



NOAA Technical Memorandum NMFS



DECEMBER 1993

**A COMPARISON OF THE RECREATIONAL AND
COMMERCIAL FISHERIES FOR LINGCOD
(*Ophiodon elongatus*) OFF THE PACIFIC COAST OF
THE UNITED STATES, AND A DESCRIPTION OF THE
RECREATIONAL LINGCOD FISHERY**

Kelly R. Silberberg
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NOAA-TM-NMFS-SWFSC-193

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

NOAA Technical Memorandum NMFS

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TABLE OF CONTENTS

List of Tables	v
List of Figures	vii
Abstract	ix
Introduction	1
Methods	2
Results	5
Comparison of recreational and commercial landings	5
Recreational landing trends	8
Comparison of MRFSS estimates with WDF and CDF&G data ..	12
Discussion	14
Comparison of combined recreational and commercial landings to Acceptable Biological Catch	14
Northern California recreational landings history	15
Size limits for lingcod	16
Comparison of MRFSS estimates with WDF and CDF&G data ..	18
Summary and Recommendations	21
Acknowledgements	22
Literature Cited	23
Appendix A	26

LIST OF TABLES

Table 1.	Recreational lingcod landings by subregion	7
Table 2.	Commercial lingcod landings by subregion	7
Table 3.	Recreational lingcod landed by fishing mode for the southern California subregion	9
Table 4.	Recreational lingcod landed by fishing mode for the northern California subregion	9
Table 5.	Recreational lingcod landed by fishing mode for the Oregon subregion	10
Table 6.	Recreational lingcod landed by fishing mode for the Washington subregion	10
Table 7.	Recreational lingcod landed by fishing mode for all subregions combined	11
Table 8.	Combined commercial and recreational landings of lingcod by year and INPFC area and Acceptable Biological Catch	15
Table 9.	Percent of lingcod taken under 559 mm (22 in.) by subregions and years	17

LIST OF FIGURES

Figure 1.	Recreational and commercial lingcod landings (1980-1989) by subregion	6
Figure 2.	Comparison of MRFSS estimates and Washington Department of Fisheries ocean sport fishery survey estimates of ocean landed recreational lingcod for the Washington subregion from 1981-1988	12
Figure 3.	Comparison of MRFSS estimates of party/charter boat lingcod landings for the combined southern and northern California subregions and California Department of Fish and Game Commercial Passenger Fishing Vessel logbook landings data for lingcod from 1980-1989	13
Figure 4.	Size at maturity of female lingcod from Monterey and Morro Bay areas	19
Figure 5.	Size at maturity of male lingcod from Monterey and Morro Bay areas	19

ABSTRACT

Recreational lingcod (*Ophiodon elongatus*) landings data from the Pacific coast of the United States were compared to commercial landings data for the same areas and years by weight for the years 1980 through 1989. Furthermore, Marine Recreational Fishery Statistics Survey (MRFSS) estimates were summarized with respect to the number and weight of fish landed, fishing modes, and length frequencies to assess their adequacy for management. Also, the MRFSS estimates for the Washington and California subregions were compared with data collected by state surveys.

Comparison of recreational and commercial landings showed that in the southern and northern California subregions, recreational landings accounted for 69% and 46% of the combined recreational and commercial landings, respectively. However, in the Oregon and Washington subregions, recreational landings only accounted for 16% of the combined landings. At least in California, the recreational landings of two-thirds to one-half of the total lingcod removals are large enough that they should be included in management plans.

There were no annual trends in recreational lingcod landings over the 1980 through 1989 period, with the possible exception of the southern California subregion. The southern California subregion had a decreasing trend in lingcod landings, but the trend was based on a single, particularly high 1980 estimate. Northern California landings were erratic, but with a slight

x

downward trend. Oregon and Washington subregions had no annual trends for recreational landings.

Examining the total number of recreationally caught lingcod landed by fishing mode showed that at least 61% of lingcod were landed from private/rental boats, and 32% from party/charter boats, with the remaining 7% being landed from shore. The average fork length of lingcod landed ranged from 602-651 mm, with a coastwide average of 634 mm.

Only California has a recreational size limit of 559 mm (22 in.); however approximately 20% of the lingcod landed in California are smaller than this size limit. In Oregon and Washington which have no size limit, 32% and 34% of lingcod landed are smaller than 559 mm. Effective size limits to protect potential reproduction will require geographically comprehensive size-at-maturity studies.

Comparison of the MRFSS estimates with both the Washington Department of Fisheries (WDF) ocean sport fishery survey data and the California Department of Fish and Game (CDF&G) Commercial Passenger Fishing Vessel catch data showed the MRFSS estimates to be higher than the WDF survey data and CDF&G data prior to 1983 and more similar in later years. There was no apparent reason for these differences.

INTRODUCTION

The purposes of this report are to compare the sizes of recreational and commercial lingcod (*Ophiodon elongatus*) fisheries off Washington, Oregon, and California, and to summarize data from recreational lingcod landings with respect to the weight landed, number of fish landed by fishing mode, and length frequencies. Also, estimates of numbers of fish landed from the Marine Recreational Fisheries Statistics Survey (MRFSS) conducted by the National Marine Fisheries Service will be compared with estimates from a survey conducted by the Washington Department of Fisheries (WDF) and from Commercial Passenger Fishing Vessel (CPFV) logbooks of daily catch which are required of any vessel operator taking passengers fishing and charging a fee by the California Department of Fish and Game (CDF&G).

Currently, recreational landings are not included in the groundfish management plan nor are they counted against landings when compared to the Acceptable Biological Catch (ABC), but as lingcod stocks become more fully exploited, recreational landings will need to be included in the stock assessment. Therefore, this is an effort to summarize the data from recreational lingcod landings, to compare their size to commercial landings, to assess their adequacy for management, and to recommend if additional information will be necessary.

METHODS

Data for this report cover the years from 1980 through 1989 and were taken from a variety of sources. Data for recreational landings came from the MRFSS (Holliday et al. 1984; U.S. Department of Commerce 1984, 1985, 1986, 1987, 1992). Data for commercial landings were taken from the Pacific Fisheries Information Network (PacFIN) database.

Recreational landings data are separated geographically into the four MRFSS subregions: southern California (south of Monterey County), northern California (north of San Luis Obispo County), Oregon, and Washington. Commercial landings data from the PacFIN database were available by port and year and were grouped into the same four subregions used by the MRFSS for comparison.

Data collection for the MRFSS consisted of two complementary surveys: (1) an intercept survey of anglers at fishing sites, and (2) a telephone survey of coastal county households. The intercept survey of anglers provided an average number of fish by species landed per angler trip, and individual length measurements. The length measurements were used for conversion from numbers to weights, using length-weight formulas. The total number of trips from the telephone survey was expanded by the fraction of anglers encountered in the intercept survey who lived outside the telephone survey area. The average number of fish by species landed per angler trip was expanded with the expanded number of total trips made covering the previous two-month period, and this resulted in a total estimate of recreationally landed fish by species (for more detail see Holliday et al.

1984). Data were divided into two major categories or MRFSS "Catch Types." Catch Type A included all fish available for identification while Catch Type B included all fish not available for identification. Catch Type B were further divided into Catch Type B1 (used for bait, filleted, discarded dead, etc.) and Catch Type B2 (released alive).

In order to compare total recreational and commercial landings to ABC's, which are based on International North Pacific Fisheries Commission (INPFC) areas and are in units of metric tons (t), recreational landings in numbers were converted to weights. Estimated weights in metric tons of recreationally landed lingcod were divided into INPFC areas using the same ratios found for commercially landed lingcod (following Almeida 1989). Catch Type A + B1 was the most appropriate measure of recreational landings to combine with commercial landings because it represented the total number of fish removed from the population. However, estimated weights of recreationally landed fish were only available for Catch Type A. Weights for Catch Type B1 were estimated using numbers of fish for Catch Type B1 and average weights per fish from Catch Type A.

Estimates for total numbers of fish caught (Catch Type A + B1 + B2) were examined and compared between subregions for the following fishing modes: private/rental boats, party/charter boats, and shore. In many years, estimates for private/rental boat, party/charter boat, and shore landings for the individual subregions were less than 30,000 lingcod and were therefore not given by the MRFSS, but were included in totals.

Length frequency data were only available for the recreational fishery. Length frequencies for each subregion and year were grouped into 25-mm length classes ranging from 25 to 1300 mm. Length frequency data were then displayed as histograms for each subregion and year, giving the number of fish for each length class. Length frequency data were only from fish that were actually measured through the intercept survey (Catch Type A) and were not estimates.

The MRFSS estimates data for the Washington subregion ocean fishery (Catch Type A + B1) from 1981 through 1988 (John Witzig, NMFS, Silver Springs, Maryland, pers. comm.) were compared to the WDF ocean sport fishery survey estimates of lingcod landed (Thomas Jagielo, Washington Department of Fisheries, Olympia, Washington, pers. comm.). Ocean fishing boats were not sampled by the MRFSS in the Washington subregion during 1989, so were not included in this comparison. The Washington ocean sport fishery survey estimates were from a two-stage survey (Lai et al. 1991). The number of boats fishing per port was counted on a daily basis (number of cars was used as a substitute for boats in shore-based fisheries). An intercept interview was used to determine the number of anglers per trip and the number of fish by species taken per angler per trip. The individual intercept data were used to expand the number of trips into total estimated landings.

The MRFSS party/charter boat data for the California subregions were compared to data from CDF&G CPFV logbooks. Operators of CPFV's are required to tally their passengers' landings by species or species group on a daily basis and submit the results to the CDF&G on a monthly basis (Young 1969). By

law, CPFV operators are required to complete their logbooks between the time that fishing has concluded and the time their passengers disembark. Logbooks are required of any operator taking passengers and charging a fee. The data used here covers the period from 1980 through 1989 (Oliphant et al. 1990; California Department of Fish and Game 1988, 1989¹).

RESULTS

Comparison of recreational and commercial landings

Comparison of recreational and commercial landings of lingcod showed that recreational landings were exceeded by commercial landings in just 2 years in the southern California subregion, 7 years in the northern California subregion, and all 10 years in the Oregon and Washington subregions (Fig. 1, Tables 1 and 2). The southern and northern California subregions had recreational landings averaging 69% and 46%, respectively, of the total landings over all years. The Oregon and Washington subregions each had recreational landings averaging only 16% of the total landings over all years. There was no north-to-south decreasing trend in the MRFSS recreational lingcod landings, as there was in the commercial landings².

¹California Department of Fish and Game. 1988, 1989. Report of fish caught by the commercial passenger fishing boat fleet.

²Silberberg, K. R., and P. B. Adams. in prep. The commercial fishery for lingcod (*Ophiodon elongatus*) off the coast of Washington, Oregon, and California: Distribution of landings by gear type, and an analysis of targeting in the trawl fishery. 23 p.

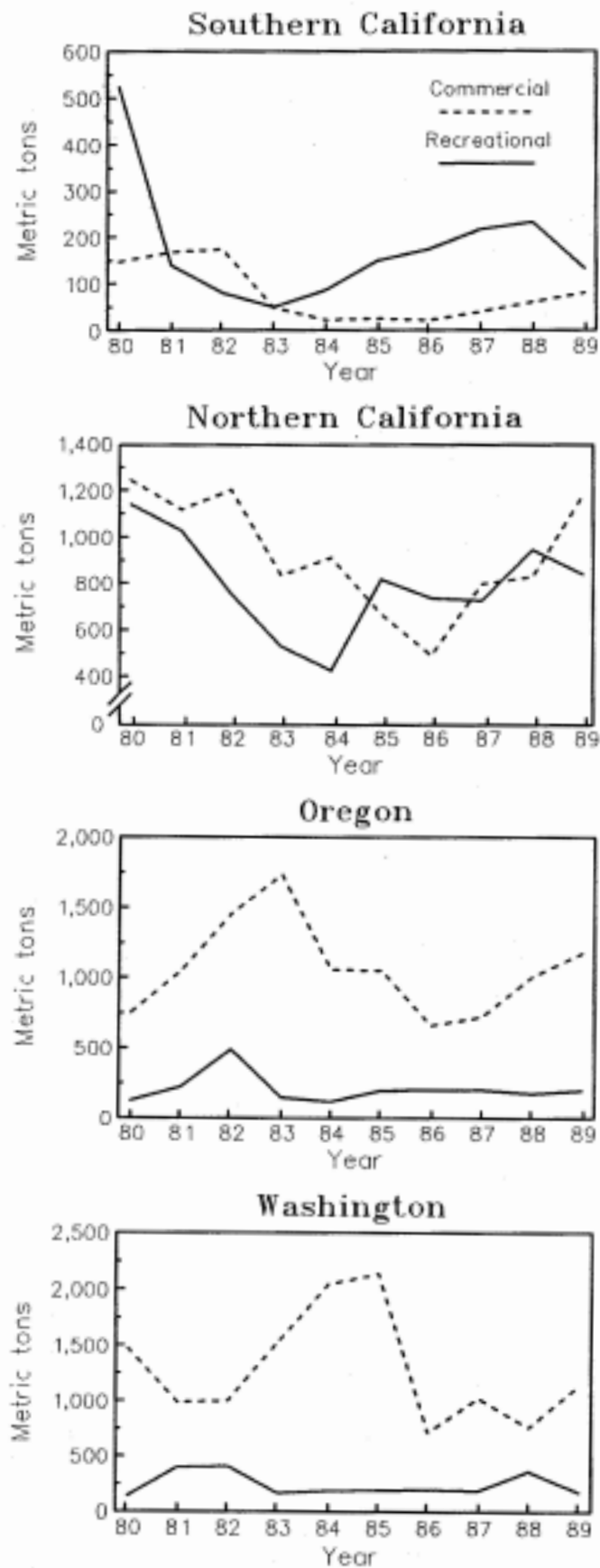


Figure 1. Recreational (MRFSS Catch Type A + B1) and commercial (PacFIN) lingcod landings in metric tons (1980-1989) by subregion.

Table 1. Recreational lingcod landings (MRFSS Catch Type A + B1) in metric tons by subregion.

YEAR	SOUTHERN CALIFORNIA	NORTHERN CALIFORNIA	OREGON	WASHINGTON
1980	524	1,140	124	141
1981	139	1,027	218	395
1982	81	752	485	407
1983	50	527	145	165
1984	86	424	118	190
1985	150	816	195	192
1986	174	735	197	198
1987	217	724	200	184
1988	233	943	175	363
1989	133	837	196	173
AVERAGE	179	792	205	241

Table 2. Commercial lingcod landings (PacFIN) in metric tons by subregion.

YEAR	SOUTHERN CALIFORNIA	NORTHERN CALIFORNIA	OREGON	WASHINGTON
1980	146	1,242	754	1,471
1981	168	1,116	1,046	987
1982	174	1,200	1,458	999
1983	49	832	1,733	1,525
1984	23	908	1,057	2,044
1985	25	667	1,052	2,135
1986	22	489	657	714
1987	40	794	719	1,024
1988	61	826	1,008	758
1989	81	1,177	1,176	1,137
AVERAGE	79	925	1,066	1,279

Recreational landing trends

No annual trends were found in the MRFSS estimates over the 1980 through 1989 period, with the possible exception of southern California. The southern California subregion had a decreasing trend in recreational lingcod landings by weight (Fig. 1) and by numbers (Table 3) over the 1980 through 1989 time period, but this trend was based on a high 1980 estimate. The northern California subregion landings were erratic, again with a very high initial estimate (Fig. 1, Table 4). Oregon and Washington subregions had no annual trends for recreational landings (Fig. 1 and Tables 5 and 6). The northern California subregion had greater recreational landings of lingcod and larger variations than the other subregions (Fig. 1). The northern California subregion, which has the longest coastline of all the subregions, about 463 nautical miles, had the highest average recreational landings of 792 t per year. The southern California subregion with a coastline of 320 nautical miles, Oregon subregion with a coastline of 243 nautical miles, and Washington subregion with a coastline of 145 nautical miles averaged 179, 205, and 241 t per year, respectively.

For all MRFSS subregions during 1980-1989, an average of 335,400 lingcod per year (61%) were landed by private/rental boats and an average of 177,300 lingcod per year (32%) were landed by party/charter boats, with the remaining 7% being landed from shore (Table 7). Northern California was the only subregion

Table 3. Recreational lingcod landed (x 1,000) from Catch Type A + B by fishing mode for the southern California subregion.

YEAR	PRIVATE/ RENTAL BOAT	PARTY/ CHARTER BOAT	SHORE	ALL MODES
1980	191	61	*	256
1981	37	*	*	57
1982	*	*	*	35
1983	*	*	*	*
1984	*	*	*	60
1985	56	*	*	73
1986	127	41	*	169
1987	117	*	*	144
1988	109	47	*	167
1989	34	43	*	79

An asterisk (*) denotes numbers less than thirty thousand lingcod, which were not given by the MRFSS.

Table 4. Recreational lingcod landed (x 1,000) from Catch Type A + B by fishing mode for the northern California subregion.

YEAR	PRIVATE/ RENTAL BOAT	PARTY/ CHARTER BOAT	SHORE	ALL MODES
1980	176	193	*	400
1981	155	155	*	325
1982	153	75	*	254
1983	86	68	*	173
1984	109	*	*	146
1985	158	42	*	209
1986	191	58	*	264
1987	196	66	*	286
1988	232	66	33	331
1989	256	41	*	323

An asterisk (*) denotes numbers less than thirty thousand lingcod, which were not given by the MRFSS.

Table 5. Recreational lingcod landed (x 1,000) from Catch Type A + B by fishing mode for the Oregon subregion.

YEAR	PRIVATE/ RENTAL BOAT	PARTY/ CHARTER BOAT	SHORE	ALL MODES
1980	*	*	*	34
1981	*	60	*	72
1982	31	142	*	176
1983	*	32	*	57
1984	*	*	*	36
1985	35	*	*	58
1986	*	*	*	46
1987	31	*	*	68
1988	38	*	*	53
1989	*	35	*	47

An asterisk (*) denotes numbers less than thirty thousand lingcod, which were not given by the MRFSS.

Table 6. Recreational lingcod landed (x 1,000) from Catch Type A + B by fishing mode for the Washington subregion.

YEAR	PRIVATE/ RENTAL BOAT	PARTY/ CHARTER BOAT	SHORE	ALL MODES
1980	67	*	*	81
1981	95	117	*	216
1982	87	100	*	193
1983	70	36	*	110
1984	65	*	*	78
1985	66	*	*	86
1986	48	*	*	58
1987	55	*	*	71
1988	83	*	*	98
1989	34	*	*	49

An asterisk (*) denotes numbers less than thirty thousand lingcod, which were not given by the MRFSS.

Table 7. Recreational lingcod landed (x 1,000) from Catch Type A + B by fishing mode for all subregions combined.

YEAR	PRIVATE/ RENTAL BOAT	PARTY/ CHARTER BOAT	SHORE	ALL MODES
1980	452	274	*	770
1981	297	351	*	670
1982	299	323	*	659
1983	193	143	*	363
1984	217	62	*	320
1985	315	94	*	426
1986	386	126	*	536
1987	399	129	41	570
1988	462	138	50	650
1989	334	133	31	498

An asterisk (*) denotes numbers less than thirty thousand lingcod, which were not given by the MRFSS.

which had substantial landings by both private/rental boats and party/charter boats in most years. For the nine years when estimates were available for both private/rental boats and party/charter boats for the northern California subregion, landings were dominated by private/rental boats in seven years.

Analysis of the length frequency data for recreationally landed lingcod showed a distinctly unimodal distribution and remarkably consistent average sizes among subregions; southern California 607 mm, northern California 652 mm, Oregon 631 mm, and Washington 636 mm (see Appendix A).

Comparison of MRFSS estimates with WDF and CDF&G data

The MRFSS estimates were compared with both the WDF ocean sport fishery survey estimates (Fig. 2) and CDF&G CPFV logbook data (Fig. 3). In both cases, there was a pattern of large differences prior to 1983 after which the MRFSS and state data were similar. The MRFSS and WDF survey estimates of ocean-landed recreational lingcod for the Washington subregion during the period from 1981 through 1988 (ocean fishing boats were not

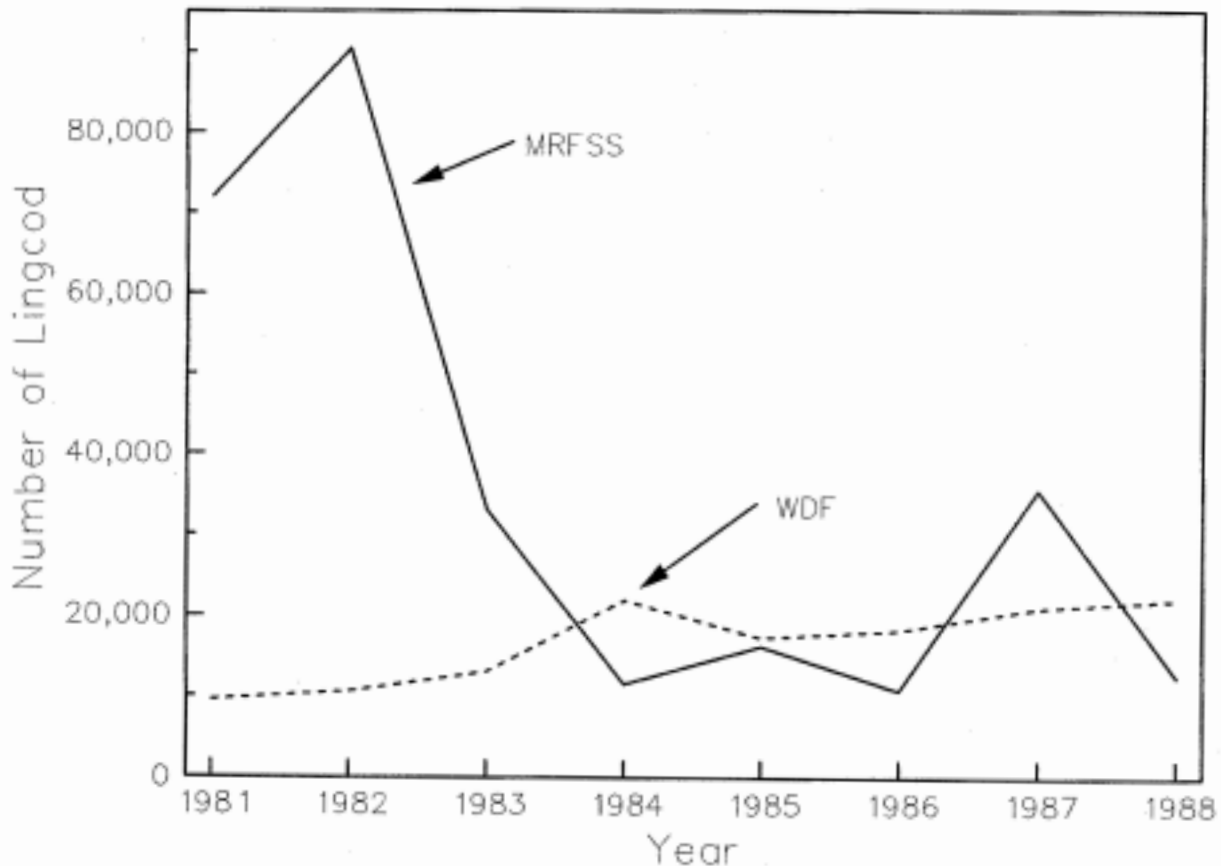


Figure 2. Comparison of MRFSS estimates (solid line) and Washington Department of Fisheries (WDF) ocean sport fishery survey estimates (dashed line) of ocean-landed recreational lingcod for the Washington subregion from 1981-1988 (ocean fishing boats were not sampled by the MRFSS in the Washington subregion during 1989).

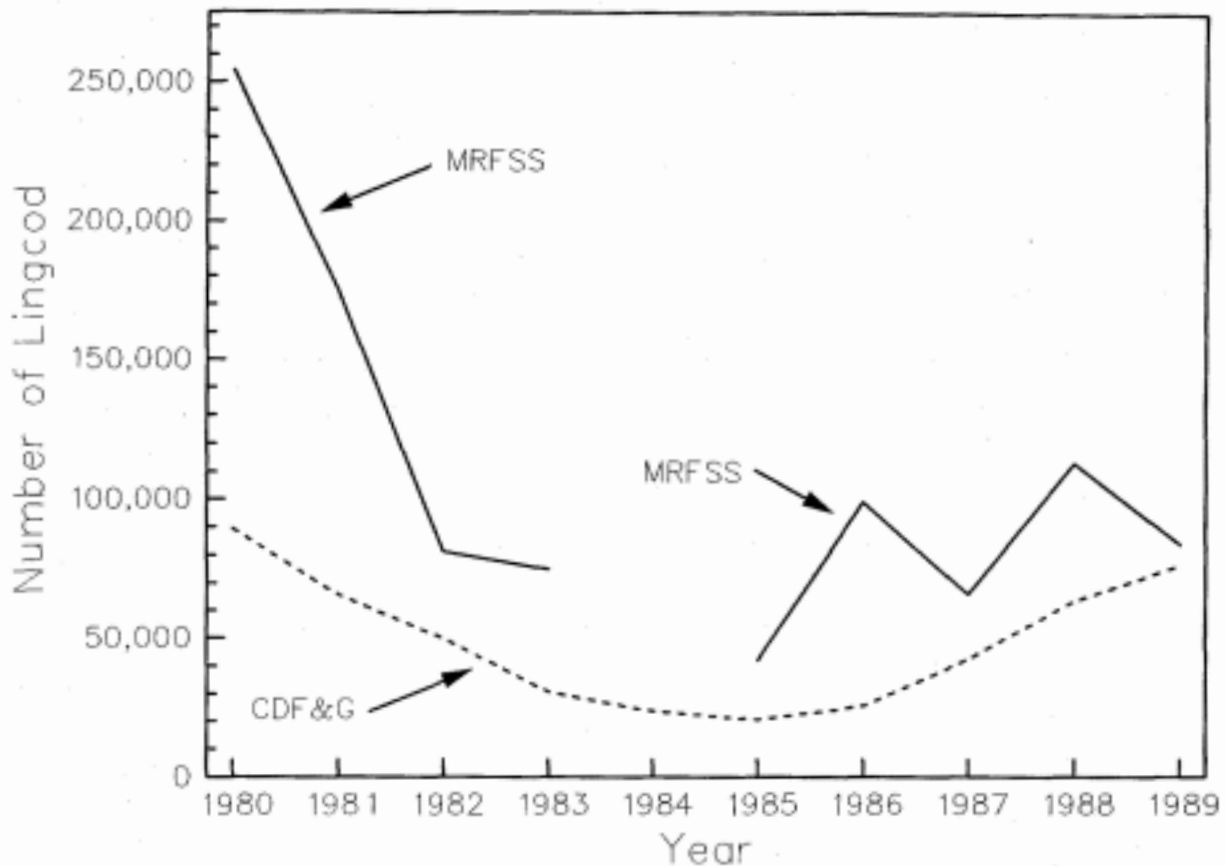


Figure 3. Comparison of MRFSS estimates of party/charter boat lingcod landings for the combined southern and northern California subregions (solid line) and California Department of Fish and Game (CDF&G) Commercial Passenger Fishing Vessel (CPFV) logbook landings data for lingcod (dashed line) from 1980-1989. Estimates for 1984 for both the southern and northern California subregions were less than 30,000 lingcod and were not included in these calculations, as were 1985 and 1987 estimates for the southern California subregion.

sampled by the MRFSS in the Washington subregion during 1989) were 281,690 and 133,301 fish, respectively. Most of the difference in the two surveys came from the 1981 and 1982 estimates which account for 96% of the total difference.

The comparison between the MRFSS estimates and the CDF&G CPFV logbook data followed the same general pattern of high MRFSS estimates prior to 1983 (Fig. 3). Following 1982, MRFSS

estimates dropped, but remained higher in terms of absolute numbers. The MRFSS estimates and CDF&G CPFV logbook data for the period from 1980 through 1989 were 988,000 and 463,889 fish, respectively. The MRFSS estimates for 1984 for both the southern and northern California subregions were less than 30,000 lingcod and were not included in these calculations, as were 1985 and 1987 estimates for the southern California subregion. Again, most of the difference in the two surveys came from the estimates prior to 1983, which accounted for 58% of the total difference.

DISCUSSION

Comparison of combined recreational and commercial landings to Acceptable Biological Catch

When recreational and commercial lingcod landings were combined, they exceeded the Acceptable Biological Catches (ABC's) in 7 out of 10 years in the Eureka area, 6 of 10 years in the Monterey area, and 1 year each in the Conception and Vancouver areas (Table 8). Combined landings for the Columbia area never approached the ABC of 4,000 metric tons set for that area. Almost all of the cases in which the ABC's were exceeded were in the Eureka and Monterey INPFC areas. The ABC's were set considering only commercial landings. The relatively large size of recreational landings compared to commercial landings in the Eureka and Monterey areas mark these areas as important for incorporating recreational landings in future management plans.

Table 8. Combined commercial and recreational landings in metric tons of lingcod by year and INPFC area. Acceptable Biological Catch (ABC) is given for each INPFC area.

YEAR	VANCOUVER	COLUMBIA	EUREKA	MONTEREY	CONCEPTION
1980	812	1,492	706	1,763	670
1981	871	1,741	682	1,586	307
1982	1,084	2,364	699	1,444	255
1983	846	2,429	539	1,006	99
1984	788	2,033	462	986	109
1985	463	2,133	509	1,097	175
1986	428	1,167	402	906	196
1987	318	1,355	486	1,123	257
1988	316	1,555	577	1,309	294
1989	256	1,807	660	1,409	214
ABC	1,000	4,000	500	1,100	400

Northern California recreational landings history

Historically, lingcod recreational landings by weight have been one of the highest for individual species among northern California sportfish. From 1958 through 1961, lingcod had the highest percent composition by weight of all sportfish except salmon (Miller and Gotshall 1965). The MRFSS lingcod estimates from 1980 through 1989 had the highest percent composition by weight in 6 out of 10 years, surpassed only by the multispecies rockfish complex in 1982, 1983, and 1984, and by the sturgeon complex in 1988.

In the last 30 years, private/rental boats have exchanged places with the party/charter boats as the dominant fishing mode

in northern California. From 1958 through 1961, an average of 25,595 recreationally landed lingcod or 50% of the total recreational landings came from party/charter boats, while an average of 18,378 lingcod or 36% came from private/rental boats (Miller and Gotshall 1965). The MRFSS estimates from 1980 through 1989 averaged 84,889 lingcod or 30% coming from party/charter boats and 171,200 lingcod or 63% coming from private/rental boats. The exchange in importance between the two fishing modes has come from a more rapid expansion of the private/rental boat landings. Over the 30-year time period, party/charter boat landings increased by three times, while private rental boat landings increased by nine times.

Size limits for lingcod

While the 1981 size limit of 559 mm (22 in.) caused a substantial drop in the number of small lingcod landed in California, approximately 20% of the lingcod landed in California after 1980 were still smaller than allowed by the size limit (Table 9). In 1980, the year before the size limit was adopted, 60.7% of the lingcod taken in the southern California subregion and 43.6% of the lingcod taken in the northern California subregion were under 559 mm. From 1981 through 1989, those percentages decreased to averages of 31.2% and 17.4% in the southern California and northern California subregions, respectively.

Table 9. Percent of lingcod taken under 559 mm (22 in.) by subregions and years (Size data, John Witzig, NMFS, Silver Springs, Maryland, pers. comm.).

YEAR	SOUTHERN CALIFORNIA	NORTHERN CALIFORNIA	OREGON	WASHINGTON
1980	60.7	43.6	39.8	49.7
1981	33.3	19.4	61.4	47.4
1982	35.1	17.0	39.9	42.6
1983	26.8	18.4	27.9	33.6
1984	38.7	16.3	29.2	55.0
1985	20.9	10.5	20.9	51.7
1986	32.8	16.8	20.5	22.4
1987	43.4	26.0	31.1	20.3
1988	38.1	16.8	34.8	16.5
1989	12.0	15.2	21.8	19.0

California's 559-mm size limit has only succeeded in reducing the average percentage of fish taken under 559 mm in the southern California subregion to approximately equal, and in the northern California subregion to approximately one-half the percentage taken in the Oregon and Washington subregions, where there are no size limits. The size limit has had a greater effect in the northern California subregion where the 1981-1989 average percentage of undersize fish was 17.4%, than in the southern California subregion where it was 31.2%. In the Oregon and Washington subregions, the 1981-1989 average percentage of recreational lingcod landed under the California 559-mm size limit were 31.9% and 34.3%, respectively.

Size limits are intended to protect reproductive potential of the population by allowing fish to survive to maturity, and therefore are based on size-at-maturity data. In California, size-at-maturity studies have been based on small sample sizes, and the results are not consistent. Phillips (1959) found that both female (n=55) and male (n=64) lingcod from Fort Bragg started to mature at around 585 mm (23 in.). Miller and Geibel (1973) found fish taken from Monterey and Morro Bay mature at a much smaller size. The smallest spawning female (n=181) they found was 510 mm (20 in.) and the smallest spawning male (n=111) was 390 mm (15.3 in.) (Figures 4 and 5). For the Miller and Geibel data, 50% maturity for females was estimated at 588 mm, and 50% maturity for males was estimated at 424 mm (from Richards et al. 1990). Size at maturity in Canadian waters is much larger: 50% of females mature over a range of 641 to 665 mm (n=6,140), and 50% of males mature over a range of 581 to 622 mm (n=3,218). These increases in size at maturity with higher latitude could be attributed to fish growing faster further north, and/or later ages at maturity further north. Whatever the reason for these differences, unless a current, geographically comprehensive size-at-maturity study is conducted, choosing an appropriate size limit will be difficult.

Comparison of MRFSS estimates with WDF and CDF&G data

Comparison of Washington MRFSS estimates with the WDF ocean sport fishery survey estimates and California party/charter boat

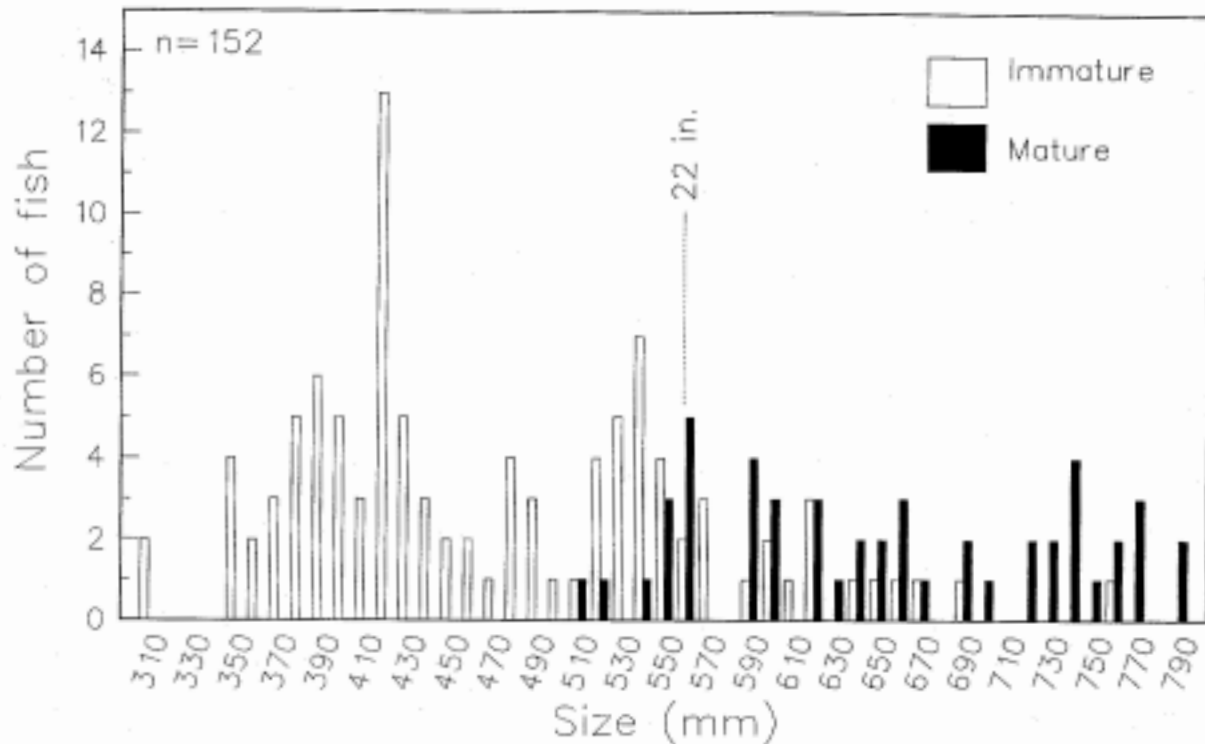


Figure 4. Size at maturity of female lingcod from Monterey and Morro Bay (Miller and Geibel 1973). Individuals over 790 mm were all mature and were not included.

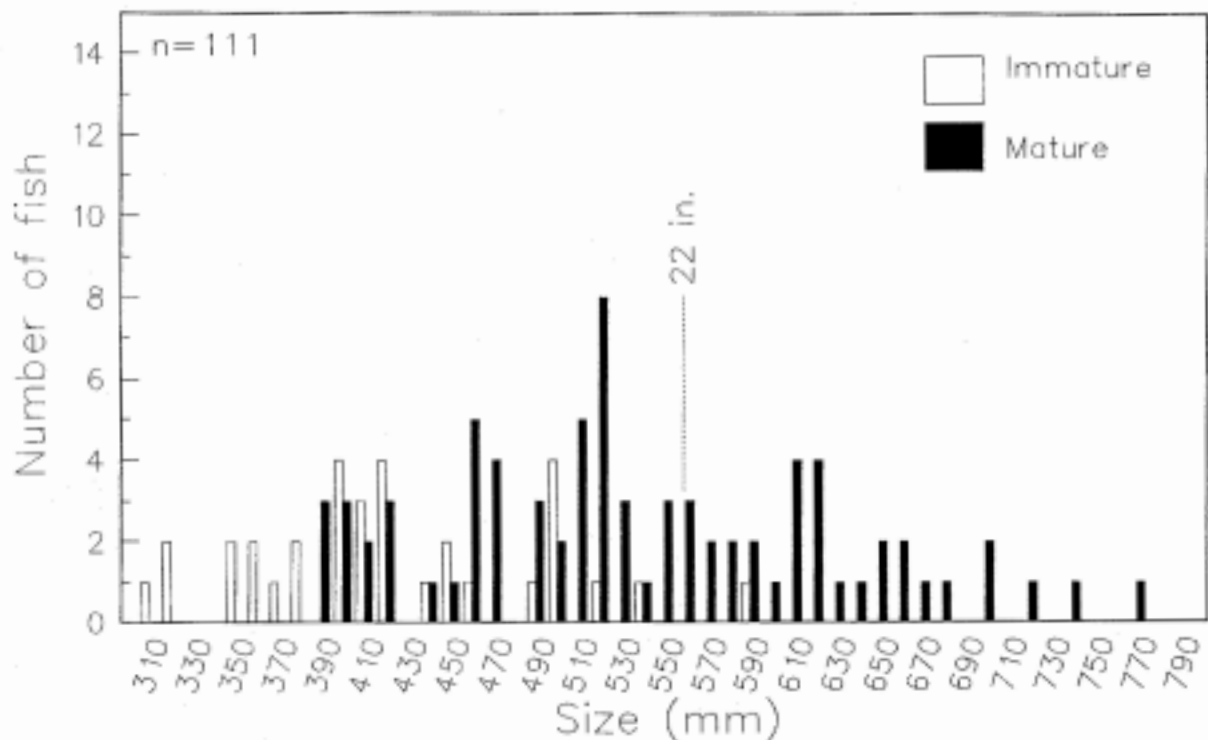


Figure 5. Size at maturity of male lingcod from Monterey and Morro Bay (Miller and Geibel 1973). Individuals over 790 mm were all mature and were not included.

MRFSS estimates with the CDF&G CPFV logbook data showed the MRFSS estimates to be higher prior to 1983 and more similar in later years (Figures 2 and 3). Although the difference was much greater with the WDF ocean sport fishery estimates than the difference associated with the CDF&G CPFV logbook data, both exhibited similar trends. The reasons for these differences between the MRFSS estimates and both the WDF survey estimates and the CDF&G CPFV numbers prior to 1983 are not apparent.

The California party/charter boat MRFSS estimates are consistently higher than the CPFV data (Fig. 3), even after 1982. The CPFV data are considered to be minimum numbers because of under-reporting by CPFV vessel operators (Helvey and Witzig 1990), and this is probably responsible for the lower numbers of the CPFV data after 1982. The difference in numbers for lingcod between these two data sets is similar to the difference in numbers for California halibut (Paralichthys californicus) found by Helvey and Witzig.

SUMMARY AND RECOMMENDATIONS

In northern California, recreational fishing is responsible for almost half of the total removals from the population. Therefore, northern California is the area where management attention to recreational landings is most critical. In southern California, recreational landings are larger than commercial landings, but total lingcod landings are small. In Oregon and Washington, recreational landings are a much smaller portion of the total removals from the population.

Coastwide lingcod length frequencies have similar average sizes, although lengths at maturity increase with latitude. Currently, only California has a recreational size limit of 559 mm (22 in.). If size limits are to be used for recreational management to protect potential reproduction, then size-at-maturity studies with adequate sample sizes over the entire geographical area covered by the size limit are needed.

When comparing the MRFSS data with both the Washington and California data, the pattern of large differences in early years with later years being similar reduces confidence in these early estimates. This suggests that care be used when these estimates are analyzed for a temporal trend. The source of these differences may be identifiable by breaking the MRFSS estimates down into their component parts.

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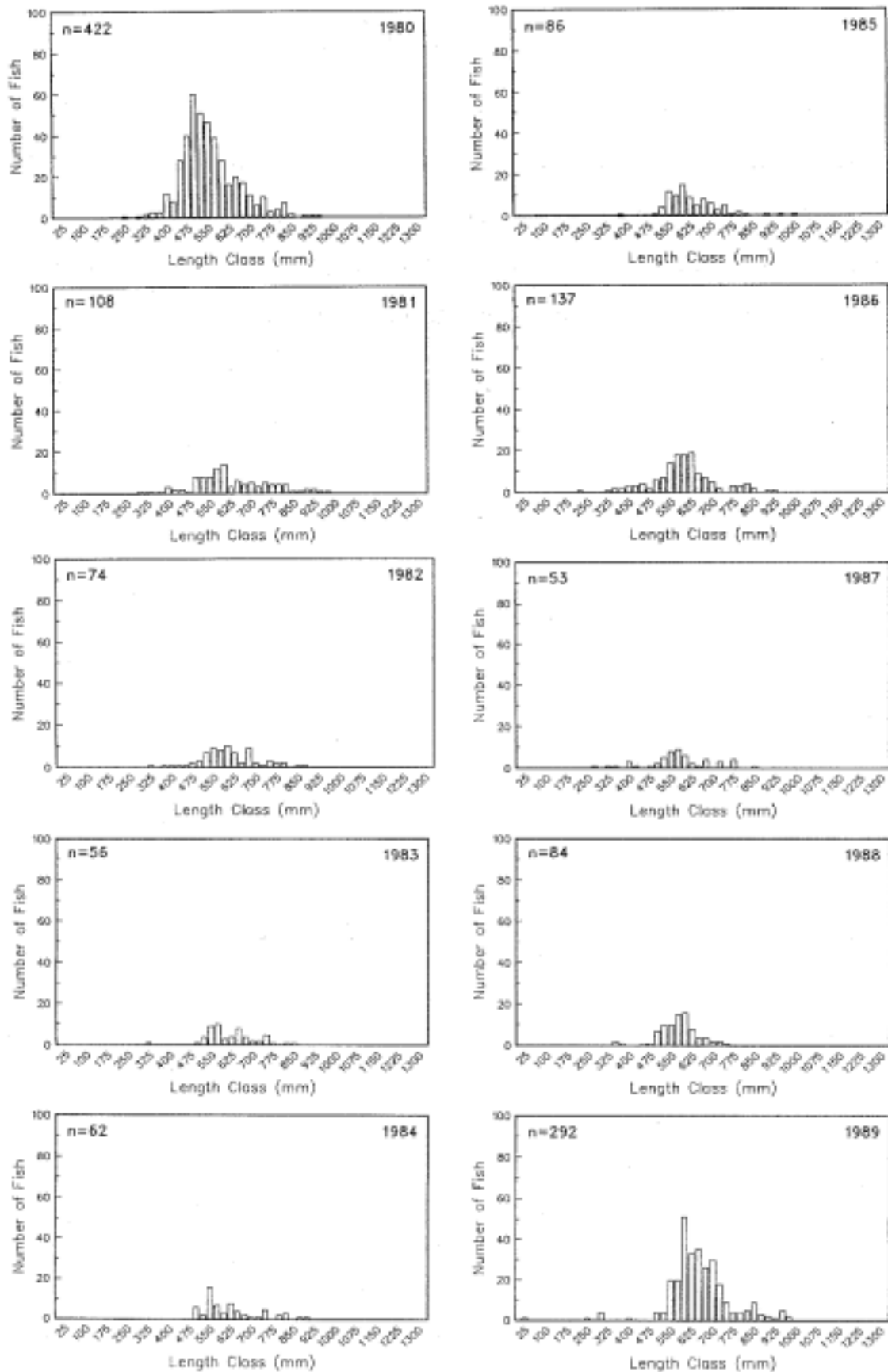
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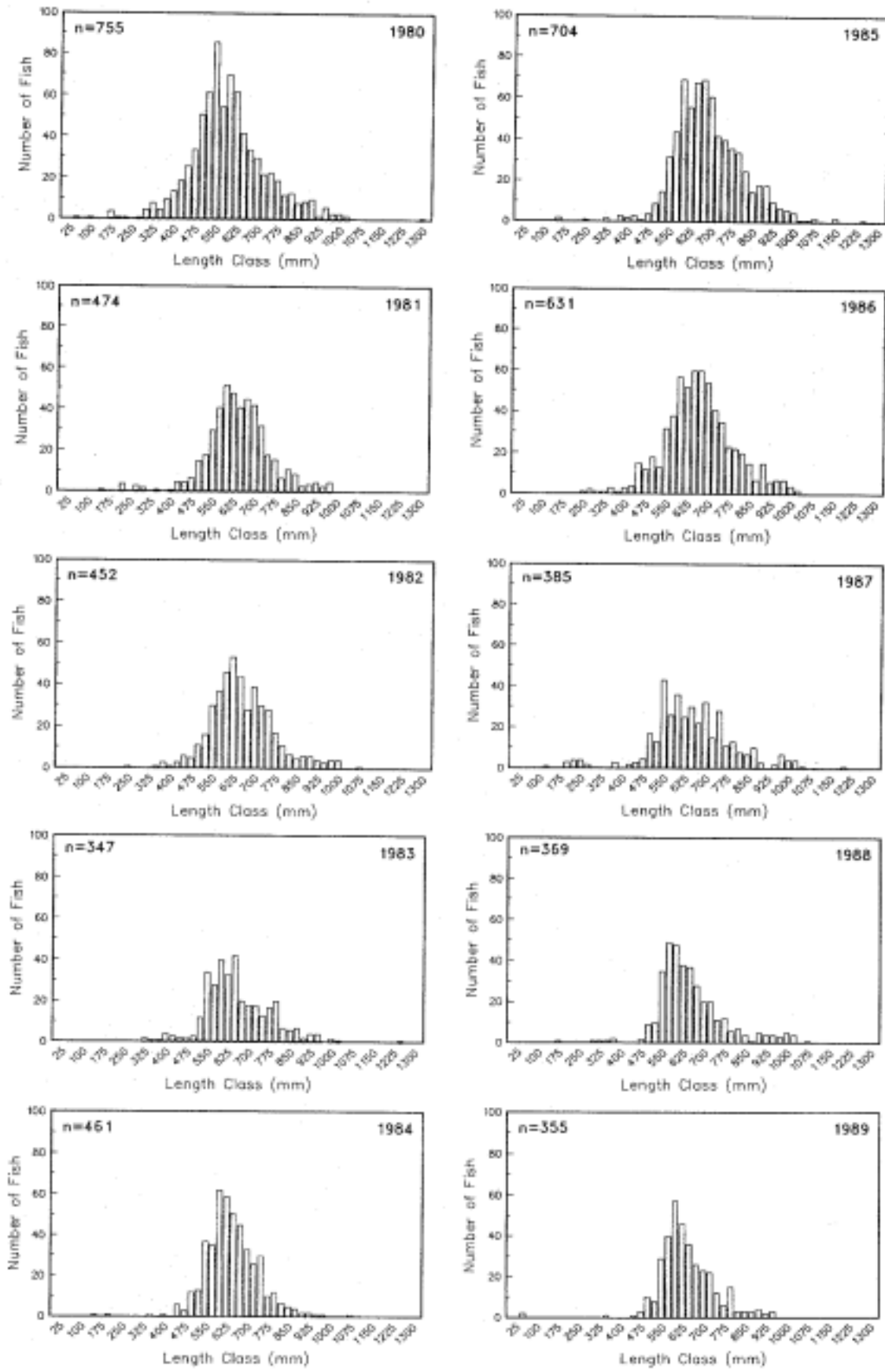
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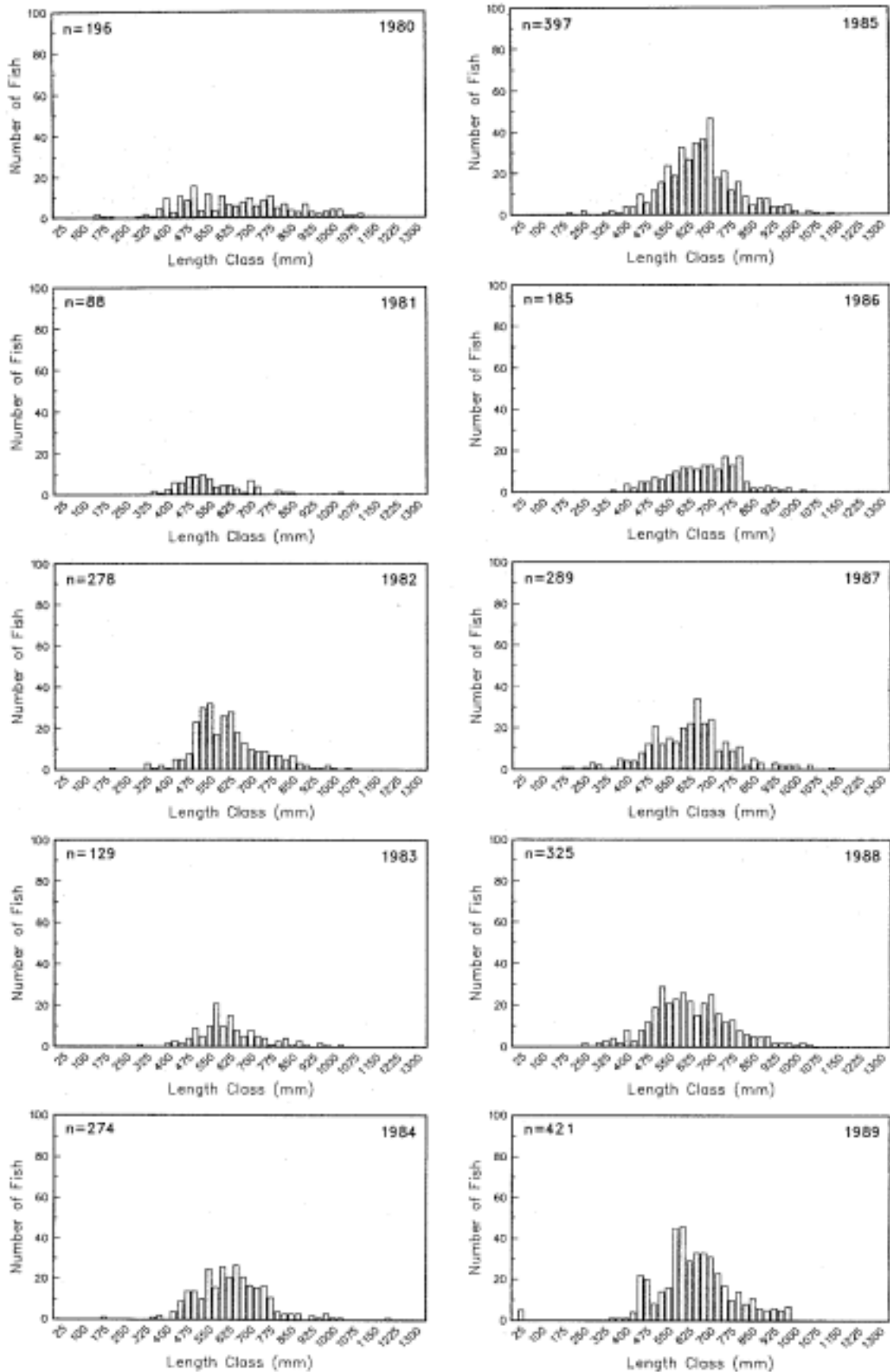
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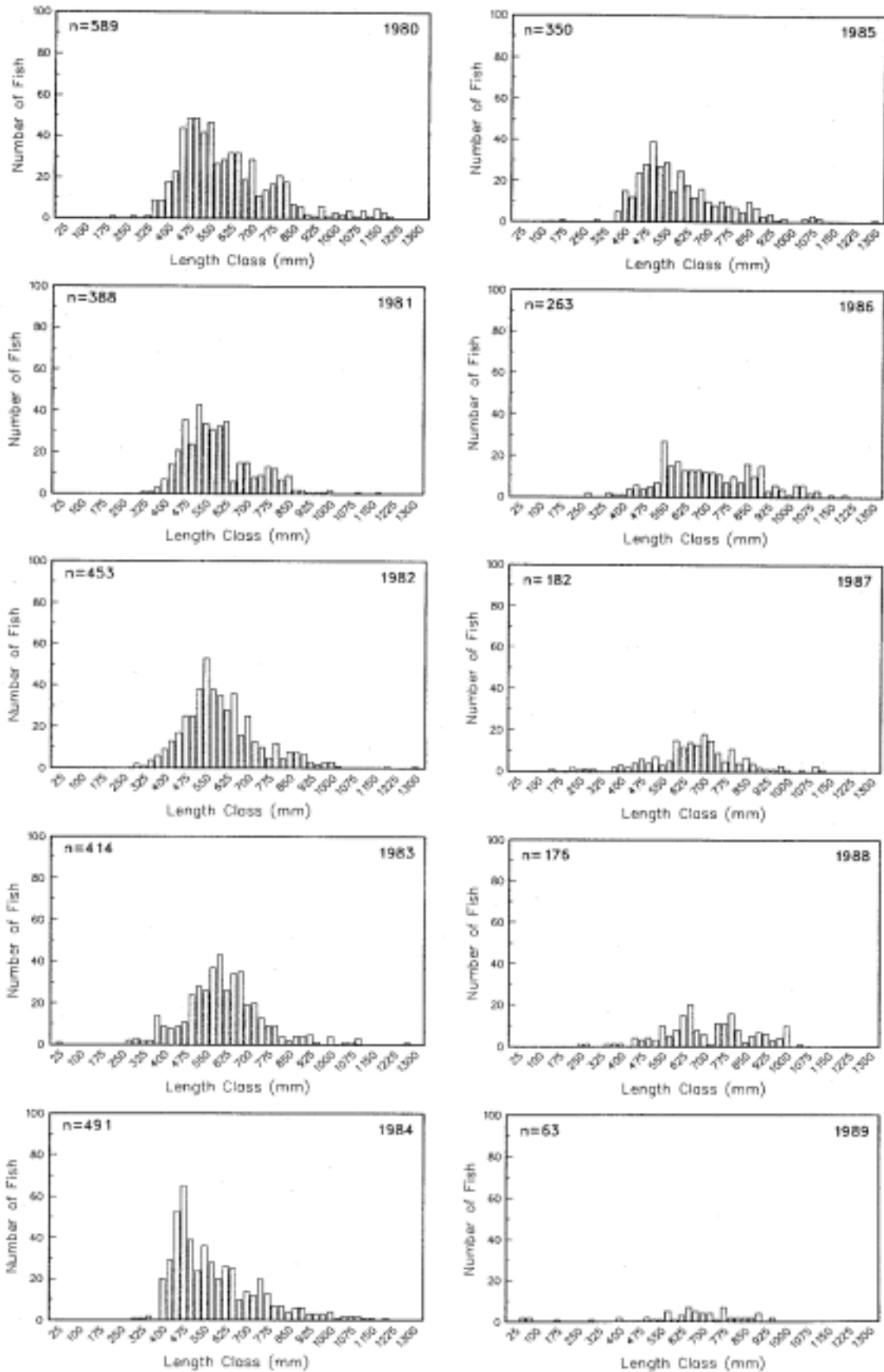
Appendix A1. Lingcod length frequencies from the MRFSS for the southern California subregion for the years 1980-1989 (n=sample size).



Appendix A2. Lingcod length frequencies from the MRFSS for the northern California subregion for the years 1980-1989 (n=sample size).



Appendix A3. Lingcod length frequencies from the MRFSS for the Oregon subregion for the years 1980-1989 (n=sample size).



Appendix A4. Lingcod length frequencies from the MRFSS for the Washington subregion for the years 1980-1989 (n=sample size).

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