ONBOARD SAMPLING OF THE ROCKFISH AND LINGCOD COMMERCIAL PASSENGER FISHING VESSEL INDUSTRY IN NORTHERN AND CENTRAL CALIFORNIA, JANUARY THROUGH DECEMBER 1994

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Abstract

The Central California Marine Sport Fish Project has been collecting angler catch data on board Commercial Passenger Fishing Vessels (CPFVs) fishing for rockfish or lingcod since 1987. The program depends on the voluntary cooperation of CPFV owners and operators. This fourth report in a series presents data collected in 1994, refers to historical data from 1987 to 1993, and documents trends in species composition, angler effort, catch per unit effort (CPUE), and, for selected species, mean length and length frequency.

Angler catches on board central and northern California CPFVs were sampled from 14 ports, ranging from Crescent City in the north to Port San Luis (Avila Beach) in the south. Technicians observed a total of 2053 anglers fishing on 237 CPFV trips. These observed anglers caught 24,731 fish of which samplers determined 22,615 were kept. Over 63% of these fish were caught at Monterey or Morro Bay area ports. Only 18 of the 53 species each comprised at least one percent of the catch. The top ten species in order of abundance were blue, yellowtail, rosy, chilipepper, canary, and black rockfishes, lingcod, and widow, starry and greenspotted rockfishes. Blue and yellowtail rockfishes together comprised approximately 44% of the observed catch. Overall, rockfishes represented 32 species or 60% of the 53 identified species.

In general, 1994 data showed continued evidence of sustainability of the CPFV rockfish fishery with a few exceptions for some species in each port area sampled. We identified areas of concern for three nearshore species (black, blue, and brown rockfishes), three offshore species (bocaccio, chilipepper, and widow rockfish), and two wide-depth range species (canary and yelloweye rockfishes). Declining trends in CPAH in at least one port area were identified for each of these species except black and blue rockfishes, some of which may be related to natural variability in year class strength or stock movement. Mean length decreased in at least one port area for black, blue, brown, and canary rockfishes and chilipepper, although for black rockfish and chilipepper this was attributed to increased recruitment of juveniles.

Positive trends identified included increased CPAH for black rockfish in the San Francisco and Monterey areas, for canary rockfish in the San Francisco area, and for brown rockfish in the Morro Bay area.

Total northern and central California CPFV catch estimates, based on logbook data and adjusted by sampling data and compliance rates, indicated that port area-specific decreases have occurred since 1988 for yellowtail rockfish and lingcod (San Francisco), chilipepper (Monterey), and blue rockfish (Monterey and Morro Bay.)

The competing influences of the nearshore commercial hook-and-line fishery were apparent when comparing relative species composition to that of the CPFV fishery. Declines in CPAH in the CPFV fishery for some shallow water species, such as brown rockfish in the Bodega Bay area, may be related to increased commercial fishing effort.

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INTRODUCTION

The Central California Marine Sport Fish Project has been collecting angler catch data from the Commercial Passenger Fishing Vessel (CPFV) industry intermittently for several decades in order to assess the status of this valuable nearshore recreational fishery. The project has focused on rockfish and lingcod angling and has not sampled salmon trips. This fourth report in a series presents data collected in 1994, refer to historical data from 1987 to 1993, and documents trends by port area in species composition, angler effort, catch, and, for selected species, catch per unit effort (CPUE), mean length and length frequency. In addition, total catch and effort estimates are made based on adjustments of logbook data by sampling information.

Before 1987 catch information was primarily obtained on a general port basis from dockside sampling of CPFVs, also called party boats. This did not allow documentation of specific areas of importance to recreational anglers and was not sufficient to assess the status of rockfish populations at specific locations.

CPFV operators are required by law to record total catch and location for all fishing trips in logbooks provided by the California Department of Fish and Game (CDFG). However, the required information is too general for use in assessing the status of the multi-species rockfish complex on a reef-by-reef basis. Rockfish catch data are not reported by species and information on location is only requested by block number (a block is an area of 100 square miles). Many rockfishes tend to be residential, underscoring the need for site-specific data. Thus, there is a strong need to collect catch information on board CPFVs at sea. However, locations of specific fishing sites are not revealed since that information is confidential.

In May 1987 the Central California Marine Sport Fish Project began on-board sampling of the CPFV fleet. Data collection continued until June 1990, when state budgetary constraints temporarily precluded further sampling, resumed in August 1991, and continued through 1994. The program depends on the voluntary cooperation of CPFV owners and operators.

METHODS

Study Area

Angler catches on board central and northern California CPFVs were sampled from 14 ports, ranging from Crescent City in the north to Port San Luis (Avila Beach) in the south (Figure 1). In 1987 the program began in the Santa Cruz-Monterey area and was expanded to other ports in 1988. During 1994 data were collected at fishing locations ranging from Point St. George (ca. lat. 41°50'N) to Purisima Point (ca. lat. 34°45'N), a distance of approximately 425 naut. mi., and out to 95 fm. Fishery Technicians, supplied by the Pacific States Marine Fisheries Commission (PSMFC) under contract with the Department, and project biologists conducted all on-board sampling of catches. The following ports or port groups were sampled: 1) Eureka, Trinidad, and Crescent City (**EK**); 2) Fort Bragg (**FB**); 3) Bodega Bay and Dillon Beach (**BB**); 4) Princeton (Half Moon Bay), Emeryville, and Sausalito (**SF**); 5) Santa Cruz and Monterey (**MT**); 6) San Simeon, Morro Bay, and Port San Luis (**MB**).

Description of CPFV Fleet

CPFVs which allowed on-board sampling ranged in length from 26 to 102 ft and passenger capacity ranged from 6 to 120 persons (average capacity 45 persons). The number of cooperating CPFVs per port area ranged from 3 to 14. Trips were usually one

half or one full day, the latter typically departing at 0700 and returning by 1600. Two vessels from the Morro Bay area occasionally operated a 2- or 3-day trip on weekends.

Trip Selection

Trips were selected on a random basis from a complete list of rockfish/lingcod CPFVs for each port area. CPFV operators were telephoned and asked if a trip was available. If the boat was either unavailable or full to capacity, or if the sampler was refused passage, successive boats on the list were contacted until a trip was secured. When the sampler began scheduling the next trip, the next boat on the list was contacted first. Targeted sample size for each sampler was one trip for each successive 3-day block in a month, or approximately 10 trips per month. Primarily due to weather constraints, unavailability of trips, and lack of Fisheries Technicians during a contract restructuring from August to October 1994, this sample size was seldom achieved.

Sampling Procedures

Samplers were initially trained in marine fish species identification. Each sampler was equipped with foul weather gear, gloves, clipboard, waterproof data sheets, fish length measuring board, lead pencils, and field guides to California marine fishes. At the start of each trip, the sampler asked the vessel operator for the number of paid and free anglers (the latter was increased if the captain and/or deck hand(s) fished during the trip). Department of Fish and Game vessel number, port code, departure time, type of fishing trip (offshore, nearshore, surface, bottom, mix), and type of fishing tackle used were recorded on a standard sampling form.

When the vessel arrived at a fishing location, the sampler recorded depth in fathoms, the time when fishing lines were lowered, and either latitude and longitude, LORAN coordinates, or land bearings. When the last observed fishing line was raised, time and depth were again recorded and the process was repeated throughout the day. New location coordinates were obtained only when the sampler determined that the vessel had moved to a different location, as defined under 'Shoreside Data Processing'.

At the first fishing location, the sampler chose a reasonable number of anglers to observe throughout the trip and recorded this number (usually less than 15). In most cases, this was less than the total number of anglers. Samplers recorded the number of observed and total anglers actually fishing during each drift, or within each drift if the number of anglers changed.

Samplers observed anglers in the stern half of the vessel, where a larger sample size could be obtained. An assumption in our sampling methodology, shown to be statistically valid in 1993 (Wilson-Vandenberg et al. 1995), is that catch, effort, and catch per unit effort (CPUE) data from observed anglers in the stern of the vessel are representative of all anglers on the vessel.

To avoid sample bias, samplers were careful not to influence the fishing activity of observed anglers. Samplers identified and counted each fish caught by all observed anglers. If a fish could not be identified to species, it was identified to the lowest taxon possible. The ultimate fate of each observed fish was recorded as either kept, released, used as bait, or unknown. If the fish was released, the sampler attempted to determine if it survived or died (in the latter case, it was usually consumed by a pelican or gulls). The combined catch by species for all observed anglers was recorded on one data sheet; individual catches per angler were not recorded.

All observed fish were recorded separately by location. If the sampler could not determine whether one location was different from a previous one, it was considered to be different until the locations could be compared using nautical charts.

When fishing had ceased for the day, the sampler then measured total length (TL) in mm of as many observed kept fishes as possible by marking the length of each fish on a plastic measuring board, keeping all species separated. Fork length was used for mackerel species. Not all observed kept fishes were measured due to refusal of an angler to have his/her catch examined, early filleting by the deck hand, or hazardous working conditions caused by inclement weather. When time permitted, fishes caught by unobserved anglers also were measured and their lengths recorded separately from observed fishes' lengths.

Miscellaneous data were recorded on reproductive condition of fishes, weather and sea conditions, commercial fishing activity in the area, and sightings of marine mammals. Lingcod length and sex data, and fin rays, were collected for a cooperative study with the National Marine Fisheries Service whenever possible.

Shoreside Data Processing

Confidential codes were assigned to each unique fishing location after plotting the location on a nautical chart. Unique fishing locations were defined as circular areas separated from other locations by a minimum distance based on depth. For depths less than 20 fm, location centers were no closer than 0.5 naut. mi. to other locations. For depths between 20 and 40 fm, location centers were no closer than 1.0 naut. mi. to each other. For depths greater than 40 fm, location centers were no closer than 2.0 naut. mi. to each other.

All fish measurements on the measuring board were determined to the nearest mm and transferred to length data forms by species. At this time, all species' length data were assigned to a range of location codes as specifically as possible.

Data Entry and Analysis

Data were entered into dBASE databases by Technicians using a C program and were edited first by technicians and again in Monterey by project biologists. Data analyses, summaries, and graphical displays were produced using dBASE, Lotus 123, and Sigma Plot software programs.

Catch Per Angler Day and Catch Per Angler Hour

Catch per angler day (CPAD) is the average catch per angler per day for one or more port areas calculated as the total number of fish divided by the total number of anglers. Catch per angler hour (CPAH), also an average, was calculated by adding the products of the number of observed anglers and the fishing time in hours on each trip and dividing this into the total number of fish caught, for one or more port areas or fishing locations. This standardized the catch rate by weighting fishing time by number of anglers in order to compare angler success.

Mean Length and Catch Per Angler Hour by Location

In order to compare mean length, CPAD, and CPAH of selected sport fishes relative to distance from port and depth, fishing locations were defined as either "near" or "distant", or "shallow", "mixed" or "deep". Near locations were defined as having the location center less than or equal to 10 naut. mi. from any sampled port. Distant locations were defined as having the location center greater than 10 naut. mi. from all sampled

ports. This partitioning was based on a tagging study by Miller and Geibel (1973), in which all tagged fish returned by CPFV anglers were caught within 10 naut. mi. of a port area, indicating low or no utilization of more distant fishing areas.

Shallow and deep fishing locations were defined as ones in which all observed depths during sampling trips were less than or greater than 40 fm, respectively. A mixed location was defined as one in which some observed maximum and minimum depths were greater than and less than 40 fm, or where all depths were exactly 40 fm. These criteria also were based on work by Miller and Geibel (1973), who reported a change in rockfish species composition north of Point Arguello (lat. 34°35'N) at approximately 240 ft (40 fm).

In examining differences in depths fished among port areas, locations were defined by depths observed only in 1994. Thus a historic mixed depth location could be considered as deep or shallow for this comparison. For comparisons of CPAH by species and port area, the historic depth range of locations was used. Fishing has been observed at some locations since 1987, and depth has been recorded each time a documented location was sampled. As a result, some locations have been reclassified from a shallow or deep location to a mixed location designation.

Use of Cluster Analysis in Identifying Trends in CPAH by Location Groups from the Monterey Area

In a Department of Fish and Game Technical Report (Sullivan 1995) CPFV fishing locations within the Monterey/Santa Cruz port area were grouped by similarities in observed species, using either of two cluster analysis techniques: Pearson Product-Moment Correlation Coefficient and Kendall's Tau Ranking Coefficient. Subsequent analyses calculated annual mean CPAH and standard deviation by location group for the most frequently observed rockfish species. Means were weighted by angler effort per trip visit. A trip visit was defined as an observed trip to a location within a particular clustered group. Data from 1990 and 1991 were combined because each year was partially sampled with no overlap of months, and most months were represented. Trends in mean CPAH by location group for 1987-1992 will be discussed for midwater and benthic species. Data from 1990 and 1991 were combined because each year was partially sampled with no overlap of months, and most months were represented. Use of cluster analysis essentially stratifies our random sampling of CPFV's and fishing locations and reduces the variability in CPAH estimates by eliminating effort in areas where a particular species occurs infrequently or not at all.

Length Frequency Histograms

Length frequency histograms, by species and port area, were generated for samples of at least 20 fish. The Y-axis scale was varied among graphs to facilitate comprehension. On the X axis, intervals of either 5 or 10 mm were used, based on the maximum total length of the species, with the upper bound of every fifth or tenth interval labeled (i.e. 150 = 146-150 mm TL). One exception to this was for lingcod, where the 551- to 560-mm interval was partitioned into a 551- to 558-mm interval (less than minimum legal size) and a 559- to 560-mm interval; the latter was combined with the 561- to 570-mm interval.

Estimated Total Catch and Effort

CPFV operators are required to submit logs every month for each fishing trip made during the month. Logbook data include

number of rockfish caught, number of hours fished, number of anglers, and block number where the vessel fished. CPFV log data were obtained from the CDFG's mainframe computer for 1994 to estimate total catch and effort for all marine sport fish caught on rockfish and lingcod trips in northern and central California. Interpretation and summarization of logbook data required several intermediate steps for meaningful comparisons with our sampling data. Logs from salmon trips and trips fishing in the San Francisco Bay estuarine complex were eliminated.

We restricted analyses to all northern and central California trips targeting only lingcod or rockfish. New logbooks that included a column for target species were distributed to CPFV operators beginning in late 1993. However, these data were not available at the time of this report preparation. Criteria used to eliminate trips targeting other species (e.g. sturgeon, striped bass, or salmon) were twofold. First, rockfish or lingcod must have been caught on the trip (virtually eliminating striped bass or sturgeon trips). Second, if salmon were caught, and the catch of all fish was less than four per angler, the trip was eliminated from the data set. The assumption was that this type of trip was likely targeting salmon rather than rockfish. We feel confident that these criteria were successful in establishing a more realistic database.

The logbook data contained a number of multi-day trips taken from the Morro Bay area. To standardize these trips relative to total number of angler days, number of anglers was either doubled or tripled on these trips, depending on whether it was considered a 2- or 3-day trip.

Logbook data initially included trips from all northern and central California ocean and bay ports and were combined into port groups. In general, these port groups corresponded to port areas in this study; for example, Crescent City, Eureka, Pt. Arena, Shelter Cove, and Trinidad (Figure 1) constituted the Northern California group.

Based on these log data, tables are presented for northern and central California ports, summarizing total number of kept fish, number of rockfish, lingcod, and other fish, total number of angler days, total number of trips, total number of hours fished, and average catch per angler day and per angler hour.

Although logs are required for each fishing trip, all CPFV operators do not always submit logs for each trip. In order to estimate the total catch and effort for central and northern California it was necessary to determine the proportion of the logs that was not submitted. We determined a compliance rate for each port group by using the total number of trips we observed (known fishing trips) and checking for each of those trips in the logbook data. Thus the **compliance rate** is the number of observed trips which were logged divided by the total number of observed trips for that port group expressed as a percentage. Data from observed trips, including average catch per angler, total number of anglers and actual fishing time (lines in the water) were then compared with logbook data.

Additional tables are presented with total estimates adjusted by compliance rate. Correction factors, based on observed number of anglers and kept fish per angler from sampled trips, were applied to log data from the same trips. No adjustments were made for the northern California port group due to the small number of sampled trips which may not result in a representative compliance rate.

Total catch estimates by port for lingcod, the 18 most frequently observed rockfishes,

and other rockfishes were made based on adjusted catch estimates of total fish and the proportion of each species from sampling data.

Throughout the report, comparisons to "previous data" refer to our project data from 1987 to 1993 which have been summarized in three previous Administrative Reports (Reilly et al. 1993, Wilson et al. 1995, Wilson-Vandenberg et al. 1995). For the sake of brevity, this will be the only specific reference to those reports. Data from sources other than these will be cited in the text. All references to sexual maturity in the text are based on data from Wyllie-Echeverria (1987).

RESULTS AND DISCUSSION

Total Observed and Measured Catch and Catch Per Angler Effort

Fishery Technicians and project biologists sampled on board 237 CPFV trips and observed 2053 sport anglers who fished for 6274 hr in 1994 (Table 1). The observed catch of 24,731 fish represented 53 species, 32 of these being rockfishes (Appendix 1). Observed anglers retained 22,615 fishes, or 91.4% of the total catch. Catch per angler day for all fishes averaged 12.05, and for kept fishes averaged 11.02, within the range from previous years but slightly less than the long term averages of 1987 to 1993 of 12.61 and 11.90, respectively. The San Francisco area had the highest average CPAD while the Morro Bay and Eureka areas had the lowest.

Catch per angler hour for all fishes averaged 3.94, and for kept fishes 3.60, again within the range from previous years but slightly less than the long-term averages of 3.99 and 3.76, respectively. The Fort Bragg area had the highest average CPAH while the Eureka, Monterey and Bodega Bay areas all were below average. Summary data on CPAD and CPAH by species and port area are presented in Appendices 2-6 for the most frequently observed species. CPAH data are partitioned by near, distant, shallow, and deep locations and will be discussed in the Port Area Summaries section for selected species.

Samplers measured a total of 26,187 fish representing 48 species (Appendix 1). Summary mean length data by species and port area are presented in Appendices 7-11 for the most frequently observed species and include partitioning by near, distant, shallow, and deep locations. Appendices 12-30 contain histograms, by species and port area, for lingcod and the 18 most frequently measured rockfish species. An updated list of maximum lengths by port area for all species measured since 1987 is presented in Appendix 31. In 1994, 23 port area-specific maximum length records were established for this study. Most of these were for species infrequently encountered and in some cases were the first port area record for this study.

Average Fishing Time

Among the five most southern port areas, from 1988 to 1994 Fort Bragg has consistently had the lowest average fishing time, while either Bodega Bay or San Francisco has had the highest for a particular year (Table 2). Most anglers spent between 2 and 4 hours with fishing lines in the water on CPFV trips. No port area demonstrated a trend of increasing average fishing time, an encouraging sign. The Fort Bragg and Morro Bay areas showed a trend of decreasing average fishing time since 1990 or 1991, although in the Morro Bay area the trend may be an artifact of sampling a higher frequency of half-day trips in the past few years. This is evidenced by a gradual decline in average catch per angler day, which was 12.8, 11.6, and 10.3 fish, respectively in 1992, 1993, and 1994 and thus does not indicate fishing success has improved during this time.

Trends in Fishing Effort

Distance from Port

It is well known by CPFV anglers and

operators that fishing success is usually in direct proportion to distance traveled from port areas, primarily due to lower fishing pressure at more remote sites. Our location-specific data base has allowed us to document trends in effort relative to distance from port since 1987 in the Monterey area and since 1988 in other areas. Primarily due to the accessibility of Cordell Bank and the Farallon Islands (although requiring a long boat ride), the Bodega Bay and San Francisco areas consistently have had a majority of trips to distant locations (Table 3). The percentage of distant trips sampled in the San Francisco area increased from 53-55% in 1992 and 1993 to 75% in 1994, but the latter value was also observed in the 1988-1991 period. For all trips sampled a slight increase in frequency of sampled trips to distant locations has occurred from 1992 (29%) to 1994 (38%).

Depth

An increase in frequency of trips to deep fishing locations by CPFV operators may be in response to one or more factors: 1) greater overall fishing pressure in shallow areas (such as by recreational skiff and commercial hook-and-line fishing); 2) depth changes of schooling rockfishes due to ocean temperature increases from El Niño events; and 3) greater availability of several desirable offshore rockfish species such as greenspotted and chilipepper.

The majority of sampled trips in the Eureka, Fort Bragg, San Francisco, and Morro Bay areas were to shallow locations (Table 4). Only in the Morro Bay area was this pattern not consistent with previous years, when mixed-depth trips usually were most frequently observed. In all years sampled except 1993 the Bodega Bay area had more trips to deep locations than to shallow or mixed locations, while the Monterey area has shown a gradual decrease in trip frequency to deep locations since 1992. This may be related to a weakening of the 1992-93 El Niño or a decrease in the relative abundance of chilipepper since 1991, even though catch rates in May and June 1994 improved over the previous 2 years. The percentage of observed trips to shallow locations increased substantially in the three most southern port areas from 1993 to 1994 (San Francisco, 27 to 52; Monterey, 7 to 31; and Morro Bay, 17 to 59. This may be due in part to cooling of nearshore waters and subsequent greater availability of rockfishes in these waters.

Single-location Trips

The frequency of trips to single locations may be considered an indicator of CPFV angler success. However, CPFV operators may intentionally visit multiple locations to ease fishing pressure at favorite sites or to provide a variety of species for anglers. Of the 237 sampled trips in 1994, 44% fished at single locations (Table 5). This is greater than in 1993 (31%) but is still below that of 1988 to 1992 (range 56 to 58%). Consistent with all previous years, the Bodega Bay area had the lowest frequency of single-trip visits and the Fort Bragg area had the highest (exception 1993 when the Eureka area was higher).

Catch Per Unit Effort by Port Area

This project has identified 270 unique fishing locations, as defined earlier. Eleven of these are shared by more than one port area, and 31 locations were added to our data base in 1994.

In the Bodega Bay, San Francisco, and Morro Bay areas, CPAH was as much as 49% greater from deep locations than from shallow locations (Table 6), while the Monterey area CPAH from shallow locations was 54% greater than that from deep locations. Among shallow location groups, the Fort Bragg area had the highest CPAH. The Bodega Bay area average CPAH from shallow locations was the lowest observed for this area since 1988 and has declined steadily since 1992. Within a port area, no consistent relationship has been observed between CPAH from shallow and deep locations

among all years sampled.

CPAH data for all port areas except Bodega Bay showed less variability between near and distant locations (Table 7) than between shallow and deep locations, and no consistent relationship was evident among areas. Highest CPAH for near and distant locations occurred in the Fort Bragg area. The Bodega Bay area CPAH for near locations was 33% lower than that from distant locations and was the lowest observed since observations began in 1988. Similar to depth location data, within a port area no consistent relationship has been observed between CPAH from near and distant locations among all years sampled.

Port Area Summaries

Eureka Area

Species Composition and Percentage Retained by Species In the Eureka area seven species comprised 95% of the observed catch (Table 8), but only three trips were observed. Rockfishes comprised 89% by number and lingcod comprised 10% of the observed catch, which was dominated by canary and black rockfishes. Copper rockfish were relatively more important here than in other port areas, ranking third in observed abundance. Retention rate for all species observed was 94%, similar to most port areas to the south. The retention rate for lingcod (89%) was the highest observed among port areas.

Fort Bragg Area

Species Composition and Percentage Retained by Species In the Fort Bragg area eight species comprised 95% of the observed catch (Table 9). Blue and black rockfishes accounted for 81% of the observed catch, not unexpected since all eight observed trips were to shallow locations. Overall species composition was 98% rockfishes by number, and lingcod comprised 1% of the observed catch. Ninety-six percent of all observed fishes were kept by anglers, and among the top five rockfish species only yellowtail rockfish had a retention rate less than 95%.

Cumulative Monthly CPAH for Selected Species All trends in average monthly CPAH must be considered in the context of directed fishing effort. In general, CPFVs fish more frequently in shallow, nearshore waters from late spring to early fall, and consequently catch rates of nearshore species tend to be higher. The converse is true for deeper, offshore species. However, lingcod and deep water, schooling rockfish species such as widow, yellowtail, chilipepper, and bocaccio may undergo seasonal or age-related movements (Miller and Geibel 1973, Wilkins 1980, Lenarz 1992, Lea et al. 1995) and differences in monthly CPAH may reflect relative abundance. Monthly CPAH data may best be used by the sport angler seeking particular species but not familiar with CPFV fishing practices.

Sixty-one trips representing 1240 angler hours were observed from the Fort Bragg area from 1988 to 1994 (Appendix 32). Although sample size is small, the 12 observed trips from March through May had the highest average monthly CPAH for all species combined, ranging from 6.2 to 7.2 (Figure 2), and these values were the highest observed among all port areas. Overall catch rate declined steadily from April to June and increased again in fall. High CPAH in spring was largely due to blue rockfish (Figure 2), which comprised 55% of all fish observed from March to May. The highest average monthly CPAH for blue rockfish in March (3.6) immediately followed the lowest in February (1.1). This may be related to the cessation of spawning and the onset of intensive feeding by blue rockfish to replenish diminished fat reserves and muscle mass.

Norton and MacFarlane (1995) observed a dramatic decrease in muscle and fat tissue in female yellowtail rockfish, coinciding with the development of larvae prior to winter spawning.

Interestingly, yellowtail rockfish demonstrated a similar pattern to blue rockfish in the Fort Bragg area, with the lowest CPAH occurring in January (0.2) followed by the highest CPAH (1.6) in February (Figure 3).

Widow rockfish are an important offshore species in the Fort Bragg area. Average monthly CPAH from December to April was six times higher than that of the rest of the year (Figure 3).

Although at least a portion of lingcod stocks are thought to migrate inshore in fall and winter for spawning (Miller and Geibel 1973), limited catch data from the Fort Bragg area did not show this. Highest monthly CPAH occurred in March and April, and 2 of the 4 lowest months were December and January (Figure 3).

Black rockfish, typically a shallow, nearshore species, exhibited less seasonality in CPAH than in other port areas, with relatively high catch rates as early as March and as late as November (Figure 4).

Highly desirable copper and vermilion rockfishes generally were caught more frequently from late spring to late fall (Figure 4).

Areas of Concern *Black rockfish* CPAH for black rockfish was 48% greater at distant locations than at near locations (Appendix 2). Mean length of black rockfish was 8% greater at distant locations (Appendix 7). These data are indicators of greater fishing pressure for this species closer to port. The length frequency histogram (Appendix 17) indicated a scarcity of adult fish in the sampled catch. Only 14% of observed black rockfish were at or greater than 360 to 410 mm (14.2 to 16.1 in.), the length range corresponding to 50% sexual maturity. In 1993, 35% of the sampled catch was at or above this length range. This situation is approaching that of port areas to the south and thus is an area of concern.

Comparison of CPFV Sampling Data with Commercial Hook-and-Line Sampling Data The top five species landed by weight in the commercial hook-and-line fishery in the Fort Bragg area in 1994 were yellowtail rockfish, lingcod, and canary, yelloweye, and copper rockfishes (Collier and Kalvass 1995). Of these, only yellowtail and canary rockfishes were among the five most frequently observed species in the CPFV catch. Until recently there had been minimal sport-commercial conflict in this port area (Collier and Kalvass 1995). However, they reported that commercial activity is now increasing for rockfish, cabezon, greenling, and lingcod in Mendicino County nearshore waters, an area traditionally fished mainly by sport anglers.

Bodega Bay Area

Species Composition and Percentage Retained by Species In the Bodega Bay area 14 species comprised 95% of the observed catch (Table 10). Chilipepper and yellowtail and blue rockfishes were the three most frequently observed species, similar to all previous complete years sampled except 1992 when widow rockfish replaced chilipepper within the top three. Overall species composition was 95% rockfishes by number, and lingcod comprised 4% of the observed catch. Black rockfish ranked seventh and equaled the highest rank observed since 1988. In 1993 this species ranked 12th in observed abundance. Yelloweye rockfish have declined steadily in relative abundance since 1988 and 1989 when they ranked 10th. From 1992 to 1994 this species ranked 15th, 16th, and 17th, respectively. On the other hand, widow rockfish have increased dramatically in importance. In 1988 and 1989 this species ranked 23rd and 13th, respectively, while from 1992 to 1994 it consistently ranked in the top six species.

Retention rate for all observed fishes was 95%, similar to most other port areas. Among rockfishes, only blue, rosy, greenstriped, and starry had retention rates less than 95%. These species are either relatively small or have a

significant proportion of juveniles available to the fishery.

Cumulative Monthly CPAH for Selected Species From 1988 to 1994, 129 trips representing 4185 angler hours were observed from the Bodega Bay area (Appendix 33). No seasonal trends were apparent in CPAH for all species combined, but highest values were in February and June and lowest average CPAH was in July and September (Figure 5).

Chilipepper exhibited a marked seasonality with two peaks in CPAH (Figure 6). A steady increase in catch rate occurred from November to February and a sharp increase occurred from July to August. Few chilipepper were caught from May to July.

Yellowtail rockfish CPAH was lowest from June to August, coinciding with the primary period for nearshore fishing effort (Figure 6). The nearshore species complex of blue, black, brown, China, and gopher rockfishes were caught most frequently during the May-October period (Figure 5). Copper and vermilion rockfishes, species with wide depth ranges, were observed caught more frequently from June to August (Figure 7).

Among the deeper-dwelling species, bocaccio were caught with greatest frequency in February and March. Widow rockfish CPAH was four times greater in the October to March period than the rest of the year (Figure 6), while unexpectedly yelloweye rockfish CPAH was lowest from March to May.

CPAH of lingcod showed little seasonality in the Bodega Bay area, with highest CPAH in August and December and lowest CPAH in April (Figure 7).

Areas of Concern Five species of rockfishes were identified as areas of concern (black, blue, brown, and yelloweye) or potential concern (chilipepper) in the Bodega Bay area CPFV fishery. The first three of these species are distributed primarily in shallow nearshore waters.

Black rockfish From 1992 to 1994 mean length of observed black rockfish declined by 13%, and the 1994 length frequency histogram (Appendix 17) indicates that only 15% of the sampled catch is at or above the length of 50% sexual maturity of males. This warrants attention in light of the importance of this species in the CPFV catch (rank 7 in 1994).

Blue rockfish Although the length frequency histogram for 1994 (Appendix 12) indicates a significant proportion of sexually mature fish in the sampled catch (length range at 50% maturity is 270-290 mm or 11.0-11.4 in.), some concern is warranted by trends in the data. Since 1989 mean length has declined by 17% and fewer large adults have been observed. In 1989 35% of observed fish exceeded 350 mm (13.8 in.) while in 1994 only 8% exceeded this length.

Brown rockfish Brown rockfish have declined in importance in the Bodega Bay area, averaging rank 6 during the 1988-1991 period but only ranking 13 in 1994. Average CPAH in 1992, 1993, and 1994 has been only 15-24% of average CPAH in 1988-1989. Mean length in 1994 declined 13% from that of 1989, and percentage of large adults (greater than 350 mm or 13.8 in.) declined from 43 in 1989 to 6 in 1994.

Yelloweye rockfish For the third consecutive year, average CPAH for yelloweye was less than half of average values from 1988 to 1991.

Chilipepper A steady decline in annual mean length had occurred since 1991 totaling 14%. This may, however, reflect year class strength of recruiting year classes, particularly in 1994 , and may not necessarily be cause for concern. This species is characterized by highly variable recruitment and the last strong year class to be observed in the fishery was born in 1984. In 1994 the highest percentage of fish less than 340 mm or 13.4 in. (length at 50% maturity for females) was observed since 1988 (Appendix 15), possibly indicating another strong recruitment year. Other indicators that the

decline in mean length is not related to fishing pressure were the average CPAH, which was the second highest observed in 1994, and a wide length range of sampled fish (Appendix 15).

Comparison of CPFV Sampling Data with Commercial Hook-and-Line Sampling Data The top five species sampled from the nearshore component of the Bodega Bay area commercial hook-and-line fishery in 1994 were gopher, blue, canary, China, and black-and-yellow rockfishes (J. Mello, CDFG Bodega Bay, pers. comm.); these comprised 80% by weight of total landings. Of these species, only blue and canary rockfishes also were important components of the CPFV catch.

The offshore troll longline fishery landed predominantly chilipepper, darkblotched, yellowtail, widow, and blackgill rockfishes, accounting for more than 90% by weight of the total catch (J. Mello, pers. comm.). Chilipepper, yellowtail rockfish, and widow rockfish were all among the six most frequently observed species in the CPFV fishery.

San Francisco Area

Species Composition and Percentage Retained by Species In the San Francisco area 16 species comprised 95% of the observed catch (Table 11). Yellowtail, blue and rosy rockfishes were the three most frequently observed species, similar to all previous years sampled except 1988 when lingcod replaced rosy rockfish for third rank. These three species comprised 53% of the observed catch in 1994. Overall species composition was 92% rockfishes by number, and lingcod comprised 5% of the observed catch. Black rockfish ranked fourth, the highest since observations began in 1988 and a substantial increase in relative importance from 1992 (13th) and 1993 (8th). Copper rockfish ranked 13th in 1994, the lowest since 1988 and a sharp decline from rank 6 in 1992 and 1993.

The San Francisco area had a retention rate of 95% for all observed fishes, and only rosy rockfish, lingcod, and Pacific sanddabs were kept at rates less than 90%. Many species of rockfishes had retention rates of 100%, including olive, China, copper, bocaccio, vermilion, yelloweye, speckled, and quillback. Ninety-three percent of black rockfish were retained, the majority of these juveniles (see below). This is a disappointing result in that the San Francisco area was the focus of a voluntary catch-and-release program for black rockfish less than 14 in. initiated by this project in April 1994.

Cumulative Monthly CPAH for Selected Species From 1988 to 1994, 250 trips representing 12,183 angler hours were observed from the San Francisco area (Appendix 34). CPAH for all species combined was generally higher from November to March than during the rest of the year (Figure 8). Lingcod CPAH appeared to exhibit some seasonality with a slight increase observed from June to October (Figure 9), just prior to the November to February spawning season. Catch rates remained relatively high throughout fall and early winter and declined from February to April. Unexpectedly, the highest CPAH was observed in May.

Yellowtail rockfish CPAH was lowest from May to July, corresponding to the heart of the nearshore fishing season (Figure 9). The nearshore complex of species, including cabezon and black, brown, and gopher rockfishes, all had substantially higher CPAH from either March or April to either August or September (Figure 10). Of 2194 observed black rockfish, 97% were caught from April to September.

Blue rockfish, which inhabit deeper reefs in the San Francisco area and are not confined primarily to nearshore areas as in more northern port areas, exhibited a sharp increase in CPAH in February after showing relatively low catch rates from October to January (Figure 10). As mentioned previously, this may be in response to the cessation of spawning and the onset of intensive feeding.

Offshore species, including widow rockfish (Figure 9) and bocaccio, had higher CPAH from November to March. CPAH of the widely distributed copper rockfish peaked in January and declined steadily to lowest values in April and May, while vermilion rockfish CPAH showed little trend (Figure 10).

Areas of Concern *Black rockfish* Black rockfish continues to be the species of greatest concern in the CPFV fishery, and of the four port areas with greatest effort, it is relatively most important in the San Francisco area. Little change has occurred in the length frequency distribution of the sampled catch since 1990, when the virtual disappearance of sexually mature fish was first observed. This occurrence prompted the initiation of a voluntary catch-and-release program by the Central California Sport Fish Project on April 1, 1994 for black rockfish less than 14 in. (356 mm). Based on the relatively high retention rate in 1994, the program was not successful in its first year.

Mean length of black rockfish in 1994 was 291 mm (11.5 in.) and was the lowest annual mean length observed from the San Francisco area. However, an encouraging sign was the catch rate per angler hour, which at 0.30 was the highest ever recorded for this area. Evidently strong recruitment (Appendix 17) provided the bulk of the catch in 1994. If fishing pressure is not heavy on these stocks the adult population may rebuild in 3-4 years.

Copper rockfish The potential concern for this species involves relative abundance, as mean length and length frequency data since 1988 do not indicate a problem. Average CPAH in 1994 was 50% of the previous year and equaled the lowest annual average observed since 1988. This reverses a trend in increasing CPAH since 1988; additional years of sampling are needed to put this in perspective.

Comparison of CPFV Sampling Data with Commercial Hook-and-Line Sampling Data The five most frequent species sampled from the commercial hook-and-line fishery in the San Francisco area, all gears combined, were canary, brown, rosy, gopher, and blue rockfishes, in decreasing order of abundance (B. Ota, CDFG, Menlo Park, pers. comm.). Canary, blue, and rosy rockfishes also were among the top five species sampled in the San Francisco area CPFV fishery, and thus there is considerable overlap.

Monterey Area

Species Composition and Percentage Retained by Species In the Monterey area 19 species comprised 95% of the observed catch (Table 12). As in past years, this area had the greatest diversity, with 47 species, 28 of these rockfishes, observed in the catch. Yellowtail and blue rockfishes and chilipepper were the three most frequently observed species, similar to all previous complete years sampled. These three species comprised 50% of the observed catch in 1994. Overall species composition was 88% rockfishes by number, the lowest among port areas, and lingcod comprised 3% of the observed catch. Widow rockfish were conspicuously scarce; in all previous complete years sampled this species had been among the top six in relative abundance, but in 1994 widow rockfish ranked only 16th. Similarly, bocaccio, a species often caught with widow rockfish, ranked only 14th in 1994, whereas in previous years it had ranked no lower than 8th. Starry, canary, and black rockfishes and Pacific sanddabs were relatively more important in the observed catch in 1994. Black rockfish had ranked no higher than 20th in previous years but were 10th in 1994.

The Monterey area had the lowest overall retention rates among all port areas (85%), primarily due to the occurrence of live bait fishing. Unidentified sanddabs and species including Pacific sanddabs, chub mackerel, jack mackerel, and Pacific sardines were caught and subsequently used as bait. However, the

exclusion of these species yielded an overall retention rate of 91%, still the lowest among port areas. Other species with relatively low retention rates included rosy rockfish (84%), squarespot rockfish (80%), black rockfish (78%), and lingcod (50%). The latter two species are usually returned alive, partly because of the 22 in. minimum size limit for lingcod. The former two species rarely exceed 300 mm (11.8 in.).

Cumulative Monthly CPAH for Selected Species From 1987 to 1994, 578 trips representing 20,733 angler hours were observed from the Monterey area (Appendix 35). CPAH for all species combined showed a definite seasonality and was 60% lower in October and November than the average for the rest of the year (Figure 11). Highest catch rates were observed in May and June, largely influenced by directed effort towards chilipepper in spring and summer. Eighty-six percent of all chilipepper were observed caught from March to September, and a gradual and steady increase in CPAH occurred from February to May (Figure 11). This was the opposite of the trend observed for Bodega Bay area chilipepper and may indicate a southward shift of stocks during this period to submarine canyons in and adjacent to Monterey Bay. From August to October, CPAH for chilipepper in the Monterey area decreased by a factor of 90.

Lower catch rates in fall are primarily due to directed effort towards lingcod. CPAH for lingcod increased more than threefold from September to October, when lingcod "season" begins (Figure 12). Lower catch rates for all species combined are expected because single hooks are frequently used for lingcod rather than multiple-hook gangions. Lingcod CPAH decreased more than fourfold from December to February and remained relatively low throughout spring and summer.

Although blue rockfish are available year-round in the Monterey area, CPAH generally was higher from June to September when more nearshore fishing effort occurs (Figure 11). Similar to the San Francisco area, a dramatic increase in CPAH occurred from January to February, coinciding with the cessation of spawning and the onset of intensive feeding for this species.

Several nearshore species, including black, brown, gopher, and olive rockfishes, had higher CPAH in summer and fall (Figure 13). Copper and vermilion rockfishes CPAH showed little seasonality, and the months with greatest angler success were July and February, respectively (Figure 13).

Among offshore species, bocaccio and widow rockfish (Figure 12) demonstrated bimodality in peak CPAH, with higher rates from January to March and again in late summer to early fall. Both species had relatively low CPAH in June and July.

Although jack mackerel is a species of minor importance in the Monterey area fishery, some seasonality was noted; 85% of all fish observed were caught from July to December. Pacific hake, an important component of the catch until 1990, but now rarely observed (due to undesirability), also exhibited distinct seasonality, with 95% of the observed catch occurring in a 4-month period, April to July. Black rockfish, typically a shallow, nearshore species, exhibited less seasonality in CPAH than in other port areas, with relatively high catch rates in all months except December to February (Figure 4).

Areas of Concern *Black rockfish* Similar to other port areas, the primary concern with black rockfish in the Monterey area is the scarcity of fish in the sampled catch in the length range of sexually mature adults (Appendix 17). However, as in the case of the San Francisco area, average annual CPAH was the highest ever recorded and is reflective of recent strong recruitment.

Bocaccio Average CPAH has declined steadily from 0.29 in 1992 to 0.09 in 1994 (the

lowest average observed since 1987) and indicates cause for concern. This is consistent with the general consensus of West coast fishery biologists that bocaccio stocks have declined coast wide recently (D. Thomas, CDFG Menlo Park, pers. comm.). A strong year class has not occurred since 1984 and bocaccio stocks are largely dependent upon these infrequent recruitment events. As this species is also an important component of the commercial fishery, commercial fishing effort may be a primary factor in the observed decrease in relative abundance.

Canary rockfish Mean length has declined steadily from 1990 to 1993 and appears to have leveled off in 1994. This coupled with the scarcity of fish in the length range of sexually mature adults is cause for potential concern. However, juvenile fish have comprised the majority of the sampled catch since observations began. It is likely that spawning stocks are less available to the Monterey area CPFV fishery than they are to the Bodega Bay area fishery (Appendix 16). Bodega Bay is considered the southern limit of their commercial range (Adams 1992). The lower mean length in 1993 and 1994 may be due to increased recruitment rather than a scarcity of larger fish. Canary rockfish ≤ 300 mm (11.8 in.) comprised between 16 and 18% of the observed catch in those years, while in all other years percent composition ranged from 2 to 10%.

Chilipepper In 1994 average CPAH was only 17% of that in 1987, and a steady and gradual decline has occurred between those years. Similar to bocaccio, this species is characterized by infrequent strong year classes, and the last strong one occurred in 1984 (Rogers and Bence 1992). In addition, annual mean length in 1994 was the lowest recorded to date, but examination of the length frequency histogram (Appendix 15) indicates that recruitment to the fishery may have been above average in 1994. No other histogram since 1987 for the Monterey area has been so skewed to the left and contained such a high proportion of fish ≤ 300 mm (11.8 in.).

Widow rockfish The primary concern for this species is relative abundance. Average annual CPAH in 1994 was the lowest ever recorded and has declined steadily since 1992.

Yelloweye rockfish A potential area of concern is a steadily declining mean length from 454 mm (17.9 in.) in 1992 to the lowest mean ever recorded of 387 mm (15.2 in.) in 1994. In addition, a relative scarcity of fish exceeding 500 mm (19.7 in.) characterized the 1994 histogram (Appendix 30). However, yelloweye rockfish generally are larger with increasing depth, and in 1994 a greater proportion of trips to shallow locations was observed than in the 2 previous years. This may explain the decreased mean. Partitioning the data using cluster analysis (Sullivan 1995) may resolve this.

Use of Cluster Analysis in Identifying Trends in CPAH by Location Groups from the Monterey Area Annual weighted mean CPAH and standard deviation were calculated for eight midwater and eight benthic rockfish species (Tables 13 and 14). Five Pearson location groups were examined for midwater species, and three Pearson and four Kendall's Tau location groups were examined for benthic species.

Midwater Species Several trends were apparent in midwater species. Yellowtail rockfish mean CPAH declined dramatically from 1990-91 to 1992 and remained low in 1993 in the "Blue" group (Table 13), a relatively shallow area with average depths in the 49 to 61 m (162 to 201 ft) range. Analysis of variance indicated significant differences ($p=0.0045$) among years. On the other hand, average CPAH of yellowtail rockfish in the deeper "Yellowtail" group (average depth range 83 to 96 m or 274 to 317 ft) increased by 47% during this same period. It is likely that these data indicate a response by yellowtail rockfish to warmer ocean temperatures due to the 1992-93 El Niño rather than to intense fishing pressure in the "Blue" group; warmer

ocean temperatures caused yellowtail rockfish to seek deeper water. Preliminary data from 1994 showed a dramatic increase in average CPAH in the "Blue" group to 0.94, coinciding with a cessation of the El Niño event and a decrease in ocean temperatures in shallow water.

The value of cluster analysis in documenting this occurrence is aptly demonstrated by examining average annual CPAH from all Monterey area locations combined; CPAH ranged from only 0.50 to 0.70 between 1987 and 1994 and showed no trend. Overall CPAH decreased only slightly from 0.70 in 1990-91 to 1992, and in 1994 was less than in 1992. Stratifying CPUE data by depth range can be a valuable tool in discerning whether trends are caused by fishing pressure or by natural phenomena.

Consistent with data reported above for all locations combined, bocaccio CPAH has declined gradually in the "Widow" group since 1987 and in 1993 was only 18% of that in 1987 (Table 13). Differences among years were significant ($p=0.0396$). This group is centered in the 86 to 95 m (284 to 314 ft) depth range. A longer time series of data is needed to distinguish natural variability from the effects of fishing.

Widow rockfish CPAH in the "Yellowtail" group and "Chilipepper" group showed opposite trends from 1990-91 to 1992 (Table 13), with the former showing a decrease in average CPAH and the latter showing an increase. Since the "Chilipepper" group is deeper than the "Yellowtail" group, this may indicate a response to ocean temperatures similar to yellowtail rockfish.

Eighty-six percent of all chilipepper observed in the Monterey area from 1987 to 1993 originated from the 13-location "Chilipepper" group. Analysis of variance indicated significant differences among years ($p=0.0002$), with specific pairwise differences between the 1990-91 combined mean (the lowest mean CPAH recorded) and 1987, 1988, and 1993 (Table 13).

Olive rockfish mean CPAH revealed significant differences in the relatively shallow "Blue" group for the years 1988 (lower value) and 1992 (Table 13). No other significant differences occurred in mean annual CPAH for other location groups or midwater species (black, blue, canary, and widow rockfishes.

Benthic Species Few trends from 1987 to 1993 were apparent for the eight benthic species analyzed. Greenspotted rockfish showed a generally increasing trend in CPAH in the "Shelf Flats" group, an area centered around the 87 to 99 m (287 to 327 ft) depth range (Table 14). Average annual CPAH was significantly greater ($p= 0.02$) in 1993 than in 1987 and 1988. Two declining trends were observed. Mean CPAH for rosy rockfish declined steadily, but not significantly, from 0.27 in 1989 to 0.15 in 1993 in the "Greenspotted/Copper" group, an area centered around the 95 to 104 m (313 to 343 ft) depth range. Mean CPAH for vermilion rockfish declined steadily from 0.08 in 1988 to 0.01 in 1993 in the "South Shallow" group and, although differences in CPAH were not significant, this is cause for concern due to the desirability of this species. This location group is a heavily fished area by the Monterey CPFVs and has an average depth range of 55 to 68 m (181 to 224 ft).

Analysis of variance of weighted mean CPAH revealed significant differences for greenspotted rockfish in the "Canyon Ledge" group, for starry rockfish in the "South Shallow" and "Rosy" groups, and for vermilion rockfish in the "Shelf Flats" group, and in all cases the higher CPAH values were in later years than the lower values, an encouraging sign.

Comparison of CPFV Sampling Data with Commercial Hook-and-Line Sampling Data

The top five species sampled from the nearshore (< 15 fm) component of the Monterey area commercial hook-and-line fishery in 1994 were black-and-yellow, gopher, vermilion, brown, and copper rockfishes (Wild et al. 1995); these

accounted for 90% of the estimated total landed weight. None of these species ranked higher than 15 in the observed CPFV catch (black-and-yellow rockfish were not observed), and together they comprised less than 6% by number of the observed CPFV catch.

On the other hand, the offshore (> 15 fm) component of the Monterey area commercial hook-and-line landings demonstrated more similarity in relative species composition with the CPFV fishery. The top five commercial hook-and-line species were chilipepper, yellowtail rockfish, bocaccio, starry rockfish, and lingcod and they comprised 85% of the estimated total landed weight. Three of these species, chilipepper and yellowtail and starry rockfishes, were among the top 10 CPFV species, and all five species comprised 31% of the observed CPFV catch.

Blue rockfish was distinctive in being utilized heavily by the CPFV fishery but were only a minor component of the commercial hook-and-line fishery. In 1994 28% of the observed CPFV catch consisted of blue rockfish, while less than 2% of the estimated total landed weight of the commercial hook-and-line fishery was blue rockfish. Widow and rosy rockfishes also were considerably more important in the CPFV fishery.

Morro Bay Area

Species Composition and Percentage Retained by Species In the Morro Bay area 14 species comprised 95% of the observed catch (Table 15). Yellowtail and blue rockfishes were the two most frequently observed species, similar to all previous complete years sampled, and comprised 50% of the observed catch in 1994. Overall species composition was 96% rockfishes by number, and lingcod comprised 3% of the observed catch. Compared with other ports, no substantial changes in relative abundance of important species were noted when compared with previous years. For example gopher and vermilion rockfish have consistently ranked among the top six species since 1988. However, the relative abundance of chilipepper, a minor species in this area, can best be characterized as sporadic; this species ranked 11th and 15th in 1989 and 1993, respectively, but in other years was not among the top 25 species or was not observed at all.

The Morro Bay area had an overall retention rate of 95%, and among those rockfish species with at least 20 individuals observed, only rosy and greenstriped were kept at frequencies less than 97%. Many rockfishes, including vermilion, olive, copper, brown, canary, greenspotted, flag, China, kelp, yelloweye, speckled, and squarespot, had 100% retention rates. Continuing a steadily declining north-south gradient, lingcod had the lowest retention rate (35%), and thus the highest percentage of sub-legal sized fish, among all port areas. This is consistent with observations from previous years.

Cumulative Monthly CPAH for Selected Species From 1988 to 1994, 371 trips representing 11,311 angler hours were observed from the Morro Bay area (Appendix 36). Monthly CPAH for all species combined demonstrated the narrowest range among all port areas, ranging only from 3.2 to 4.2 (Figure 14). Several peaks were evident from January to February and from September to November, with lowest catch rates observed in April and May.

Similar to more northern port areas, blue rockfish CPAH increased substantially from January to February, but declined just as rapidly from March to April (Figure 15).

Several important nearshore species, including black, brown, and gopher rockfishes, had higher catch rates in summer (Figure 15), and conversely, offshore species including widow (Figure 16) and yellowtail (Figure 15) rockfishes and bocaccio showed lower CPAH in late spring and summer.

Highly desirable vermilion and copper rockfishes had catch rates 50% and 35% higher, respectively, from January to June than from July to December (Figure 16).

Lingcod CPAH increased steadily from July to October and may be related to increased abundance during the inshore spawning migration (Figure 16).

Areas of Concern *Black rockfish* Similar to port areas to the north, the primary concern with black rockfish in the Morro Bay area is the scarcity of fish in the length range of sexually mature adults in the sampled catch (Appendix 17).

In the Morro Bay area approximately equal percentages of near and distant locations were also shallow locations; thus differences in average CPAH for shallow species may be related to fishing pressure. CPAH of black rockfish was three times greater at distant locations (Appendix 6).

Canary rockfish Average CPAH has declined steadily since 1989 and in 1994 was 50% of that in 1989; this trend is cause for concern. Similar to the Monterey area, juvenile fish have comprised the majority of the sampled catch since observations began and it is likely that spawning stocks are largely unavailable to the Morro Bay area CPFV fishery.

Starry rockfish A potential concern is a gradual decline in mean length of 5% from 1988 to 1994. However, a sufficient proportion of fish in the length range of sexually mature adults (50% maturity at 270-300 mm or 10.6-11.8 in.) continue to comprise the sampled catch (Appendix 20). The decline in mean length in 1993 and 1994 is likely due to newly-recruited fish, as CPAH for these years was two to three times higher than in previous years.

Comparison of CPFV Sampling Data with Commercial Hook-and-Line Sampling Data

The top five species sampled from the nearshore (< 10 fm) component of the Morro Bay area commercial hook-and-line landings were gopher rockfish, cabezon, and black-and-yellow, vermilion, and grass rockfishes (Wild et al. 1995). Only gopher and vermilion rockfishes were significant components of the observed CPFV catch, while the other three species each comprised no more than 0.1% of the sampled catch. These three species are caught primarily in depths less than 60 ft, infrequently fished by CPFVs.

The top five species in the offshore component (generally > 50 fm) of the commercial hook-and-line landings were vermilion rockfish, chilipepper, bocaccio, and blackgill and yellowtail rockfishes. Vermilion and yellowtail rockfishes ranked 2 and 3, respectively, in the observed CPFV catch, bocaccio ranked 10, chilipepper were infrequently observed, and blackgill rockfish were not observed.

Only 22% of sampled CPFV trips in the Morro Bay area fished at depths less than 10 fm or greater than 50 fm, so the overlap with the commercial hook-and-line fishery in area fished is less than in port areas to the north.

Improved Fishery Trends

Several port specific negative trends described in previous Administrative Reports reversed themselves in 1994 and other positive trends continued, an encouraging sign. Yellowtail rockfish and lingcod CPAH in the Bodega Bay area had been declining since 1989 and 1988, respectively, but catch rates improved in 1994. Lingcod average CPAH was the highest recorded to date in the Bodega Bay area. Chilipepper CPAH continued to increase in this area after a steady decline from 1988 to 1992.

Canary rockfish average CPAH in the San Francisco area continued to improve and in 1994 was 2.3 times higher than the lowest value, recorded in 1988. Bocaccio observed in the San Francisco area fishery in 1994 had the highest

mean length ever recorded in this study. Sport anglers are likely taking advantage of the strong 1984 year class as it cycles through the fishery.

In the Monterey area gopher rockfish has not been one of the primary species in the CPFV catch, but CPAH in 1994 was the highest on record and twice as high as any previous year. This may be in part due to a higher frequency of shallow trips observed in 1994.

In the Morro Bay area brown rockfish in 1994 reversed declining trends in both CPAH and mean length. Prior to 1991 this port area yielded greater mean lengths for brown rockfish than any other area to the north. By 1993 a declining trend, which began in 1990, resulted in the Morro Bay area having the lowest mean length. In 1994 both CPAH and mean length values returned to levels similar to those observed in 1992.

Total Observed Effort and Estimated Total Catch and Effort

Logbook data

There is some indication that, compared with previous years, CPFV logbook data from 1994 are potentially incomplete. For example, no logbook data are available for at least two primary fishing vessels from the Monterey area from September to either October or December; these were vessels which consistently submit logs and fish regularly. Thus, catch and effort estimates are considered preliminary.

There were 26,981 CPFV trips logged in 1994 for all of California; of these, 10,170 occurred from ports in northern and central California. There were 4818 trips assumed to be targeting rockfish and/or lingcod in northern and central California (Table 16). An additional 205 trips in which salmon and rockfish both were caught were not included in the data base because they were assumed to be targeting salmon.

Ninety CPFVs fished for rockfish and lingcod north of Point Conception in 1994, and of these, 67 completed more than 10 trips each during the year. Samplers observed fishing on board 47 different CPFVs, representing 70% of the fleet.

Logbook data indicated northern and central California anglers caught 910,183 rockfishes and 27,111 lingcod on targeted trips (Table 16), accounting for over 99% of the catch of these species on all CPFV trips in this area.

The unadjusted preliminary catch and effort data appear to have declined markedly compared with previous years. For example, in 1993 logbook data indicated anglers caught 1,257,950 fish, while in 1994 only 956,340 fish were reported in logged catches, an apparent decrease of 30%. Reported total catch and effort were the lowest observed since 1987, although trip effort in 1994 was only 2% less than that in 1987, the next lowest year.

Fort Bragg was the only port area not showing a decline in reported rockfish and lingcod catch and effort from 1993 to 1994, although in both of these years the reported catch unexpectedly was less than that from CPFVs in the Eureka area. In the Monterey and Morro Bay areas there were declines of more than 100,000 fish caught compared with 1993.

Adjusted Logbook Data

Compliance rates were determined for each port area and were comparable to other years in ports with more than 10 observed trips. Values for each port group (logged/observed trips) were: Northern California (3/3, 100%); Fort Bragg (0/8, 0%); Bodega Bay (18/26, 69%); San Francisco (36/40, 90%); Monterey (40/84, 48%); Morro Bay (50/76, 66%).

The port of Monterey historically has had a low compliance rate and this year we attempted to derive an independent estimate of compliance via a ground truth survey of boats not in port on specific days during October-December. Only 28% of the vessel days were accounted for by submitted logs. This lower value was primarily

due to the previously mentioned absence of logbook data from two primary vessels. We decided that the compliance rate from sampling data was more realistic and used that to adjust catch and effort.

Logbook data were adjusted only for port groups from Bodega Bay south due to sample size and, as expected, adjusted catch and effort values were much lower than in previous years (Table 17). As previously stated, a potentially incomplete data base and relatively higher salmon effort may explain the declines.

The total estimated non-salmon catch for CPFV anglers in northern and central California was 1.37 million fish (Table 17), a 20% decrease from 1994 and the lowest total estimate in the past 7 years. The preliminary nature of the logbook data base warrants caution in interpreting trends. However, fishing effort for salmon reduces effort directed towards rockfish and lingcod; the 1987-89 period was one of the best ever for sport salmon fishing in northern and central California (A. Grover, CDFG, Healdsburg, pers. comm.). Salmon effort declined steadily from 1989 to 1992 by 55% and then increased by 1994 to about 70% of that in 1989. An inverse relationship exists between salmon effort (in angler days) and adjusted total non-salmon CPFV catch from our data during the 1988-94 period, so it is likely that the declining trend in total estimated rockfish catch since 1992 is real.

Total estimated rockfish catches by port area were partitioned by species and are presented along with lingcod catch estimates in Tables 18-23. Within the overall trend of a general decline in total estimated CPFV rockfish and lingcod catch from adjusted logbook data, several species are notable for declines of a more substantial nature or for the absence of a decline.

In the Bodega Bay area, the estimated yellowtail rockfish catch has declined approximately 60% since 1992, while bocaccio and brown rockfish have also experienced substantial declines. On the other hand, estimated canary rockfish catches have been fairly consistent since 1988.

In the San Francisco area, 1994 estimated catches of blue and yellowtail rockfishes were only 30% and 42%, respectively, of those in 1992. Estimated lingcod catches have declined steadily since 1988 by approximately 50%.

The Monterey area estimated chilipepper catch declined 80% from 1987 to 1994. In contrast, the estimated gopher rockfish catch in 1994 was more than twice that of any other year since 1987. The average estimated blue rockfish catch during the 1992-94 period was 60% greater than that of the 1989-91 period.

Although the estimated blue rockfish catch in the Morro Bay area declined 33% from that in 1993, it was still approximately twice that of estimates from the 1988-89 period.

The 237 trips observed in 1994 represent approximately 3% of all logged trips targeting rockfish and lingcod in northern and central California, adjusted by compliance rate. Since not all CPFVs are sampled, including some that fish on a regular basis, our data base may not be truly representative, and catch estimates by species may be biased. For this reason we place less importance on trends of total estimated catch by species than on the primary indicators of the health of the fishery: catch-per-unit effort, mean length, and length frequency of the sampled catch.

SUMMARY

It is not possible to obtain direct population estimates of important sport rockfishes and lingcod. We continue to use estimates of catch per unit effort, mean length, length frequency distributions, and proportion of adults in the sampled catch as indicators of the health of the fishery. Only long-term data collected annually will allow us to properly assess fishery trends using these parameters and make distinctions between those caused by natural variability and those caused by fishing.

CPUE Trends

We have not observed a general decrease in catch per unit effort in any port area since on board sampling data were first collected in 1987 and 1988. However, there have been declining trends in CPAH noted for certain species in the Bodega Bay, Monterey, and Morro Bay areas, and these are cause for concern. In the Fort Bragg area, CPAH was 48% greater at distant locations compared to near locations, likely due to greater fishing pressure closer to port.

In the Bodega Bay area, a steadily decreasing CPAH at shallow locations for all species combined since 1992, and for brown rockfish, a nearshore species, since 1988, may be related to the impact of increased commercial hook-and-line effort during this period. The lower observed CPAH for yelloweye rockfish in 1992-94 compared with 1988-91 is more difficult to explain. The longevity of this solitary species coupled with its large size at sexual maturity (400 mm or 15.7 in.) are factors which slow recovery after over fishing.

In the Monterey area, the declining CPAH of chilipepper from 1987 to 1994 is of great concern. This species has been of primary importance during spring and summer and may contribute more than 30% of the annual CPFV rockfish catch. This is a widely distributed and federally managed commercial species. Commercial fishing trends are difficult to interpret prior to 1992 because chilipepper were often combined with bocaccio or listed as "unspecified rockfish" on landing receipts. However, commercial landings of chilipepper in the Monterey area increased by more than 50% from 1993 to 1994, while at the same time average CPAH in the CPFV fishery decreased by over 50%. Since trawlers range much father than CPFVs in their search for fish, the apparent decline in the CPFV fishery may be related to changing distributional patterns of major stocks related to oceanographic events rather than overfishing.

On the other hand, the declining trend in bocaccio CPAH observed in the Monterey area since 1990-91 may be indicative of a statewide decline in stocks. Commercial quotas were recently instituted for bocaccio, and commercial landings in the Monterey area have decreased approximately 40% from 1992 to 1994. Chilipepper and bocaccio recruitment patterns are highly variable and strong year classes are infrequent. An increase in CPAH coupled with a decrease in mean length in the CPFV fishery would be good indicators of a newly-recruited strong year class.

Canary rockfish CPAH has declined gradually since 1989 in the Morro Bay area and in 1994 was only 50% of that observed in 1989. Recruitment may be dependent upon adults in deeper water or to the north where this species is found in commercial abundance.

CPAH of black rockfish in the Morro Bay area has declined substantially at distant locations, from 0.20 in the 1988-91 period to 0.06 in 1994. At locations within 10 miles of port there has been little change, although in 1994 CPAH was still only one third of that at distant locations. Although this species is of lesser importance here than in port areas to the north, this trend is of concern due to the relatively narrow and shallow depth distribution and the scarcity of adults in the sampled catch.

There have been some positive trends observed in CPAH, some of which are reversals of previously identified declines. Most encouraging was an increase in CPAH in the San Francisco area for black rockfish, our species of greatest concern. A similar trend was observed for this species in the Monterey area and appears to be a function of increased recruitment of juveniles. Positive indicators in the Bodega Bay area included increases in CPAH for chilipepper, yellowtail rockfish, and lingcod. CPAH of canary rockfish in the San Francisco area has increased gradually for 6 years and in 1994 was more than double that of 1988. In the Morro Bay

area, an increase in CPAH of brown rockfish reversed a previously identified decline, and is particularly encouraging in light of the commercial hook-and-line effort also occurring there.

Trends in Mean Length and Proportion of Adults

A decline in mean length occured in measured catches of blue and brown rockfishes from the Bodega Bay area due to a decrease in the proportion of adults. This is an area of concern and may be related to increased hook-and-line effort during the past 6 years. However, a similar decline in mean length for chilipepper is more likely due to increased recruitment, an encouraging sign.

In the Monterey area, canary rockfish mean length has decreased since 1990 and few fish in the length range of sexually mature adults occurred in the sampled catch. As adults are more common in deeper water, the proximity of Monterey Submarine Canyon would seem a likely place to provide suitable habitat. Their absence may reflect a more northern center of distribution, and adults may not be common in this area; our data have never shown a high proportion of adults in the sampled catch. Thus, successful recruitment may be dependent upon stocks in other areas. As fishing pressure increases in general all along the coast, this dependency is a concern as adult fish are removed elsewhere.

As a highly desirable species, yelloweye rockfish are always of concern when declines in mean length occur. In the Monterey area, mean length of this species decreased 10% from 1993, and few fish were observed greater than 500 mm (19.7 in.). However, this may be related to a lower frequency of observed trips to deep locations where larger fish occur.

Our greatest concern continues to be with the black rockfish population in all port areas south of Eureka. Decreases in mean length from 1989 to 1994 have been most significant in the Bodega Bay (32%) and San Francisco (19%) areas. Although the increased relative abundance of juveniles in these areas is an encouraging sign, continued heavy pressure from the commercial hook-and-line fishery along with CPFV and sport skiff effort may prevent a rapid recovery of adult stocks. In Washington and Oregon, where this is the primary sport rockfish species and also important commercially, more restrictive regulations have been implemented recently.

In the Morro Bay area, what appears to be an exceptionally strong year class of vermilion rockfish resulted in an increase in mean length in the observed catch of 95 mm (3.8 in.) from 1988 to 1992. Mean length decreased moderately in 1993 and did not change in 1994. It is likely that anglers will see a gradual decline in mean length during the next several years as this year class diminishes in abundance and recruitment occurs. This is probably the best example of how our long-term data base has allowed us to document natural variability in mean length of one of the most important rockfish species to sport anglers.

In the Morro Bay area starry rockfish have shown a gradual decline in mean length since 1988 which has totaled approximately 5%. We will be monitoring this species for indicators of successful recruitment.

Trends in Fishing Effort

Trends in areas fished may be indicative of CPFV operators' perceptions (whether real or implied) of fishing quality. For all port areas, there was a slight increase in the proportion of trips to distant locations from 1993 to 1994, indicating fishing quality in areas close to port has not improved and that CPFV operators continue to search for new, unwished areas. Every year our location data base is increased by the addition of previously unsampled areas.

The proportion of trips to single locations may be indicative of overall fishing quality, although some CPFV operators may decide to

spread fishing effort over a larger area even though limits could have been achieved at a single location. In 1993 and 1994, a lower proportion of observed trips were to single locations than in 1988-1992, possibly indicating a decline in overall fishing quality.

In the Monterey area, a gradual decrease in the proportion of observed trips to deep locations may be related to the decreased relative abundance of chilipepper, a deep water species. In addition, the weakening of the 1992-93 El Niño event may have caused species such as yellowtail rockfish, a primary sport species, to move back into shallower waters as temperatures decreased.

Some of the declining trends identified in the CPFV fishery in 1994 have been for nearshore species, of great concern to recreational anglers when one considers all modes, including CPFV, skiff, and shore. Legislation effective January 1, 1996 restricts commercial hook-and-line activity in waters within 1 mile of shore in northern and central California by limiting the number of hooks per line and the total number of hooks allowed on boats. With an anticipated decline in commercial landings, this legislation will provide an opportunity to monitor these nearshore species for signs of improvement.

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Without the voluntary cooperation of the CPFV operators and owners, deckhands, and landing operators this project would not be possible. We thank you for your past and continued cooperation in our long-term monitoring of this important resource. We can never achieve your combined knowledge of the fishery, but we are grateful for the information you have shared.

Many thanks go to Dr. R. N. Lea for his assistance and training in fish identification and careful scrutiny of our database. His expertise in fish taxonomy, particularly *Sebastes*, has increased our confidence in, and identified the limitations of, our data. We have all become better fish biologists with his enthusiastic help.

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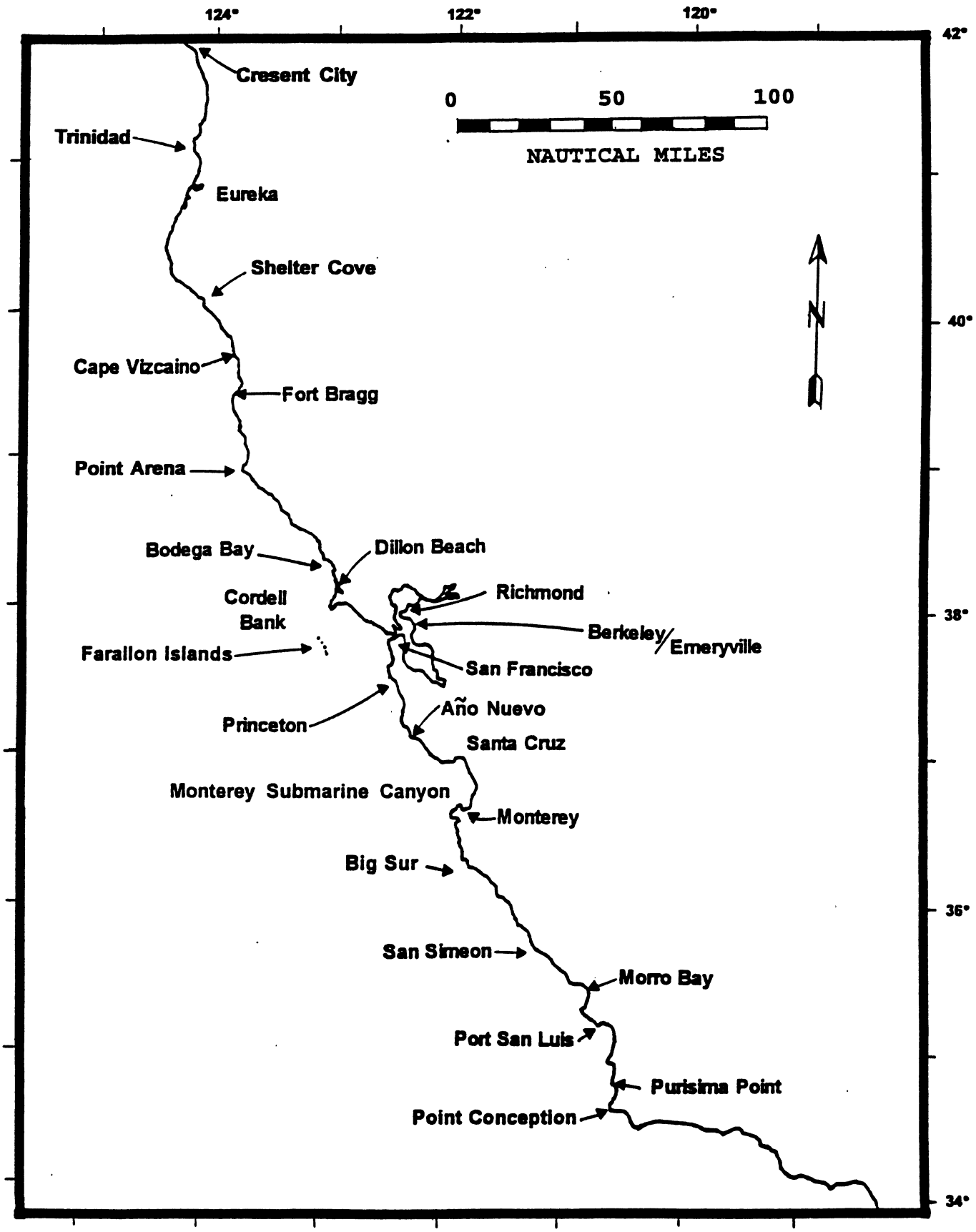


Figure 1. CPFV sampling area in central and northern California.

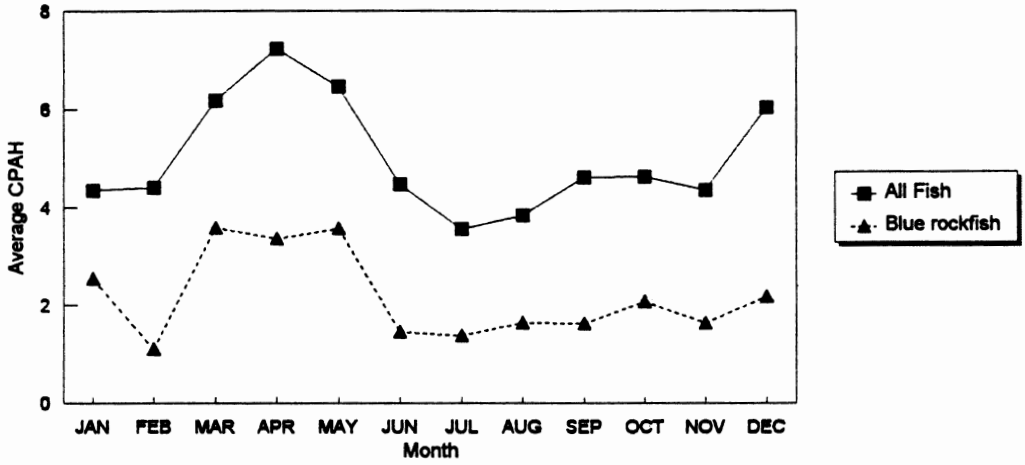


Figure 2. Average monthly catch per angler hour for all species and blue rockfish from the Fort Bragg area, 1988 - 94.

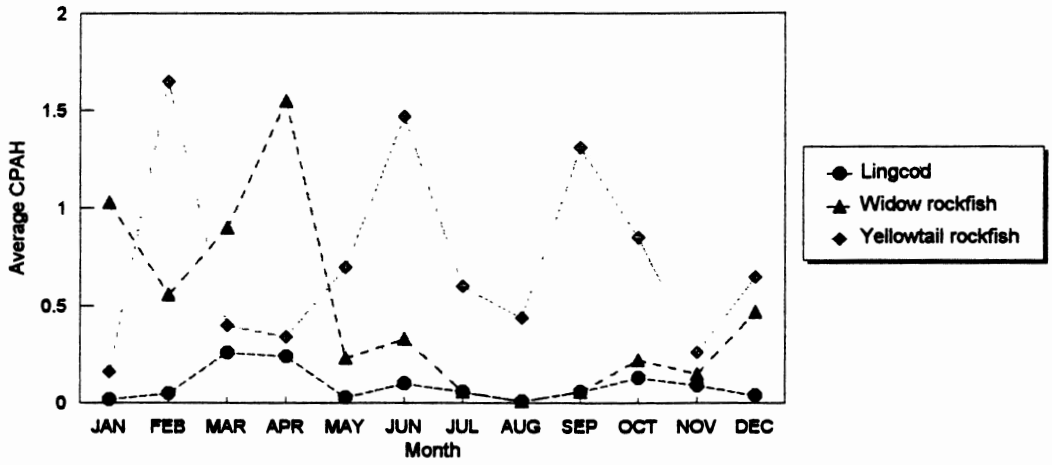


Figure 3. Average monthly catch per angler hour for lingcod, widow and yellowtail rockfishes from the Fort Bragg area, 1988 - 94.

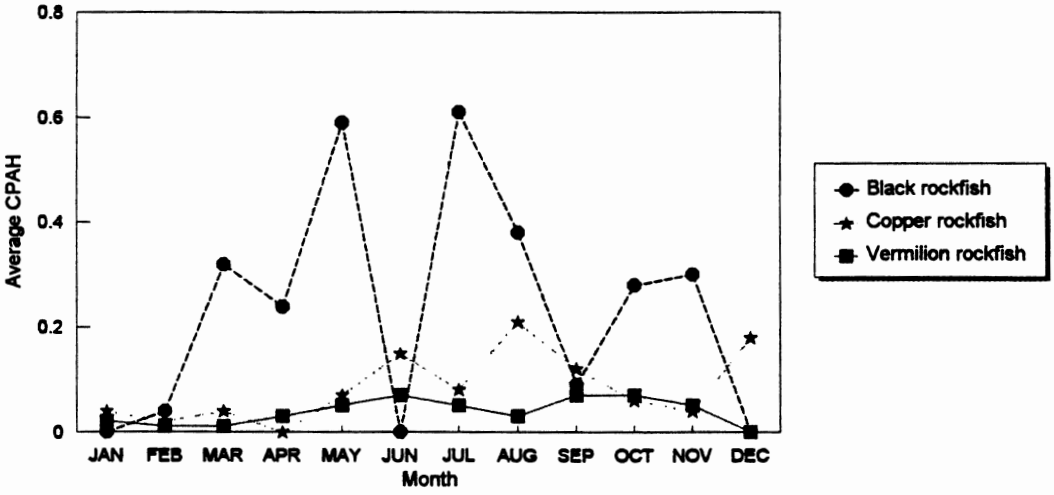


Figure 4. Average monthly catch per angler hour for black, copper and vermilion rockfishes from the Fort Bragg area, 1988 - 94.

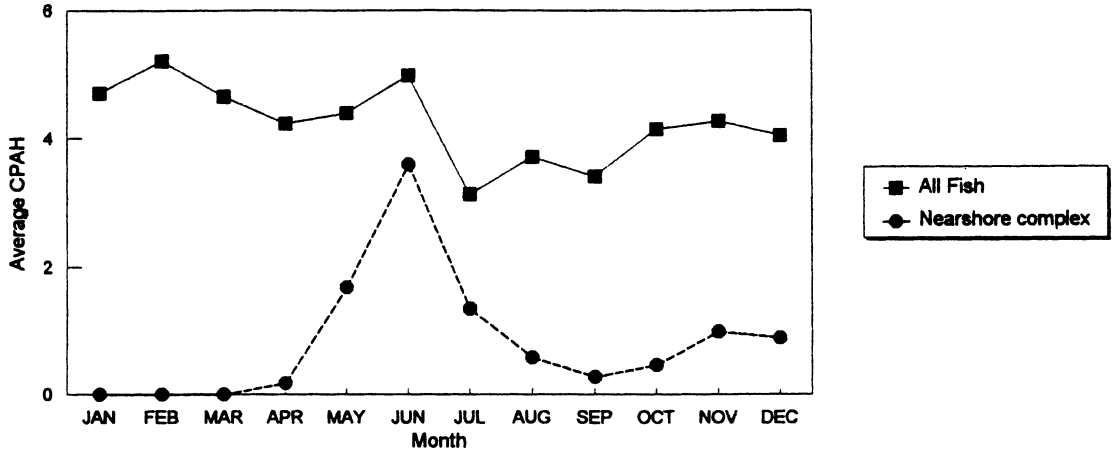


Figure 5. Average monthly catch per angler hour for all species and the nearshore rockfish complex from the Bodega Bay area, 1988 - 94.

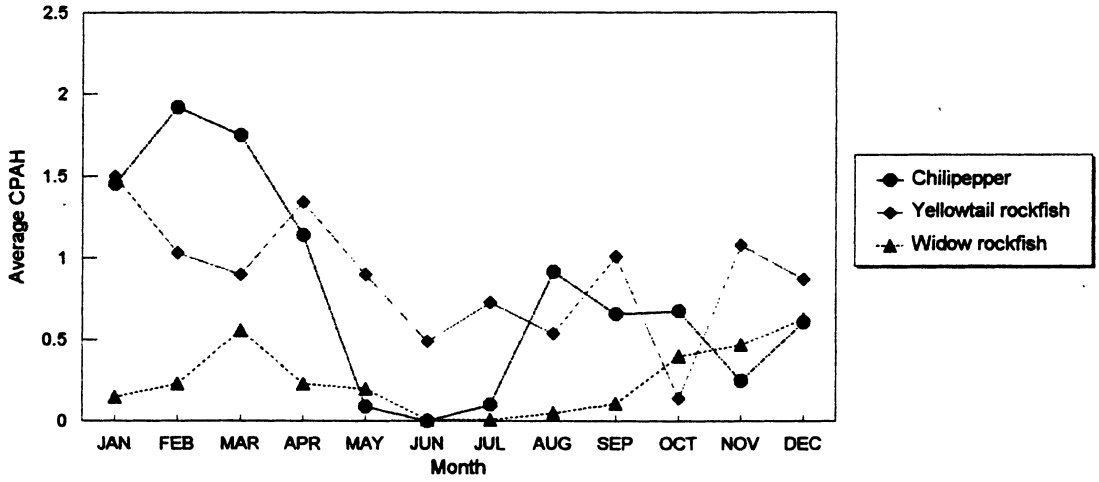


Figure 6. Average monthly catch per angler hour for chilipepper, and yellowtail and widow rockfishes from the Bodega Bay area, 1988 - 94.

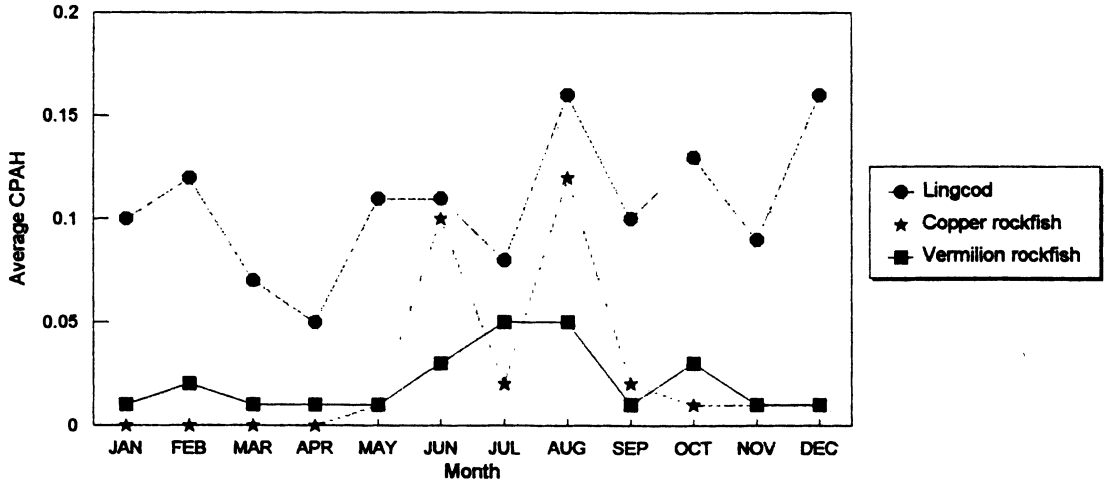


Figure 7. Average monthly catch per angler hour for lingcod and copper and vermilion rockfishes from the Bodega Bay area, 1988 - 94.

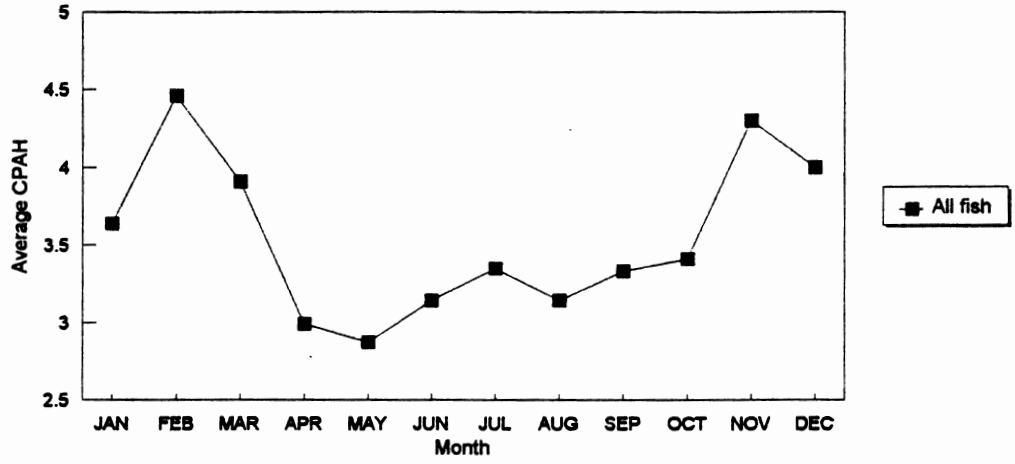


Figure 8. Average monthly catch per angler hour for all species from the San Francisco area, 1988 - 94.

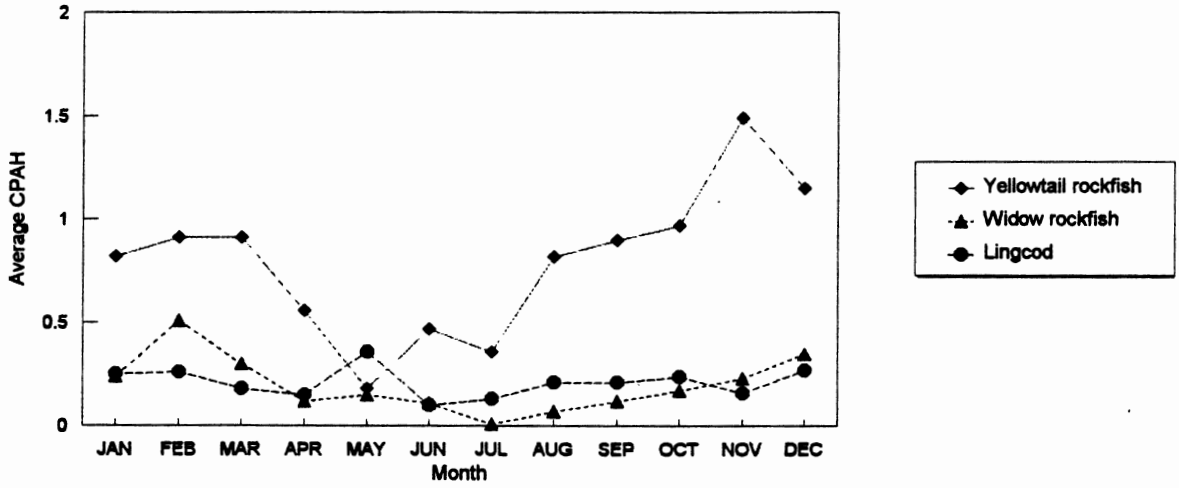


Figure 9. Average monthly catch per angler hour for yellowtail and widow rockfishes and lingcod from the San Francisco area, 1988 - 94.

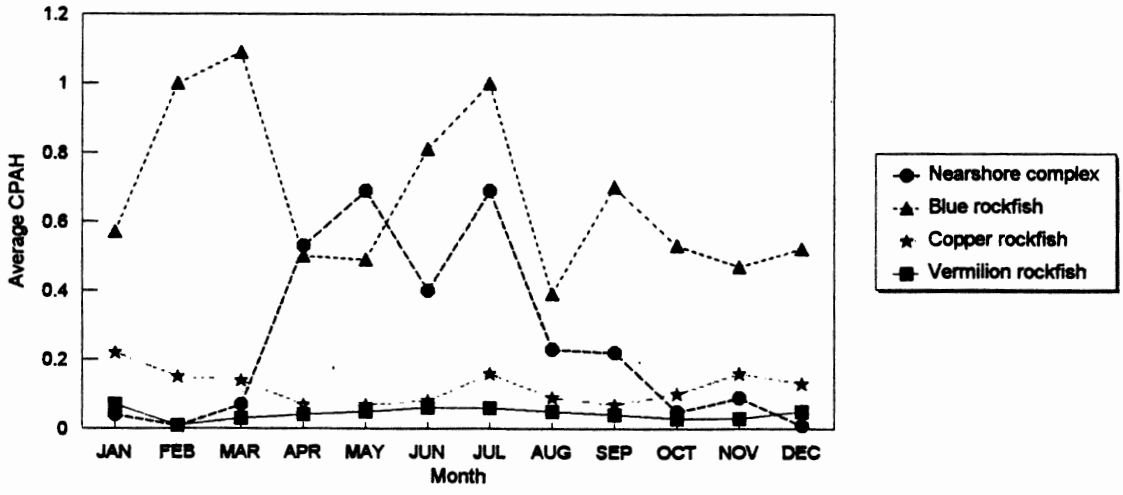


Figure 10. Average monthly catch per angler hour for the nearshore rockfish complex and blue, copper, and vermilion rockfishes from the San Francisco area, 1988 - 94.

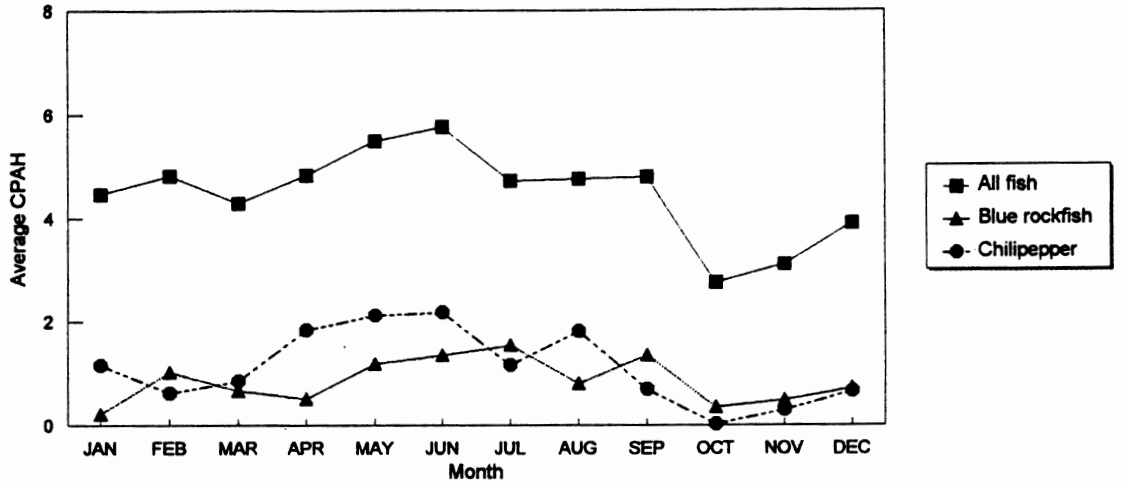


Figure 11. Average monthly catch per angler hour for all species, blue rockfish and chilipepper from the Monterey area, 1987 - 1994.

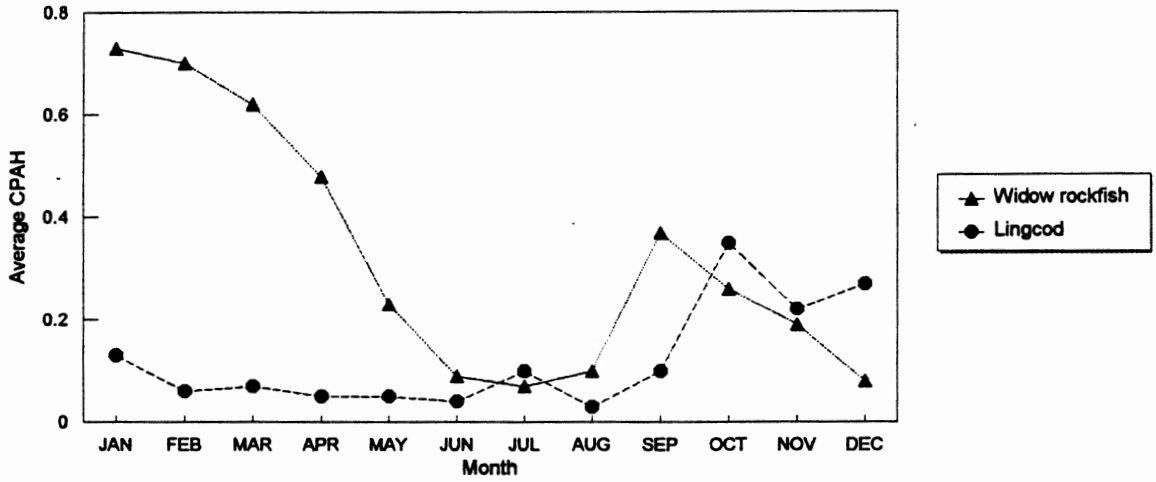


Figure 12. Average monthly catch per angler hour for widow rockfish and lingcod from the Monterey area 1987 - 94.

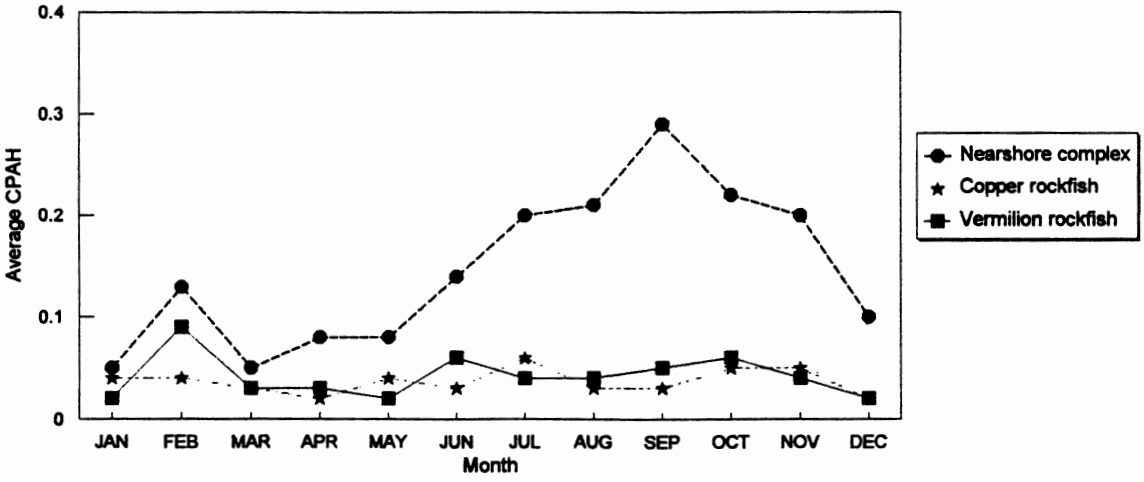


Figure 13. Average catch per angler hour for the nearshore rockfish complex and copper and vermilion rockfishes from the Monterey area, 1987 - 94.

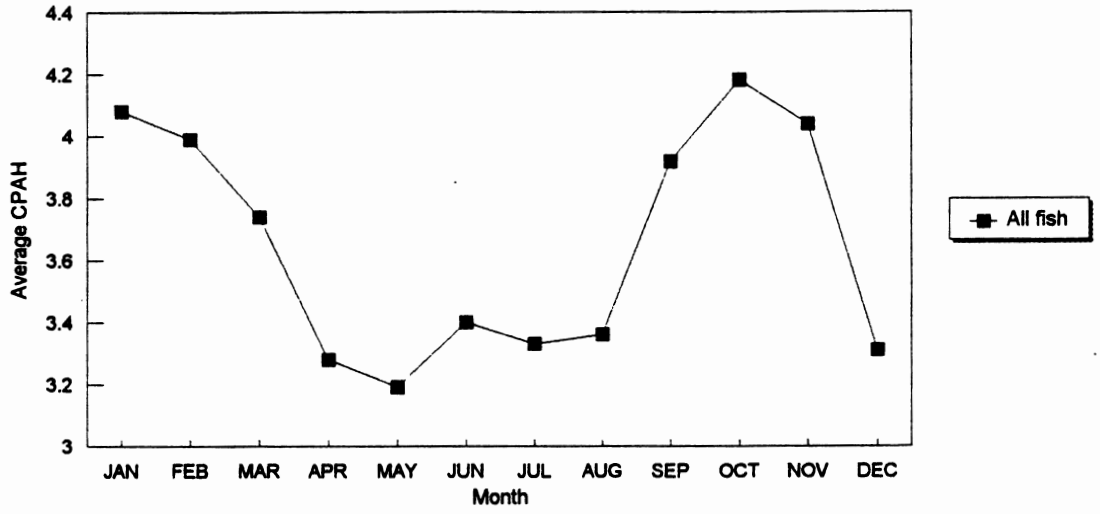


Figure 14. Average monthly catch per angler hour for all species from the Morro Bay area, 1988 - 94.

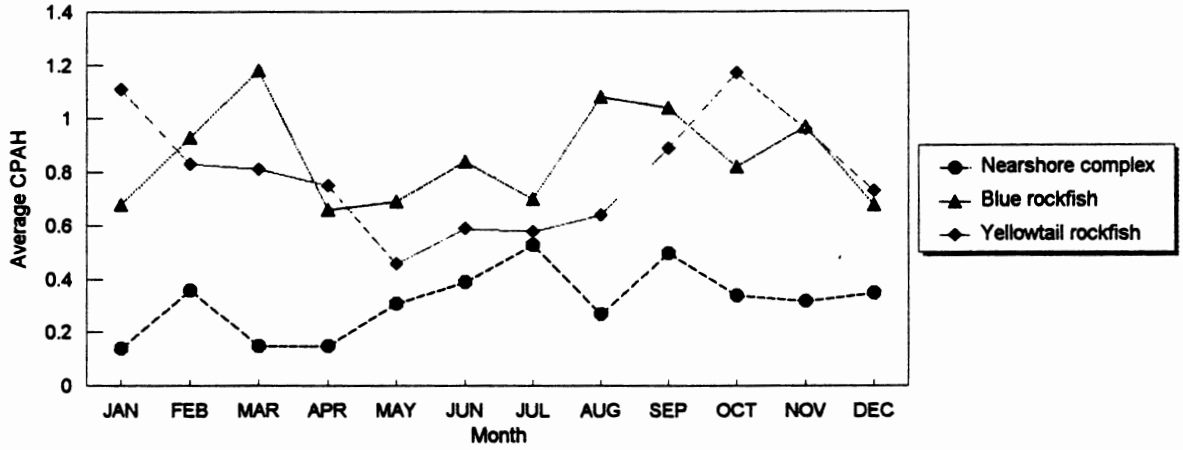


Figure 15. Average monthly catch per angler for the nearshore rockfish complex and blue and yellowtail rockfishes from the Morro Bay area, 1988 - 94.

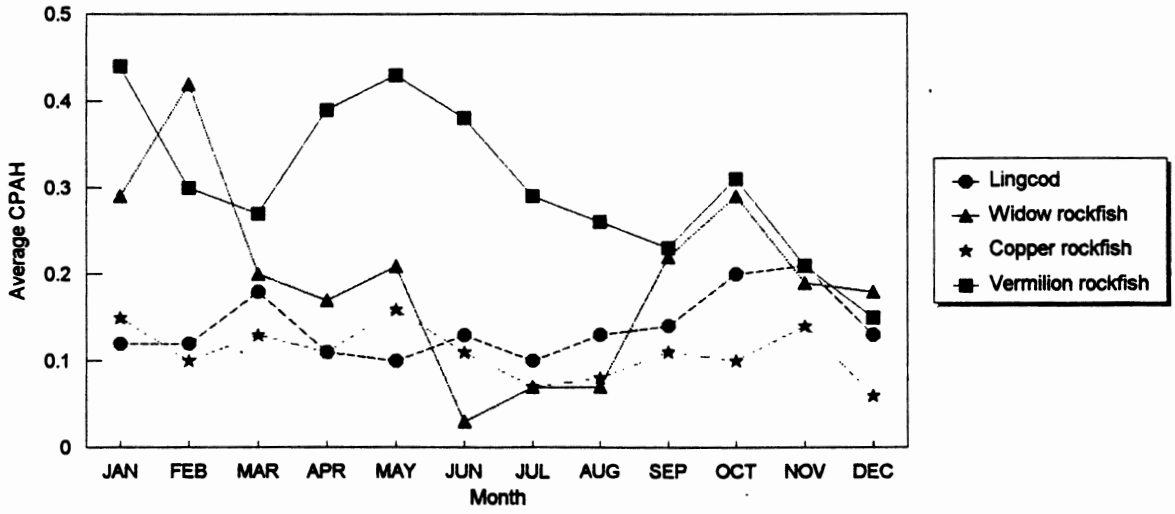


Figure 16. Average monthly catch per angler hour for lingcod, and widow, copper, and vermilion rockfishes from the Morro Bay area, 1988 - 94.

Table 1. Summary of Commercial Passenger Fishing Vessel trips sampled in northern and central California, 1994.

Port area	Number of trips	Number of observed anglers	Number of angler hours	Number of observed fish		Average number of fish per angler day		Average number of fish per angler hr		Number of fish measured
				All	Kept	All	Kept	All	Kept	
Eureka	3	27	77.3	272	256	10.07	9.48	3.52	3.31	298
Fort Bragg	8	71	159.4	892	852	12.56	12.00	5.60	5.35	934
Bodega Bay	26	255	849.9	3305	3135	12.96	12.29	3.89	3.69	3341
San Francisco	40	324	1144.2	4597	4353	14.19	13.44	4.02	3.80	5126
Monterey	84	697	2302.4	8654	7349	12.42	10.54	3.76	3.19	9096
Morro Bay	76	679	1740.9	7011	6670	10.33	9.82	4.03	3.83	7392
Total	237	2053	6274.1	24,731	22,615	12.05	11.02	3.94	3.60	26,187

Table 2. Average fishing time (hours) per observed trip by port area, 1987-1994.

Year	Fort Bragg	Bodega Bay	San Francisco	Monterey	Morro Bay
1987	-	-	-	3.0	-
1988	2.1	3.1	3.6	3.0	3.4
1989	2.7	3.2	3.4	3.0	2.9
1990	2.7	3.5	3.3	2.7	3.4
1991	2.9	3.1	3.6	3.1	3.2
1992	2.7	2.9	3.2	3.2	3.0
1993	2.6	3.3	3.6	3.0	2.6
1994	2.3	3.3	3.3	3.3	2.5
Average	2.6	3.2	3.4	3.0	3.0

Table 3. Summary of sampled CPFV trips by location distance from port for each port area, 1994.

Port area	Number of trips	Percent
Eureka		
Near	1	33
Distant	2	67
Mixed	0	0
Total	3	
Fort Bragg		
Near	5	63
Distant	3	37
Mixed	0	0
Total	8	
Bodega Bay		
Near	2	8
Distant	20	77
Mixed	4	15
Total	26	
San Francisco		
Near	7	17
Distant	30	75
Mixed	3	8
Total	40	
Monterey		
Near	49	58
Distant	26	31
Mixed	9	11
Total	84	
Morro Bay		
Near	63	83
Distant	10	13
Mixed	3	4
Total	76	

Table 4. Summary of sampled CPFV trips by depth of fishing locations for each port area, 1994.

Port area	Number of trips	Percent
Eureka		
Shallow	2	67
Deep	1	33
Mixed	0	0
Total	3	
Fort Bragg		
Shallow	8	100
Deep	0	0
Mixed	0	0
Total	8	
Bodega Bay		
Shallow	10	39
Deep	12	46
Mixed	4	15
Total	26	
San Francisco		
Shallow	21	52
Deep	6	15
Mixed	13	33
Total	40	
Monterey		
Shallow	26	31
Deep	28	33
Mixed	30	36
Total	84	
Morro Bay		
Shallow	45	59
Deep	10	13
Mixed	21	28
Total	76	

Table 5. Number of single location trips sampled from each port area in 1994.

Port area	Number of trips	Percent
Eureka	2	67
Fort Bragg	6	75
Bodega Bay	5	19
San Francisco	23	57
Monterey	25	30
Morro Bay	42	55
All Ports	103	44

Table 6. Average catch per angler hour (CPAH) from shallow and deep fishing locations by port area, 1994.

	SHALLOW		DEEP	
Port area	**Number of Fish**	**Average CPAH**	**Number of Fish**	**Average CPAH**
Fort Bragg	892	5.60	-	-
Bodega Bay	1145	3.43	1536	4.79
San Francisco	1547	3.64	926	4.35
Monterey	4087	4.77	2933	3.09
Morro Bay	3141	3.83	818	4.36

Table 7. Average catch per angler hour (CPAH) from near and distant fishing locations by port area, 1994.

	NEAR		DISTANT	
Port area	Number of Fish	Average CPAH	Number of Fish	Average CPAH
Fort Bragg	505	5.49	387	5.74
Bodega Bay	383	2.74	2922	4.12
San Francisco	724	4.15	3873	3.99
Monterey	5535	3.78	3119	3.72
Morro Bay	5286	4.11	1725	3.80

Table 8. Summary of sport fishes caught by observed CPFV anglers from the ports of Trinidad, Crescent City, and Eureka, 1994.

Species	Total Catch	Percent Composition	Rank	Percent Retained
Canary rockfish	88	32.4	1	94
Black rockfish	70	25.7	2	99
Copper rockfish	29	10.7	3	100
Lingcod	28	10.3	4	89
Yellowtail rockfish	17	6.3	5	71
Blue rockfish	17	6.3	5	88
Yelloweye rockfish	10	3.7	7	100
China rockfish	8	2.9	8	100
Kelp greenling	2	0.7	9	100
Quillback rockfish	2	0.7	9	100
Bocaccio	1	0.4	11	100
Total	**272**	**100.0**		**94**

Table 9. Summary of sport fishes caught by observed CPFV anglers from the port of Fort Bragg, 1994.

Species	Total Catch	Percent Composition	Rank	Percent Retained
Blue rockfish	600	67.3	1	97
Black rockfish	123	13.8	2	99
Canary rockfish	44	4.9	3	95
Yellowtail rockfish	25	2.8	4	76
China rockfish	18	2.0	5	100
Olive rockfish	16	1.8	6	100
Widow rockfish	16	1.8	6	100
Lingcod	11	1.2	8	82
Vermilion rockfish	9	1.0	9	89
Rosy rockfish	6	0.7	10	50
Kelp greenling	5	0.6	11	100
Gopher rockfish	5	0.6	11	80
Quillback rockfish	4	0.5	13	25
Yelloweye rockfish	3	0.3	14	100
King salmon	2	0.2	15	0
Copper rockfish	2	0.2	15	100
Cabezon	2	0.2	15	100
Starry rockfish	1	0.1	18	100
Total	**892**	**100.0**		**96**

Table 10. Summary of sport fishes caught by observed CPFV anglers from the ports of Bodega Bay and Dillon Beach, 1994.

Species	Total Catch	Percent Composition	Rank	Percent Retained
Chilipepper	702	21.2	1	96
Yellowtail rockfish	674	20.4	2	100
Blue rockfish	412	12.5	3	87
Canary rockfish	323	9.8	4	98
Bocaccio	173	5.2	5	100
Widow rockfish	158	4.8	6	100
Black rockfish	143	4.3	7	97
Lingcod	140	4.2	8	77
Greenspotted rockfish	108	3.3	9	99
Rosy rockfish	93	2.8	10	74
Greenstriped rockfish	85	2.6	11	88
Olive rockfish	55	1.7	12	100
Brown rockfish	45	1.4	13	98
Copper rockfish	28	0.9	14	100
China rockfish	26	0.8	15	96
Gopher rockfish	22	0.7	16	100
Yelloweye rockfish	22	0.7	16	95
Chub mackerel	20	0.6	18	100
Starry rockfish	16	0.5	19	88
Speckled rockfish	15	0.5	20	100
Vermilion rockfish	13	0.4	21	100
Rosethorn rockfish	8	0.2	22	100
King salmon	5	0.2	23	60
Quillback rockfish	5	0.2	23	100
Redstripe rockfish	3	0.1	25	100
Kelp greenling	3	0.1	25	100
Jack mackerel	2	0.1	27	100
Petrale sole	2	0.1	27	100
Spiny dogfish	1	-	29	0
Cowcod	1	-	29	100
Pacific sanddab	1	-	29	100
Rock sole	1	-	29	100
Total	**3305**	**100.0**		**95**

Table 11. Summary of sport fishes caught by observed CPFV anglers from the ports of Princeton, Emeryville, and Sausalito, 1994.

Species	Total Catch	Percent Composition	Rank	Percent Retained
Yellowtail rockfish	1098	23.9	1	96
Blue rockfish	779	17.0	2	98
Rosy rockfish	579	12.6	3	87
Black rockfish	339	7.4	4	93
Canary rockfish	284	6.2	5	99
Greenspotted rockfish	237	5.2	6	98
Lingcod	226	4.9	7	73
Starry rockfish	188	4.1	8	98
Olive rockfish	127	2.8	9	100
Widow rockfish	90	2.0	10	98
Brown rockfish	87	1.9	11	99
China rockfish	81	1.8	12	100
Copper rockfish	76	1.7	13	100
Bocaccio	56	1.2	14	100
Pacific sanddab	55	1.2	15	85
Vermilion rockfish	55	1.2	15	100
Yelloweye rockfish	43	0.9	17	100
Gopher rockfish	38	0.8	18	97
Greenstriped rockfish	30	0.7	19	97
Kelp greenling	24	0.5	20	100
Cabezon	19	0.4	21	100
Speckled rockfish	16	0.4	22	100
Quillback rockfish	14	0.3	23	100
King salmon	12	0.3	24	92
Rock sole	12	0.3	24	100
Rosethorn rockfish	10	0.2	26	90
Black-and-yellow rockfish	6	0.1	27	100
Flag rockfish	5	0.1	28	100
White croaker	4	0.1	29	100
Squarespot rockfish	3	0.1	30	100
Cowcod	1	-	31	100
Wolf-eel	1	-	31	100
Redstripe rockfish	1	-	31	100
Unidentified rockfish	1	-	31	0
Total	**4597**	**100.0**		**95**

Table 12. Summary of sport fishes caught by observed CPFV anglers from the ports of Santa Cruz and Monterey, 1994.

Species	Total Catch	Percent Composition	Rank	Percent Retained
Blue rockfish	2393	27.7	1	88
Yellowtail rockfish	1305	15.1	2	94
Chilipepper	663	7.7	3	99
Rosy rockfish	460	5.3	4	84
Greenspotted rockfish	364	4.2	5	99
Pacific sanddab	297	3.4	6	40
Starry rockfish	285	3.3	7	97
Canary rockfish	267	3.1	8	97
Greenstriped rockfish	267	3.1	8	93
Black rockfish	264	3.1	10	78
Lingcod	238	2.8	11	50
Olive rockfish	225	2.6	12	98
Unidentified sanddab	210	2.4	13	2
Bocaccio	209	2.4	14	96
Gopher rockfish	178	2.1	15	94
Widow rockfish	176	2.0	16	98
Copper rockfish	155	1.8	17	99
Chub mackerel	142	1.6	18	31
Vermilion rockfish	110	1.3	19	100
Jack mackerel	75	0.9	20	25
Squarespot rockfish	49	0.6	21	80
China rockfish	40	0.5	22	98
Flag rockfish	39	0.5	23	100
Yelloweye rockfish	35	0.4	24	100
Brown rockfish	31	0.4	25	90
Rosethorn rockfish	29	0.3	26	93
Speckled rockfish	28	0.3	27	100
Pacific sardine	27	0.3	28	0
White croaker	13	0.2	29	31
Cowcod	10	0.1	30	100
Petrale sole	9	0.1	31	100
California lizardfish	7	1.0	32	0
Spiny dogfish	7	0.1	32	0
Kelp rockfish	7	0.1	32	86
Rock sole	6	0.1	35	100
Stripetail rockfish	6	0.1	35	83
Shortbelly rockfish	5	0.1	37	0
King salmon	5	0.1	37	100
Ocean whitefish	3	-	39	100
Kelp greenling	3	-	39	67
Unidentified rockfish	2	-	41	0
Swordspine rockfish	2	-	41	100
Cabezon	2	-	41	100
Sarcastic fringehead	1	-	44	0
Sablefish	1	-	44	0
Red brotula	1	-	44	100
Butter sole	1	-	44	100
Quillback rockfish	1	-	44	100
Starry flounder	1	-	44	100
Total	**8654**	**100.0**		**85**

Table 13. Annual mean catch per angler hour for selected midwater rockfish species from the Monterey area based on cluster analysis grouping, 1987-1993 (n= number of trip visits).

Species	Location group		Year 1987	1988	1989	1990-91	1992	1993
Black rockfish	Black	**Mean**	**0.54**	**1.18**	**0.14**	**2.71**	**0.00**	**1.52**
		Std. dev.	4.18	4.69	1.35	4.30	-	6.37
		n	4	6	6	2	8	4
Blue rockfish	Blue	**Mean**	**2.61**	**3.28**	**2.98**	**0.77**	**2.01**	**3.16**
		Std. dev.	14.65	22.59	20.71	3.03	7.74	8.43
		n	36	47	37	7	29	33
Bocaccio	Yellowtail	**Mean**	**0.54**	**0.13**	**0.15**	**0.26**	**0.32**	**0.11**
		Std. dev.	2.87	0.91	0.88	1.32	1.75	0.97
		n	25	25	48	20	44	41
	Widow	**Mean**	**0.79**	**0.51**	**0.53**	**0.26**	**0.33**	**0.14**
		Std. dev.	5.97	4.91	4.91	1.25	5.32	2.80
		n	19	15	8	2	9	7
	Chilipepper*	**Mean**	**0.39**	**0.40**	**0.27**	**0.93**	**0.40**	**0.13**
		Std. dev.	3.50	5.48	3.74	8.74	5.64	0.97
		n	42	49	40	27	23	35
Canary rockfish	Yellowtail	**Mean**	**0.13**	**0.10**	**0.12**	**0.12**	**0.05**	**0.17**
		Std. dev.	0.77	0.84	1.20	1.45	0.45	1.21
		n	25	25	48	20	44	41
	Chilipepper	**Mean**	**0.01**	**0.04**	**0.02**	**0.17**	**0.07**	**0.07**
		Std. dev.	0.19	1.15	0.62	2.39	0.82	1.52
		n	42	49	40	27	23	35
Chilipepper	Chilipepper*	**Mean**	**4.39**	**4.12**	**3.74**	**1.37**	**2.52**	**2.69**
		Std. dev.	22.33	21.93	13.40	11.00	11.97	21.05
		n	42	49	40	27	23	35
Olive rockfish	Blue*	**Mean**	**0.13**	**0.24**	**0.51**	**0.10**	**0.63**	**0.20**
		Std. dev.	1.92	1.37	3.10	0.89	2.28	1.92
		n	36	47	37	7	29	33
Widow rockfish	Yellowtail	**Mean**	**0.10**	**0.41**	**0.22**	**0.25**	**0.10**	**0.001**
		Std. dev.	1.17	13.51	7.74	4.46	1.89	0.19
		n	25	25	48	20	44	41
	Widow	**Mean**	**1.11**	**2.20**	**0.09**	**0.75**	**0.97**	**0.41**
		Std. dev.	9.27	15.65	2.22	9.52	6.07	3.64
		n	19	15	8	2	9	7
	Chilipepper	**Mean**	**0.10**	**0.19**	**0.11**	**0.49**	**0.75**	**0.42**
		Std. dev.	2.84	13.11	1.30	5.79	4.16	5.60
		n	42	49	40	27	23	35
Yellowtail rockfish	Blue	**Mean**	**0.84**	**1.22**	**1.17**	**1.30**	**0.39**	**0.37**
		Std. dev.	3.13	6.55	4.30	2.71	1.68	1.74
		n	36	47	37	7	29	33
	Yellowtail*	**Mean**	**1.10**	**1.01**	**0.95**	**0.85**	**1.25**	**0.94**
		Std. dev.	3.50	5.02	4.93	3.70	4.39	3.37
		n	25	25	48	20	44	41

* significantly different among years at p=0.05

Table 14. Annual mean catch per angler hour for selected benthic rockfish species from the Monterey area based on cluster analysis grouping, 1987-1993 (n=number of trip visits).

Species	Location group		Year 1987	1988	1989	1990-91	1992	1993
Copper rockfish	Shelf Flats	**Mean**	**0.02**	**0.01**	**0.10**	**0.06**	**0.09**	**0.13**
		Std. dev.	0.44	0.50	2.09	0.57	1.31	1.12
		n	40	35	52	22	54	62
Gopher rockfish	North Shallow	**Mean**	**0.51**	**0.16**	**0.12**	**0.10**	**0.14**	**0.50**
		Std. dev.	2.64	1.81	0.93	-	0.81	1.87
		n	4	6	6	1	6	4
	South Shallow	**Mean**	**0.03**	**0.02**	**0.04**	**0.06**	**0.04**	**0.07**
		Std. dev.	0.62	0.74	0.53	**0.79**	0.79	0.84
		n	46	58	41	11	31	27
Greenspotted rockfish	Shelf Flats*	**Mean**	**0.09**	**0.13**	**0.42**	**0.30**	**0.32**	**0.43**
		Std. dev.	1.32	3.24	4.77	3.17	2.05	3.00
		n	40	35	52	22	54	62
	Canyon Ledge*	**Mean**	**0.04**	**0.04**	**0.11**	**0.25**	**0.09**	**0.34**
		Std. dev.	0.34	0.60	1.56	1.72	0.44	5.39
		n	23	32	27	19	16	17
	Greenspotted/ Copper	**Mean**	**0.54**	**0.86**	**0.78**	**0.42**	**0.42**	**0.59**
		Std. dev.	1.61	3.12	4.35	3.76	1.05	2.88
		n	3	2	28	13	35	35
Greenstriped rockfish	Shelf Flats	**Mean**	**0.09**	**0.14**	**0.25**	**0.14**	**0.15**	**0.18**
		Std. dev.	1.56	3.17	3.50	1.39	1.98	2.28
		n	40	35	52	22	54	62
	Canyon Ledge	**Mean**	**0.08**	**0.16**	**0.16**	**0.33**	**0.25**	**0.23**
		Std. dev.	0.61	1.70	1.73	2.18	1.77	1.33
		n	23	32	27	19	16	17
	Greenspotted/ Copper	**Mean**	**0.43**	**0.82**	**0.45**	**0.19**	**0.20**	**0.25**
		Std. dev.	2.59	2.96	3.27	1.51	1.98	2.31
		n	3	2	28	13	35	35
	Greenstriped/ Sablefish	**Mean**	**0.11**	**0.16**	**0.17**	**0.31**	**0.28**	**0.23**
		Std. dev.	0.60	1.63	1.75	2.10	1.79	1.28
		n	19	32	28	21	16	18
Rosy rockfish	South shallow	**Mean**	**0.20**	**0.23**	**0.31**	**0.45**	**0.28**	**0.35**
		Std. dev.	1.29	0.93	1.12	1.36	1.24	1.25
		n	46	58	41	11	31	27
	Shelf Flats	**Mean**	**0.23**	**0.09**	**0.23**	**0.18**	**0.19**	**0.14**
		Std. dev.	1.59	0.76	1.60	0.87	1.21	1.32
		n	40	35	52	22	54	62
	Rosy	**Mean**	**0.28**	**0.23**	**0.34**	**0.40**	**0.30**	**0.27**
		Std. dev.	1.47	0.94	1.26	1.28	1.46	1.17
		n	57	62	55	16	36	43
	Greenspotted/ Copper	**Mean**	**0.36**	**0.00**	**0.27**	**0.17**	**0.19**	**0.15**
		Std. dev.	1.41	-	1.50	0.88	1.01	1.60
		n	3	2	28	13	35	35

Table 14. Continued

Species	Location group		Year 1987	1988	1989	1990-91	1992	1993
Starry rockfish	South Shallow*	**Mean**	**0.13**	**0.12**	**0.21**	**0.37**	**0.21**	**0.14**
		Std. dev.	1.03	0.85	1.17	1.93	1.32	0.86
		n	46	58	41	11	31	27
	Shelf Flats*	**Mean**	**0.12**	**0.03**	**0.16**	**0.10**	**0.12**	**0.06**
		Std. dev.	0.84	0.38	1.00	0.54	0.75	0.50
		n	40	35	52	22	54	62
	Rosy*	**Mean**	**0.14**	**0.12**	**0.25**	**0.29**	**0.21**	**0.11**
		Std. dev.	0.91	0.83	1.09	1.68	1.19	0.80
		n	57	62	55	16	36	43
	Greenspotted/ Copper	**Mean**	**0.26**	**0.02**	**0.17**	**0.08**	**0.14**	**0.07**
		Std. dev.	1.01	0.07	0.89	0.52	0.83	0.51
		n	3	2	28	13	35	35
Vermilion rockfish	South Shallow	**Mean**	**0.02**	**0.08**	**0.06**	**0.04**	**0.03**	**0.01**
		Std. dev.	0.33	0.61	0.52	0.40	0.31	0.29
		n	46	58	41	11	31	27
	Shelf Flats*	**Mean**	**0.02**	**0.01**	**0.06**	**0.03**	**0.04**	**0.12**
		Std. dev.	0.45	0.30	0.83	0.37	0.38	0.84
		n	40	35	52	22	54	62
Yelloweye rockfish	Shelf Flats	**Mean**	**0.01**	**0.01**	**0.02**	**0.03**	**0.02**	**0.03**
		Std. dev.	0.26	0.27	0.30	0.35	0.38	0.51
		n	40	35	52	22	54	62

*Significantly different among years at p=0.05

Table 15. Summary of sport fishes caught by observed CPFV anglers from the ports of San Simeon, Port San Luis, and Morro Bay, 1994

Species	Total Catch	Percent Composition	Rank	Percent Retained
Blue rockfish	1895	27.0	1	98
Yellowtail rockfish	1597	22.8	2	98
Vermilion rockfish	477	6.8	1	100
Rosy rockfish	467	6.7	4	78
Widow rockfish	379	5.4	5	99
Gopher rockfish	375	5.4	6	99
Starry rockfish	329	4.7	7	97
Olive rockfish	214	3.1	8	100
Lingcod	206	2.9	9	35
Bocaccio	205	2.9	10	99
Copper rockfish	180	2.6	11	100
Brown rockfish	158	2.3	12	100
Canary rockfish	138	2.0	13	100
Black rockfish	57	0.8	14	98
Greenspotted rockfish	56	0.8	15	100
Flag rockfish	41	0.6	16	100
China rockfish	34	0.5	17	100
Greenstriped rockfish	33	0.5	18	85
Pacific sanddab	30	0.4	19	77
Kelp rockfish	27	0.4	20	100
Yelloweye rockfish	24	0.3	21	100
Speckled rockfish	19	0.3	22	100
Squarespot rockfish	19	0.3	22	100
Grass rockfish	8	0.1	24	63
Cabezon	7	0.1	25	100
Rosethorn rockfish	7	0.1	25	86
California halibut	6	0.1	27	50
Chilipepper	4	0.1	28	75
Treefish	4	0.1	28	100
King salmon	3	-	30	33
Kelp greenling	3	-	30	33
Ocean whitefish	2	-	32	100
Rock sole	2	-	32	100
Black-and-yellow rockfish	2	-	32	100
Cowcod	1	-	35	100
Petrale sole	1	-	35	100
Spiny dogfish	1	-	35	0
Totals	**7011**	**100.0**		**95**

TABLE 16. Summary of total catch and effort estimates for CPFV anglers in northern and central California from logbook data, 1994.

	Port Areas						
	Northern California	Fort Bragg	Bodega Bay	San Francisco	Monterey	Morro Bay	Total All Ports
Total Trips	340	149	465	1017	1151	1696	4818
No. fish kept	16949	11,996	131,237	208,838	240,771	346,549	956,340
No. angler days	2085	1101	9296	18,005	20,983	31,374	82,844
No. hours fished	1749	757	2153	4898	5315	7336	22,208
Average CPAD	8.13	10.90	14.12	11.60	11.47	11.05	11.54
Average CPAH	1.51	2.16	3.04	2.35	2.50	2.34	2.43
Total rockfish	15,386	11,399	118,725	194,090	229,942	340,641	910,183
Total lingcod	877	379	5168	8627	7202	4858	27,111
Total other fish	686	218	7344	6121	3627	1050	19,046

TABLE 17. Summary of total catch and effort estimates for CPFV anglers in northern and central California from logbook data, adjusted by sampling information, 1994.[1]

	Bodega Bay	San Francisco	Monterey	Morro Bay	Total All Ports
Number of trips	674	1130	2398	2570	7261
Number of fish	183,266	234,776	477,187	446,263	1,370,437
Number of angler days	12,956	19,856	43,218	47,061	126,277
CPAD	14.15	11.82	11.04	9.48	10.85

[1] Totals include unadjusted values for the Northern California and Fort Bragg groups.

TABLE 18. Estimate of total CPFV catch of rockfishes and lingcod, based on unadjusted logbook data from the ports of Trinidad, Crescent City, and Eureka, 1994.

Species	Number in Thousands
Canary rockfish	5.5
Black rockfish	4.4
Copper rockfish	1.8
Yellowtail rockfish	1.1
Blue rockfish	1.1
Yelloweye rockfish	0.6
China rockfish	0.5
Other rockfish	0.2
Total rockfish	15.2
Lingcod	1.7

TABLE 19. Estimate of total CPFV catch of rockfishes and lingcod, based on unadjusted logbook data from the port of Fort Bragg, 1994.

Species	Number in Thousands
Blue rockfish	8.1
Black rockfish	1.7
Canary rockfish	0.6
Yellowtail rockfish	0.3
China rockfish	0.2
Olive rockfish	0.2
Widow rockfish	0.2
Vermilion rockfish	0.1
Other rockfish	0.2
Total rockfish	**11.6**
Lingcod	**0.1**

TABLE 20. Estimate of total CPFV catch of rockfishes and lingcod, based on adjusted logbook data and sampling information from the ports of Bodega Bay and Dillon Beach, 1994.

Species	Number in Thousands
Chilipepper	38.9
Yellowtail rockfish	37.4
Blue rockfish	22.9
Canary rockfish	18.0
Bocaccio	9.5
Widow rockfish	8.8
Black rockfish	7.9
Greenspotted rockfish	6.0
Rosy rockfish	5.1
Greenstriped rockfish	4.8
Olive rockfish	3.1
Brown rockfish	2.6
Other rockfish	8.8
Total rockfish	**173.8**
Lingcod	**7.7**

TABLE 21. Estimate of total CPFV catch of rockfishes and lingcod, based on adjusted logbook data and sampling information from the ports of Princeton, Berkeley, Emeryville and Sausalito, 1994.

Species	Number in Thousands
Yellowtail rockfish	56.1
Blue rockfish	39.9
Rosy rockfish	29.6
Black rockfish	17.4
Canary rockfish	14.6
Greenspotted rockfish	12.2
Starry rockfish	9.6
Olive rockfish	6.6
Widow rockfish	4.7
Brown rockfish	4.5
China rockfish	4.2
Bocaccio	2.8
Vermilion rockfish	2.8
Other rockfish	8.5
Total rockfish	**213.5**
Lingcod	**11.5**

TABLE 22. Estimate of total CPFV catch of rockfishes and lingcod, based on adjusted logbook data and sampling information from the ports of Monterey and Santa Cruz, 1994.

Species	Number in Thousands
Blue rockfish	132.2
Yellowtail rockfish	72.1
Chilipeper	36.7
Rosy rockfish	25.3
Greenspotted rockfish	20.0
Starry rockfish	15.8
Canary rockfish	14.8
Greenstriped rockfish	14.8
Black rockfish	14.8
Olive rockfish	12.4
Bocaccio	11.5
Gopher rockfish	10.0
Widow rockfish	9.5
Copper rockfish	8.6
Vermilion rockfish	6.2
Other rockfish	16.7
Total rockfish	**421.4**
Lingcod	**13.4**

TABLE 23. Estimate of total CPFV catch of rockfishes and lingcod, based on adjusted logbook data and sampling information from the ports of San Simeon, Morro Bay and Port San Luis, 1994.

Species	Number in Thousands
Blue rockfish	128.8
Yellowtail rockfish	108.8
Vermilion rockfish	32.4
Rosy rockfish	32.0
Widow rockfish	25.8
Gopher rockfish	25.8
Starry rockfish	22.4
Olive rockfish	14.8
Bocaccio	13.8
Copper rockfish	12.4
Brown rockfish	11.0
Canary rockfish	9.5
Other rockfish	22.9
Total rockfish	**460.4**
Lingcod	**13.8**

Appendix 1. Summary of sport fishes caught by CPFV anglers from all ports, 1994.

Common name	Scientific name	Number observed	Number measured
Blue rockfish	*Sebastes mystinus*	6096	6618
Yellowtail rockfish	*Sebastes flavidus*	4716	5177
Rosy rockfish	*Sebastes rosaceus*	1605	1485
Chilipepper	*Sebastes goodei*	1369	1416
Canary rockfish	*Sebastes pinniger*	1144	1366
Black rockfish	*Sebastes melanops*	996	1024
Lingcod	*Ophiodon elongatus*	849	589
Widow rockfish	*Sebastes entomelas*	819	968
Starry rockfish	*Sebastes constellatus*	819	964
Greenspotted rockfish	*Sebastes chlorostictus*	765	914
Vermilion rockfish	*Sebastes miniatus*	664	752
Bocaccio	*Sebastes paucispinis*	644	721
Olive rockfish	*Sebastes serranoides*	637	845
Gopher rockfish	*Sebastes carnatus*	618	724
Copper rockfish	*Sebastes caurinus*	470	530
Greenstriped rockfish	*Sebastes elongatus*	415	389
Pacific sanddab	*Citharichthys sordidus*	383	249
Brown rockfish	*Sebastes auriculatus*	321	355
Unidentified sanddab	*Citharichthys* spp.	210	0
China rockfish	*Sebastes nebulosus*	207	236
Chub mackerel	*Scomber japonicus*	162	45
Yelloweye rockfish	*Sebastes ruberrimus*	137	189
Flag rockfish	*Sebastes rubrivinctus*	85	101
Speckled rockfish	*Sebastes ovalis*	78	109
Jack mackerel	*Trachurus symmetricus*	77	21
Squarespot rockfish	*Sebastes hopkinsi*	71	77
Rosethorn rockfish	*Sebastes helvomaculatus*	54	70
Kelp greenling	*Hexagrammos decagrammus*	40	34
Kelp rockfish	*Sebastes atrovirens*	34	45
Cabezon	*Scorpaenichthys marmoratus*	30	41
Pacific sardine	*Sardinops sagax*	27	0
King salmon	*Oncorhynchus tshawytscha*	27	3
Quillback rockfish	*Sebastes maliger*	26	22
Rock sole	*Pleuronectes bilineatus*	21	20
White croaker	*Genyonemus lineatus*	17	6
Cowcod	*Sebastes levis*	13	17
Petrale sole	*Eopsetta jordani*	12	14
Spiny dogfish	*Squalus acanthias*	9	0
Black-and-yellow rockfish	*Sebastes chrysomelas*	8	11
Grass rockfish	*Sebastes rastrelliger*	8	5
California lizardfish	*Synodus lucioceps*	7	0
Stripetail rockfish	*Sebastes saxicola*	6	11
California halibut	*Paralichthys californicus*	6	3
Ocean whitefish	*Caulolatilus princeps*	5	5
Shortbelly rockfish	*Sebastes jordani*	5	0
Redstripe rockfish	*Sebastes proriger*	4	3
Treefish	*Sebastes serriceps*	4	5
Unidentified rockfish	*Sebastes* spp.	3	0
Swordspine rockfish	*Sebastes ensifer*	2	1
Sarcastic fringehead	*Neoclinus blanchardi*	1	0
Wolf-eel	*Anarrhichthys ocellatus*	1	2
Sablefish	*Anoplopoma fimbria*	1	0
Butter sole	*Isopsetta isolepis*	1	1
Red brotula	*Brosmophycis marginata*	1	1
Pink rockfish	*Sebastes eos*	0	1
Calico rockfish	*Sebastes dalli*	0	1
Totals		24,731	26,187

Appendix 2. Summary of catch per unit effort for selected species from the Fort Bragg area in 1994.

	CPAD All locations	Catch per angler hour by location groups				
		All	Near	Distant	Shallow	Deep
Blue rockfish	8.45	3.76	3.59	4.01	3.76	-
Black rockfish	1.73	0.77	0.64	0.95	0.77	-
Canary rockfish	0.62	0.28	0.27	0.28	0.28	-
Yellowtail rockfish	0.35	0.16	0.24	0.04	0.16	-
China rockfish	0.25	0.11	0.11	0.12	0.11	-
Olive rockfish	0.23	0.10	0.07	0.15	0.10	-
Widow rockfish	0.23	0.10	0.17	0.00	0.10	-
Lingcod	0.15	0.07	0.12	0.00	0.07	-
Vermilion rockfish	0.13	0.06	0.05	0.06	0.06	-
Rosy rockfish	0.08	0.04	0.07	0.00	0.04	-
Gopher rockfish	0.07	0.03	0.04	0.01	0.03	-
Yelloweye rockfish	0.04	0.02	0.02	0.01	0.02	-
Copper rockfish	0.03	0.01	0.02	0.00	0.01	-
Starry rockfish	0.01	0.01	0.01	0.00	0.01	-

Appendix 3. Summary of catch per unit effort for selected species from the Bodega Bay area in 1994.

	CPAD All locations	Catch per angler hour by location groups				
		All	Near	Distant	Shallow	Deep
Chilipepper	2.75	0.83	0.00	0.99	0.00	2.09
Yellowtail rockfish	2.64	0.79	0.21	0.91	0.33	0.96
Blue rockfish	1.62	0.48	0.13	0.56	1.23	0.00
Canary rockfish	1.27	0.38	0.99	0.26	0.54	0.28
Bocaccio	0.68	0.20	0.00	0.24	<0.01	0.35
Widow rockfish	0.62	0.19	0.00	0.22	<0.01	0.40
Black rockfish	0.56	0.17	0.49	0.11	0.43	0.00
Lingcod	0.55	0.16	0.14	0.17	0.13	0.07
Greenspotted rockfish	0.42	0.13	0.00	0.15	0.00	0.27
Rosy rockfish	0.36	0.11	0.10	0.11	0.15	0.02
Greenstriped rockfish	0.33	0.10	0.00	0.12	0.00	0.23
Olive rockfish	0.22	0.06	0.00	0.08	0.13	<0.01
Brown rockfish	0.18	0.05	0.27	0.01	0.13	0.00
Copper rockfish	0.11	0.03	0.13	0.01	0.08	0.00
China rockfish	0.10	0.03	0.11	0.01	0.08	0.00
Gopher rockfish	0.09	0.03	0.07	0.02	0.07	0.00
Yelloweye rockfish	0.09	0.03	0.02	0.03	0.02	0.03
Starry rockfish	0.06	0.02	0.00	0.02	0.01	<0.01
Vermilion rockfish	0.05	0.02	0.04	0.01	0.04	<0.01

Appendix 4. Summary of catch per unit effort for selected species from the San Francisco area in 1994.

	CPAD	Catch per angler hour by location groups				
	All locations	All	Near	Distant	Shallow	Deep
Yellowtail rockfish	3.39	0.96	1.39	0.88	0.44	1.44
Blue rockfish	2.40	0.68	0.86	0.65	0.62	0.10
Rosy rockfish	1.79	0.51	0.41	0.52	0.43	0.58
Black rockfish	1.05	0.30	0.15	0.32	0.80	0.00
Canary rockfish	0.88	0.25	0.34	0.23	0.15	0.35
Greenspotted rockfish	0.73	0.21	0.10	0.23	0.02	0.81
Lingcod	0.70	0.20	0.14	0.21	0.28	0.12
Starry rockfish	0.58	0.16	0.10	0.18	0.09	0.23
Olive rockfish	0.39	0.11	0.03	0.12	0.18	0.03
Widow rockfish	0.28	0.08	0.06	0.08	0.00	0.08
Brown rockfish	0.27	0.08	0.11	0.07	0.16	0.00
China rockfish	0.25	0.07	0.02	0.08	0.13	0.00
Copper rockfish	0.23	0.07	0.21	0.04	0.03	0.06
Bocaccio	0.17	0.05	0.03	0.05	0.02	0.06
Vermilion rockfish	0.17	0.05	0.09	0.04	0.05	0.03
Yelloweye rockfish	0.13	0.04	0.01	0.04	0.03	0.08
Gopher rockfish	0.12	0.03	0.00	0.04	0.08	0.00
Greenstriped rockfish	0.09	0.03	0.00	0.03	0.00	0.12

Appendix 5. Summary of catch per unit effort for selected species from the Monterey area in 1994.

	CPAD All locations	Catch per angler hour by location groups				
		All	Near	Distant	Shallow	Deep
Blue rockfish	3.43	1.04	0.79	1.47	2.31	0.04
Yellowtail rockfish	1.87	0.57	0.61	0.49	0.54	0.45
Chilipepper	0.95	0.29	0.44	0.03	0.00	0.70
Rosy rockfish	0.66	0.20	0.22	0.17	0.18	0.17
Greenspotted rockfish	0.52	0.16	0.16	0.15	<0.01	0.37
Starry rockfish	0.41	0.12	0.12	0.13	0.09	0.11
Canary rockfish	0.38	0.12	0.12	0.10	0.07	0.18
Greenstriped rockfish	0.38	0.12	0.14	0.07	0.01	0.27
Black rockfish	0.38	0.11	<0.01	0.31	0.31	<0.01
Lingcod	0.34	0.10	0.11	0.09	0.09	0.08
Olive rockfish	0.32	0.10	0.07	0.15	0.17	<0.01
Bocaccio	0.30	0.09	0.10	0.08	0.04	0.09
Gopher rockfish	0.26	0.08	0.04	0.13	0.18	0.00
Widow rockfish	0.25	0.08	0.11	0.02	0.01	0.12
Copper rockfish	0.22	0.07	0.07	0.07	0.05	0.08
Vermilion rockfish	0.16	0.05	0.05	0.05	0.04	0.06
China rockfish	0.06	0.02	0.01	0.03	0.04	<0.01
Yelloweye rockfish	0.05	0.02	0.02	0.02	<0.01	0.02
Brown rockfish	0.04	0.01	0.01	0.01	0.03	<0.01

Appendix 6. Summary of catch per unit effort for selected species from the Morro Bay area in 1994.

	CPAD All locations	Catch per angler hour by location groups				
		All	Near	Distant	Shallow	Deep
Blue rockfish	2.79	1.09	1.21	0.73	1.22	0.14
Yellowtail rockfish	2.35	0.92	1.04	0.58	0.77	0.84
Vermilion rockfish	0.70	0.27	0.27	0.30	0.22	0.60
Rosy rockfish	0.69	0.27	0.32	0.13	0.22	0.25
Widow rockfish	0.56	0.22	0.25	0.12	0.02	0.38
Gopher rockfish	0.55	0.22	0.21	0.24	0.40	0.00
Starry rockfish	0.48	0.19	0.19	0.19	0.12	0.35
Olive rockfish	0.32	0.12	0.08	0.23	0.15	0.05
Lingcod	0.30	0.12	0.09	0.19	0.12	0.19
Bocaccio	0.30	0.12	0.05	0.30	0.03	0.57
Copper rockfish	0.27	0.10	0.12	0.07	0.11	0.11
Brown rockfish	0.23	0.09	0.03	0.25	0.19	0.00
Canary rockfish	0.20	0.08	0.07	0.09	0.08	0.13
Black rockfish	0.08	0.03	0.02	0.06	0.07	0.00
Greenspotted rockfish	0.08	0.03	0.01	0.09	<0.01	0.20
China rockfish	0.05	0.02	0.02	0.02	0.03	0.00
Greenstriped rockfish	0.05	0.02	<0.01	0.06	0.00	0.18
Yelloweye rockfish	0.04	0.01	0.01	0.04	0.00	0.07
Chilipepper	0.01	<0.01	0.00	0.01	0.00	0.02

Appendix 7. Summary of mean total length (mm) data for selected species from the Fort Bragg area in 1994.

		Location groups				
		All	Near	Distant	Shallow	Deep
Blue rockfish	**Mean**	**304**	**298**	**310**	**304**	-
	Std. dev.	40	38	41	40	-
	n	600	319	281	600	-
Black rockfish	**Mean**	**323**	**307**	**333**	**323**	-
	Std. dev.	44	29	49	44	-
	n	148	55	93	148	-
Canary rockfish	**Mean**	**304**	**287**	**317**	**304**	-
	Std. dev.	41	37	40	41	-
	n	53	22	31	53	-
Olive rockfish	**Mean**	**386**	**340**	**401**	**386**	-
	Std. dev.	47	42	38	47	-
	n	25	6	19	25	-
Widow rockfish	**Mean**	**294**	**294**	-	**294**	-
	Std. dev.	27	27	-	27	-
	n	23	23	0	23	-
China rockfish	**Mean**	**306**	**312**	**301**	**306**	-
	Std. dev.	24	28	19	24	-
	n	22	10	12	22	-
Yellowtail rockfish	**Mean**	**274**	**273**	**277**	**274**	-
	Std. dev.	30	25	50	30	-
	n	21	17	4	21	-

Appendix 8. Summary of mean total length (mm) data for selected species from the Bodega Bay area in 1994.

			Location groups			
		All	Near	Distant	Shallow	Deep
Yellowtail rockfish	**Mean**	**391**	**263**	**392**	**372**	**401**
	Std. dev.	46	23	44	63	45
	n	685	7	634	91	246
Chilipepper	**Mean**	**379**	-	**372**	-	**380**
	Std. dev.	54	-	57	-	61
	n	594	0	449	0	246
Blue rockfish	**Mean**	**284**	**296**	**285**	**284**	-
	Std. dev.	39	36	39	39	-
	n	482	9	412	482	0
Canary rockfish	**Mean**	**367**	**292**	**468**	**300**	**474**
	Std. dev.	100	33	76	37	67
	n	353	101	142	218	36
Bocaccio	**Mean**	**586**	-	**579**	**633**	**586**
	Std. dev.	78	-	80	144	71
	n	208	0	155	2	58
Black rockfish	**Mean**	**322**	**276**	**326**	**322**	-
	Std. dev.	47	55	35	47	-
	n	181	4	14	181	0
Widow rockfish	**Mean**	**416**	-	**416**	**263**	**414**
	Std. dev.	50	-	50	0	44
	n	147	0	146	1	70
Greenspotted rockfish	**Mean**	**328**	-	**327**	-	**323**
	Std. dev.	54	-	54	-	60
	n	117	0	101	0	44
Lingcod	**Mean**	**673**	**606**	**668**	**623**	**697**
	Std. dev.	106	72	133	108	122
	n	91	6	32	28	13
Olive rockfish	**Mean**	**388**	-	**391**	**394**	-
	Std. dev.	35	-	34	37	-
	n	82	0	64	55	0
Rosy rockfish	**Mean**	**244**	**259**	**242**	**250**	**246**
	Std. dev.	25	14	26	22	23
	n	73	7	58	41	4
Brown rockfish	**Mean**	**300**	**288**	-	**300**	-
	Std. dev.	33	24	-	33	-
	n	66	24	0	66	0
Greenstriped rockfish	**Mean**	**274**	-	**272**	-	**265**
	Std. dev.	34	-	35	-	35
	n	56	0	53	0	28
Copper rockfish	**Mean**	**365**	**366**	**419**	**365**	-
	Std. dev.	51	64	4	51	-
	n	41	14	2	41	0

Appendix 8. (cont.)

			Location groups			
		All	Near	Distant	Shallow	Deep
China rockfish	**Mean**	**281**	**244**	**294**	**281**	-
	Std. dev.	37	11	26	37	-
	n	30	7	3	30	0
Yelloweye rockfish	**Mean**	**428**	**303**	**487**	**372**	**470**
	Std. dev.	108	52	83	105	16
	n	27	2	14	14	3
Gopher rockfish	**Mean**	**268**	**242**	**290**	**268**	-
	Std. dev.	28	12	23	28	-
	n	25	4	4	25	0

Appendix 9. Summary of mean total length (mm) data for selected species from the San Francisco area in 1994.

			Location groups			
		All	Near	Distant	Shallow	Deep
Yellowtail rockfish	**Mean**	**334**	**313**	**340**	**294**	**350**
	Std. dev.	57	39	61	45	54
	n	1299	274	962	92	278
Blue rockfish	**Mean**	**302**	**295**	**304**	**286**	**307**
	Std. dev.	43	37	45	49	29
	n	927	156	707	190	20
Rosy rockfish	**Mean**	**225**	**197**	**228**	**221**	**215**
	Std. dev.	30	29	29	18	26
	n	543	44	498	44	71
Canary rockfish	**Mean**	**339**	**323**	**341**	**307**	**344**
	Std. dev.	47	32	49	35	56
	n	354	52	295	39	44
Black rockfish	**Mean**	**291**	-	**291**	**291**	-
	Std. dev.	40	-	42	40	-
	n	294	0	247	286	0
Greenspotted rockfish	**Mean**	**298**	**337**	**297**	**250**	**298**
	Std. dev.	56	53	56	17	56
	n	293	9	284	5	175
Lingcod	**Mean**	**639**	**611**	**640**	**641**	**678**
	Std. dev.	94	72	95	93	93
	n	223	3	217	45	13
Starry rockfish	**Mean**	**297**	**270**	**299**	**260**	**315**
	Std. dev.	61	69	61	25	60
	n	204	12	192	12	29
Olive rockfish	**Mean**	**384**	**316**	**385**	**384**	**382**
	Std. dev.	44	63	42	39	69
	n	174	4	170	71	6

Appendix 9. (cont.)

		Location groups				
		All	Near	Distant	Shallow	Deep
Widow rockfish	**Mean**	**341**	**334**	**342**	**374**	**395**
	Std. dev.	50	44	54	87	51
	n	120	13	83	4	17
China rockfish	**Mean**	**291**	**229**	**293**	**273**	-
	Std. dev.	32	0	31	25	-
	n	93	1	82	35	0
Copper rockfish	**Mean**	**381**	**372**	**387**	**386**	**390**
	Std. dev.	47	43	49	39	35
	n	82	36	46	10	5
Bocaccio	**Mean**	**545**	**527**	**547**	**435**	**562**
	Std. dev.	98	45	100	162	76
	n	71	4	67	7	16
Brown rockfish	**Mean**	**338**	**307**	**346**	**346**	-
	Std. dev.	59	52	59	59	-
	n	69	12	54	55	0
Vermilion rockfish	**Mean**	**402**	**389**	**407**	**376**	**464**
	Std. dev.	81	82	81	93	19
	n	63	19	42	18	2
Yelloweye rockfish	**Mean**	**443**	**376**	**444**	**415**	**524**
	Std. dev.	100	0	101	61	60
	n	55	1	54	11	3
Gopher rockfish	**Mean**	**274**	-	**273**	**274**	-
	Std. dev.	28	-	28	30	-
	n	37	0	35	31	0
Greenstriped rockfish	**Mean**	**276**	-	**276**	-	**276**
	Std. dev.	28	-	28	-	29
	n	34	0	34	0	25

Appendix 10. Summary of mean total length (mm) data for selected species from the Monterey area in 1994.

		Location groups				
		All	Near	Distant	Shallow	Deep
Blue rockfish	**Mean**	**277**	**269**	**283**	**277**	**314**
	Std. dev.	42	38	44	42	29
	n	2470	1008	1154	1507	14
Yellowtail rockfish	**Mean**	**316**	**307**	**333**	**276**	**344**
	Std. dev.	56	54	58	44	50
	n	1420	890	417	261	447
Chilipepper	**Mean**	**319**	**315**	**426**	-	**319**
	Std. dev.	54	50	45	-	54
	n	820	787	30	0	818
Rosy rockfish	**Mean**	**224**	**225**	**223**	**221**	**230**
	Std. dev.	23	23	23	22	21
	n	483	295	137	63	148

Appendix 10. (cont.)

		Location groups				
		All	Near	Distant	Shallow	Deep
Greenspotted rockfish	**Mean**	**304**	**308**	**298**	**197**	**305**
	Std. dev.	56	59	52	0	56
	n	451	258	111	1	433
Starry rockfish	**Mean**	**294**	**284**	**308**	**291**	**287**
	Std. dev.	44	42	43	44	45
	n	382	197	159	34	80
Olive rockfish	**Mean**	**373**	**375**	**375**	**360**	**441**
	Std. dev.	59	53	62	58	20
	n	332	106	186	120	2
Canary rockfish	**Mean**	**350**	**348**	**340**	**300**	**367**
	Std. dev.	53	55	47	46	45
	n	329	203	83	67	210
Black rockfish	**Mean**	**310**	**319**	**310**	**310**	-
	Std. dev.	31	9	31	31	-
	n	274	3	271	274	0
Greenstriped rockfish	**Mean**	**268**	**264**	**279**	-	**268**
	Std. dev.	30	28	34	-	30
	n	273	198	45	0	260
Widow rockfish	**Mean**	**338**	**339**	**328**	**324**	**345**
	Std. dev.	50	49	57	70	47
	n	273	259	14	6	200
Bocaccio	**Mean**	**457**	**451**	**473**	**415**	**452**
	Std. dev.	81	86	57	82	94
	n	261	195	62	15	102
Gopher rockfish	**Mean**	**275**	**273**	**280**	**276**	-
	Std. dev.	31	34	29	31	-
	n	230	50	147	202	0
Lingcod	**Mean**	**634**	**637**	**624**	**633**	**665**
	Std. dev.	83	74	87	83	81
	n	170	103	57	41	53
Copper rockfish	**Mean**	**384**	**379**	**393**	**337**	**401**
	Std. dev.	62	67	47	58	56
	n	164	110	51	30	91
Vermilion rockfish	**Mean**	**418**	**414**	**420**	**388**	**429**
	Std. dev.	68	60	77	93	52
	n	148	80	62	42	71
China rockfish	**Mean**	**297**	**288**	**304**	**299**	**316**
	Std. dev.	35	23	37	37	0
	n	45	13	30	36	1
Yelloweye rockfish	**Mean**	**385**	**363**	**427**	**298**	**373**
	Std. dev.	86	71	99	53	85
	n	42	26	15	2	23
Brown rockfish	**Mean**	**344**	**335**	**360**	**341**	**357**
	Std. dev.	63	66	55	61	75
	n	37	24	13	31	6

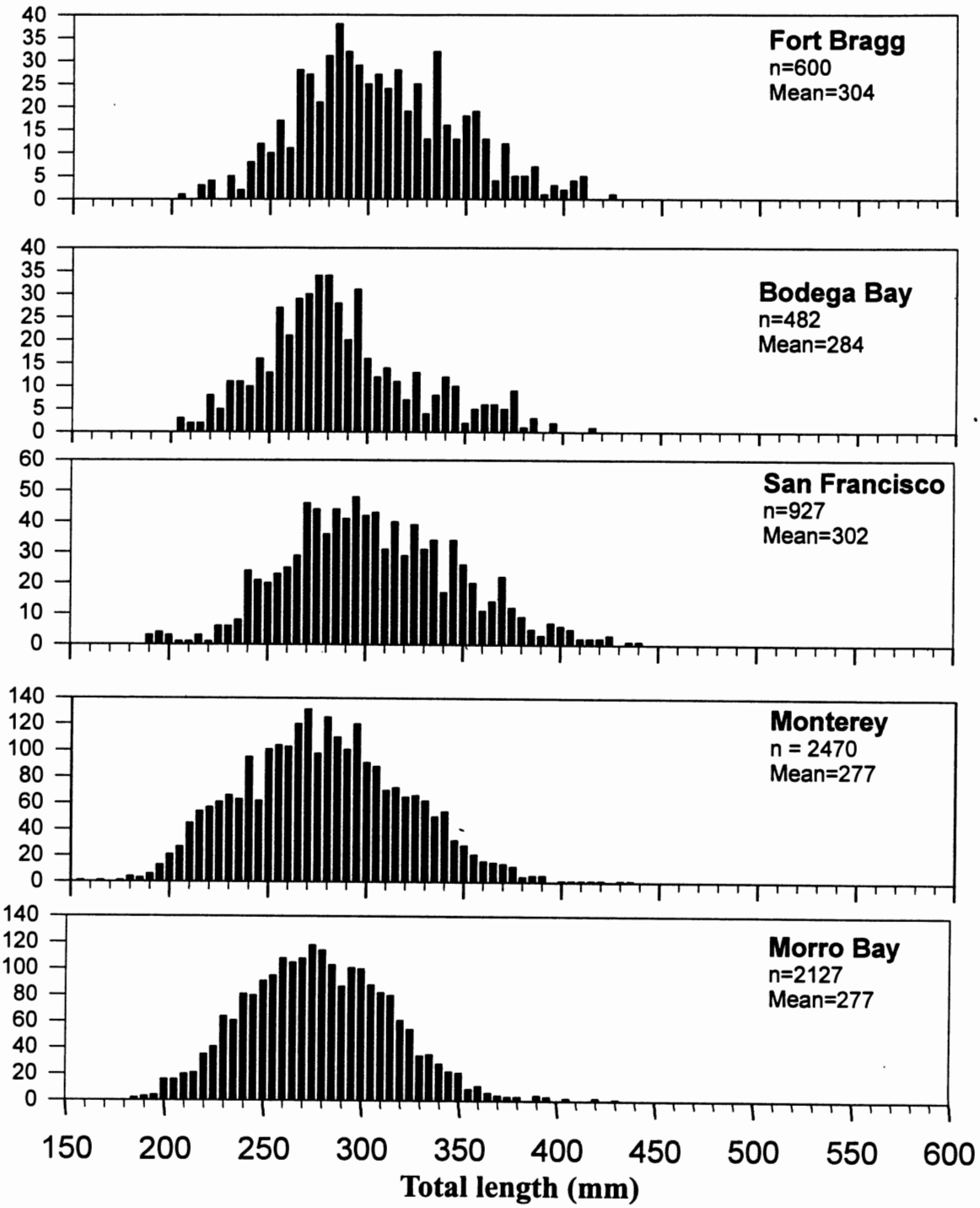
Appendix 11. Summary of mean total length (mm) data for selected species from the Morro Bay area in 1994.

			Location groups			
		All	Near	Distant	Shallow	Deep
Blue rockfish	**Mean**	**277**	**274**	**291**	**274**	-
	Std. dev.	37	35	43	36	-
	n	2127	1733	276	919	0
Yellowtail rockfish	**Mean**	**283**	**278**	**308**	**273**	-
	Std. dev.	37	33	45	31	-
	n	1741	1466	275	513	0
Vermilion rockfish	**Mean**	**395**	**383**	**437**	**365**	**433**
	Std. dev.	69	69	57	71	46
	n	515	377	112	179	63
Gopher rockfish	**Mean**	**270**	**265**	**285**	**270**	-
	Std. dev.	26	24	23	26	-
	n	427	316	111	374	0
Widow rockfish	**Mean**	**291**	**288**	**315**	**256**	**336**
	Std. dev.	48	49	53	52	75
	n	405	341	26	18	9
Rosy rockfish	**Mean**	**221**	**220**	**230**	**220**	**222**
	Std. dev.	20	19	24	18	30
	n	383	354	29	147	7
Starry rockfish	**Mean**	**295**	**289**	**313**	**285**	**300**
	Std. dev.	42	39	43	41	33
	n	359	273	86	78	37
Olive rockfish	**Mean**	**376**	**362**	**394**	**347**	-
	Std. dev.	57	51	60	47	-
	n	232	131	101	136	0
Copper rockfish	**Mean**	**347**	**342**	**373**	**321**	**353**
	Std. dev.	63	62	61	59	41
	n	206	169	37	99	7
Brown rockfish	**Mean**	**335**	**316**	**343**	**335**	-
	Std. dev.	59	50	60	59	-
	n	183	55	128	183	0
Bocaccio	**Mean**	**462**	**424**	**484**	**474**	**432**
	Std. dev.	70	59	67	81	83
	n	180	66	108	16	32
Canary rockfish	**Mean**	**324**	**310**	**342**	**300**	**338**
	Std. dev.	57	54	54	54	45
	n	157	98	52	70	14
Lingcod	**Mean**	**615**	**596**	**625**	**611**	-
	Std. dev.	60	33	70	42	-
	n	71	26	45	26	0
Greenspotted rockfish	**Mean**	**314**	**299**	**324**	-	**315**
	Std. dev.	55	58	51	-	57
	n	53	21	32	0	34

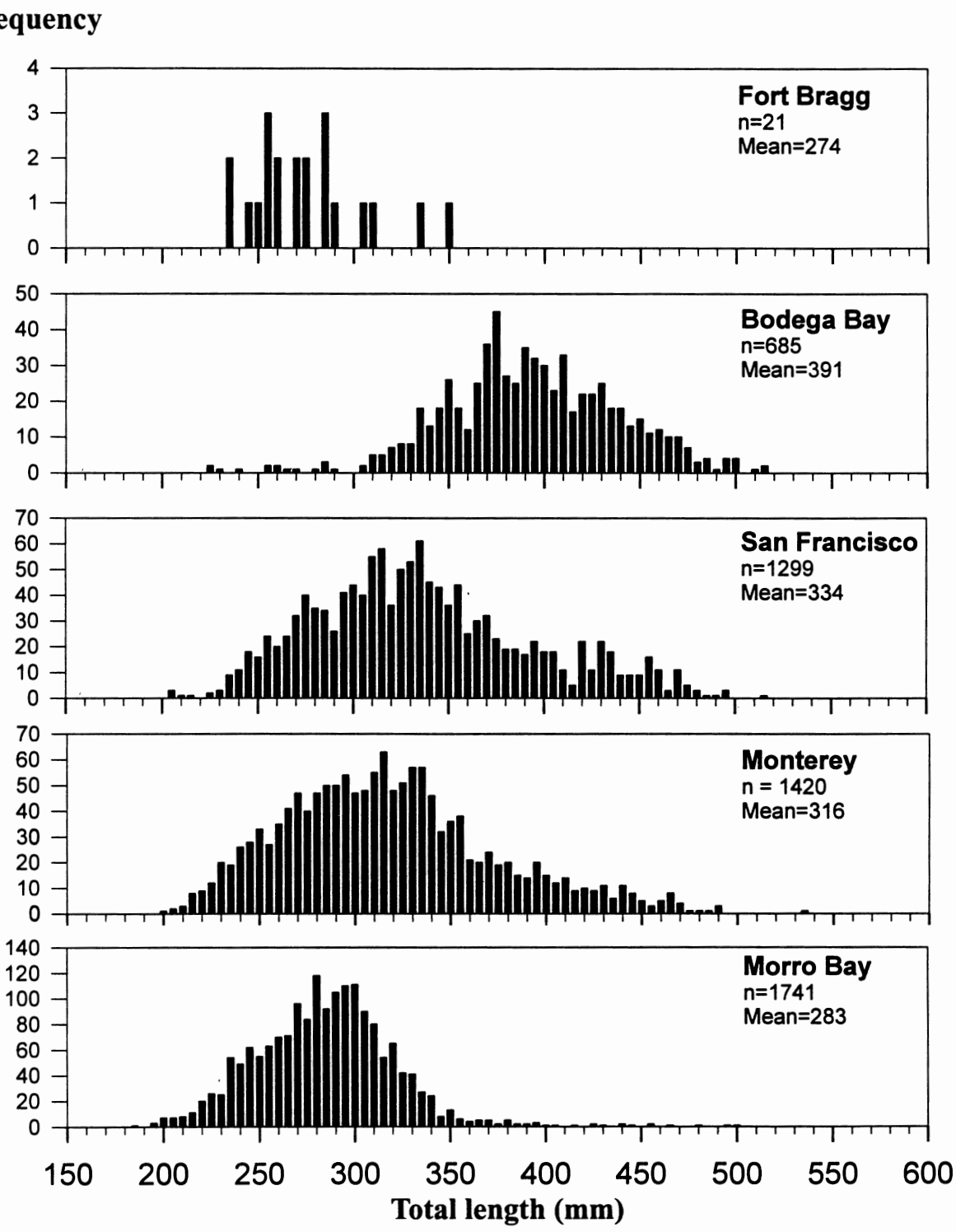
Appendix 11. (cont.)

		Location groups				
		All	Near	Distant	Shallow	Deep
Yelloweye rockfish	**Mean**	**380**	**414**	**370**	-	**344**
	Std. dev.	80	82	78	-	53
	n	52	12	40	0	34
Black rockfish	**Mean**	**327**	**326**	**335**	**327**	-
	Std. dev.	29	30	25	29	-
	n	51	37	12	51	0
China rockfish	**Mean**	**282**	**278**	**298**	**282**	-
	Std. dev.	24	25	11	28	-
	n	40	32	8	25	0
Greenstriped rockfish	**Mean**	**275**	**236**	**284**	-	**275**
	Std. dev.	31	22	25	-	31
	n	26	5	21	0	26

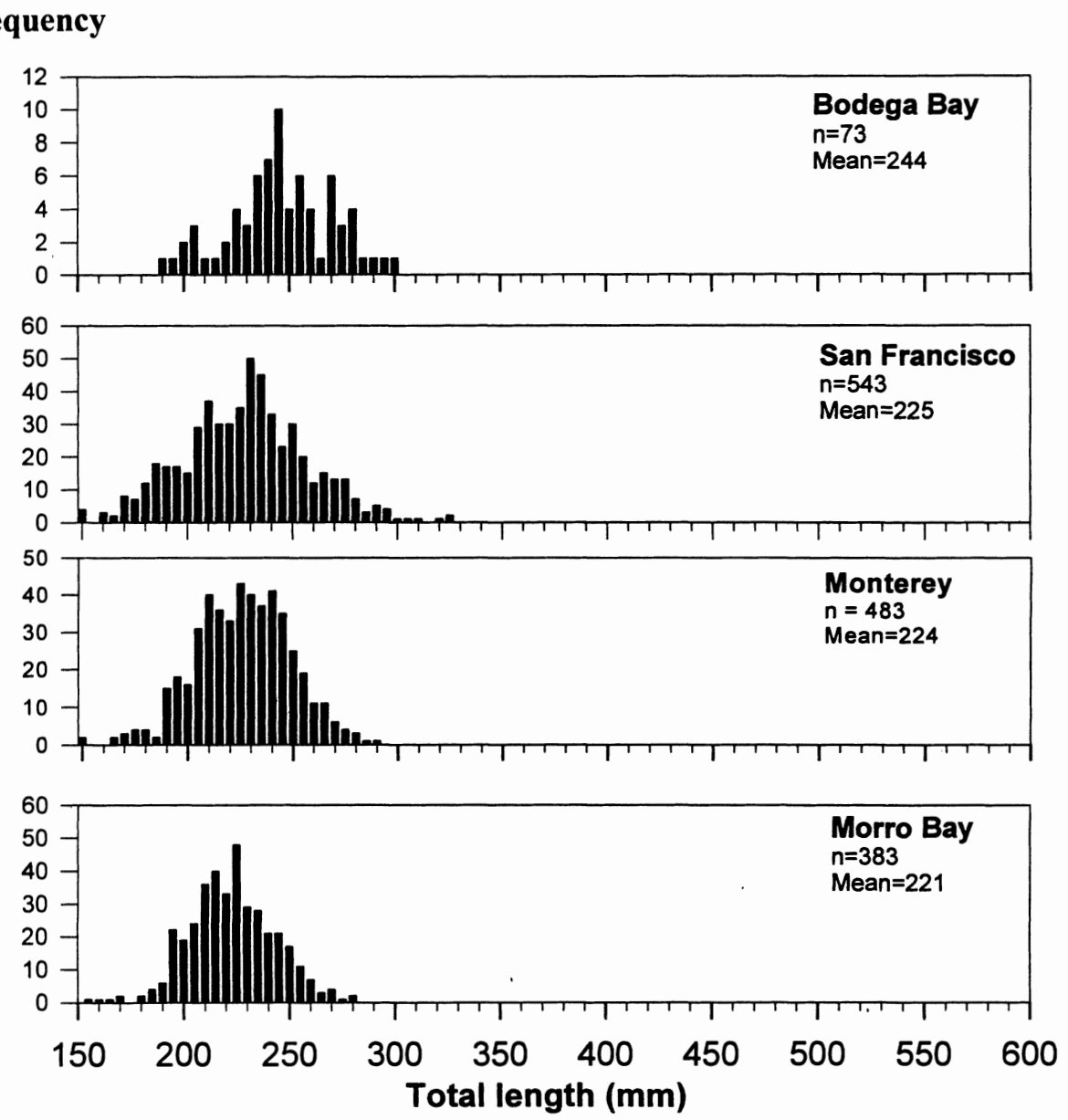
Appendix 12. Length frequency of blue rockfish by port area, 1994.



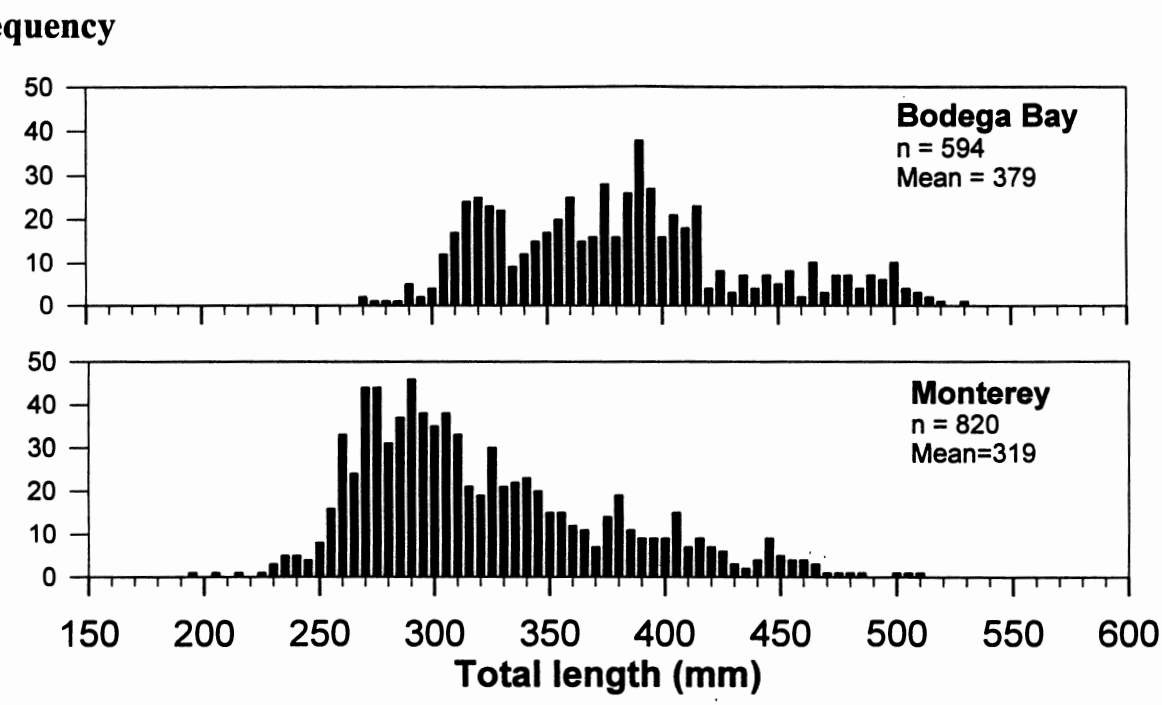
Appendix 13. Length frequency of yellowtail rockfish by port area, 1994.



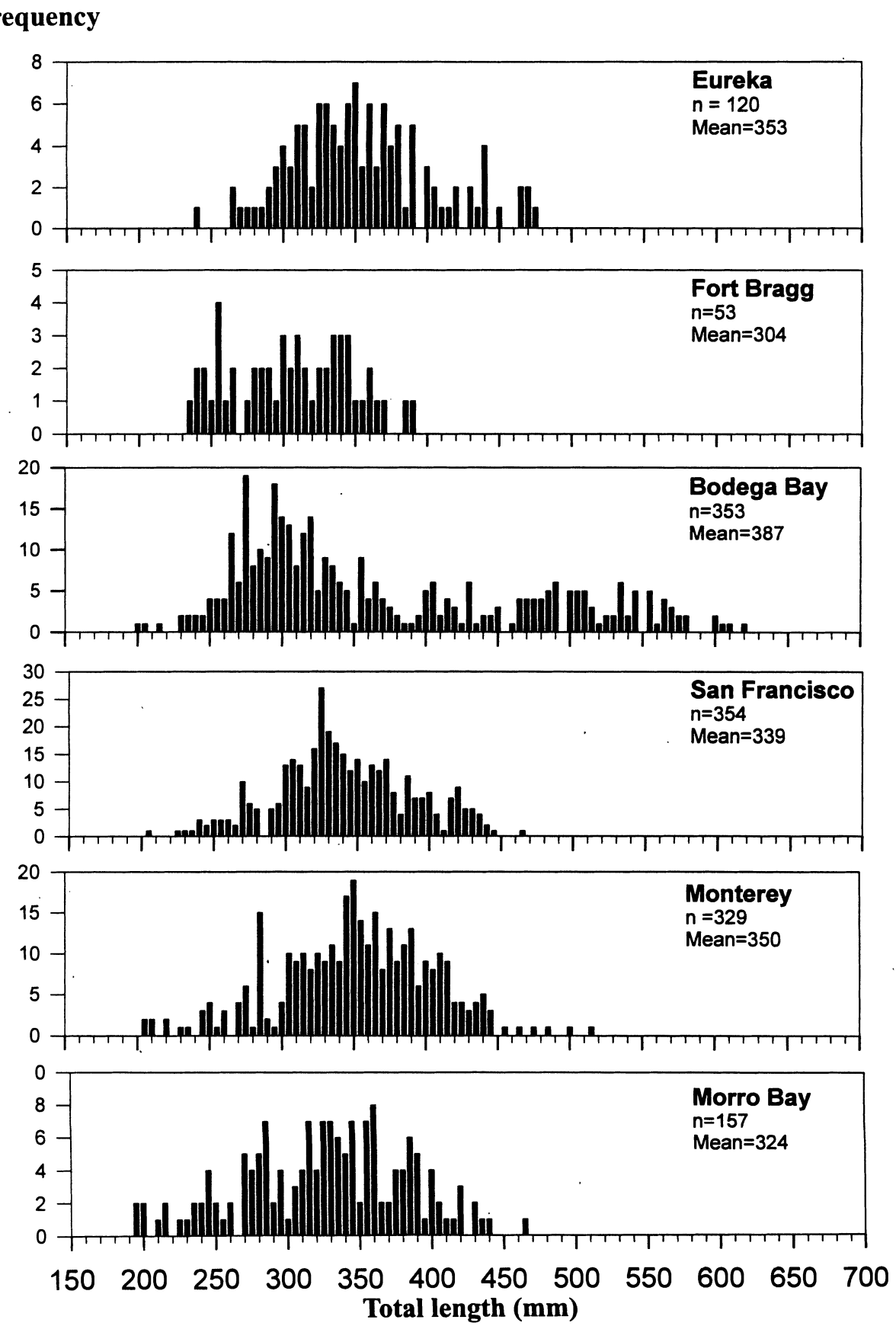
Appendix 14. Length frequency of rosy rockfish by port area, 1994.



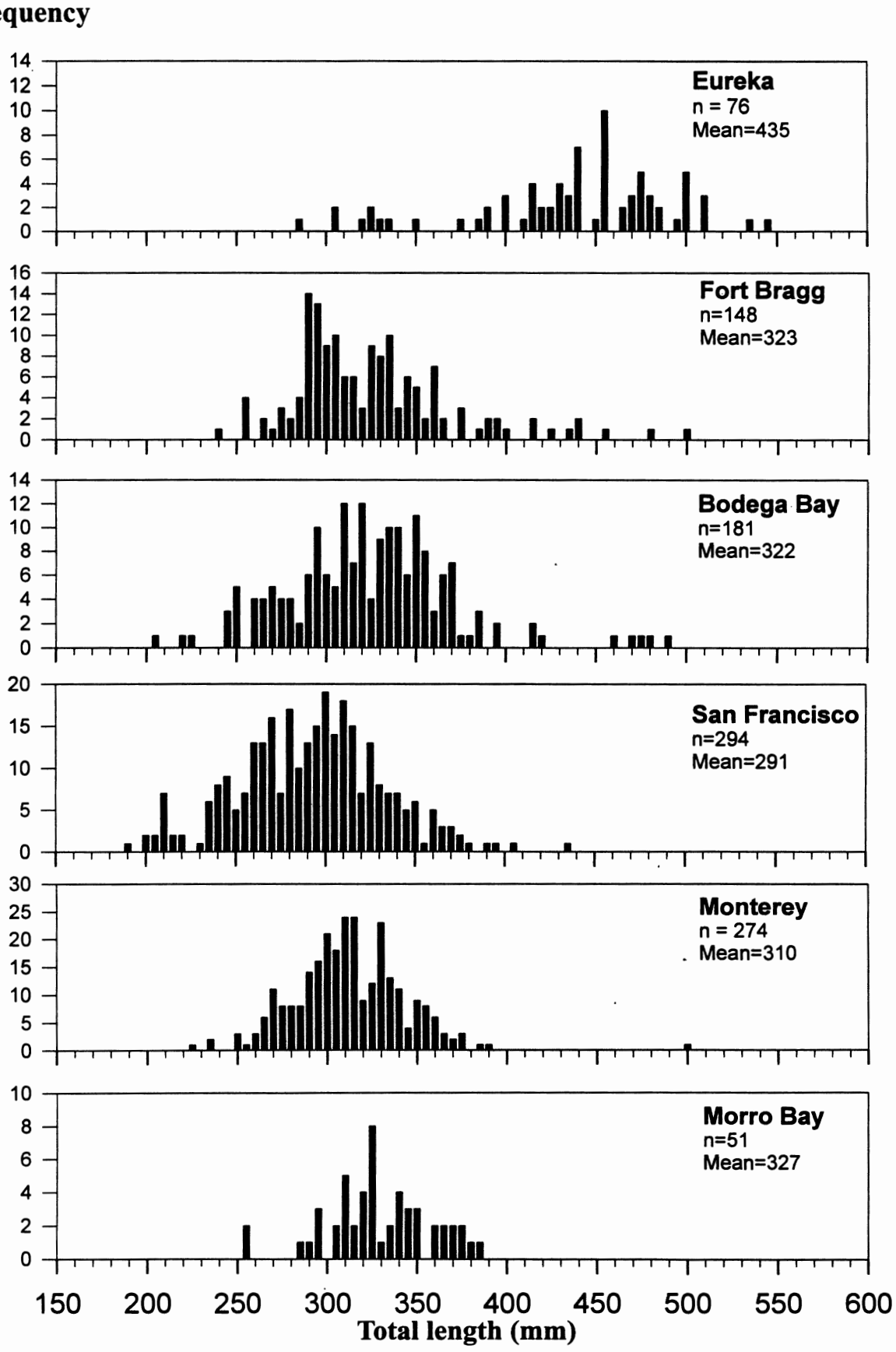
Appendix 15. Length frequency of chilipepper by port area, 1994.



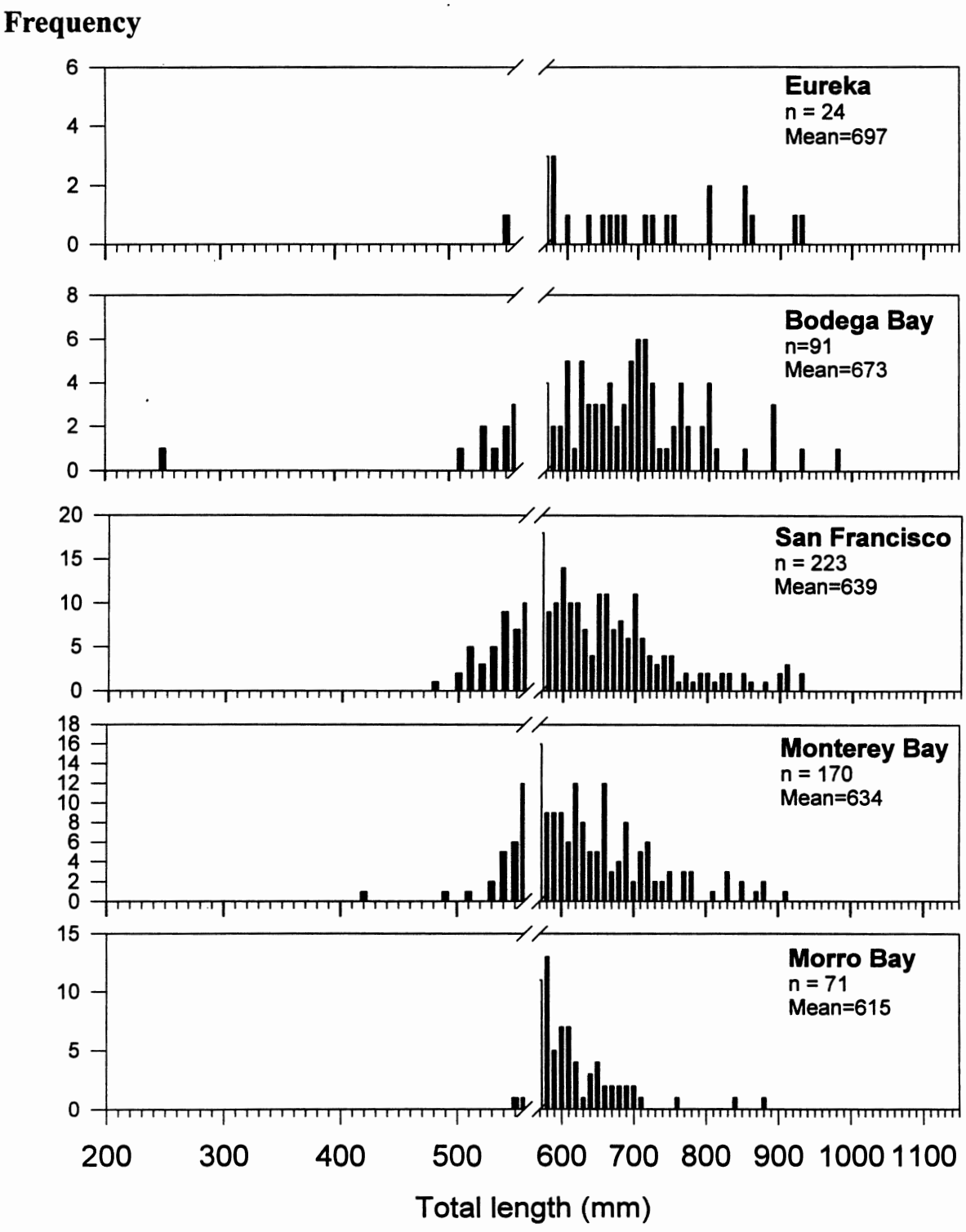
Appendix 16. Length frequency of canary rockfish by port area, 1994.



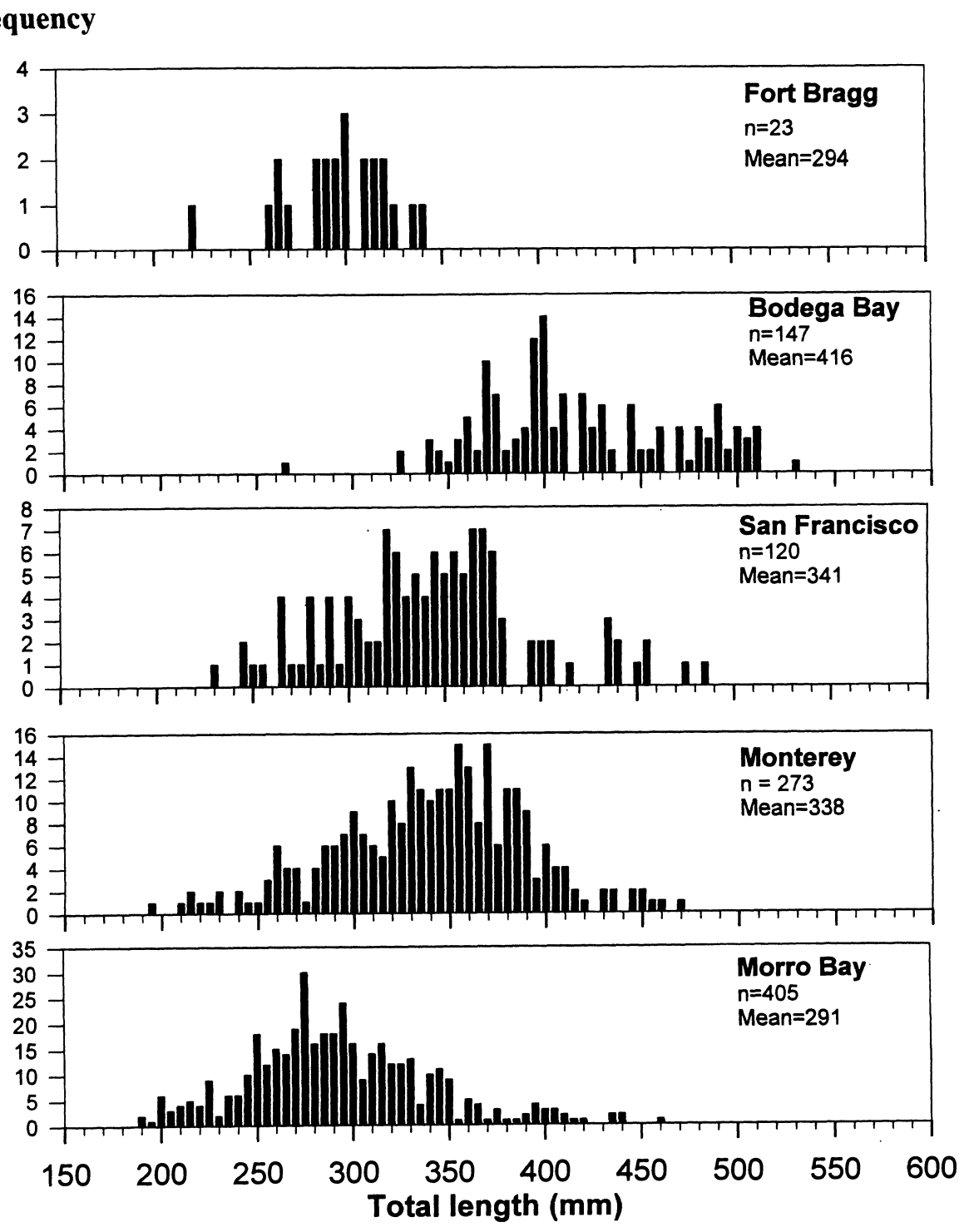
Appendix 17. Length frequency of black rockfish by port area, 1994.



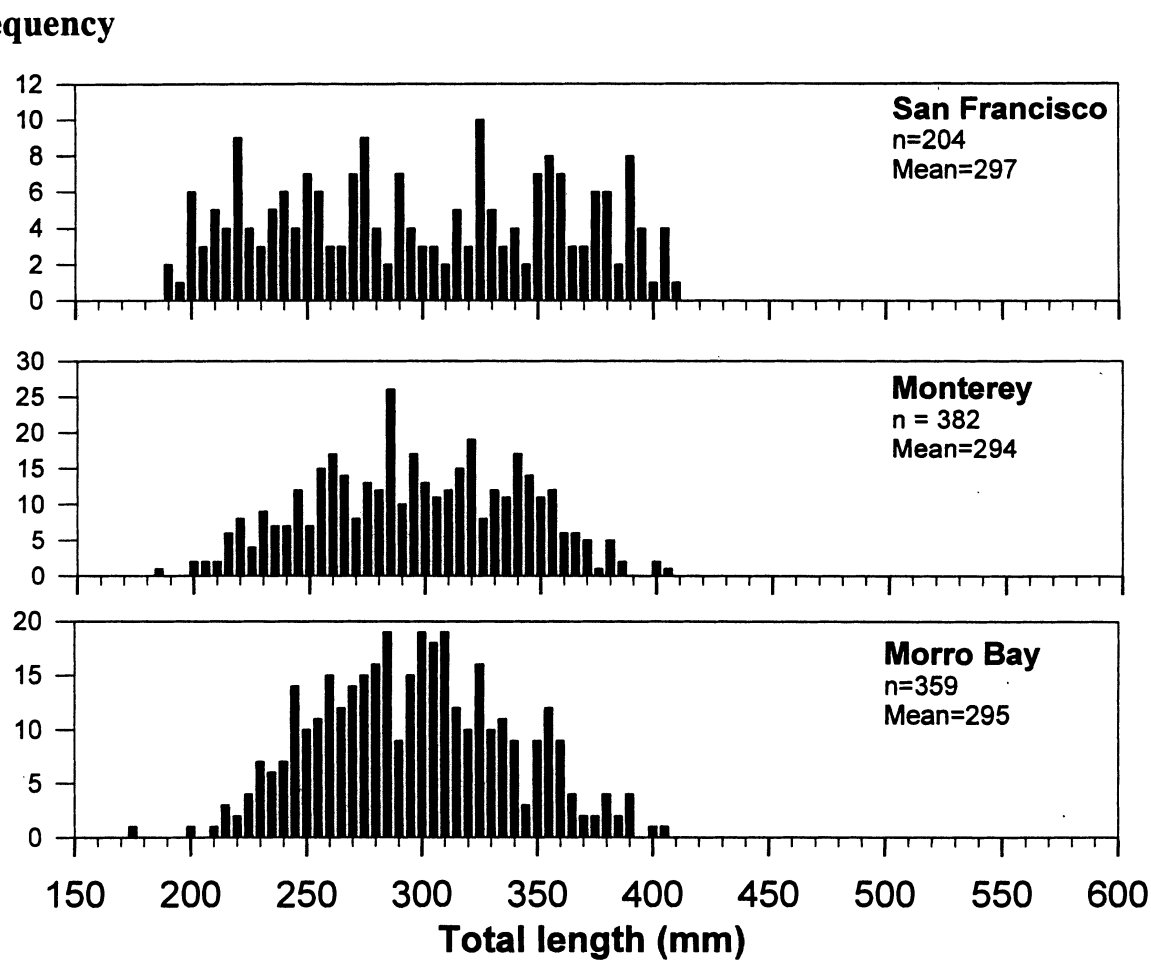
Appendix 18. Length frequency of lingcod by port area, 1994.



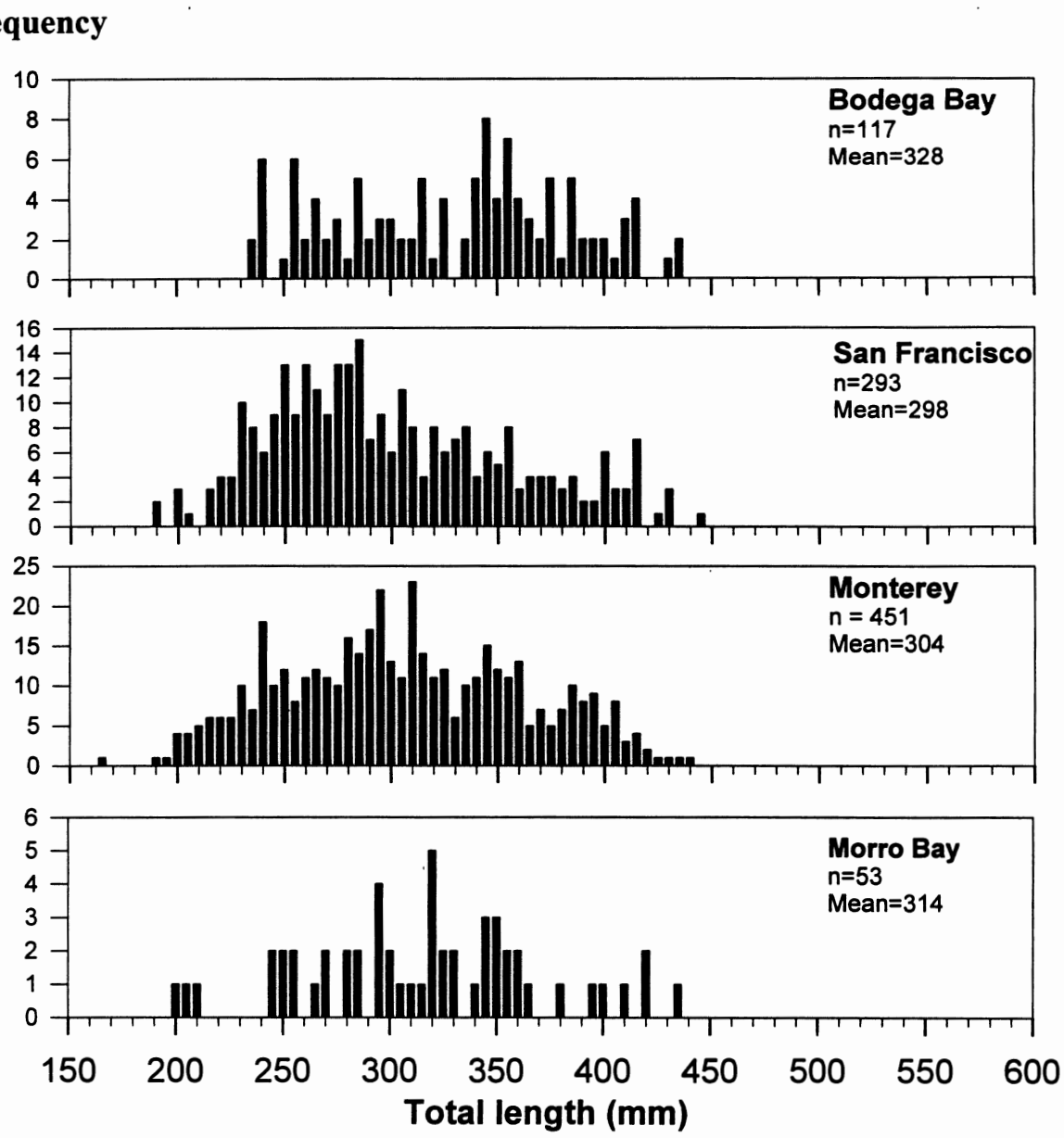
Appendix 19. Length frequency of widow rockfish by port area, 1994.



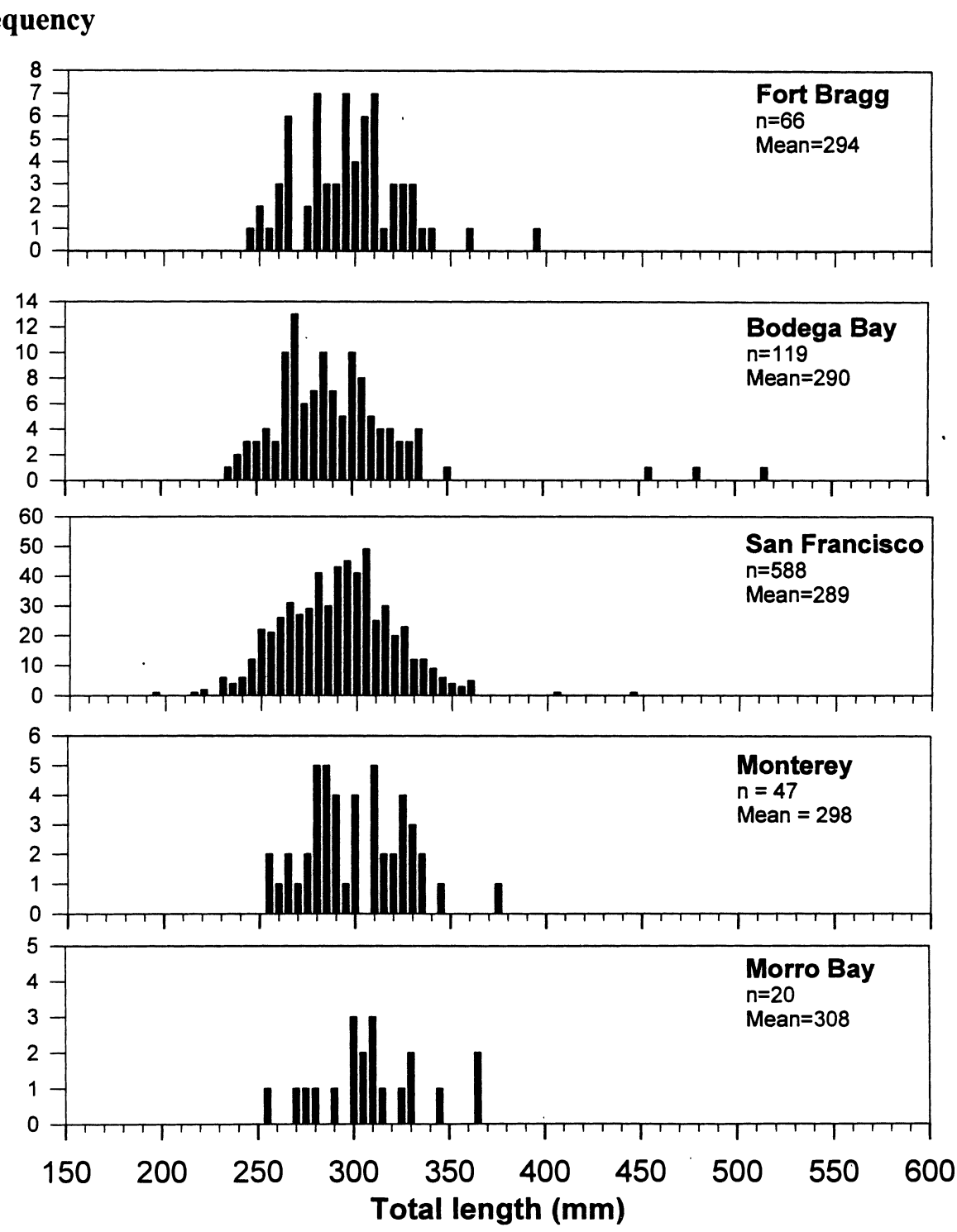
Appendix 20. Length frequency of starry rockfish by port area, 1994.



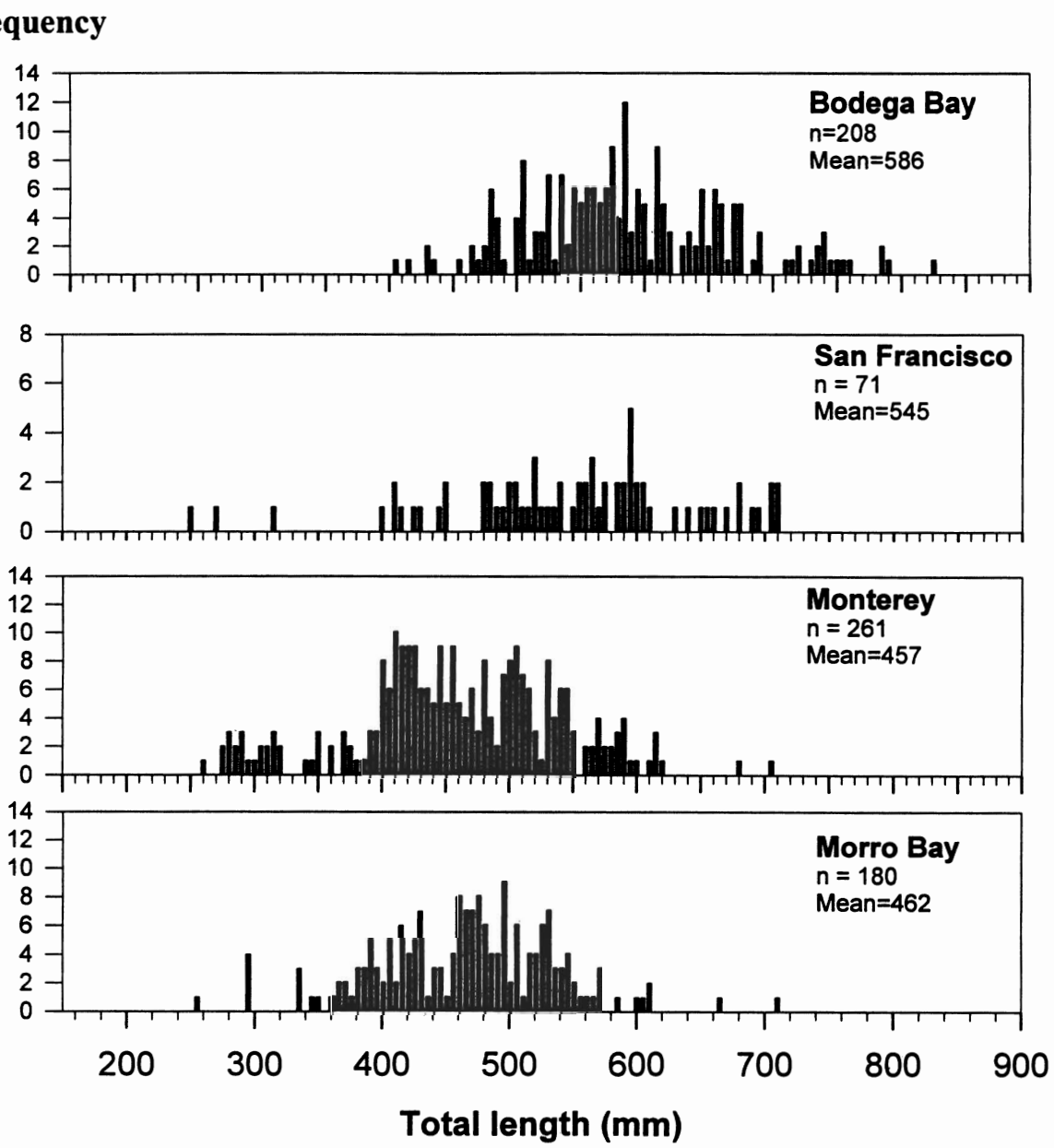
Appendix 21. Length frequency of greenspotted rockfish by port area, 1994.



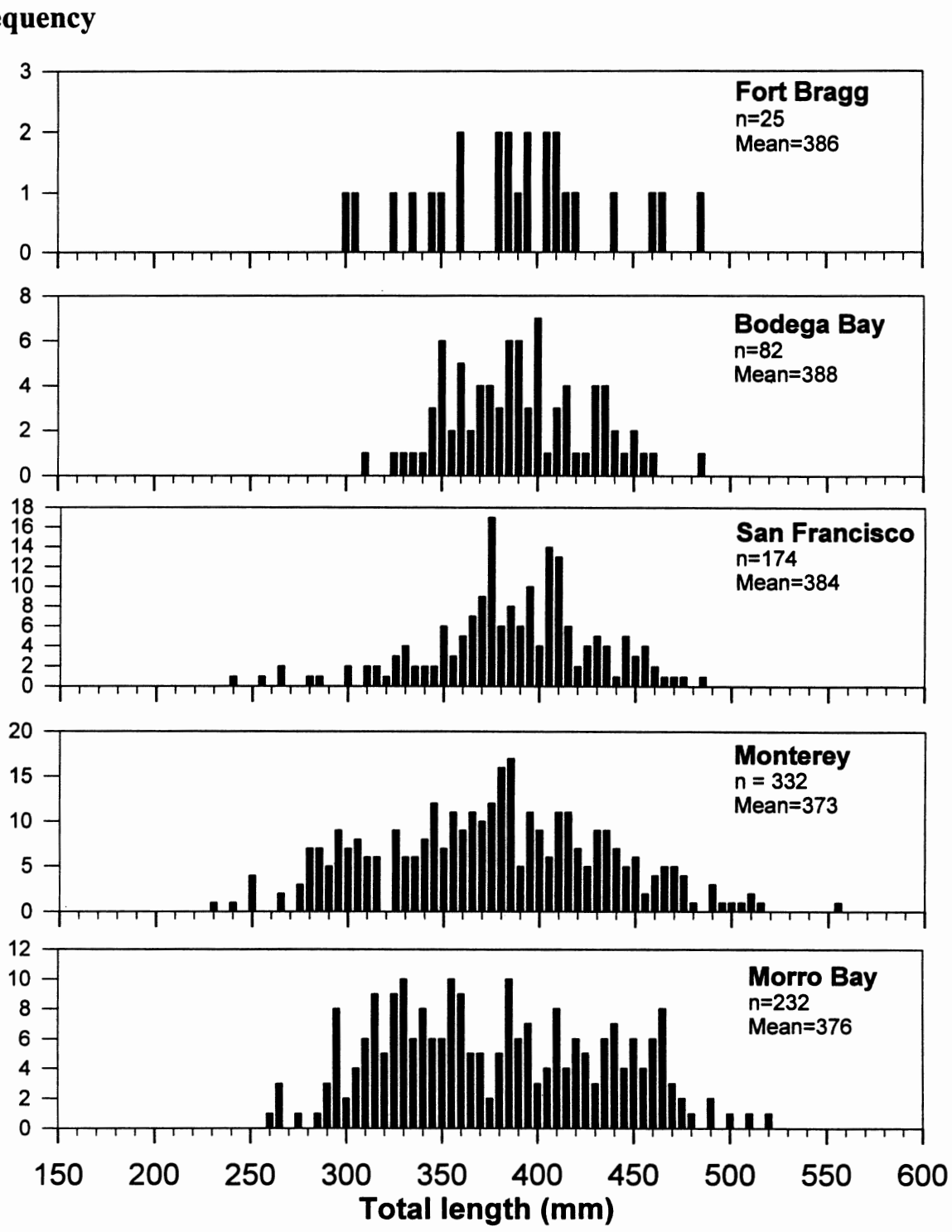
Appendix 22. Length frequency of black rockfish by port area, 1995.



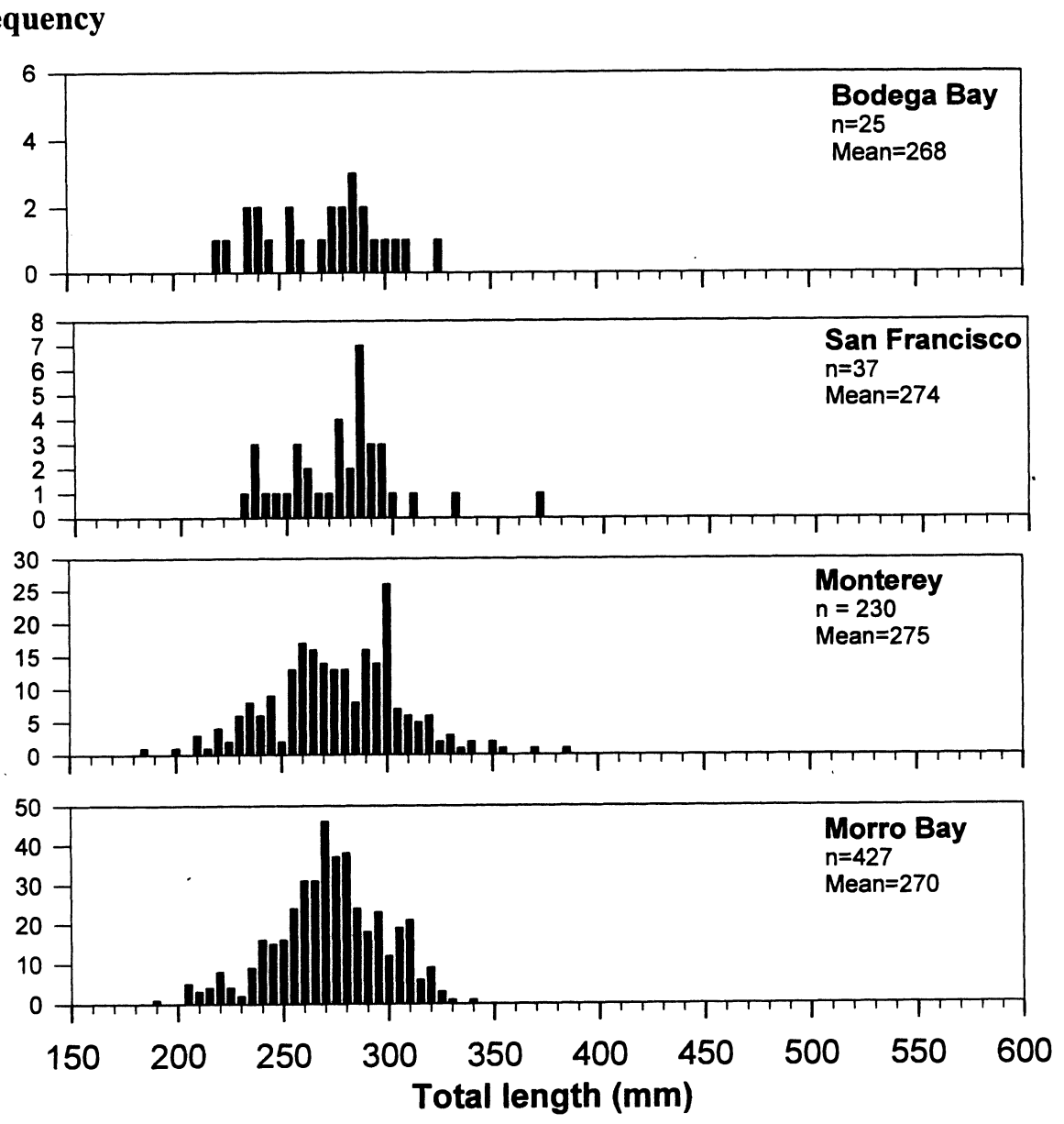
Appendix 23. Length frequency of bocaccio by port area, 1994.



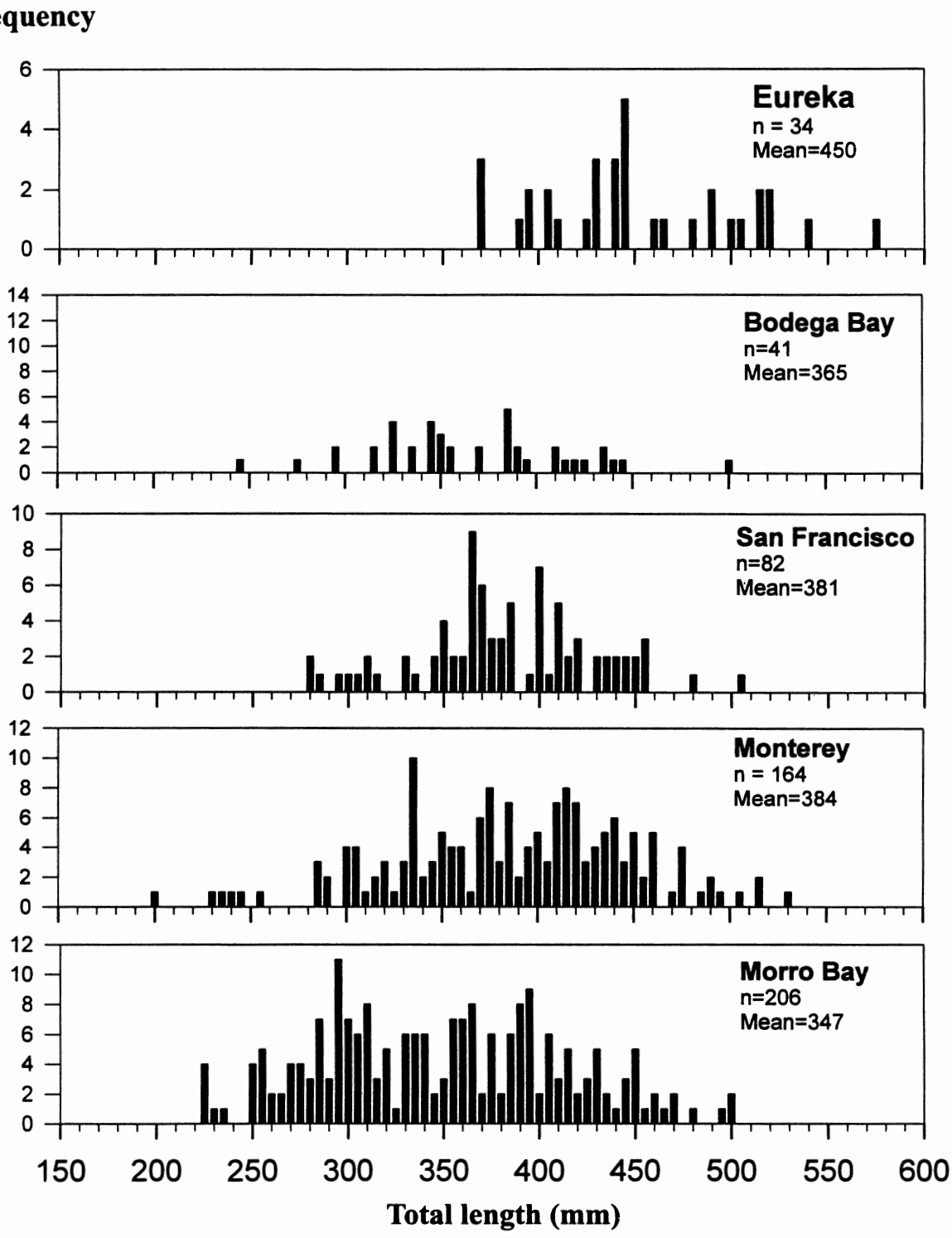
Appendix 24. Length frequency of olive rockfish by port area, 1994.



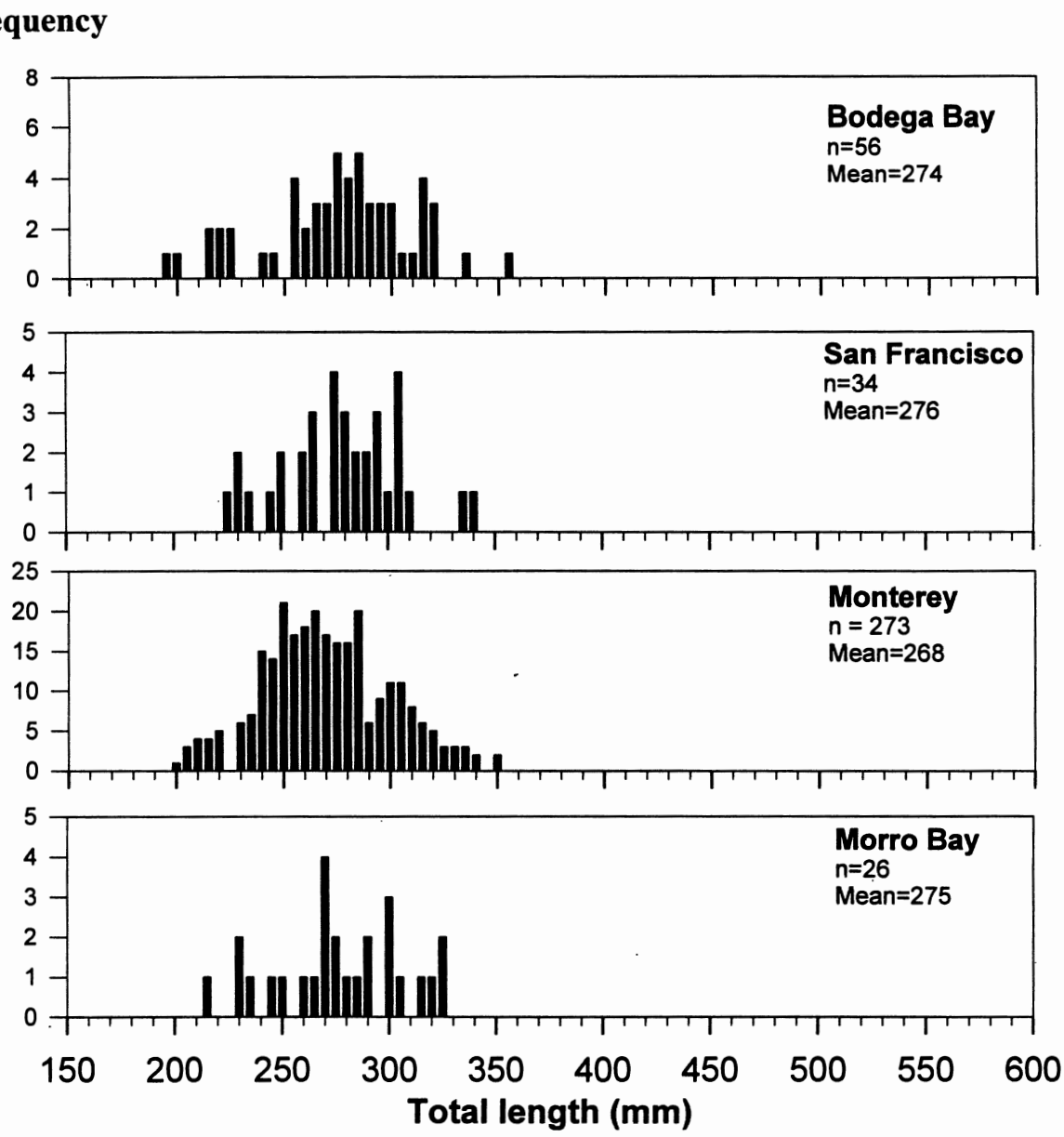
Appendix 25. Length frequency of gopher rockfish by port area, 1994.



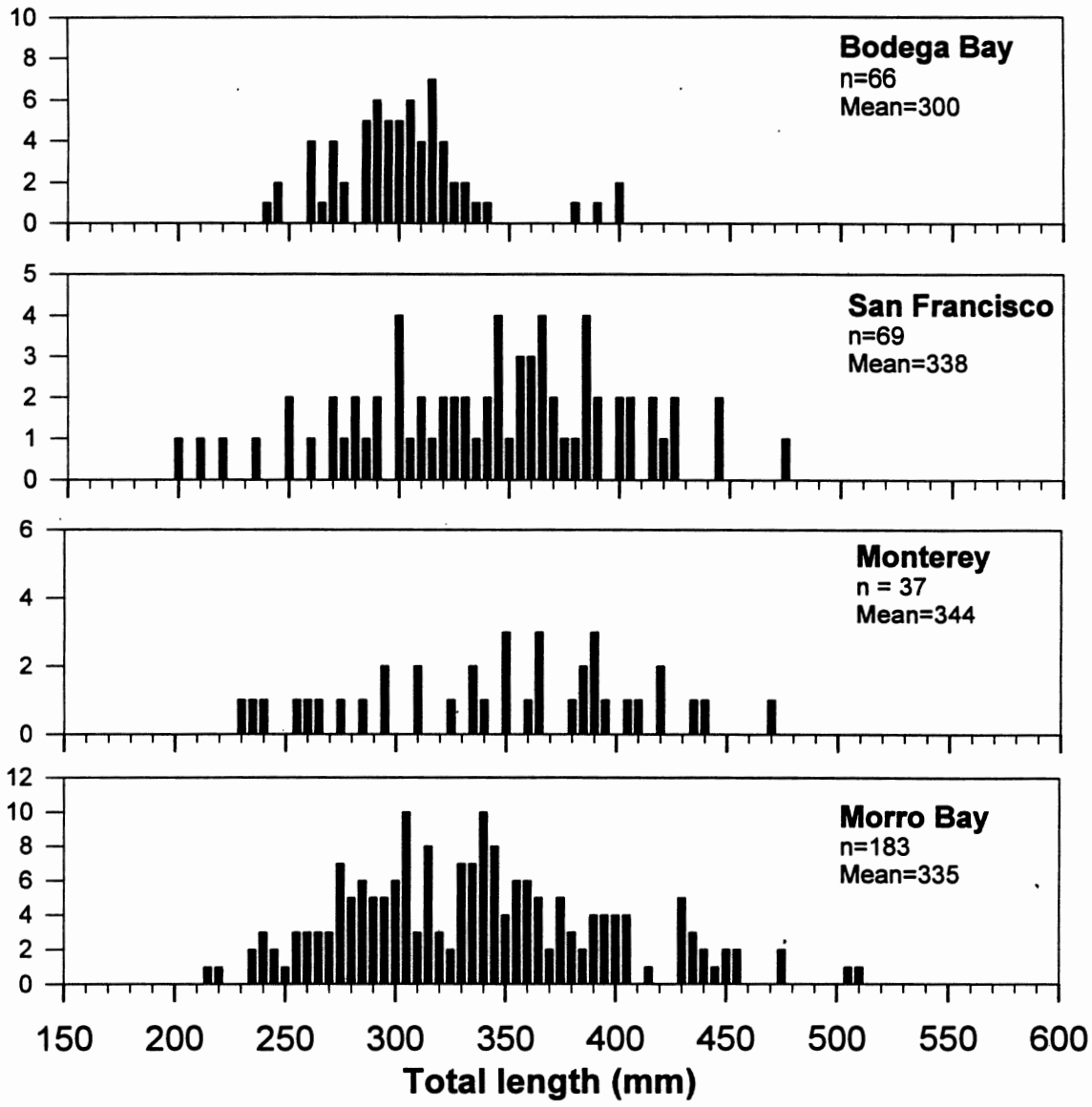
Appendix 26. Length frequency of copper rockfish by port area, 1994.



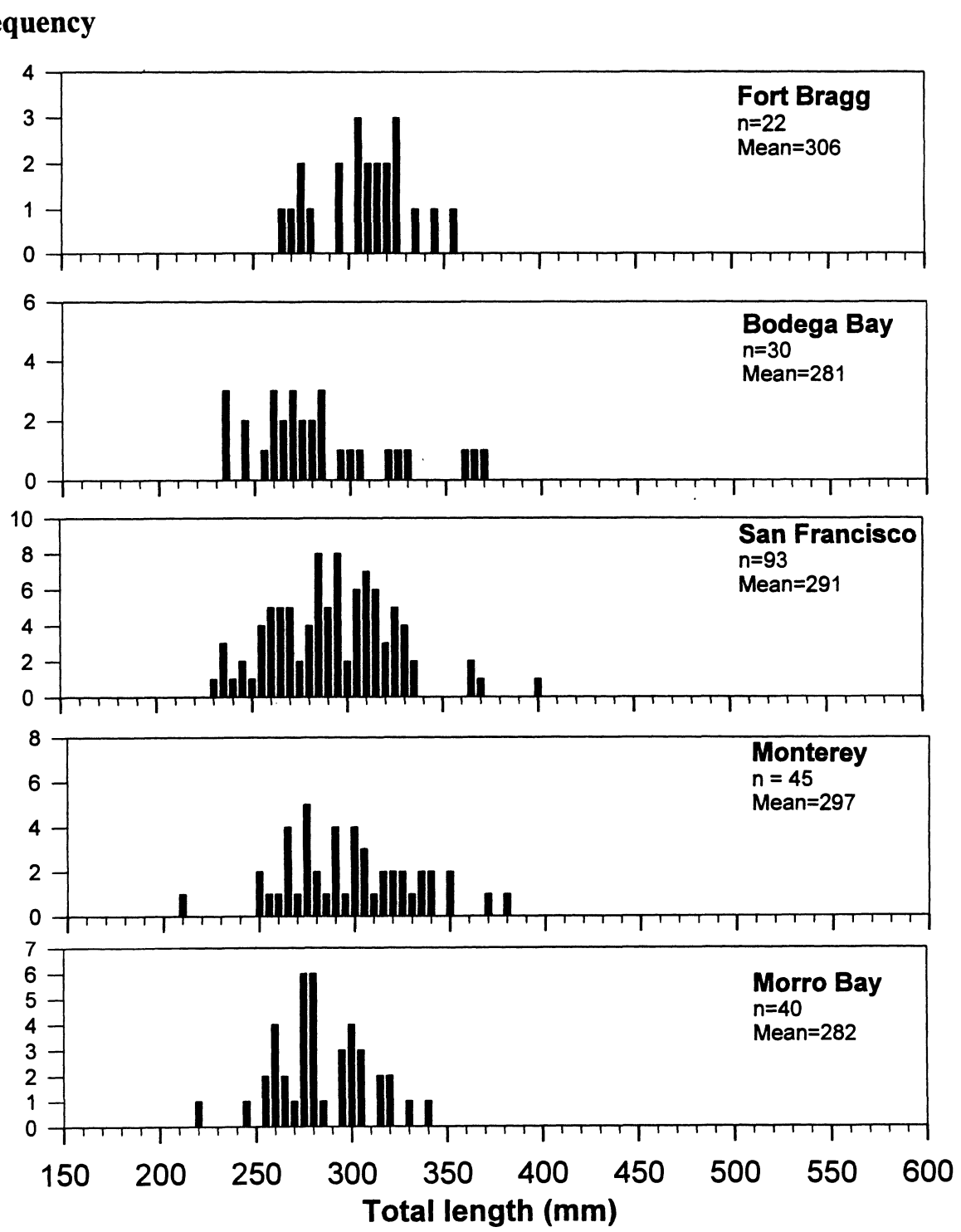
Appendix 27. Length frequency of greenstriped rockfish by port area, 1994.



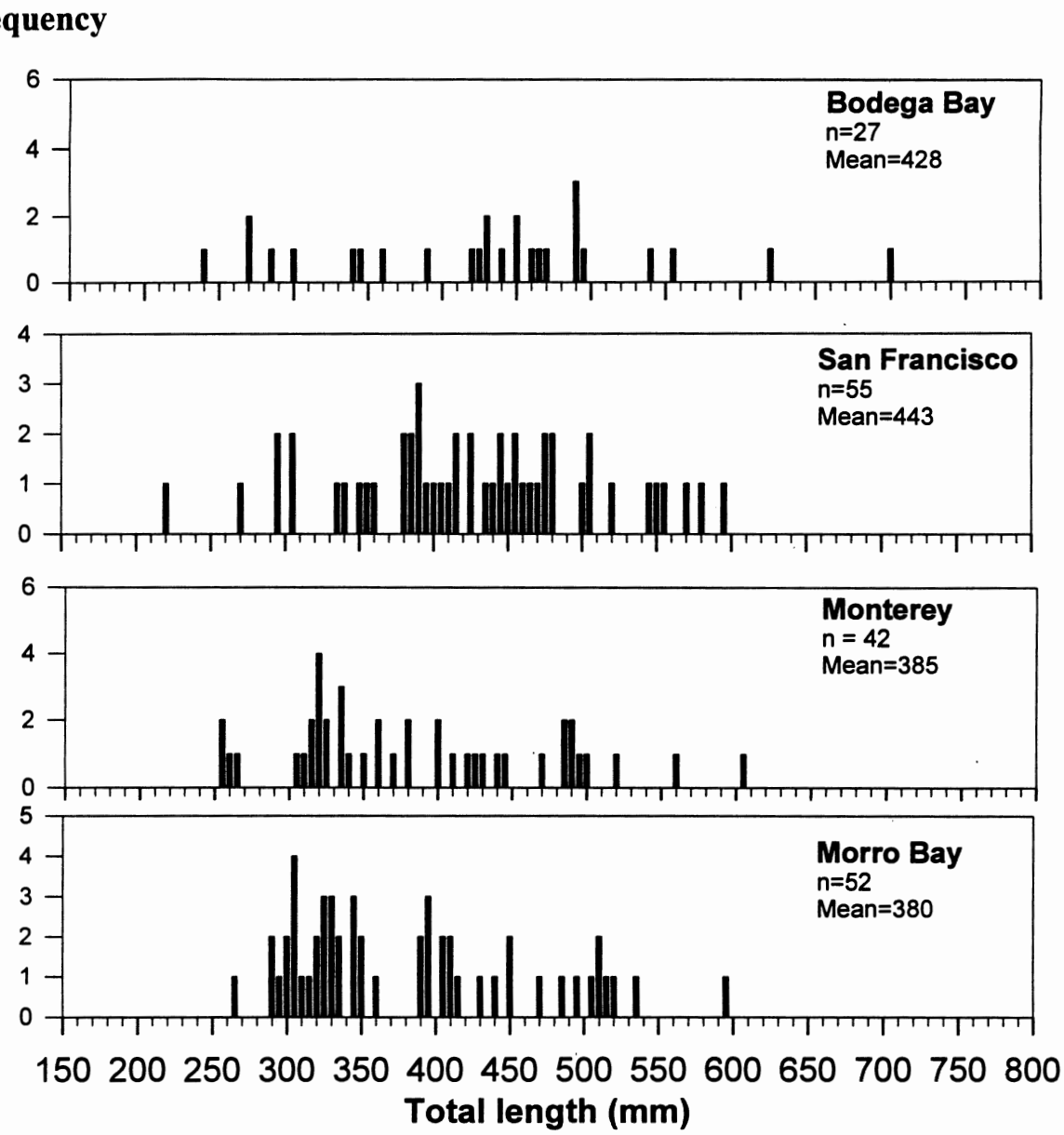
Appendix 28. Length frequency of brown rockfish by port area, 1994.



Appendix 29. Length frequency of China rockfish by port area, 1994.



Appendix 30. Length frequency of yelloweye rockfish by port area, 1994.



Appendix 31. Maximum total length, by port area, of all species measured in CPFV catch, 1987 to 1994.

Commom name	Observed maximum length (mm) Ek[a]	BB	FB	SF	MT	MB	Observed maximum length (in.) EK	FB	BB	SF	MT	MB	Known maximum length (in.)[b]
Rockfishes													
Aurora rockfish	-	-	-	-	350	-	-	-	-	-	12.7	-	14.7
Bank rockfish	-	357	455	503	503	-	-	14.1	17.9	19.8	19.8	-	20.1
Black rockfish	557	496	550	575	497	455	21.9	19.5	21.7	22.6	19.6	17.9	23.75
Black/yellow rf.	-	309	-	345	358	330	-	12.2	-	13.6	14.1	13.0	15.25
Blue rockfish	470	468	491	527	457	500	18.5	18.4	19.3	20.7	18.0	19.7	21.0
Bocaccio	544	790	889	840	836	756	21.4	31.1	35.0	33.1	32.9	29.8	36.0
Brown rockfish	451	-	497	504	468	532	17.8	-	19.6	19.8	18.4	20.9	21.5
Calico rockfish	-	-	-	146	-	242	-	-	-	5.7	-	9.5	9.8[c]
Canary rockfish	546	487	687	635	574	503	21.5	19.2	27.0	25.0	22.6	18.8	30.0
Chameleon rockfish	-	-	-	-	368	-	-	-	-	-	14.5	-	17.0
Chilipepper	-	-	556	530	535	512	-	-	21.9	20.9	21.0	20.2	22.0
China rockfish	388	395	416	412	379	422	15.3	15.6	16.4	16.2	14.9	16.6	17.0
Copper rockfish	574	560	519	582	533	541	22.6	22.0	20.4	22.9*	21.0	21.3	22.5
Cowcod	-	-	771	560	768	693	-	-	30.4	22.0	30.2	27.3	37.0
Flag rockfish	-	-	410	495	451	440	-	-	16.1	19.5	17.8	17.3	25.0
Gopher rockfish	-	413	322	425	385	410	-	16.3*	12.7	16.7*	15.2	16.1*	15.6
Grass rockfish	-	-	-	455	430	508	-	-	-	17.9	16.9	20.0	22.0
Greenblotched rf.	-	-	-	-	475	285	-	-	-	-	18.7	11.2	19.0
Greenspotted rf.	-	399	479	473	461	463	-	15.7	18.9	18.6	18.1	18.2	19.75

APPENDIX 31(cont.)

Commom name	Observed maximum length (mm) Ek[a]	BB	FB	SF	MT	MB	Observed maximum length (in.) EK	FB	BB	SF	MT	MB	Known maximum length (in.)[b]
Greenstriped rf.	-	305	392	408	397	356	-	12.0	15.4*	16.1*	15.6*	14.0	15.0
Halfbanded rf.	-	-	-	183	207	-	-	-	-	7.2	8.1	-	10.0
Kelp rockfish	-	-	-	386	382	414	-	-	-	15.2	15.0	16.3	16.75
Olive rockfish	421	484	508	523	557	560	16.6	19.1	20.0	20.6	21.9	22.0	24.0
Pink rockfish	-	-	391	-	-	-	-	-	15.4	-	-	-	22.0
Quillback rockfish	556	428	415	480	407	360	21.9	16.9	16.3	18.9	16.0	14.2	24.0
Redstripe rf.	-	-	319	297	263	-	-	-	12.6	11.7	10.4	-	20.0
Rosy rockfish	-	335	346	353	344	352	-	13.2	13.6	13.9	13.5	13.9	14.2
Rosethorn rf.	312	324	298	270	291	272	12.3	12.8	11.7	10.6	11.5	10.7	16.0
Sharpchin rf.	-	-	-	303	-	-	-	-	-	11.9	-	-	13.0
Shortbelly rf.	-	-	205	-	326	-	-	-	8.1	-	12.8*	-	13.4[c]
Speckled rockfish	-	-	501	455	502	429	-	-	19.7	17.9	19.8	16.9	22.0
Splitnose rockfish	-	-	-	-	378	374	-	-	-	-	14.9	14.7	18.0
Squarespot rf.	-	-	280	285	290	282	-	-	11.0	11.2	11.4*	11.1	11.25
Starry rockfish	-	340	427	439	449	444	-	13.4	16.8	17.3	17.7	17.5	18.0
Stripetail rf.	-	-	-	-	313	-	-	-	-	-	12.3	-	15.3
Swordspine rf.	-	-	-	297	250	-	-	-	-	11.7	9.8	-	12.0
Tiger rockfish	-	336	-	449	305	-	-	13.2	-	17.7	12.0	-	24.0
Treefish	-	-	-	-	-	408	-	-	-	-	-	16.1	16.0
Vermilion rockfish	545	620	723	662	653	667	21.5	24.4	28.5	26.1	25.7	26.3	30.0
Widow rockfish	345	423	548	520	548	530	13.6	16.7	21.6	20.5	21.6	20.9	21.7

APPENDIX 31(cont.)

Commom name	Observed maximum length (mm) Ek[a]	BB	FB	SF	MT	MB	Observed maximum length (in.) EK	FB	BB	SF	MT	MB	Known maximum length (in.)[b]
Yelloweye rockfish	655	649	715	680	688	610	25.8	25.6	28.1	26.8	27.1	24.0	36.0
Yellowtail rf.	515	544	594	573	557	553	20.3	21.4	23.4	22.6	21.9	21.8	26.0
Other fishes													
Blue shark	-	-	-	1560	-	1600	-	-	-	61.4	-	63.0	156.0
Bonito shark	-	-	-	-	-	1700	-	-	-	-	-	66.9	156.0
Butter sole	-	-	-	-	441	-	-	-	-	-	17.4	-	21.75
Cabezon	560	550	416	661	628	617	22.0	21.7	16.4	26.0	24.7	24.3	39.0
CA barracuda	-	-	-	-	-	871	-	-	-	-	-	34.3	48.0
CA halibut	-	-	-	900	-	758	-	-	-	35.4	-	29.8	60.0
CA sheephead	-	-	-	-	-	525	-	-	-	-	-	20.7	36.0
Fantail sole	-	-	-	-	363	-	-	-	-	-	14.3	-	21.0
Jack mackerel	-	-	661	713	674	411	-	-	26.0	28.1	26.5	16.2	32.0
Jacksmelt	-	-	-	-	388	-	-	-	-	-	15.3	-	17.5
Kelp greenling	413	386	386	438	483	375	16.3	15.2	15.2	17.2	19.0	14.8	21.0
King salmon	-	800	724	840	917	736	-	31.5	28.5	33.1	36.1	29.0	58.0
Lingcod	985	912	1170	1097	1028	955	38.8	35.9	46.1	43.2	40.5	37.6	52.0
Ocean whitefish	-	-	-	-	519	633	-	-	-	-	20.4	26.1	40.0
Pacific bonito	-	-	-	-	815	-	-	-	-	-	32.1	-	40.0
Pacific hake	-	-	-	504	736	362	-	-	-	19.8	29.0	14.3	36.0
Pacific mackerel	-	447	428	477	521	403	-	17.6	16.9	18.8	20.5	15.9	25.0
Pacific sanddab	286	-	220	415	369	343	11.3	-	8.7	16.3*	14.5	13.5	16.0

APPENDIX 31(cont.)

Commom name	Observed maximum length (mm) Ek[a]	BB	FB	SF	MT	MB	Observed maximum length (in.) EK	FB	BB	SF	MT	MB	Known maximum length (in.)[b]
Pacific sardine	-	-	-	-	275	-	-	-	-	-	10.8	-	16.0
Petrale sole	-	-	473	495	494	503	-	-	18.6	19.5	19.4	19.8	27.5
Ratfish	-	-	-	-	543	-	-	-	-	-	21.4	-	38.0
Rock sole	-	-	342	478	499	473	-	-	13.5	18.8	19.6	18.6	23.5
Rubberlip surfperch	-	-	-	-	-	408	-	-	-	-	-	16.1	18.5
Sablefish	-	-	-	525	630	393	-	-	-	20.7	24.8	15.5	40.0
Silver salmon	-	656	-	-	668	-	-	25.8	-	-	26.3	-	38.5
Spiny dogfish	-	-	-	-	1005	1017	-	-	-	-	39.6	40.0	62.4
Striped surfperch	-	-	-	-	-	243	-	-	-	-	-	9.6	15.0
White croaker	-	-	-	302	301	287	-	-	-	11.9	11.9	11.3	16.3
Wolf-eel	-	-	-	1424	1352	1524	-	-	-	56.1	53.2	60.0	80.0
Yellowfin croaker	-	-	-	297	-	-	-	-	-	11.7	-	-	20.1

[a] Legend: EK-Eureka; FB-Fort Bragg; BB-Bodega Bay; SF-San Francisco; MT-Monterey; MB-Morro Bay.
[b] Maximim length as reported in Miller and Lea (1972).
[c] Don Pearson, National Marine Fisheries Service, Tiburon (pers. commun.).
* Exceeds maximum length as reported in Miller and Lea (1972).

Appendix 32. Summary of average monthly CPAH for selected species from the Fort Bragg area, 1988 to 1994.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# of fish observed
Blue rockfish	2.55	1.12	3.60	3.38	3.58	1.47	1.38	1.64	1.63	2.08	1.65	2.18	2442
Black rockfish	0.00	0.04	0.32	0.24	0.59	0.00	0.61	0.38	0.09	0.28	0.30	0.00	306
Canary rockfish	0.19	0.29	0.33	0.24	0.39	0.54	0.20	0.35	0.55	0.35	0.30	0.87	478
Yellowtail rockfish	0.16	1.65	0.40	0.34	0.70	1.47	0.60	0.44	1.31	0.85	0.26	0.65	1070
China rockfish	0.04	0.03	0.02	0.24	0.08	0.05	0.05	0.11	0.04	0.10	0.05	0.00	76
Olive rockfish	0.02	0.01	0.01	0.14	0.04	0.00	0.14	0.32	0.05	0.07	0.26	0.00	116
Widow rockfish	1.03	0.56	0.90	1.55	0.23	0.33	0.06	0.01	0.06	0.22	0.15	0.47	383
Lingcod	0.02	0.05	0.26	0.24	0.03	0.10	0.06	0.01	0.06	0.13	0.09	0.04	103
Vermilion rockfish	0.02	0.01	0.01	0.03	0.05	0.07	0.05	0.03	0.07	0.07	0.05	0.00	57
Rosy rockfish	0.21	0.37	0.11	0.51	0.16	0.11	0.13	0.16	0.40	0.23	0.40	0.58	320
Gopher rockfish	0.00	0.00	0.02	0.07	0.07	0.00	0.02	0.02	0.02	0.03	0.04	0.00	27
Yelloweye rockfish	0.04	0.07	0.03	0.10	0.04	0.10	0.03	0.08	0.06	0.04	0.06	0.33	78
Copper rockfish	0.04	0.02	0.04	0.00	0.07	0.15	0.08	0.21	0.12	0.06	0.04	0.18	107
Starry rockfish	0.02	0.02	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.02	0.02	0.00	12
All fish	4.35	4.41	6.18	7.23	6.46	4.47	3.55	3.84	4.62	4.63	4.36	6.04	5823
Number of trips	2	5	6	2	4	5	6	7	10	8	4	2	61

Appendix 33. Summary of average monthly CPAH for selected species from the Bodega Bay area, 1988 to 1994.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# of fish observed
Chilipepper	1.45	1.92	1.75	1.14	0.09	0.00	0.10	0.92	0.66	0.68	0.25	0.61	2853
Yellowtail rockfish	1.50	1.03	0.90	1.34	0.90	0.49	0.73	0.54	1.01	0.14	1.08	0.87	3802
Blue rockfish	0.00	0.00	0.00	0.18	1.17	2.87	0.75	0.23	0.22	0.34	0.95	0.84	2710
Canary rockfish	0.19	0.66	0.36	0.45	0.25	0.34	0.39	0.42	0.17	0.36	0.13	0.11	1314
Bocaccio	0.29	0.64	0.66	0.37	0.12	0.02	0.06	0.20	0.42	0.32	0.37	0.18	1167
Widow rockfish	0.15	0.23	0.56	0.23	0.20	0.01	<.01	0.05	0.11	0.40	0.47	0.63	964
Black rockfish	0.00	0.00	0.00	0.00	0.06	0.37	0.42	<.01	0.02	0.01	0.01	0.02	367
Lingcod	0.10	0.12	0.07	0.05	0.11	0.11	0.08	0.16	0.10	0.13	0.09	0.16	471
Greenspotted rockfish	0.36	0.23	0.09	0.07	0.50	0.01	0.08	0.28	0.24	0.24	0.42	0.06	935
Rosy rockfish	0.19	0.04	0.04	0.06	0.12	0.12	0.10	0.15	0.11	0.13	0.14	0.13	495
Greenstriped rockfish	0.14	0.08	0.13	0.00	0.17	0.00	0.03	0.08	0.09	0.05	0.12	0.02	309
Olive rockfish	0.02	0.00	0.00	0.30	0.15	0.05	0.05	0.03	0.05	0.07	0.01	0.22	258
Brown rockfish	0.00	0.00	0.00	0.00	0.42	0.27	0.12	0.28	0.03	0.08	0.03	0.01	507
Copper rockfish	0.00	0.00	0.00	0.00	0.01	0.10	0.02	0.12	0.02	0.01	<.01	0.01	141
China rockfish	0.00	0.00	0.00	0.00	0.02	0.06	0.04	0.04	<.01	0.02	0.00	<.01	86
Gopher rockfish	0.00	0.00	0.00	0.00	<.01	0.03	0.02	0.03	<.01	0.02	0.00	0.01	52
Yelloweye rockfish	0.04	0.06	0.02	0.00	0.02	0.04	0.05	0.08	0.05	0.05	0.07	0.05	211
Starry rockfish	0.04	0.01	<.01	0.00	0.02	<.01	<.01	0.02	0.02	0.01	0.02	0.01	55
Vermilion rockfish	<.01	0.02	<.01	0.01	0.01	0.03	0.05	0.05	<.01	0.03	0.01	0.01	97
All fish	4.71	5.21	4.66	4.24	4.40	4.98	3.13	3.72	3.41	4.15	4.28	4.05	17,130
Number of trips	7	6	8	7	9	12	14	17	12	19	11	7	129

Appendix 34. Summary of average monthly CPAH for selected species from the San Francisco area, 1988 to 1994.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# of fish observed
Yellowtail rockfish	0.82	0.91	0.91	0.56	0.18	0.47	0.36	0.82	0.90	0.97	1.49	1.15	9198
Blue rockfish	0.57	1.00	1.09	0.50	0.49	0.81	1.00	0.39	0.70	0.53	0.47	0.52	7981
Rosy rockfish	0.47	0.67	0.44	0.26	0.26	0.36	0.22	0.45	0.40	0.53	0.48	0.59	4865
Black rockfish	0.00	0.00	0.01	0.34	0.48	0.18	0.50	0.11	0.13	0.01	0.06	0.00	2194
Canary rockfish	0.29	0.18	0.23	0.15	0.14	0.14	0.14	0.14	0.13	0.18	0.25	0.24	2022
Greenspotted rockfish	0.13	0.06	0.08	0.10	0.05	0.06	0.12	0.16	0.04	0.09	0.27	0.14	1272
Lingcod	0.25	0.26	0.18	0.15	0.36	0.10	0.13	0.21	0.21	0.24	0.16	0.27	2422
Starry rockfish	0.04	0.11	0.06	0.08	0.09	0.09	0.09	0.12	0.08	0.11	0.11	0.07	1120
Olive rockfish	0.14	0.07	0.10	0.05	0.04	0.09	0.06	0.05	0.05	0.06	0.18	0.09	879
Widow rockfish	0.24	0.51	0.30	0.12	0.15	0.11	0.01	0.07	0.12	0.17	0.23	0.35	1831
Brown rockfish	0.04	0.00	0.06	0.16	0.15	0.18	0.11	0.08	0.05	0.03	0.02	0.01	1048
China rockfish	0.05	0.09	0.03	0.05	0.06	0.06	0.04	0.06	0.07	0.04	0.02	0.07	630
Copper rockfish	0.22	0.15	0.14	0.07	0.07	0.08	0.16	0.09	0.07	0.10	0.16	0.13	1290
Bocaccio	0.07	0.10	0.09	0.04	0.02	0.04	0.05	0.06	0.05	0.06	0.11	0.07	711
Vermilion rockfish	0.07	0.01	0.03	0.04	0.05	0.06	0.06	0.05	0.04	0.03	0.03	0.05	544
Yelloweye rockfish	0.05	0.10	0.02	0.03	0.02	0.04	0.02	0.07	0.03	0.04	0.04	0.03	478
Gopher rockfish	<.01	<.01	<.01	0.03	0.06	0.04	0.08	0.04	0.04	0.01	0.01	<.01	417
Greenstriped rockfish	0.01	0.03	0.02	0.01	0.03	0.01	0.01	0.03	0.01	0.03	0.02	0.02	47
All fish	3.64	4.46	3.91	2.99	2.87	3.14	3.35	3.14	3.33	3.41	4.30	4.00	41,427
Number of trips	8	9	25	21	17	27	25	28	32	25	20	13	250

Appendix 35. Summary of average monthly CPAH for selected species from the Monterey area, 1987 to 1994.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	No. of fish observed
Blue rockfish	0.22	1.03	0.67	0.51	1.18	1.35	1.55	0.81	1.36	0.35	0.48	0.72	18,030
Yellowtail rockfish	0.64	0.79	0.58	0.71	0.51	0.50	0.52	0.49	0.78	0.58	0.38	0.53	11,950
Chilipepper	1.16	0.62	0.86	1.84	2.13	2.19	1.16	1.82	0.70	0.02	0.29	0.66	22,737
Rosy rockfish	0.15	0.21	0.16	0.12	0.08	0.08	0.13	0.14	0.24	0.11	0.15	0.16	2929
Greenspotted rockfish	0.26	0.14	0.16	0.06	0.06	0.22	0.14	0.18	0.10	0.09	0.14	0.03	2734
Starry rockfish	0.09	0.09	0.09	0.09	0.05	0.04	0.07	0.07	0.12	0.11	0.13	0.10	1831
Canary rockfish	0.08	0.12	0.08	0.08	0.05	0.07	0.06	0.05	0.07	0.06	0.07	0.05	1396
Greenstriped rockfish	0.15	0.13	0.19	0.09	0.07	0.14	0.08	0.15	0.07	0.03	0.10	0.10	2121
Black rockfish	0.00	0.01	0.00	0.00	<.01	0.02	0.05	0.05	0.01	0.03	0.05	0.00	458
Lingcod	0.13	0.06	0.07	0.05	0.05	0.04	0.10	0.03	0.10	0.35	0.22	0.27	2690
Olive rockfish	0.04	0.09	0.04	0.07	0.06	0.11	0.09	0.11	0.23	0.16	0.12	0.08	2314
Bocaccio	0.32	0.43	0.37	0.22	0.33	0.10	0.08	0.33	0.26	0.25	0.42	0.15	5545
Gopher rockfish	0.01	0.03	0.01	0.01	0.02	0.01	0.05	0.03	0.04	0.03	0.02	0.02	544
Widow rockfish	0.73	0.70	0.62	0.48	0.23	0.09	0.07	0.10	0.37	0.26	0.19	0.08	6017
Copper rockfish	0.04	0.04	0.03	0.02	0.04	0.03	0.06	0.03	0.03	0.05	0.05	0.02	815
Vermilion rockfish	0.02	0.09	0.03	0.03	0.02	0.06	0.04	0.04	0.05	0.06	0.04	0.02	849
China rockfish	0.01	<.01	<.01	<.01	<.01	<.01	0.01	0.01	0.01	0.02	0.01	0.01	198
Yelloweye rockfish	0.01	0.02	0.02	<.01	<.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	246
Brown rockfish	0.00	0.00	0.00	<.01	0.00	<.01	0.01	0.02	0.01	<.01	0.01	<.01	106
All fish	4.47	4.82	4.30	4.83	5.49	5.76	4.72	4.76	4.80	2.75	3.11	3.90	91,270
Number of trips	33	29	41	51	50	49	58	62	60	66	50	29	578

Appendix 36. Summary of average monthly CPAH for selected species from the Morro Bay area, 1988 to 1994.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Number of fish observed
Blue rockfish	0.68	0.93	1.18	0.66	0.69	0.84	0.70	1.08	1.04	0.82	0.97	0.68	10,077
Yellowtail rockfish	1.11	0.83	0.81	0.75	0.46	0.59	0.58	0.64	0.89	1.17	0.96	0.73	8951
Vermilion rockfish	0.44	0.30	0.27	0.39	0.43	0.38	0.29	0.26	0.23	0.31	0.21	0.15	3394
Rosy rockfish	0.22	0.14	0.19	0.14	0.19	0.18	0.20	0.20	0.15	0.16	0.26	0.17	2069
Widow rockfish	0.29	0.42	0.20	0.17	0.21	0.03	0.07	0.07	0.22	0.29	0.19	0.18	2061
Gopher rockfish	0.08	0.21	0.14	0.13	0.18	0.33	0.27	0.21	0.23	0.20	0.23	0.22	2344
Starry rockfish	0.11	0.10	0.09	0.10	0.10	0.17	0.13	0.12	0.12	0.16	0.21	0.09	1450
Olive rockfish	0.05	0.13	0.10	0.05	0.09	0.09	0.11	0.13	0.13	0.24	0.11	0.10	1363
Lingcod	0.12	0.12	0.18	0.11	0.10	0.13	0.10	0.13	0.14	0.20	0.21	0.13	1616
Bocaccio	0.34	0.24	0.20	0.14	0.10	0.09	0.15	0.12	0.15	0.12	0.11	0.17	1683
Copper rockfish	0.15	0.10	0.13	0.11	0.16	0.11	0.07	0.08	0.11	0.10	0.14	0.06	1233
Brown rockfish	0.05	0.11	<.01	0.02	0.10	0.06	0.21	0.03	0.18	0.10	0.08	0.05	948
Canary rockfish	0.19	0.13	0.08	0.13	0.13	0.14	0.12	0.11	0.05	0.11	0.12	0.14	1282
Black rockfish	0.01	0.04	<.01	0.00	0.03	<.01	0.05	0.03	0.09	0.04	0.01	0.08	377
Greenspotted rockfish	0.04	0.04	0.03	0.04	0.04	0.07	0.03	0.02	0.03	0.03	0.03	0.07	405
China rockfish	0.01	0.03	0.01	0.02	0.03	0.03	0.04	0.03	0.02	0.04	0.04	0.01	322
Greenstriped rockfish	0.04	0.01	0.01	0.03	0.01	0.04	0.03	<.01	0.01	0.01	0.02	0.03	212
Yelloweye rockfish	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01	142
Chilipepper	0.01	<.01	0.00	0.20	0.00	0.01	0.06	0.00	0.01	0.01	0.00	0.04	244
All fish	4.08	3.99	3.74	3.28	3.19	3.40	3.33	3.36	3.92	4.18	4.04	3.31	41,279
Number of trips	24	22	32	23	35	29	30	43	40	41	29	23	371