45	617	17	17	335	7	5	115	7	4
1998	1,930	87	31	687	19	16	279	6	3	122	1	3
1999	2,747	102	41	836	28	17	405	1	1	162	1	1
2000	2,889	70	15	911	6	5	264	3	9	116	1	1

	Gen Rec						Headboat					
	Number of Fish			Number of Trips			Number of Fish			Number of Trips		
FYear	U	F	M	U	F	M	U	F	M	U	F	M
2001	2,171	197	102	712	69	51	197	4	10	90	2	6
2002	2,154	451	238	691	214	122	271	28	25	141	14	12
2003	1,600	338	182	573	163	99	148	11	10	70	9	6
2004	1,684	368	169	618	123	72	205	37	15	47	12	8
2005	1,609	483	248	580	195	127	238	6	4	44	6	4
2006	2,178	459	290	692	195	138	227	11	8	62	7	4
2007	1,252	377	255	455	119	84	140	1	0	35	1	0
2008	1,382	490	245	461	121	76	94	4	2	41	4	2
2009	1,579	688	315	519	481	196	87	15	9	36	14	7
2010	791	473	242	317	307	124	89	5	0	17	5	0
2011	1,438	697	387	488	285	166	127	19	20	31	12	12
2012	1,199	452	225	477	202	122	779	289	232	167	128	113
2013	1,152	496	270	416	248	152	678	144	123	124	72	52
2014	1,602	699	327	579	406	219	1,302	51	61	189	33	28
2015	1,427	607	350	587	258	177	835	61	38	177	33	29
2016	1,667	606	299	531	255	161	1,141	36	44	168	24	30
2017	1,552	272	155	521	135	83	778	47	46	118	34	32
2018	1,375	229	155	490	120	76	770	73	66	129	40	42
2019	882	121	35	326	65	27	409	48	31	75	25	20
2020	853	202	104	302	95	46	0	1	0	0	1	0
2021	695	53	18	259	32	18	261	17	12	55	13	9
2022	299	46	10	149	28	7	48	4	0	28	3	0
2023	563	31	13	243	16	10	43	3	2	25	3	2

	Gen Rec						Headboat					
	Number of Fish			Number of Trips			Number of Fish			Number of Trips		
FYear	U	F	M	U	F	M	U	F	M	U	F	M
2024	246	11	9	145	8	7	42	1	5	20	1	3
2025	59	0	0	30	0	0	0	0	0	0	0	0

Table 6: Number of fish and trips sampled for length from from the West (TX and LA) and East (MS, AL, and FL) weighting subregions. Values in red do not meet the recommended minimum threshold of 30 fish or 10 trips per strata.

	Gen Rec				Headboat			
	Number of Fish		Number of Trips		Number of Fish		Number of Trips	
FYear	West	East	West	East	West	East	West	East
1980	0	46	0	9	0	2	0	2
1981	9	34	7	26	19	0	5	0
1982	66	23	33	15	0	1	0	1
1983	498	56	160	14	14	1	7	1
1984	854	45	291	23	0	0	0	0
1985	762	45	266	21	85	0	28	0
1986	496	625	208	181	283	6	82	6
1987	488	356	178	170	292	25	81	22
1988	390	264	170	103	416	27	98	21
1989	504	530	204	154	534	41	113	26
1990	500	629	198	139	122	73	47	30
1991	1,069	657	344	179	505	129	84	65
1992	788	535	247	152	581	63	113	41
1993	759	394	255	183	542	62	123	42
1994	625	504	230	177	545	167	108	64

	Gen Rec				Headboat			
	Number of Fish		Number of Trips		Number of Fish		Number of Trips	
FYear	West	East	West	East	West	East	West	East
1995	1,263	438	439	105	664	33	135	25
1996	1,029	741	373	134	539	49	77	21
1997	1,165	817	377	258	268	79	79	46
1998	924	1,124	347	360	232	56	92	33
1999	816	2,074	293	572	340	67	119	45
2000	745	2,229	309	609	182	94	70	47
2001	585	1,885	207	602	171	40	70	27
2002	820	2,023	282	678	253	71	114	42
2003	605	1,515	229	563	133	36	58	21
2004	869	1,352	259	501	242	15	50	10
2005	1,176	1,164	372	469	226	22	38	14
2006	1,232	1,695	383	568	192	54	38	32
2007	880	1,004	243	359	122	19	23	13
2008	1,056	1,061	312	286	68	32	22	25
2009	866	1,716	280	872	62	49	16	38
2010	479	1,027	128	573	85	9	14	8
2011	1,116	1,406	286	554	121	45	26	21

	Gen Rec				Headboat			
	Number of Fish		Number of Trips		Number of Fish		Number of Trips	
FYear	West	East	West	East	West	East	West	East
2012	693	1,183	225	508	1,232	68	212	39
2013	665	1,253	211	548	915	30	143	22
2014	652	1,976	231	878	1,324	90	172	43
2015	728	1,656	275	614	847	87	163	35
2016	680	1,892	211	612	1,157	64	154	42
2017	1,020	959	293	382	815	56	115	42
2018	996	763	332	302	840	69	124	40
2019	629	409	208	195	474	14	78	11
2020	407	752	146	260	0	1	0	1
2021	421	345	146	159	274	16	50	14
2022	188	167	83	98	44	8	23	7
2023	303	304	101	164	34	14	16	13
2024	71	195	33	126	40	8	16	7
2025	0	59	0	30	0	0	0	0

Table 7. Data suitability for the Gen Rec fleet.

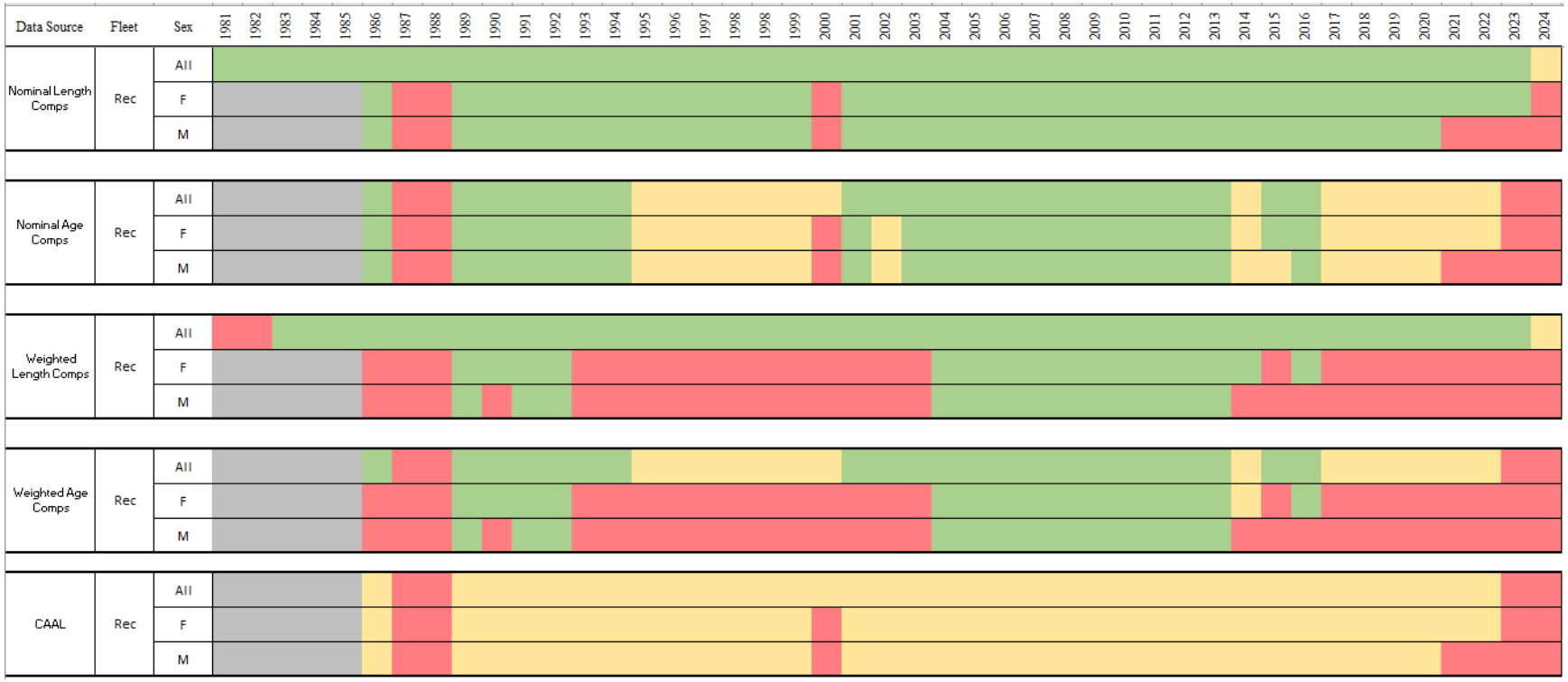

Table 8. Data suitability for the Headboat fleet.

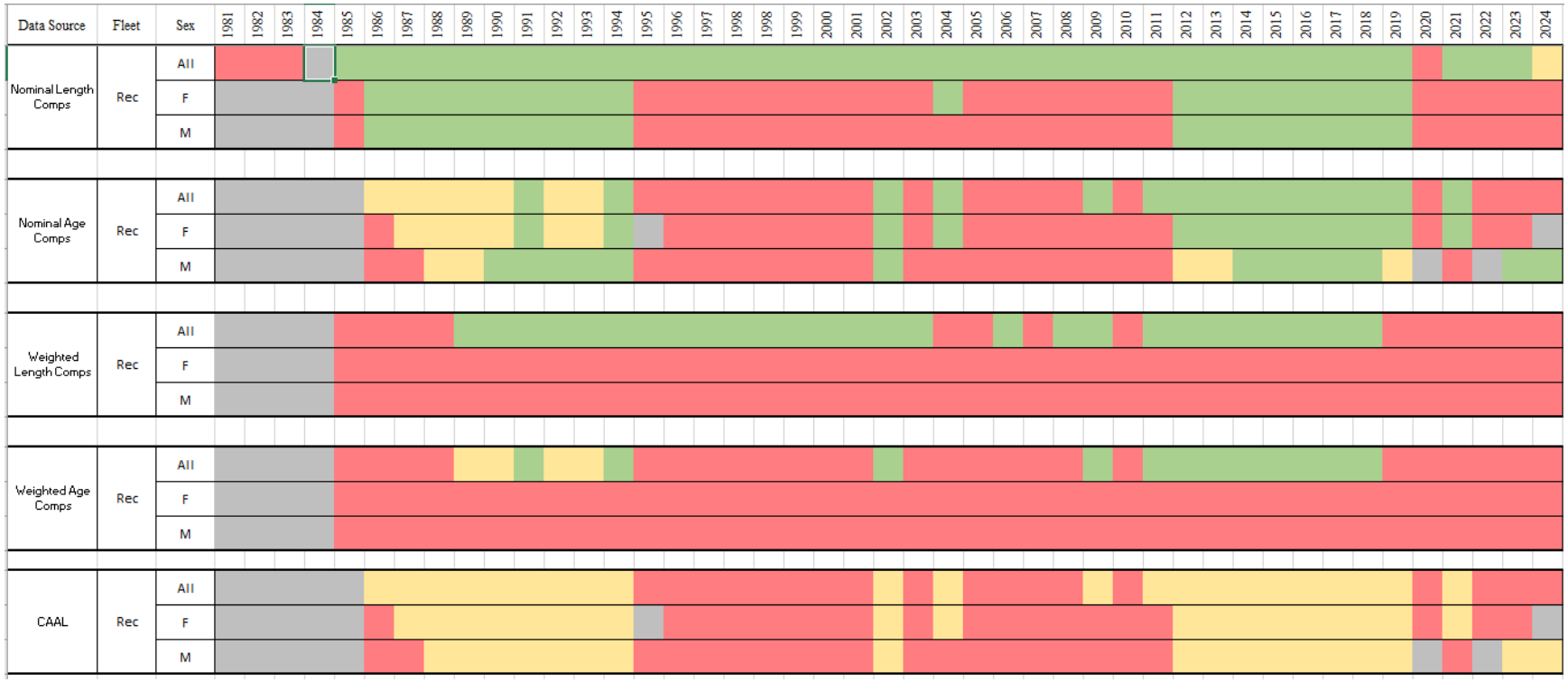

Table 9: Number of fish and trips sampled for age from from the West (TX and LA) and East (MS, AL, and FL) subregions. Values in red do not meet the recommended minimum threshold of 10 fish or 10 trips per strata.

	Gen Rec				Headboat			
	Number of Fish		Number of Trips		Number of Fish		Number of Trips	
FYear	West	East	West	East	West	East	West	East
1986	0	190	0	25	42	0	13	0
1987	15	10	2	4	29	0	14	0
1988	7	39	4	5	169	0	41	0
1989	110	327	38	58	135	0	46	0
1990	102	440	41	63	61	33	26	3
1991	171	369	51	68	264	15	34	4
1992	131	247	23	34	75	6	10	2
1993	102	38	22	27	117	9	15	4
1994	23	227	3	55	33	37	4	8
1995	0	272	0	37	0	1	0	1
1996	0	502	0	45	0	13	0	1
1997	0	150	0	19	0	6	0	4
1998	0	141	0	27	0	9	0	3
1999	0	203	0	58	0	2	0	2
2000	0	90	0	10	0	12	0	1
2001	78	200	9	46	1	8	1	3
2002	38	675	11	152	19	28	7	8
2003	61	447	22	107	5	5	3	2
2004	223	272	39	66	35	1	11	1
2005	203	400	37	111	7	0	6	0
2006	202	389	51	111	6	10	3	4
2007	348	198	62	46	1	0	1	0
2008	221	370	55	60	1	3	1	2
2009	226	601	47	164	5	12	3	7
2010	219	447	33	130	0	4	0	4
2011	373	550	61	153	11	12	7	4
2012	233	247	53	81	195	7	72	6
2013	174	361	41	103	121	9	58	6
2014	3	527	2	309	31	31	16	18
2015	15	882	7	290	45	35	24	17

	Gen Rec				Headboat			
	Number of Fish		Number of Trips		Number of Fish		Number of Trips	
FYear	West	East	West	East	West	East	West	East
2016	61	765	14	266	30	24	13	13
2017	2	373	2	146	41	30	17	23
2018	10	344	5	138	87	32	31	17
2019	1	167	1	79	64	2	24	2
2020	1	292	1	99	0	1	0	1
2021	0	40	0	30	18	6	12	5
2022	5	46	3	24	2	1	1	1
2023	0	10	0	8	1	1	1	1
2024	0	14	0	8	2	0	1	0

Figures

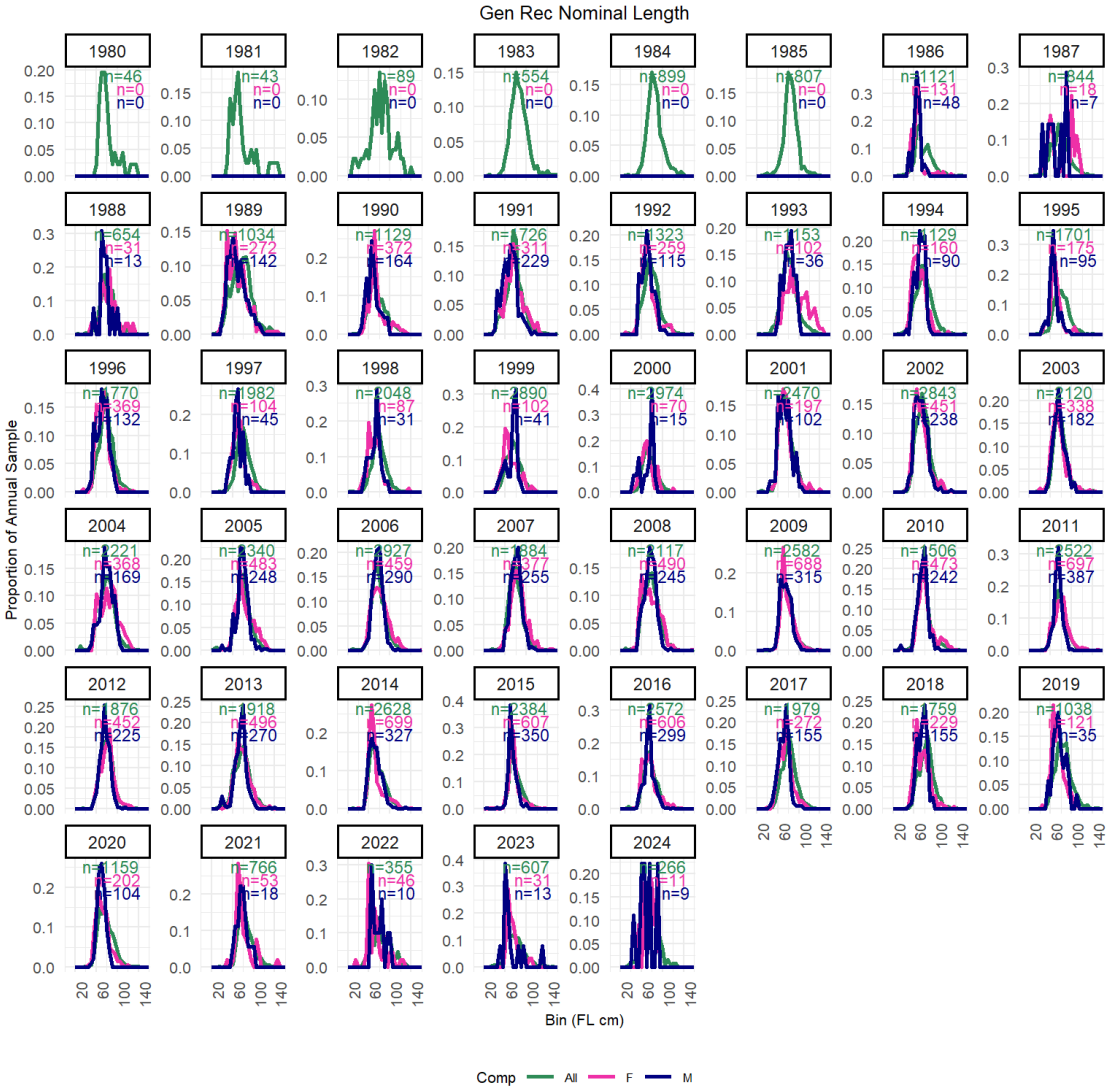

Figure 1. Nominal length distributions for the combined sex (All), female (F), and male (M) categories from the **Gen Rec** fleet. The number of fish (n) for each category is provided in the top right corner of each panel.

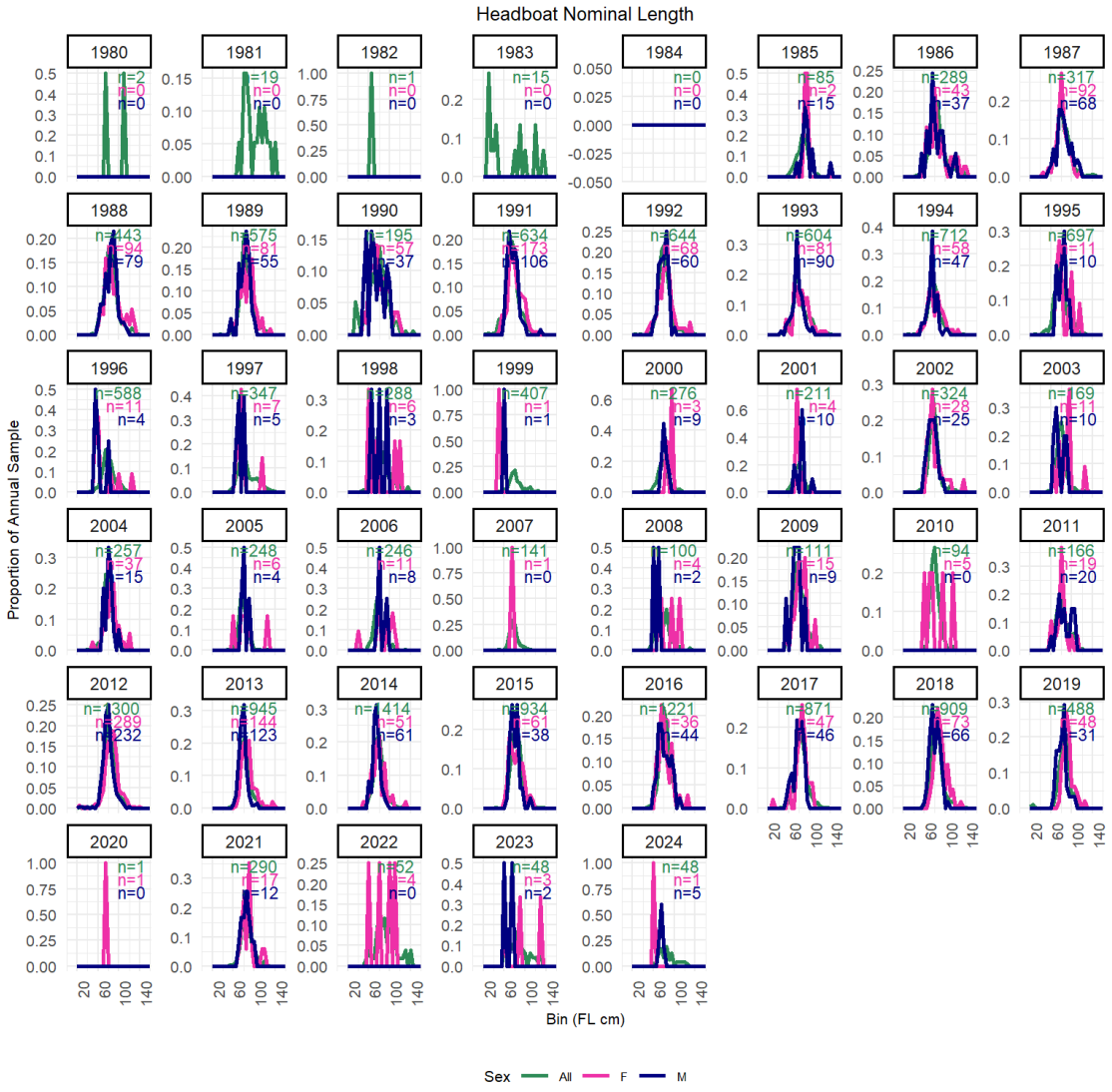

Figure 2. Nominal length distributions for the combined sex (All), female (F), and male (M) categories from the **Headboat** fleet. The number of fish (n) for each category is provided in the top right corner of each panel.

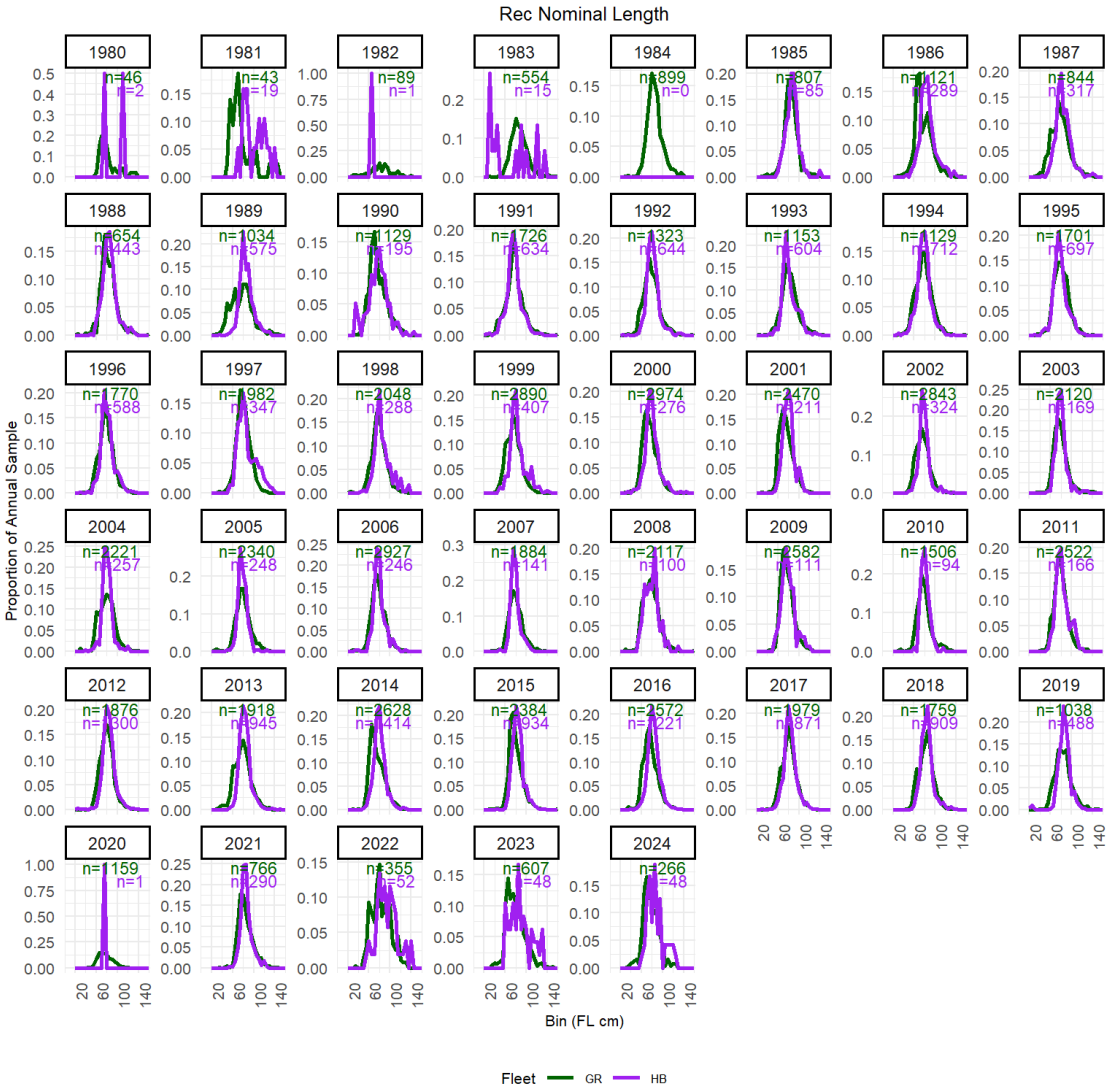

Figure 3. Nominal length distributions for the Gen Rec (GR) and Headboat (HB) fleets using the sex-combined data. The number of fish (n) for each fleet is provided in the top right corner of each panel.

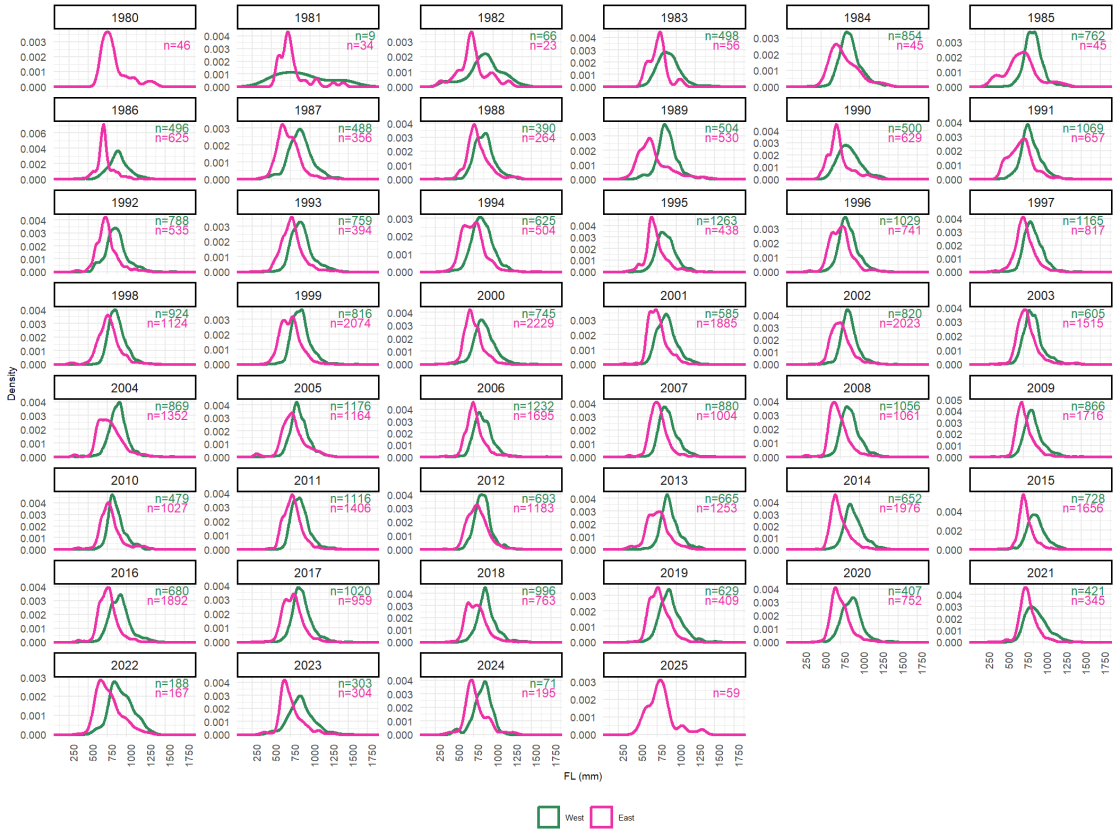

Figure 4. Comparison of the length distribution of King Mackerel sampled in the West (TX and LA) and East (MS, AL, and FL) weighting subregions for the Gen Rec fleet. The number of fish (n) for each fleet is provided in the top right corner of each panel.

Figure 5. Comparison of the length distribution of King Mackerel sampled in the West (TX and LA) and East (MS, AL, and FL) weighting subregions for the Headboat fleet. The number of fish (n) for each fleet is provided in the top right corner of each panel.

Figure 6. Weighted length distributions for the combined sex (All), female (F), and male (M) categories from the **Gen Rec** fleet. The number of fish (n) for each category is provided in the top right corner of each panel.

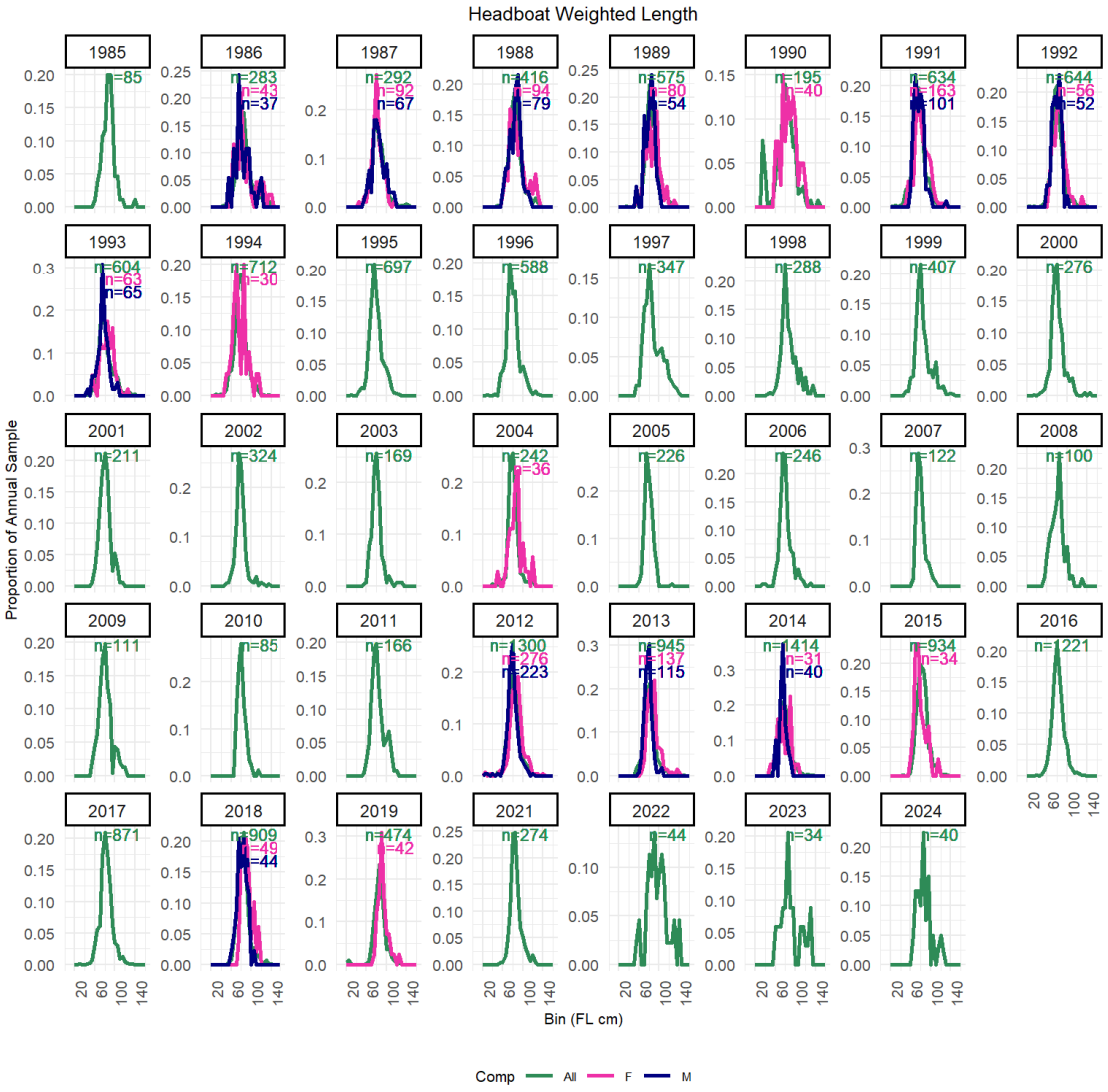

Figure 7. Weighted length distributions for the combined sex (All), female (F), and male (M) categories from the **Gen Rec** fleet. The number of fish (n) for each category is provided in the top right corner of each panel.

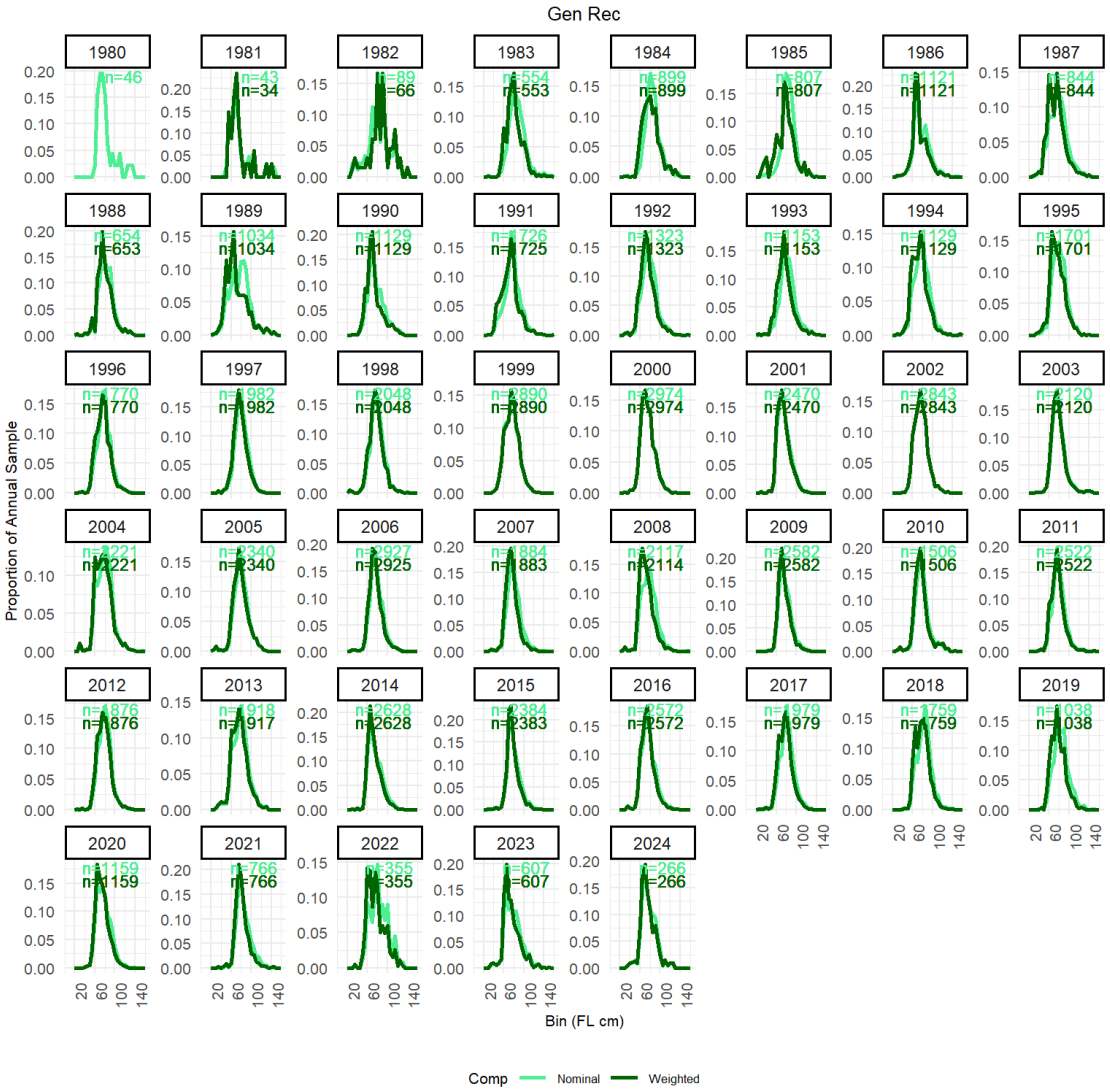

Figure 8. Comparison of nominal and weighted length distributions of fish sampled from the **Gen Rec** fleet (sex combined). The number of fish (n) for each composition type is provided in the top right corner of each panel.

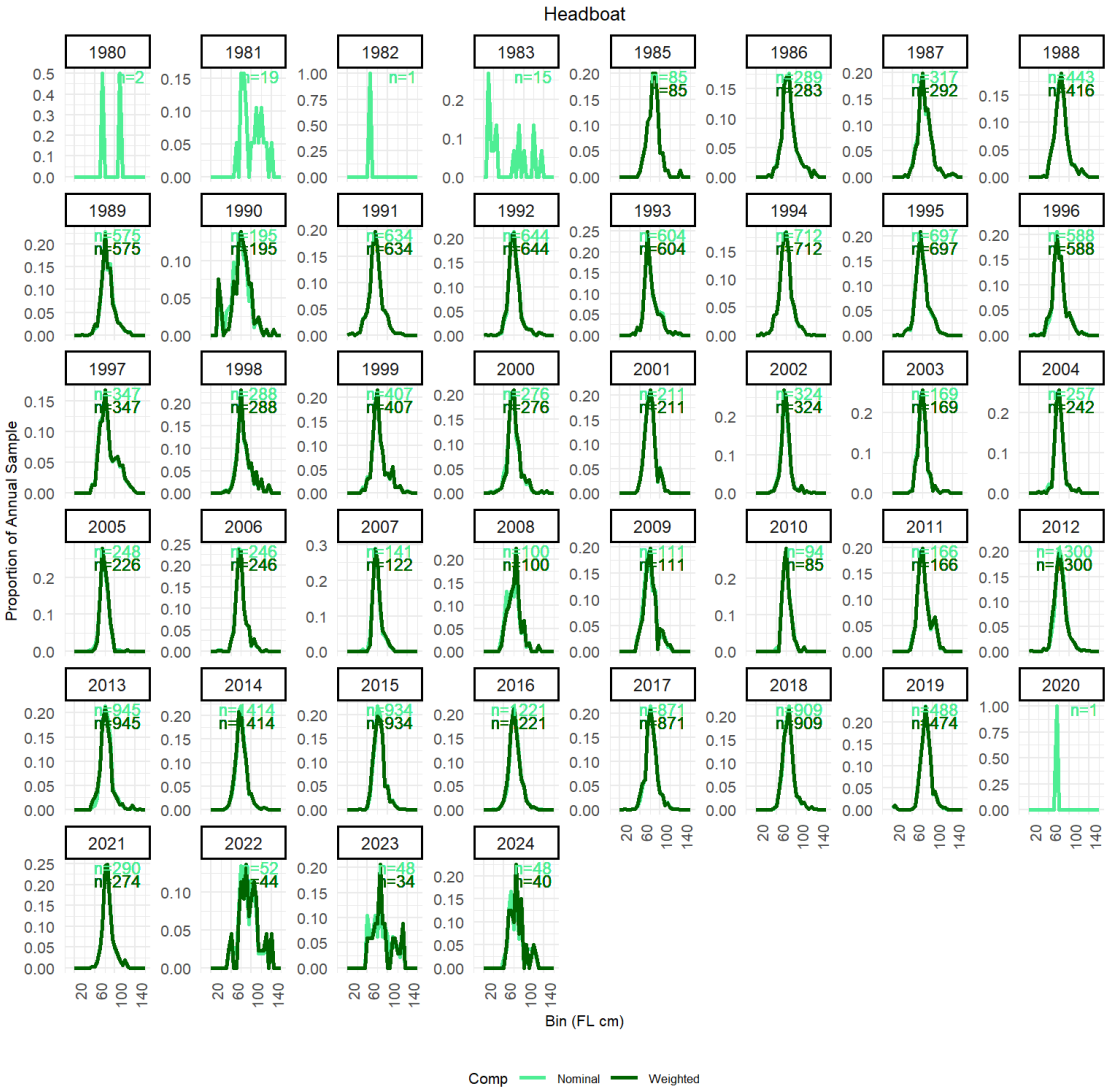

Figure 9. Comparison of nominal and weighted length distributions of fish sampled from the **Headboat** fleet (sex combined). The number of fish (n) for each composition type is provided in the top right corner of each panel.

Figure 10. Comparison of the weighted length distribution for fish sampled from the Gen Rec (GR) and Headboat (HB) fleets. The number of fish (n) for each composition type is provided in the top right corner of each panel.

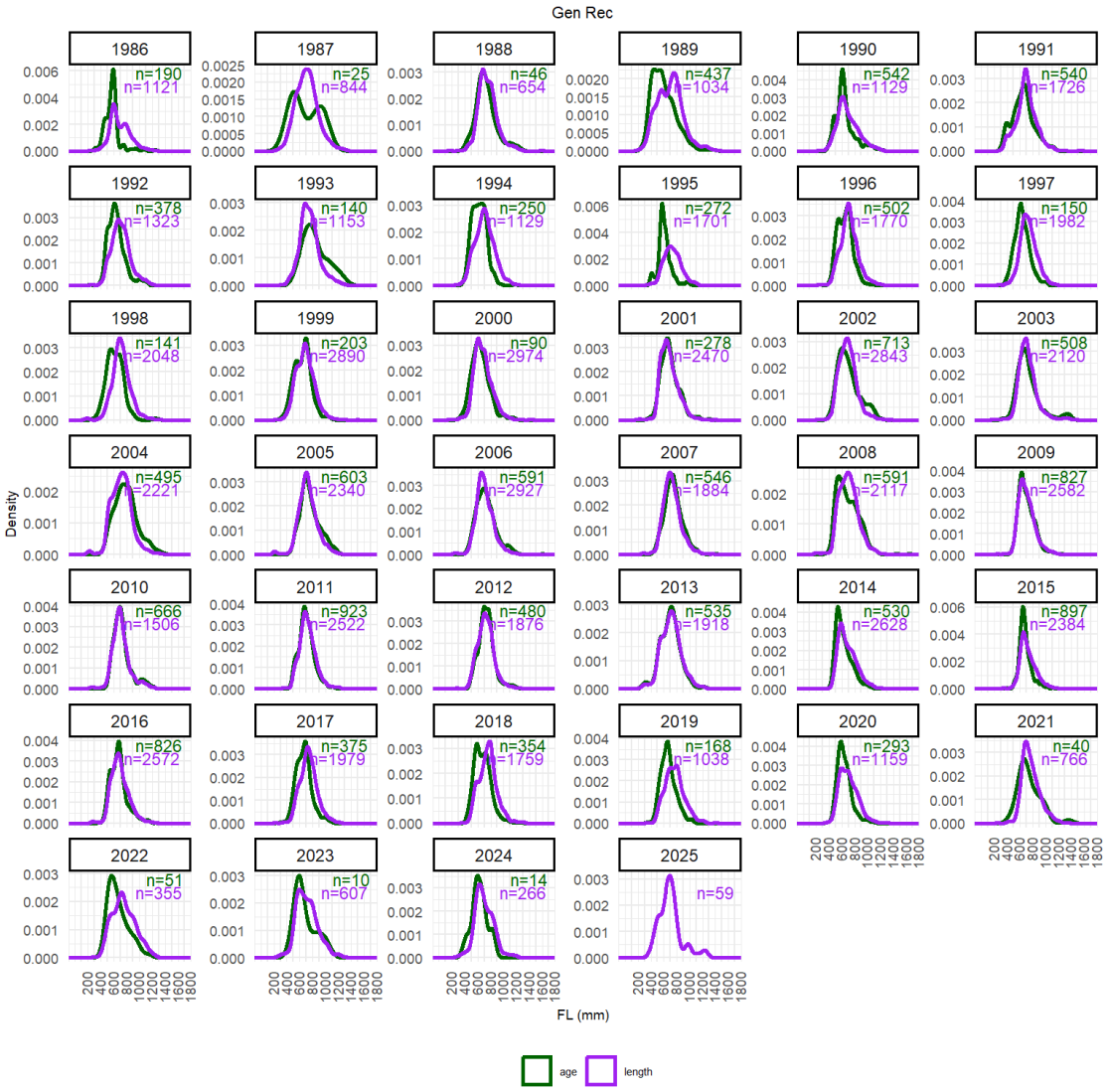

Figure 11. Comparison of the length distribution of samples included in the length compositions and the age compositions for the **Gen Rec** (combined sex) fleet. The number of fish (n) for each composition type is provided in the top right corner of each panel.

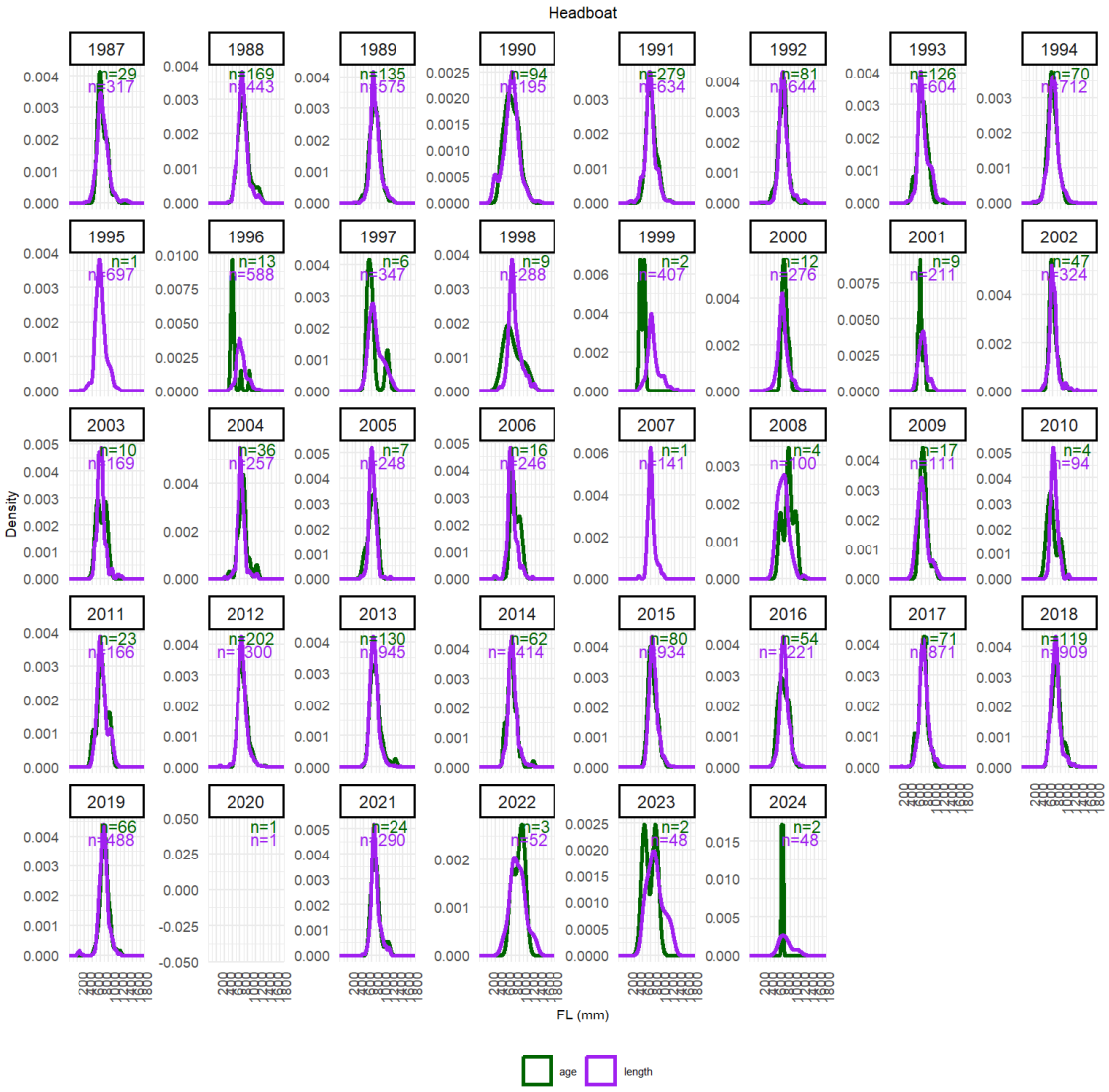

Figure 12. Comparison of the length distribution of samples included in the length compositions and the age compositions for the **Headboat** (combined sex) fleet. The number of fish (n) for each composition type is provided in the top right corner of each panel.

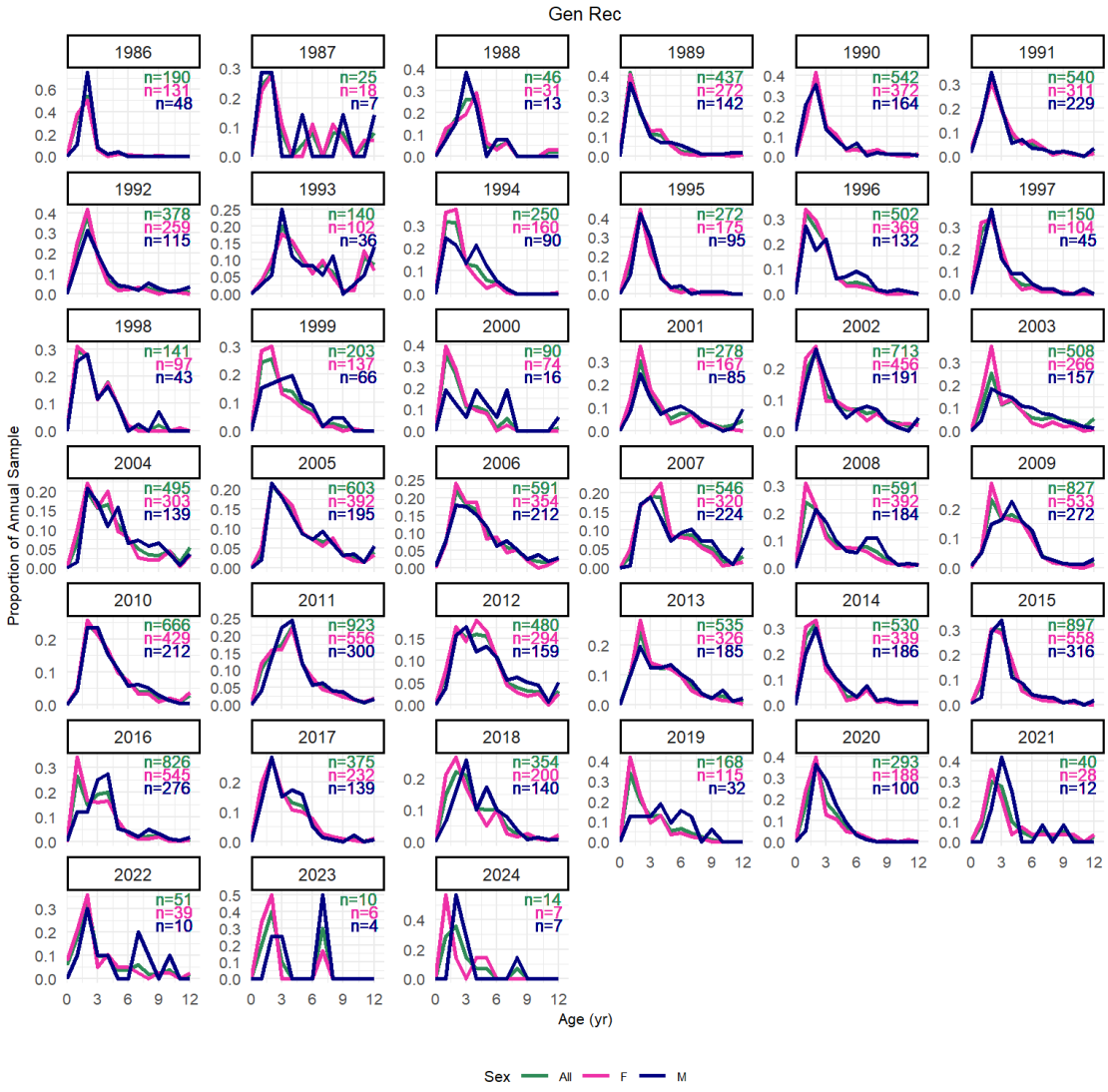

Figure 13. Nominal age distribution, by sex, for the **Gen Rec** fleet. All = combined sex, F = female, and M = male. The number of fish (n) for each composition type is provided in the top right corner of each panel.

Figure 14. Nominal age distribution, by sex, for the **Headboat** fleet. All = combined sex, F = female, and M = male. The number of fish (n) for each composition type is provided in the top right corner of each panel.

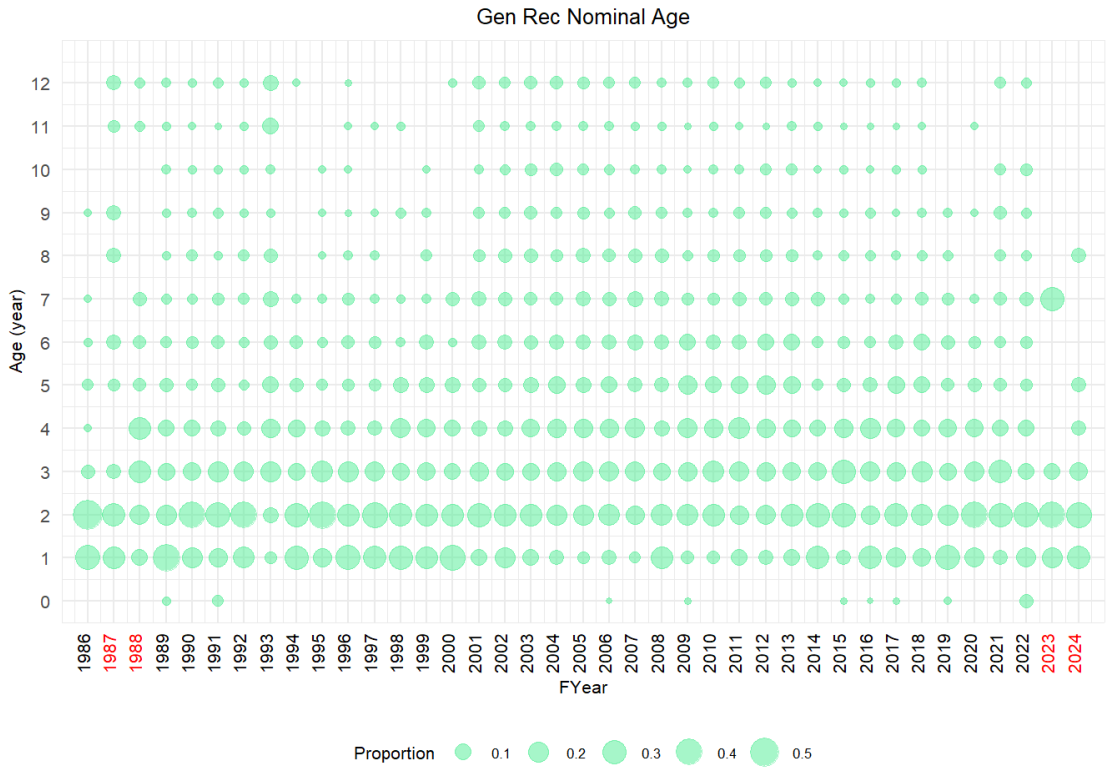

Figure 15. Nominal age composition for fish sampled in the **Gen Rec** (sex combined) fleet. Years in red do not meet the threshold of 10 fish or 10 trips per strata.

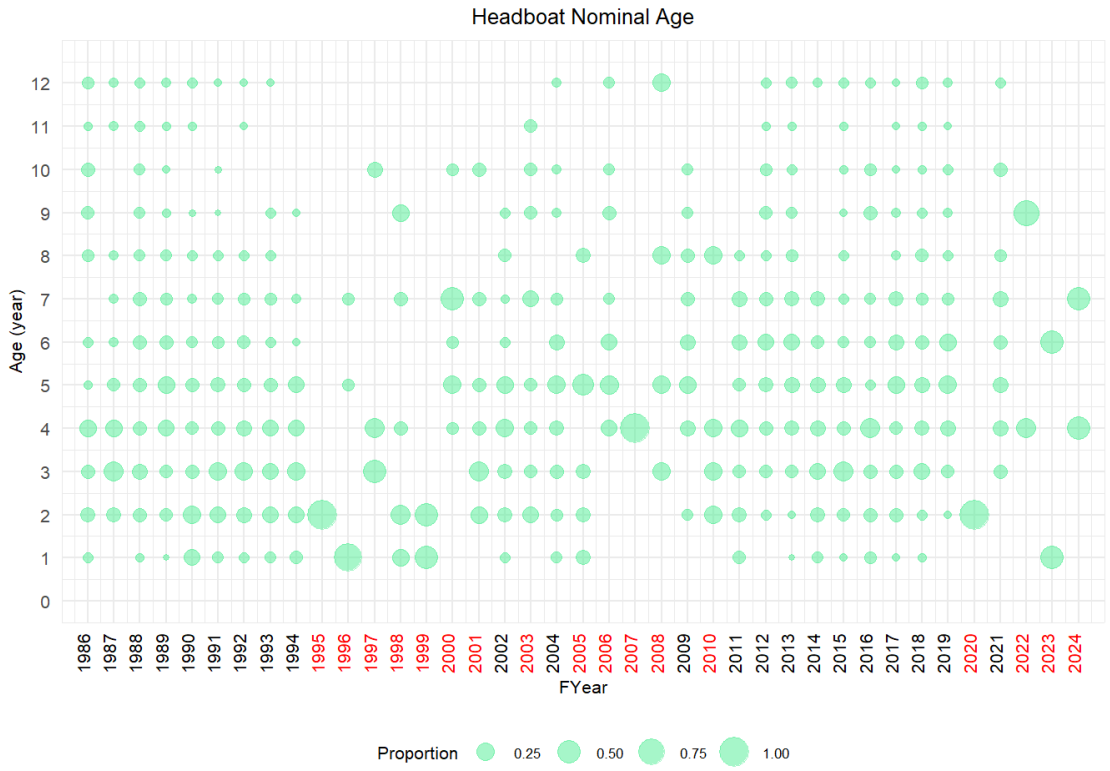

Figure 16. Nominal age composition for fish sampled in the **Headboat** (sex combined) fleet. Years in red do not meet the threshold of 10 fish or 10 trips per strata.

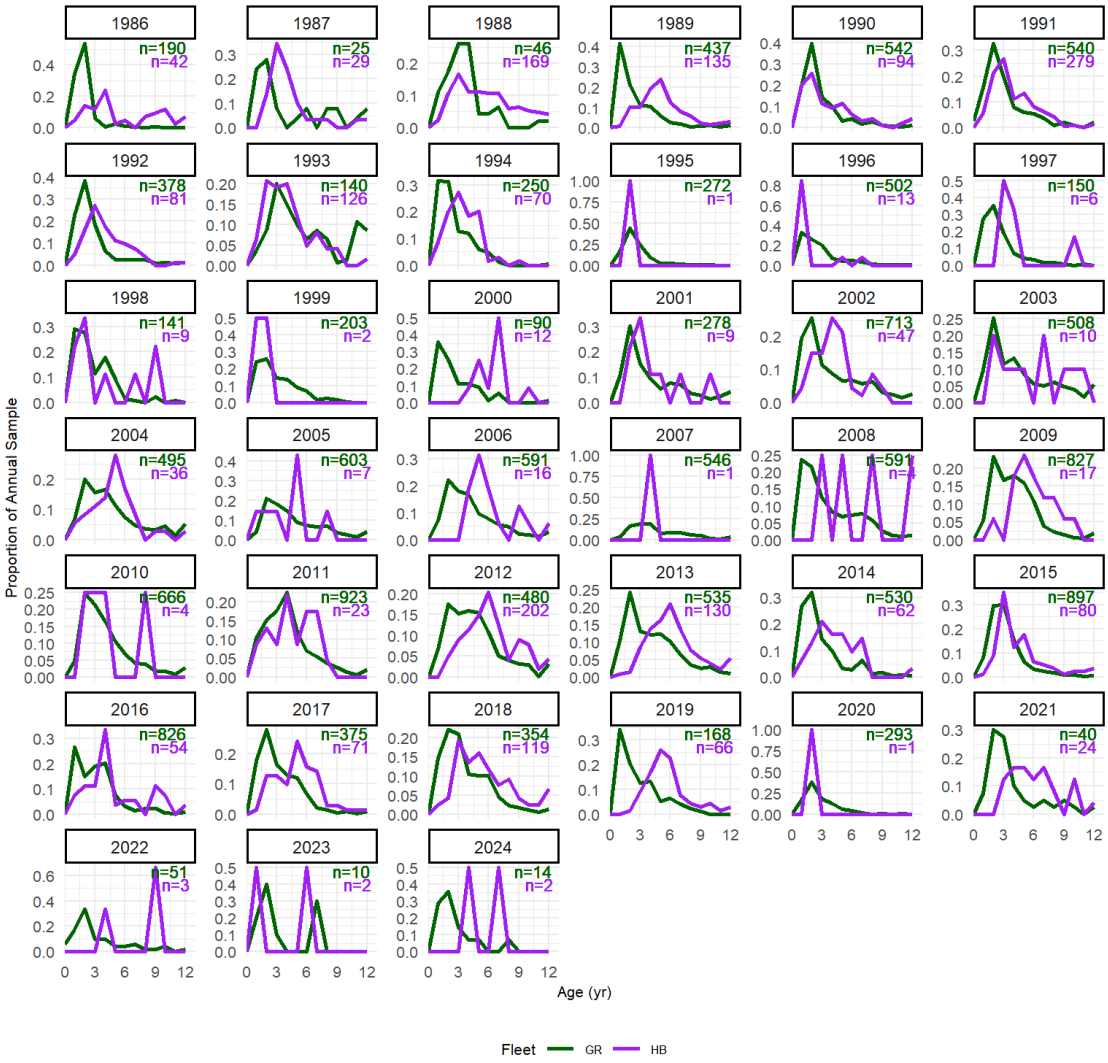

Figure 17. Comparison of the nominal age (combined sex) distribution of fish sampled from the Gen Rec (GR) and Headboat (HB) fleets. The number of fish (n) for each composition type is provided in the top right corner of each panel.

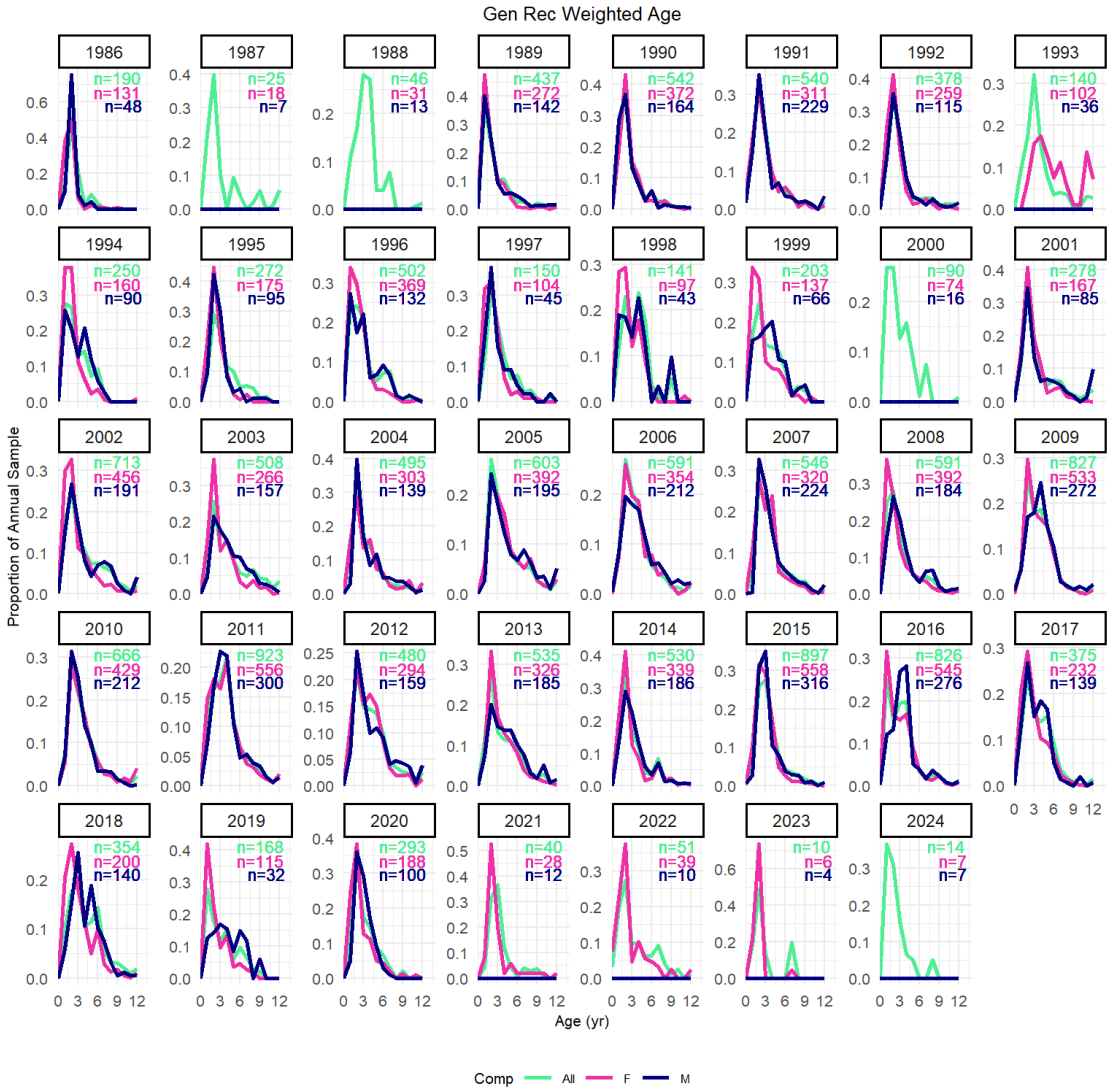

Figure 18. Weighted age composition, by sex, for fish sampled in the **Gen Rec** fleet. All = combined sex, F = female, and M = male. The number of fish (n) for each composition type is provided in the top right corner of each panel.

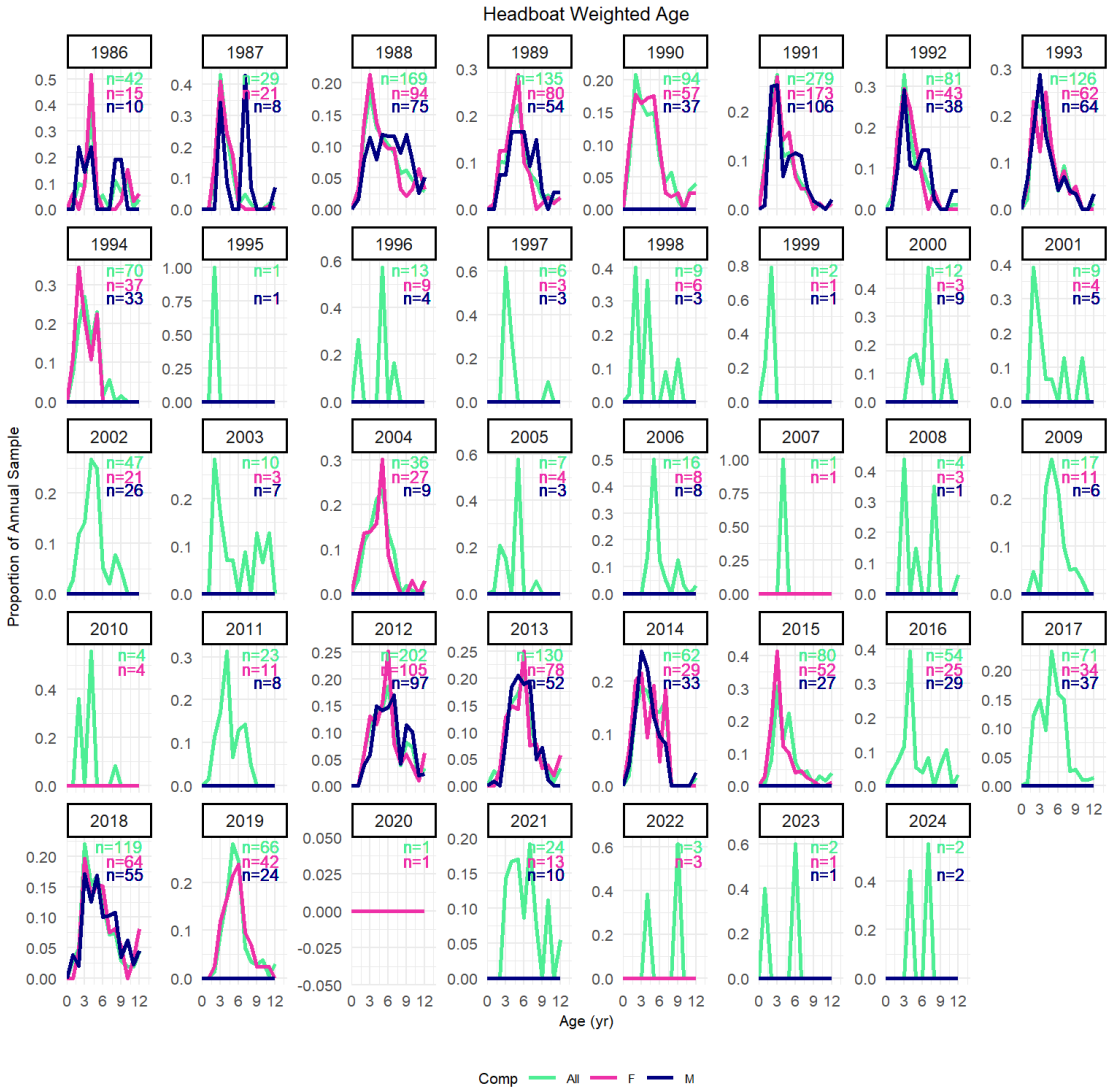

Figure 19. Weighted age composition, by sex, for fish sampled in the **Headboat** fleet. All = combined sex, F = female, and M = male. The number of fish (n) for each composition type is provided in the top right corner of each panel.

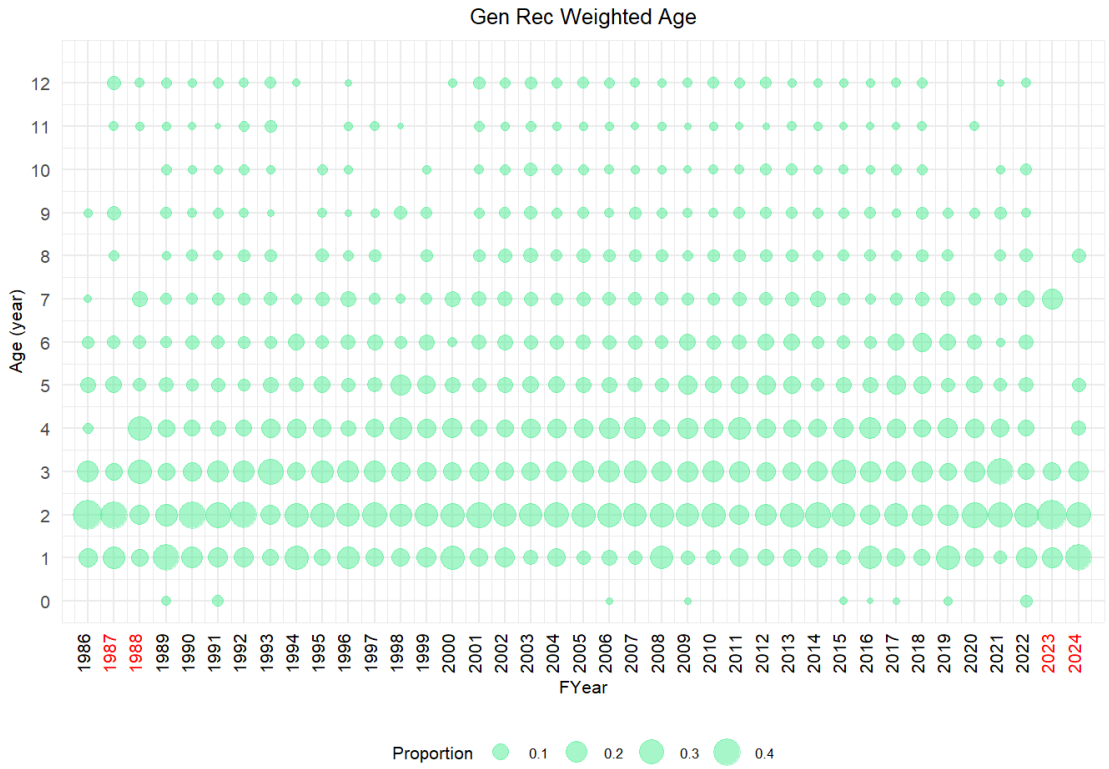

Figure 20. Weighted age composition for fish sampled in the **Gen Rec** (sex combined) fleet. Years in red do not meet the threshold of 10 fish or 10 trips per strata or the associated weighted length compositions had insufficient sample sizes.

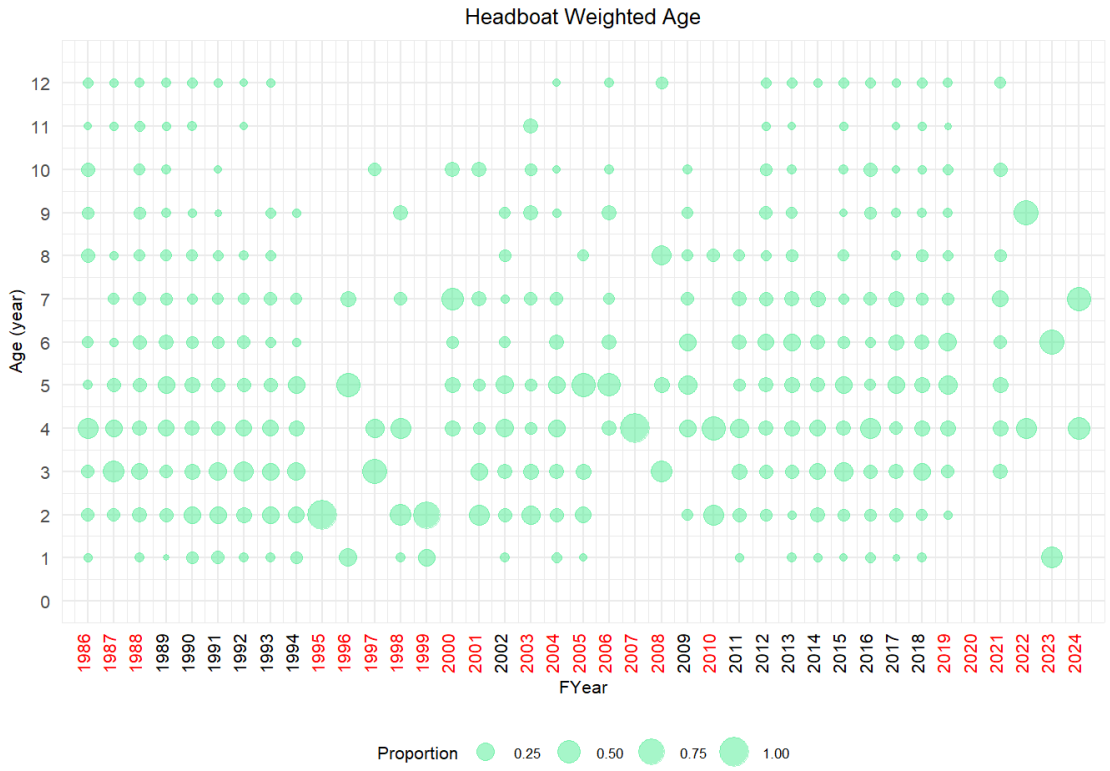

Figure 21. Weighted age composition for fish sampled in the **Gen Rec** (sex combined) fleet. Years in red do not meet the threshold of 10 fish or 10 trips per strata or the associated weighted length compositions had insufficient sample sizes.

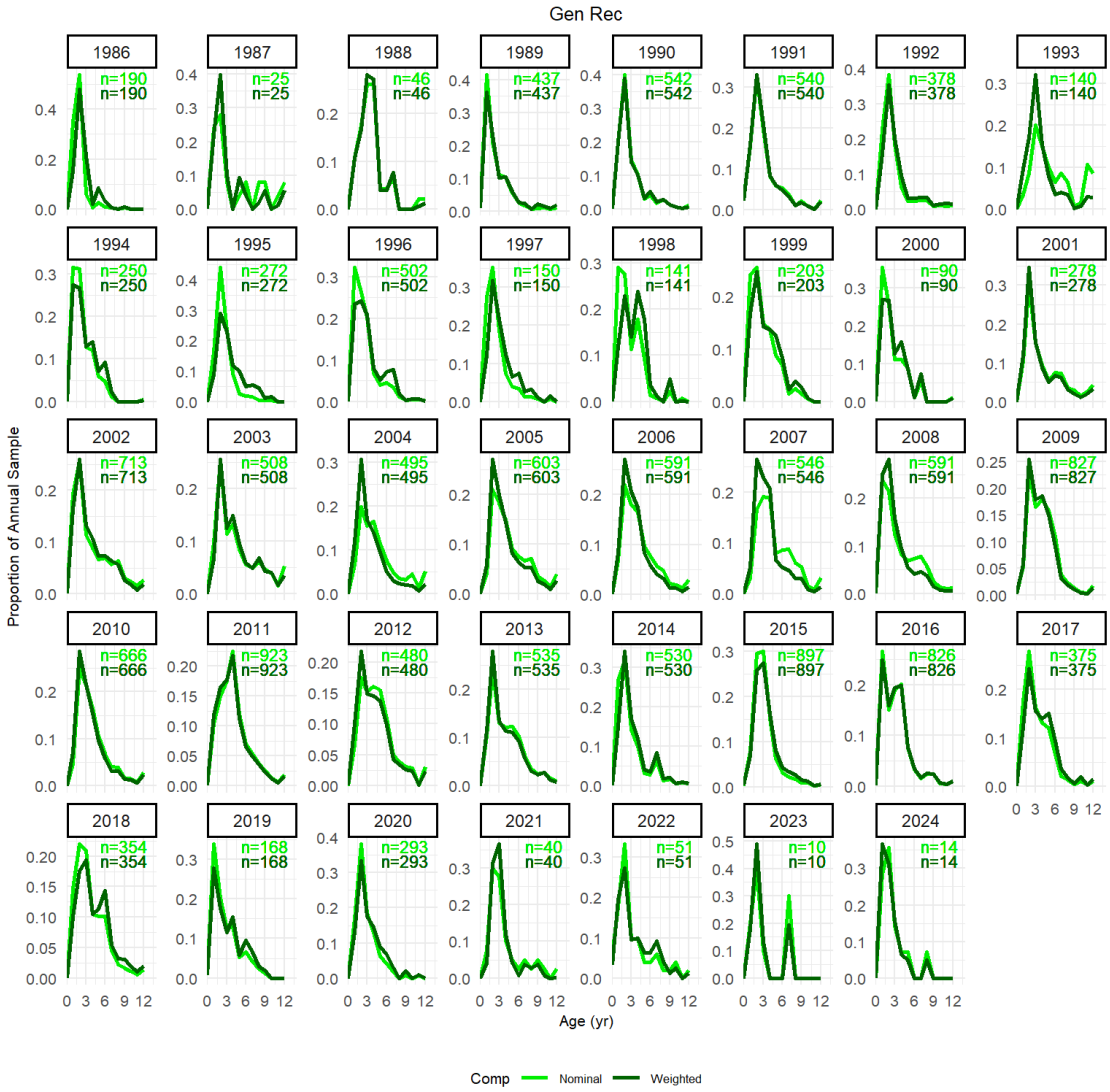

Figure 22. Nominal and weighted age compositions (combined sex) for fish sampled from the **Gen Rec** fleets. The number of fish (n) for each composition type is provided in the top right corner of each panel.

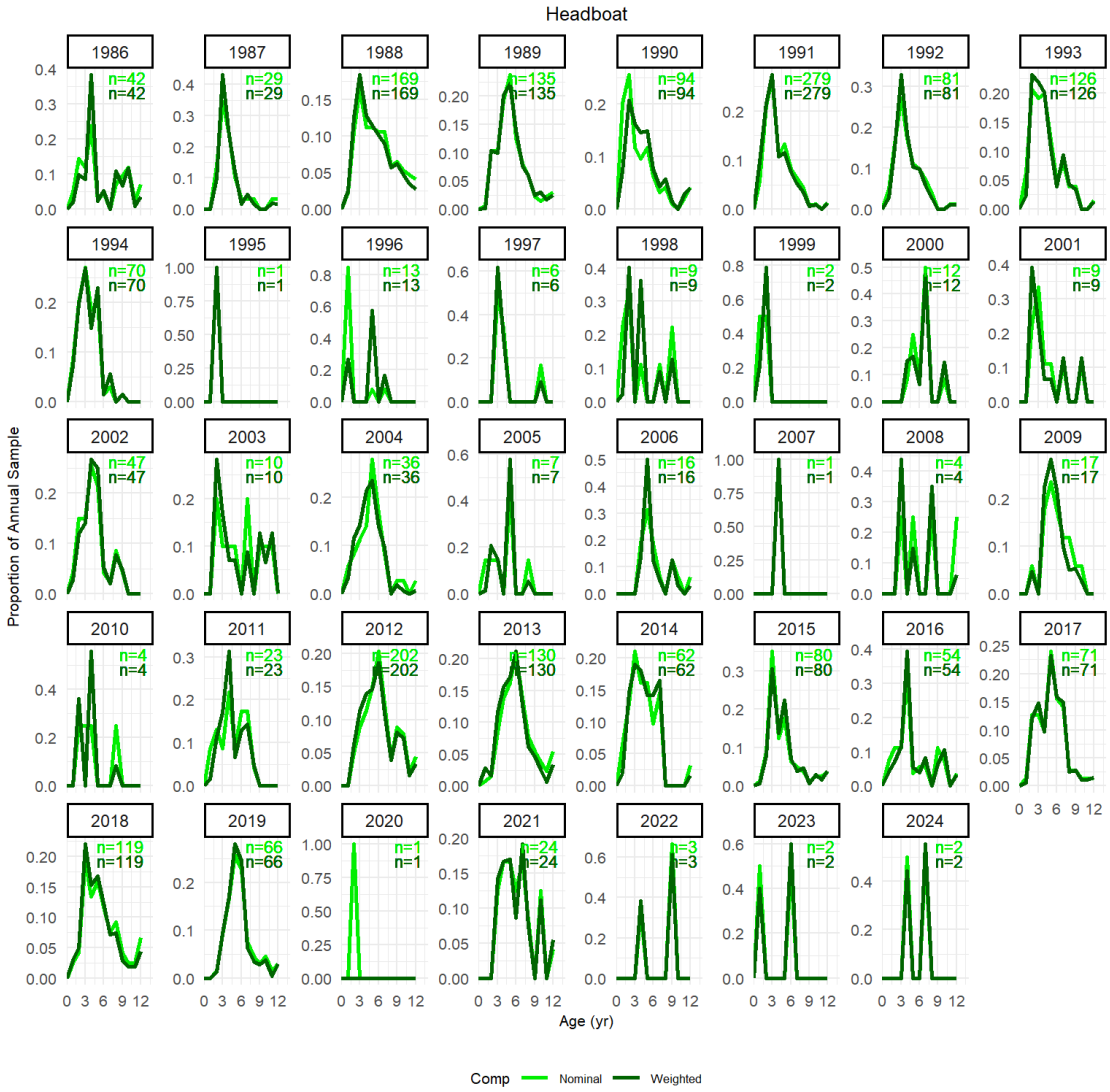

Figure 23. Nominal and weighted age compositions (combined sex) for fish sampled from the **Gen Rec** fleets. The number of fish (n) for each composition type is provided in the top right corner of each panel.

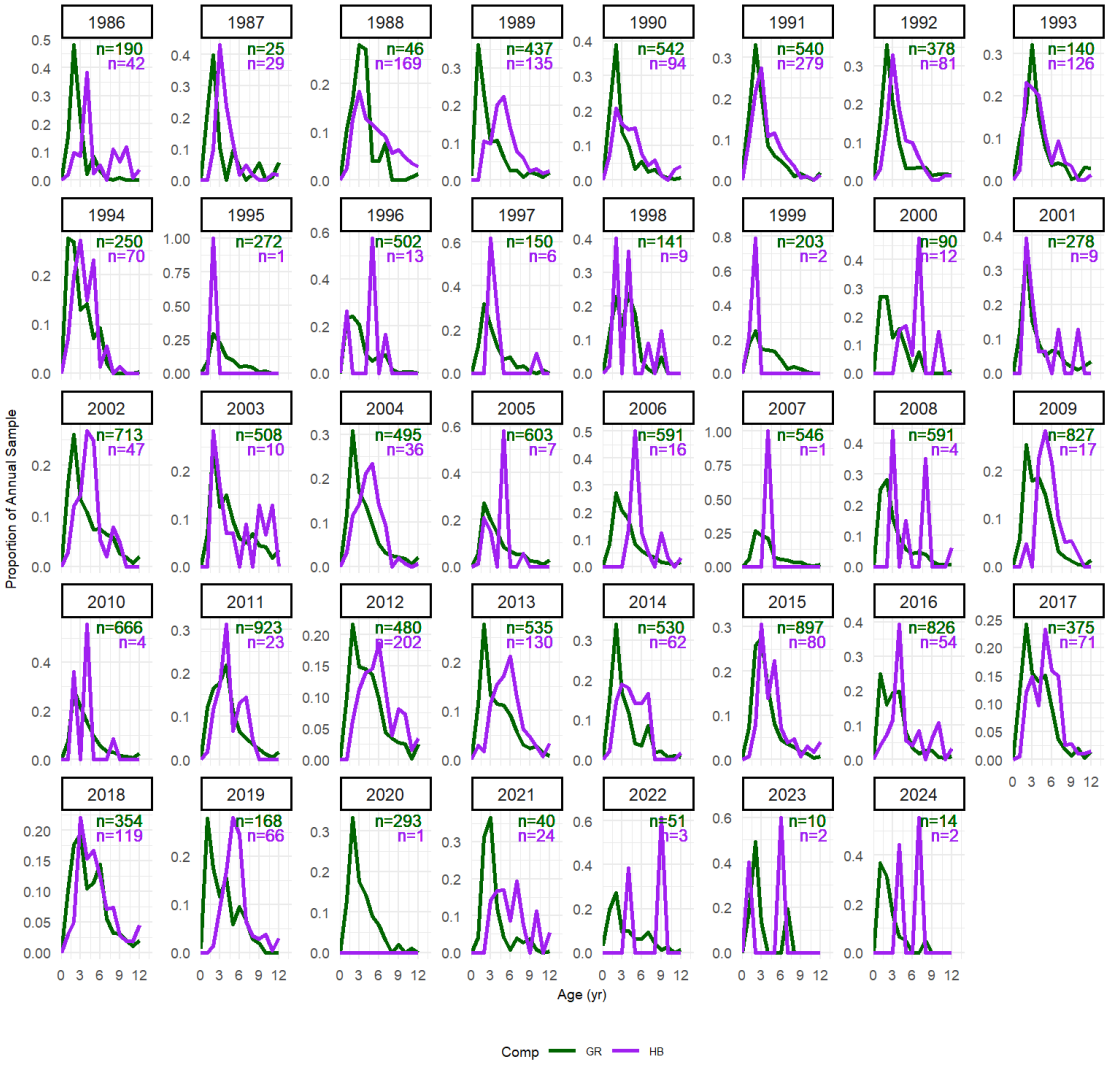

Figure 24. Comparison of the weighted age (combined sex) distribution of fish sampled from the Gen Rec (GR) and Headboat (HB) fleets. The number of fish (n) for each composition type is provided in the top right corner of each panel.

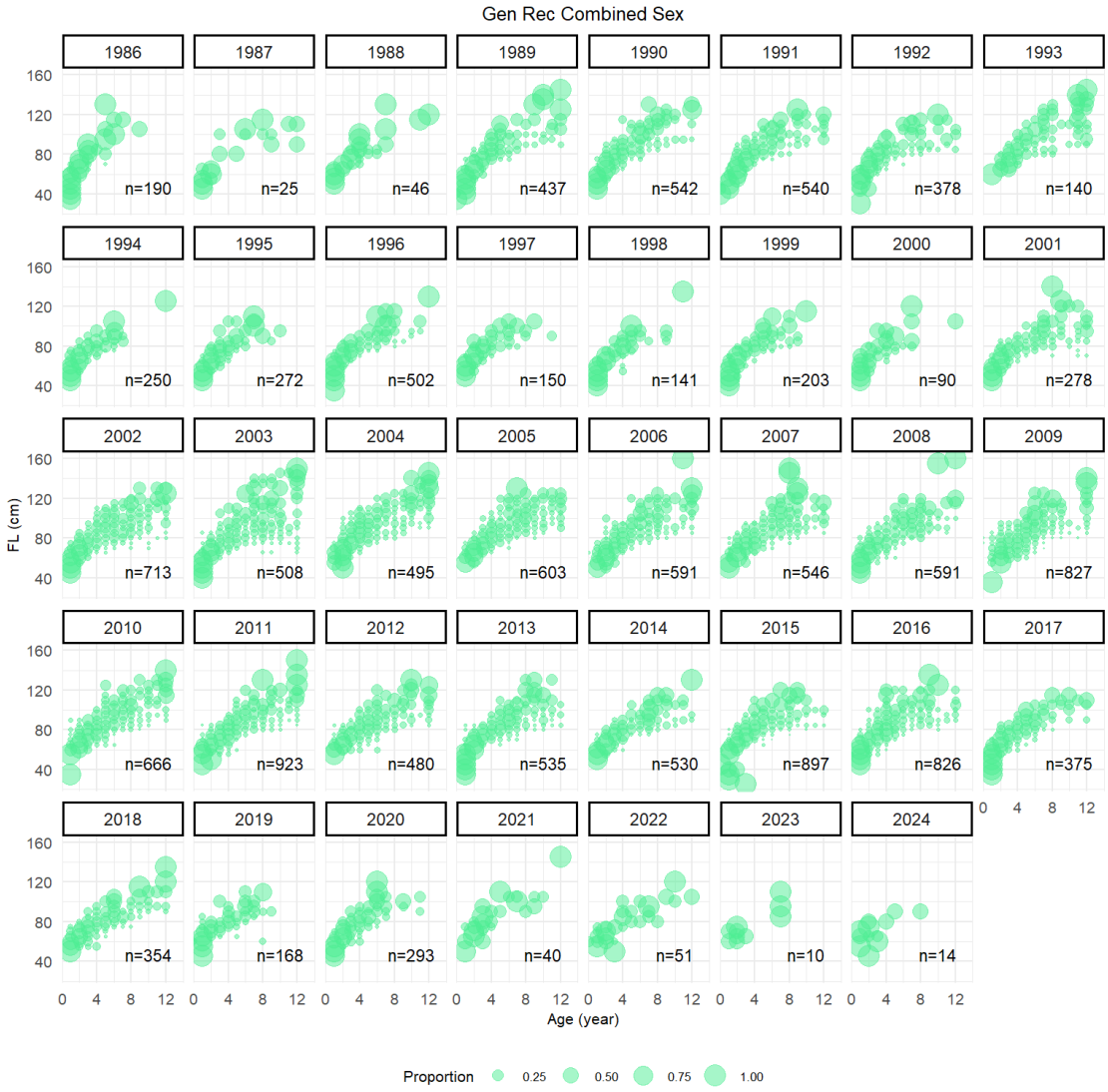

Figure 25. Conditional-age-at-length (CAAL) for fish sampled from the **Gen Rec** fleet using the combined sex age data. The number of fish (n) is provided in the bottom left panel.

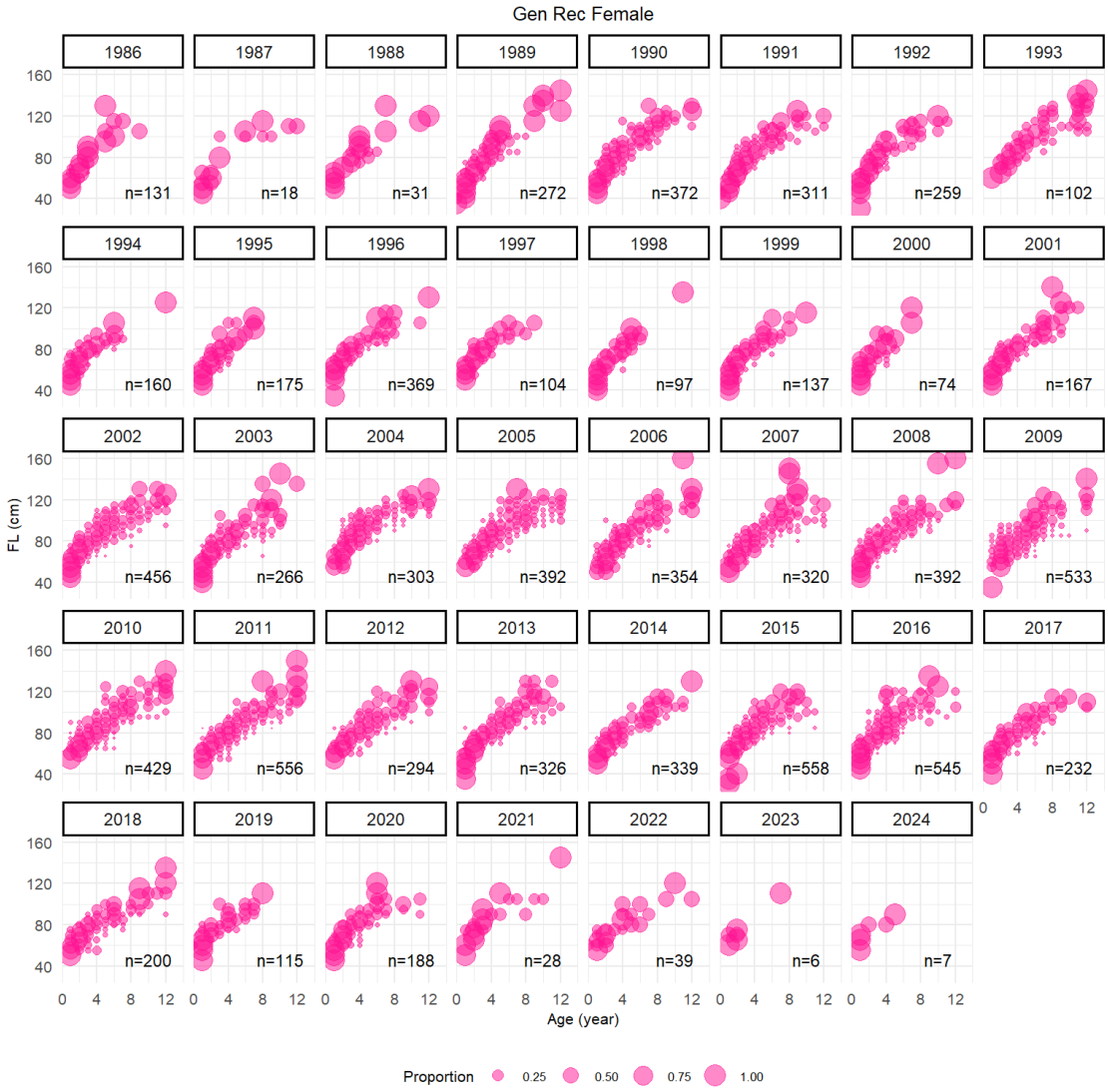

Figure 26. Conditional-age-at-length (CAAL) for fish sampled from the **Gen Rec** fleet using the female age data. The number of fish (n) is provided in the bottom left panel.

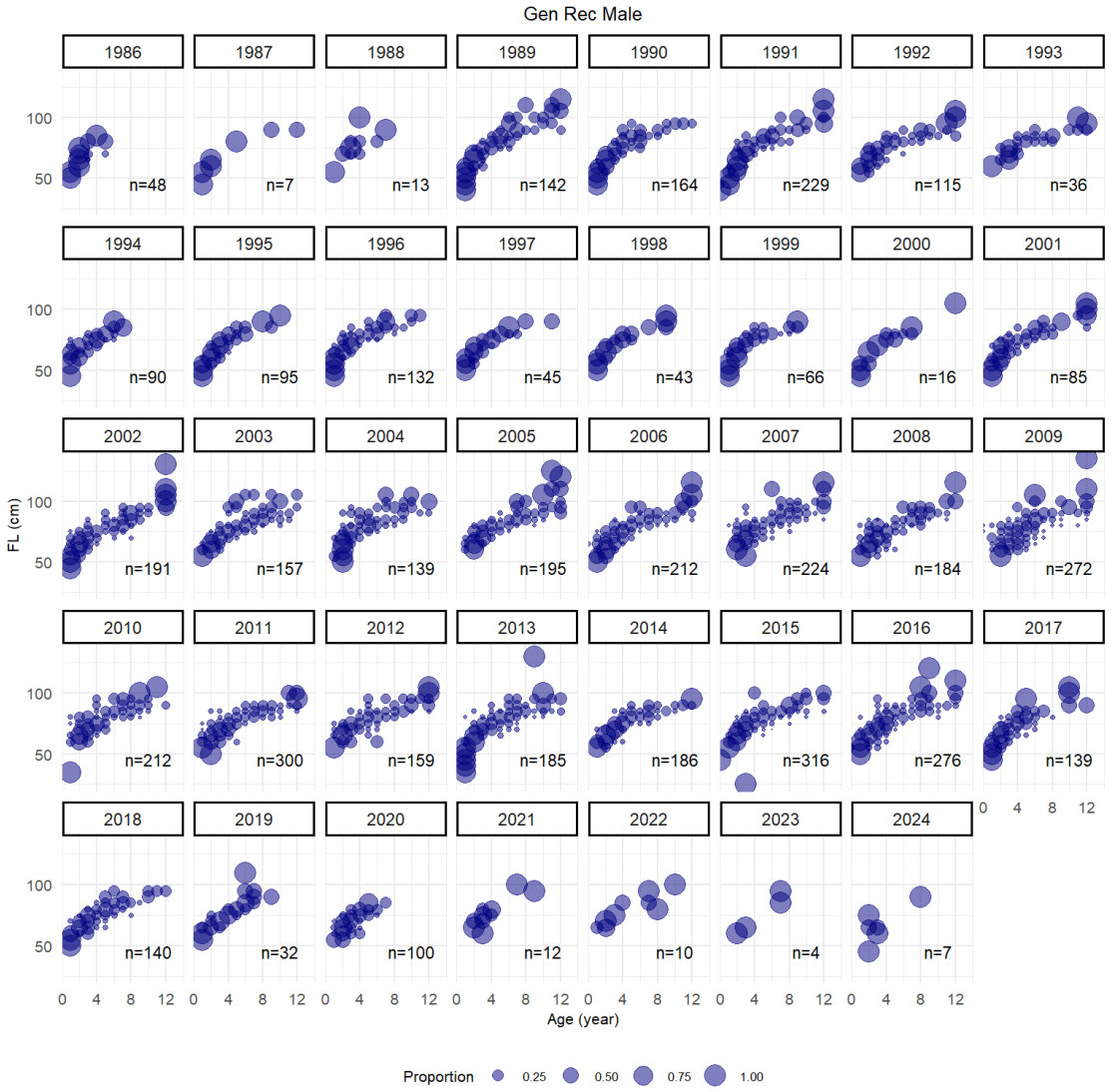

Figure 27. Conditional-age-at-length (CAAL) for fish sampled from the **Gen Rec** fleet using the male age data. The number of fish (n) is provided in the bottom left panel.

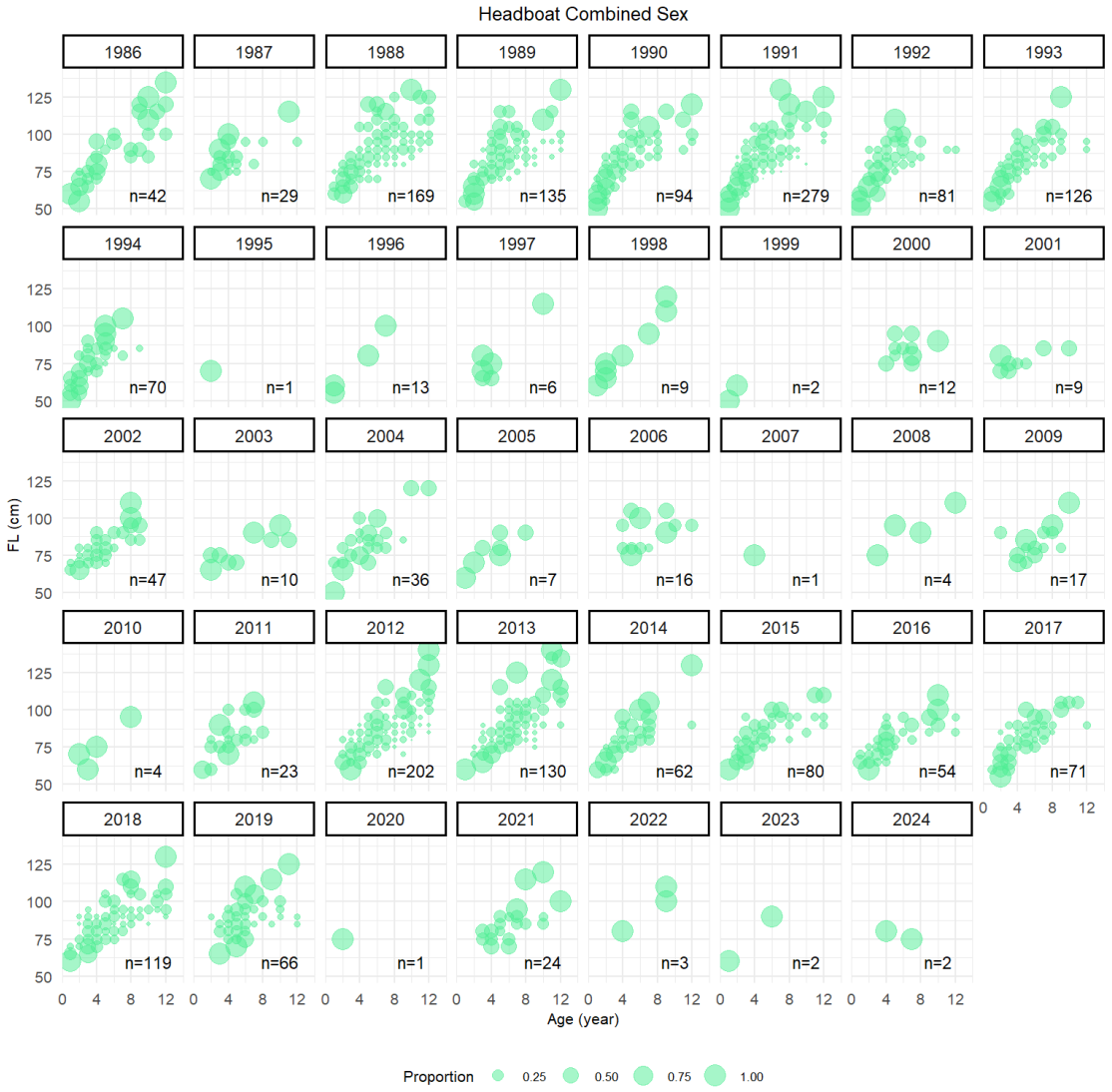

Figure 28. Conditional-age-at-length (CAAL) for fish sampled from the **Headboat** fleet using the combined sex age data. The number of fish (n) is provided in the bottom left panel.

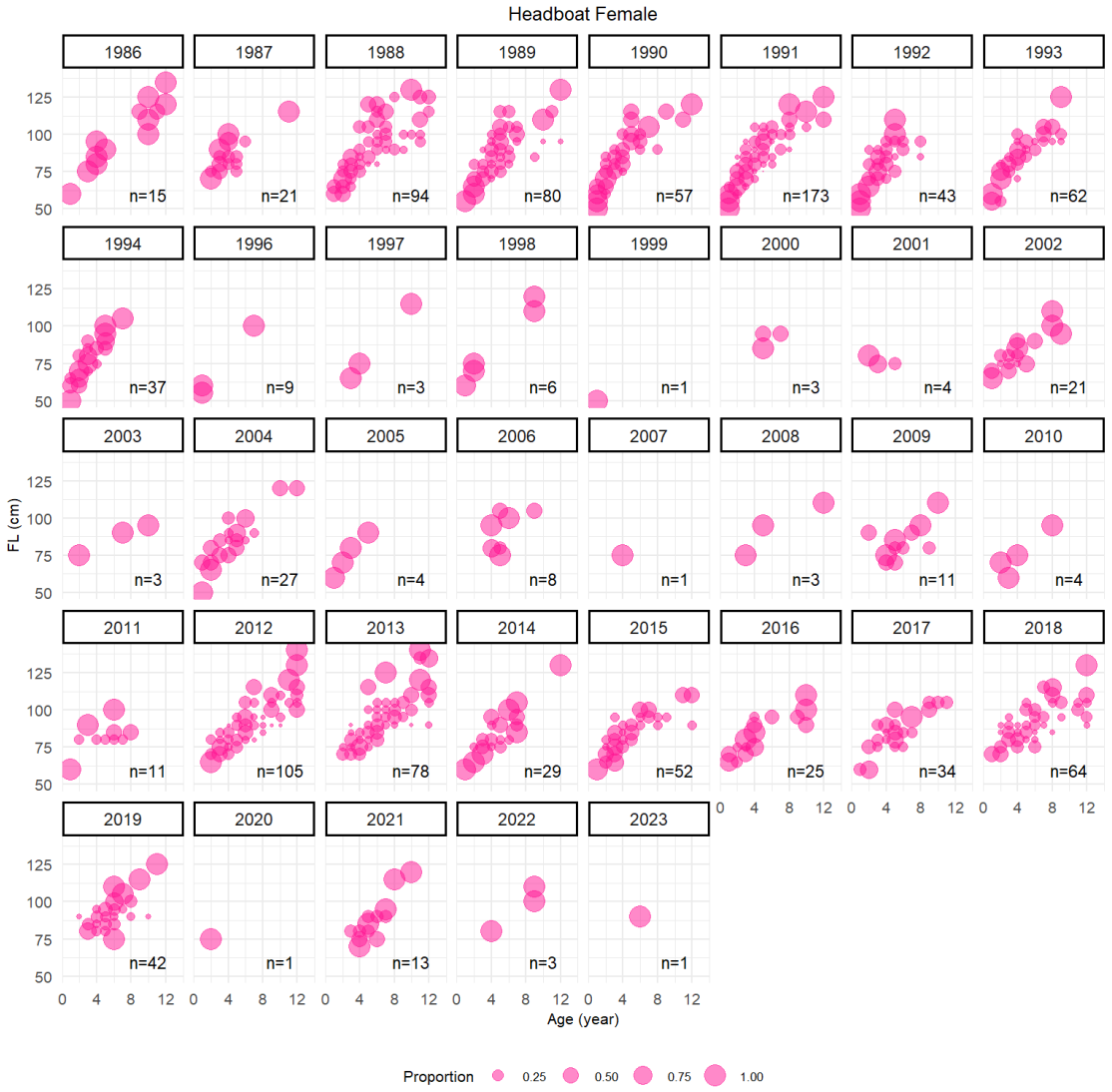

Figure 29. Conditional-age-at-length (CAAL) for fish sampled from the **Headboat** fleet using the female age data. The number of fish (n) is provided in the bottom left panel.

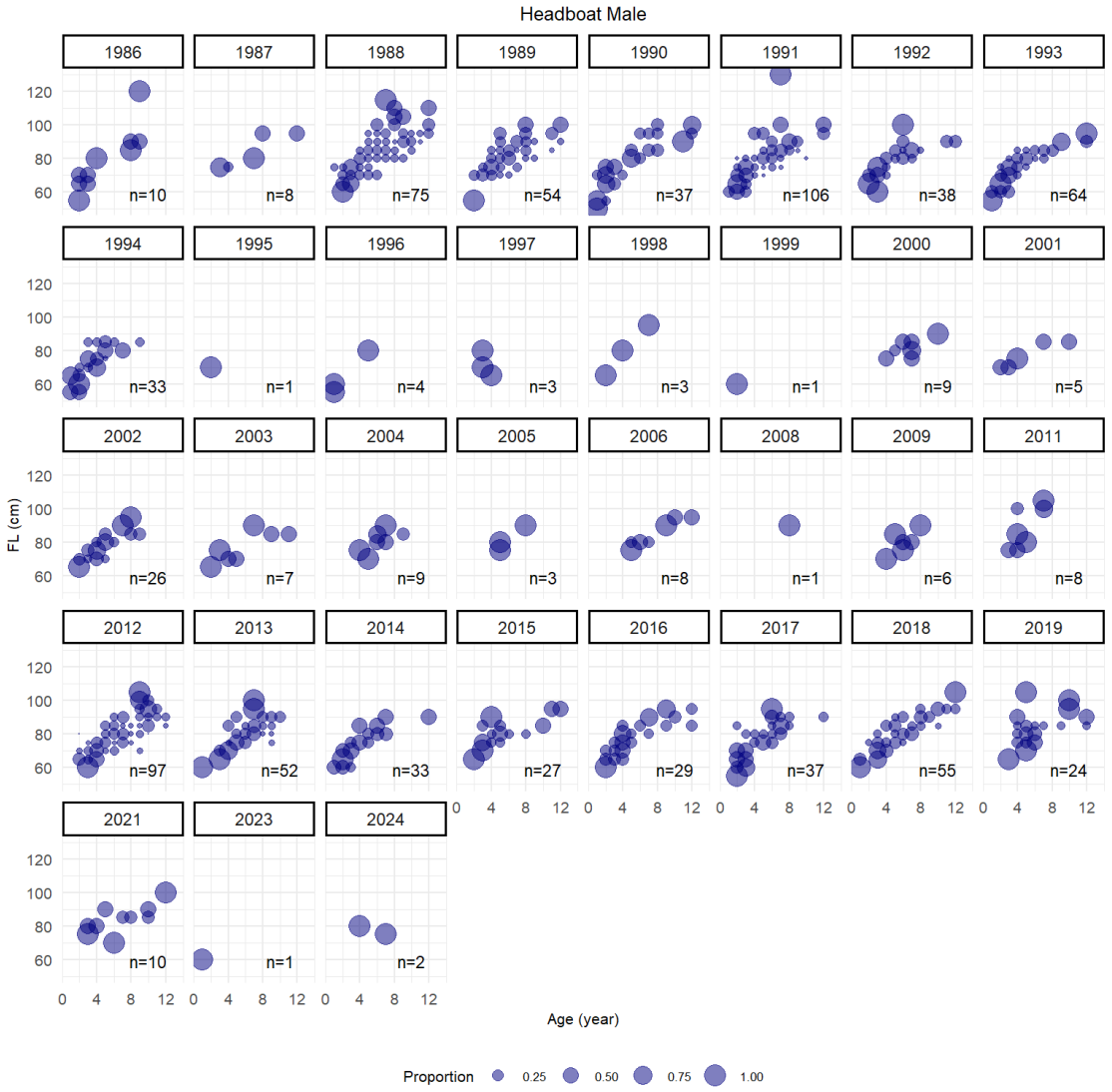

Figure 30. Conditional-age-at-length (CAAL) for fish sampled from the **Headboat** fleet using the male age data. The number of fish (n) is provided in the bottom left panel.

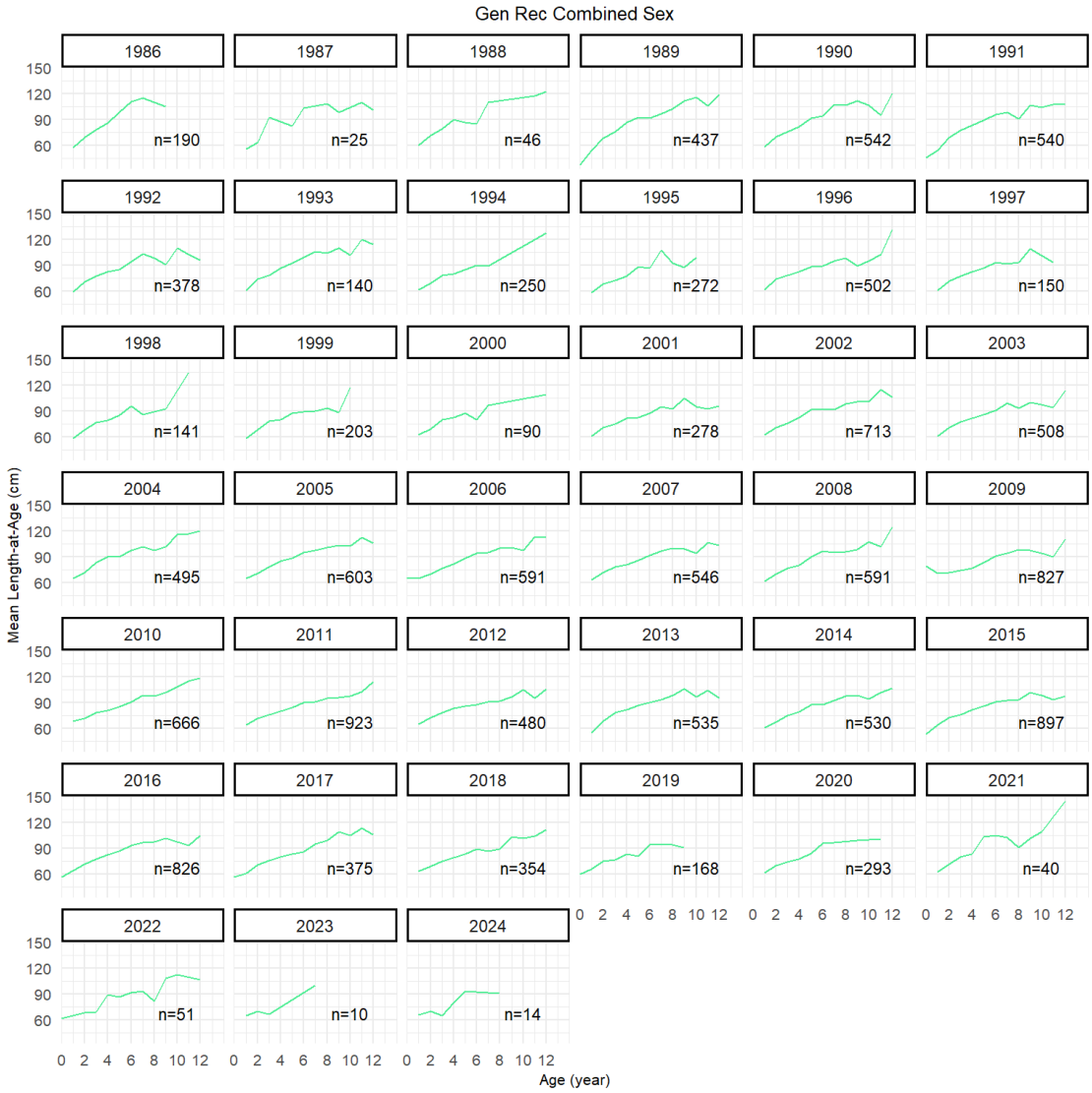

Figure 31. Mean length-at-age (MLAA) for fish sampled from the **Gen Rec** fleet using the combined sex age data. The number of fish (n) is provided in the bottom left panel.

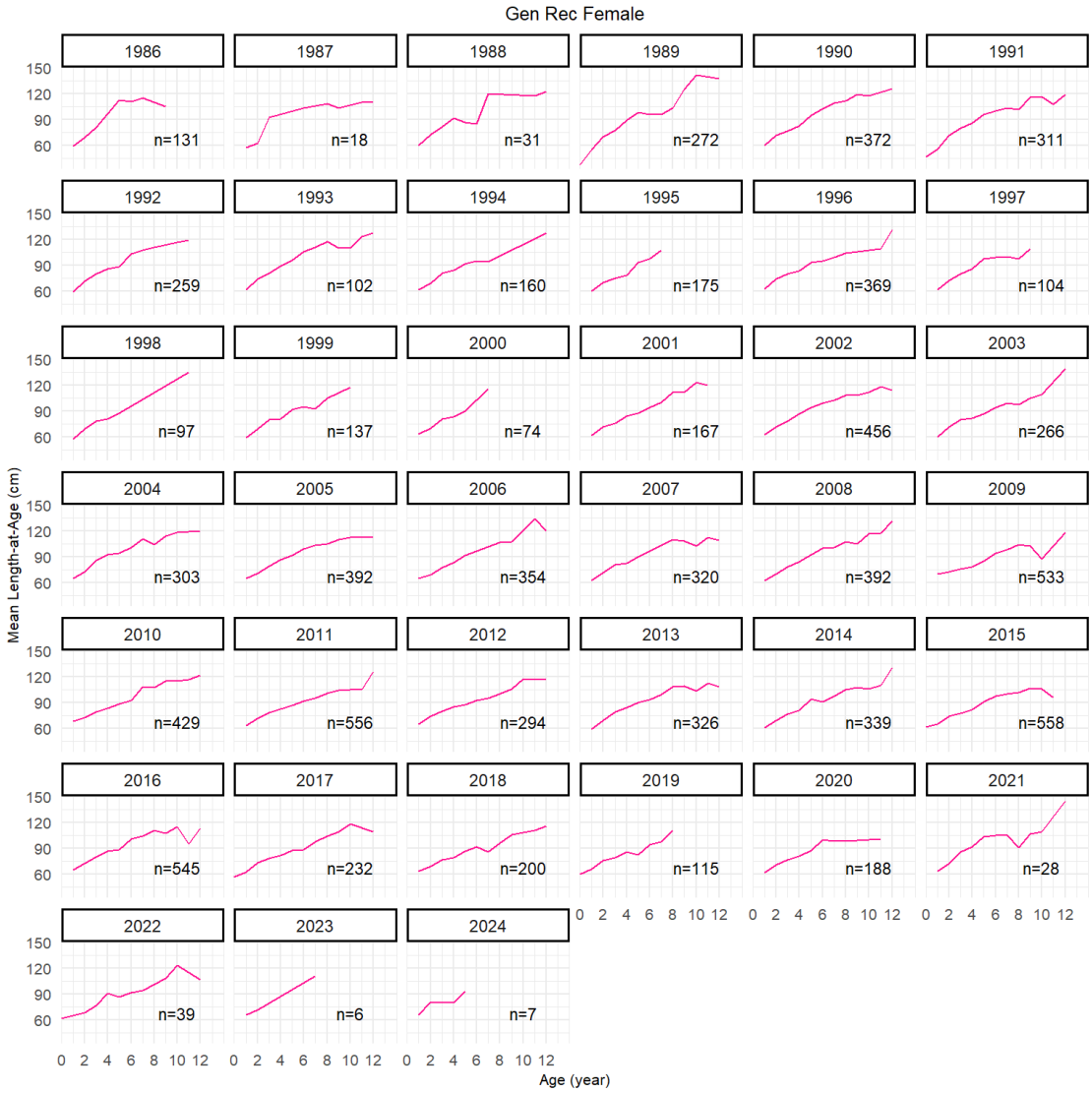

Figure 32. Mean length-at-age (MLAA) for fish sampled from the **Gen Rec** fleet using the female age data. The number of fish (n) is provided in the bottom left panel.

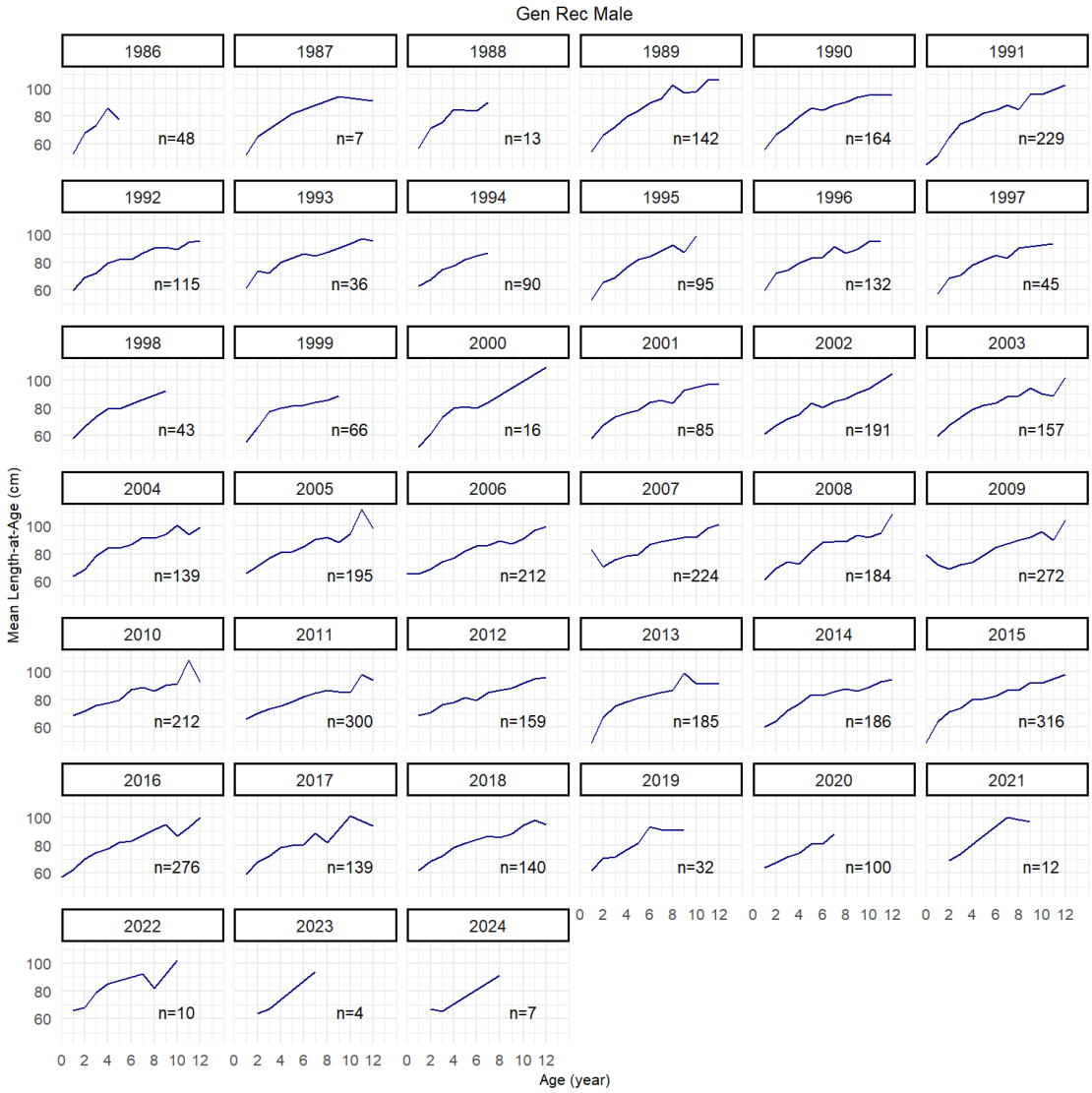

Figure 32. Mean length-at-age (MLAA) for fish sampled from the **Gen Rec** fleet using the male age data. The number of fish (n) is provided in the bottom left panel.

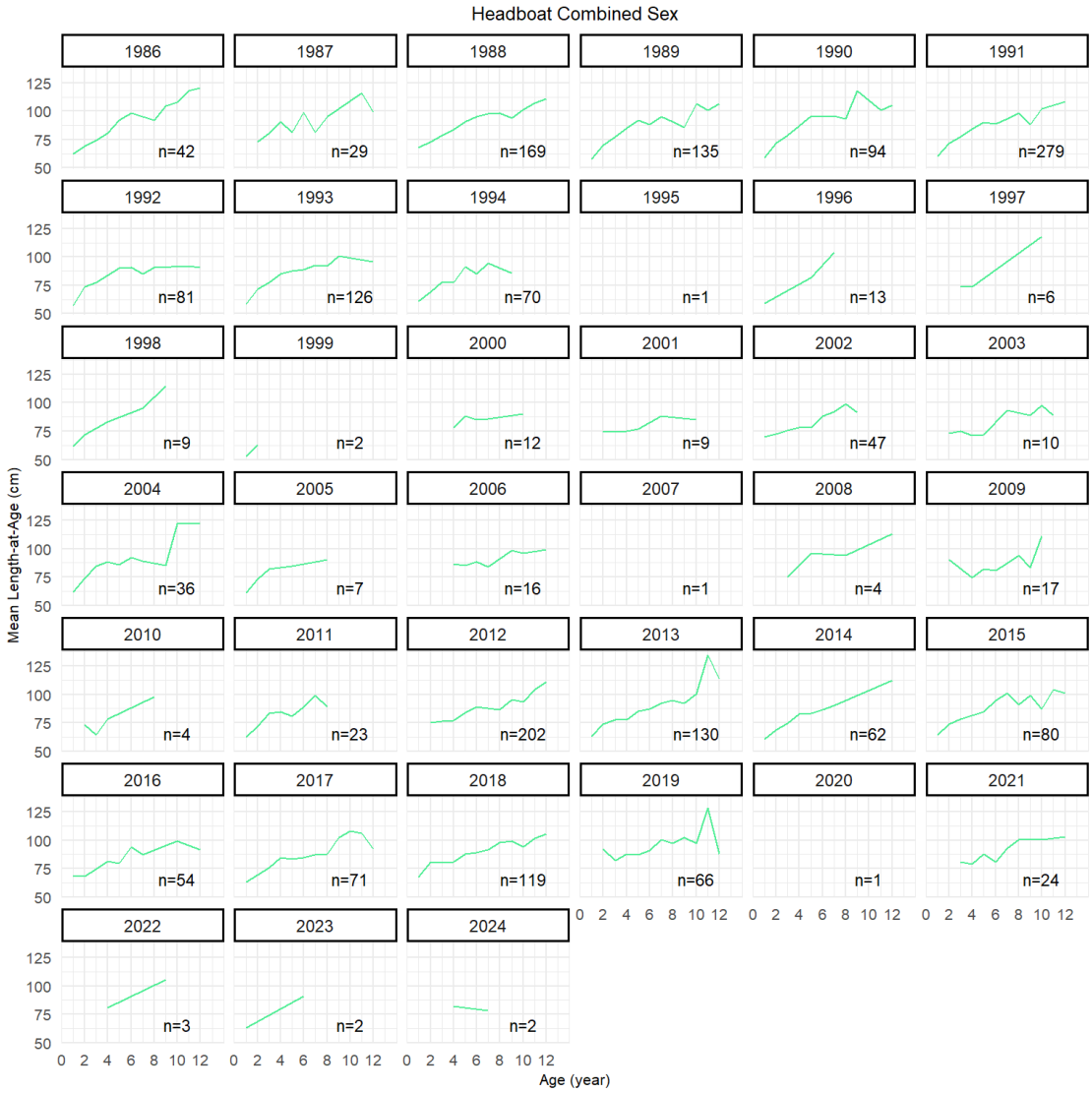

Figure 34. Mean length-at-age (MLAA) for fish sampled from the **Headboat** fleet using the combined sex age data. The number of fish (n) is provided in the bottom left panel.

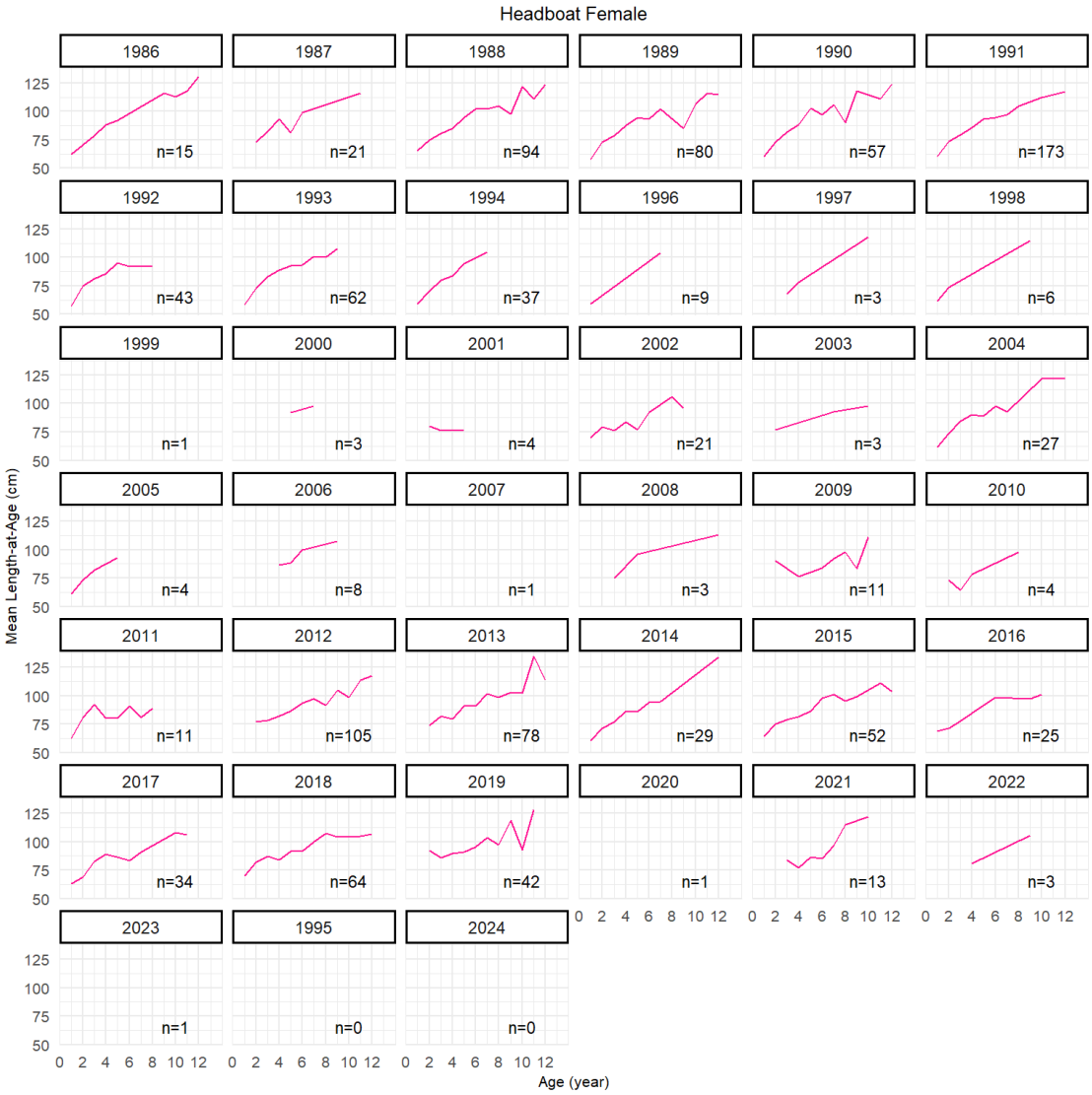

Figure 35. Mean length-at-age (MLAA) for fish sampled from the **Headboat** fleet using the female age data. The number of fish (n) is provided in the bottom left panel.

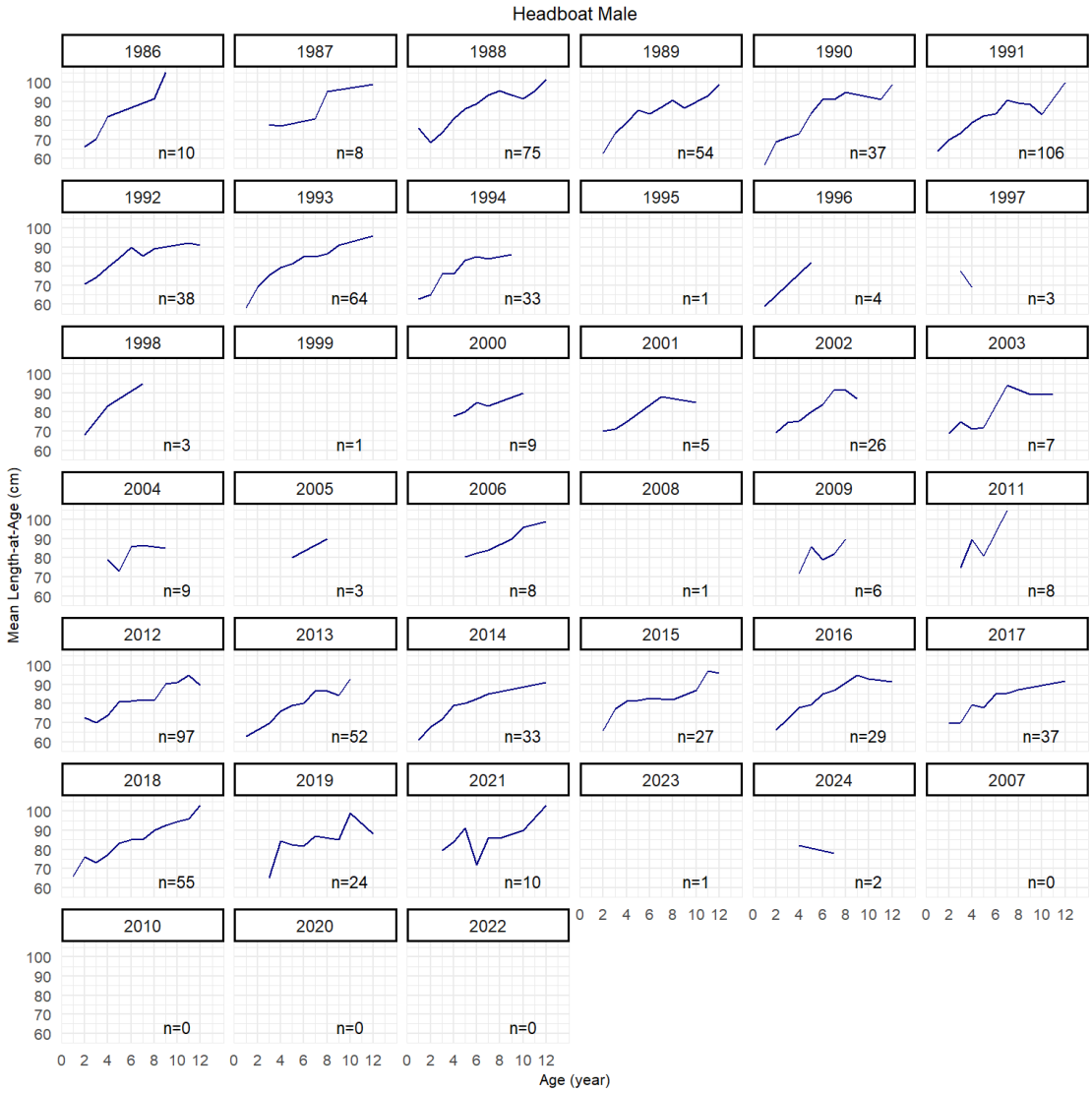

Figure 36. Mean length-at-age (MLAA) for fish sampled from the **Headboat** fleet using the male age data. The number of fish (n) is provided in the bottom left panel.