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Gulf of Mexico Yellowedge Grouper (*Hyporthodus flavolimbatus*) Landings Length and Age Compositions

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Introduction

This document outlines the data and methodologies used to estimate length and age compositions of landings for SEDAR 85 Gulf of Mexico Yellowedge Grouper (*Hyporthodus flavolimbatus*) Assessment. In many SEDAR assessments, both commercial and recreational length and age compositions are provided. In the case of Yellowedge Grouper recreational length and age data, there were insufficient data to consider providing length or age compositions for recreational fleets. The number of available lengths and number of associated trips are presented in Table 1, while the number of available age samples and number of associated trips are presented in Table 2. The decision to exclude recreational length and age compositions is consistent with what was done for SEDAR 22.

From this point on, this document outlines the data and methodologies used to estimate length and age compositions of commercial landings only. These compositions were estimated using data sources approved in SEDAR 22. SEDAR 22 included nominal length compositions and conditional age at length, by commercial fishing gear (Longline and Vertical line), sex (Male, Female, and Unknown), and subregion (East and West Gulf). New data requests for SEDAR 85 included nominal age compositions and mean length-at-age to enable incorporation of more recent best practices developed during the SEDAR 68 Gulf of Mexico Scamp Research Track Assessment. As SEDAR 85 is an operational assessment, the procedures used in SEDAR 22 were followed as closely as possible to replicate the previous results. Resulting analyses and data limitations are discussed below.

Data Description

SEDAR 85 assesses all Gulf of Mexico Yellowedge Grouper in federal waters extending northward from the Texas/Mexico border and eastward to the Florida Keys US1 boundary. The commercial data sources used to generate length compositions include length sample data collected by the Trip Interview Program (TIP, 1983 - 2021) and three historical datasets 1) Bullock dataset collected by Bullock (FWRI), Godcharles (NMFS) and Crabtree (FWRI) from 1977 - 1984, 2) Johnson dataset collected by Lucious Johnson (1982 - 1983), and 3) Prytherch dataset collected by Prytherch et al. (1983). Further description of the historical datasets is available in the SEDAR 22 report. As this assessment is structured by sex, and landings are not available by sex, only nominal compositions were provided, and therefore no landings information was used to weight the compositions. Yellowedge Grouper age samples were collected by several sampling programs through time and age estimates provided by GulfFIN and Florida Fish and Wildlife Research Institute (FWRI) were compiled by the SEFSC Panama City Laboratory alongside their age data. The following sampling programs yielded Yellowedge Grouper age structures, with the years of age data available and number of samples listed in parentheses: TIP (n = 15,088, year range = 1991 – 2021), Prytherch et al. 1983 (n = 852, year range = 1982 – 1983), FWRI (n = 454, year range = 1977 – 1988), Shark Bottom Longline Observer Program (SBLOP: n = 418, year range = 2007 – 2012), Cooperative Research Program (n = 363, year range = 2003 – 2009), and Galveston Observer Program (GOP: n = 107, year range = 2012 – 2013).

Commercial fleets for length and age compositions were defined by vertical line (VL) and longline (LL) gears. For landings, other gears were combined with VL, however, for length and age compositions those gears were excluded as they make up a very small proportion of VL

landings, and could potentially bias the compositions. The exclusion of other gears is also consistent with what was done in SEDAR 22. These data were compiled using length bins of 2 centimeters (cm) to match SEDAR 22. Fork length (FL) in cm was converted to total length (TL) in cm using the following conversion equation:

$$TL = -1.5065 + 1.067 * FL$$

Commercial Length Compositions of Landings

Length Samples

Length samples of commercial landings were obtained from the TIP database maintained by the NMFS Southeast Fisheries Science Center (SEFSC) and were filtered to remove biases that include samples from pooled trips and any non-random sampling. Commercial lengths ranged from 21cm TL to 126cm TL. All lengths fell within a reasonable size range, therefore no observations were removed as outliers.

Length Compositions

Because fishery-dependent sampling is typically opportunistic, lengths may not be representative of the true landings composition throughout the entire Gulf of Mexico. Possible sampling bias in the collection of length samples is typically removed by weighting the length compositions with the associated landings on the finest spatial and temporal scale available without losing data. However, because landings data are not available by sex, only nominal compositions are provided for this assessment, which is consistent with what was done in SEDAR 22.

Commercial fleets (VL, LL) were aggregated into two stocks in the Gulf of Mexico based on the NMFS areas fished shown in Figure 1: Eastern (E: areas 1-12), and Western (W: areas 13-21). These gears were sufficiently distinct to remain separate fleets (Figure 2) and gear-specific annual compositions across the Gulf of Mexico are shown in Figure 3. Length distributions are shown by fishing areas grouped by stock (W, E) for VL (Figure 4) and LL (Figure 5). Annual length distributions by sex are shown for VL (Figure 6) and LL (Figure 7). These plots demonstrate the relatively low contribution of male and female samples to the length distributions, the vast majority of the available data are for individuals with unknown sex. As this assessment is an operational assessment, the spatial resolution of the stocks is on the same scale used to provide the length compositions in SEDAR 22. Nominal compositions were provided for each fleet alongside sample sizes of commercial lengths (Table 3) and trips (Table 4) for each stock (E, W), sex (F, M, U), and gear (VL,LL).

Within each fleet, subregional and sex-specific nominal length compositions were estimated using length bins of 2 cm, where for each year i, length bin j, subregion r, and sex s

$$LC_{i,j,r,s} = \frac{n_{i,j,r,s}}{n_{i,r,s}}$$

$n_{i,j,r,s}$ is the number of samples in year i, subregion r, sex s and lower inclusive length bin j; $n_{i,r,s}$ is the number of samples in year i, subregion r, and sex s; and $LC_{i,j,r,s}$ is the proportion of the total number of sampled fish in each year i, subregion r, and sex s within each lower inclusive length bin j. A minimum sample size threshold was recommended annually within each stratum, $LC_{i,r,s}$, where these should be dropped and excluded from further analyses if

$n_{i,r,s} < 30$ or if the number of trips sampled is less than 10. Number of commercial samples within gear/subregion/sex strata are shown in Table 3.

Commercial Age Compositions of Landings

Age Samples

Age data compiled by the SEFSC Panama City Laboratory were filtered to remove duplicated and biased data. Nominal age compositions were estimated for each fleet alongside sample sizes of commercial ages (Table 5), and commercial trips sampled for age (Table 6). Yellowedge Grouper ages ranged from 0 - 85 years, but a plus group of 40 was used here as in SEDAR 22 to overcome gaps at older ages and simplify the modeling process.

Commercial Conditional Age-at-Length

Commercial age samples were a subset of the length samples. Length distributions of otolith samples were compared to nominal length compositions for all commercial fleets (Figure 8, Figure 9). Within each commercial fleet (VL, LL) conditional age-at-length in number (rather than proportion) was estimated where for each year i, subregion r, sex s, length bin j, and age class k

$$CAAL_{i,r,s,j,k} = a_{i,r,s,j,k}$$

$a_{i,r,s,j,k}$ is the number of age samples in year i, subregion r, sex s, lower inclusive length bin j, and age class k. CAAL is more typically calculated as a proportion, however for this assessment it was requested in numbers rather than as a proportion which allows for easy collapsing of strata if needed. The data are shown as proportions in the CAAL plots to allow for easier interpretation (Figures 10 – 20).

Fleet-specific mean length-at-age and associated sample sizes were also provided to aide in model diagnostics. Mean length-at-age, $MLAA_{i,r,s,k}$, was estimated as the sum of all lengths $L_{i,r,s,k}$ divided by the associated sample sizes $a_{i,r,s,k}$ within each year i, subregion r, sex s, and age class k.

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

Age Compositions

Nominal age compositions were estimated for each commercial gear (VL, LL), and sex (F, M, U), within each stock (E, W), resulting in 12 sets of age compositions. The process outlined below was applied to each fleet individually, and any strata with less than 10 age samples was recommended to be dropped. Nominal age compositions of landings were estimated for all gears using the following equation within each year i, subregion r, sex s, and age bin k.

$$AC_{i,r,s,k} = \frac{a_{i,r,s,k}}{a_{i,r,s}}$$

$a_{i,r,s,k}$ is the number of age samples in year i, subregion r, sex s, and lower inclusive age bin k; $a_{i,r,s}$ is the number of age samples in year i, subregion r, and sex s; and $AC_{i,r,s,k}$ is the proportion of the total number of sampled fish in each year i, subregion r, and sex s within each

lower inclusive age bin k. A minimum sample size threshold was recommended annually within each strata, $AC_{i,r,s}$, where these were recommended to be dropped and excluded from further analyses if $a_{i,r,s} < 10$. Nominal age distributions are shown in Figures 21 – 23.

Data Limitations

Length and age data are very sparse for the Male and Female strata in most year, gear, and subregion combinations. There are considerably more samples with sex "Unknown". Caution should be used when modeling length strata with fewer than 30 fish sampled, and age strata with fewer than 10 fish sampled.

Changes from SEDAR 22

A comparison of length sample sizes used in SEDAR 22 and SEDAR 85 found some discrepancies in the number of samples by strata. Investigation into this issue identified that changes in the data extraction process likely led to the observed discrepancies. In particular, improvements to region and gear assignment were implemented that resulted in either the movement of samples from one gear category to the other (i.e. from VL to LL or vice versa), or in the addition or removal of samples all together based on region assignment (i.e. samples previously identified as Gulf of Mexico now South Atlantic or vice versa).

References

Prytherch, H.F. (1983). A descriptive survey of the bottom long line fishery in the Gulf of Mexico. NOAA Technical Memorandum NMFS-SEFSC-122. 33p.

Tables

Table 1. Number of recreational length samples (Rec n) and associated trips (Rec trips) sampled for all modes combined, by subregion (West, East). Note that any years not listed between 1986 and 2021 had no available samples.

Year	Rec n West	Rec trips West	Rec n East	Rec trips East	Rec total samples	Rec total trips
1986	33	12	6	2	39	14
1987	22	16	1	1	23	17
1988	24	15	0	0	24	15
1989	13	7	0	0	13	7
1990	11	5	1	1	12	6
1991	1	1	0	0	1	1
1993	4	4	0	0	4	4
1994	0	0	1	1	1	1
1995	5	5	0	0	5	5
1997	0	0	1	1	1	1
1998	1	1	4	2	5	3
1999	0	0	3	3	3	3
2001	1	1	5	4	6	5
2002	0	0	1	1	1	1
2003	1	1	1	1	2	2

Year	Rec n West	Rec trips West	Rec n East	Rec trips East	Rec total samples	Rec total trips
2004	0	0	3	1	3	1
2005	5	2	2	2	7	4
2006	3	2	2	1	5	3
2007	1	1	0	0	1	1
2009	3	2	1	1	4	3
2011	1	1	3	2	4	3
2012	2	2	4	2	6	4
2013	4	2	3	3	7	5
2014	2	2	3	3	5	5
2015	2	2	10	4	12	6
2016	0	0	3	3	3	3
2017	5	1	6	3	11	4
2019	3	1	17	9	20	10
2020	0	0	4	3	4	3
2021	1	1	9	4	10	5
2022	5	3	21	8	26	11

Table 2. Number of recreational age samples (Rec n) and associated trips (Rec trips) sampled for all modes combined, by subregion (West, East). Note that any years not listed between 1986 and 2021 had no available samples.

Year	Rec n West	Rec trips West	Rec n East	Rec trips East	Rec total samples	Rec total trips
1991	25	2	0	0	25	2
2003	0	0	1	1	1	1
2006	1	1	0	0	1	1
2011	0	0	1	1	1	1

Table 3: Annual number of Yellowedge Grouper commercial vertical line (VL), and longline (LL) length samples by stock (E,W), and sex (F,M,U).

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_M	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
1977	0	0	1	0	0	0	0	0	0	0	0	0
1978	136	54	93	0	0	0	0	0	0	0	0	0
1979	158	77	333	0	0	16	0	0	0	0	0	0
1980	20	18	164	0	0	0	22	15	57	0	0	0
1982	0	0	0	0	0	0	0	0	711	0	0	0
1983	0	0	0	0	0	0	0	0	175	0	0	0
1984	0	0	84	25	1	34	0	0	761	41	0	510
1985	0	0	6	17	0	94	0	0	781	150	1	1,844
1986	0	0	0	0	0	55	0	0	1,193	0	0	813
1987	0	0	43	0	0	25	0	0	900	0	0	203
1988	0	0	28	0	0	61	0	0	243	0	0	84
1989	0	0	4	0	0	76	0	0	217	0	0	31
1990	0	0	29	0	0	237	0	0	666	0	0	263
1991	9	0	77	21	3	430	1	0	1,164	46	17	653
1992	28	0	46	1	0	737	0	0	1,120	14	1	782
1993	2	1	130	0	0	165	27	2	486	0	0	544
1994	15	4	378	1	0	243	15	0	1,971	0	0	253
1995	27	0	355	0	0	162	0	13	1,807	0	0	159

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_M	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
1996	0	0	637	0	0	45	0	0	1,000	0	0	44
1997	12	0	263	0	0	123	9	0	1,690	0	0	20
1998	0	0	261	0	0	32	0	26	4,031	0	0	0
1999	0	0	191	0	0	55	0	0	4,942	0	0	171
2000	17	0	98	0	0	2	0	0	10,172	0	0	311
2001	0	0	77	0	0	12	0	27	4,144	0	0	24
2002	11	2	36	0	0	29	0	0	2,352	0	0	7
2003	0	0	52	0	0	24	0	43	3,650	0	0	15
2004	0	0	54	0	0	2	0	0	2,598	0	0	61
2005	7	0	48	0	0	84	0	0	2,137	0	0	60
2006	0	0	48	0	0	52	0	0	504	0	0	115
2007	3	0	16	0	0	107	4	0	1,468	0	0	273
2008	4	0	93	0	0	188	5	0	855	0	0	483
2009	3	0	22	0	0	317	1	0	1,509	0	0	570
2010	0	0	31	9	0	415	0	0	604	0	0	480
2011	1	0	46	0	0	319	1	0	735	0	0	569
2012	5	0	173	0	0	589	6	1	1,175	0	0	778
2013	3	0	49	3	0	572	0	0	1,196	0	0	1,036
2014	5	0	89	2	0	690	0	0	1,322	1	0	589

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_M	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
2015	7	0	75	3	0	463	0	0	1,471	0	0	682
2016	3	0	36	0	0	523	0	0	1,362	4	0	683
2017	0	0	38	1	0	417	0	0	1,079	5	1	899
2018	3	0	33	0	0	298	1	0	1,393	4	0	894
2019	5	0	65	9	0	261	2	1	1,465	11	1	1,320
2020	1	0	27	3	1	67	2	2	444	0	0	472
2021	0	0	32	5	0	49	0	0	225	0	0	446

Table 4: Annual number of Yellowedge Grouper commercial vertical line (VL) and longline trips sampled for lengths by stock (W,E) and sex (F,M,U).

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_M	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
1977	0	0	1	0	0	0	0	0	0	0	0	0
1978	29	19	15	0	0	0	0	0	0	0	0	0
1979	26	21	21	0	0	1	0	0	0	0	0	0
1980	3	2	3	0	0	0	2	2	2	0	0	0
1982	0	0	0	0	0	0	0	0	32	0	0	0
1983	0	0	0	0	0	0	0	0	7	0	0	0
1984	0	0	5	6	1	9	0	0	20	7	0	18
1985	0	0	2	4	0	24	0	0	13	17	1	58
1986	0	0	0	0	0	9	0	0	29	0	0	47
1987	0	0	9	0	0	8	0	0	23	0	0	9
1988	0	0	2	0	0	11	0	0	9	0	0	10
1989	0	0	2	0	0	14	0	0	5	0	0	5
1990	0	0	5	0	0	56	0	0	21	0	0	11
1991	3	0	10	12	3	82	1	0	23	7	5	33
1992	3	0	10	1	0	114	0	0	26	1	1	32
1993	1	1	19	0	0	45	2	1	28	0	0	18
1994	3	2	39	1	0	35	1	0	51	0	0	7
1995	1	0	46	0	0	14	0	1	42	0	0	3

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_M	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
1996	0	0	58	0	0	2	0	0	21	0	0	2
1997	2	0	48	0	0	25	1	0	43	0	0	1
1998	0	0	40	0	0	10	0	2	78	0	0	0
1999	0	0	39	0	0	5	0	0	83	0	0	4
2000	1	0	14	0	0	1	0	0	116	0	0	7
2001	0	0	19	0	0	5	0	1	94	0	0	1
2002	1	1	11	0	0	10	0	0	67	0	0	3
2003	0	0	21	0	0	8	0	3	107	0	0	2
2004	0	0	11	0	0	1	0	0	78	0	0	6
2005	1	0	5	0	0	19	0	0	68	0	0	4
2006	0	0	7	0	0	11	0	0	53	0	0	6
2007	1	0	6	0	0	13	2	0	73	0	0	10
2008	3	0	7	0	0	17	1	0	65	0	0	17
2009	1	0	8	0	0	22	1	0	80	0	0	23
2010	0	0	7	3	0	46	0	0	32	0	0	18
2011	1	0	8	0	0	48	1	0	54	0	0	26
2012	2	0	32	0	0	94	2	1	68	0	0	29
2013	3	0	17	2	0	78	0	0	70	0	0	40
2014	4	0	21	1	0	69	0	0	67	1	0	23

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_M	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
2015	5	0	18	2	0	63	0	0	64	0	0	26
2016	1	0	11	0	0	77	0	0	53	2	0	32
2017	0	0	14	1	0	62	0	0	60	2	1	46
2018	3	0	12	0	0	62	1	0	73	1	0	41
2019	2	0	22	6	0	55	2	1	83	4	1	55
2020	1	0	10	2	1	21	2	1	19	0	0	20
2021	0	0	6	2	0	14	0	0	16	0	0	19

Table 5:1 Annual number of commercial vertical line (VL), and longline (LL) age samples by stock (W,E), and sex (F,M,U).

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
1977	1	3	0	0	0	0	0	0	0	0	0
1978	96	18	2	0	0	0	0	0	0	0	0
1979	119	44	20	0	2	1	1	0	0	0	0
1980	35	26	1	0	0	14	5	1	0	0	0
1982	0	0	0	0	0	0	0	682	0	0	0
1983	0	0	0	0	0	0	0	170	0	0	0
1984	0	0	0	0	0	0	0	2	0	0	0
1991	0	0	0	0	206	0	0	0	0	0	12
1992	0	0	0	0	31	0	0	0	0	0	27
1993	0	0	0	0	6	0	0	0	0	0	3
1994	0	0	0	0	2	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	5	0	0	0
1999	0	0	0	0	0	0	0	55	0	0	0
2000	0	0	12	0	0	0	0	85	0	0	5
2001	4	1	31	0	16	0	0	350	0	0	0
2002	0	0	20	0	19	0	0	150	0	0	2
2003	0	0	37	0	10	142	45	506	0	0	11
2004	3	0	19	0	19	77	24	349	0	0	41

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
2005	0	0	7	0	71	51	21	459	0	0	49
2006	0	0	8	0	45	0	0	277	0	0	99
2007	2	0	19	0	95	23	9	452	0	0	230
2008	3	0	47	0	194	183	48	366	0	0	411
2009	0	0	6	0	275	14	2	519	0	0	475
2010	0	0	18	0	377	0	0	554	0	0	440
2011	1	0	39	0	275	1	0	428	0	0	470
2012	19	0	156	0	506	21	10	480	45	7	715
2013	5	0	65	3	409	52	6	408	2	3	388
2014	4	0	73	1	233	0	0	279	0	0	255
2015	7	0	60	1	202	0	0	213	0	0	215
2016	3	0	34	0	216	0	0	217	0	0	221
2017	0	0	31	0	205	0	0	219	0	0	198
2018	3	0	28	0	216	0	0	237	0	0	184
2019	5	0	62	0	216	0	1	206	2	0	207
2020	1	0	23	0	45	2	1	169	0	0	176
2021	0	0	30	2	43	0	0	122	0	0	221

Table 6: Annual number of commercial vertical line (VL), and longline (LL) trips sampled for ages by stock (W,E) and sex (F,M,U).

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
1977	1	2	0	0	0	0	0	0	0	0	0
1978	36	14	2	0	0	0	0	0	0	0	0
1979	39	20	11	0	1	1	1	0	0	0	0
1980	10	9	1	0	0	2	1	1	0	0	0
1982	0	0	0	0	0	0	0	32	0	0	0
1983	0	0	0	0	0	0	0	7	0	0	0
1984	0	0	0	0	0	0	0	1	0	0	0
1991	0	0	0	0	32	0	0	0	0	0	1
1992	0	0	0	0	17	0	0	0	0	0	3
1993	0	0	0	0	2	0	0	0	0	0	1
1994	0	0	0	0	1	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	1	0	0	0
1999	0	0	0	0	0	0	0	5	0	0	0
2000	0	0	2	0	0	0	0	8	0	0	1
2001	1	1	9	0	4	0	0	34	0	0	0
2002	0	0	7	0	7	0	0	26	0	0	1
2003	0	0	16	0	5	9	8	43	0	0	2
2004	2	0	8	0	3	2	2	35	0	0	5

Year	VL_E_F	VL_E_M	VL_E_U	VL_W_F	VL_W_U	LL_E_F	LL_E_M	LL_E_U	LL_W_F	LL_W_M	LL_W_U
2005	0	0	2	0	17	3	3	41	0	0	4
2006	0	0	2	0	10	0	0	38	0	0	6
2007	1	0	6	0	13	10	7	40	0	0	9
2008	2	0	2	0	17	54	33	48	0	0	27
2009	0	0	2	0	21	11	1	38	0	0	21
2010	0	0	2	0	44	0	0	32	0	0	18
2011	1	0	8	0	43	1	0	52	0	0	26
2012	14	0	31	0	93	11	8	67	16	7	32
2013	3	0	19	2	73	41	5	73	2	2	40
2014	3	0	19	1	58	0	0	57	0	0	24
2015	5	0	15	1	51	0	0	52	0	0	24
2016	1	0	10	0	62	0	0	53	0	0	30
2017	0	0	11	0	52	0	0	49	0	0	37
2018	3	0	9	0	54	0	0	61	0	0	32
2019	2	0	23	0	46	0	1	66	2	0	39
2020	1	0	9	0	15	2	1	18	0	0	17
2021	0	0	6	1	12	0	0	15	0	0	17

Figures

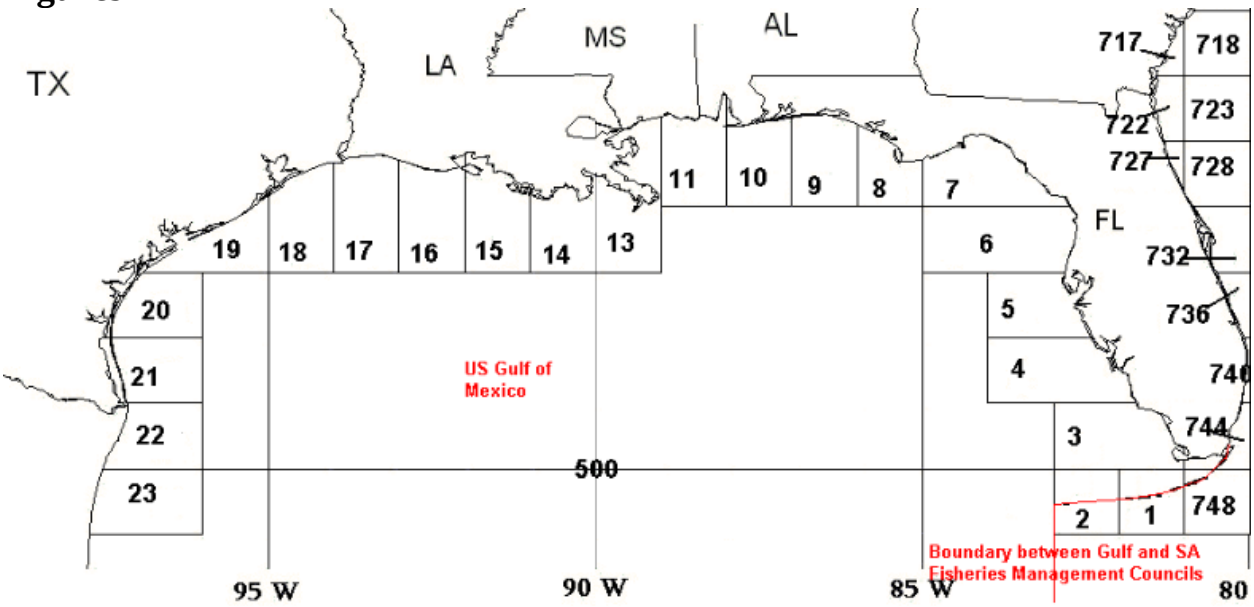

Figure 1: NMFS commercial fishing areas in the Gulf of Mexico used to define stock boundaries.

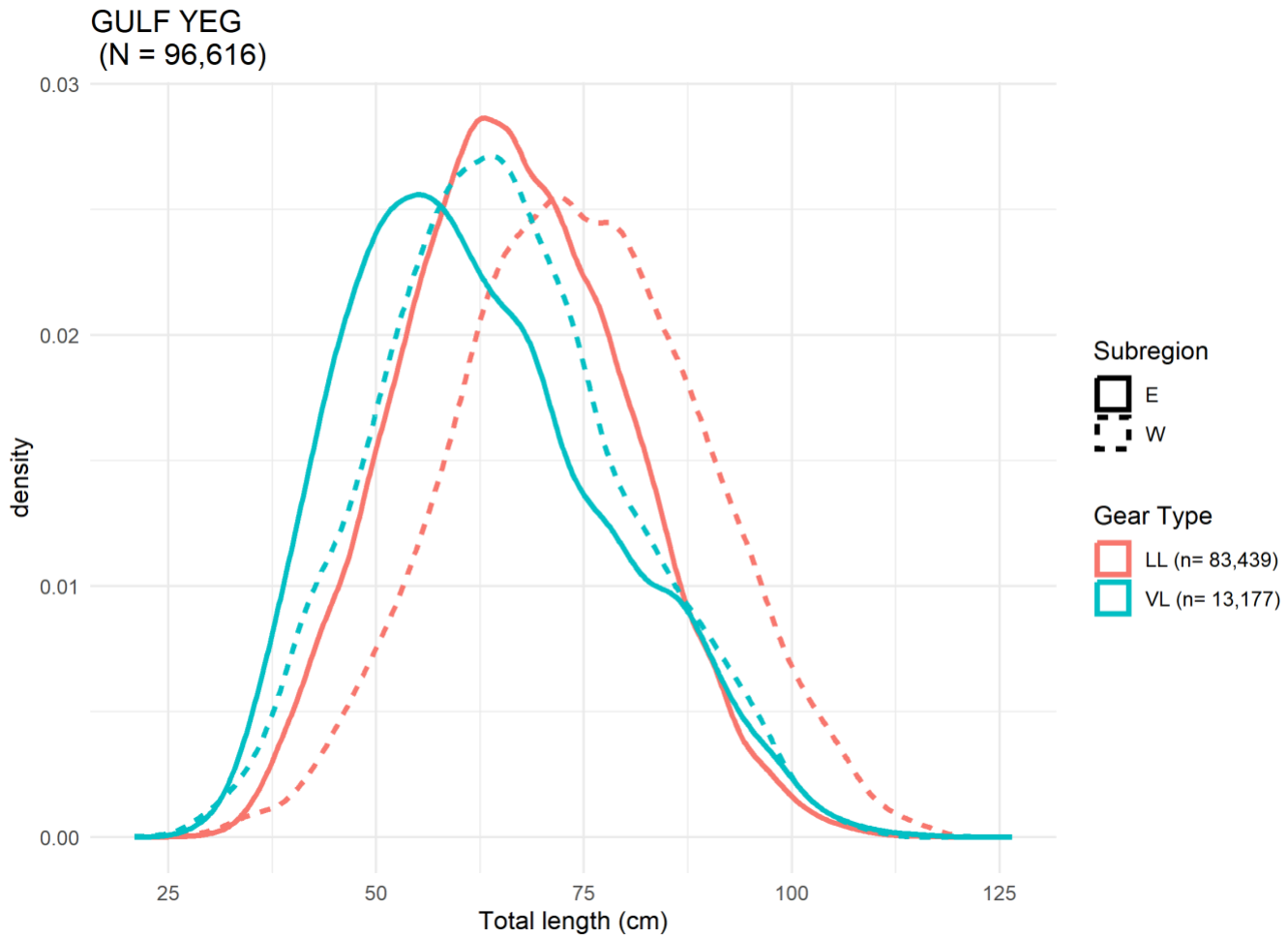

Figure 2: Annually aggregated commercial gear nominal length distributions for each subregion – East (E) and West (W) and gear type – longline (LL), and vertical line (VL).

Figure 3: Annual Yellowedge Grouper commercial gear cumulative length distributions for all sexes combined by gear - longline (LL) and vertical line (VL) and subregion – East (E) and West (W). Strata with less than 30 samples were dropped.

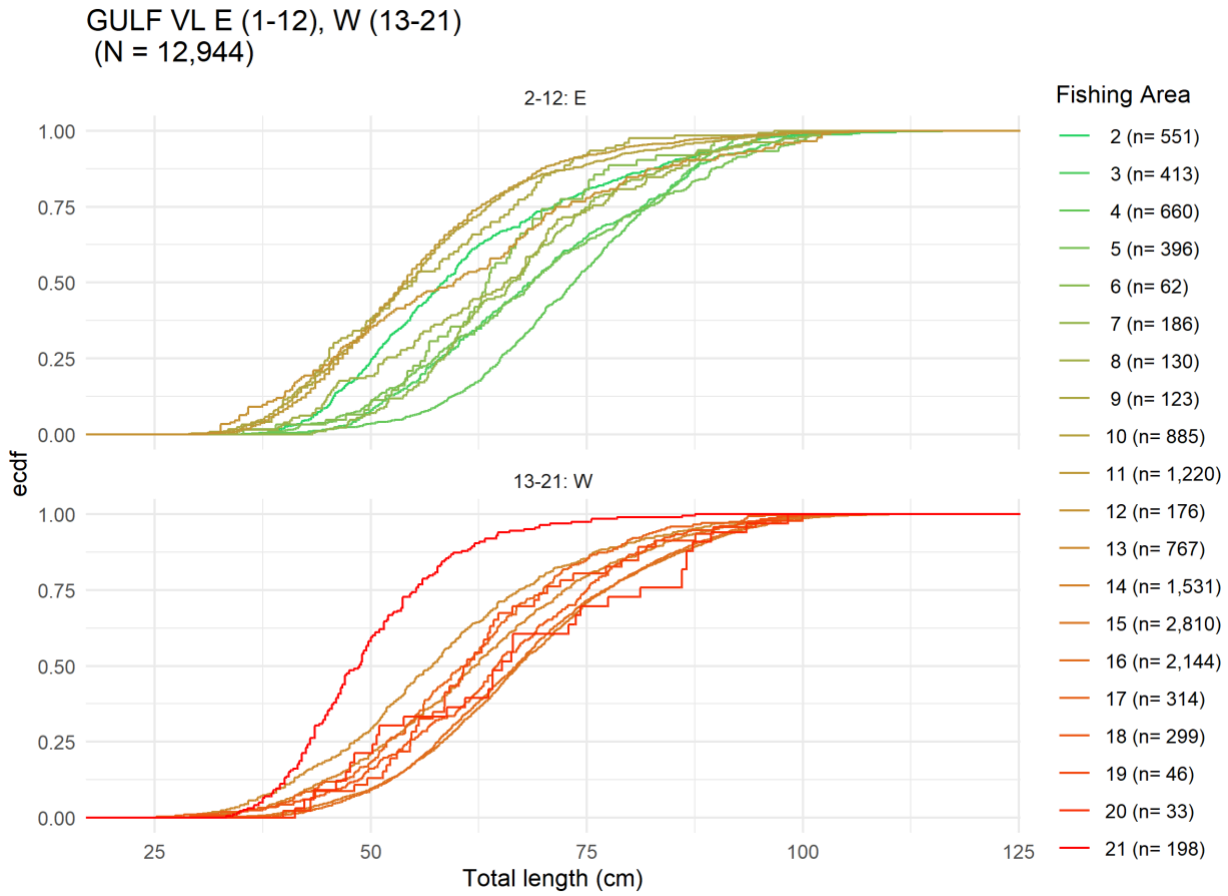

Figure 4: Temporally aggregated Yellowedge Grouper commercial VL cumulative length distributions by fishing area for all sexes combined: Eastern (E: 1-12), and Western (W: 13-21).

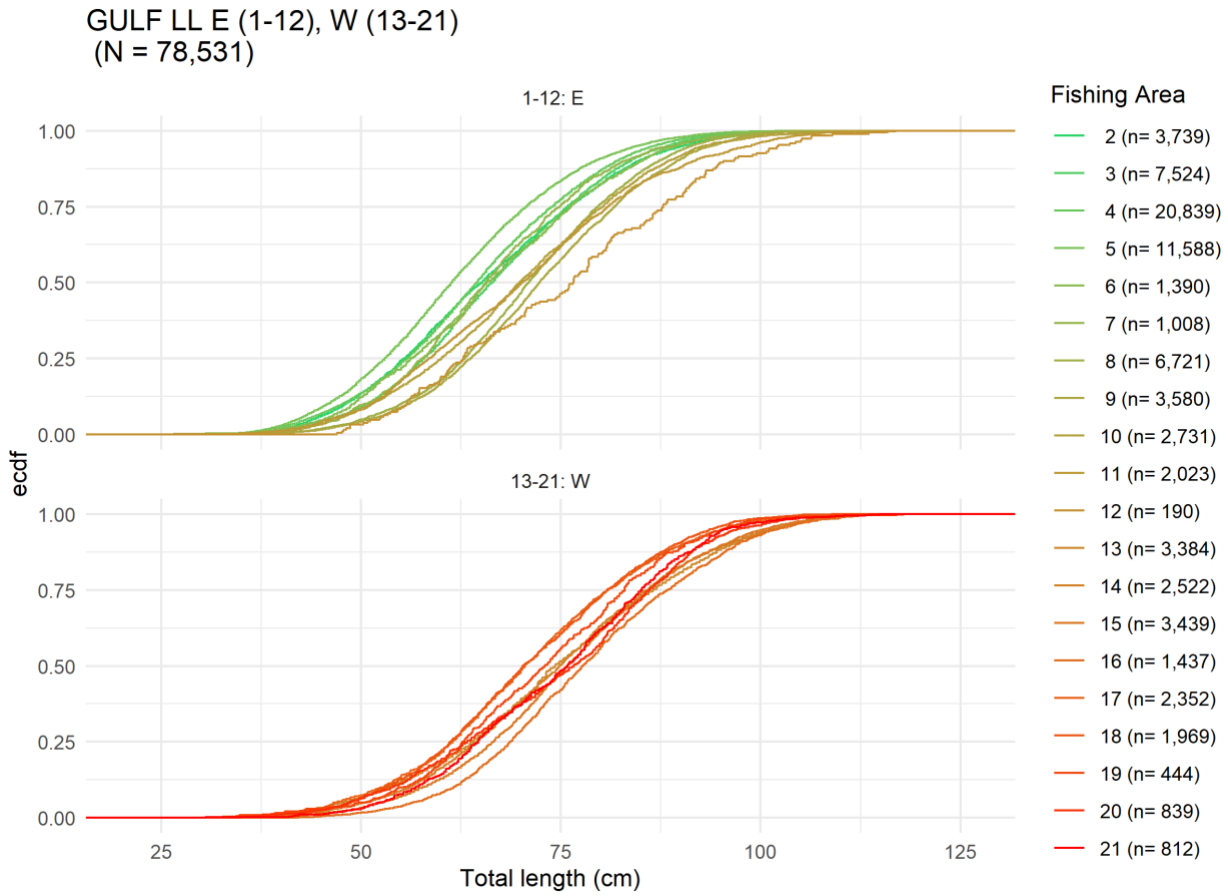

Figure 5: Temporally aggregated Yellowedge Grouper commercial LL cumulative length distributions by fishing area for all sexes combined: Eastern (E: 1-12), and Western (W: 13-21).

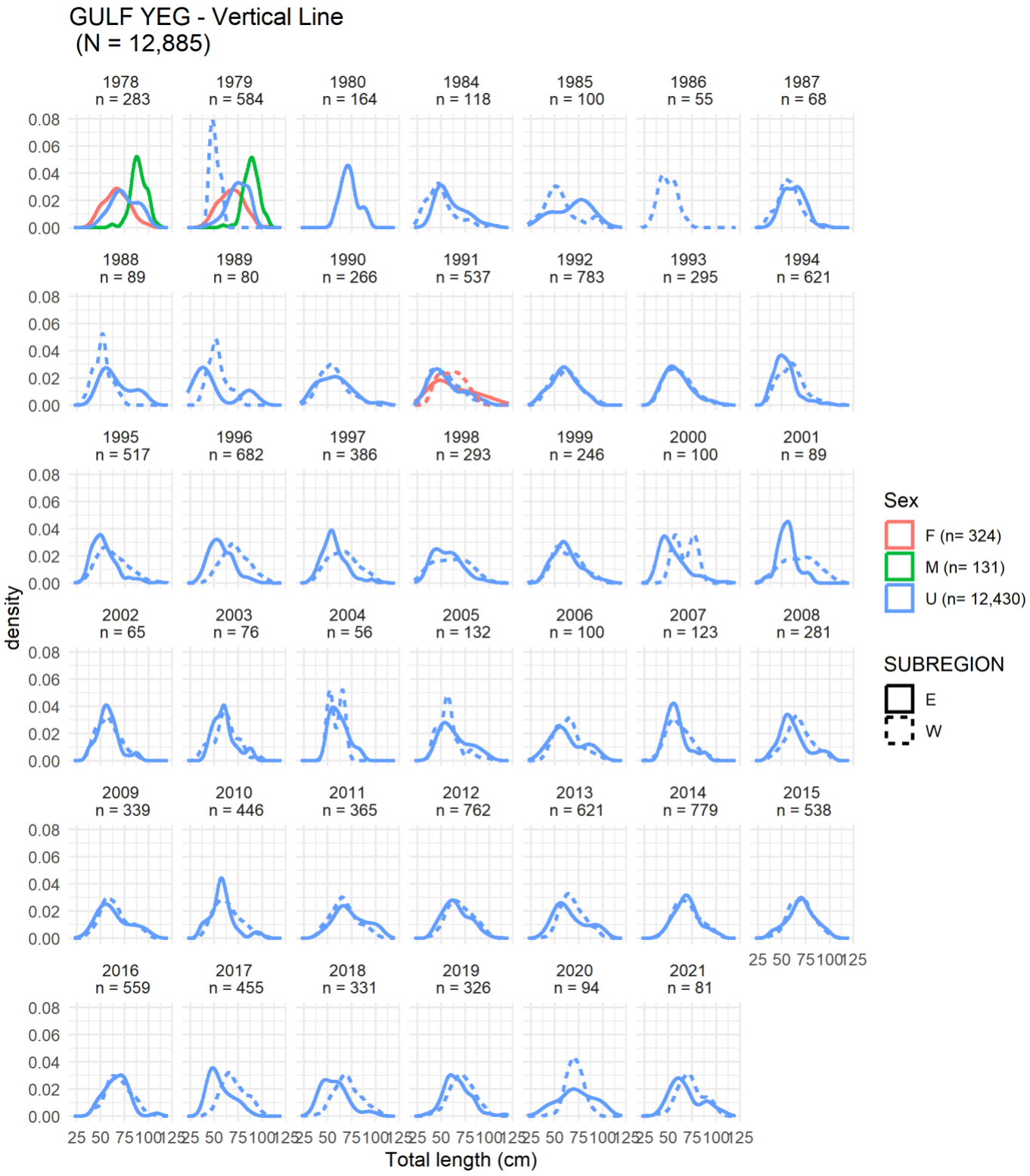

Figure 6: Annual Yellowedge Grouper commercial VL cumulative length distributions by sex – Female (F), Male (M) and Unknown (U) and subregion – East (E) and West (W).

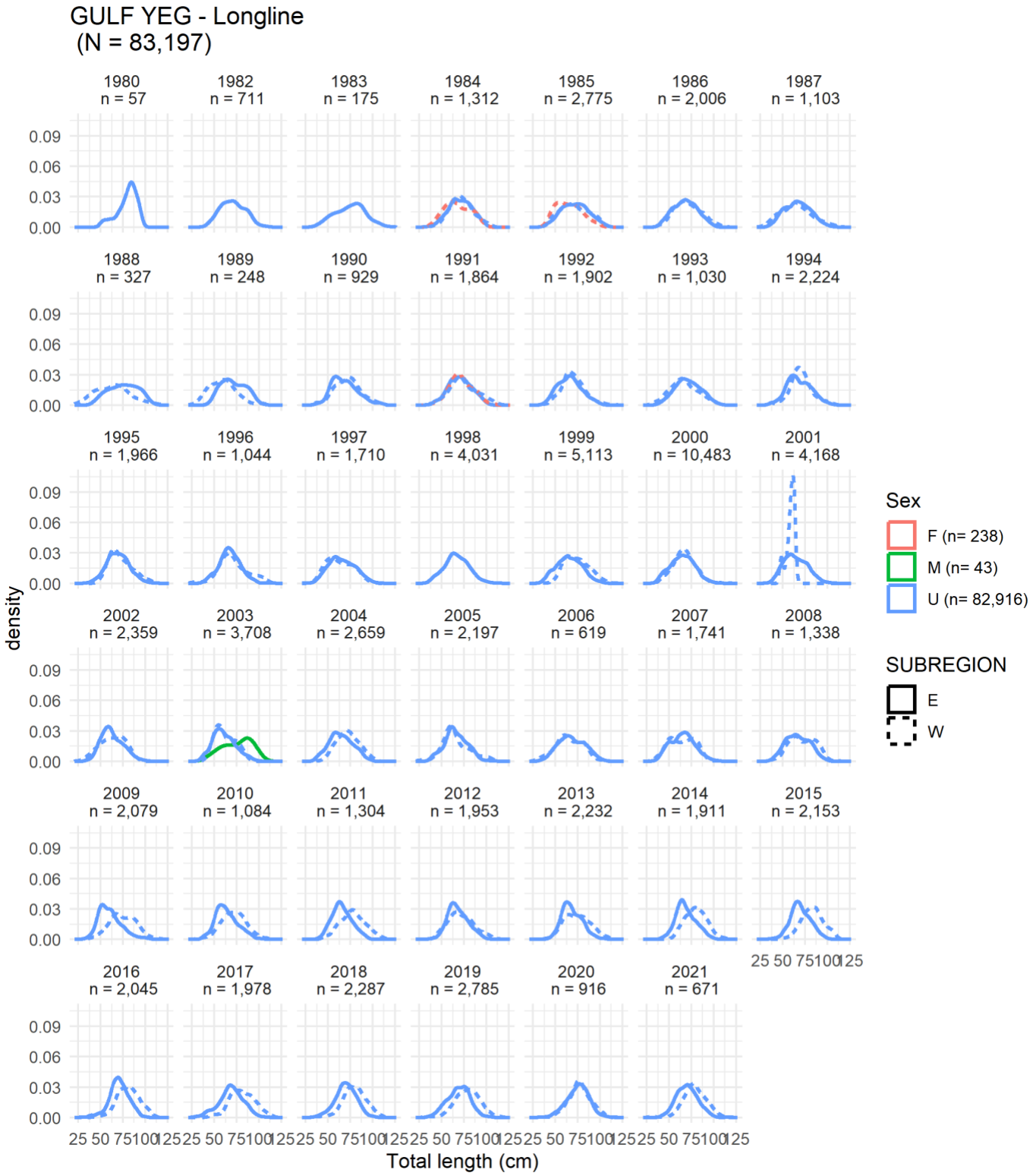

Figure 7: Annual Yellowedge Grouper commercial LL cumulative length distributions by sex – Female (F), Male (M) and Unknown (U) and subregion – East (E) and West (W).

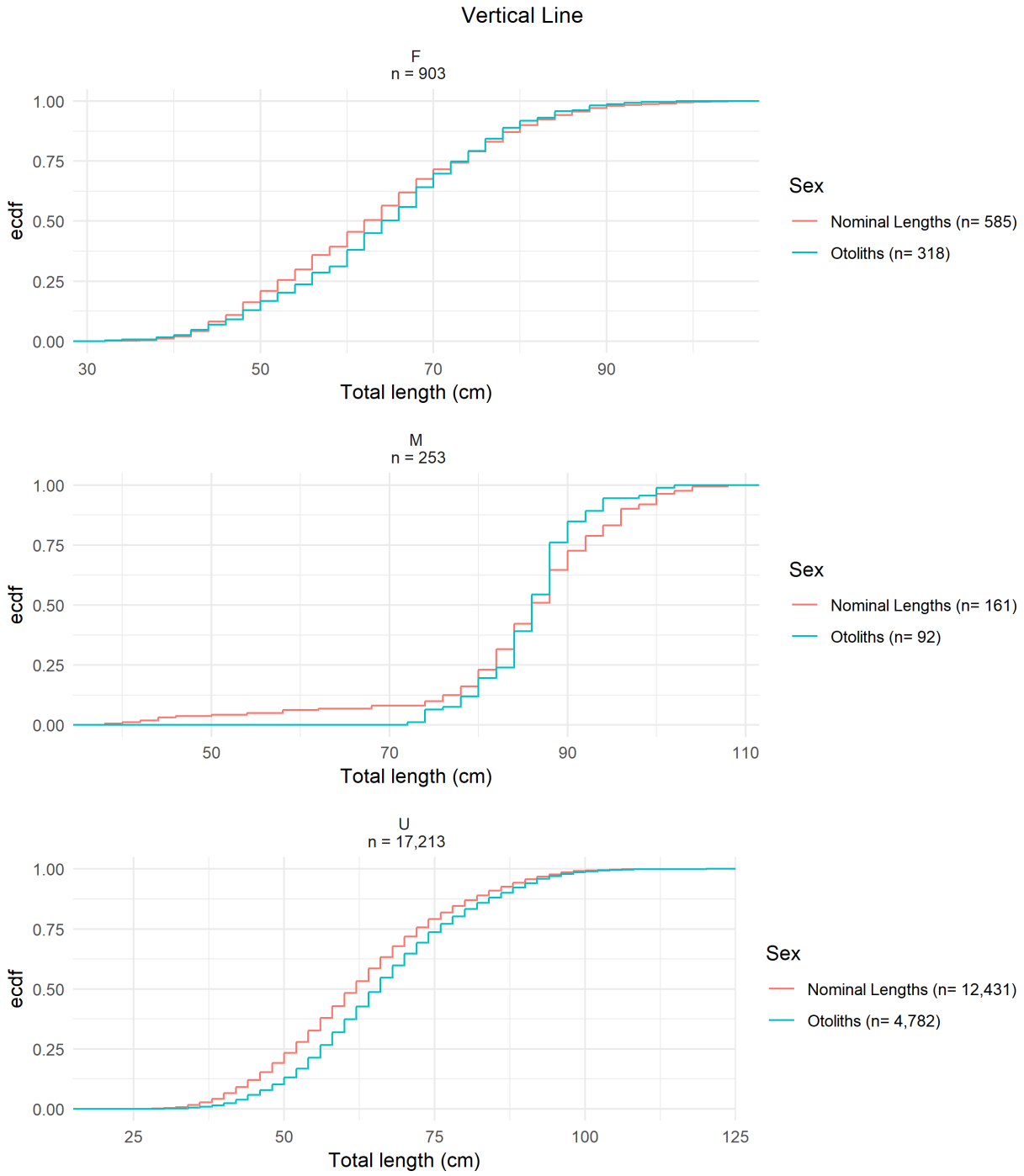

Figure 8: Yellowedge Grouper commercial VL cumulative length distribution comparison for Nominal lengths and Otolith lengths for each sex (F,M,U).

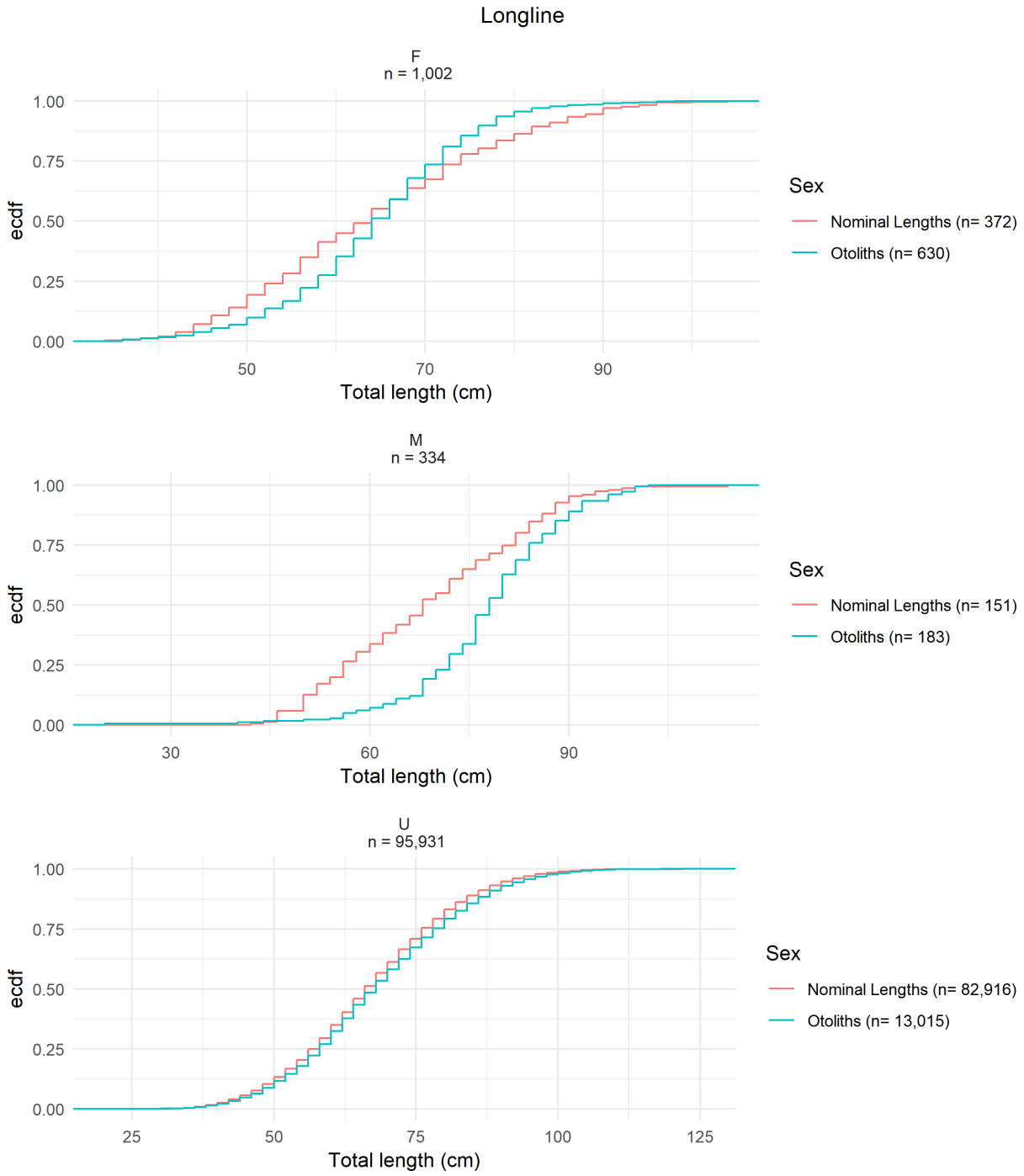

Figure 9: Yellowedge Grouper commercial LL cumulative length distribution comparison for Nominal lengths and Otolith lengths for each sex (F,M,U).

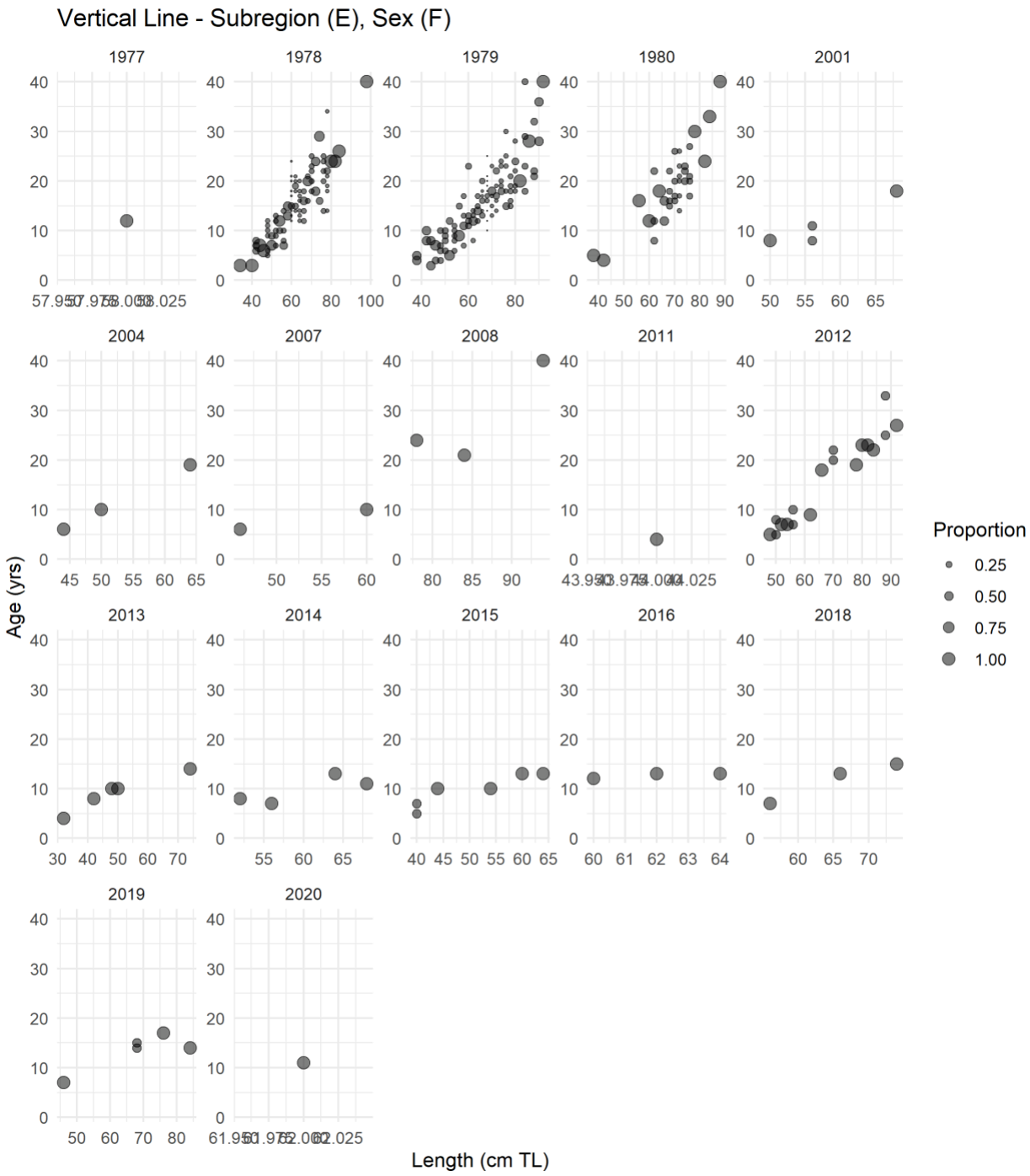

Figure 10: Annual female Yellowedge Grouper conditional age-at-length estimates from the commercial vertical line fleet in the Eastern Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

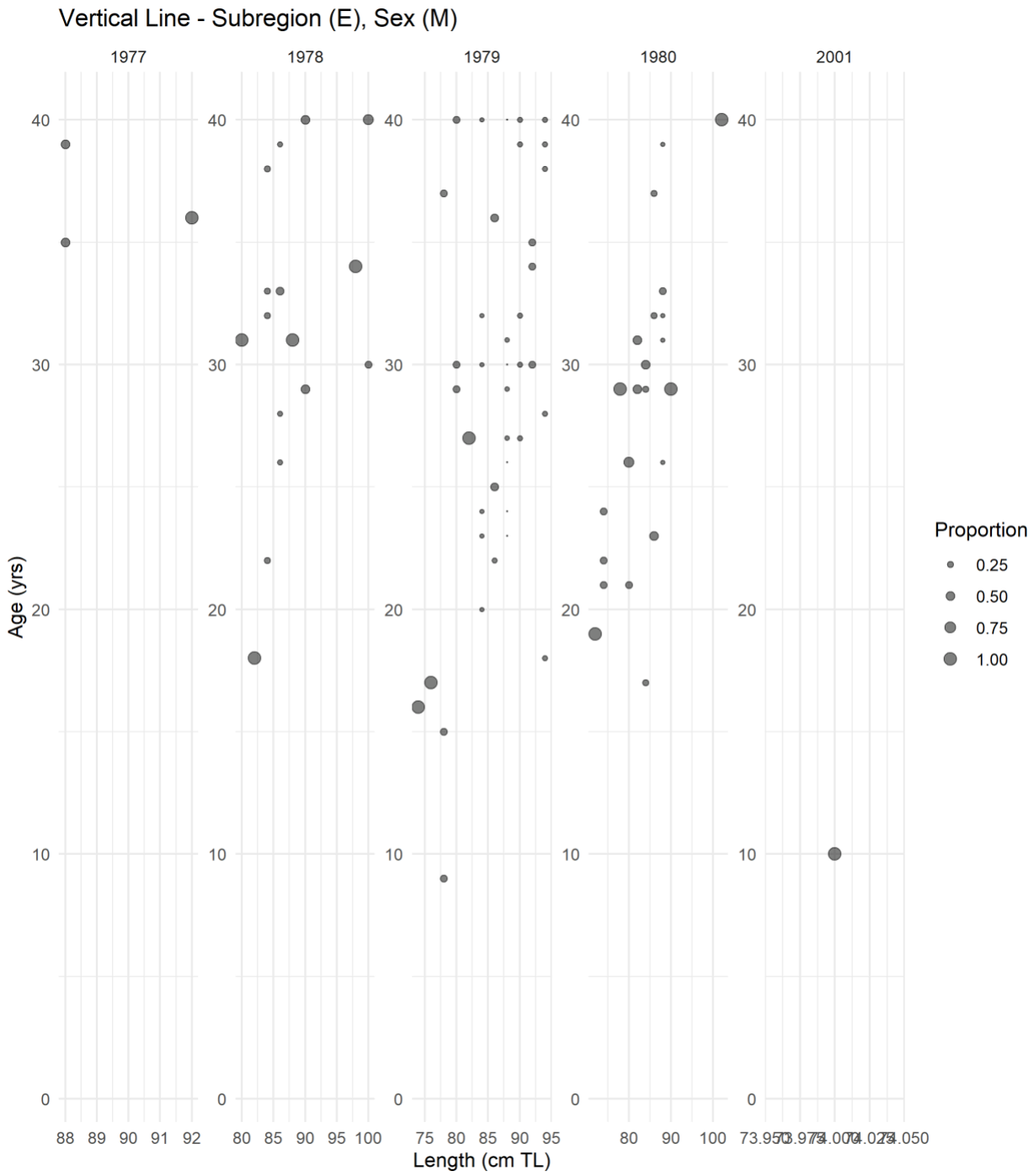

Figure 11: Annual male Yellowedge Grouper conditional age-at-length estimates from the commercial vertical line fleet in the Eastern Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

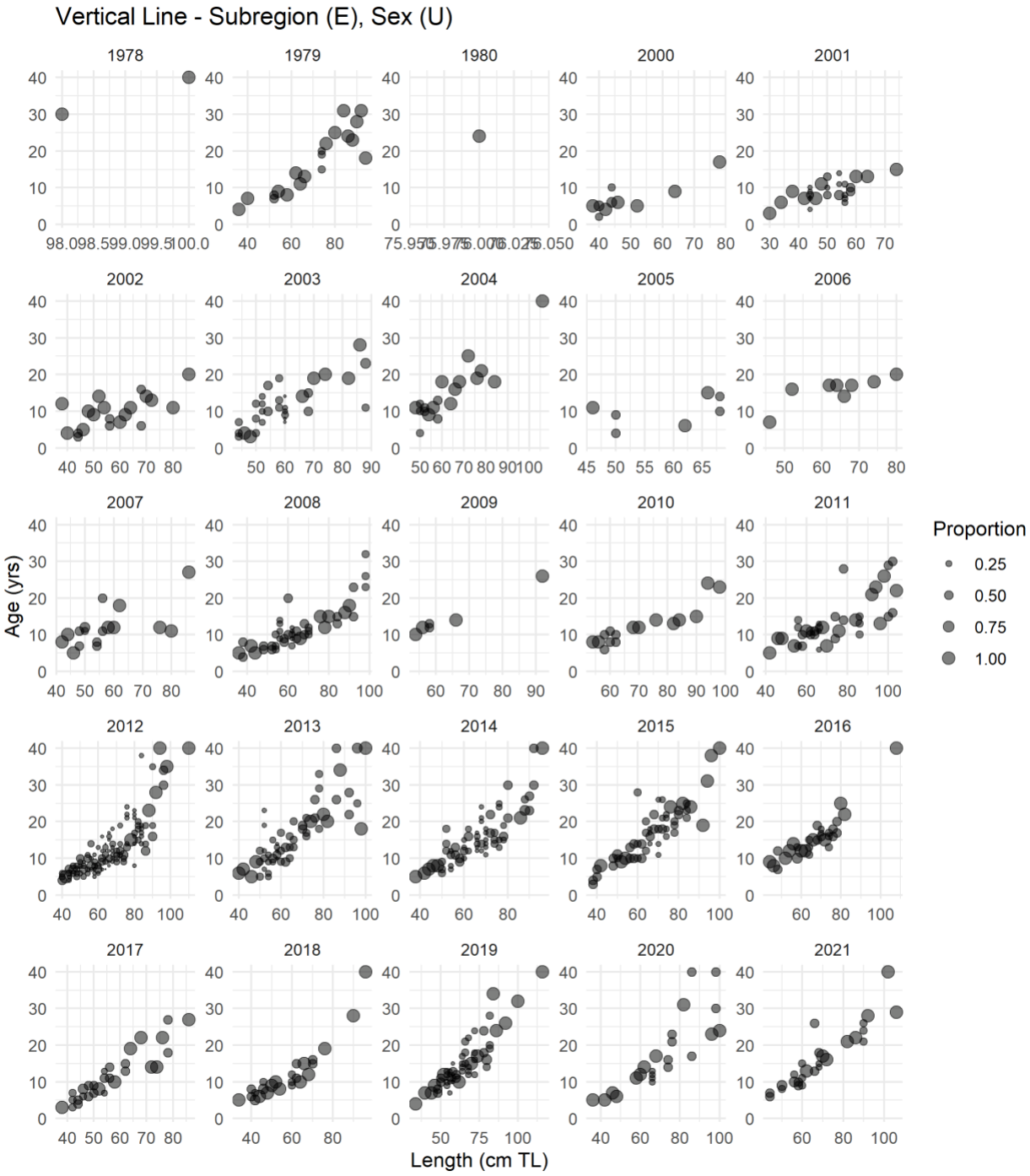

Figure 12: Annual Yellowedge Grouper conditional age-at-length estimates for fish of unknown sex from the commercial vertical line fleet in the Eastern Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

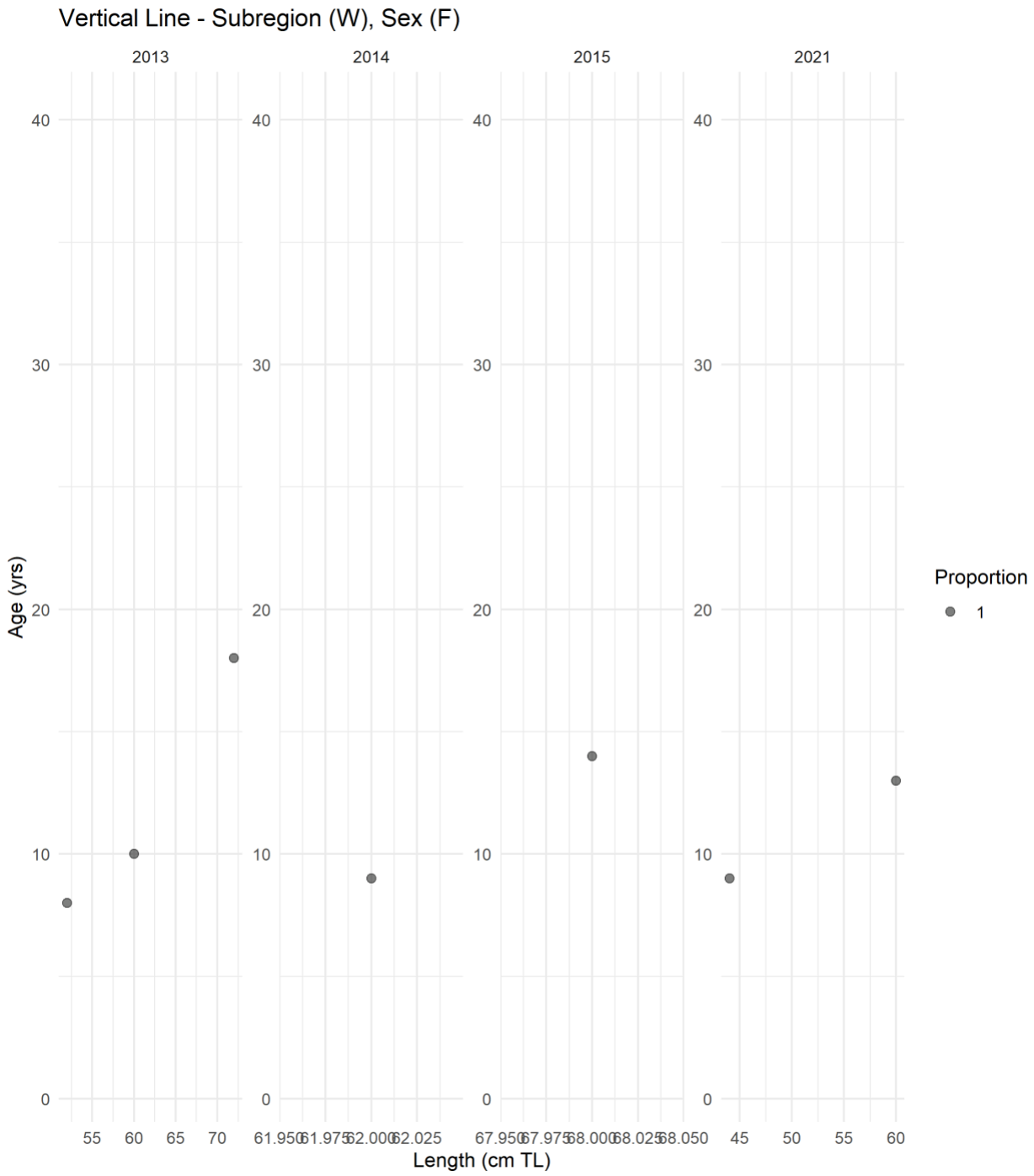

Figure 13: Annual female Yellowedge Grouper conditional age-at-length estimates from the commercial vertical line fleet in the Western Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

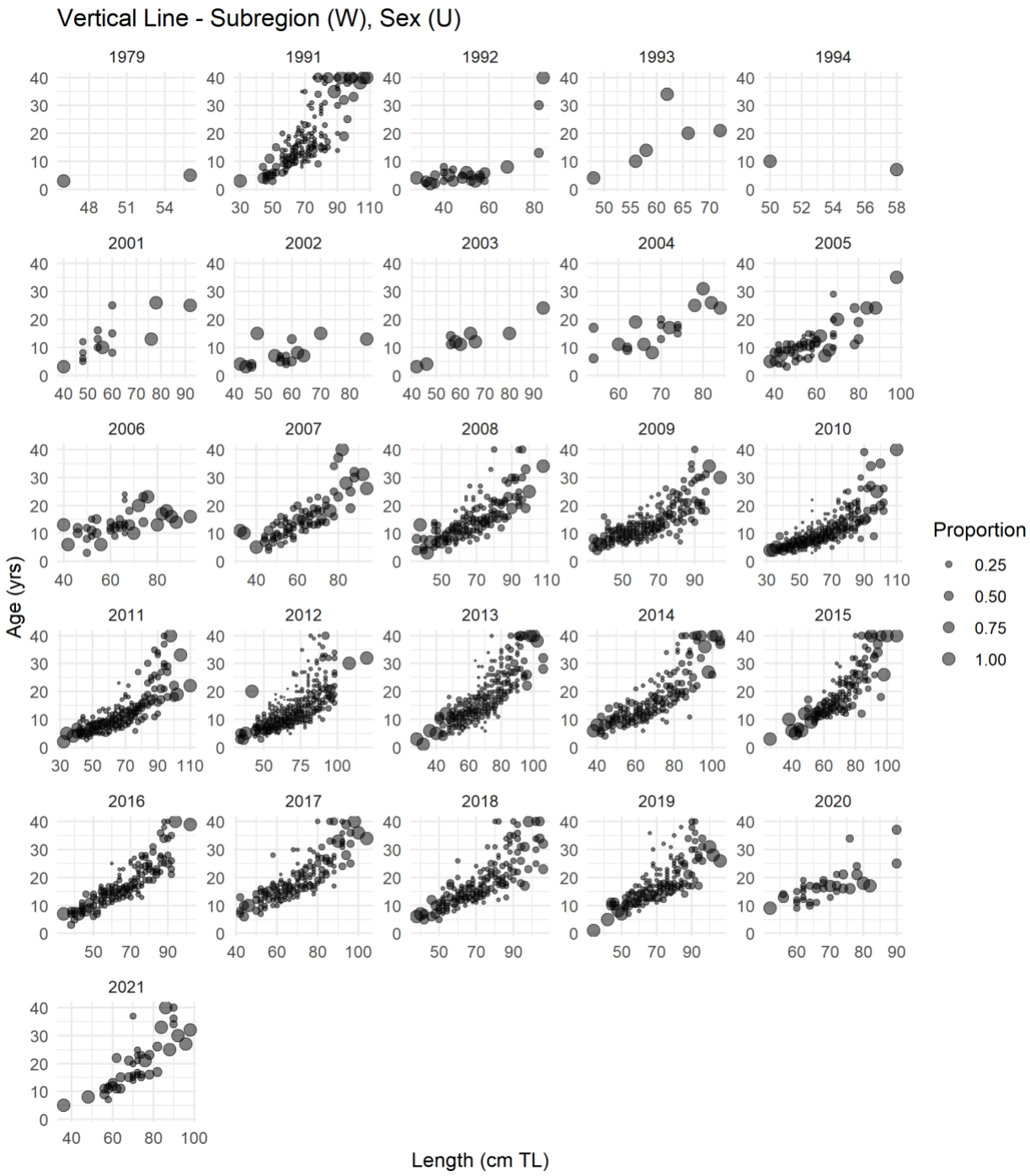

Figure 14: Annual Yellowedge Grouper conditional age-at-length estimates for fish of unknown sex from the commercial vertical line fleet in the Western Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

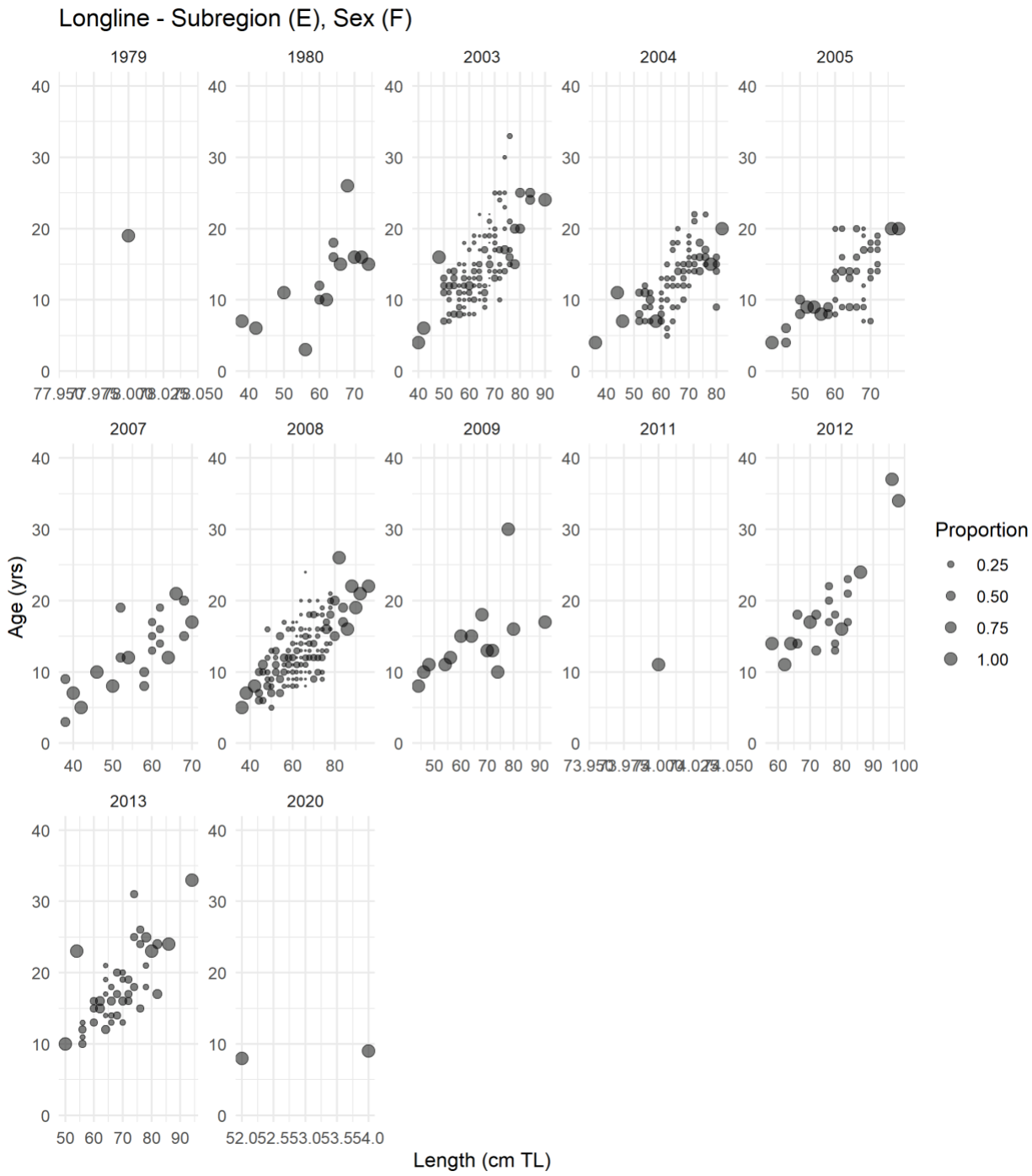

Figure 15: Annual female Yellowedge Grouper conditional age-at-length estimates from the commercial longline fleet in the Eastern Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

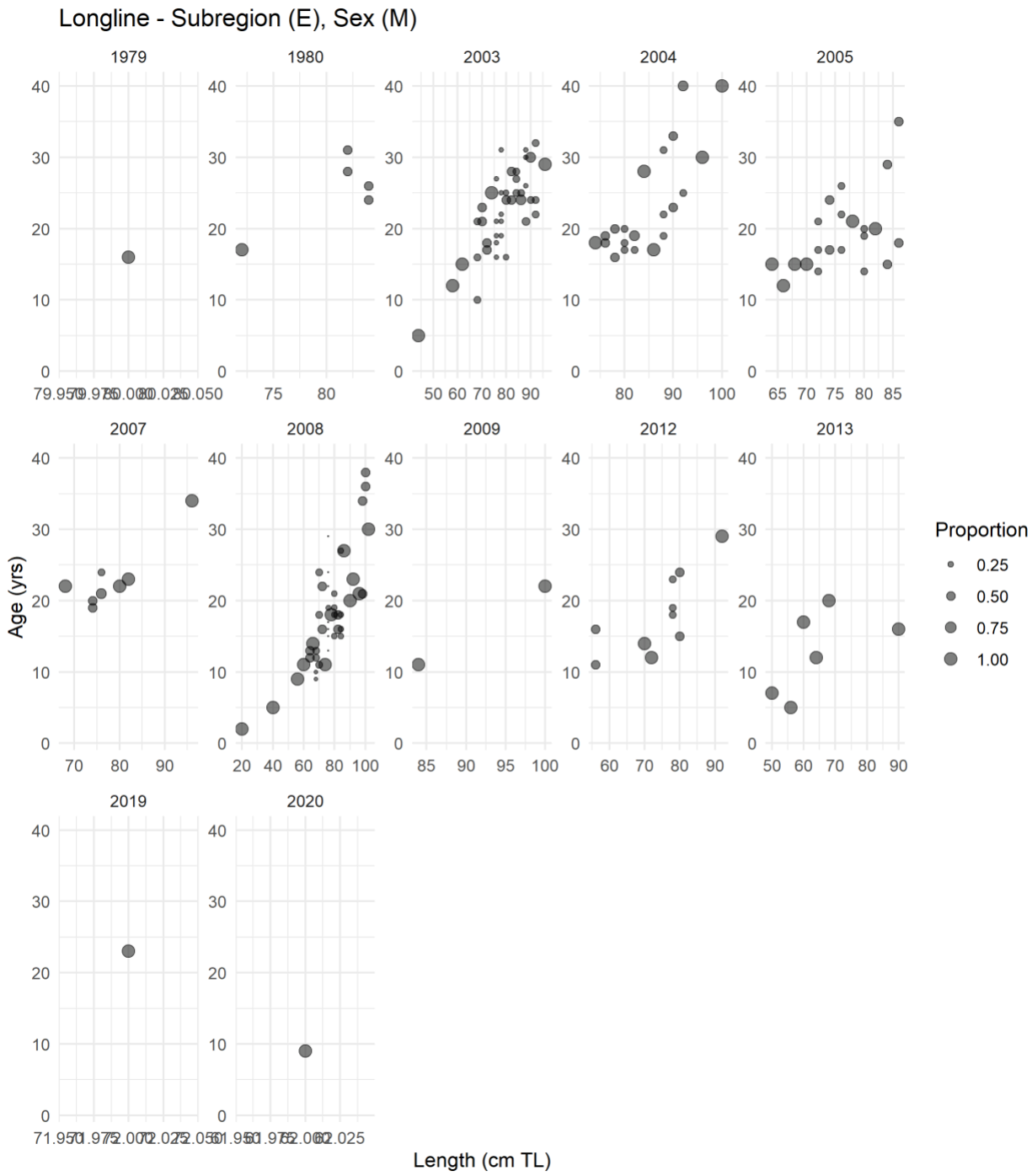

Figure 16: Annual male Yellowedge Grouper conditional age-at-length estimates from the commercial longline fleet in the Eastern Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

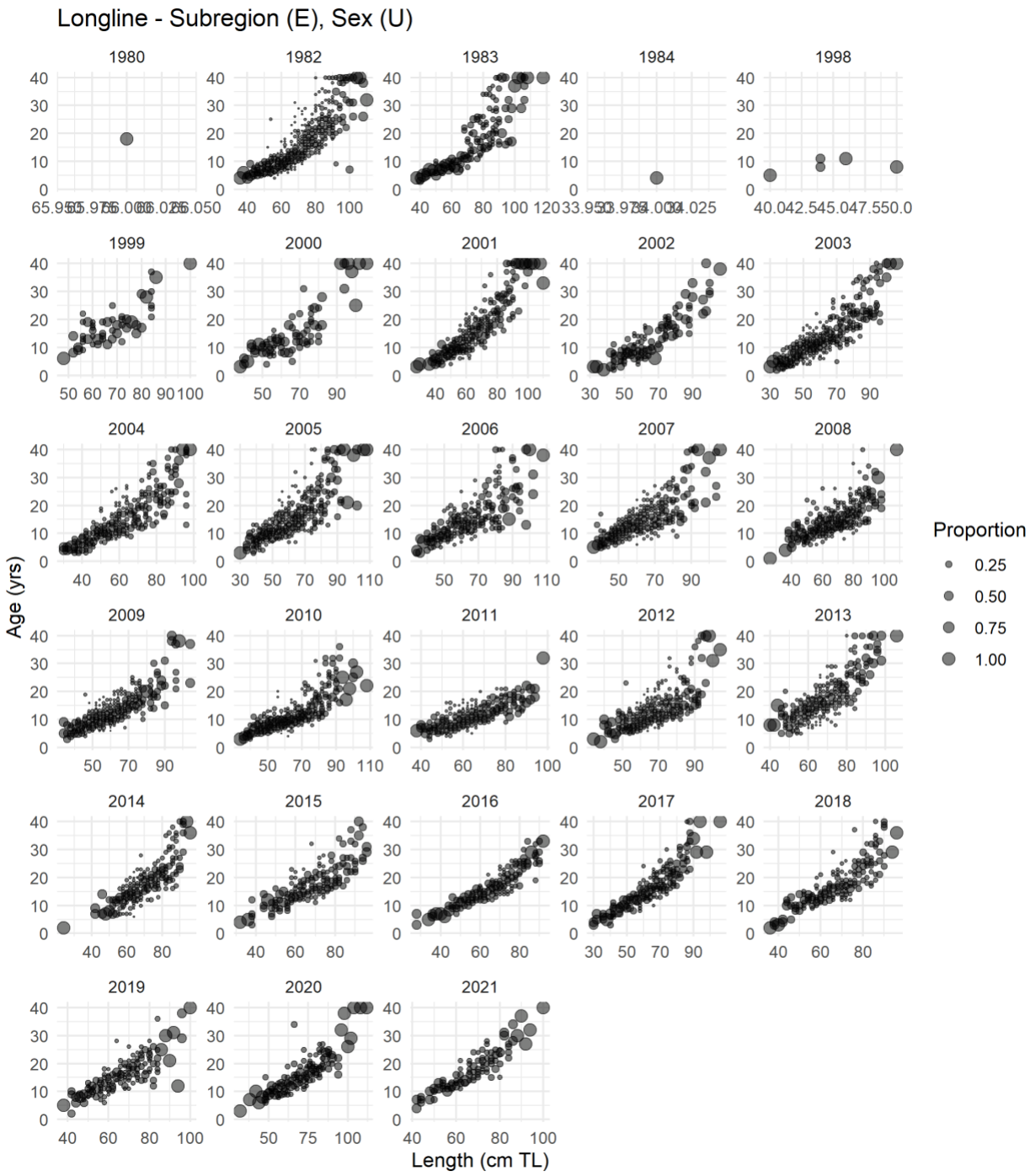

Figure 17: Annual Yellowedge Grouper conditional age-at-length estimates for fish of unknown sex from the commercial longline fleet in the Eastern Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

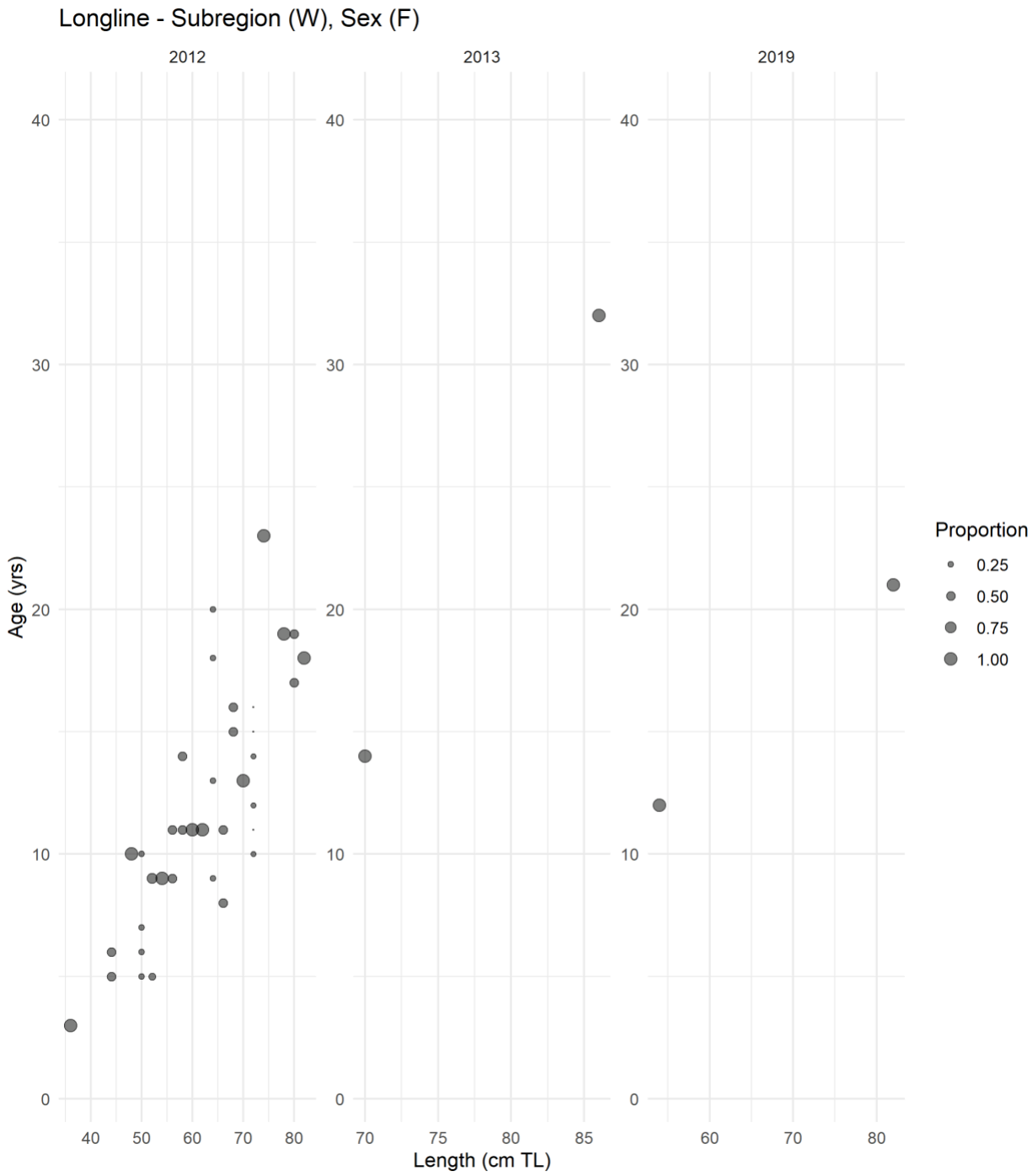

Figure 18: Annual female Yellowedge Grouper conditional age-at-length estimates from the commercial longline fleet in the Western Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

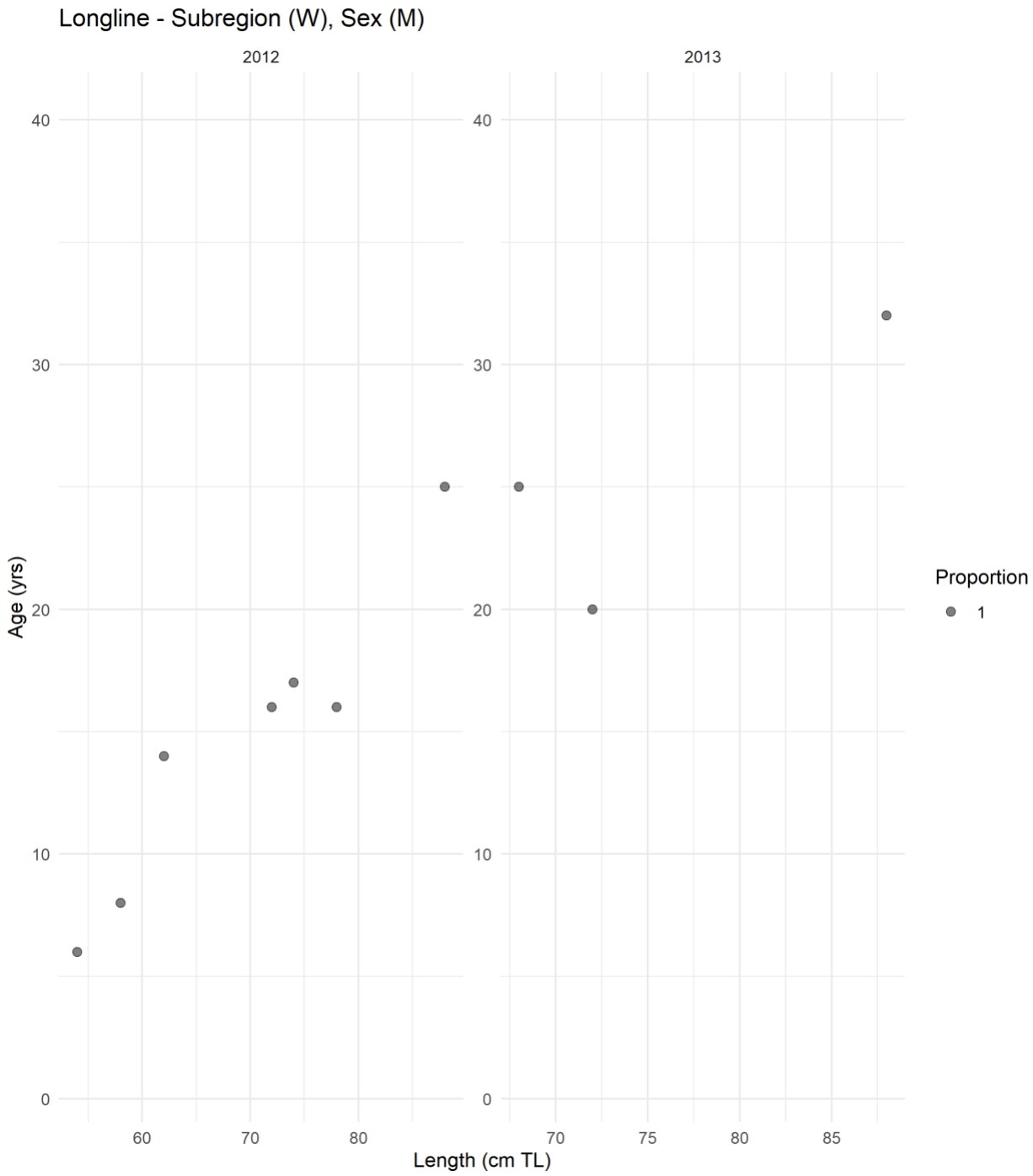

Figure 19: Annual male Yellowedge Grouper conditional age-at-length estimates from the commercial longline fleet in the Western Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

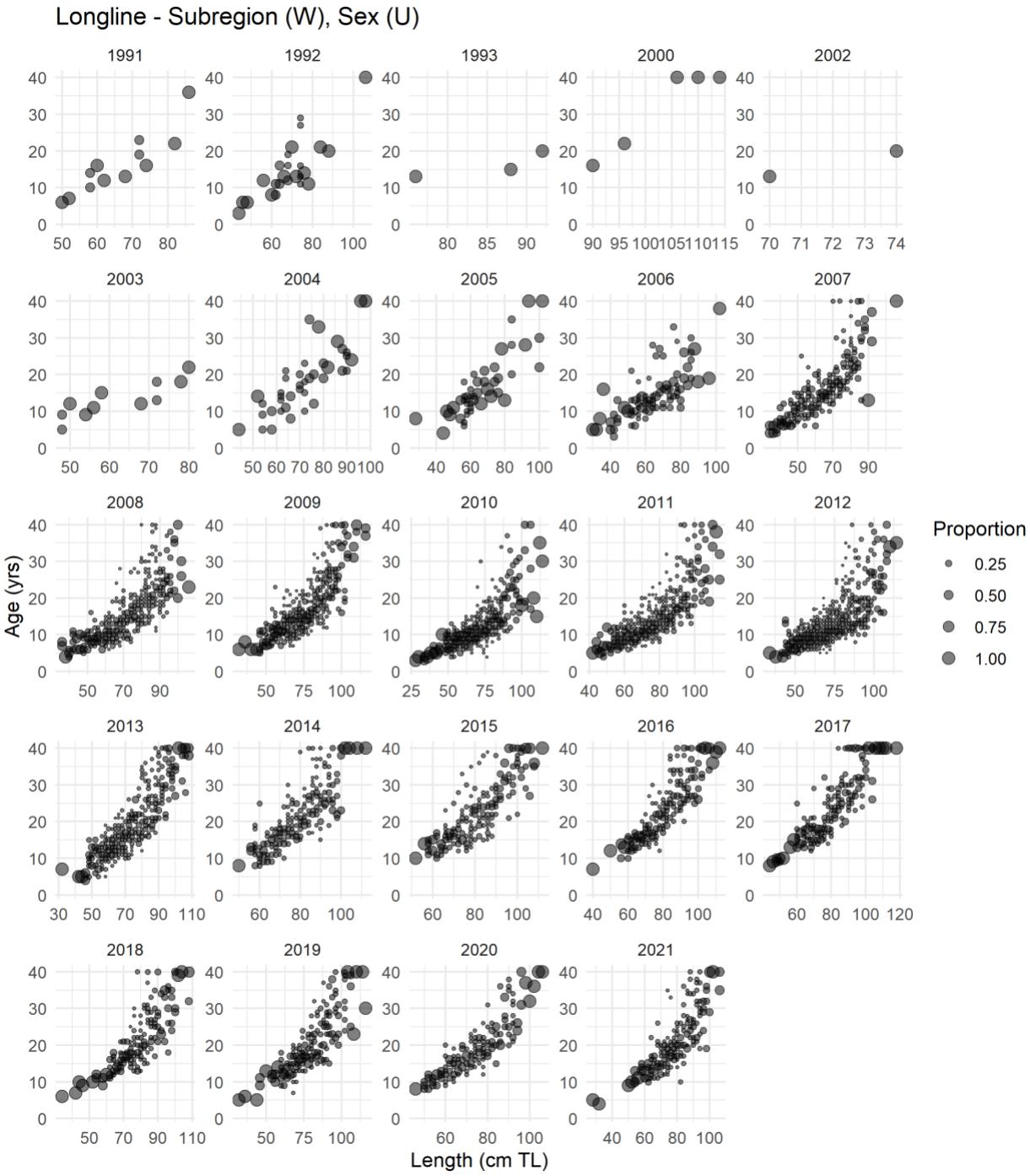

Figure 20: Annual Yellowedge Grouper conditional age-at-length estimates for fish of unknown sex from the commercial longline fleet in the Western Gulf. Each plot shows the proportion of individuals within a length bin observed at each age.

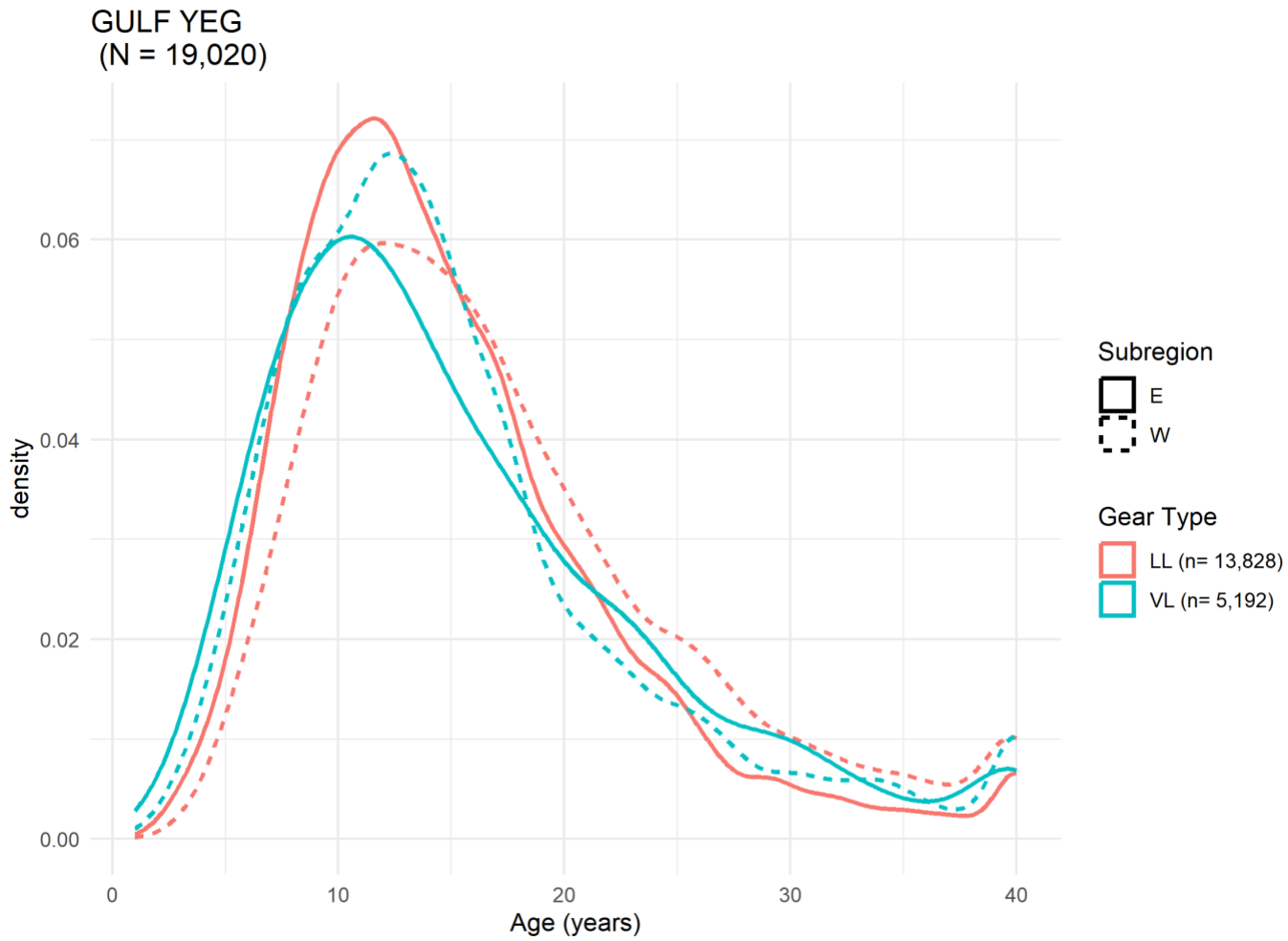

Figure 21: Annually aggregated commercial gear nominal age distributions for each subregion – East (E) and West (W) and gear type – longline (LL), and vertical line (VL).

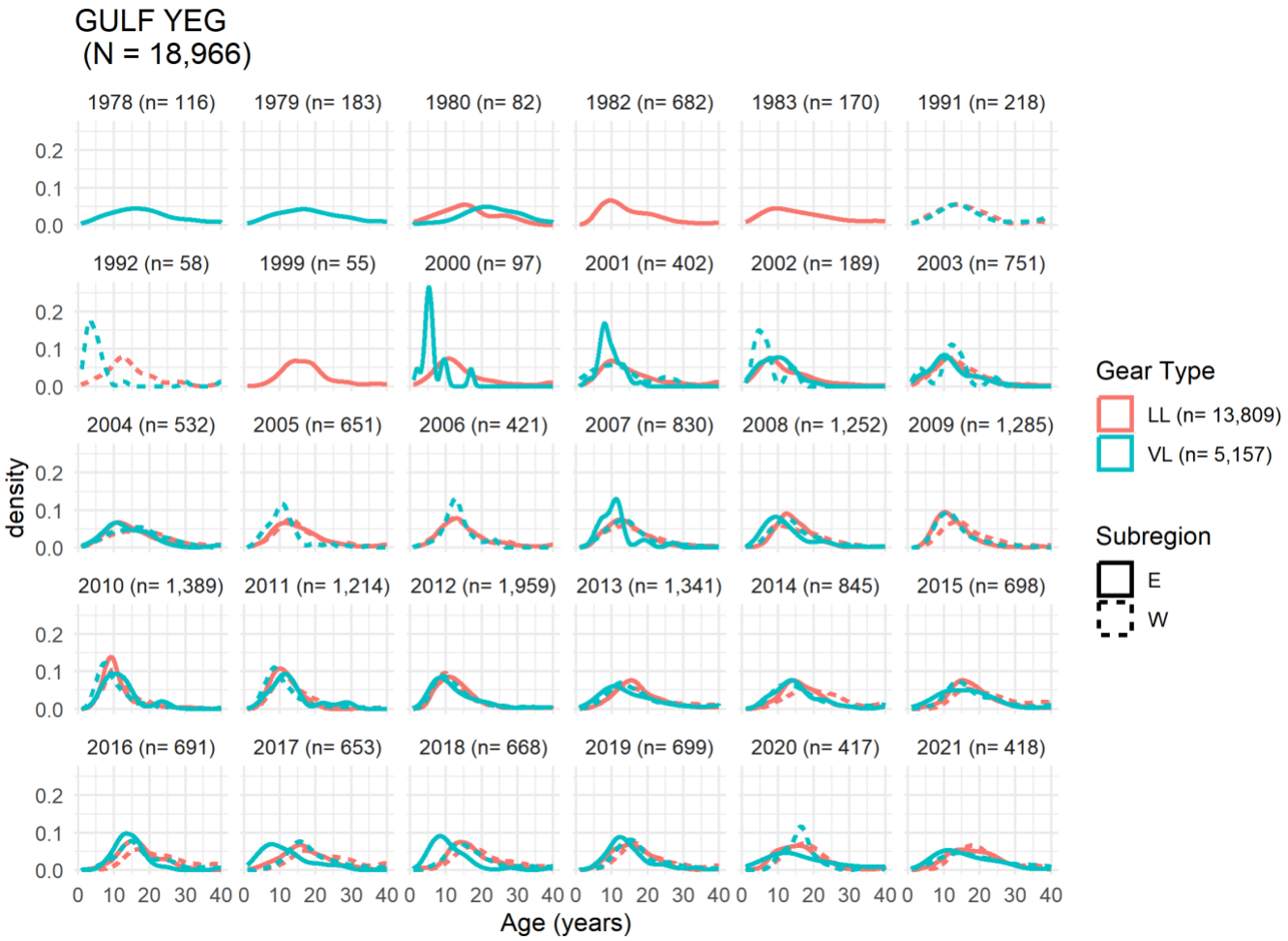

Figure 22: Annual Yellowedge Grouper commercial gear nominal age distributions for all sexes combined by gear - longline (LL) and vertical line (VL) and subregion – East (E) and West (W). Strata with less than 10 samples were dropped.

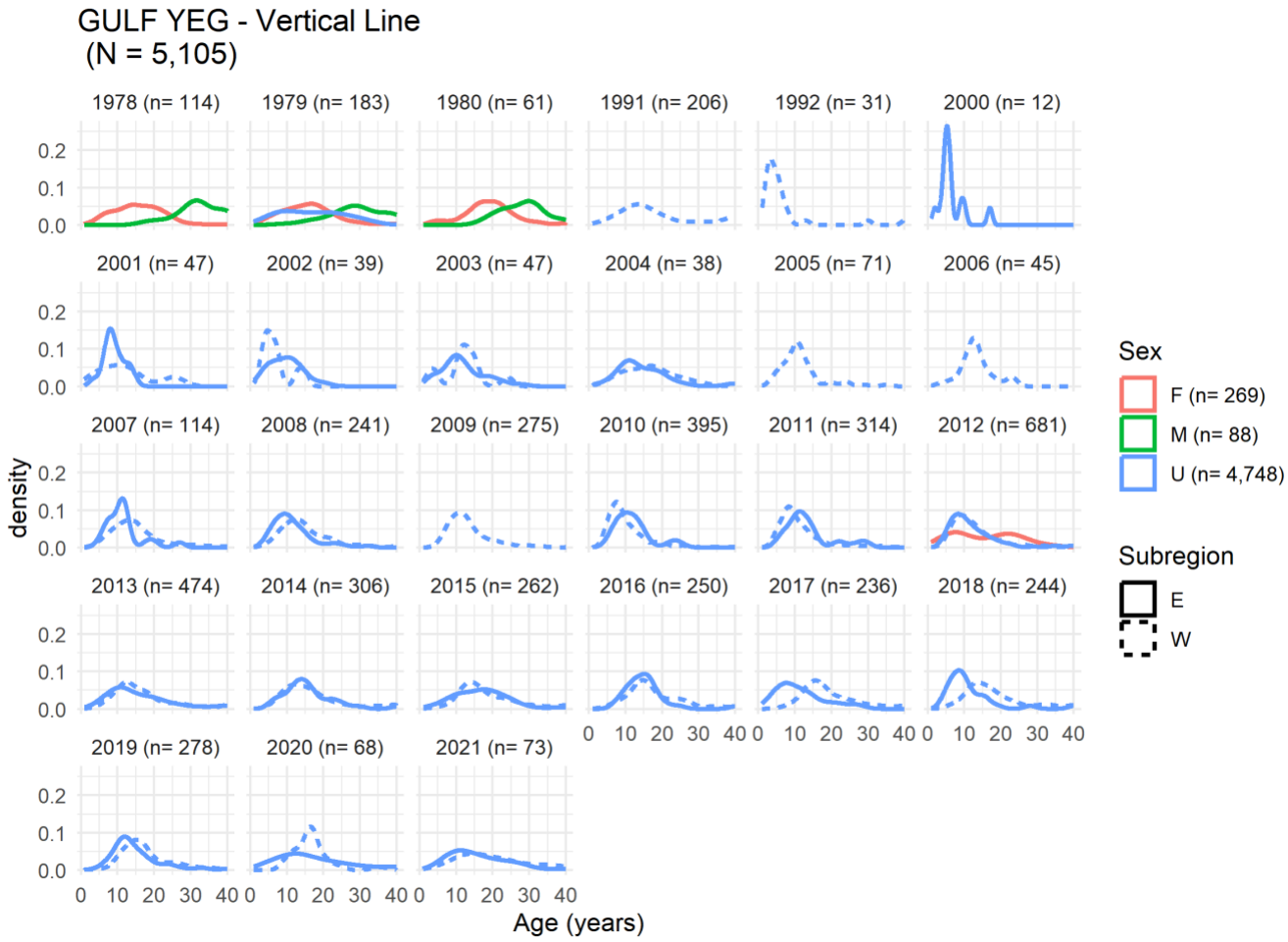

Figure 23: Annual Yellowedge Grouper commercial VL nominal age distributions by sex – Female (F), Male (M) and Unknown (U) and subregion – East (E) and West (W). Strata with less than 10 samples were dropped.

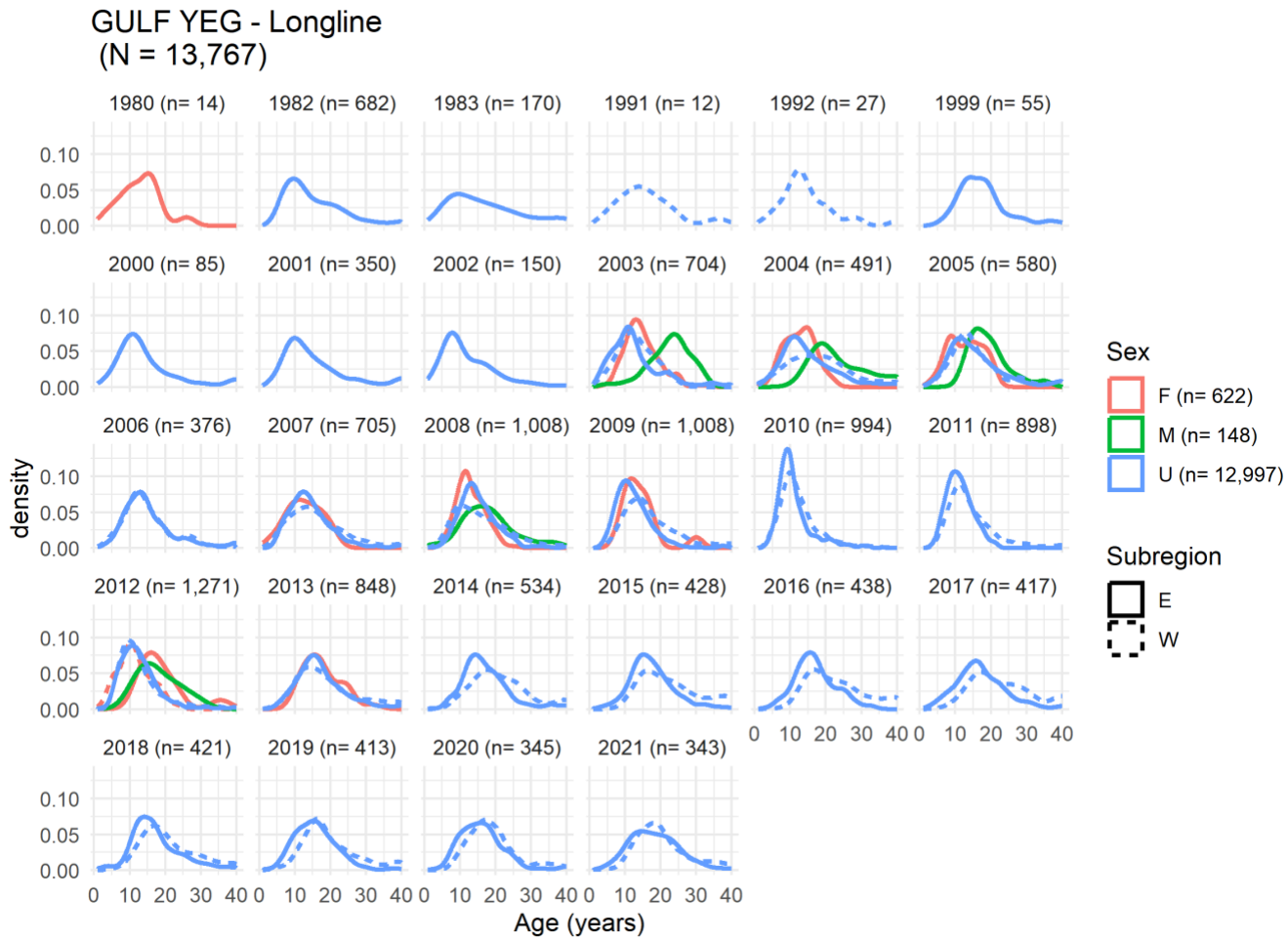

Figure 24: Annual Yellowedge Grouper commercial LL nominal age distributions by sex – Female (F), Male (M) and Unknown (U) and subregion – East (E) and West (W). Strata with less than 10 samples were dropped.

Appendix A.

After the initial data and working paper submissions, the lead analyst requested that weighted length compositions be provided in addition to the previously submitted data products. The assessment model is already divided into two regions (East and West), meaning that in order to further weight the length compositions by landings, each region would need to be divided further into subregions so that the landings totals from the subregions could be used to weight the compositions. Previous assessments have divided the East region into two separate subregions, however, the West region had not previously been subdivided. As this was an operational assessment, it was decided that the west would remain a single subregion, and therefore only nominal compositions would be provided, while the East region would be split into two subregions (Southeast (SE) : shrimp grid areas 1 – 6, Northeast (NE) : shrimp grid areas 7 – 12) and landings by subregion would be used to weight the length compositions. Unlike the previous data submission, sex was not taken into account for this analysis, only subregion and fleet.

To construct the weighted compositions for each fleet, proportions of annual landings from each subregion, $p_{i,r}$, were used to weight the subregional length compositions, $LC_{i,j,r}$, which were then summed across subregions r

$$LC_{i,j} = \sum_{r} (LC_{i,j,r} * p_{i,r})$$

resulting in the final weighted estimates of landings length compositions, LCi,j . Here, subregion is referring to the NE and SE subregions within the eastern subregion of the Gulf of Mexico. The effects of this weighting procedure are shown for vertical line (Figure A1) and longline (Figure A2). The weighting procedure had very little impact on the length compositions.

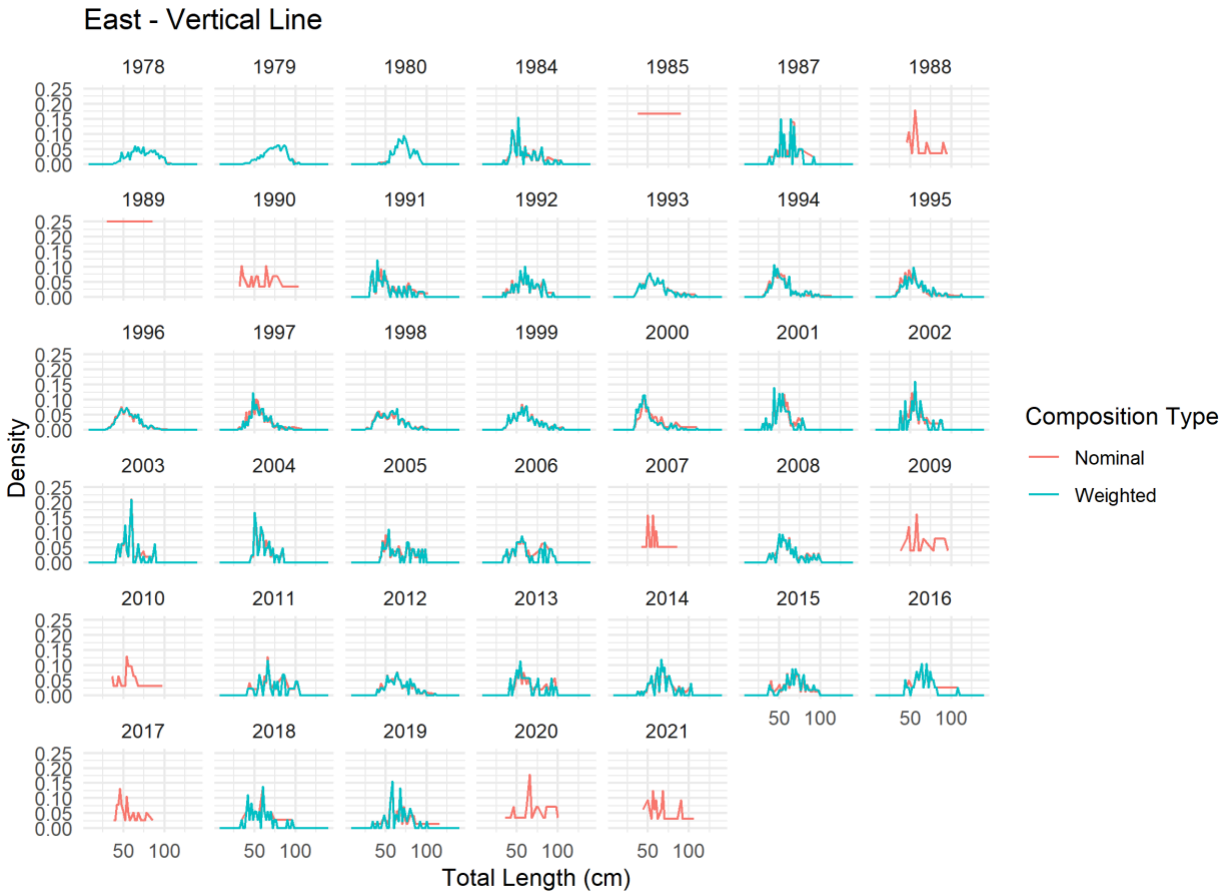

Figure A1. Annual Yellowedge Grouper nominal and weighted length compositions for the East subregion and vertical line fleet.

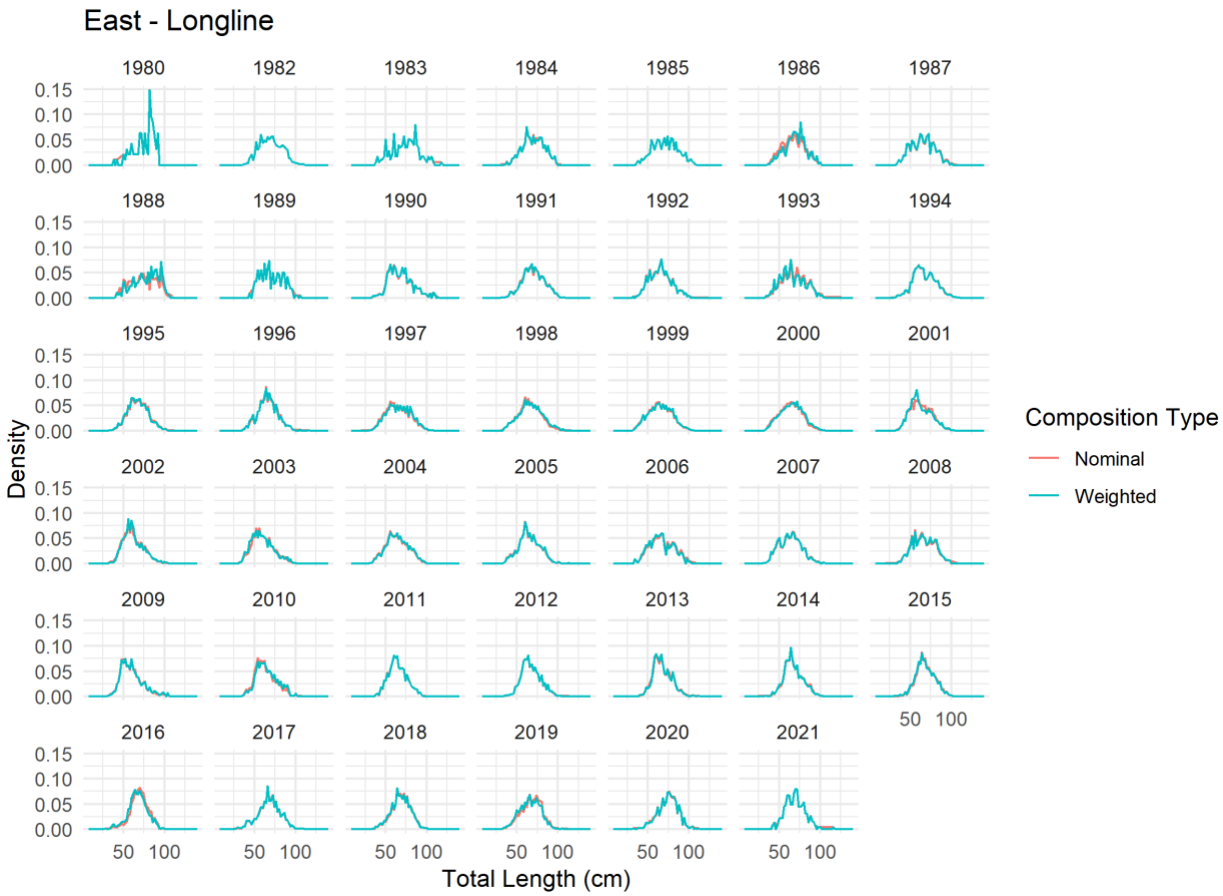

Figure A2. Annual Yellowedge Grouper nominal and weighted length compositions for the East subregion and longline line fleet.