NOAA Technical Memorandum NMFS

JUNE 1995

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NOAA-TM-NMFS-SWFSC-218

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

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ABSTRACT

The California Commercial rockfish fishery accounts for approximately half of California's groundfish landings. Rockfish are landed at 11 port complexes. Three types of gear are used (hook and line, trawl, and gill net). Rockfish are sorted into as many as 52 sort groups known as market categories. Primary information about the rockfish fishery is obtained by sampling of the landings. Given the large number of possible strata, it is important to know how the landings are distributed among the strata and how effective the sampling program has been.

We found that for the most part, sampling effort has been well distributed among the landings. While there are known gaps in the sampling program, particularly in southern California, most of the important strata are well sampled. We also noted that there were no clear long-term patterns in the way that fish are landed in the strata although the importance of gill nets has decreased in recent years.

We discuss the need for close monitoring of sample effort and the distribution of landings. We briefly examined the species compositions of some of the market categories to examine the dynamics of sorting of the catch.

CONTENTS

INTRODUCTION

In California, rockfish (genus Sebastes) make up about 50% of the commercial groundfish landings (Pacific Fishery Management Council, 1993). There are three primary fisheries for groundfish: the line gear fishery, the trawl fishery, and the gill net fishery. Rockfish are landed commercially at eleven different port complexes (Fig. 1). In many stock assessments, catch statistics are subdivided by International North Pacific Fisheries Commission (INPFC) areas, with each area containing two or more port complexes.

For line gears, there has been a general increase in the reported landings since 1984 in all INPFC areas (Fig. 2). For trawl gears, there has been a general decrease in reported landings since 1982 with the sharpest decline observed in the Monterey INPFC area (Fig. 2). The gill net fishery exhibited an increase in reported landings through 1986 and then underwent a sharp decline. The pattern for gill nets was strongest in the Monterey INPFC area (gill nets are prohibited north of latitude 38 [Fig. 1]).

To monitor the landings, the California Department of Fish and Game and the National Marine Fisheries Service operate a commercial market sampling program. This program was developed in 1977 and was originally focused on the trawl fishery in northern and central California. The program has evolved over time to monitor all aspects of the fishery.

California had 52 market categories into which rockfish could be sorted between 1980-92 (Appendix A). Rockfish are sorted into market categories for two reasons: regulation and dealer/fisherman option. For three species, bocaccio (Sebastes paucispinus), yellowtail rockfish (S. flavidus), and widow rockfish (S. entomelas), there are trip limits recommended by the Pacific Fishery Management Council (PFMC) and implemented and enforced by the National Marine Fisheries Service and the states. Fishermen are required to sort these species to allow enforcement officials to monitor compliance with trip limits and to facilitate tracking of the landings. The requirement to sort widow rockfish began in 1983, bocaccio sorting began in 1991, and yellowtail rockfish began in 1994 (Pacific Fishery Management Council, 1994).

The remaining 49 possible market categories have been used solely at the discretion of the dealers and fishermen. There is no legal requirement governing the sorting of fish into these market categories. The market category sort groups may include any species including non-rockfish species.

The existence of these market categories creates problems when managers attempt to estimate species, age, sex, and length compositions of the rockfish fishery. Complicating this

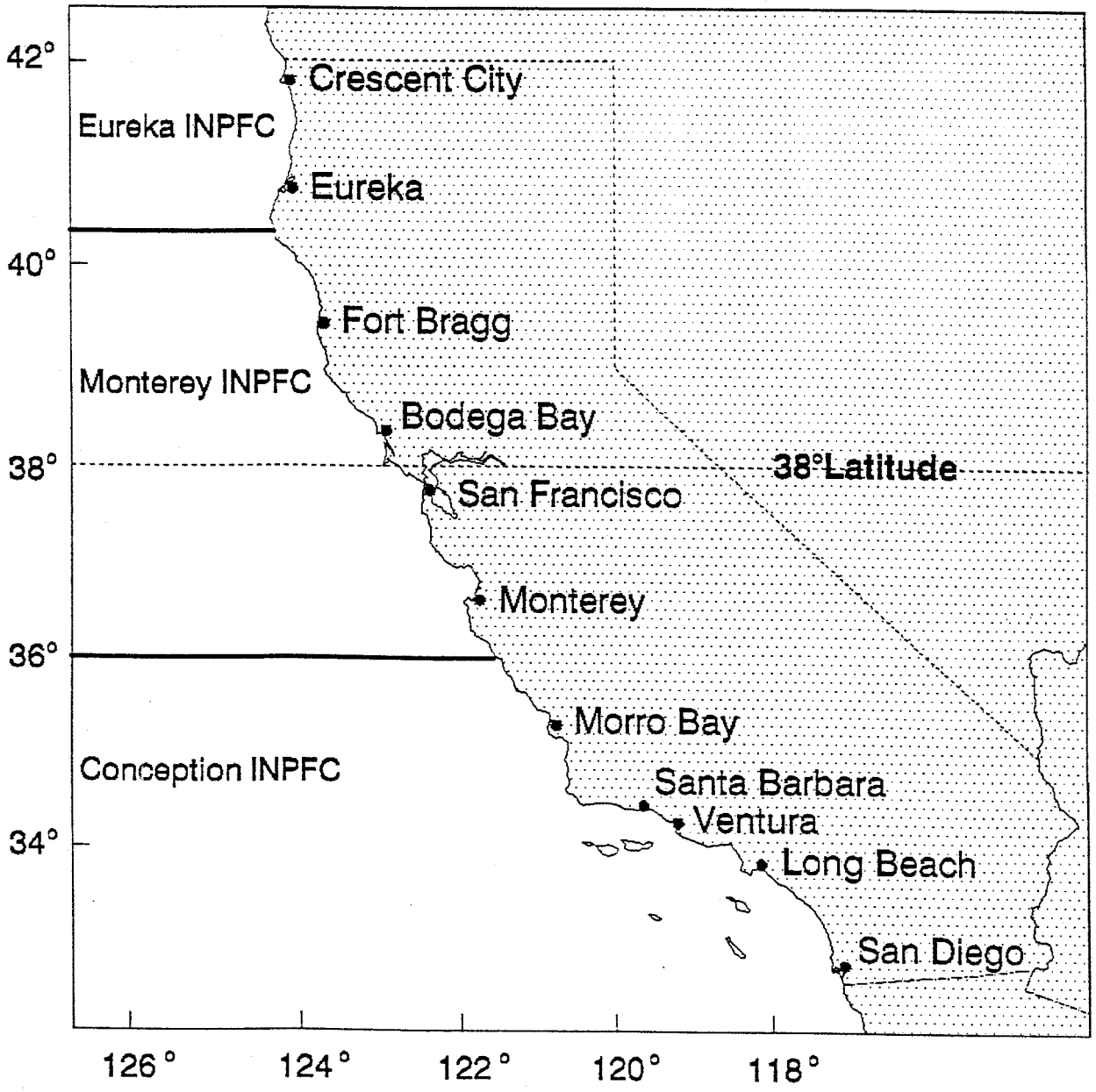


Figure 1.--Map of the California coast showing the location of the three International North Pacific Fishery Management Council (INPFC) areas and the eleven commercial fishing port complexes.

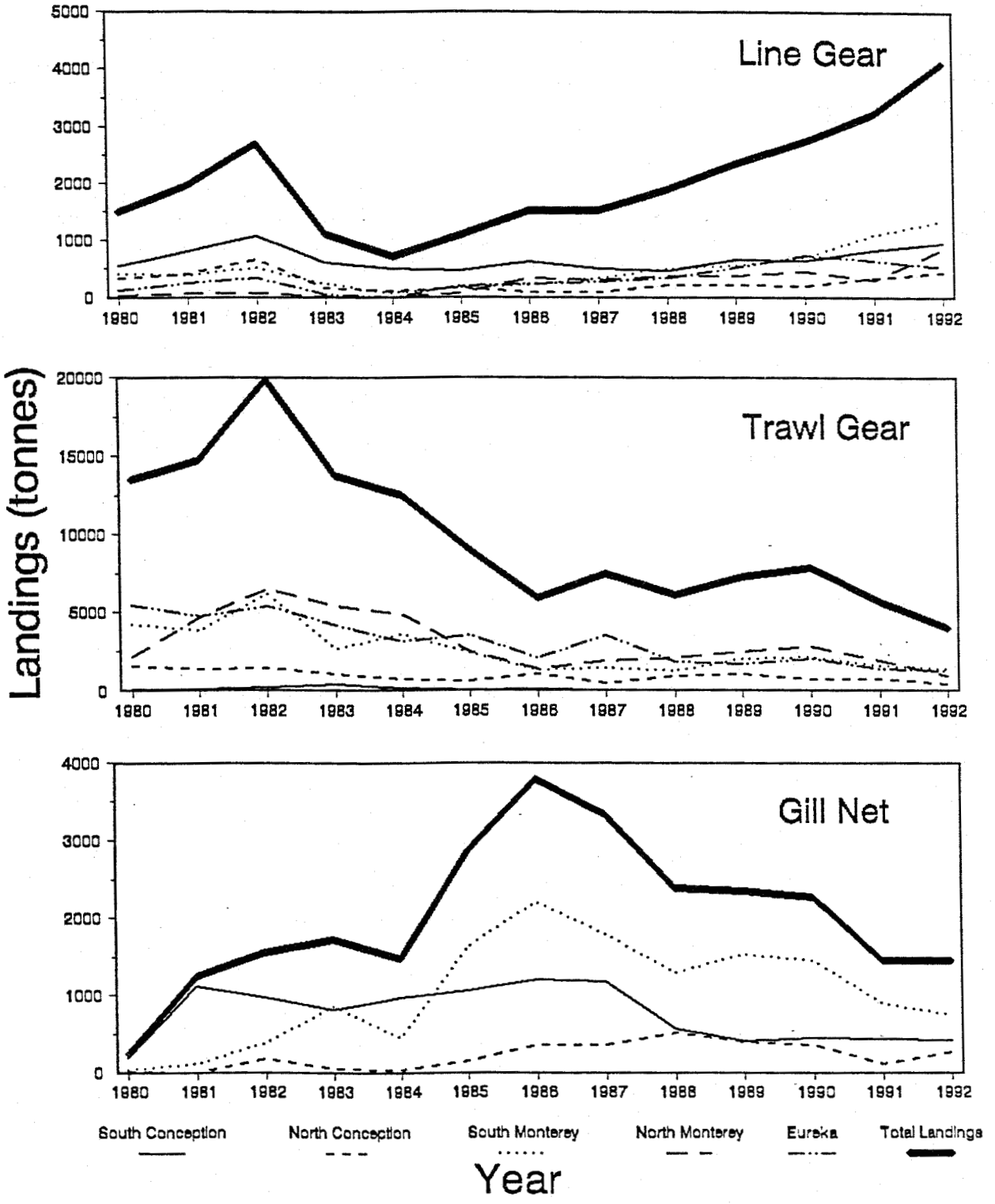


Figure 2.--California commercial rockfish landings by gear type for five regions. Note: Gill nets are prohibited from the Eureka and north Monterey regions.

situation even further is the fact that rockfish are landed by two different types of gear at eleven port complexes and a third gear at seven of the port complexes. Taken together, there are 1,537 possible combinations under which rockfish could be landed commercially in California in any given year.

This large number of possible combinations represents a serious problem to sampling of the commercial landings. There are between 7 and 15 samplers monitoring landings in California depending upon year and season. With this level of sampling, it is not possible to completely sample all of the strata.

This analysis was done to determine how landings are distributed among market categories and to examine how effective the sampling program has been. We then describe the species composition of some of the market categories to help managers make decisions about sampling effort and the way in which samples are expanded to the landings.

METHODS

Data used in this study came from two sources: the commercial landing receipt database and the California Cooperative Survey program. All vessels making a commercial landing of fish are required to make out a landing receipt which is provided to the California Department of Fish and Game (CDF&G). The landing receipts include the following information: gear, vessel number, date of landing, pounds landed, and market category. The landing receipt data is maintained by CDF&G and is used to monitor landings. To obtain detailed information on the groundfish fishery, the CDF&G jointly operates a port sampling program with the National Marine Fisheries Service's Tiburon Laboratory. This survey has been conducted since 1977. During the early years of the study (1977-79), there were problems with the data and sampling was sporadic, so we chose to omit these years from the analysis.

In this study, the landing receipts for all rockfish market categories (Appendix A) and commercial rockfish samples from 1980-92 were used. The receipts were first divided into three gear types: line, trawl, and gill net. All line gears were combined as were all trawl gears. The receipts were further divided into four time intervals: 1980-82, 1983-85, 1986-88, 1989-92. Finally, they were divided into five regions: south Conception (San Diego, Long Beach, Ventura, and Santa Barbara), north Conception (Morro Bay), south Monterey (Monterey and San Francisco), north Monterey (Bodega Bay and Fort Bragg), and Eureka (Eureka and Crescent City) (Appendix B).

To examine the relationship of availability of landings (number of deliveries) to importance of the strata (tonnes landed), we performed simple linear regressions by market category. This analysis was stratified by gear, region, and time interval. The analysis was done using the General Linear Models procedure in the SAS statistical package (SAS Institute, 1987).

To examine how landings were distributed among gear/region/time interval/market category strata, we looked at the percentage of tonnes each combination represented of the total landings. We stratified by region, time interval, and gear, and plotted the percentage that each of the market categories contributed to the landings. To simplify the plots, we deleted all market categories which contributed less than one percent. We then inspected the plots for trends.

To examine how samples were distributed among strata, we plotted the percentage of samples in each of the gear/region/time interval/market category combinations. These plots were examined for apparent trends.

We used simple linear regression to determine how well sampling effort matched the distribution of landings. We first calculated the percentage of samples by market category/gear type. We then matched them with the percentage of landings (tonnes) by market category/gear type. Finally, we performed a simple linear regression, stratified by region and time interval, and inspected the plots. Since no samples were taken in the south Conception region prior to 1986, the landings from that time and region were omitted from the analysis.

To examine the species compositions of the general rockfish market category (250), an expansion of selected subsets of the data was performed. The expansion was done by obtaining the fraction (by weight) each species made up of each sample and multiplying the fraction by the landed weight of the sample. Then the expanded weights of the individual species were summed and the overall sampled percent was calculated. This method was similar to that proposed by Sen (1984) which is used for the annual expansions in California. This was done to compare the species composition among gears, regions, and time intervals. The species compositions were examined for apparent trends and are used for discussion purposes only.

We also examined the species compositions of seldom sampled market categories. The species compositions were calculated in the same manner as for the general rockfish market category.

We were also interested in determining whether certain market categories could be safely combined. In particular, we were interested in determining whether the species compositions for brown rockfish (267) could be combined with group bolina (957),

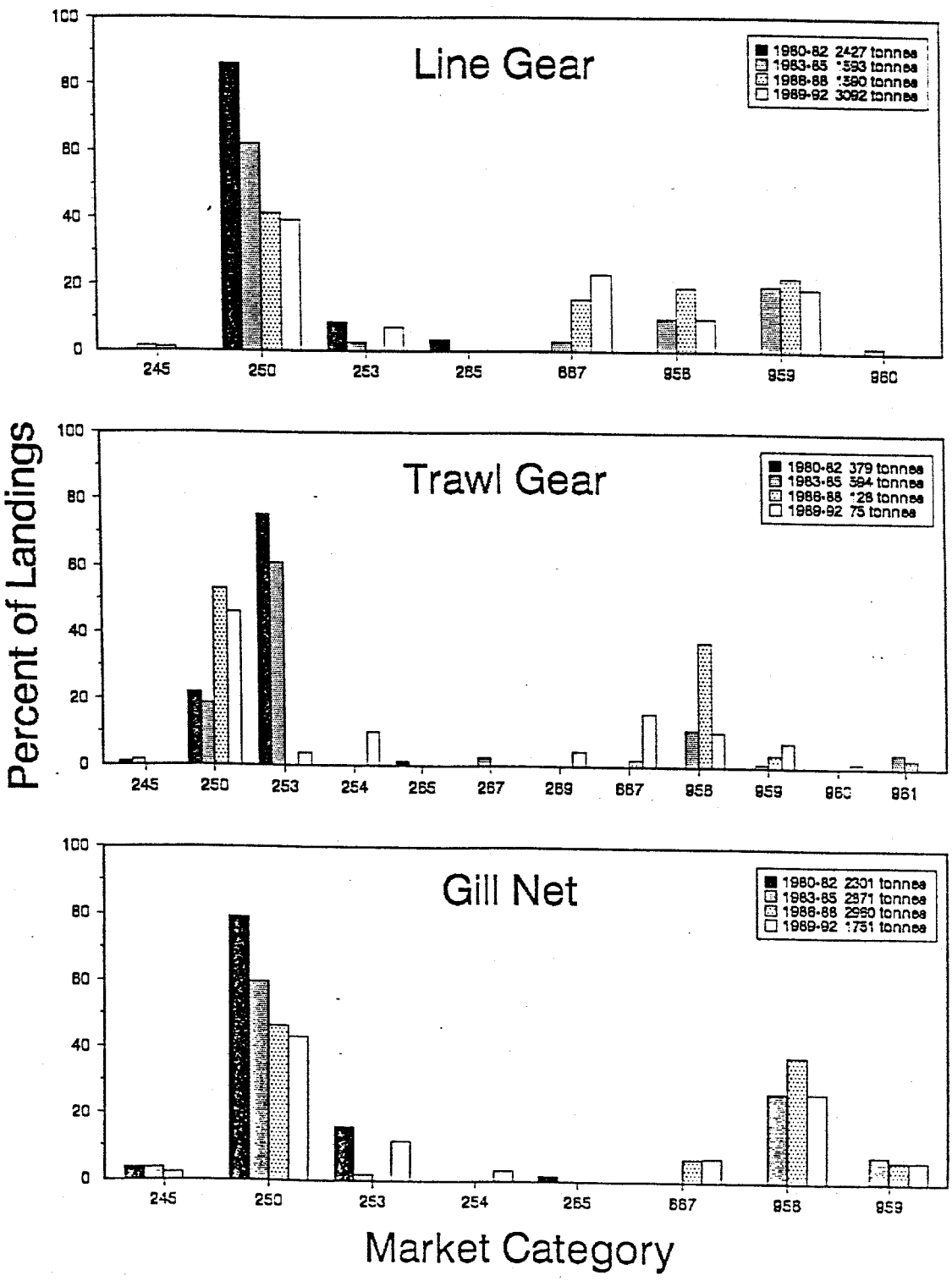
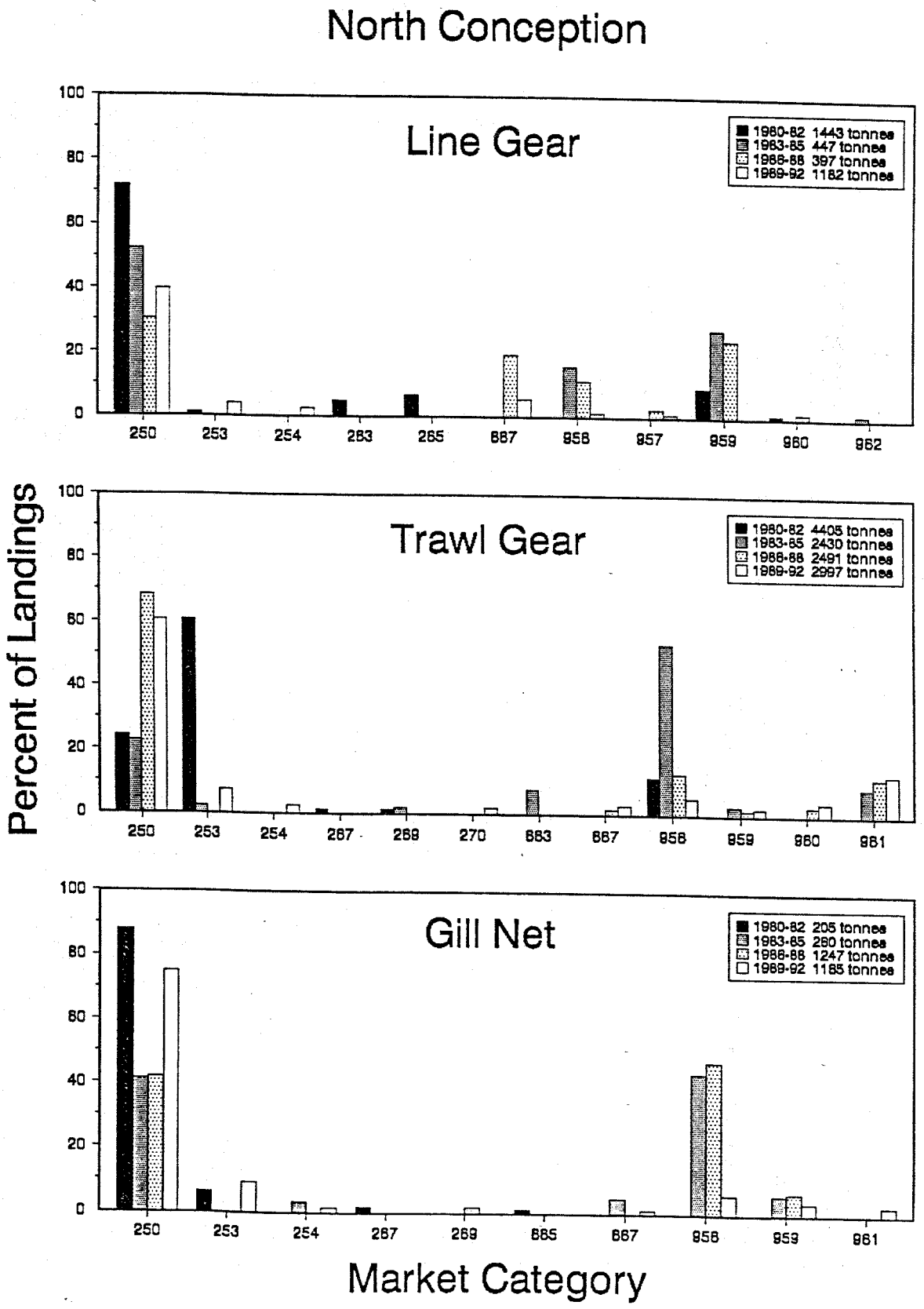


Figure 3.--Percent of commercial rockfish landings in each market category for five regions, four time intervals, and three gear types from 1980-92.



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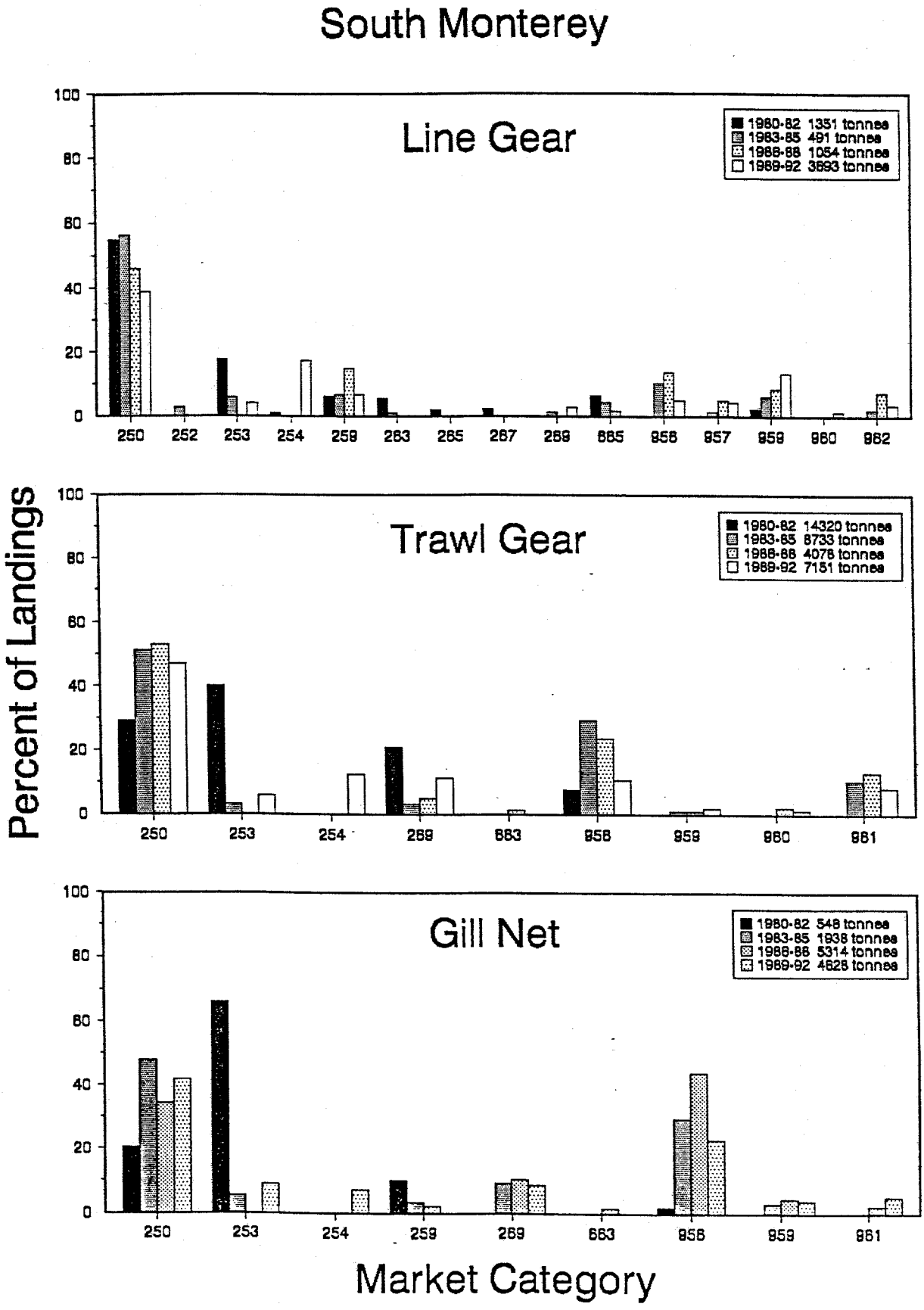

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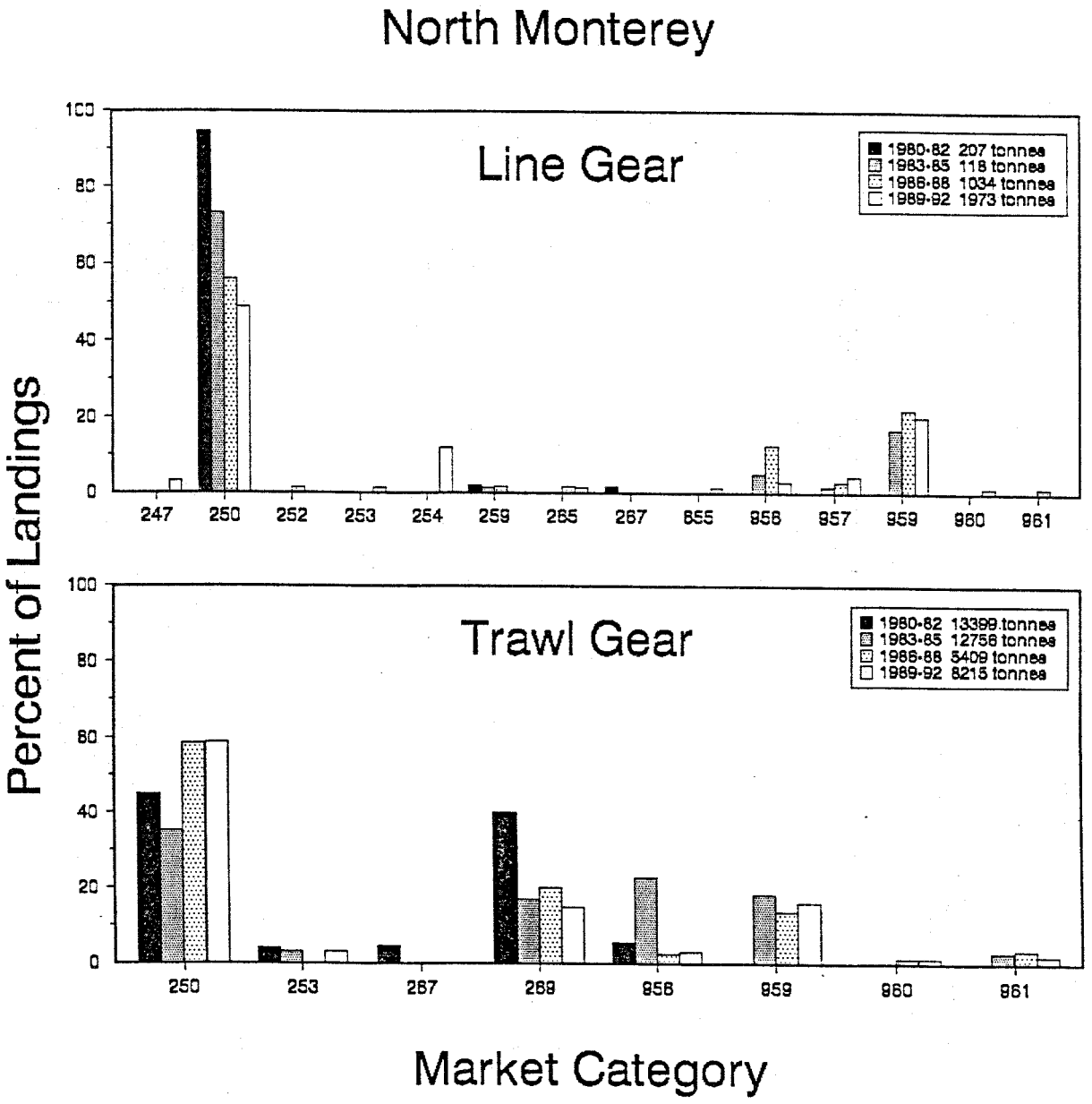

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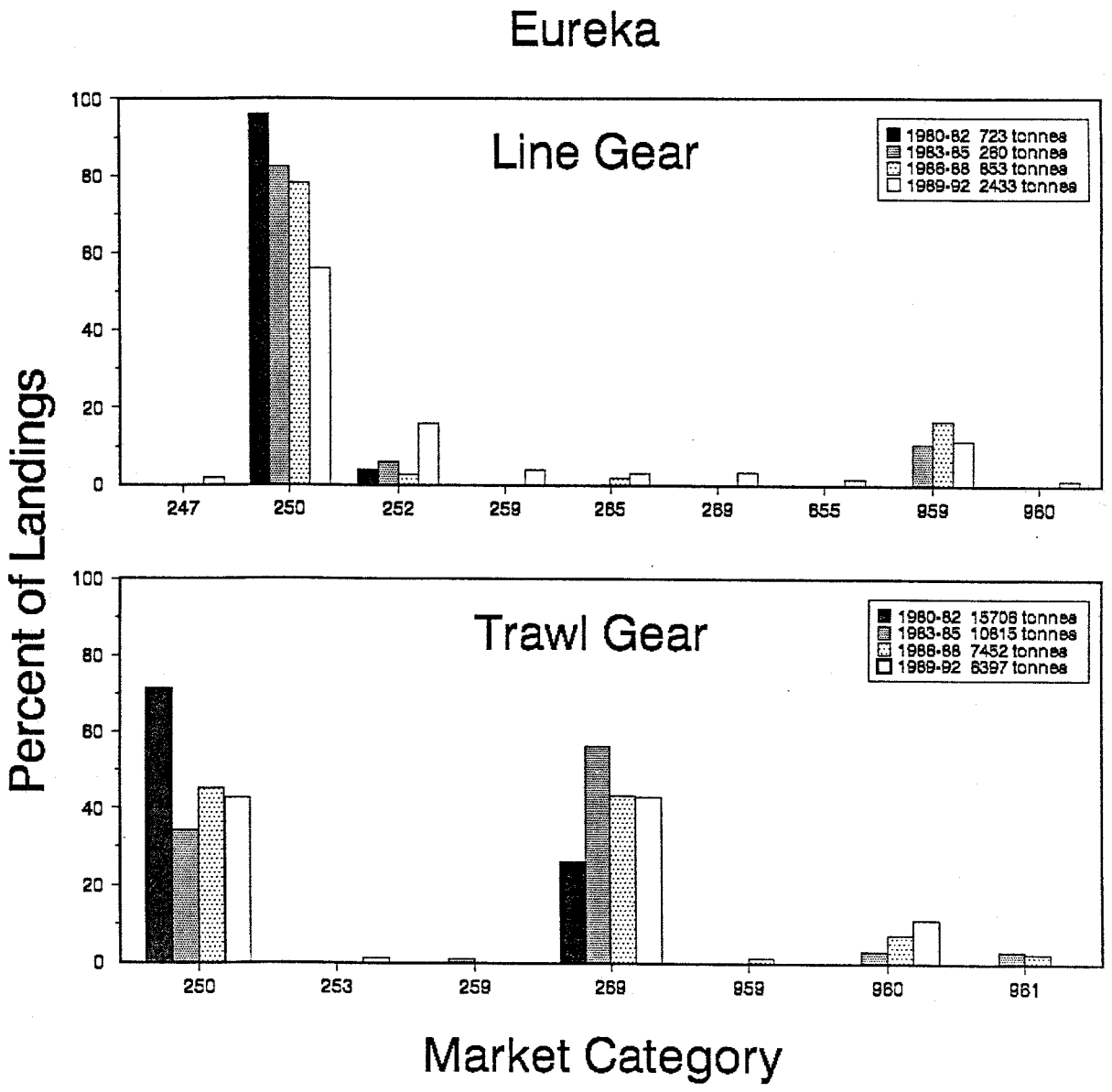


Figure 3.--Continued.

gopher (263) could be combined with group gopher (962), and whitebelly (246) could be combined with copper (655). To examine this possibility, we compared the species compositions of the three brown rockfish samples with the 38 samples of group bolina. We compared the two samples of gopher with the 37 samples of group gopher. To determine whether whitebelly (a name used for copper rockfish in southern California [Miller and Lea, 1972]) could be considered a pure copper rockfish market category, we examined where the landings were made in comparison to where the copper rockfish samples were taken. This was necessary because no samples of whitebelly had ever been taken.

RESULTS

Frequency of Deliveries Versus Total Landings

The R^2 and F values of the regression of deliveries versus tonnes landed (Appendix C) suggest that within a gear/port complex/ time period, the availability of a landed market category (number of deliveries) is a good indication of the relative importance of the market category (tonnes landed). Line gear generally had the highest correlation. Gill net had the lowest correlation, which was still significant in most strata.

Distribution of Landings Among Market Categories

The plots presented in Figure 3 and the data in Appendix D suggest that for most gears and ports, there has been an increase in number of market categories and a decrease in the importance of the general rockfish market category (250) over time. This pattern does not seem to be dependent on changes in the landings since line gear landings have been increasing over time, while trawl landings are generally decreasing (Fig. 2). The exception to this pattern is for trawl gear in the south Monterey and north and south Conception regions where market category 250 is increasing in importance.

In most regions, line gear typically has more sort groups than the other gears (Fig. 3, Appendix D). In addition, market category 959 (group red) is important in line gear and much less in the other gears. For the most part, market category 269 (widow rockfish) is only important for trawl gear in the Monterey (north and south) and Eureka regions. In Eureka, market category 252 (black rockfish) is important for line gear and not important for trawl gear. Also, in the Eureka region, market category 960 (group small reds) is important for trawl gear but not for line gear. In the north Conception region, market category 961 (group rosefish) is important for trawl gear but not for either line or gill net. Market category 667 (blackgill rockfish) is important

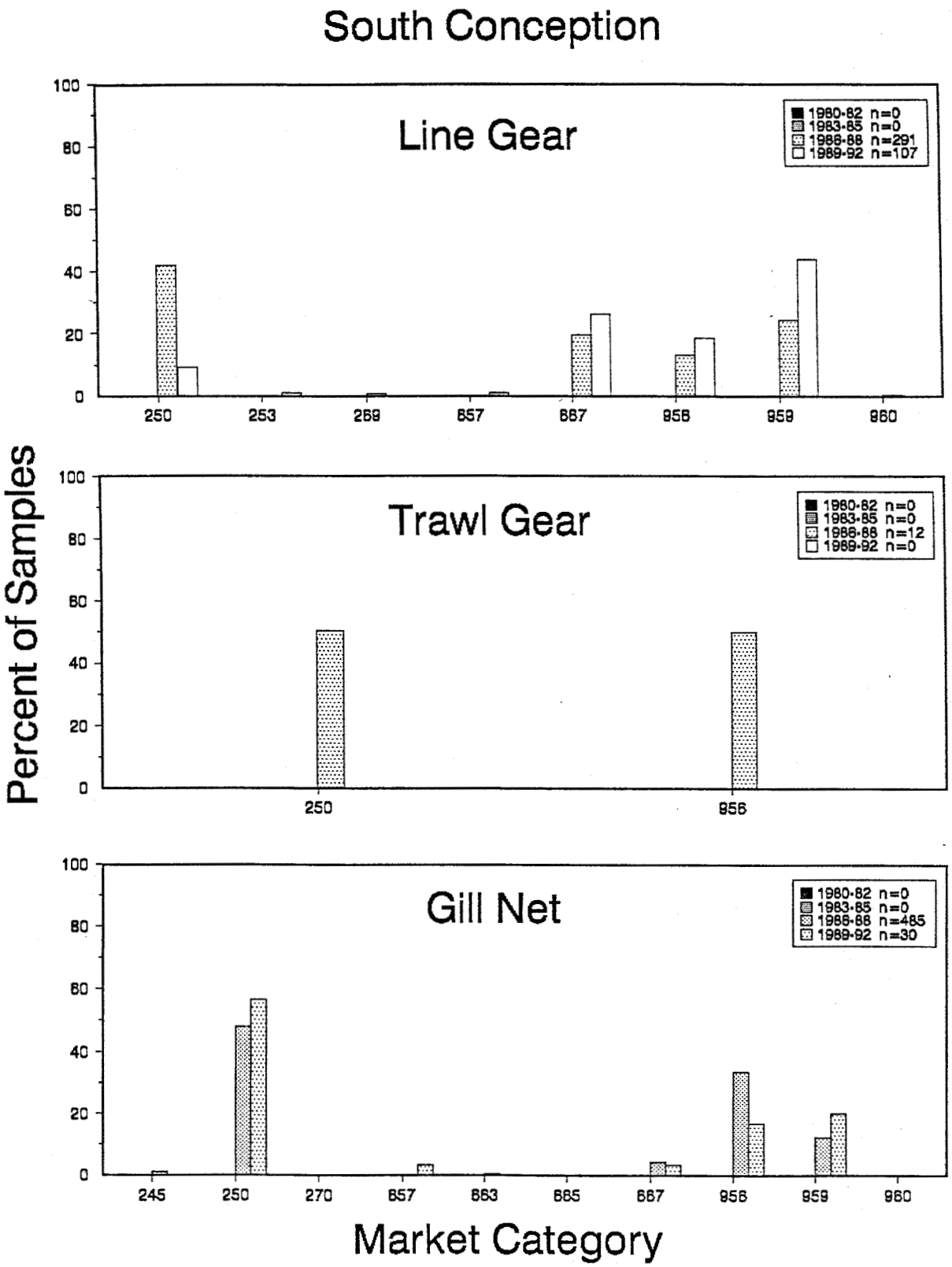
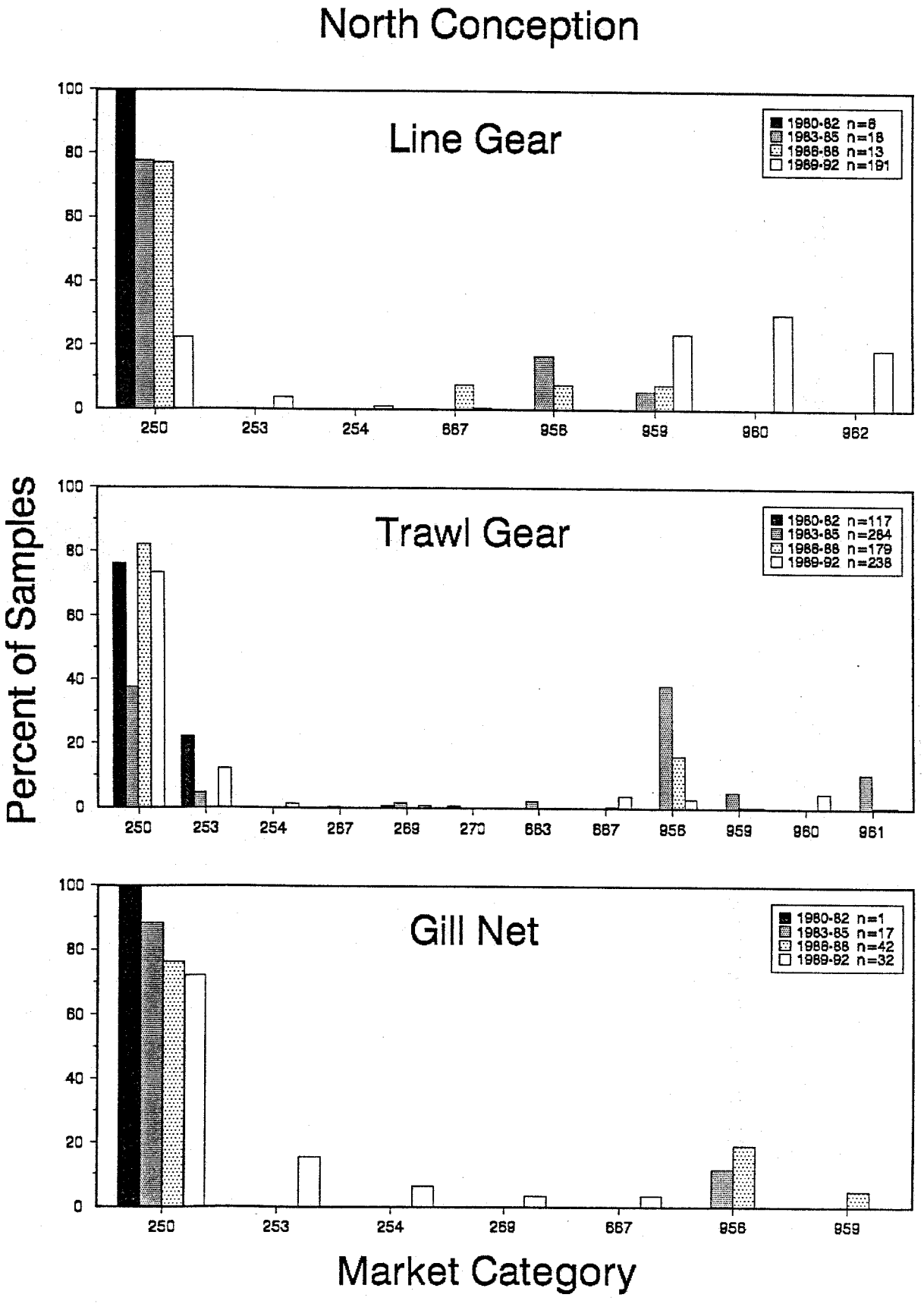


Figure 4.--Percent of the commercial rockfish samples in each market category for five regions, four time intervals, and three gear types from 1980-92. Sample size is indicated in the legend.



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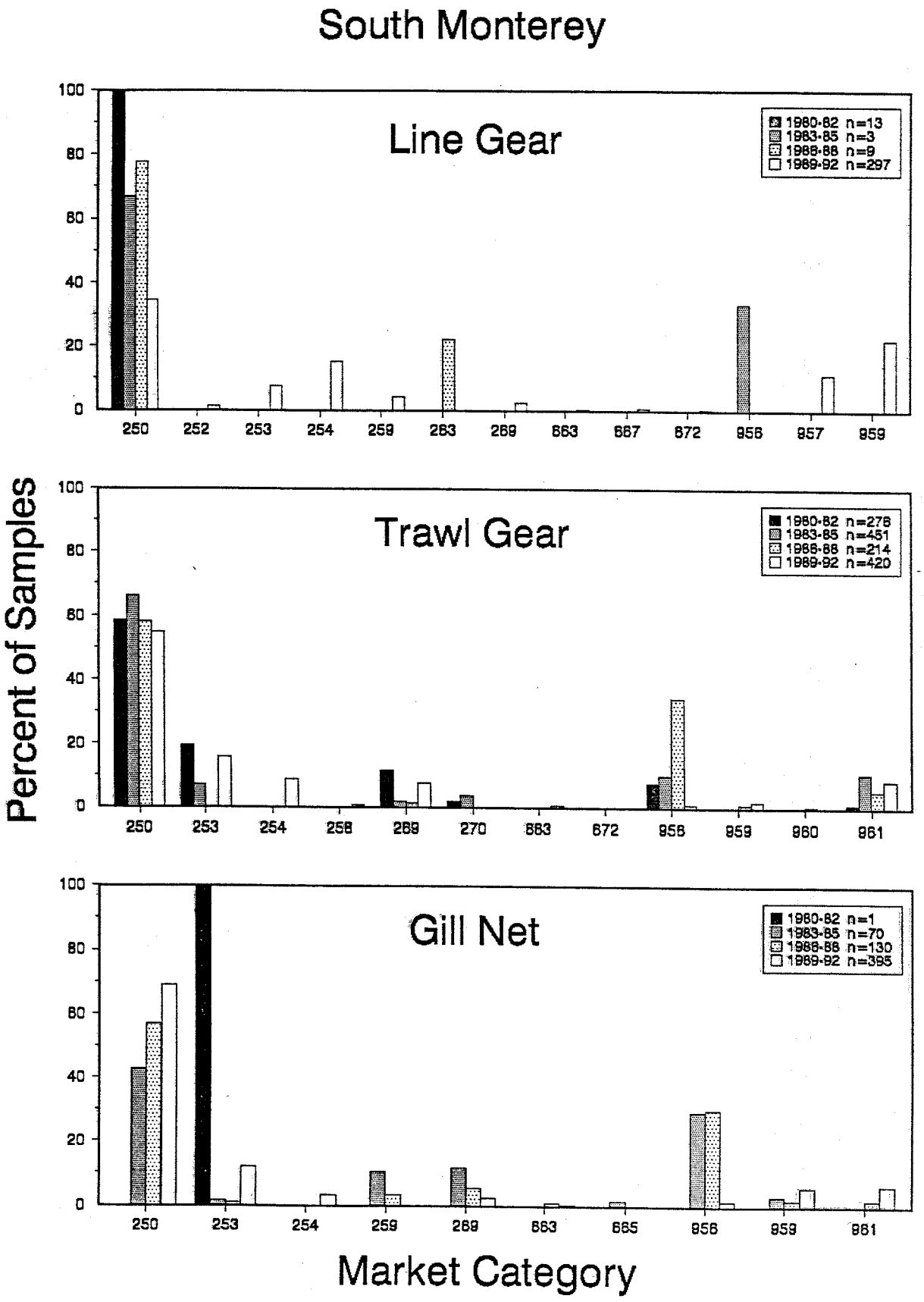

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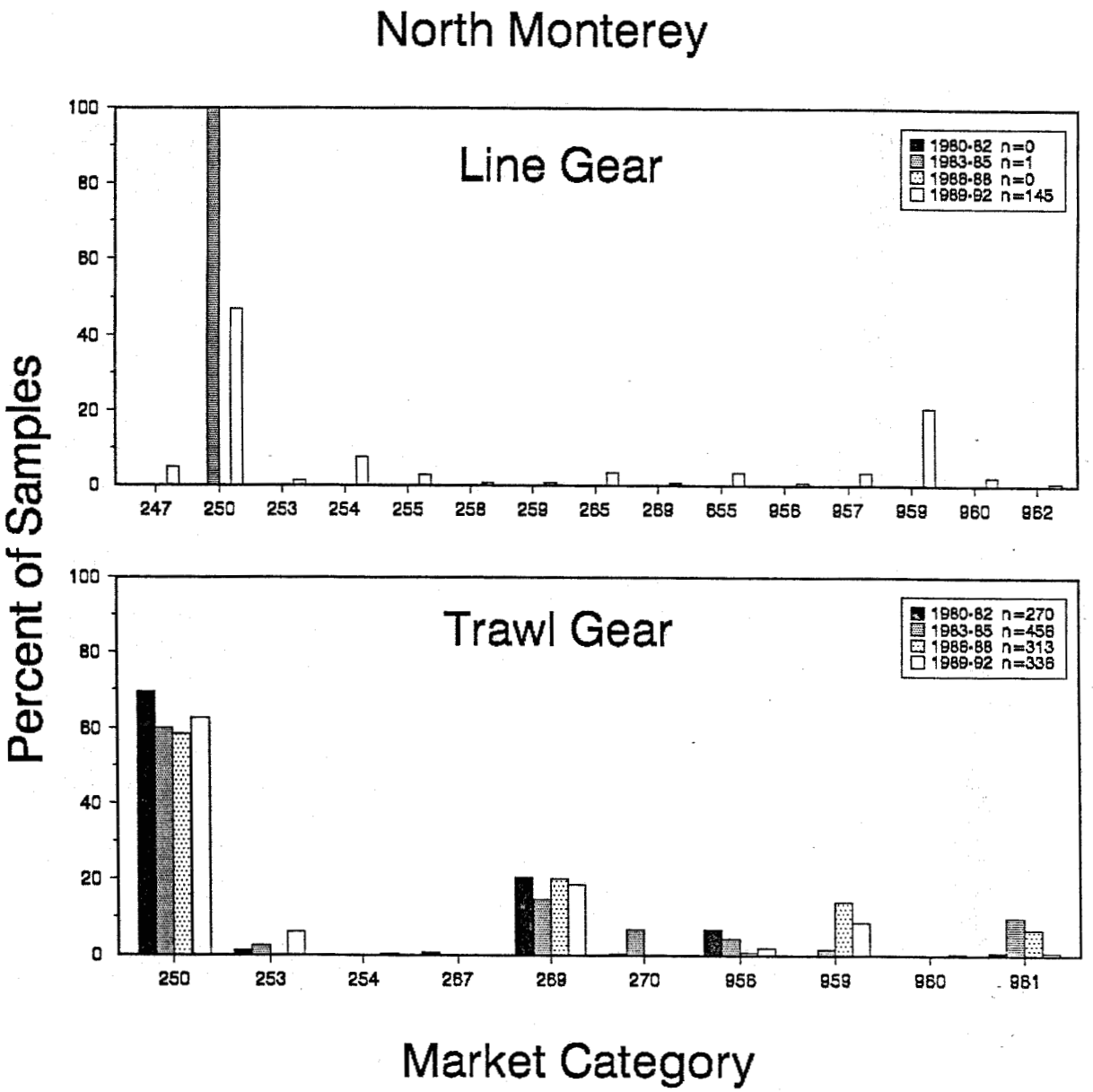

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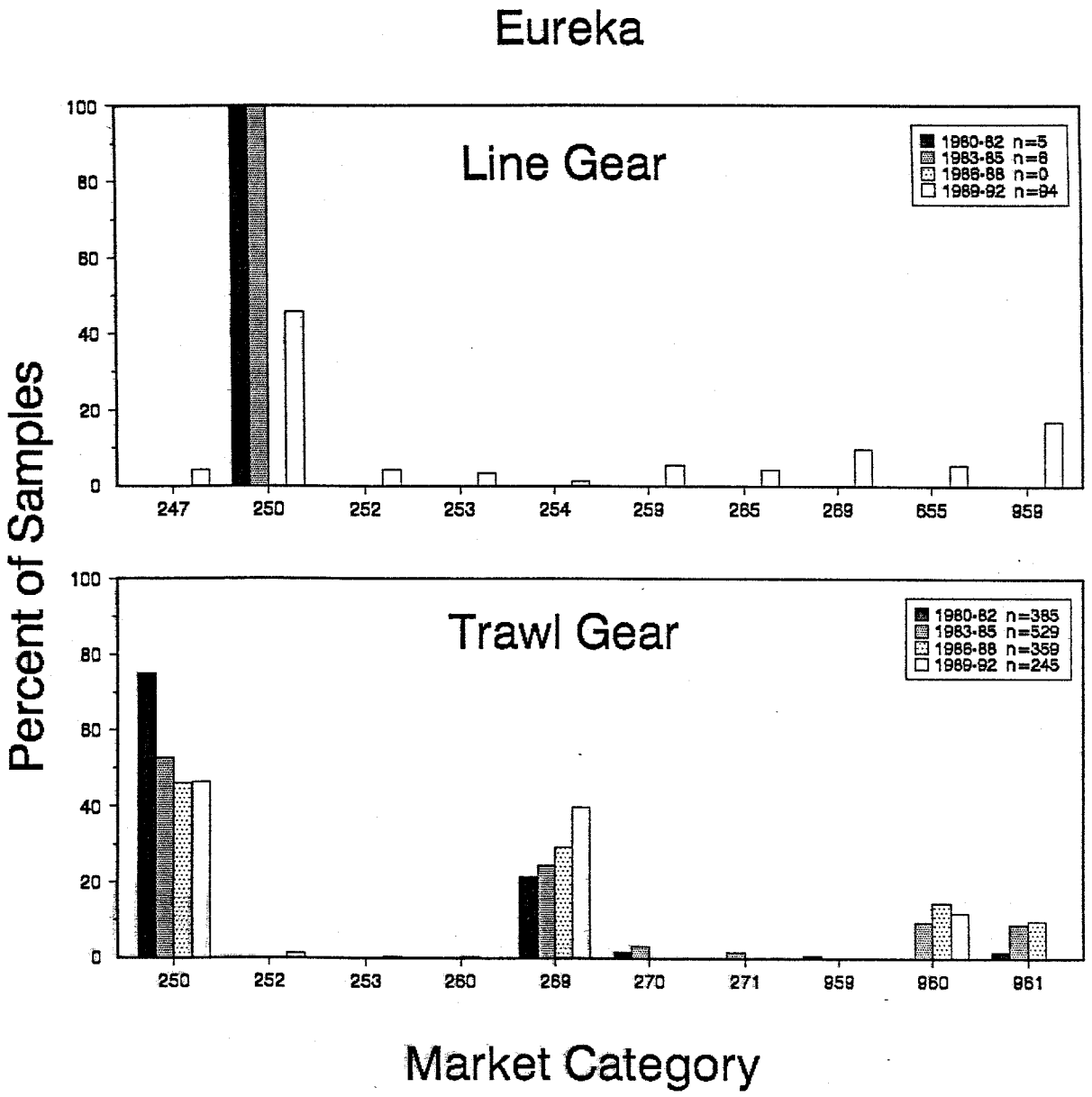


Figure 4.--Continued.

in line gear landings in the north and south Conception regions but not in any other region.

Distribution of Samples Among Strata

Very little sampling has been done in the south Conception region (Fig. 4, Appendix D). There are no samples for this region prior to 1986, and there were only 12 samples between 1980 and 1992 for trawl gear. After 1986, there has been an average of 56 samples per year for line gear. The samples were distributed among the following market categories: general rockfish (250), blackgill (667), chilipepper-bocaccio (956), and group red (959). For gill nets, the amount of sampling was good from 1986-88 (160 samples per year) and poor from 1989-92 (7 samples per year). Gill net samples were predominantly general rockfish (250), chilipepper-bocaccio (956), and group red (959).

Sampling of line gear prior to 1989 was poor in all areas (Fig. 4, Appendix E). Beginning in 1989, sampling for line gear was well distributed among a variety of market categories.

Sampling of trawl gear in all regions except south Conception has been at a high level (Fig. 4, Appendix E). Several market categories have been sampled, with general rockfish (250) being the most heavily sampled. In the north Monterey and Eureka regions, widow rockfish (269) has been heavily sampled.

Prior to 1983, sampling of the gill net fishery was limited. Since then, it has been sporadic. The general rockfish market category (250) is the most heavily sampled, followed by the chilipepper/bocaccio market category (956).

Comparison of Sample Distribution to Landings

The results of the linear regression of sampled frequency versus landing percentage (Fig. 5, Table 1) suggest that the sampling effort has been well distributed among the landings. In 10 of the 18 cases, R^2 values were .80 or greater and had slopes (b) within the range of 0.90-1.10. Note that the regressions were done after eliminating market categories without landings. There were four cases where the sampling did not match the landings well: south Conception 1989-92, north Conception 1980-82, north Monterey 1983-85, and Eureka 1983-85. Much of the problem for the south Conception area in 1989-92 stems from the poor sampling coverage (Appendix B). Only 137 samples were taken from 4,918 tonnes of groundfish. A similar problem was responsible for the north Conception region in 1980-82. Only 124 samples were taken from 6,053 tonnes of groundfish. Lack of

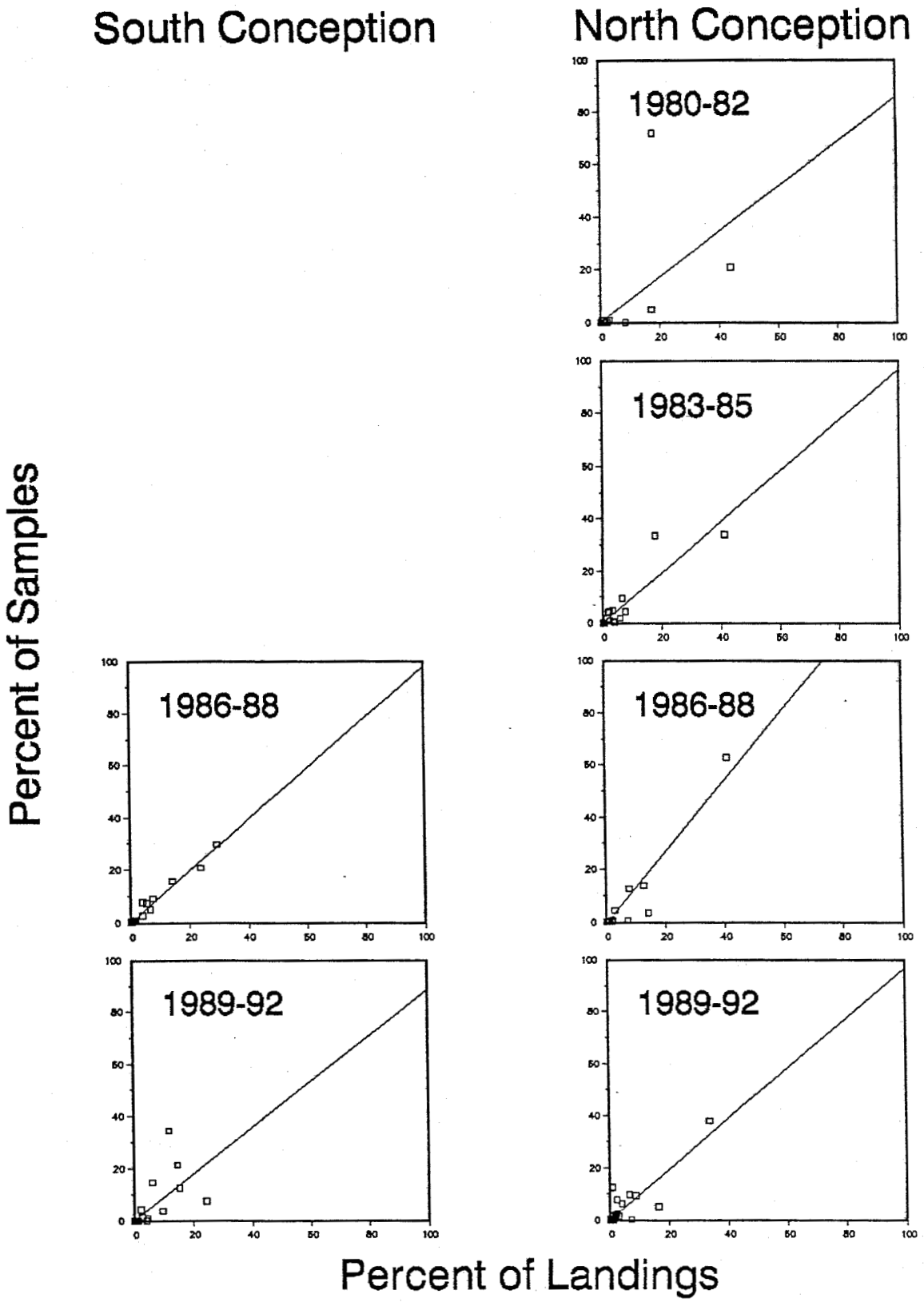
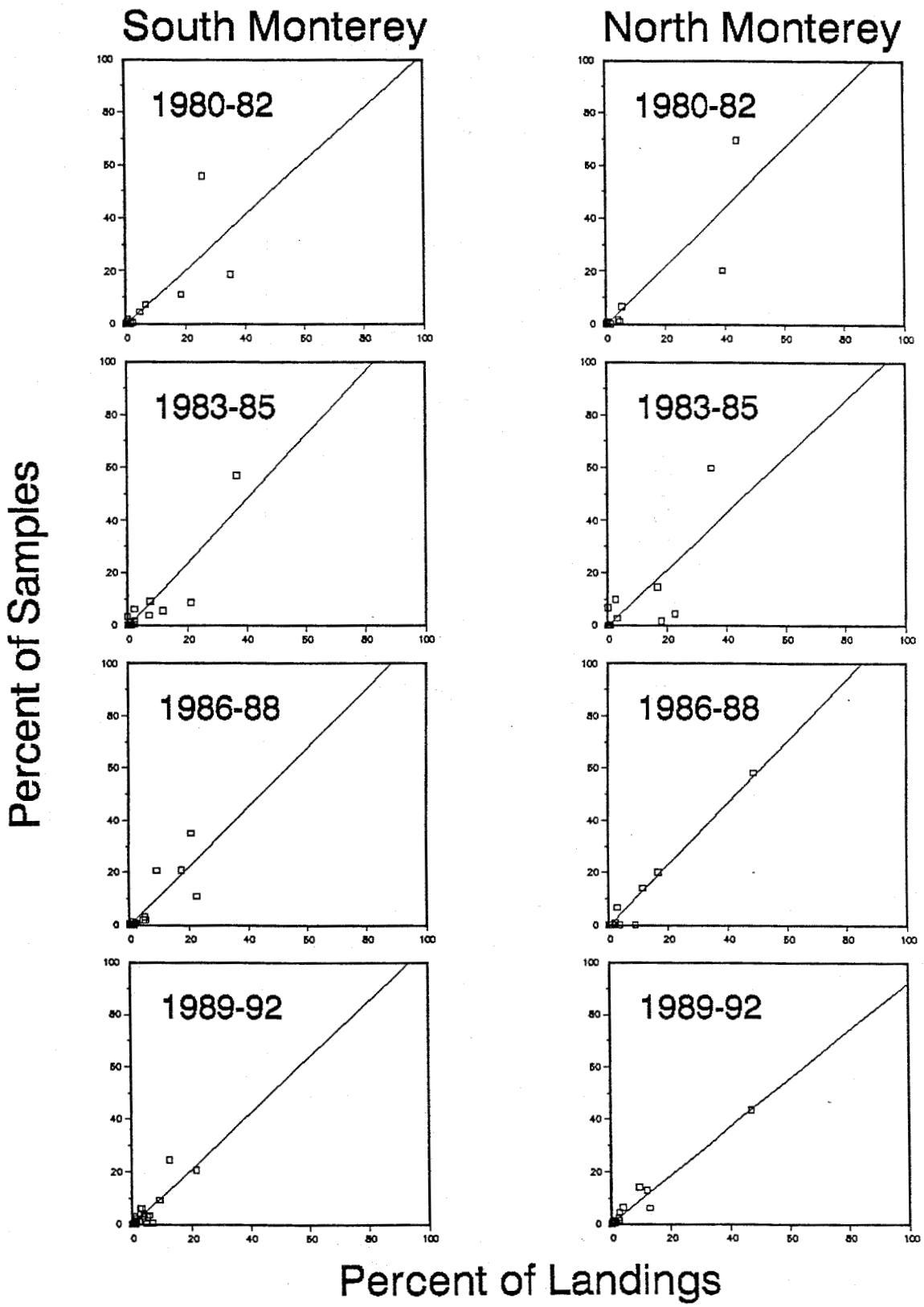


Figure 5.--Scatter plot and expected regression line of commercial rockfish samples versus landings for five regions and four time intervals. Note: Regressions were done on gear/market category combinations.



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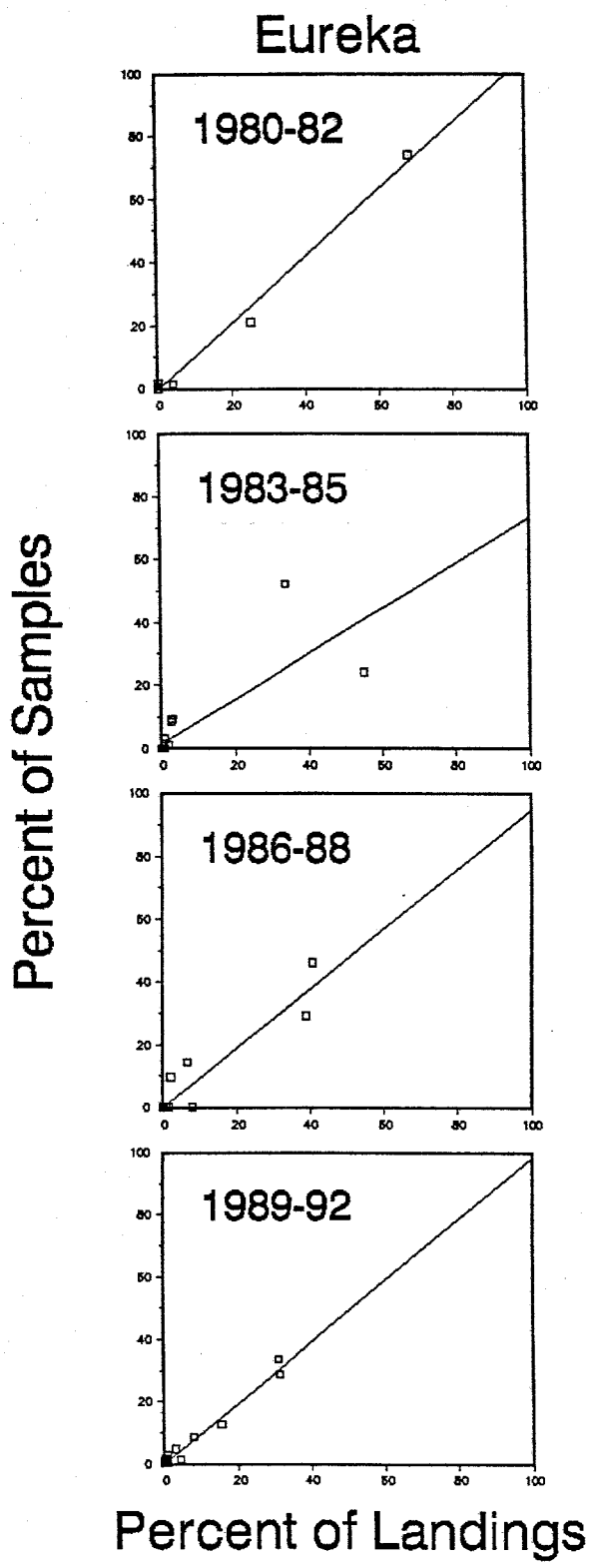

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sampling does not account for the poor correlation in the other two region/time intervals. For the north Monterey area, about 50% of the samples were from general rockfish market category (250) which only accounted for 38% of the landings. At the same time, group red market category (959) and chilipepper/bocaccio market category (956) were sampled at a very low rate. In the Eureka area from 1983-85, a large fraction of the landings (58%) were in the widow rockfish market category (269) which received about 20% of the sampling effort. At the same time, about 55% of the sampling effort was directed at the trawl gear, general rockfish market category (250) which accounted for only about 35% of the landings. The reduced effort on widow rockfish was intentional to avoid excessive sampling of a single species market category.

Table 1.--Correlation coefficients R^2, slopes (b), intercepts (a) and sample size (n) for regressions of sampled percent versus landing percent on gear/market category combinations from five regions and four time intervals from the California commercial rockfish fishery.

REGION	INTERVAL	R^2	b	a	n
South Conception	1980-82				
	1983-85				
	1986-88	0.98	0.98	0.04	51
	1989-92	0.49	0.88	0.18	64
North Conception	1980-82	0.33	0.85	0.27	54
	1983-85	0.84	0.97	0.05	60
	1986-88	0.90	1.37	-0.72	51
	1989-92	0.79	0.97	0.05	67
South Monterey	1980-82	0.65	1.02	-0.03	62
	1983-85	0.83	1.21	-0.32	67
	1986-88	0.76	1.13	-0.21	61
	1989-92	0.78	1.06	-0.08	77
North Monterey	1980-82	0.80	1.11	-0.45	25
	1983-85	0.64	1.07	-0.22	31
	1986-88	0.96	1.18	-0.51	34
	1989-92	0.96	0.92	0.15	54
Eureka	1980-82	0.99	1.05	-0.23	24
	1983-85	0.64	0.72	1.26	22
	1986-88	0.90	0.95	0.19	28
	1989-92	0.98	0.99	0.04	47

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South Conception	1980-82				
	1983-85				
	1986-88	0.98	0.98	0.04	51
	1989-92	0.49	0.88	0.18	64
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	1983-85	0.84	0.97	0.05	60
	1986-88	0.90	1.37	-0.72	51
	1989-92	0.79	0.97	0.05	67
South Monterey	1980-82	0.65	1.02	-0.03	62
	1983-85	0.83	1.21	-0.32	67
	1986-88	0.76	1.13	-0.21	61
	1989-92	0.78	1.06	-0.08	77
North Monterey	1980-82	0.80	1.11	-0.45	25
	1983-85	0.64	1.07	-0.22	31
	1986-88	0.96	1.18	-0.51	34
	1989-92	0.96	0.92	0.15	54
Eureka	1980-82	0.99	1.05	-0.23	24
	1983-85	0.64	0.72	1.26	22
	1986-88	0.90	0.95	0.19	28
	1989-92	0.98	0.99	0.04	47

Species Compositions

The species composition of the general rockfish market category (250) varies considerably among time intervals, among regions, and among gears. For clarity, only the five most abundant species in each group are shown in the subsequent tables.

The five most abundant species from the Eureka trawl fishery during four time intervals are shown in Table 2. The effect of the widow rockfish sort regulation which began in 1983 was to eliminate widow rockfish from the species composition after 1982. While many of the species are the same for the different time intervals, there are large differences in the relative importance.

There are no clearly detectable patterns in the compositions.

Table 2.--Estimated species composition (percent) of general rockfish samples from the trawl fishery from the Eureka region over four time intervals. Note: Only the top five most important species for each time interval are shown.

SPECIES	1980-82	1983-85	1986-88	1989-92
Widow rockfish	65%			
Bocaccio	10%	16%	8%	8%
Canary rockfish	8%	17%	8%	18%
Black rockfish	3%			
Chilipepper rockfish	3%	7%	5%	11%
Yellowtail rockfish		23%	6%	26%
Darkblotched Rockfish		16%	48%	22%

In Table 3, the species compositions for line gear in 1989-92 are compared across five regions. There are strong differences in the compositions although many of the species are repeated. The fraction of bocaccio rockfish varied without pattern among the areas. Chilipepper rockfish were far more abundant in the central areas. Blackgill rockfish are important only in the south. Yellowtail rockfish show a pattern of decreasing importance with decreasing latitude.

In Table 4, the species compositions from the general rockfish market category (250) during 1986-88 in the south Conception region are examined, comparing the three gears. Once again, there are very large differences in the species compositions. While blackgill rockfish are the most abundant in all three gears, the fraction they constitute varies from 42% to 83%. Bank rockfish are virtually absent in trawl and line gear; however, it comprises 31% of the gill net fishery.

Table 3. Estimated species compositions (percent) for samples from line gear from 1989-92 from the general rockfish market category (250) for five different regions. Note: Only the five most abundant species are shown for each region.

SPECIES	EUREKA	N. MONT	S. MONT	N. CONCEP	S. CONCEP
Black	51%				
Blue	27%	4%			
Yellowtail	18%	25%	20%	7%	
Quillback	1%				
Widow	1%		2%		
Chilipepper		49%	57%	37%	
Bocaccio		10%	5%	23%	5%
Blackgill		3%		24%	75%
Bank			9%		3%
Olive				3%	
Greenblotched					2%
Canary					13%

Table 4. Species compositions (percent) from samples taken from the general rockfish market category (250) in the south Conception region during the time interval of 1986-88 for three different types of gear. Note: The percentages shown are only for the top five most abundant species.

SPECIES	LINE	TRAWL	GILL NET
Blackgill	83%	68%	42%
Bocaccio	3%	9%	8%
Vermillion	3%		
Greenspotted	3%		
Bank	2%	2%	31%
Redbanded		16%	
Splitnose		3%	14%
Chilipepper			1%

We ran species composition analyses by region and gear for all market categories which had ever been sampled. Any market category containing 95% or more of a single species, in all regions and for all gears for which it was sampled, was considered to be a single species market category. Table 5 lists the single species and mixed species market categories as determined by this analysis. While most of the categories are multi-species categories, five categories can be described as single species categories. The bocaccio market category (253) will probably become a single species market category because of recent regulatory changes requiring sorting.

Table 5. Rockfish market categories determined to be primarily single species (S), and market categories determined to be primarily multi-species (M). This was determined by all species compositions having 95% or more of a single species for each gear and region in which they were sampled.

MARKET CATEGORY	TYPE
Greenspotted (255)	S
Yellowtail (259)	S
Widow (269)	S
Pacific Ocean Perch (271)	S
Copper (655)	S
Cowcod (245)	M
Canary (247)	M
General Rockfish (250)	M

Black (252)	M
Bocaccio (253)	M
Chilipepper (254)	M
China (258)	M
Gopher (263)	M
Brown (267)	M
Splitnose (270)	M
Bank (663)	M
Blue (665)	M
Blackgill (667)	M
Shortbelly (672)	M
Bocaccio/Chilipepper (956)	M
Group bolina (957)	M
Group deepwater reds (958)	M
Group red (959)	M
Group small reds (960)	M
Group rosefish (961)	M
Group gopher (962)	M

In Table 6 we show a combined gear and region species composition for brown rockfish (267) versus group bolina (957). There is no similarity in the observed species compositions. It should be noted that in the early years of the widow fishery, commercial fishermen called widow rockfish "brownies," hence a possible confusion in recording of the market category (William Lenarz, National Marine Fisheries Service, 3150 Paradise Drive, Tiburon, California 94920. Pers. commun., December 1994). Table 7 shows the comparison of the combined species composition of gopher rockfish (263) to group gopher (962). Again, there is no similarity between the two market categories. However, the species present are similar in appearance and hence these market categories are not random assemblages. Examination of where the landings of whitebelly rockfish (246) were made (Appendix D) versus where copper rockfish (655) were made indicates that most of the whitebelly were landed in the southern regions, while most of the copper rockfish (where the samples were taken) were landed in the northern regions.

Table 6. Estimated species compositions of brown rockfish market category (267) versus group bolina market category (957) based on 3 and 38 samples respectively. Regions, time interval, and gears were combined. Note: Only the top five most abundant species are shown for each market category.

SPECIES	BROWN	GROUP BOLINA
Widow Rockfish	57%	

Copper rockfish	37%	25%
Brown rockfish	5%	58%
Bocaccio	1%	
Canary rockfish	1%	3%
Quillback rockfish		6%
Gopher rockfish		3%

Table 7. Estimated species compositions of gopher rockfish market category (263) versus group gopher market category (962) based on 2 and 37 samples respectively. Regions, time interval, and gears were combined. Note: Only the top five most abundant species are shown for each market category.

SPECIES	GOPHER	GROUP GOPHER
Black-and yellow	80%	4%
Kelp rockfish	16%	
Grass rockfish	4%	
Gopher rockfish		85%
China rockfish		7%
Copper rockfish		2%
Brown rockfish		1%

DISCUSSION

Number of Deliveries Versus Amount of Landings

The importance of sampling a given gear/region/market category strata is determined, in part, by how many tonnes are landed in that strata. The finding that the number of deliveries is directly related to the number of tonnes within a gear/port/time interval strata suggests that samplers can fairly well sample the landings by random selection of landings. There are, however, other factors which cause a strata to be important, including number of species in the strata, importance of the species in the strata, and the need to determine interactions among the commercial and sport fisheries.

In California, eight rockfish species have been the subject of stock assessments since 1990 (Pacific Fishery Management Council, 1990, 1991, 1992, 1993, 1994): widow rockfish, bocaccio, chilipepper (S. goodei), shortbelly rockfish (S. jordani), bank rockfish (S. rufus), darkblotched rockfish (S. crameri), yellowtail rockfish, and splitnose rockfish (S. diploproa). In addition, several species have been identified as being important in the commercial fisheries (Pearson and Ralston

1990): blackgill rockfish (S. melanostomus), canary rockfish (S. pinniger), aurora rockfish (S. aurora), and greenspotted rockfish (S. chlorostictus). Several of these species are believed to have been heavily impacted by fishing activity.

There are two principle types of data obtained by sampling the commercial landings: species composition and biological data. Species composition data is the primary means for determining species specific removals. Biological data is used to determine the characteristics of the population and to estimate the impact of fishing on the stocks.

Currently, the decision to sample any given landing is determined by the port sampler. This decision is based on several factors, including availability of a landing to be sampled, target levels of sampling for the strata provided by Menlo Park personnel, and guidance from the port biologists. It is important to recognize that guidance from managers is critical since port samplers may not have a good idea of what species are important. It is also important to sample market categories with complex species compositions.

Distribution of Landings Among Strata

Landings in the different strata have been dynamic over time. Distribution of landings among gears, regions, and market categories have all changed. The ability to describe the species composition and biology of the rockfish fishery is heavily influenced by these changes.

Trawl gear accounts for the largest fraction of the landings (Fig. 2), but this is changing as line gear takes an increasingly large share. This suggests that the need to sample trawl gear is decreasing, while the need to sample the line gear fishery is increasing. Landings by gill nets increased through 1986 and have since declined suggesting a decreased need to sample gill nets.

The line gear fishery tends to distribute their landings among different market categories than the trawl fishery (Fig. 3). In addition, mean landing weight is lower and total number of deliveries is greater in the line fishery than the trawl fishery. At least superficially, this suggests that more sampling is required to describe the line gear fishery than the trawl fishery.

The gill net fishery is a difficult fishery to describe. Part of this difficulty stems from the increasing number of regulations placed upon this fishery. These regulations have influenced which species are being caught and from which ports gill net fishermen can profitably operate. In addition, the gill net fishery is difficult to sample because the vessels tend to be

small and often land at obscure locations.

The general rockfish market category (250) is, and always has been, the most important market category (in terms of tonnes landed) for most regions and gears (Fig. 3, Appendix D). In recent years there has been an increasing tendency to sort the catch into more market categories. While this increased sorting results in more strata to be sampled, it could ultimately require less sampling and/or more precise estimation of the species composition of the fishery with the same level of sampling. This would occur if the additional sorting results in more single species market categories.

Distribution of Samples Among the Strata

The single largest gap in the sampling has been in southern California (Appendix E). The region identified as south Conception includes four port complexes (Santa Barbara, Ventura, Long Beach, and San Diego) (Fig. 1). These four port complexes were not sampled prior to 1986. Between 1980 and 1992, only 12 trawl samples were taken (Appendix B), while total trawl landings during that time amounted to 1,176 tonnes. However, the southern conception trawl landings only accounted for about 1% of the total trawl landings coastwide and only about 6% of the total landings for the southern Conception area.

The next largest gap in sampling coverage is for line gear prior to 1989 in all regions. Line gear landings have proven difficult to sample. Many of the vessels are small, and, like the gill net vessels, many landings were at obscure locations. Since a large part of the line gear landings occurred in the southern Conception area where sampling effort has been limited, it was not possible to adequately sample this fishery. In recent years, the sampling of the line gear fishery has improved substantially.

The majority of samples for all gears and all ports have been taken in the general rockfish market category (250) (Fig. 4, Appendix E). In the northern regions (Eureka and north Monterey), the widow rockfish market category has been heavily sampled. The decision to heavily sample the widow rockfish market category was made due to the very large landings being made and the urgent need to assess this stock. In recent years, sampling has been distributed among an increasing number of strata. This change matches the trends in landings among the strata.

Sample Distribution Versus Landings

The results of regressions performed on the percentage of samples versus the percentage landed (Fig. 5, Appendix C)

indicate that the sampling effort has matched the landings reasonably well. Ten of the eighteen R^2 values were 0.80 or greater, and slopes for 10 of the 18 were between 0.90 and 1.10. For those regressions with poor correlations (the two worst cases being south Conception [1989-92] and north Conception [1980-82]), the primary problem appeared to be lack of samples as opposed to misdirected sampling (Appendix E).

In the case of Eureka (1983-85), more samples were directed at the general rockfish market category (250) than the landings would apparently justify (Appendices D and E). As a result, the widow rockfish market category (269) had a lower sampling rate than the landings would appear to justify. The general rockfish market category is a multi-species strata and the widow rockfish market category is, for the most part, a single species strata. This suggests that increased effort in the general rockfish market category was probably warranted. It should be noted that the sample effort on the widow market category was intentionally constrained by managers.

Identification of multi-species versus single species market categories is important because it helps determine the amount of sampling effort necessary to describe the species composition. In general, if a species is required to be sorted by law, then the market category into which it is sorted is typically composed of a single species. Describing the species composition of a strata is a useful way of determining how much sampling effort is required to estimate the overall species composition of the entire strata.

Species Compositions of Strata

The general rockfish market category (250) is the most heavily sampled and landed of all the market categories. It is a multi-species market category, and the species composition of the category is dynamic and varies among gears and regions. This makes it a useful case study of market category dynamics.

The observed differences in species compositions among gears, regions, and time intervals indicate the importance of sampling the multispecies market categories. It also suggests that there is a large potential for error if a mixed species composition from one gear is applied to a different gear type, or from one year to another, or one area to another.

We were able to identify five market categories which are predominantly single species market categories. This suggests that, in the absence of samples, they could be considered to consist exclusively of the target species for purposes of species composition estimation. It is worthwhile to note that the bocaccio market category (253) should be single species category after 1991 when sorting of bocaccio was required. We do not recommend treating the bocaccio market category as a single

species category for past expansions since it was not a required sort until recently.

The inability to combine some market categories was unfortunate. This is because the brown rockfish market category was poorly sampled (0.3 samples per 100 tonnes) as compared to group bolina (7.2 samples per 100 tonnes) (Appendix A). Moreover, the total landings of the brown rockfish category amount to 957 tonnes. Similarly, the gopher market category had a sample rate of 1.2 samples/100t as opposed to 8.6 samples/100t for group gopher. In this case, gopher rockfish total landings were only 167 tonnes, so the problem is not as severe as for brown rockfish. In the case of the whitebelly market category (never sampled) versus the copper rockfish market category (13.7 samples per 100 tonnes) only 20 tonnes of whitebelly rockfish have been reported, and therefore it is not considered to be a major problem.

One last thing to note is that there are some market categories which have been landed but never sampled. Appendix A shows that 20 of the landed market categories have never been sampled. The combined tonnage of the unsampled market categories is only 139 tons. This amount is small in comparison to the total landings, and therefore not considered to be a problem.

CONCLUSION

The results of this analysis suggest that, while there are some gaps in the sampling of the groundfish fishery, in general the sampling has been good. For the most part, sampling effort has been distributed among the gears and market categories in a reasonable fashion. Unfortunately, some of the gaps in sampling coverage have the potential to affect management decisions.

Decisions must be made regarding what to do about unsampled strata. Under what conditions can landings from market categories be combined? Is it reasonable to "borrow" species compositions from adjacent ports? Can we "borrow" length and age compositions from adjacent ports? Can we treat some unsampled market categories as single species market categories and expand on that basis? Can we use historic species compositions? These questions must be addressed in light of the primary goal of obtaining the best available information.

The most important reason for sampling the commercial catch is to estimate landings of individual species. A secondary purpose is to estimate length and age compositions of the

commercial fishery. If a large fraction of the landings are not expanded, then the estimates of total landings by species will be severely underestimated.

The preliminary results presented in this study suggest that different gears land different species. The results also suggest that the species compositions and market category sorting differs among port complexes. Finally, the results suggest that the species compositions of market categories can change over time. These factors must be considered by managers when deciding how to make expansions and how to allocate sampling effort.

The single best way to improve sampling performance is to provide good sampling target levels to the port samplers. An effort should be made to improve sampling priority criteria, monitoring landings and sampling, and feedback to the port biologists and samplers. An effort should be made to get at least one sample of all landed market categories each year. In practice this may be difficult, but it is important.

In recent years, there has been increasing concern over the interaction between the sport and commercial fisheries. The CDF&G has responded to this concern by increasing the number of samplers. The additional samplers have directed their efforts at sampling the line fishery, which is suspected to have the greatest impact on the sport fishery. The increased level of sampling of the line gear fishery has been effective in helping to describe this increasingly important part of the fishery.

The California commercial rockfish fishery is very complex. The fishery covers a large geographic area, utilizes several types of gear, a large number of species, and employs a somewhat whimsical way that fish are sorted. In addition, the fishery has changed over time. The level of complexity of the fishery means that managers must make many difficult choices with minimal information in many cases.

ACKNOWLEDGEMENTS

We would like to thank Brenda Erwin and Dave Thomas of the California Department of Fish and Game in Menlo Park for their valuable critical review of this paper. We would also like to thank Bill Lenarz of the National Marine Fisheries Service in Tiburon, California, for his reviews and helpful insights into the development of the California port sampling program.

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APPENDIX A

List of California Rockfish Market Categories, codes, number of deliveries (tickets), tonnes landed, number of samples, and number of samples/100 tonnes made by commercial fishermen in California from 1980 to 1992.

DESCRIPTION	TICKETS	TONNES	SAMPLES	SAMP/100t
Cowcod (245)	2,723	382	5	1.3
Whitebelly (246)	1,051	20		
Canary (247)	1,826	128	11	8.6
Vermillion (249)	252	22		
Unspecified (250)	197,230	86,399	4,189	4.9
Black-and-yellow (251)	6	1		
Black (252)	3,924	682	11	1.6
Bocaccio (253)	15,043	13,948	349	2.5
Chilipepper (254)	2,281	2,429	116	29.1
Greenspotted (255)	201	27	4	14.8
Starry (256)	210	32		
China (258)	1,834	111	4	3.6
Yellowtail (259)	4,636	1,142	30	14.1
Gopher (263)	6,117	167	2	1.2
Rosethorn (264)	12	1		
Yelloweye (265)	3,687	482	9	1.2
Brown (267)	3,513	957	3	0.3
Rosy (268)	28	5		
Widow (269)	9,827	31,946	789	2.5
Splitnose (270)	840	248	78	31.5
Pacific Ocean Perch (271)	786	121	8	6.6
Olive (651)	136	2		
Grass (652)	733	6		
Pink (653)	3	1		
Greenstriped (654)	12	1		
Copper (655)	2,057	73	10	13.7
Flag (657)	2	1	2	200.0
Treefish (658)	7	1		
Kelp (659)	20	1		
Honeycomb (660)	1	1		
Greenblotched (661)	2	1		
Bronzespotted (662)	3	1		
Bank (663)	215	410	14	3.4
Pinkrose (664)	56	3		
Blue (665)	6,526	214	2	0.9
Squarespot (666)	0	0		
Blackgill (667)	2,072	1,680	121	7.2
Stripetail (668)	0	0		
Speckled (669)	9	1		
Swordspine (670)	0	0		
Calico (671)	0	0		
Shortbelly (672)	21	54	2	3.7

Appendix A continued.

DESCRIPTION	TICKETS	TONNES	SAMPLES	SAMP/100
Chameleon (673)	3	1		
Aurora (674)	0	0		
Redbanded (675)	5	1		
Bocaccio/chilipepper(956)	21,127	20,672	646	3.1
Group bolina (957)	12,171	526	38	7.2
Group deepwater reds (958)	25	17		
Group red (959)	57,750	9,976	480	4.8
Group small reds (960)	12,451	2,511	208	8.3
Group rosefish (961)	10,897	4,760	315	6.6
Group gopher (962)	18,827	431	37	8.6

APPENDIX B

Tonnes of rockfish landed and number of port samples taken in three types of gear, five regions, and four time intervals.

REGION	TIME INTERVAL	GEAR	TONNES	SAMPLES
South Conception	1980-82	Line Gear	2,427	
		Trawl Gear	379	
		Gill Net	2,301	
	1983-85	Line Gear	1,593	
		Trawl Gear	594	
		Gill Net	2,871	
	1986-88	Line Gear	1,590	291
		Trawl Gear	128	12
		Gill Net	2,960	485
	1989-92	Line Gear	3,092	107
		Trawl Gear	75	
		Gill Net	1,751	30
North Conception	1980-82	Line Gear	1,443	6
		Trawl Gear	4,405	117
		Gill Net	205	1
	1983-85	Line Gear	447	18
		Trawl Gear	2,430	284
		Gill Net	260	17
	1986-88	Line Gear	397	13
		Trawl Gear	2.491	179
		Gill Net	1,247	42
	1989-92	Line Gear	1,182	191
		Trawl Gear	2,997	238
		Gill Net	1,165	32
South Monterey	1980-82	Line Gear	1,351	13
		Trawl Gear	14,320	276
		Gill Net	546	1
	1983-85	Line Gear	491	3
		Trawl Gear	8,733	451
		Gill Net	2,938	70
	1986-88	Line Gear	1,054	9
		Trawl Gear	4,078	214
		Gill Net	5,314	130
	1989-92	Line Gear	3,693	291
		Trawl Gear	7,151	420
		Gill Net	4,628	395

Appendix B continued.

REGION	TIME INTERVAL	GEAR	TONNES	SAMPLES
North Monterey	1980-82	Line Gear	207	
		Trawl Gear	13,399	270
	1983-85	Line Gear	118	1
		Trawl Gear	12,756	456
	1986-88	Line Gear	1,034	
		Trawl Gear	5,409	313
	1989-92	Line Gear	1,973	145
		Trawl Gear	8,215	336
Eureka	1980-82	Line Gear	723	5
		Trawl Gear	15,706	385
	1983-85	Line Gear	260	6
		Trawl Gear	10,815	529
	1986-88	Line Gear	853	
		Trawl Gear	7,452	359
	1989-92	Line Gear	2,433	94
		Trawl Gear	6,397	2

APPENDIX C

Results of regression analysis of deliveries versus tonnes landed by commercial market category. The analysis was stratified by gear (line, trawl, and gill net), region (south Conception, north Conception, south Monterey, north Monterey, and Eureka), and time interval (1980-82, 1983-85, 1986-88, and 1989-92).

GEAR	REGION	TIME	DF	R^2	F	P>F
Line	S. Concep	1980-82	21	.99	49,040.28	.0001
		1983-85	19	.99	3,795.65	.0001
		1986-88	21	.95	410.44	.0001
		1989-92	29	.84	151.93	.0001
Line	N. Concep	1980-82	20	.83	90.68	.0001
		1983-85	21	.74	57.29	.0001
		1986-88	22	.65	39.17	.0001
		1989-92	29	.77	95.21	.0001
Line	S. Mont	1980-82	26	.93	349.32	.0001
		1983-85	24	.95	479.32	.0001
		1986-88	23	.79	82.40	.0001
		1989-92	30	.76	89.42	.0001
Line	N. Mont	1980-82	12	.99	5,995.58	.0001
		1983-85	14	.99	1,467.82	.0001
		1986-88	20	.99	1,865.09	.0001
		1989-92	32	.96	672.55	.0001
Line	Eureka	1980-82	9	.99	50,607.82	.0001
		1983-85	8	.99	1,472.73	.0001
		1986-88	13	.94	182.58	.0001
		1989-92	26	.83	122.81	.0001
Trawl	S. Concep	1980-82	11	.90	93.15	.0001
		1983-85	13	.43	9.12	.0107
		1986-88	10	.96	199.74	.0001
		1989-92	12	.86	66.95	.0001
Trawl	N. Concep	1980-82	17	.67	32.49	.0001
		1983-85	20	.75	55.66	.0001
		1986-88	15	.82	62.18	.0001
		1989-92	17	.76	51.89	.0001
Trawl	S. Mont	1980-82	21	.81	87.06	.0001
		1983-85	21	.88	152.05	.0001
		1986-88	14	.83	62.27	.0001
		1989-92	24	.87	157.93	.0001

Appendix C continued.

GEAR	REGION	TIME	DF	R^2	F	P>F
Trawl	N. Mont	1980-82	11	.60	14.76	.0033
		1983-85	15	.84	71.92	.0001
		1986-88	12	.89	92.04	.0001
		1989-92	20	.95	382.07	.0001
Trawl	Eureka	1980-82	13	.91	122.66	.0001
		1983-85	12	.39	7.02	.0226
		1986-88	13	.57	16.16	.0017
		1989-92	19	.60	28.15	.0001
Gill	S. Concep	1980-82	12	.99	753.62	.0001
		1983-85	17	.93	199.91	.0001
		1986-88	17	.85	92.97	.0001
		1989-92	20	.80	75.28	.0001
Gill	N. Concep	1980-82	14	.82	57.67	.0001
		1983-85	16	.34	7.85	.0134
		1986-88	11	.36	5.71	.0380
		1989-92	18	.78	58.96	.0001
Gill	S. Mont	1980-82	12	.18	2.49	.1431
		1983-85	19	.85	98.26	.0001
		1986-88	21	.64	35.19	.0001
		1989-92	20	.61	30.03	.0001

APPENDIX D

Distribution of commercial rockfish landings (tonnes) among market categories by gear, region, and time interval.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Line	S. Conception	245	22	28	23	24
		246		2		9
		249	15	3	1	2
		250	2,103	997	663	1,216
		252	4	4	4	5
		253	211	41	1	226
		254	16	3	3	23
		255	1			
		256				28
		258			1	3
		259	3	3	2	4
		263	6	5		1
		265	82		1	2
		267	10	1		2
		268				1
		269		7	1	1
		270	1		1	2
		271			1	
		651	6	2	1	
		652	1			1
		653			1	
		654				2
		655	5		1	3
		662	1			
		663	2			1
		664				1
		665	9	4	4	7
		667	2	49	252	721
		669		1		
		672				1
		956	3	161	308	304
		957		2	6	13
		959	8	321	356	593
		960	1	29	20	3
		961				1
		962		1	2	6
Line	N. Conception	245	8	3	2	1
		246	8	3	3	5
		247				1
		249	2		1	2
		250	1,041	239	122	469
		252	3	1		2

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Line	N. Conception	253	17	2		48
		254	7	2	3	29
		255	10	4		
		256				1
		258			2	3
		259	6	3	2	2
		263	74	5	2	4
		265	97	1	1	
		267	13	1	1	4
		268		1		
		269	1		1	3
		271		3	1	
		651	2	2	2	3
		652			1	6
		655	1			2
		658				1
		659				1
		661				1
		662				1
		663			1	1
		665	13	3	3	14
		667	10	2	80	65
		956	5	73	47	16
		957	3	4	11	15
		959	133	128	99	349
		960	16	3	7	52
		961		3	3	4
		962		7	41	129
Line	S. Monterey	245	3	1	2	2
		246				6
		247		2	3	7
		249	3	4	3	4
		250	744	280	489	1,433
		251			1	
		252	12	16	4	17
		253	243	31		149
		254	18	7	6	640
		255				1
		256	3	1		3
		258	8	6	10	12
		259	87	36	160	248
		263	78	9		4
		265	28	1	6	18
		267	33	6		7
		269	3	9	13	107
		271	1	1	1	

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Line	S. Monterey	651	2	1	2	3
		652	2		1	3
		655	2	2	3	8
		657				1
		658	1			
		659	2	1		
		660	1			
		662				1
		663	1		3	8
		665	91	25	20	34
		667			1	15
		669	1			
		956	9	53	149	189
		957	7	10	55	162
		958				3
		959	31	33	95	499
		960	1	4	7	55
		961		1	7	34
		962		11	82	127
Line	N. Monterey	245	1			2
		246				2
		247			1	63
		249	1		1	5
		250	199	91	580	967
		251			1	1
		252	5	3	18	25
		253	3			28
		254		1	2	241
		255				13
		256				1
		258	3	2	2	10
		259	6	4	20	15
		264				2
		265	3		19	29
		267	5	2		3
		269		2	3	12
		270				1
		271			1	
		654				1
		655	1	1	7	32
		657	1			
		663			1	1
		664				4
		665	5	4	1	8
		667				3
		669			1	

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Line	N. Monterey	673				1
		675				1
		956		9	131	59
		957		3	31	90
		958				1
		959	2	24	228	397
		960		2	6	28
		961		2	17	8
		962		1	9	17
Line	Eureka	245	1			
		246		1		1
		247			5	49
		249	1		671	5
		250	698	217	1	1,369
		252	31	19	27	397
		253				17
		254				10
		255			1	6
		256	1			2
		258	3	2	1	9
		259		1	3	103
		265	4	1	19	82
		267	2		2	7
		268				1
		269		1	2	83
		655			2	41
		659				1
		665	2			9
		667			1	1
		675				2
		956			3	3
		957				5
		958				1
		959	3	31	146	282
		960		1		31
		961				4
		962				4
Trawl	S. Conception	245	5	13	5	5
		249	1			
		250	87	117	77	45
		252	3			
		253	289	366		7
		254	1	1		11
		256				1
		265	7	1		

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Trawl	S. Conception	267	2	17		
		269		3	1	4
		271	1		2	
		653			1	
		655	2			
		665	1	1		1
		667		1	3	14
		956		71	56	16
		957		2	2	1
		959	3	10	12	13
		960		2	3	3
		961		28	5	1
Trawl	N. Conception	245	3	4	5	5
		246		3	2	
		249	1			
		250	1,068	556	1,703	1,816
		252	2			
		253	2,666	57		220
		254	4	1	3	81
		255	1	1		1
		256				
		259	1	4		
		265	16			
		267	59			
		268		3		2
		269	65	48	8	8
		270	16		1	57
		271	4	2	1	2
		655		1		
		661	1			
		663		185	3	3
		665		1	1	1
		667		3	44	88
		672		3		
		956	505	1,297	319	160
		957	4	5	6	5
		959	10	71	42	71
		960		6	75	125
		961	1	208	298	384
		962		1	2	4
Trawl	S. Monterey	245	2	5	4	15
		246				1
		247	2	6		6
		250	4,176	4,477	2,169	3,353
		252	14	1		1

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Trawl	S. Monterey	253	5,710	271		419
		254	15	2	2	904
		256	3			
		258	53	12	9	9
		259	3	3	2	7
		263	1			
		265	11		1	3
		267	77	6	1	9
		268				1
		269	2,990	282	208	808
		270	99	1		
		271	4	4		
		655				1
		663		6	55	44
		665	2	3		1
		667				11
		672	1	32		4
		673		1		
		956	1,079	2,568	972	760
		957	20	49	18	14
		958	17			1
		959	9	107	49	146
		960		31	90	108
		961	69	918	538	593
		962		1	2	5
Trawl	N. Monterey	246				1
		247			1	13
		250	6,003	4,493	3,156	4,822
		252	1	1	2	2
		253	561	413		269
		254		9		25
		255				1
		256				1
		258				3
		259	1	1	3	1
		265	7	2	1	5
		267	636	48	7	4
		269	5,347	2,173	1,093	1,234
		270	64			5
		271		1		
		655				2
		665		1		
		672		1	17	2
		956	728	2,909	144	270
		957	3	22	12	5
		959	5	2,335	747	1,321

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Trawl	N. Monterey	960		34	69	117
		961	63	346	183	167
Trawl	Eureka	245			1	
		247			1	3
		250	11,253	3,741	3,388	2,740
		252	60	58	3	3
		253	1	1		81
		254				2
		255				1
		258	8		1	1
		259	44	114	2	49
		265	51		1	7
		267	20	2	7	
		269	4,143	6,099	3,240	2,765
		270	18			1
		271	48	72	2	
		655				1
		667				1
		672	3	1		
		956		7	1	3
		957		3		2
		958				1
		959	36	91	94	36
		960	2	336	545	713
		961	34	321	187	13
		962				20
Gill	S. Conception	245	83	106	68	25
		246		1		3
		249	10	1		
		250	1,821	1,716	1,381	765
		252	2	1		2
		253	369	52		206
		254	3		2	55
		256				4
		259	1		1	19
		263	4	3		
		265	32			2
		267	8	3	3	3
		268		1	3	
		269		5	1	9
		270		1	1	6
		271			2	
		651	1		1	1
		653				1
		663			6	

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Gill	S. Conception	665	3	2	5	1
		667		18	196	128
		956		771	1,123	476
		957		4	4	2
		959	1	226	188	119
		960		9	8	
		961		3	23	2
		962				2
Gill	N. Conception	245	1	1	7	6
		246	3	3	3	4
		250	185	109	525	875
		253	14			109
		254		8		16
		255	1			
		259	3	1		
		263	3	2		1
		265	2			
		267	5	1		1
		268				1
		269	2	1	23	8
		271		2		
		663				1
		665	4	2	2	2
		667		13	12	13
		956	2	116	589	72
		957	2	4	6	4
		959	2	18	84	42
		960	1	1	3	4
		961		2	9	31
		962		2	3	4
Gill	S. Monterey	245	2	5	7	9
		249		1	1	
		250	114	1,414	1,823	1,937
		252	2	1	20	5
		253	364	159	1	418
		254		18	9	338
		258	2	5	4	1
		259	58	100	114	10
		263	5			
		265	5	1	2	1
		267	6	5	3	13
		268			2	
		269		275	558	399
		271	2	3		
		652				2

Appendix D continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Gill	S. Monterey	655			1	
		663		6	69	40
		665	5	11	16	6
		667				2
		956	11	870	2,337	1,064
		957		8	10	6
		958			2	1
		959	2	92	229	180
		960		4	46	26
		961		7	111	230
		962		4	14	7

APPENDIX E

Distribution of commercial samples among market categories by gear, region, and time interval.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Line	S. Conception	250			122	10
		253				1
		269			2	
		657				1
		667			57	28
		956			38	20
		959			71	47
		960			1	
Line	N. Conception	250	6	14	10	43
		253				7
		254				2
		667			1	1
		956		3	1	
		959		1	1	45
		960				57
		962				36
Line	S. Monterey	250	13	2	7	102
		252				4
		253				23
		254				45
		259				13
		269			2	7
		663				1
		667				2
		672				1
		956		1		
		957				33
		959				66
Line	N. Monterey	247				7
		250		1		68
		253				2
		254				11
		255				4
		258				1
		259				1
		265				5
		269				1
		655				5
		956				1
		957				5

Appendix E continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Line	N. Monterey	959				30
		960				3
		962				1
Line	Eureka	247				4
		250	5	6		43
		252				4
		253				3
		254				1
		259				5
		265				4
		269				9
		655				5
		959				16
Trawl	S. Conception	250			6	
		956			6	
Trawl	N. Conception	250	89	107	147	175
		253	26	13		29
		254				3
		267		1		
		269	1	5		2
		270	1			
		663		6		
		667			1	9
		956		108	29	7
		959		14	1	1
		960				11
		961		30	1	1
Trawl	S. Monterey	250	161	298	124	230
		253	54	32		66
		254				37
		258				3
		269	32	9	3	32
		270	5	17		3
		672		1		
		956	21	46	73	4
		959			2	8
		960			1	1
		961	3	48	11	36
Trawl	N. Monterey	250	188	273	183	210
		253	4	12		21
		254				2
		267	2			

Appendix E continued.

GEAR	REGION	MARKET CATEGORY	1980-82	1983-85	1986-88	1989-92
Trawl	N. Monterey	269	55	67	63	62
		270	1	31		
		956	18	20	2	7
		959		8	44	29
		960				2
		961	2	45	21	3
Trawl	Eureka	250	289	280	166	114
		252				3
		253				1
		269	82	129	106	98
		270	6	16		
		271		8		
		959	2			
		960		50	52	29
		961	6	46	35	
Gill	S. Conception	245			5	
		250			233	17
		270			1	
		657				1
		663			2	
		665			1	
		667			20	1
		956			162	5
		959			60	6
		960			1	
Gill	N. Conception	250	1	15	32	23
		253				5
		254				2
		269				1
		667				1
		956		2	8	
		959			2	
Gill	S. Monterey	250		29	74	273
		253	1	1	1	47
		254				13
		259		7	4	
		269		8	7	9
		663			1	1
		665		1		
		956		20	39	5
		959		2	2	22
		961			2	25

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