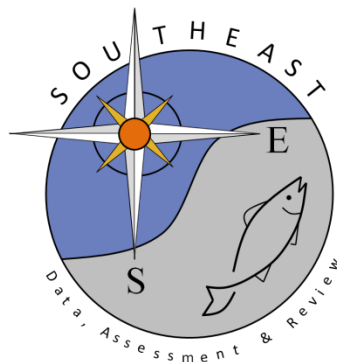


Length composition of king mackerel (*Scomberomorus cavalla*) from the artisanal fishery operating in the southern Gulf of Mexico

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SEDAR99-WP-20

11 May 2026



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Caña-Hernández, S., R.E. Lara-Mendoza, V. Caballero-Chávez, E. Romero-Hernández & M.G. Gómez-Ortíz. 2026. Length composition of king mackerel (*Scomberomorus cavalla*) from the artisanal fishery operating in the southern Gulf of Mexico. SEDAR99-WP-20. SEDAR, North Charleston, SC. 13 pp.

**MEXICAN INSTITUTE FOR SUSTAINABLE FISHERIES AND
AQUACULTURE RESEARCH**

DIRECTORATE OF FISHERIES RESEARCH IN THE ATLANTIC

**“Implementation of the Strategic Action Program of the
Gulf of Mexico Large Marine Ecosystem” Project**

**Length composition of king mackerel (*Scomberomorus
cavalla*) from the artisanal fishery operating in the southern
Gulf of Mexico**

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1. Abstract

Length composition data for king mackerel (*Scomberomorus cavalla*) from artisanal commercial landings in the southern Gulf of Mexico were analyzed for the 2011–2024 period using fishery-dependent information collected through the IMIPAS Marine Finfish Monitoring Program. A total of 16,860 individuals from 816 sampled fishing trips were included. Samples were stratified by fishing gear into gillnet (GN; 2010–2024) and trolling line (TR; 2010–2024) fleets. Total length (TL) measurements were grouped into 5-cm intervals to estimate annual length-frequency distributions by fleet. Summary statistics, including mean length and standard deviation, were calculated for each year and fleet.

Length compositions differed consistently between fleets. Gillnet landings exhibited narrower and more size-restricted distributions, whereas trolling landings encompassed a broader size range, including both smaller and larger individuals. These data are intended to inform fleet-specific selectivity patterns and characterize sampled size structure within the artisanal commercial sector.

2. Data sources

Length data used in this analysis were collected by Mexican Institute for Sustainable Fisheries and Aquaculture Research (IMIPAS) as part of routine fishery monitoring programs in the Gulf of Mexico. Sampling was fishery-dependent and focused on commercial landings of king mackerel from the artisanal fleets. Observations were recorded directly at landing sites. For each sampled trip, individual fish total length (TL, cm) was measured, as well as other morphometrical measures. When available, additional trip information such as gear type, landing location, and sampling date was also recorded. The dataset analyzed in this work represents all available king mackerel length records collected between 2010 and 2024. The data were aggregated based on a fishing year (july 1 to june 30) rather than the calendar year.

3. Commercial length compositions of landings

Sampling is fishery-dependent and conducted at landing sites through direct observation of commercial catches. Fishing trips are sampled opportunistically based on vessel arrival and logistical feasibility. The artisanal fleet operates using multiple gear types; however, king mackerel landings are primarily associated with gillnets and trolling lines. For analytical purposes, samples were stratified into two fleets according to fishing gear:

- Gillnet fleet (GN): 2010–2024
- Trolling line fleet (TR): 2010–2024

Although sampling is conducted monthly, the number of trips and individuals measured differs among years and fleets, however observations represent the accessible catch at the time of sampling.

Length Samples

The fishing year for Gulf of Mexico king mackerel is from July 1 to June 30. Individual total length measurements were compiled by year and gear type from Tamaulipas to Campeche (Fig 1). Sample sizes varied annually depending on monitoring coverage and fleet activity. All lengths were recorded in centimeters (TL). No raising or expansion factors were applied due to the absence of total landings by length category. Records with missing length values or clearly unrealistic measurements were excluded.

3.2 Length Compositions

Length compositions were estimated for the commercial GN fleet and the commercial TR fleet for king mackerel landings. Total lengths (TL) were grouped into 5-cm intervals, from which length frequencies were estimated (Table 1). For each annual sample, descriptive statistics were calculated, including the mean and standard deviation (Table 2).

4. Results

Annual sample sizes varied across the time series, reflecting changes in sampling intensity and fleet activity. In general, higher sample sizes were associated with years of increased monitoring coverage.

4.1 Gillnet Fleet (GN)

Length compositions from the gillnet fleet showed a relatively concentrated size structure. Most individuals were distributed within intermediate length classes, with limited representation of smaller and larger fish. Interannual variability was observed, with some years showing shifts toward larger modal sizes. A total of 6,517 individuals sampled from 318 fishing trips were recorded for the gillnet fleet during the 2011–2024 period (Fig 2). Observed total lengths (TL) ranged from 30 to 130 cm, with most individuals concentrated between 55 and 95 cm TL (Fig 3; Table 2).

4.2 Trolling fleet (TR)

The TR fleet exhibited a broader size distribution compared to gillnets. Catches included both smaller and larger individuals. 10,343 individuals from 498 fishing trips were sampled

during the 2011–2025 period. Total lengths ranged from 25 to 144 cm TL (Fig 4). Length-frequency distributions for the TR fleet were generally wider across years, with multiple years showing higher variance (Fig 5). Smaller size classes (<40 cm TL) were more frequently represented in trolling landings compared to gillnets, while larger individuals (>110 cm TL) were also consistently present. Across the overlapping years, the trolling fleet consistently sampled a wider range of lengths than the gillnet fleet. Differences in modal size, variance, and distribution shape suggest distinct selectivity patterns between fishing gears (Fig 6).

5. Discussion

The observed length compositions of king mackerel from artisanal commercial landings in the Gulf of Mexico reveal clear and consistent differences between fishing gears, as well as notable interannual variability. The narrower length range observed in the gillnet fleet are consistent with the size-selective nature of gillnets, where mesh size constrains the capture of individuals to a relatively limited range of body sizes. The consistent occurrence of larger individuals in trolling landings indicates that this gear remains effective across a wide spectrum.

Interannual shifts in modal length suggest variability in population structure over time, but it may be influenced by sampling effort. The decision to aggregate sexes was necessary due to limitations in the ability to reliably identify sex during sampling, due to fisheries characteristics. The observed differences between fleets highlight the importance of treating fishing gears separately in integrated assessment models.

6. Data limitations

Several limitations should be considered when interpreting these data:

- Sampling is fishery-dependent and may not represent the full population.
- Coverage varies among years and landing sites.
- No total landings by size category were available for weighting.
- Some years have low sample sizes.

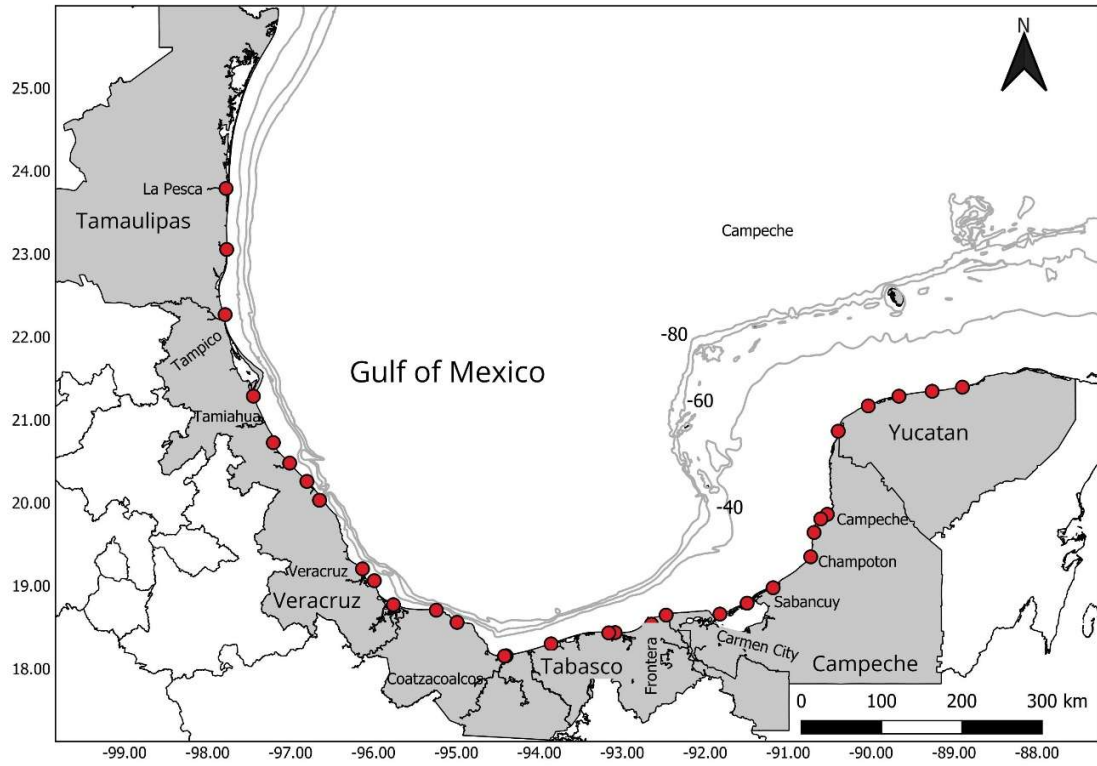


Figure 1. Map of the main sampling sites of king mackerel fishery in the southern Gulf of Mexico.

Table 1. Overall size frequency (all years) by 5 cm size bin interval for king mackerel from southern Gulf of Mexico.

Length bin	GN	TR
20	0	11
25	2	59
30	15	33
35	187	64
40	846	163
45	1676	190
50	1398	309
55	912	1074
60	471	1255
65	323	1279
70	282	1510
75	192	1415
80	103	1280
85	58	744
90	23	454
95	13	232
100	6	132
105	4	67
110	1	35
115	2	21
120	2	3
125	1	5
130	0	2
135	0	1
140	0	5

Table 2. Size composition analysis by fleet and year for the king mackerel in southern Gulf of Mexico.

Year	Fishing gear	N	Min TL	Max TL	Mean TL	SD	CV	Fishing year
2010	GN	31	53.4	108	73.4	8.97	0.12	7/1 - 6/30
2011	GN	35	50.6	120	62.0	18.52	0.30	7/1 - 6/31
2012	GN	200	44.5	120	68.47	10.98	0.16	7/1 - 6/32
2013	GN	253	35.5	92	55.79	13.94	0.25	7/1 - 6/33
2014	GN	116	34	97	54.07	18.60	0.34	7/1 - 6/34
2015	GN	210	33.9	97	49.14	10.32	0.21	7/1 - 6/35
2016	GN	1668	31	126.2	52.59	9.58	0.18	7/1 - 6/36
2017	GN	2058	27.5	107	51.16	8.90	0.17	7/1 - 6/37
2018	GN	946	32.2	94.1	55.65	9.75	0.18	7/1 - 6/38
2019	GN	238	36	115	59.70	11.67	0.20	7/1 - 6/39
2020	GN	30	41.1	86.1	68.08	10.38	0.15	7/1 - 6/40
2021	GN	427	32.1	114	59.48	10.99	0.18	7/1 - 6/41
2022	GN	167	41.7	100	58.77	10.45	0.18	7/1 - 6/42
2023	GN	18	35.1	85.2	70.82	11.00	0.16	7/1 - 6/43
2024	GN	119	41	83.8	48.65	7.85	0.16	7/1 - 6/44
2010	TR	177	59	115	83.8	8.93	0.11	7/1 - 6/45
2011	TR	228	53.1	127	82.9	14.74	0.18	7/1 - 6/46
2012	TR	931	33.6	144	76.6	13.97	0.18	7/1 - 6/47
2013	TR	916	36.7	144	73.0	16.65	0.23	7/1 - 6/48
2014	TR	693	31	140	76.2	13.31	0.17	7/1 - 6/49
2015	TR	1093	33.7	117	69.3	12.46	0.18	7/1 - 6/50
2016	TR	1205	26.1	124	67.3	14.12	0.21	7/1 - 6/51
2017	TR	1626	38.9	116	65.9	11.19	0.17	7/1 - 6/52
2018	TR	1632	22.2	131	68.3	13.94	0.20	7/1 - 6/53
2019	TR	562	59	137	80.8	9.64	0.12	7/1 - 6/54
2020	TR	41	59.5	116.5	84.6	13.45	0.16	7/1 - 6/55
2021	TR	154	49	118	77.9	13.43	0.17	7/1 - 6/56
2022	TR	245	50.5	116	72.7	12.49	0.17	7/1 - 6/57
2023	TR	284	56.4	116	78.3	11.69	0.15	7/1 - 6/58
2024	TR	556	57	116	77.1	9.23	0.12	7/1 - 6/59

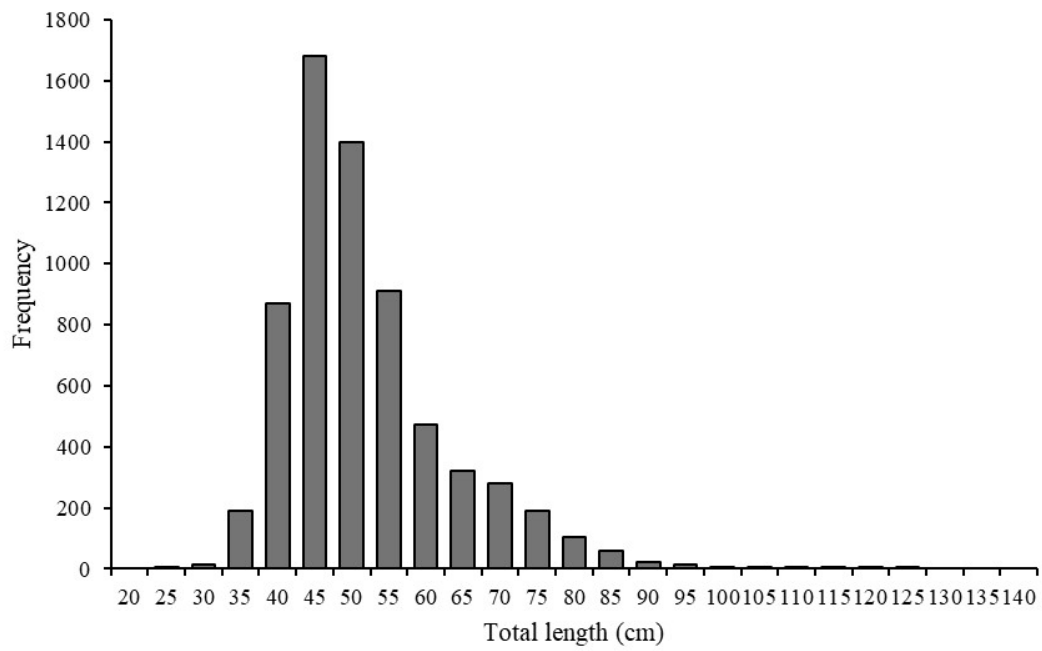


Figure 2. Overall length-frequency distribution (TL, 5-cm bins) of king mackerel sampled from gillnet landings in the southern Gulf of Mexico.

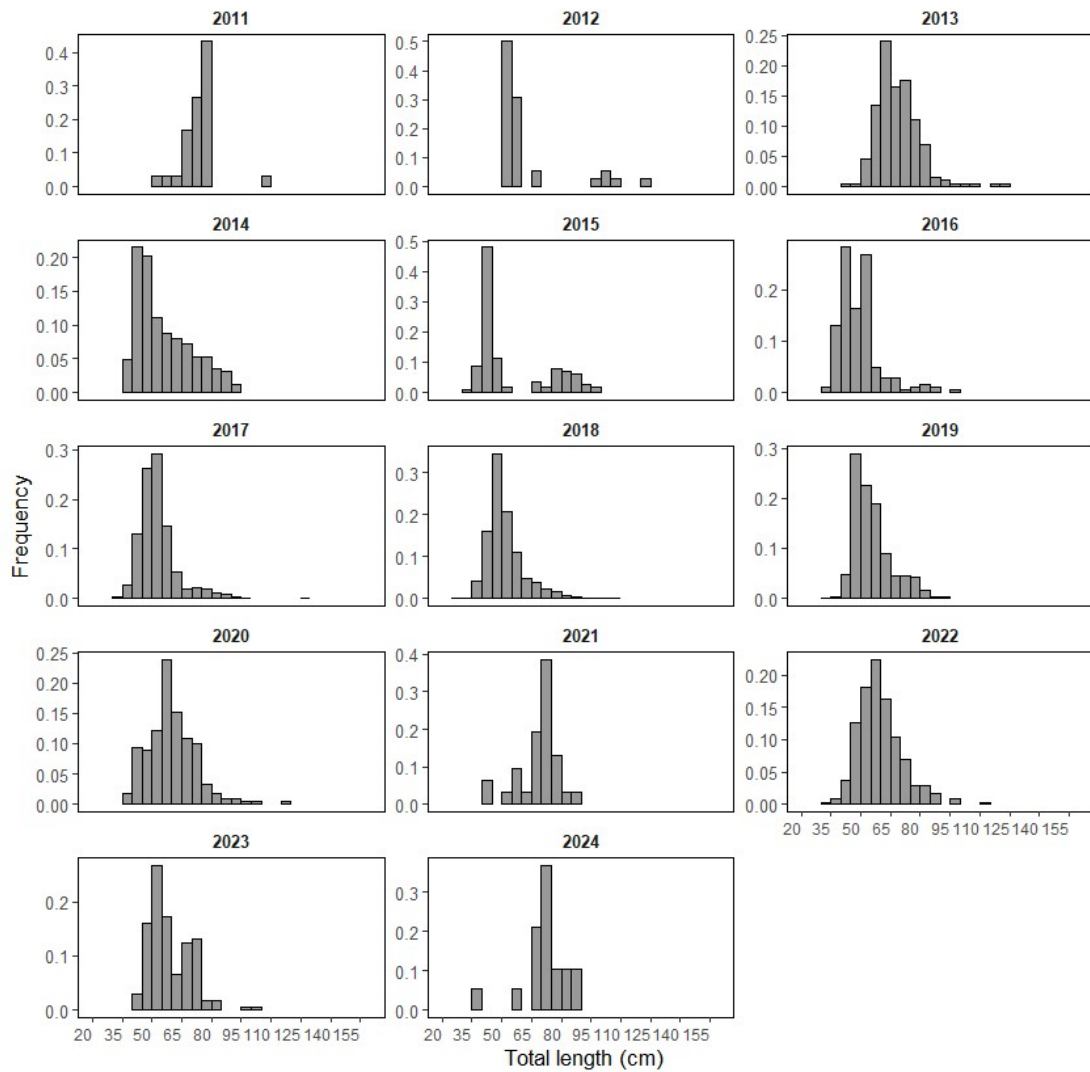


Figure 3. Annual length frequency distributions of king mackerel sampled from the gillnet fleet in the southern Gulf of Mexico

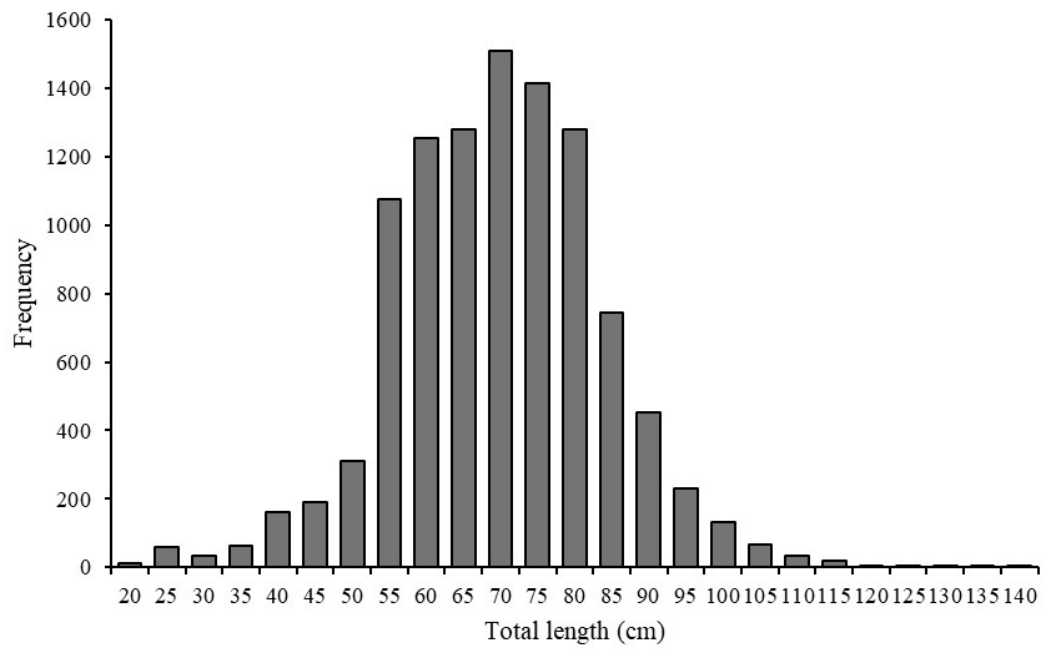


Figure 4. Overall length-frequency distribution (TL, 5-cm bins) of king mackerel sampled from trolling lines landings in the southern Gulf of Mexico.

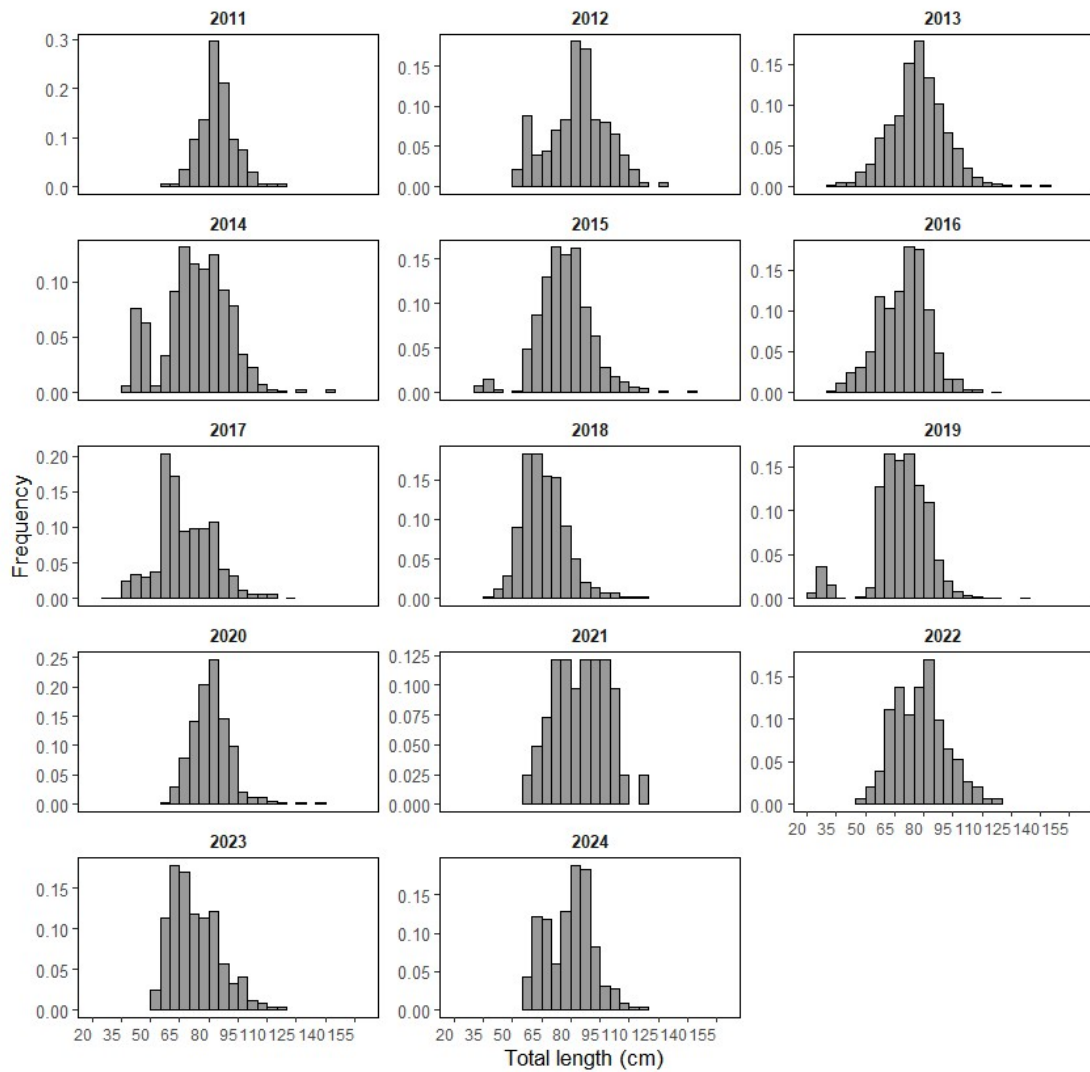


Figure 5. Annual length frequency distributions of king mackerel sampled from the trolling fleet in the southern Gulf of Mexico.

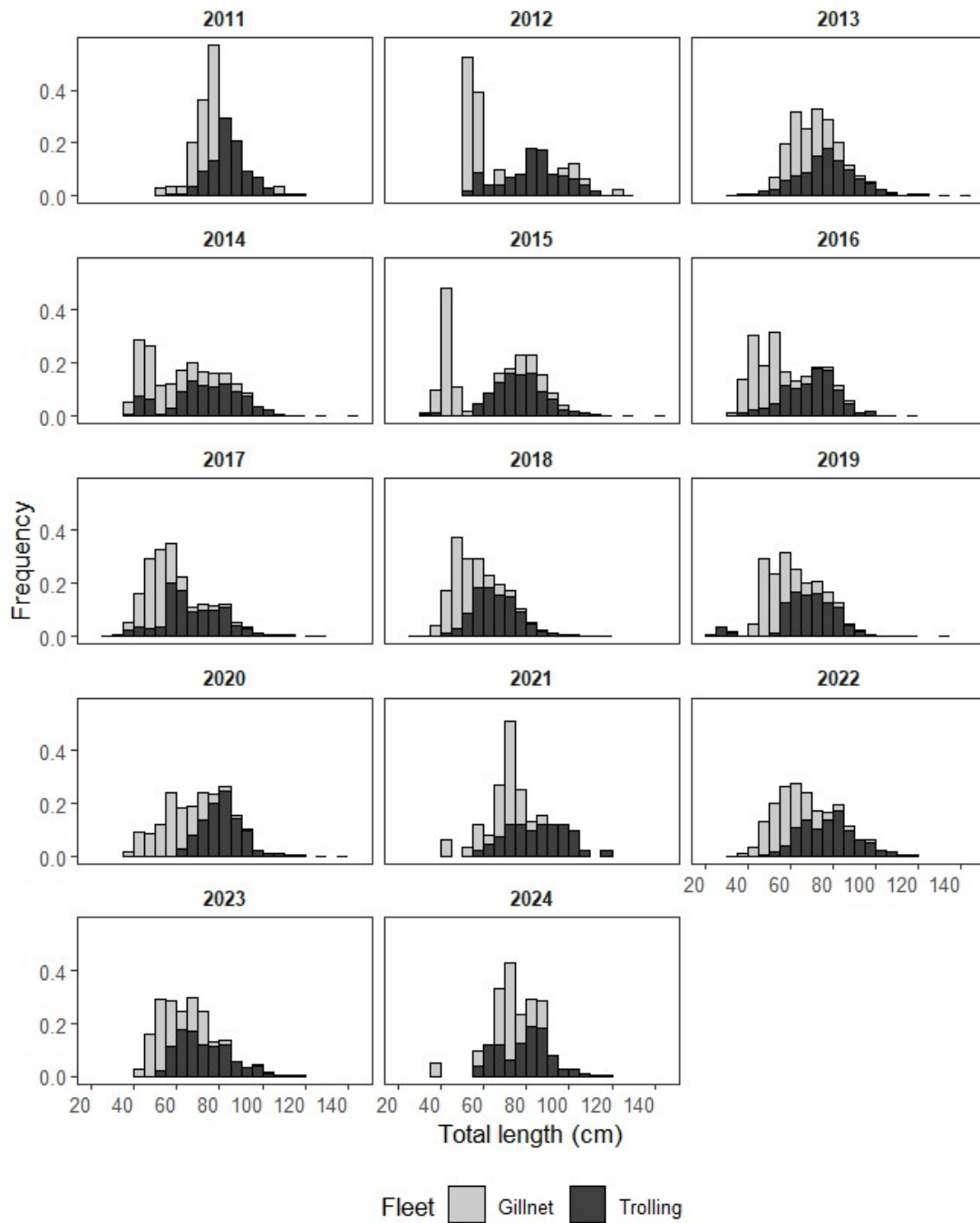


Figure 4. Annual size-frequency distributions (TL, cm) by fishing fleet, expressed as relative frequencies and grouped into 5-cm bins for the king mackerel from the southern Gulf of Mexico.