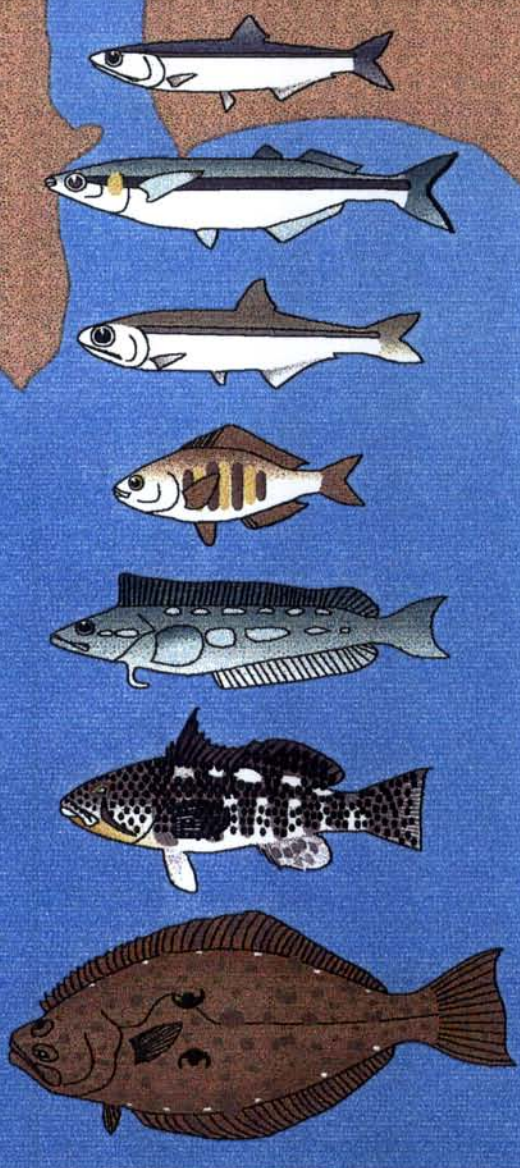
FISHERIES INVENTORY AND UTILIZATION OF SAN DIEGO BAY, SAN DIEGO, CALIFORNIA

FINAL REPORT
Sampling Periods July 1994 to April 1999



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FINAL REPORT
Sampling Periods July 1994 to April 1999

by

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EXECUTIVE SUMMARY

The overall objectives of this study were to: 1) identify, quantify and determine the seasonal utilization of the fishery populations in San Diego Bay, 2) identify key habitats that support juvenile fish species, and 3) determine geographic and/or habitat areas of San Diego Bay that support significant populations of fish species utilized as forage by endangered avian species.

To these ends, the following were determined and described over a five-year period in San Diego Bay: 1) physical and chemical (PC) factors, 2) species composition and abundance, 3) principle species, 4) species diversity, 5) abundance by bay ecoregion, 6) seasonal abundance, 7) ecological importance of species, 8) nursery area function, 9) fish assemblage structure, 10) abundance patterns in relationship to PC factors, 11) density in vegetated versus non-vegetated areas, 12) numerical and biomass density, 13) density and standing stock of avian forage species, 14) density and standing stock of fisheries species, and 15) "southern" species unique to San Diego Bay.

Abundance and Biomass

Over the five-year period of the study, a total of 497,344 fishes belonging to 78 species and weighing 2,775 kg were captured in the 20 sampling dates from July 1994 to April 1999 in San Diego Bay. Northern anchovy was the most abundant fish species comprising 43% of the total catch despite its virtual absence in 1997-98, followed by topsmelt at 23%, the slough anchovy at 19%, Pacific sardine at 3% and shiner surfperch at about 2% of the total catch. Round stingrays continued to dominate in weight constituting almost 25% of the total biomass taken followed by spotted sand bass at about 14%, northern anchovy at 9%, bat ray, 9%, topsmelt, 9%, and slough anchovy, 7%.

When catches are summed over five years of the study, the North Ecoregion (Station 1) was dominated numerically by northern anchovy, topsmelt, Pacific sardines, California grunion, slough anchovy, and shiner surfperch while northern anchovy, topsmelt, round stingrays, bat rays, spotted sand bass, and California halibut constituted most of the biomass captured. Northern anchovy, topsmelt, and slough anchovy were the three most abundant species taken in the North-Central Ecoregion (Station 2) while round stingrays, spotted sand bass, northern anchovy, and topsmelt completely dominated in terms of biomass. The South-Central Ecoregion (Station 3) was dominated numerically by the slough anchovy, topsmelt, northern anchovy, shiner surfperch, and bay pipefish. Round stingrays, spotted sand bass, slough anchovy, topsmelt, and California halibut dominated in terms of biomass. In the southern most ecoregion, the South (Station 4), slough anchovy, topsmelt, arrow goby, round stingray, northern anchovy, and shiner surfperch were the most abundant species while round stingrays, spotted sand bass, barred sand bass, and bat rays dominated in biomass.

Seasonality

Marked changes in the number individuals and total biomass have occurred over the study. When all four stations are considered together, numerical abundance was generally highest in the spring (April 1995, 1996, 1997, 1998, and 1999) and summer (July 1995, 1996, and 1998) months. Heavy recruitment of juvenile surfperches and topsmelt in April of 1995 and 1996 was largely responsible for those abundance peaks. Large numbers of topsmelt, slough anchovy, shiner surfperch and California grunion were responsible for relatively high catches in April 1997, while the April 1998 catches were dominated by slough anchovies. Very large catches of juvenile northern anchovy and Pacific sardine caused the pronounced peaks in July 1995 and 1996. Interestingly, July 1997 catches were low due to the virtual absence of northern anchovies. The catch in July 1998 was dominated by slough anchovy, northern anchovy, and topsmelt. Lowest abundances were generally encountered in the coldest months of the study (January 1995, 1996, 1997, and 1999) with the January 1998 sample containing about 3X the number of fishes as the previous January samples due to a large recruitment of jacksmelt. This abundance pattern was consistent among Stations 1, 2, and 3. However, the southern-most station, 4, exhibited peak abundance in October 1994, October 1996, and April 1998. Biomass varied greatly from quarter to quarter and was largely related to the abundance of northern anchovy, round stingrays, bat rays, and spotted sand bass in the catch. In the first four years of the study, weights of the catches consistently peaked in the spring (April 1995, 1996, 1997 and 1998) and the summer (July 1995 and 1996) except for July 1997. Significant catches of bat rays in October 1998 (Sta 1) and January 1999 (Sta 4) greatly disrupted this earlier pattern.

Species Diversity

Species richness (number of species) was generally highest in the northern section of the bay nearest the bay mouth (Sta 1 - 2) being highest at station 1. H' diversity which incorporates evenness of relative species abundances was found to be highest in the southern portion of the bay (Sta 3 - 4) peaking at about H' = 1.5. The higher H' values in the south bay reflect the lower numerical dominance by a one or two species at these stations. Northern anchovy was the numerically dominant species overall at Station 1 in the North Bay while slough anchovy dominated Station 4 in the South Bay.

In the first three years of this study (July 1994 to April 1997), species richness consistently peaked between 40 and 50 species in the spring-summer months (April and July). This pattern was disrupted in April and July 1997 when only 37 and 35 total species were captured. Within the last two sampling years the April and July catches included only 24 to 37 species. In 1997 – 1999, the highest number of species was actually taken in October 1997. H' diversity followed a pattern which was typically the inverse of species richness in the first three years. H' was typically highest in October and January reflecting the higher evenness of species abundances during these months. The generally lower H' values in April and July were due to the numerical dominance a few species in these months. Again, this pattern changed starting in 1997 when April and, especially July had relatively high H' values. The relatively low recruitment of shiner surfperch in April 1997 and the lack of the usual occurrence of large numbers of northern anchovies in July 1997 were primarily responsible for this change. H' values rose again in July and October 1998 indicating a partial return to the pattern observed in the first three years of the study.

Nursery Area Function

Approximately 70% of all individual fish captured in San Diego Bay during this study were juveniles. In fact, 28 of the 35 most abundant species were represented by over 50% juveniles. Of these, ten species were represented by more than 90% juveniles including the most abundant species, northern anchovy (100% juveniles). This high proportion of juveniles overall in the catch underscores the importance of the San Diego Bay system, particularly the intertidal habitat, as an important nursery area for a large number of fishes.

Assemblage Structure

Fish assemblage structure was examined using cluster analysis. The clustering strategy was based on co-occurrences of the species ranking in the top 35 in numerical abundance or in the top 20 in biomass and yielded 13 distinct species groupings. These species groups reflected the varying abundances and distributions of these species in space and time.

Relationships to Physical Factors

Multivariate correlation analysis (canonical correlation) was used to compare the three prominent PC factors of station (as a surrogate for distance from the mouth of the bay), temperature, and salinity with the individual station abundances ($\log_{10}(x+1)$) of the 35 most abundant species. These three PC factors accounted for nearly 95% ($R^2 = 0.945$) of the variance in individual species abundance among stations over sampling month. Temperature and salinity alone accounted for almost 76% of the total variance. These extremely high R^2 values serve to underscore the great influence which temperature, salinity and distance from the ocean have on the fish assemblages of the bay over time.

Comparison of Vegetated versus Non-vegetated Areas

A strikingly similar number of fish were taken in the vegetated and non-vegetated areas (224,983 for non-vegetated and 239,607 for vegetated). Both large seine (LS) and purse seine (PS) samples yielded overall densities that were similar in V and N sites. LS and PS catches were both highly variable and these small differences were not statistically significant at the $p = 0.05$ level.

All other methods yielded significantly higher numerical catches in vegetated areas. Square enclosure (SE) catches were significantly higher in vegetated areas.

Likewise, the relatively low mean densities that were calculated from the small seine (SS) and the beam trawl (BT) were greater in V versus N areas.

Unlike with numerical density, all three seine methods, the small seine (SS), LS and PS yielded comparable mean biomass densities in non-vegetated (N) than in vegetated (V) areas. Not surprisingly, these differences were not statistically significant, probably due to the high variance of samples caused by sporadic catches of small schools of fish. The beam trawl (BT) and square enclosure (SE) biomass densities were significantly greater in the V areas though the beam trawl yielded higher overall densities.

The non-significant comparisons must also be interpreted with caution because the non-vegetated sites actually had varying degrees of eelgrass coverage. The eelgrass beds in San Diego Bay are currently very healthy covering most of the available nearshore areas. In fact, in the original selection of station sites, it was difficult to locate non-vegetated sites. For this reason, the non-vegetated sites actually contained eelgrass as less than about 20% bottom cover initially. Seasonal growth and die-off of eelgrass within the established stations over the four years of the study also added unwanted variance to the distinction between vegetated and non-vegetated areas.

Best Estimates of Density and Standing Stock : Ecoregion Comparisons

All Fish Species

Over all Ecoregions for all five years, total best estimate of numerical density was 1.75 indiv./m^2 . Based on a surface area of approximately 4858 ha, San Diego Bay, on average, contains almost 85 million fish. Most of the individuals are made up of northern anchovies (42 million), but there are also, again on average, almost 18 million slough anchovies, 10 million topsmelt, 3 million sardines, 3 million arrow gobies, and nearly 2 million shiner surfperch. Among the most common, higher-level carnivores, there are an estimated 280,000 round stingrays, 169,000 spotted sand bass, 133,000, barred sand bass, and almost 80,000 California halibut.

The best estimates of numerical density for the individual Ecoregions were 2.03 indiv./m^2 for the North, 1.93 indiv./m^2 for the North-Central, 0.81 indiv./m^2 for the South-Central, and 1.15 indiv./m^2 for the South.

Over all Ecoregions for all five years, total best estimate of biomass density was 7.05 g/m^2. San Diego Bay contains, on average about 305 metric tons (mt) of fish. The standing stock ranged from a low of about 57 mt in the North-Central Ecoregion to a high of 95 mt in the South-Central Ecoregion.

Forage Species

Forage species are defined herein as those which are accessible to diving avian predators, particularly terns. Forage species are typically silvery-sided, schooling fishes which spend much of their time near the surface of the water over all depth strata. Of all the species captured during this study, eleven qualified as significant forage. These species were northern anchovy, topsmelt, slough anchovy, jack smelt, Pacific sardine, shiner surfperch, Pacific mackerel, California grunion, deepbody anchovy, California halfbeaks, and striped mullet (juveniles).

Over all Ecoregions for all five years, these eleven forage species averaged 3.15 ($\pm$1.28) g/m^2. Based on a surface area of approximately 4858 ha, San Diego Bay contains, on average about 139 metric tons (mt) of these important forage species. The standing stock ranged from a low of about 22 mt in the South Ecoregion to a high of 43 mt in the North Ecoregion.

Fisheries Species

During the five-year study period, eight fish species were captured that can be characterized as fisheries species which are important to the recreational and/or commercial (RC) catch in California waters. Ranked according to mean biomass density, these species were northern anchovy, spotted sand bass, Pacific sardine, California halibut, barred sand bass, Pacific mackerel, shortfin corvina, and yellowfin croaker.

Over all Ecoregions for all five years, these eight, RC species averaged 2.40 ($\pm$1.14) g/m^2 . Based on a surface area of approximately 4858 ha, San Diego Bay contains, on average about 104 metric tons (mt) of these important RC species. The standing stock of RC species ranged from a low of about 15 mt in the South Ecoregion to a high of 31 mt in the North Ecoregion.

Southern Species Unique to San Diego Bay

During the study period eight fish species were taken that can be described as southern or "Panamic Province" species including California halfbeaks (*Hyporhamphus rosae*), bonefish (*Albula vulpes*), California needlefish (*Strongylura exilis*), shortfin corvina (*Cynoscion parvipinnis*), Pacific seahorse (*Hippocampus ingens*), California butterfly ray (*Gymnura marmorata*), banded guitarfish (*Zapteryx exasperata*), and red goatfish (*Pseudupeneus grandisquamous*).

The Bay's Uniqueness as an Important Fish Habitat

In summary, the fish assemblages of San Diego Bay can be characterized as being diverse, abundant, highly seasonal, and highly productive serving as a significant nursery area for at least 28 species of fish. The bay itself represents a very large, unique combination of harbor, nearshore soft bottom, and bay/estuarine habitats which each contribute unique sets of species to the overall assemblage. One of these is a group of 12 species which are indigenous to the bays and estuaries of southern California. South San Diego Bay represents a critical habitat for these unique bay/estuarine species whose habitats have disappeared at an alarming rate during the last century. The extensive shallow water habitat and eelgrass beds of the bay also support very high standing stocks of both fisheries species and of midwater, schooling fishes, such as northern anchovies, slough anchovies and topsmelt which, in turn, serve as an important forage resource for predatory fish and avian species. In addition, the generally warm and hypersaline waters of south San Diego Bay offer a warm-water refuge for a number of southern, "Panamic" province fish species making it unique among all other southern California embayments.

INTRODUCTION

The overall goal of this research project was to provide the first definitive assessment of the fish populations inhabiting San Diego Bay, the largest California embayment south of San Francisco Bay. San Diego Bay provides expansive and diverse habitats for fishes including deep channels, marinas, and extensive shallows largely covered with eelgrass. A characterization of the ichthyofauna of San Diego Bay can best be understood in the context of our current knowledge of bay and estuarine systems, especially those within southern California.

Bays and estuaries are normally considered to be important nursery areas for coastal marine fishes (Haedrich and Hall, 1976; Cronin and Mansueti, 1971). The warm spring-summer water temperatures coupled with the high productivity enable these environments to support large numbers of juvenile fish. Southern California bays and estuaries are relatively small and scarce when compared to the large, river-dominated estuaries common in other parts of the world. They do, however, function as nursery areas in the classical sense for some species. At least one commercially important species (California halibut, *Paralichthys californicus*) has been shown, thus far, to rely heavily on southern California bays and estuaries as nursery areas (Allen, 1988). Juveniles of non-commercial fishes can be extremely abundant and usually dominate the fish assemblages of bays and estuaries in the Southern California Bight (Allen, 1982). Many of these abundant, non-commercial species (e.g. gobies, anchovies, and silversides) are important forage fishes for commercial fish species (Horn, 1980) and sea birds. Another characteristic of the fish assemblages from southern California bays and estuaries which is often overlooked is that these habitats support a unique set of species found nowhere else in the bight (Horn, 1980; Allen, 1985).

The principal, resident species found in the smaller bays and estuaries of the Bight include topsmelt (*Atherinops affinis*), California killifish (*Fundulus parvipinnis*), striped mullet (*Mugil cephalus*), longjaw mudsucker (*Gillichthys mirabilis*), arrow goby (*Clevelandia ios*), shadow goby (*Quietula ycauda*), cheekspot goby (*Ilypnus gilberti*), yellowfin goby (*Acanthogobius flavimanus* - introduced), deepbody anchovy (*Anchoa compressa*), slough anchovy (*Anchoa delicatissima*), shiner surfperch (*Cymatogaster aggregata*), black surfperch (*Embiotoca jacksoni*), diamond turbot (*Hypsopsetta *guttulata*), and juvenile California halibut (*Paralichthys californicus*), spotted sand bass (*Paralabrax maculatofasciatus*), round stingray (*Urolophus halleri*), and yellowfin croaker (*Umbrina roncador*).

California killifish and longjaw mudsuckers are most abundant in the shallow tidal channels of the marsh islands. Topsmelt, striped mullet, deepbody anchovy, and slough anchovy inhabitat the water column of both the main channels and along the shoreline, although topsmelt and mullet feed on the bottom. The five species of gobies (family Gobiidae) as a group are the most abundant benthic fishes along the shoreline. The deeper channels are inhabited mainly by residents and seasonal migrants including shiner surfperch, black surfperch, diamond turbot, juvenile California halibut, spotted sand bass, barred sand bass, yellowfin croaker, and round stingray (Horn and Allen, 1981).

San Diego Bay is the largest naturally occurring marine embayment between San Francisco and Scammon's Lagoon in central Baja California containing approximately 12,000 acres (4,858 ha) of marine habitat (San Diego Unified Port, 1990). Only the lower portion, South San Diego Bay appears to most comparable to other Southern California bays and estuaries in terms of physical and biotic characteristics.

Since 1968, the fish populations of San Diego Bay have been the subject of numerous monitoring studies with most being concentrated in the to the South San Diego Bay region (Ford 1968, 1985, & 1986, Ford *et al.* 1971, Lockheed 1979, San Diego Unified Port District 1980, San Diego Gas & Electric Co. 1980, Lockheed 1983). Most of these studies were limited in scope and duration. A comprehensive review of all work and the work in South San Diego Bay, in particular, is presented in San Diego Unified Port District (1990). *No comprehensive studies of the fish populations of the entire bay existed prior to the present study.*

San Diego Unified Port District (1990) also presented the most complete work on the South San Diego Bay fish populations yet completed. Sampling was conducted on a quarterly basis throughout the south bay in 1988-89. The sampling included multiple gear protocol (otter trawls, gill nets, beam trawls, and two sizes of beach seine) to effectively sample the major subhabitats utilized by fishes. This study concluded that the species composition, relative abundances, and biomass contributions of the south bay fishes have remained very similar since 1968. Topsmelt, slough anchovy, arrow goby, barred pipefish, and California killifish were the most numerically abundant species found in South San Diego Bay while round stingrays, California halibut, and spotted sand bass dominated in terms of biomass.

Hoffman (1986) compared abundance and biomass of fish utilizing eelgrass beds and adjacent non-vegetated areas in three sections of San Diego Bay. Beach seine hauls were made in the north, central, and south portions of the bay on a quarterly basis from July 1980 through April 1981. Topsmelt, shiner surfperch, and four species of gobies (arrow, cheekspot, shadow and bay) made up 93% of the individuals taken. Topsmelt, shiner surfperch, spotted sand bass, staghorn sculpin, round stingray, and California halibut comprised more than 87% of the fish biomass sampled. Hoffman (1986) concluded that nearly twice as many individual fish and fish species were taken at eelgrass sights than non-vegetated sites when all samples were considered. Furthermore, the total number of individuals and total biomass seemed to remain relatively constant from season to season in these shallow nearshore areas. Hoffman's (1986) results underscore the importance of the eelgrass habitat in San Diego in supporting juvenile and adult fish populations. This study served as a major impetus for the present study, which will eventually provide a statistically reliable comparison of fish numbers and biomass between vegetated (eelgrass) and non-vegetated areas.

The most recent work on the fishes of San Diego Bay was a long-term beach seine study also conducted by Hoffman (1995; and unpubl. data). A single station at the base of the Coronado Bridge has been sampled quarterly since January 1988. This sight corresponds directly with the station 2, vegetated site in the present investigation.

Finally, since 1985, nine, southern or "Panamic", fish species have been recorded from San Diego that add to the overall species list recorded from the bay (Table 1).

The overall objectives of this study were to: 1) identify, quantify and determine the seasonal utilization of the fishery populations in San Diego Bay, 2) identify key habitats that support juvenile fish species, and 3) determine geographic and/or habitat areas of San Diego Bay that support significant populations of fish species utilized as forage by endangered avian species.

To these ends, the following were determined and described in San Diego Bay:

1) physical and chemical (PC) factors, 2) species composition and abundance, 3) principle species, 4) species diversity, 5) abundance by bay ecoregion, 6) seasonal abundance, 7) ecological importance of species, 8) nursery area function, 9) fish assemblage structure, 10) abundance patterns in relationship to PC factors, 11) density in vegetated versus non-vegetated areas, 12) numerical and biomass density, 13) density and standing stock of avian forage species, and 14) density and standing stock of fisheries species.

METHODS AND MATERIALS

Station Locations

In order to assess the status of all components of the ichthyofauna of San Diego Bay, we sampled intensively at four stations located in each of four geographic sections (north, north-central, south-central, and south) of bay (Figure 1, Table 2).

At each station, five subhabitat types were sampled. These subhabitats are designated as follows (from deep to shallow water): 1) channel, 2) nearshore, non-vegetated, 3) nearshore, vegetated, 4) intertidal, non-vegetated, and 5) intertidal vegetated.

Sampling Procedures

The actual sampling locations for each type of gear within each station subhabitat were randomly selected for each sampling period. Sampling was conducted on a quarterly basis beginning in July 1994. Subsequent sampling occurred in October 1994, January 1995, April 1995, July 1995, October 1995, January 1996, April 1996, July 1996, October 1996, January 1997, April 1997, July 1997, October 1997, January 1998 and April 1998, July 1998, October 1998, January 1999 and April 1999. We occupied each station on a separate day in order to sample each section thoroughly with a multiple gear approach. The use of multiple gears was necessary to adequately sample all of the habitat types available to the fishes of San Diego Bay. Collections were carried out using the R/V Yellowfin as our base of operations. Much of the work was conducted out of two, 5 m Boston Whalers that were towed behind the *R/V Yellowfin*.

At each station, the following gear types were employed:

1) A 15.2 X 1.8 m **large seine** fitted with a 1.8 X 1.8 X 1.8 m bag (1.2 cm mesh in wings and 0.6 cm mesh in bag) was utilized to sample juvenile fishes in the nearshore portion of the station at a depth of 0-2 m. This net was set parallel to shore and hauled to shore by 15 m lines. This seine is an accurate sampler of nearshore schooling fishes and gives reliable density estimates. Two replicate hauls were made at each station, each of which covered about 220 m^2;

2) A 4.6 m X 1.2 m **small seine** (3 mm mesh) was employed to collect juvenile and adult fishes occupying the shallow, inshore areas (0- 0.5 m depth). The small seine was hauled 10 m along shore and pivoted shoreward yielding a consistent areal coverage of about 62 m^2.

3) A **square enclosure** (1m x 1m x 1m) constructed of 2.5 cm PVC pipe and canvas was used to sample small, burrow inhabiting fish species such as gobies in the shallow waters of the bay. The enclosure was set randomly within each subhabitat in a depth range of 0.25 to 0.75 m and firmly settled into the substrate. One liter of 3:1 acetone-rotenone solution was then added to the enclosed water column and the substrate searched thoroughly for 10 min. with a 1 mm mesh, long-handled dipnet. This device samples an area of 1.0 m^2.

4) A 1.6 m **beam trawl** with 4 mm mesh in the wings and 2 mm knotless mesh in the codend. Standardized ten minute tows were be made behind the 5m Boston Whalers.

5) A 66 x 6 m **purse seine** (1.2 cm mesh in wings and 0.6 cm mesh in bag) was utilized to sample juvenile and adult fishes in the water column of nearshore portion and channel of the station.

6) An 8 m semi-balloon **otter trawl** (2 cm mesh in wings and 0.8 cm mesh in codend) towed behind the R/V Yellowfin was used to sample demersal juvenile and adult fishes from the deepest channel portions of each sampling area.

Large seines, small seines, and square enclosures (all N=3 each) were used to sample both types of intertidal subhabitat. Both the nearshore subhabitats (non-vegetated and vegetated) were sampled using beam trawls (N=3 each) and purse seines (N=3 each). The channel was sampled using otter trawls (N=3) and purse seines (N=3)(Figure 2).

All fishes or subsamples of large catches were identified, counted and weighed aboard ship or in the laboratory after freezing to the nearest 0.1g on a Mettler PE2000 digital scale.

Water temperature (°C), salinity (ppt), dissolved oxygen (mgO^2/l), and pH were measured at each station at the shoreline, nearshore surface and bottom, and channel surface and bottom using a Hydrolab Digital 4041 field analyzer. Maximum depth of each station was recorded using Lowrance depth sounders mounted on each Boston Whaler. PC measurements were taken once at each of the four stations during each of the

4 sampling periods. Unfortunately, technical difficulties with the D.O. and pH electrodes in October 1996 prevented the measurements of these parameters during that sampling period.

Data summarization and graphing were accomplished using *Microsoft Excell* and *Axum* software on an IBM compatible Pentium PC. Data analysis including paired t-tests comparing densities in vegetated and non-vegetated areas and canonical and regular correlations among PC factors and numbers and biomass were carried out using *Statistica*. As is the usual case with ecological data on fishes, raw catch data were generally non-normal with unequal variances. For this reason, all catch data for number of individuals of all species were log-transformed ($\log_{10}(x+1)$) before statistical comparisons were made. This transformation solved problems of normality and unequal variances in this data set.

The Shannon-Weiner Diversity index (H'):

$$H' = -\Sigma\ p_i\ (\ln p_i) \qquad \text{where } p_i = \text{proportion of species i}$$

was calculated for total catches by station and total catch by sampling month. This index incorporates both components of species diversity, species richness and evenness.

In order to determine the relative importance of each species to the energy flow within the fish component of the bay ecosystem, an Ecological Index (E.I.) was calculated using the total catch for each species over the four years of the study. This index incorporates the three significant ecological variables (% Number, %Weight, and %Frequency of Occurrence by station over month) for each species as follows:

$$E.I. = (\%N + \%Wt) \times \%F.$$

The structure of the fish assemblages was examined using cluster analysis (*Statistica*). Clustering was based on co-occurrences of the 35 most abundant species in samples summed over gear-type from each station over sampling month and utilized complete linkage and the correlation coefficient, *r*, as the index for distance.

For the current study, the *Best Estimate of Density* within each Ecoregion was determined in the following manner:

1) Sample densities estimated by gear type for each species were averaged over all samples within the three depth strata (Intertidal, Nearshore, and Channel).

2) The *maximum* density for each species by gear type within the each depth stratum was determined to be the *Best Estimate of Density* for that species within that depth stratum.
3) The proportional areal coverage of the three depth strata within the ecoregion was determined using a grid on a scaled chart of San Diego Bay (Table 3). These areal proportions were then used to weight the *Best Estimates of Density* within the depth strata by species. A weighted average was then taken among these best estimates over the three depth strata for each species.
4) The sum of the weighted densities of all species then represented the *Best Estimate of Density* (numerical and biomass) for each depth stratum and the Ecoregion (station).
5) Standing stock estimates were then made by simply multiplying the best estimates by the total area of the individual Ecoregions and San Diego Bay, as a whole.

RESULTS and DISCUSSION

Physical and Chemical (PC) Factors

Over the five years of the study, temperature varied from a high of 27.3 °C at Station 4 in July 1997 to a low of 14.9 °C at Station 1 in January 1995 and 1997 (Appendix: Figure 1). Predictably, the highest mean temperatures were also encountered in the summer of all five years (July 1994, 1995, 1996, 1997 and 1998) and the lowest in the winter (January 1995, 1996, 1997, 1998 and 1999). In January 1998, the mean temperature for the entire bay, while being low, was almost 1.5 degrees higher than the four other January sampling periods. Thermal stratification was evident during all sampling periods with temperatures becoming warmer (2-5 °C) north to south (Station 4 being the warmest) in the bay except in October 1994 when Station 1 had the highest mean temperature (Appendix: Figure 1).

Surface salinity was relatively stable over the first two years of the study period varying about 6 ppt (39.8 to 33.4 ppt) over the entire year despite heavy rainfall in January of 1995 which had little impact on surface salinity. After July 1996 salinities increased to a peak in October 1996 followed by a dramatic drop-off in January 1997. During the fourth year (1997-98) salinities rose into the summer months then decreased to an overall low of less than 33 ppt in April 1998. Salinities were typically higher than 34 ppt, the average value for sea water. Mean salinities peaked in October of each year (1994, 1995, 1996 and 1997) when 35-37 ppt prevailed at all stations, but where particularly hypersaline in October 1996 at station 4 (39.8 ppt)(Appendix: Figure 1). Salinities were generally lower than 34 ppt in January and April 1998. Overall, mean salinities ranged from 31.6 ppt in April 1998 1995 to 38.6 ppt in October 1996.

Mean surface pH readings were generally varying only from 7.5 in January 1995 to 8.2 in July 1994 while mean surface dissolved oxygen exhibited a range of 7.2 to 9.2 mgO_2/l in July 1995 and April, 1995, respectively (Appendix: Figure 1). Unfortunately, problems with the calibration and the operation of the Hydrolab remote sensing unit have resulted in numerous unreliable readings for pH and dissolved oxygen. Therefore, it became necessary to exclude pH and D.O. from most analyses.

From 1994 to 1999, the eastern Pacific was subjected to a fairly intense El Nino-Southern Oscillation (ENSO) event in 1997-98. This event was clearly reflected in the temperature readings recorded during our sampling in San Diego Bay. Surface water temperature was significantly higher in July 1997 (two-way ANOVA, $F = 8.34$; $df = 3, 4$; $p < 0.01$) than in the four other July samples (1994, 1995, 1996, 1998). In addition, surface water temperature was significantly higher in January 1998 (two-way ANOVA, $F = 5.08$; $df = 3, 4$; $p < 0.05$) than in the other four January samples (1995,1996, 1997, and 1999).

Surface water temperatures were also elevated at the beginning of the study in July 1994 which may have represented a lag effect of the 1992-93 El Nino event.

Abundance and Biomass

A total of 497,344 fishes belonging to 78 species and weighing 2,775 kg were captured in the 20 sampling dates from July 1994 to April 1998 in San Diego Bay (Table 4 and 5). Northern anchovy remains as the most abundant fish species comprising 43% of the total catch despite its virtual absence in 1997-98, followed by topsmelt at 23%, the slough anchovy at 19%, Pacific sardine at 3% and shiner surfperch at about 2% of the total catch (Table 4). Round stingrays continued to dominate in weight constituting almost 25% of the total biomass taken followed by spotted sand bass at about 14%, northern anchovy at 9%, bat ray, 9%, topsmelt, 9%, and slough anchovy, 7% (Table 5).

The greatest number of individuals has been taken at Station 1 (198,141) followed closely by Station 2 (188,147), then Station 3 (57,892), and Station 4 (53,164) (Table 4; Figure 3). The high count at Station 1 and 2 compared to the other stations was due to the large numbers of juvenile northern anchovy, Pacific sardine, and topsmelt taken at this station in most years. This northern portion of the bay may represent a preferred nursery area for northern anchovy, Pacific sardine, and topsmelt within San Diego Bay.

The abundances of four of the numerically dominant, schooling species, northern anchovy, topsmelt, slough anchovy, and Pacific sardine showed an interesting pattern. The station abundances of the northern anchovy, topsmelt, and sardine appear to have a positive relationship with these three species dominating in north San Diego Bay. This pattern of abundance was the opposite of that found in the slough anchovy which was prominent in the south (Figure 4).

The catch in terms of biomass showed an interesting pattern across stations for all species (Table 5; Figure 5). Large catches of round stingray and spotted sand bass were taken across all stations. Large catches of northern anchovies at Stations 1 and 2, in addition to those of stingrays and spotted sand bass yielded much higher biomass in the northern part of the bay.

Although the most common species generally occur throughout the bay, the four ecoregions (North, North-Central, South-Central, and South) exhibit slightly different assemblages in terms of relative abundances. These subtle differences in species composition are illustrated, qualitatively, in Figures 6, 7, 8, & 9.

Abundance by Bay Ecoregion

North (Station 1) - A total of 198,141 fishes belonging to 68 species and weighing 985.5 kg were captured in the North Ecoregion over the 20 sampling dates from July 1994 to April 1999 (Table 6). Northern anchovy was the most abundant fish species comprising 62% of the total catch, followed by topsmelt at 22%, Pacific sardine at 5%, slough anchovy, 2%, California grunion (*Leuresthes tenuis*), 2% and shiner surfperch at about 2% of the total catch (Table 6). Round stingrays led in total biomass at 18% followed closely by bat rays also at 18%, northern anchovy at 14%, topsmelt, 11%, spotted sand bass, 7%, and California halibut, 4% (Table 6).

North-Central (Station 2) - A total of 188,147 fishes belonging to 55 species and weighing 759.2 kg were captured in the North-Central Ecoregion over the 20 sampling dates from July 1994 to April 1999 (Table 7). Northern anchovy remains the most abundant fish species comprising nearly 47% of the total catch, followed by topsmelt at 27%, slough anchovy at 14%, jacksmelt at 4%, shiner surfperch at about 2%, and giant kelpfish at approximately 1% of the total catch (Table 7). Round stingrays constituted the largest portion of total biomass at 22%, followed closely by spotted sand bass, 20%, northern anchovy, 15%, topsmelt, 10%, and slough anchovy at almost 8% (Table 7).

South-Central (Station 3) - A total of 57,892 fishes belonging to 49 species and weighing 440.2 kg were captured in the South-Central Ecoregion over the 20 sampling dates from July 1994 to April 1999 (Table 8). Slough anchovy was the most abundant fish species comprising 55% of the total catch, followed by topsmelt at 22%, northern anchovy at 6%, shiner surfperch at about 6%, and bay pipefish at approximately 2% of the total catch (Table 8). Round stingrays ranked first in total biomass at 28% followed closely by spotted sand bass at 20%, slough anchovy, 15%, topsmelt, 7%, and California halibut, 5% (Table 8).

South (Station 4) - A total of 53,164 fishes belonging to 51 species and weighing 590.4 kg were captured in the South Ecoregion over the 20 sampling dates from July 1994 to April 1999 (Table 9). Slough anchovy was, again, the most abundant fish species comprising over 66% of the total catch, followed by topsmelt at 14%, arrow goby at 3%, round stingray at also at 3%, and shiner surfperch at 2% of the total catch (Table 9). Once again, round stingrays led in total biomass at nearly 37% of the total biomass followed by spotted sand bass at 13%, bat ray at 10%, and barred sand bass at 8% (Table 9).

The species composition and relative abundances of fishes taken in the South region remain remarkably similar to those reported by Ford in 1988-89 (San Diego Unified Port District, 1990).

A breakdown of the total abundance of fishes captured in each subhabitat is contained in Table 10. Additional summaries of numerical and biomass abundance for each station over the sixteen sampling periods are included in Appendix Tables 1 - 8.

Seasonal Abundance

Marked changes in the number individuals and total biomass have occurred over the study. When all four stations are considered together, numerical abundance was generally highest in the spring (April 1995, 1996, 1997, 1998, and 1999) and summer (July 1995, 1996, and 1998) months. Heavy recruitment of juvenile surfperches and topsmelt in April of 1995 and 1996 was largely responsible for those abundance peaks (Table 11; Figure 10, 11). Large numbers of topsmelt, slough anchovy, shiner surfperch and California grunion were responsible for relatively high catches in April 1997, while the April 1998 catches were dominated by slough anchovies. Very large catches of juvenile northern anchovy and Pacific sardine caused the pronounced peaks in July 1995 and 1996. Interestingly, July 1997 catches were low due to the virtual absence of northern anchovies. The catch in July 1998 was dominated by slough anchovy, northern anchovy, and topsmelt. Lowest abundances were generally encountered in the coldest months of the study (January 1995, 1996, 1997, and 1999) with the January 1998 sample containing about 3X the number of fishes as the previous January samples due to a large recruitment of jacksmelt. This abundance pattern was consistent among Stations 1, 2, and 3. However, the southern-most station, 4, exhibited peak abundance in October 1994, October 1996, and April 1998 (Figure 12). Biomass varied greatly from quarter to quarter and was largely related to the abundance of northern anchovy, round stingrays, bat rays, and spotted sand bass in the catch (Table 12). In the first four years of the study, weights of the catches consistently peaked in the spring (April 1995, 1996, 1997 and 1998) and the summer (July 1995 and 1996) except for July 1997(Figure 13). Significant catches of bat rays in October 1998 (Sta 1) and January 1999 (Sta 4) greatly disrupted this earlier pattern.

Abundance in Vegetated versus Non-vegetated Areas

Number of Individuals - A strikingly similar number of fish were taken in the vegetated and non-vegetated areas (224,983 for non-vegetated; 239,607 for vegetated; Table 13). However, the only meaningful way to compare both numerical and biomass densities among subhabitats was to compare the catches only within gear types (see Appendix Tables 9, 10, 11, & 12). This controls for the substantial differences in both areal coverage and gear efficiency among the different sampling devices.

For the large seine, the mean numerical density of 0.36 ind./m^2 in V samples was not significantly different from the 0.38 ind./m^2 in N samples (LS paired t-value = -1.64, df = 79, p = 0.104; Appendix Table 9, Figures 14 and 15).

Purse seine (PS) samples yielded overall densities that were similar in V and N sites with a somewhat higher density in N sites. PS catches were highly variable and this small difference was not statistically significant at the p = 0.05 level. (PS paired t-value = -1.29, df = 79, p = 0.20) (Figures 14 and 15; Appendix Table 9).

All other methods yielded significantly higher catches in vegetated areas. Square enclosure (SE) catches were significantly higher in vegetated areas (SE paired t-value = -4.112, df = 79, p = 0.0001**). Small seine (SS) catches were also significantly higher in vegetated areas (SS paired t-value = -3.163, df = 79, p = 0.002**) Likewise, the relatively low mean densities that were calculated from the beam trawl (BT) were greater in V versus N areas (Figures 14 and 15). For beam trawls the mean numerical density of 0.10 ind./m^2 in V samples was significantly greater than the 0.06 ind./m^2 in N samples (BT paired t-value = -4.049, df = 79, p = 0.0001**).

Biomass - All three seining methods captured comparable biomass densities in non-vegetated (N) and in vegetated (V) areas. The small seine (SS) yielded higher mean biomass densities between V and N sites, however the difference was not statistically significant (SS paired t-value = -1.92, df = 79, p = 0.06) due to the high variance of samples caused by sporadic catches of small schools of fish. Purse seine (PS) samples yielded relatively high biomass densities at both N (8.68 g/m^2) and V (8.23 g/m^2) sites. But, again, these densities were not significantly different (PS paired t-value = -0.81, df = 79, p = 0.42) probably due to high variance in catches (Figure 16). For the large seine, the mean biomass density of 0.92 g/m^2 in V samples was not significantly different than the 1.19 g/m^2 in N samples (LS paired t-value = –0.72, df = 79, p = 0.47).

The beam trawl (BT) and square enclosure (SE) biomass densities were significantly greater in the V areas (Figure 16) though the beam trawl yielded higher overall densities. For beam trawls, the mean biomass density of 2.76 g/m^2 in V samples was significantly greater than the 1.70 g/m^2 in N samples (BT paired t-value = -3.38, df = 79, p = 0.001**). Mean biomass density for square enclosure samples of 0.91 g/m^2 in V samples was significantly greater than the 0.36 g/m^2 in N samples (SE paired t-value = -4.02, df = 79, p = 0.0001**).

The significantly higher catches at vegetated sites in five of the ten possible gear comparisons is consistent with the findings of Hoffman (1986) who concluded that catches were generally twice as large over eelgrass compared to non-vegetated sites. Seine methods are prone to high variance of catches because they tend to target midwater, schooling fishes which show clumped distributions. This high variance in seine catches makes statistical comparisons difficult even with high sample sizes. Also, these midwater, schooling species probably represent the species least likely to be depend on eelgrass. Significantly higher catches in vegetated areas using beam trawls and square enclosures is not surprising because these methods target the eelgrass associated fishes. Lastly, the non-significant comparisons must also be interpreted with caution because the non-vegetated sites actually had varying degrees of eelgrass coverage. The eelgrass beds in San Diego Bay are currently very healthy covering most of the available nearshore areas. In fact, in the original selection of station sites, it was difficult to locate non-vegetated sites. For this reason, the non-vegetated sites actually contained eelgrass as less than about 20% bottom cover initially. Seasonal growth and die-off of eelgrass within the established stations over the four years of the study also added unwanted variance to the distinction between vegetated and non-vegetated areas.

Otter trawl (OT) and purse seine (PS) samples from the channel yielded similar very low mean numerical and biomass densities (Figure 15 & 17). Summaries of all density calculations are contained in Appendix Tables 11 & 12.

Principle Species

Topsmelt - *Atherinops affinis*. This species was ranked first in terms of Ecological Index (E.I.) because of its high ranking in all categories. Topsmelt ranked second overall in numerical abundance and fifth in biomass for the five-year period of the study making up about 23% of the individuals and 9% of the total weight. Topsmelt were a captured at every station in every sampling month (100% frequency) and are obviously one of the most important resident, schooling, fish species in San Diego Bay. Peak abundance occurred in April of most years due to heavy recruitment of young-of-the-year (YOY). Topsmelt occurred in a wide size range over the study with three and possibly four age classes being well represented (Appendix Figure 2). Typically, YOY and juvenile topsmelt occupied the intertidal zone while older fish frequented the intertidal, nearshore and midwater channel subhabitats.

Round stingray – *Urolophus halleri*. Round stingrays ranked second in terms of Ecological Index (E.I.) also due to its high ranking in all categories. This elasmobranch ranked ninth overall in numerical abundance and first in biomass for the five-year period of the study making up only about 1% of the individuals, but 25% of the total weight. As with topsmelt , round stingrays were captured at every station in every sampling month (100% frequency) and obviously must be considered one of the most important resident fish species in San Diego Bay. Abundance of stingrays was highly variable over time with peaks in abundance occurring in April 1995, October 1996, July 1997 and January 1999 . Round stingrays occurred in a wide size range over the study with most small juveniles occurring in the south bay (Appendix Figure 2). Typically, most *Urolophus* frequented the benthos of the nearshore and channel subhabitats.

Northern anchovy – *Engraulis mordax*. This species was ranked third in terms of Ecological Index (E.I.) ranking first overall in numerical abundance and third in biomass for the five-year period of the study making up over 43% of all individuals and about 9% of the total weight. The northern anchovy represents a highly seasonal (45% frequency), schooling species which was captured in great numbers mainly in July of each year of the study except July of 1997. Peak abundance occurred in July of most years due to heavy recruitment of young-of-the-year (YOY). *Engraulis* occurred in a limited size range over the study with only the YOY age class being well represented (Appendix Figure 2). Typically, the YOY northern anchovies occupied the midwaters of the nearshore and channel subhabitats in the North and North Central Ecoregions.

Slough anchovy – *Anchoa delicatissima*. Slough anchovies were fourth in Ecological Index (E.I.) ranking third overall in numerical abundance and sixth in biomass for the five-year period of the study making up almost 20%% of all individuals and about 7% of the total weight. Slough anchovies are varied greatly in abundance over each year of the study as would be expected of a planktivorous, schooling species, but was found in virtually every month of the study in the southern regions of the bay (69% frequency). Peak abundance occurred in July of most years, again due to heavy recruitment of young-of-the-year (YOY). *Anchoa* occurred in a limited size range over the study, however, this short-lived species was represented by both juveniles and adults in our samples (Appendix Figure 2). Typically, the slough anchovies occupied the midwaters of the intertidal, nearshore and channel subhabitats, mainly in the South and South Central Ecoregions of San Diego Bay.

Spotted sand bass – *Paralabrax maculatofasciatus*. This important benthic predator ranked fifth in terms of Ecological Index (E.I.) due to its high ranking in biomass and frequency of occurrence. Although spotted sand bass ranked fourteenth overall in numerical abundance (0.3%), it ranked second in biomass (14%) for the five-year period. Spotted sand bass were captured at virtually every station in every sampling month (96% frequency) and also must be considered one of the most important resident fish species in San Diego Bay. Abundance of *P. maculatofasciatus* was variable over time with peaks in abundance occurring in April and July in the northern portion of San Diego Bay and October and January in the southern portion . Spotted sand bass occurred in a wide size range representing all possible age classes. YOY recruitment occurred in October, primarily in the North Central and South Central portions of the bay. (Appendix Figure 2). Typically, juvenile and adult spotted sand bass were captured in all of the nearshore and channel subhabitats throughout the bay.

Barred sand bass – *Paralabrax nebulifer*. This benthic predator ranked sixth in terms of Ecological Index (E.I.) due also to its high ranking in biomass and frequency of occurrence. Although barred sand bass ranked twelfth overall in numerical abundance (0.4%), it ranked seventh in biomass (4%) for the five-year period. Barred sand bass were captured at virtually every station in every sampling month (96% frequency) and also must be considered one of the important resident fish species in San Diego Bay. Abundance of *P. nebulifer* was variable over time with peaks in abundance occurring in April, July, and October mainly in the northern portion of San Diego Bay . Barred sand bass captured in San Diego Bay were mainly juveniles representing a relatively narrow range of sizes indicating that the bay is an important nursery area for this primarily coastal species. As with its close relative, YOY recruitment occurred in October, primarily in the North Central and South Central portions of the bay. (Appendix Figure 2). Typically, juvenile barred sand bass were captured in most of channel subhabitats throughout the bay.

California halibut – *Paralichthys californicus*. This benthic predator ranked seventh in E.I. ranking 16th in numerical abundance (0.2%) and eighth in biomass (4%) for the five-year period. halibut were captured at every station in every sampling month (100% frequency) and also represents an important resident fish species in San Diego

Bay. Abundance of *P. nebulifer* was variable over time with peaks in abundance occurring in April and July in the northern portion and October and January in the southern section of San Diego Bay . California halibut captured in San Diego Bay were represented a relatively wide range of sizes, most of which are still in the range of juveniles for this species. As with barred sand bass, San Diego Bay represents an important nursery area for this important commercial species. Recruitment of YOY occurred primarily in April in the North and North Central portions of the bay. (Appendix Figure 2). Newly recruited YOY occurred in the intertidal with progressively larger fish occurring in the nearshore and channel areas.

Shiner surfperch – ***Cymatogaster aggregata***. This schooling embiotocid ranked eighth in E.I. ranking fifth in numerical abundance (2%) and ninth in biomass (3%) for the five-year period of the study. Shiner surfperch were a seasonal (72% frequency) being captured in large numbers throughout the bay mainly in April of each year of the study. The peaks in abundance in April and July of each year corresponded to the heavy recruitment of young-of-the-year (YOY) as gravid females gave live birth . *Cymatogaster* occurred in over a relatively broad size range with both YOY and adult age classes being well represented (Appendix Figure 2). Typically, the YOY northern anchovies occupied the midwaters of the nearshore subhabitats in all Ecoregions.

Pacific sardine – ***Sardinops sagax***. This species was ninth in E.I. ranking fourth overall in numerical abundance (3%) and tenth in biomass (2%) for the five years. The Pacific sardine, like the northern anchovy, represents a highly seasonal (40% frequency), schooling species which was captured in great numbers mainly in July and October of each year . *Sardinops* occurred in a limited size range over the study with mainly the YOY age class being represented (Appendix Figure 2). Typically, the YOY northern anchovies occupied the midwaters of the nearshore and channel subhabitats in the North and North Central Ecoregions, but penetrated into the southern portions of the bay in July 1995 and January 1998.

Giant kelpfish – ***Heterostichus rostratus***. Giant kelpfish were tenth in E.I. ranking eighth in numerical abundance (1%) and twelfth in biomass (1.3%). Kelpfish varied greatly in abundance over species, but was found in virtually every month of the study (75% frequency) in eelgrass throughout the bay until April 1998. After this date kelpfish occurrence became more sporadic and was limited mainly to the southern portion of the bay. regions of the bay. Peak abundance occurred in July and October, again due to heavy recruitment of young-of-the-year (YOY). *Heterostichus* occurred over a relatively wide size representing both juveniles and adults in our samples (Appendix Figure 2). Typically, the giant kelpfish occupied the eelgrass beds of the intertidal and nearshore subhabitats throughout San Diego Bay.

Nursery Area Function

Approximately 70% of all individual fish captured in San Diego Bay during this study were juveniles. In fact, 28 of the 35 most abundant species were represented by over 50% juveniles (Table 14). Of these, ten species were represented by more than 90% juveniles including the most abundant species, northern anchovy (100% juveniles). This high proportion of juveniles overall in the catch underscores the importance of the San Diego Bay system as an important nursery area for a large number of fishes.

Ecological Importance of Species

The Ecological Index (Table 15) incorporates three significant ecological variables (% Number, %Weight, and %Frequency) for each species and yields a value that is indicative of the importance of each species to the energy flow within the fish component of the bay ecosystem. When all three factors are taken into account, topsmelt rank first among all San Diego Bay fish species with an E.I. of 3230. Round stingrays ranked second with an E.I. of 2553 followed by northern anchovy with 2271(only 45% frequency within stations by sampling month), slough anchovy with 1790, and spotted sand bass with 1354 (Figure 18).

Species Diversity

Species richness (number of species) was generally highest in the northern section of the bay nearest the bay mouth (Sta 1 - 2) being highest at station 1 (Figure 19). H' diversity which incorporates evenness of relative species abundances was found to be highest in the southern portion of the bay (Sta 3 - 4) peaking at about H' = 1.5. The higher H' values in the south bay reflect the lower numerical dominance by a one or two species at these stations. Northern anchovy was the numerically dominant species overall at Station 1 in the North Bay while slough anchovy dominated Station 4 in the South Bay.

In the first three years of this study (July 1994 to April 1997), species richness consistently peaked between 40 and 50 species in the spring-summer months (April and July)(Figure 20). This pattern was disrupted in April and July 1997 when only 37 and 35 total species were captured. Within the last two sampling years the April and July catches included only 24 to 37 species. In 1997 – 1999, the highest number of species was actually taken in October 1997. H' diversity followed a pattern which was typically the inverse of species richness in the first three years. H' was typically highest in October and January reflecting the higher evenness of species abundances during these months. The generally lower H' values in April and July were due to the numerical dominance a few species in these months. Again, this pattern changed starting in 1997 when April and, especially July had relatively high H' values. The relatively low recruitment of shiner surfperch in April 1997 and the lack of the usual occurrence of large numbers of northern anchovies in July 1997 were primarily responsible for this change. H' values rose again in July and October 1998 indicating a partial return to the pattern observed in the first three years of the study.

The five years of sampling in San Diego Bay yielded a total of 78 fish species. This total is close to the predicted 89 species predicted from the species-area relationship developed by Horn and Allen (1976). A number of relatively rare, large, and mobile species were undoubtedly missed by this quantitative sampling protocol. From June 1996 through August 1999, San Diego Bay was sampled by gill nets as part of the Ocean Resource Enhancement and Hatchery Program (OREHP) by Mike Shane of Hubbs-Sea World Research Institute and San Diego State University. This gill net survey yielded eight species which were not taken in the current sampling program in the same general time period. The addition of these species (green jack, *Caranx caballus;* pile surfperch, *Damalichthys vacca;* middling thread herring, *Opisthonema medirastre; white* surfperch, *Phanerodon furcatus;* Pacific sierra, *Scomberomorus sierra;* scalloped hammerhead, *Sphyrna lewini;* angel shark, *Squatina californica;* leopard shark, *Triakis semifasciata*) bring the total up to 86 species, closer to the predicted level.

Two, introduced species of Japanese gobies were captured during the study. The yellowfin goby (*Acanthogobius flavimanus*) was well represented in the samples (n = 34) while a single specimen of the chameleon goby (*Tridentiger trigonocephalus*) was captured in the eelgrass bed in the South-Central Ecoregion (Station 3).

Species richness by station in San Diego was comparable, if not higher than values obtained from other southern California bays, estuaries, and harbors. The northern San Diego Bay stations 1 and 2 (No. spp = 69 and 55) had similar species richness to multiple-gear sampling studies in Los Angeles Harbor and Lower Newport Bay. Allen et al. (1982) captured 65 fish species in the Cabrillo Beach are of western Los Angeles Harbor in 1979. Marine Ecological Consultants (1988) reported 69 fish species in the area covering most of outer Los Angeles Harbor in 1986-87. Allen (1976) sampled a total of 65 species from Newport Bay in 1974-75 in a sampling strategy that included station from throughout the upper and lower bay.

The southern San Diego Bay stations 3 and 4 (No. spp. = 49 and 52) yielded slightly higher species richness than comparable studies in two other bay/ estuaries in southern California, Mugu Lagoon and upper Newport Bay. Onuf and Quammen (1983) caught a total of only 28 fish species from the small, shallow embayment of Mugu Lagoon. Horn and Allen (1981) reported 46 species captured in a comparable, multiple-gear sampling design in Upper Newport Bay in 1978. Furthermore, Allen (1988) reported 41 species from upper Newport Bay in 1986-87.

Total Shannon-Weiner diversity (H') for the San Diego Bay stations in 1994-99 ranged from values of 2.05 to 2.32. These H' values were intermediate to the somewhat lower values reported from upper Newport Bay (1.71 from 1978; 1.94 from 1986-87) and the slightly higher values in Los Angeles Harbor and lower Newport Bay (Cabrillo, H' = 2.39; outer LA Harbor, H' = 2.69; lower Newport Bay, H' = 3.09). The lower H' values in upper Newport Bay reflect the numerical dominance of a single species, the topsmelt in the catches. The intermediate values of the San Diego Bay stations were the result of numerical dominance of three species, northern anchovy, slough anchovy and topsmelt.

Fish Assemblage Structure

Fish assemblage structure was examined using cluster analysis. The clustering strategy was based on co-occurrences of the species ranking in the top 35 in numerical abundance or in the top 20 in biomass and yielded 13 distinct species groupings (Figure 21). These species groups reflected the varying abundances and distributions of these species in space and time (Table 16). Species groups which tended to occur in both the intertidal and nearshore depth strata are characterized as "inshore" below.

Species Group I - This group contained five species of inshore, primarily north bay, resident and summer-seasonal, schooling (midwater) fishes. Northern anchovy, California grunion, Pacific sardine, and queenfish tended to be numerically dominant species, particularly, in the north and north-central bay during the spring-summer months when large numbers of their young-of-the-year (YOY) occurred. Topsmelt represented the truly resident member of this group which was abundant at all stations in the bay with YOY occurring in highest abundance in spring samples (April). All members of this group tended to also occur in lower abundance in the midwater regions of the channels (Figure 22).

Species Group II – A group of three, inshore, primarily south bay, resident and summer-seasonal, schooling species closely allied to species group I. The numerically dominant, resident fish in the south-central and south bay, the slough anchovy, clustered in this group along with the highly summer-seasonal species, the shiner surfperch and Pacific mackerel (*Scomber japonicus*). As with species group I, the members of species group II also occurred in lower abundance in the midwater zone of the channels (Figure 22).

Species Group III – A small group of two, inshore, primarily intertidal, resident, schooling species which occurred mainly in the south-central and south bay. These included the California killifish (*Fundulus parvipinnis*) and California halfbeak (*Hyporhamphus rosae*) (Figure 22).

Species Group IV – This small group included two species of nearshore, summer-seasonal, eelgrass-associated fishes represented only by YOY which occurred mainly in the north bay. This group included the kelp bass (*Paralabrax clathratus*) and salema (*Xenistius californiensis*) which use the eelgrass beds of the north bay as nursery areas (Figure 22).

Species Group V – This group was made up of three large carnivores which occupied the nearshore and channel areas in low to moderate numbers throughout the bay, but were most often captured in the south bay. The group included resident (Shortfin corvina, *Cynoscion parvipinnis* and bat rays, *Myliobatis californicus*) and summer seasonal (yellowfin croaker, *Umbrina roncador*) species (Figure 22).

Species Group VI - This group was made up of two, nearshore, seasonal, eelgrass associated "species" which recruited to the bay in the summer and fall, primarily in the north-central and south-central regions. These included, YOY spotted sand bass (*Paralabrax maculatofasciatus*) and the deepbody anchovy (*Anchoa compressa*)(Figure 23).

Species Group VII – This group included five, inshore, resident, eelgrass-associated fishes which occurred throughout the bay with the greatest abundance in the north, north-central, and south-central portions. These species included the cryptically colored fishes, the giant kelpfish (*Heterostichus rostratus*), spotted kelpfish (*Gibbonsia elegans*), bay blenny (*Hypsoblennius gentilis*), barred pipefish (*Syngnathus auliscus*), and bay pipefish (*Syngnathus leptorhynchus*) (Figure 23).

Species Group VIII – Another small group comprised of two species of inshore, summer-seasonal, eelgrass-associated fishes which occurred only in the north and north-central bay. These included the surfperch species, the black surfperch (*Embiotoca jacksoni*) and dwarf surfperch (*Micrometrus minimus*). Most of the individuals of these surfperches were YOY (Figure 23).

Species Group IX - This group of two important, inshore, resident, small benthic species occurred in varying abundance through out the bay, but primarily in the southern portions. These included the abundant gobies, the arrow goby (*Clevelandia ios*), and shadow goby (*Quietula ycauda*)(Figure 23).

Species Group X – This group included three "species" of inshore, resident, benthic species which occurred throughout the bay primarily in the channels. YOY of the two flatfishes, California halibut (*Paralichthys californicus*) and diamond turbot (*Hypsopsetta guttulata*) inhabited the intertidal areas along with all age groups of the cheekspot goby (*Ilypnus gilberti*) (Figure 24).

Species Group XI – This group included three species of inshore, resident, schooling species which recruited in the winter months and remained abundant into the spring of some years. Included in this group were the bonefish (*Albula vulpes*), striped mullet (*Mugil cephalus*), and jacksmelt (*Atherinopsis californiensis*) (Figure 24).

Species Group XII – This group included five species of resident, benthic species which occurred throughout the bay primarily in the channels. Included in this group were the two flatfishes, California halibut (*Paralichthys californicus*) and diamond turbot (*Hypsopsetta guttulata*) which were distributed in all depth strata. The remaining two species included spotted turbot (*Pleuronichthys ritteri*) and California tonguefish (*Symphurus atricauda*) mainly occupied the channels of the north and north-central bay (Figure 24).

Species Group XIII – This was a group of large, predatory, benthic species which were resident in the nearshore areas and channels of all sections of the bay. This group was represented by all size classes of the four species, the spotted sand bass (*Paralabrax maculatofasciatus*), barred sand bass (*Paralabrax nebulifer*), round *stingray (Urolophus halleri*), and black croaker (*Cheilotrema saturnum*) (Figure 24).

The fish assemblages of San Diego Bay represent a blend of those normally associated with harbors and bay/estuaries within the Southern California Bight (Allen, 1985). San Diego Bay stations 1 and 2 cluster with the fish assemblages from previous, comparable studies in southern California harbors (Figure 25), while stations 3 and 4 are more closely associated with the assemblages in the bay/estuaries of southern California. *Therefore, San Diego Bay represents a large, unique environment within the Southern California Bight combining elements of two major types of habitats, namely harbor-nearshore soft bottom (HNSB) and bay/estuary (BE) (cf. Allen, 1985).*

South San Diego Bay provides critical habitat for at least 12 fish species (Table 17) which are indigenous to bay and estuarine environments in the Southern California Bight (Allen, 1985).

Relationship of PC factors to Fish Distribution and Abundance

Univariate correlation analysis on log-transformed ($log_{10}x+1$) abundance and biomass over station by sampling month versus temperature, salinity, pH, and dissolved oxygen yielded a number of significant relationships (df = 78). Temperature was found to be significantly correlated (positively) with the numerical abundance of all species together and with eight species individually including the deepbody anchovy, slough anchovy, black croaker, northern anchovy, California killifish, California halfbeak, yellowfin croaker (Table 18). Temperature was also found to be significantly correlated (negatively) with the numerical abundance of the jacksmelt , spotted turbot, and bay pipefish. Salinity was significantly correlated, negatively, with the abundance of bonefish, jacksmelt, and striped mullet (Species Group XI), and positively with California killifish and California halfbeak. Eleven significant correlations were also found between pH and D.O. and several species, however, the reliability of the measurements of these PC factors renders any conclusions suspect. The high variance of catches from station to station and sampling period to sampling period apparently makes it statistically difficult to detect significant trends in the data at a high level of resolution.

Multivariate correlation analysis (canonical correlation) was used to compare the three prominent PC factors of station (as a surrogate for distance from the mouth of the bay), temperature, and salinity with the individual station abundances ($log_{10}(x+1)$) of the 35 most abundant species. These three PC factors accounted for nearly 95% ($R^2 = 0.945$) of the variance in individual species abundance among stations over sampling month (Table 19). Temperature and salinity alone accounted for almost 76% of the total variance. These extremely high R^2 values serve to underscore the great influence which temperature, salinity and distance from the ocean have on the fish assemblages of the bay over time.

Catch by Sampling Method

The purse seine collected the most species (61 spp.) over the five years of the study followed by the otter trawl (52 spp.), beam trawl (46 spp.), large seine (44 spp.), small seine (31 spp.), and square enclosure with just 17 species (Table 20). The seines were the most effective at catching large numbers of fish with the purse seine ranking first catching a total of 370,381fishes followed by the small seine (64,235 fishes) and large seine (40,134 fishes)(Table 20). The purse seine and the otter trawl captured the greatest biomass totaling approximately 1,357 kg and 992 kg, respectively (Table 21).

Of the six sampling gears utilized at each station, four proved to be the most effective at estimating the densities of at least one of the 20 most abundant species (Appendix Figures 3 & 4). The square enclosure (SE) provided the highest estimate of numerical densities for 9 of the twenty and was most effective a capturing small, cryptic, demersal species, particularly gobies in the intertidal stratum. The purse seine (PS) yielded the highest estimates for 7 of the twenty species and captured midwater, schooling species most effectively in the nearshore and channel strata. The small seine provided the highest estimates of density for the young-of-year of three schooling species in the intertidal area, including one of the numerically dominant species, the topsmelt. Finally, the beam trawl (BT) yielded the highest estimate of densities of three species: 1) an eelgrass associated species, giant kelpfish, 2) the dominant species in terms of biomass, the round stingray, and 3) the juveniles stages of an important predator, barred sand bass.

In terms of mean sampling density for all species combined, the square enclosure yielded the highest numerical density (3.6 ind/m^2) of fishes, followed by the small seine (2.3 ind/m^2) and the purse seine (1.8 ind/m^2)(Figure 26). The purse seine estimated the highest biomass density (6.3 g/m^2) of any gear followed by the beam trawl (2.2 g/m^2) and the otter trawl (1.7 g/m^2).

Purse seines also caught the greatest number of species (61) with otter trawls collecting 52 species, beam trawls 46 species, and large seine (LS) accounting for 44 species (Figure 26).

In conclusion, multiple gear sampling designs are necessary because:

1) Habitats contain numerous subhabitats with their own suite of associated fish species. Some gears are much more effective at sampling some of the subhabitats than other gears. Purse seines are superior for sampling and estimating densities of midwater, schooling species and large, mobile species. Square enclosures and small seines are most effective at estimating intertidal densities of cryptic, demersal as well as juvenile schooling fishes. Beam trawls effectively assess the abundance and density of eelgrass associated species and some larger, demersal species. Finally, otter trawls are needed to sample fishes including large, relatively rare, demersal species in the deeper channels.

2) In order to characterize the fish assemblage as a whole, the replicate catches of all gears can be combined into a single sample of the fishes at that particular station at that particular time. If the same design with the same replication among all gears is repeated each time a station is sampled, then valid comparisons of total numerical abundance and biomass can be made among stations and sampling months since sampling effort is constant.

Mean Numerical and Biomass Density

In order to compare density estimates from San Diego Bay with those from previous studies and to err on the conservative side, numerical and biomass densities estimated from the various gears were averaged over all species.

When this is done, mean numerical density (No./m^2) for San Diego Bay fishes over the 1994-99 period was 1.36 (Table 22). This value was the lowest among the four comparable southern California studies. Both previous studies of upper Newport Bay (1978, 1.85; 1986-87, 1.72) had higher overall numerical densities than the estimate for San Diego Bay (Horn and Allen, 1981; Allen, 1988). Outer Los Angeles Harbor was slightly higher than the San Diego Bay estimate at 1.53 ind/ m^2 . Even though, the numerical density of fishes calculated in this study is the lowest for these studies, it should be pointed out that all four of these estimates are high compared to most other fish assemblages on the outer coast.

On the other hand, the biomass density estimate of 2.03 g/m^2 for the San Diego Bay fishes was actually higher than that of the 1986-87 study in Newport Bay (Table 22). The biomass estimate of 2.53 g/m^2 for upper Newport Bay in 1978 was higher than that for the San Diego samples, however, the upper Newport Bay estimate was accompanied by the one of the highest estimates of fish productivity (9.35 gDW/m^2 /yr) ever recorded in the literature (Allen, 1982). From this, we infer that the high biomass density of San Diego Bay fishes from 1994-99 translated into an extremely high productivity of fishes over the same time period.

Finally, even though the numerical and biomass density estimates for San Diego Bay were comparable to the other two habitats, the overall impact of San Diego Bay as a fish habitat in southern California, in all likelihood, greatly exceeds that of upper Newport Bay and outer Los Angeles Harbor due to the shear size of San Diego Bay. San Diego Bay has a surface area of about 4858 ha which is 30-times that of upper Newport Bay (144 ha) and 6-times greater than outer L.A. Harbor (915 ha). This large size translates into much higher overall standing stocks for the fishes of San Diego Bay.

Estimation of *actual densities* is much more complicated. Estimates of mean sampling density is fairly straight forward. Mean sampling density is simply the number (or biomass) of fish captured per unit area (usually per m^2). The number of fish is divided by the area of coverage of the net haul. The mean density is always an underestimate of *actual density* because some fish that were originally in the area escape the area during the hauling process. The proportion of the fish which are caught compared to the total originally in the area represents the gear efficiency. For example, if 100 topsmelt were actually in the area of haul coverage before the hauling process began and 60 were actually caught. That haul by that net had an efficiency of .6 for that haul for that species.

If gear efficiency can be estimated precisely, then corrections can be made to the catches and estimated densities to produce more accurate density estimates. However, precise estimation of gear efficiency is rarely, if ever, carried out in conjunction with large scale sampling efforts. The reason for this deficiency is usually financial. In addition, gear efficiency trials that have been carried out indicate that efficiencies vary among gears, habitats, subhabitats, tidal and current regimes, species and size classes within species (Kjelson, 1976, Horn and Allen, 1981). Accurate estimation of gear efficiencies is, therefore, extremely difficult.

A prominent, recent study of the fish assemblages in outer Los Angeles Harbor endeavored to estimate total standing stock of fishes in the area by assuming particular gear efficiencies. The procedure of assuming what the efficiency of a particular gear is over all samples introduces a *great deal of uncertainty and potential error* into the standing stock estimates since a tremendous amount of variation is not taken into account.

Up to this point, the densities referred to have been mean sampling densities (or mean densities). Typically, mean density values for different gear types, when averaged together, are not accurate representations of overall, *actual densities*. To better estimate actual densities in multiple gear sampling strategies (when precise gear efficiencies have not been determined), I believe it is necessary to apply a *best estimate of density* procedure.

Best Estimates of Numerical and Biomass Density

The *Best Estimate of Density* procedure (Allen, 1982) is based on the same simple, premise as the multiple gear sampling strategy. That is, that certain gears are better suited for sampling certain species, in certain habitats. The comparison of catches among gear types presented previously, clearly showed that this is certainly true for this study. Logically, it makes no sense to average catches of gears that have dramatically different efficiencies for a set group of species. Averaging such density estimates artificially decreases estimates of *actual densities*. For example, an intertidal area is sampled and yields topsmelt densities of 0, 1.0, and 0.25 ind/m^2 for SE, SS, And LS gear types, respectively. A simple mean of these values would estimate topsmelt density at .42 ind/m^2. I argue that the most realistic estimate of density should be 1.0 ind/m^2 (a difference of over 100%) since it comes from that gear (SS) which has proven to be the best sampler for topsmelt in that depth stratum overall. The estimate of zero density of topsmelt in the series of square enclosure sets does not mean that topsmelt are not in the area. It simply means that the SE is not an effective sampler of that species. By the same reasoning, the LS catch may be low because fewer small topsmelt are retained by the larger mesh and, therefore, do not provide a reasonable estimate either.

Whether the highest estimates of densities are the best, or most accurate ones, may be subject to argument. I believe that they are for the following reason. One might reasonably assume that the highest estimate is likely to be the most accurate because the gear with the highest estimate (which is usually still an underestimate of abundance) has the lowest escapement and, therefore, highest efficiency for a particular set of species.

With all of the above in mind, I make the following recommendations. The only way to make valid comparisons of densities among habitats is to establish a set of procedures that must be adhered to consistently. These procedures should include the following:

1) Multiple gear strategies should always be used to effectively sample all species and all subhabitats.

2) All gears must be deployed in a consistent manner, with a consistent areal coverage, and adequately replicated.

3) *The gears that are determined to be most effective for sampling particular species within the various subhabitats should be relied upon to yield the best estimate of density for that particular species in that particular subhabitat.*

4) The best estimates of density for each species in each subhabitat (or strata) may then be summed over the station and represent the best estimate of density for all species at that station at that time period.

5) Corrections for gear efficiencies should not be made unless adequate assessment of actual gear efficiencies have been made for the particular gears, species, and size classes under conditions typical for the regular sampling periods.

Ecoregion Comparisons: Best Estimates of Density and Standing Stock

All Fish Species

Over all Ecoregions for all five years, total best estimate of numerical density was 1.75 indiv./m^2 (Table 23). Based on a surface area of approximately 4858 ha, San Diego Bay, on average, contains almost 85 million fish. Most of the individuals are made up of northern anchovies (42 million), but there are also, again on average, almost 18 million slough anchovies, 10 million topsmelt, 3 million sardines, 3 million arrow gobies, and nearly 2 million shiner surfperch. Among the most common, higher-level carnivores, there are an estimated 280,000 round stingrays, 169,000 spotted sand bass, 133,000, barred sand bass, and almost 80,000 California halibut.

The best estimates of numerical density for the individual Ecoregions were 2.03 indiv./m^2 for the North, 1.93 indiv./m^2 for the North-Central, 0.81 indiv./m^2 for the South-Central, and 1.15 indiv./m^2 for the South. (Appendix Table 13).

Over all Ecoregions for all five years, total best estimate of biomass density was 7.05 g/m^2 (Table 24). San Diego Bay contains, on average about 305 metric tons (mt) of fish. The standing stock ranged from a low of about 57 mt in the North-Central Ecoregion to a high of 95 mt in the South-Central Ecoregion (Table 24).

In terms of biomass, within the North Ecoregion, northern anchovy ranked first contributing an average of nearly 14 mt over the study period followed by topsmelt (10.1 mt), Pacific sardine (7.9 mt), and round stingray (7.7 mt)(Appendix Table 14). The standing stock of the North-Central region was dominated, again, by northern anchovy (13.0 mt), followed by spotted sand bass (11.4 mt), slough anchovy (8.5 mt) and topsmelt (6.3 mt). Slough anchovy (22.6 mt), spotted sand bass (19.4 mt), and round stingray (19.0 mt) made up the bulk of the standing stock in the South-Central Ecoregion while round stingray (22.5 mt), bat ray (15.1 mt), spotted sand bass (10.5 mt), and slough anchovy (10.2 mt) dominated the South Ecoregion.

The best estimate process yielded an overall biomass density (7.05 g/m^2) which was over three times higher than that (2.03 g/m^2) derived from taking the simple mean of individual gear densities. This discrepancy is due to the artificial bias introduced when catches from gears with dramatically different efficiencies are simply averaged quantitatively with no regard to quality of the estimate.

I conducted the only comparable study utilizing the best estimate process in upper Newport Bay in 1978 (Allen, 1980). In that study using a similar sampling design, overall biomass density was calculated to be 4.13 g/m^2 for the littoral (Intertidal) fish assemblages. This value was about two-thirds of the value of 6.3 g/m^2 derived from the best estimate process. It is important to note that the overall biomass density for San Diego Bay (7.05 g/m^2) exceeded that from the highly productive environment of upper Newport Bay.

Within individual Ecoregions, the intertidal areas contained, in general, the highest numerical densities with the North-Central and South regions with best estimates of over 6 indiv./m^2 overall (Figure 27). This was undoubtedly due to the large number of juvenile fishes which recruit to and occupy these warm, productive areas, particularly in the spring (see April; Figure 27). The nearshore habitat supported, by far, the highest biomass densities of fish over the study period (Figure 27) with the highest being recorded in the North and North-Central ecoregions due primarily to large catches of northern anchovy and spotted sand bass in the summer. The relatively high biomass density found in the South Ecoregion was due mainly to large catches of round stingrays, spotted sand bass, and slough anchovies.

Forage Species

Forage species are defined herein as those which are accessible to diving avian predators, particularly terns. Forage species are typically silvery-sided, schooling fishes which spend a lot of their time near the surface of the water overall depth strata. Of all the species captured during this study, eleven species qualified as significant forage. These species were northern anchovy, topsmelt, slough anchovy, jack smelt, Pacific sardine, shiner surfperch, Pacific mackerel, California grunion, deepbody anchovy, California halfbeaks, and striped mullet (juveniles).

Over all Ecoregions for all five years, these eleven forage species averaged 3.15 ($\pm$1.28) g/m^2 (Table 25). Based on a surface area of approximately 4858 ha, San Diego Bay contains, on average about 139 metric tons (mt) of these important forage species. The standing stock ranged from a low of about 22 mt in the South Ecoregion to a high of 43 mt in the North Ecoregion (Table 25).

In the North Ecoregion, northern anchovy ranked first among the forage species in contributing an average of nearly 14 mt over the study period followed by topsmelt (10.1 mt), Pacific sardine (7.9 mt), and jack smelt (4.9 mt)(Table 25). The standing stock of the North-Central region was dominated, again, by northern anchovy (13.0 mt), followed by slough anchovy (8.5 mt) and topsmelt (6.3 mt). Slough anchovy (22.6 mt), topsmelt (5.5 mt), and shiner surfperch (5.2 mt) made up the bulk of the forage in the

South-Central Ecoregion while slough anchovy (10.2 mt), topsmelt (5.4 mt) and jack smelt (3.3 mt) dominated the South Ecoregion.

Based on a hypothetical ecological efficiency of 1%, overall, San Diego Bay has the potential to support about 1.4 mt of terns – that is a lot of terns!

Fisheries Species

During the five-year study period, eight fish species were captured that can be characterized as fisheries species which are important to the recreational and/or commercial (RC) catch in California waters. Ranked according to mean biomass density, these species were northern anchovy, spotted sand bass, Pacific sardine, California halibut, barred sand bass, Pacific mackerel, shortfin corvina, and yellowfin croaker (Figure 28).

Over all Ecoregions for all five years, these eight, RC species averaged 2.40 (±1.14) g/m^2 (Table 26). Based on a surface area of approximately 4858 ha, San Diego Bay contains, on average about 104 metric tons (mt) of these important RC species. The standing stock of RC species ranged from a low of about 15 mt in the South Ecoregion to a high of 31 mt in the North Ecoregion (Table 26).

In the North Ecoregion, northern anchovy ranked first among the RC species in contributing an average of nearly 14 mt over the study period followed by Pacific sardine (7.9 mt), and spotted sand bass (4.3 mt)(Table 26). The standing stock of the North-Central region was dominated, again, by northern anchovy (13.0 mt), followed by spotted sand bass (11.4 mt) and barred sand bass (1.3 mt). Spotted sand bass (19.4 mt), Pacific sardine (2.8 mt), and California halibut (2 mt) made up the bulk of the fisheries standing stock in the South-Central Ecoregion while spotted sand bass (19.4 mt), Pacific sardine (2.8 mt) and yellowfin croaker (0.8 mt) dominated the South Ecoregion.

Southern Species Unique to San Diego Bay

During the study period eight fish species were taken that can be described as southern or "Panamic Province" species including California halfbeaks (*Hyporhamphus rosae*), bonefish (*Albula vulpes*), California needlefish (*Strongylura exilis*), shortfin corvina (*Cynoscion parvipinnis*), Pacific seahorse (*Hippocampus ingens*), California butterfly ray (*Gymnura marmorata*), banded guitarfish (*Zapteryx exasperata*), and red goatfish (*Pseudupeneus grandisquamous*)(Figure 29; Table 27). In addition, four more southern species (green jack, *Caranx caballus;* middling thread herring, *Opisthonema medirastre;* Pacific sierra, *Scomberomorus sierra;* scalloped hammerhead, *Sphyrna lewini*) were collected by gill nets in the OREHP sampling program conducted by Hubbs-Sea World Research Institute in the same general time period . All of these species are commonly encountered further south in the Eastern Subtropical and Tropical Pacific. Southern California is listed as the extreme northern end point of the geographical ranges of each of these species. In fact, the occurrence of the single specimen of the red goatfish represented the first record of this species recorded in California waters. The southern portion of San Diego Bay is undoubtedly acting as a warm water refuge for these warm water species. Three of these species, the halfbeak, needlefish and seahorse were encountered throughout the study period (Figure 30) while the remaining five occurred in greatest abundance during and just after the El Nino evident of 1997-98. Bonefish recruited heavily into the southern sections of the bay beginning in January 1998 and peaked April 1998. Bonefish leptocephalus larvae were captured in the intertidal zones in January and April 1998. These leptocephali metamorphosed into juveniles which were abundant in July and October of the same year.

Effects of 1997-98 El Nino

The greatest, detectable impact of the 1997-98 El Nino event on the fish assemblages of San Diego Bay was the generally low abundance of schooling, planktivorous species, including northern anchovy, topsmelt, slough anchovy, sardine, and shiner surfperch (the five most abundant species). In fact, the northern anchovy was virtually absent during 1997. Of the most abundant schooling fishes, topsmelt and slough anchovy seemed to be least affected by the El Nino event. Overall, the abundance of these planktivorous species was significantly and negatively correlated ($\log(n+1)$, $r = -0.86$, $df = 4$, $p < 0.05$) with summer-fall (July-October) surface water temperature over the entire 1994-1999 sampling period.

The quantitative impact of the El Nino on the total number of fishes in San Diego Bay can be approximated using the regression model:

$$N = 7232.12T - 113072;$$

where N = predicted number and T = mean surface temperature. This equation was based on the relationship between abundance of planktivorous species and surface water temperature for the non-El Nino years of the study. Based on this equation, the total catch of all species in San Diego Bay was 50,000 to 55,000 individuals lower in July and October 1997 than would be predicted for a "normal" temperature year.

Another important effect that can probably be attributed to the ENSO event was the recruitment and/or occurrence of the southern species mentioned previously.

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Table 1. Exotic, southern species recorded in San Diego Bay in the literature from 1985 to 1991.

Common name	***Scientific name***	**Citation**	**Collection Date**
Anchoveta	*Ctengraulis mysticetus*	Duffy (1987)	1986?
Pacific cervalle jack	*Caranx caninus*	Duffy (1987)	1986?
Bonefish	*Albula vulpes*	Duffy (1987)	1986?
White mullet	*Mugil curema*	Lea et al. (1988)	May 1985
Milkfish	*Chanos chanos*	Duffy and Bernard (1985)	1985?
Pacific seahorse	*Hippocampus ingens*	Jones et al. (1988)	?
Cortez grunt	*Haemulon flaviguttatus*	Lea and Rosenblatt (1992)	May 1991
Bigeye trevally	*Caranx sexfasciatus*	Lea and Walker (1995)	Nov 1990
Mexican lookdown	*Selene brevoorti*	Lea and Walker (1995)	Nov 1990

Table 2. Lambert Coordinates (LAT, LONG) for San Diego Bay Fisheries Inventory and Utilization Study, 1994-99.

AREA =STATION	SITE	LAT	LONG
1	VEGETATED	32° 41' 50"	117° 13' 40"
	NON-VEGETATED	32° 42' 45"	117° 12' 30"
2	VEGETATED	32° 41' 25"	117° 09' 50"
	NON-VEGETATED	32° 41' 12"	117° 09' 45"
3	VEGETATED	32° 39' 05"	117° 08' 30"
	NON-VEGETATED	32° 38' 48"	117° 08' 25"
4	VEGETATED	32° 37' 00"	117° 07' 45"
	NON-VEGETATED	32° 36' 50"	117° 06' 45"

Table 3. Estimates of areal coverage of depth strata within the four Ecoregions of San Diego Bay. Proportions and areas were used to weight density estimates and to estimate standing stocks of fishes.

% AREA					
Ecoregion	Intertidal	Nearshore	Channel		
NORTH	6	33	60		
NORTH-CENTRAL	5	38	57		
SOUTH-CENTRAL	3	61	36		
SOUTH	4	84	13		
Hectares/Habitat					
Ecoregion	**Intertidal**	**Nearshore**	**Channel**	**TOTAL**	**% OF BAY**
NORTH	61	327	593	982	20
NORTH-CENTRAL	41	307	460	808	17
SOUTH-CENTRAL	51	1227	726	2005	41
SOUTH	41	890	133	1064	22
# Hectares	**194**	**2751**	**1913**	**4858**	
% Bay Area	**4**	**57**	**39**		

Table 4. Total abundance of fish species taken from San Diego Bay over the five years of the study, July 1994 to April 1999 by station.

SCIENTIFIC NAME	COMMON NAME	SPCODE	STATIONS, 1994-1999 1	2	3	4	TOTAL	%
Engraulis mordax	northern anchovy	ENGMOR	121888	88925	3556	1249	215618	43.35
Atherinops affinis	topsmelt	ATHAFF	44055	51041	12791	7693	115580	23.24
Anchoa delicatissima	slough anchovy	ANCDEL	4315	25526	31874	35106	96821	19.47
Sardinops sagax	Pacific sardine	SARSAG	12964	1417	398	74	14853	2.99
Cymatogaster aggregata	shiner surfperch	CYMAGG	3191	3821	3194	1051	11257	2.26
Atherinopsis californiensis	jacksmelt	ATHCAL	399	7290	664	395	8748	1.76
Leuresthes tenuis	California grunion	LEUTEN	4225	767	600		5592	1.12
Heterostichus rostratus	giant kelpfish	HETROS	1687	1989	881	131	4688	0.94
Urolophus halleri	round stingray	UROHAL	715	1060	720	1371	3866	0.78
Syngnathus leptorhynchus	bay pipefish	SYNLEP	701	1394	1040	292	3427	0.69
Syngnathus auliscus	barred pipefish	SYNAUL	390	777	598	917	2682	0.54
Clevelandia ios	arrow goby	CLEIOS	51	484	82	1677	2294	0.46
Paralabrax nebulifer	barred sand bass	PARNEB	311	954	342	240	1847	0.37
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	226	570	334	347	1477	0.30
Ilypnus gilberti	cheekspot goby	ILYGIL	580	582	70	190	1422	0.29
Paralichthys californicus	California halibut	PARCAL	316	200	167	250	933	0.19
Quietula ycauda	shadow goby	QUIYCA	40	193	84	325	642	0.13
Fundulus parvipinnis	California killifish	FUNPAR		29	10	598	637	0.13
Mugil cephalus	striped mullet	MUGCEP	8	1	1	510	520	0.10
Hyporhamphus rosae	California halfbeak	HYPROS	18	15	203	174	410	0.08
Anchoa compressa	deepbody anchovy	ANCCOM	1	212	23	130	366	0.07
Paralabrax clathratus	kelp bass	PARCLA	268	24	4	2	298	0.06
Embiotoca jacksoni	black surfperch	EMBJAC	272	8			280	0.06
Hypsoblennius gentilis	bay blenny	HYPGEN	128	129	9	1	267	0.05
Hypsopsetta guttulata	diamond turbot	HYPGUT	69	71	43	74	257	0.05
Micrometrus minimus	dwarf surfperch	MICMIN	244	3	2		249	0.05
Seriphus politus	queenfish	SERPOL	216	12			228	0.05
Xenistius californiensis	salema	XENCAL	76	116	24	2	218	0.04
Pleuronichthys ritteri	spotted turbot	PLERIT	120	84	5	8	217	0.04
Cheilotrema saturnum	black croaker	CHESAT	55	39	31	53	178	0.04
Albula vulpes	bonefish	ALBVUL	10	115	4	46	175	0.04
Scomber japonicus	Pacific mackerel	SCOJAP	11	97	20		128	0.03
Umbrina roncador	yellowfin croaker	UMBRON	42	4	37	27	110	0.02
Gibbonsia elegans	spotted kelpfish	GIBELE	56	35	3	4	98	0.02
Symphurus atricauda	California tonguefish	SYMATR	87	11			98	0.02
Porichthys myriaster	specklefin midshipman	PORMYR	27	5	10	37	79	0.02
Xystreurys liolepis	fantail sole	XYSLIO	62	9		1	72	0.01
Synodus lucioceps	California lizardfish	SYNLUC	56	4	2	7	69	0.01
Myliobatis californica	bat ray	MYLCAL	27		2	28	57	0.01
Sphyraena argentea	California barracuda	SPHARG	14	43			57	0.01
Scorpaena guttata	spotted scorpionfish	SCOGUT	37	8	1	1	47	0.01
Post-larval anchovy	Post-larval anchovy	PLVENG				45	45	0.01
Strongylura exilis	California needlefish	STREXI	3	23	9	7	42	0.01
Syngnathus californiensis	kelp pipefish	SYNCAL	18	8	14	2	42	0.01
Leptocottus armatus	staghorn sculpin	LEPARM	9	12	11	4	36	0.01
Acanthogobius flavimanus	yellowfin goby	ACAFLA		2	7	25	34	0.01
Cynoscion parvipinnis	shortfin corvina	CYNPAR	6	8	2	14	30	0.01
Syngnathus exilis	barcheek pipefish	SYNEXI	2	7	8	8	25	0.01
Halichoeres semicinctus	rock wrasse	HALSEM	24				24	0.00
Oxyjulis californica	senorita	OXYCAL	24				24	0.00
Gillichthys mirabilis	longjaw mudsucker	GILMIR				19	19	0.00
Trachurus symmetricus	jack mackerel	TRASYM	18				18	0.00
Bryx arctos	snubnose pipefish	BRYARC	10	3		1	14	0.00
Genyonemus lineatus	white croaker	GENLIN	13				13	0.00
Hippocampus ingens	Pacific seahorse	HIPING		7	4	2	13	0.00
Mustelus californicus	grey smoothhound	MUSCAL	1	1	1	9	12	0.00
Post-larval goby	Post-larval goby	PLGOBY	9				9	0.00
Anisotremus davidsoni	sargo	ANIDAV	6		1		7	0.00
Atractoscion nobilis	white seabass	ATRNOB	3	1		3	7	0.00
Rhinobatis productus	shovelnose guitarfish	RHIPRO	4		2	1	7	0.00
Girella nigricans	opaleye	GIRNIG	6				6	0.00
Mustelus henlei	brown smoothhound	MUSHEN	5		1		6	0.00
Paraclinus integripinnis	reef finspot	PARINT	1	3	2		6	0.00
Pleuronichthys coenosus	CO turbot	PLECOE	6				6	0.00
Roncador stearnsii	spotfin croaker	RONSTE	1			5	6	0.00
Gymnura marmorata	California butterfly ray	GYMMAR	2			2	4	0.00
Pleuronichthys verticalis	hornyhead turbot	PLEVER		4			4	0.00
Citharichthys stigmaeus	speckled sand dab	CITSTI	3				3	0.00
Dorosoma petenense	threadfin shad	DORPET				3	3	0.00
Menticirrhus undulatus	California corbina	MENUND		2		1	3	0.00
Porichthys notatus	plainfin midshipman	PORNOT	1			2	3	0.00
Phanerodon furcatus	white surfperch	PHAFUR	2				2	0.00
Zapteryx exasperata	banded guitarfish	ZAPEXA	2				2	0.00
Gibbonsia metzi	striped kelpfish	GIBMET		1			1	0.00
Heterodontus francisi	California hornshark	HETFRA		1			1	0.00
Medialuna californica	halfmoon	MEDCAL	1				1	0.00
Pseudupeneus grandisquamous	red goatfish	PSEGRA	1				1	0.00
Parophrys vetulus	English sole	PARVET	1				1	0.00
Rimicola muscarum	kelp clingfish	RIMMUS	1				1	0.00
Tridentiger trigonocephalus	chameleon goby	TRITRI			1		1	0.00
TOTAL			**198141**	**188147**	**57892**	**53164**	**497344**	
					Number of Species =		**78**	

Table 5. Total biomass (g) of fish species taken from San Diego Bay over the five years of the study, July 1994 to April 1999 by station.

				STATIONS, 1994-1999				
SCIENTIFIC NAME	COMMON NAME	SPCODE	1	2	3	4	TOTAL (g)	%
Urolophus halleri	round stingray	UROHAL	175747	167033	123010	221280	687070	24.76
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	65634	152308	87005	77259	382206	13.77
Engraulis mordax	northern anchovy	ENGMOR	138927	115387	2486	1498	258297	9.31
Myliobatis californica	bat ray	MYLCAL	175731		17500	61336	254568	9.17
Atherinops affinis	topsmelt	ATHAFF	104236	78188	29324	39800	251547	9.06
Anchoa delicatissima	slough anchovy	ANCDEL	10395	61171	65690	45201	182456	6.57
Paralabrax nebulifer	barred sand bass	PARNEB	27180	35350	13494	46907	122931	4.43
Paralichthys californicus	California halibut	PARCAL	38017	22443	21142	30770	112373	4.05
Cymatogaster aggregata	shiner surfperch	CYMAGG	26621	28134	17525	3653	75933	2.74
Sardinops sagax	Pacific sardine	SARSAG	46650	5547	7560	4711	64467	2.32
Atherinopsis californiensis	jacksmelt	ATHCAL	24109	4210	2231	13875	44424	1.60
Heterostichus rostratus	giant kelpfish	HETROS	14273	13589	8407	1034	37303	1.34
Hypsopsetta guttulata	diamond turbot	HYPGUT	13600	12198	4681	6228	36707	1.32
Leuresthes tenuis	California grunion	LEUTEN	15245	10801	10007		36053	1.30
Cheilotrema saturnum	black croaker	CHESAT	5533	4520	4202	8500	22756	0.82
Rhinobatis productus	shovelnose guitarfish	RHIPRO	10150		6595	3757	20502	0.74
Scomber japonicus	Pacific mackerel	SCOJAP	4128	11405	3647		19180	0.69
Umbrina roncador	yellowfin croaker	UMBRON	5684	499	5793	4492	16469	0.59
Pleuronichthys ritteri	spotted turbot	PLERIT	7829	7843	154	121	15948	0.57
Embiotoca jacksoni	black surfperch	EMBJAC	13858	344			14202	0.51
Cynoscion parvipinnis	shortfin corvina	CYNPAR	4679	4981	1476	801	11937	0.43
Gymnura marmorata	California butterfly ray	GYMMAR	7727			2714	10441	0.38
Xystreurys liolepis	fantail sole	XYSLIO	4674	4175		188	9036	0.33
Scorpaena guttata	spotted scorpionfish	SCOGUT	6400	1161	151	182	7893	0.28
Seriphus politus	queenfish	SERPOL	6222	169			6392	0.23
Mustelus californicus	grey smoothhound	MUSCAL	336	968	950	3793	6047	0.22
Mustelus henlei	brown smoothhound	MUSHEN	4536		813		5349	0.19
Porichthys myriaster	specklefin midshipman	PORMYR	2040	384	1394	926	4744	0.17
Trachurus symmetricus	jack mackerel	TRASYM	4095				4095	0.15
Strongylura exilis	California needlefish	STREXI	483	1771	363	1137	3753	0.14
Micrometrus minimus	dwarf surfperch	MICMIN	2971	38	28		3037	0.11
Paralabrax clathratus	kelp bass	PARCLA	2309	496	29	83	2917	0.11
Xenistius californiensis	salema	XENCAL	44	2508	260	27	2840	0.10
Sphyraena argentea	California barracuda	SPHARG	2009	821			2830	0.10
Menticirrhus undulatus	California corbina	MENUND		2600		150	2750	0.10
Anchoa compressa	deepbody anchovy	ANCCOM	2	592	454	1479	2527	0.09
Heterodontus francisi	California hornshark	HETFRA		2420			2420	0.09
Symphurus atricauda	California tonguefish	SYMATR	1976	379			2354	0.08
Hypsoblennius gentilis	bay blenny	HYPGEN	911	1210	205	3	2329	0.08
Syngnathus leptorhynchus	bay pipefish	SYNLEP	512	650	1042	101	2304	0.08
Mugil cephalus	striped mullet	MUGCEP	2	0	0	2270	2272	0.08
Albula vulpes	bonefish	ALBVUL	133	744	42	880	1799	0.06
Girella nigricans	opaleye	GIRNIG	1796				1796	0.06
Atractoscion nobilis	white seabass	ATRNOB	909	250		568	1727	0.06
Synodus lucioceps	California lizardfish	SYNLUC	1473	54	45	73	1645	0.06
Syngnathus auliscus	barred pipefish	SYNAUL	313	406	378	519	1615	0.06
Fundulus parvipinnis	California killifish	FUNPAR		111	25	1318	1454	0.05
Roncador stearnsii	spotfin croaker	RONSTE	102			1163	1265	0.05
Zapteryx exasperata	banded guitarfish	ZAPEXA	1067				1067	0.04
Hyporhamphus rosae	California halfbeak	HYPROS	51	29	676	303	1059	0.04
Pleuronichthys coenosus	CO turbot	PLECOE	867				867	0.03
Acanthogobius flavimanus	yellowfin goby	ACAFLA		22	388	420	830	0.03
Halichoeres semicinctus	rock wrasse	HALSEM	743				743	0.03
Oxyjulis californica	senorita	OXYCAL	667				667	0.02
Genyonemus lineatus	white croaker	GENLIN	610				610	0.02
Phanerodon furcatus	white surfperch	PHAFUR	605				605	0.02
Anisotremus davidsoni	sargo	ANIDAV	18		579		597	0.02
Pleuronichthys verticalis	hornyhead turbot	PLEVER		597			597	0.02
Hippocampus ingens	Pacific seahorse	HIPING		267	129	91	487	0.02
Leptocottus armatus	staghorn sculpin	LEPARM	119	119	123	60	420	0.02
Gibbonsia elegans	spotted kelpfish	GIBELE	165	150	28	9	352	0.01
Quietula ycauda	shadow goby	QUIYCA	18	30	117	103	268	0.01
Ilypnus gilberti	cheekspot goby	ILYGIL	115	37	7	71	231	0.01
Clevelandia ios	arrow goby	CLEIOS	8	26	6	187	227	0.01
Dorosoma petenense	threadfin shad	DORPET				224	224	0.01
Syngnathus californiensis	kelp pipefish	SYNCAL	86	38	15	3	142	0.01
Pseudupeneus grandisquamou	red goatfish	PSEGRA	100				100	0.00
Porichthys notatus	plainfin midshipman	PORNOT	9			61	69	0.00
Gillichthys mirabilis	longjaw mudsucker	GILMIR				51	51	0.00
Citharichthys stigmaeus	speckled sand dab	CITSTI	37				37	0.00
Bryx arctos	snubnose pipefish	BRYARC	2	29		0	31	0.00
Post-larval goby	Post-larval goby	PLGOBY	30				30	0.00
Syngnathus exilis	barcheek pipefish	SYNEXI	5	7	8	7	27	0.00
Parophrys vetulus	English sole	PARVET	5				5	0.00
Paraclinus integripinnis	reef finspot	PARINT	1	1	3		5	0.00
Tridentiger trigonocephalus	chameleon goby	TRITRI			4		4	0.00
Post-larval anchovy	Post-larval anchovy	PLVENG				1	1	0.00
Gibbonsia metzi	striped kelpfish	GIBMET		0			0	0.00
Medialuna californica	halfmoon	MEDCAL	0				0	0.00
Rimicola muscarum	kelp clingfish	RIMMUS	0				0	0.00
TOTAL			985530	759210	440185	590386	2775311	

Table 6. Total number of individuals and biomass (g) of fish species captured in the NORTH Ecoregion (Station 1), July 1994-April 1999.

SPECIES	COMMON NAME	SPCODE	TOTAL#	%	TOTALWT (g)	%
Engraulis mordax	northern anchovy	ENGMOR	121888	61.52	138927	14.10
Atherinops affinis	topsmelt	ATHAFF	44055	22.23	104236	10.58
Sardinops sagax	Pacific sardine	SARSAG	12964	6.54	46650	4.73
Anchoa delicatissima	slough anchovy	ANCDEL	4315	2.18	10395	1.05
Leuresthes tenuis	California grunion	LEUTEN	4225	2.13	15245	1.55
Cymatogaster aggregata	shiner surfperch	CYMAGG	3191	1.61	26621	2.70
Heterostichus rostratus	giant kelpfish	HETROS	1687	0.85	14273	1.45
Urolophus halleri	round stingray	UROHAL	715	0.36	175747	17.83
Syngnathus leptorhynchus	bay pipefish	SYNLEP	701	0.35	512	0.05
Ilypnus gilberti	cheekspot goby	ILYGIL	580	0.29	115	0.01
Atherinopsis californiensis	jacksmelt	ATHCAL	399	0.20	24109	2.45
Syngnathus auliscus	barred pipefish	SYNAUL	390	0.20	313	0.03
Paralichthys californicus	California halibut	PARCAL	316	0.16	38017	3.86
Paralabrax nebulifer	barred sand bass	PARNEB	311	0.16	27180	2.76
Embiotoca jacksoni	black surfperch	EMBJAC	272	0.14	13858	1.41
Paralabrax clathratus	kelp bass	PARCLA	268	0.14	2309	0.23
Micrometrus minimus	dwarf surfperch	MICMIN	244	0.12	2971	0.30
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	226	0.11	65634	6.66
Seriphus politus	queenfish	SERPOL	216	0.11	6222	0.63
Hypsoblennius gentilis	bay blenny	HYPGEN	128	0.06	911	0.09
Pleuronichthys ritteri	spotted turbot	PLERIT	120	0.06	7829	0.79
Symphurus atricauda	California tonguefish	SYMATR	87	0.04	1976	0.20
Xenistius californiensis	salema	XENCAL	76	0.04	44	0.00
Hypsopsetta guttulata	diamond turbot	HYPGUT	69	0.03	13600	1.38
Xystreurys liolepis	fantail sole	XYSLIO	62	0.03	4674	0.47
Synodus lucioceps	California lizardfish	SYNLUC	56	0.03	1473	0.15
Gibbonsia elegans	spotted kelpfish	GIBELE	56	0.03	165	0.02
Cheilotrema saturnum	black croaker	CHESAT	55	0.03	5533	0.56
Clevelandia ios	arrow goby	CLEIOS	51	0.03	8	0.00
Umbrina roncador	yellowfin croaker	UMBRON	42	0.02	5684	0.58
Quietula ycauda	shadow goby	QUIYCA	40	0.02	18	0.00
Scorpaena guttata	spotted scorpionfish	SCOGUT	37	0.02	6400	0.65
Myliobatis californica	bat ray	MYLCAL	27	0.01	175731	17.83
Porichthys myriaster	specklefin midshipman	PORMYR	27	0.01	2040	0.21
Halichoeres semicinctus	rock wrasse	HALSEM	24	0.01	743	0.08
Oxyjulis californica	senorita	OXYCAL	24	0.01	667	0.07
Trachurus symmetricus	jack mackerel	TRASYM	18	0.01	4095	0.42
Syngnathus californiensis	kelp pipefish	SYNCAL	18	0.01	86	0.01
Hyporhamphus rosae	California halfbeak	HYPROS	18	0.01	51	0.01
Sphyraena argentea	California barracuda	SPHARG	14	0.01	2009	0.20
Genyonemus lineatus	white croaker	GENLIN	13	0.01	610	0.06
Scomber japonicus	Pacific mackerel	SCOJAP	11	0.01	4128	0.42
Albula vulpes	bonefish	ALBVUL	10	0.01	133	0.01
Bryx arctos	snubnose pipefish	BRYARC	10	0.01	2	0.00
Leptocottus armatus	staghorn sculpin	LEPARM	9	0.00	119	0.01
Post-larval goby	Post-larval goby	PLGOBY	9	0.00	30	0.00
Mugil cephalus	striped mullet	MUGCEP	8	0.00	2	0.00
Cynoscion parvipinnis	shortfin corvina	CYNPAR	6	0.00	4679	0.47
Girella nigricans	opaleye	GIRNIG	6	0.00	1796	0.18
Pleuronichthys coenosus	CO turbot	PLECOE	6	0.00	867	0.09
Anisotremus davidsoni	sargo	ANIDAV	6	0.00	18	0.00
Mustelus henlei	brown smoothhound	MUSHEN	5	0.00	4536	0.46
Rhinobatis productus	shovelnose guitarfish	RHIPRO	4	0.00	10150	1.03
Atractoscion nobilis	white sea bass	ATRNOB	3	0.00	909	0.09
Strongylura exilis	California needlefish	STREXI	3	0.00	483	0.05
Citharichthys stigmaeus	speckled sand dab	CITSTI	3	0.00	37	0.00
Gymnura marmorata	California butterfly ray	GYMMAR	2	0.00	7727	0.78
Zapteryx exasperata	banded guitarfish	ZAPEXA	2	0.00	1067	0.11
Phanerodon furcatus	white surfperch	PHAFUR	2	0.00	605	0.06
Syngnathus exilis	barcheek pipefish	SYNEXI	2	0.00	5	0.00
Mustelus californicus	grey smoothhound	MUSCAL	1	0.00	336	0.03
Roncador stearnsii	spotfin croaker	RONSTE	1	0.00	102	0.01
Pseudupeneus grandisquamous	red goatfish	PSEGRA	1	0.00	100	0.01
Porichthys notatus	plainfin midshipman	PORNOT	1	0.00	9	0.00
Parophrys vetulus	English sole	PARVET	1	0.00	5	0.00
Anchoa compressa	deepbody anchovy	ANCCOM	1	0.00	2	0.00
Paraclinus integripinnis	reef finspot	PARINT	1	0.00	1	0.00
Medialuna californica	halfmoon	MEDCAL	1	0.00	0	0.00
Rimicola muscarum	kelp clingfish	RIMMUS	1	0.00	0	0.00
Number of species =	**68**	**TOTAL**	**198141**		**985530**	

Table 7. Total number of individuals and biomass (g) of fish species captured in the NORTH-CENTRAL Ecoregion (Station 2), July 1994 - April 1999.

SPECIES	COMMON NAME	SPCODE	TOTAL#	%	TOTALWT (g)	%
Engraulis mordax	northern anchovy	ENGMOR	88925	47.26	115387	15.20
Atherinops affinis	topsmelt	ATHAFF	51041	27.13	78188	10.30
Anchoa delicatissima	slough anchovy	ANCDEL	25526	13.57	61171	8.06
Atherinopsis californiensis	jacksmelt	ATHCAL	7290	3.87	4210	0.55
Cymatogaster aggregata	shiner surfperch	CYMAGG	3821	2.03	28134	3.71
Heterostichus rostratus	giant kelpfish	HETROS	1989	1.06	13589	1.79
Sardinops sagax	Pacific sardine	SARSAG	1417	0.75	5547	0.73
Syngnathus leptorhynchus	bay pipefish	SYNLEP	1394	0.74	650	0.09
Urolophus halleri	round stingray	UROHAL	1060	0.56	167033	22.00
Paralabrax nebulifer	barred sand bass	PARNEB	954	0.51	35350	4.66
Syngnathus auliscus	barred pipefish	SYNAUL	777	0.41	406	0.05
Leuresthes tenuis	California grunion	LEUTEN	767	0.41	10801	1.42
Ilypnus gilberti	cheekspot goby	ILYGIL	582	0.31	37	0.00
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	570	0.30	152308	20.06
Clevelandia ios	arrow goby	CLEIOS	484	0.26	26	0.00
Anchoa compressa	deepbody anchovy	ANCCOM	212	0.11	592	0.08
Paralichthys californicus	California halibut	PARCAL	200	0.11	22443	2.96
Quietula ycauda	shadow goby	QUIYCA	193	0.10	30	0.00
Hypsoblennius gentilis	bay blenny	HYPGEN	129	0.07	1210	0.16
Xenistius californiensis	salema	XENCAL	116	0.06	2508	0.33
Albula vulpes	bonefish	ALBVUL	115	0.06	744	0.10
Scomber japonicus	Pacific mackerel	SCOJAP	97	0.05	11405	1.50
Pleuronichthys ritteri	spotted turbot	PLERIT	84	0.04	7843	1.03
Hypsopsetta guttulata	diamond turbot	HYPGUT	71	0.04	12198	1.61
Sphyraena argentea	California barracuda	SPHARG	43	0.02	821	0.11
Cheilotrema saturnum	black croaker	CHESAT	39	0.02	4520	0.60
Gibbonsia elegans	spotted kelpfish	GIBELE	35	0.02	150	0.02
Fundulus parvipinnis	California killifish	FUNPAR	29	0.02	111	0.01
Paralabrax clathratus	kelp bass	PARCLA	24	0.01	496	0.07
Strongylura exilis	California needlefish	STREXI	23	0.01	1771	0.23
Hyporhamphus rosae	California halfbeak	HYPROS	15	0.01	29	0.00
Seriphus politus	queenfish	SERPOL	12	0.01	169	0.02
Leptocottus armatus	staghorn sculpin	LEPARM	12	0.01	119	0.02
Symphurus atricauda	California tonguefish	SYMATR	11	0.01	379	0.05
Xystreurys liolepis	fantail sole	XYSLIO	9	0.00	4175	0.55
Cynoscion parvipinnis	shortfin corvina	CYNPAR	8	0.00	4981	0.66
Scorpaena guttata	spotted scorpionfish	SCOGUT	8	0.00	1161	0.15
Embiotoca jacksoni	black surfperch	EMBJAC	8	0.00	344	0.05
Syngnathus californiensis	kelp pipefish	SYNCAL	8	0.00	38	0.01
Hippocampus ingens	Pacific seahorse	HIPING	7	0.00	267	0.04
Syngnathus exilis	barcheek pipefish	SYNEXI	7	0.00	7	0.00
Porichthys myriaster	specklefin midshipman	PORMYR	5	0.00	384	0.05
Pleuronichthys verticalis	hornyhead turbot	PLEVER	4	0.00	597	0.08
Umbrina roncador	yellowfin croaker	UMBRON	4	0.00	499	0.07
Synodus lucioceps	California lizardfish	SYNLUC	4	0.00	54	0.01
Micrometrus minimus	dwarf surfperch	MICMIN	3	0.00	38	0.00
Bryx arctos	snubnose pipefish	BRYARC	3	0.00	29	0.00
Paraclinus integripinnis	reef finspot	PARINT	3	0.00	1	0.00
Menticirrhus undulatus	California corbina	MENUND	2	0.00	2600	0.34
Acanthogobius flavimanus	yellowfin goby	ACAFLA	2	0.00	22	0.00
Heterodontus francisi	California hornshark	HETFRA	1	0.00	2420	0.32
Mustelus californicus	grey smoothhound	MUSCAL	1	0.00	968	0.13
Atractoscion nobilis	white sea bass	ATRNOB	1	0.00	250	0.03
Gibbonsia metzi	striped kelpfish	GIBMET	1	0.00	0	0.00
Mugil cephalus	striped mullet	MUGCEP	1	0.00	0	0.00
No. spp. =	**55**	**TOTAL**	**188147**		**759210**	

Table 8. Total number of individuals and biomass (g) of fish species in the SOUTH-CENTRAL Ecoregion (Station 3), July 1994 - April 1999.

SPECIES	COMMON NAME	SPCODE	TOTAL#	%	TOTALWT (g)	%
Anchoa delicatissima	slough anchovy	ANCDEL	31874	55.06	65690	14.92
Atherinops affinis	topsmelt	ATHAFF	12791	22.09	29324	6.66
Engraulis mordax	northern anchovy	ENGMOR	3556	6.14	2486	0.56
Cymatogaster aggregata	shiner surfperch	CYMAGG	3194	5.52	17525	3.98
Syngnathus leptorhynchus	bay pipefish	SYNLEP	1040	1.80	1042	0.24
Heterostichus rostratus	giant kelpfish	HETROS	881	1.52	8407	1.91
Urolophus halleri	round stingray	UROHAL	720	1.24	123010	27.94
Atherinopsis californiensis	jacksmelt	ATHCAL	664	1.15	2231	0.51
Leuresthes tenuis	California grunion	LEUTEN	600	1.04	10007	2.27
Syngnathus auliscus	barred pipefish	SYNAUL	598	1.03	378	0.09
Sardinops sagax	Pacific sardine	SARSAG	398	0.69	7560	1.72
Paralabrax nebulifer	barred sand bass	PARNEB	342	0.59	13494	3.07
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	334	0.58	87005	19.77
Hyporhamphus rosae	California halfbeak	HYPROS	203	0.35	676	0.15
Paralichthys californicus	California halibut	PARCAL	167	0.29	21142	4.80
Quietula ycauda	shadow goby	QUIYCA	84	0.15	117	0.03
Clevelandia ios	arrow goby	CLEIOS	82	0.14	6	0.00
Ilypnus gilberti	cheekspot goby	ILYGIL	70	0.12	7	0.00
Hypsopsetta guttulata	diamond turbot	HYPGUT	43	0.07	4681	1.06
Umbrina roncador	yellowfin croaker	UMBRON	37	0.06	5793	1.32
Cheilotrema saturnum	black croaker	CHESAT	31	0.05	4202	0.95
Xenistius californiensis	salema	XENCAL	24	0.04	260	0.06
Anchoa compressa	deepbody anchovy	ANCCOM	23	0.04	454	0.10
Scomber japonicus	Pacific mackerel	SCOJAP	20	0.03	3647	0.83
Syngnathus californiensis	kelp pipefish	SYNCAL	14	0.02	15	0.00
Leptocottus armatus	staghorn sculpin	LEPARM	11	0.02	123	0.03
Porichthys myriaster	specklefin midshipman	PORMYR	10	0.02	1394	0.32
Fundulus parvipinnis	California killifish	FUNPAR	10	0.02	25	0.01
Strongylura exilis	California needlefish	STREXI	9	0.02	363	0.08
Hypsoblennius gentilis	bay blenny	HYPGEN	9	0.02	205	0.05
Syngnathus exilis	barcheek pipefish	SYNEXI	8	0.01	8	0.00
Acanthogobius flavimanus	yellowfin goby	ACAFLA	7	0.01	388	0.09
Pleuronichthys ritteri	spotted turbot	PLERIT	5	0.01	154	0.03
Hippocampus ingens	Pacific seahorse	HIPING	4	0.01	129	0.03
Albula vulpes	bonefish	ALBVUL	4	0.01	42	0.01
Paralabrax clathratus	kelp bass	PARCLA	4	0.01	29	0.01
Gibbonsia elegans	spotted kelpfish	GIBELE	3	0.01	28	0.01
Myliobatis californica	bat ray	MYLCAL	2	0.00	17500	3.98
Rhinobatis productus	shovelnose guitarfish	RHIPRO	2	0.00	6595	1.50
Cynoscion parvipinnis	shortfin corvina	CYNPAR	2	0.00	1476	0.34
Synodus lucioceps	California lizardfish	SYNLUC	2	0.00	45	0.01
Micrometrus minimus	dwarf surfperch	MICMIN	2	0.00	28	0.01
Paraclinus integripinnis	reef finspot	PARINT	2	0.00	3	0.00
Mustelus californicus	grey smoothhound	MUSCAL	1	0.00	950	0.22
Mustelus henlei	brown smoothhound	MUSHEN	1	0.00	813	0.18
Anisotremus davidsoni	sargo	ANIDAV	1	0.00	579	0.13
Scorpaena guttata	spotted scorpionfish	SCOGUT	1	0.00	151	0.03
Tridentiger trigonocephalus	chameleon goby	TRITRI	1	0.00	4	0.00
Mugil cephalus	striped mullet	MUGCEP	1	0.00	0	0.00
No. spp. =	49	TOTAL	57892		440185	

Table 9. Total number of individuals and biomass (g) of fish species captured in the SOUTH Ecoregion (Station 4), July 1994 - April 1999.

SPECIES	COMMON NAME	SPCODE	TOTAL#	%	TOTALWT (g)	%
Anchoa delicatissima	slough anchovy	ANCDEL	35106	66.03	45201	7.66
Atherinops affinis	topsmelt	ATHAFF	7693	14.47	39800	6.74
Clevelandia ios	arrow goby	CLEIOS	1677	3.15	187	0.03
Urolophus halleri	round stingray	UROHAL	1371	2.58	221280	37.48
Engraulis mordax	northern anchovy	ENGMOR	1249	2.35	1498	0.25
Cymatogaster aggregata	shiner surfperch	CYMAGG	1051	1.98	3653	0.62
Syngnathus auliscus	barred pipefish	SYNAUL	917	1.72	519	0.09
Fundulus parvipinnis	California killifish	FUNPAR	598	1.12	1318	0.22
Mugil cephalus	striped mullet	MUGCEP	510	0.96	2270	0.38
Atherinopsis californiensis	jacksmelt	ATHCAL	395	0.74	13875	2.35
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	347	0.65	77259	13.09
Quietula ycauda	shadow goby	QUIYCA	325	0.61	103	0.02
Syngnathus leptorhynchus	bay pipefish	SYNLEP	292	0.55	101	0.02
Paralichthys californicus	California halibut	PARCAL	250	0.47	30770	5.21
Paralabrax nebulifer	barred sand bass	PARNEB	240	0.45	46907	7.95
Ilypnus gilberti	cheekspot goby	ILYGIL	190	0.36	71	0.01
Hyporhamphus rosae	California halfbeak	HYPROS	174	0.33	303	0.05
Heterostichus rostratus	giant kelpfish	HETROS	131	0.25	1034	0.18
Anchoa compressa	deepbody anchovy	ANCCOM	130	0.24	1479	0.25
Hypsopsetta guttulata	diamond turbot	HYPGUT	74	0.14	6228	1.05
Sardinops sagax	Pacific sardine	SARSAG	74	0.14	4711	0.80
Cheilotrema saturnum	black croaker	CHESAT	53	0.10	8500	1.44
Albula vulpes	bonefish	ALBVUL	46	0.09	880	0.15
Post-larval anchovy	Post-larval anchovy	PLVENG	45	0.08	1	0.00
Porichthys myriaster	specklefin midshipman	PORMYR	37	0.07	926	0.16
Myliobatis californica	bat ray	MYLCAL	28	0.05	61336	10.39
Umbrina roncador	yellowfin croaker	UMBRON	27	0.05	4492	0.76
Acanthogobius flavimanus	yellowfin goby	ACAFLA	25	0.05	420	0.07
Gillichthys mirabilis	longjaw mudsucker	GILMIR	19	0.04	51	0.01
Cynoscion parvipinnis	shortfin corvina	CYNPAR	14	0.03	801	0.14
Mustelus californicus	grey smoothhound	MUSCAL	9	0.02	3793	0.64
Pleuronichthys ritteri	spotted turbot	PLERIT	8	0.02	121	0.02
Syngnathus exilis	barcheek pipefish	SYNEXI	8	0.02	7	0.00
Strongylura exilis	California needlefish	STREXI	7	0.01	1137	0.19
Synodus lucioceps	California lizardfish	SYNLUC	7	0.01	73	0.01
Roncador stearnsii	spotfin croaker	RONSTE	5	0.01	1163	0.20
Leptocottus armatus	staghorn sculpin	LEPARM	4	0.01	60	0.01
Gibbonsia elegans	spotted kelpfish	GIBELE	4	0.01	9	0.00
Atractoscion nobilis	white sea bass	ATRNOB	3	0.01	568	0.10
Dorosoma petenense	threadfin shad	DORPET	3	0.01	224	0.04
Gymnura marmorata	California butterfly ray	GYMMAR	2	0.00	2714	0.46
Hippocampus ingens	Pacific seahorse	HIPING	2	0.00	91	0.02
Paralabrax clathratus	kelp bass	PARCLA	2	0.00	83	0.01
Porichthys notatus	plainfin midshipman	PORNOT	2	0.00	61	0.01
Xenistius californiensis	salema	XENCAL	2	0.00	27	0.00
Syngnathus californiensis	kelp pipefish	SYNCAL	2	0.00	3	0.00
Rhinobatis productus	shovelnose guitarfish	RHIPRO	1	0.00	3757	0.64
Xystreurys liolepis	fantail sole	XYSLIO	1	0.00	188	0.03
Scorpaena guttata	spotted scorpionfish	SCOGUT	1	0.00	182	0.03
Menticirrhus undulatus	California corbina	MENUND	1	0.00	150	0.03
Hypsoblennius gentilis	bay blenny	HYPGEN	1	0.00	3	0.00
Bryx arctos	snubnose pipefish	BRYARC	1	0.00	0	0.00
No. spp. =	**51**	**TOTAL**	**53164**		**590386**	

Table 10. Total abundance of fish species taken from San Diego Bay, July 1994 to April 1999 by subhabitat. (IN = intertidal non-vegetated; IV = intertidal vegetated; NN = nearshore non-vegetated; NV = nearshore vegetated; C = channel)

SPCODE	INTERTIDAL	NEARSHORE	CHANNEL	TOTAL
ENGMOR	1081	203711	10826	215618
ATHAFF	80528	31581	3471	115580
ANCDEL	7701	80638	8482	96821
SARSAG	237	10477	4139	14853
CYMAGG	287	10957	13	11257
ATHCAL	8231	402	115	8748
LEUTEN	517	4965	110	5592
HETROS	400	4260	28	4688
UROHAL	145	1480	2241	3866
SYNLEP	411	3010	6	3427
SYNAUL	365	2314	3	2682
CLEIOS	1644	648	2	2294
PARNEB	44	729	1074	1847
PARMAC	4	1123	350	1477
ILYGIL	767	613	42	1422
PARCAL	46	167	720	933
QUIYCA	388	253	1	642
FUNPAR	635	2		637
MUGCEP	515	4	1	520
HYPROS	331	59	20	410
ANCCOM	7	354	5	366
PARCLA	1	286	11	298
EMBJAC	16	261	3	280
HYPGEN	8	255	4	267
HYPGUT	33	40	184	257
MICMIN	81	168		249
SERPOL	5	175	48	228
XENCAL	1	215	2	218
PLERIT	5	21	191	217
CHESAT		60	118	178
ALBVUL	148	7	20	175
SCOJAP		108	20	128
UMBRON	4	24	82	110
GIBELE	2	96		98
SYMATR		9	89	98
PORMYR		10	69	79
XYSLIO		32	40	72
SYNLUC		4	65	69
MYLCAL		25	32	57
SPHARG	2	54	1	57
SCOGUT		8	39	47
PLVENG	45			45
STREXI	15	22	5	42
SYNCAL	5	35	2	42
LEPARM	34	1	1	36
ACAFLA	21	13		34
CYNPAR	6	18	6	30
SYNEXI	5	20		25
HALSEM		19	5	24
OXYCAL		22	2	24
GILMIR	9	10		19
TRASYM		18		18
BRYARC	2	12		14
GENLIN		11	2	13
HIPING		5	8	13
MUSCAL	3	4	5	12
PLGOBY			9	9
ANIDAV		7		7
ATRNOB		3	4	7
RHIPRO		1	6	7
GIRNIG	2	4		6
MUSHEN		1	5	6
PARINT		6		6
PLECOE			6	6
RONSTE			6	6
GYMMAR		2	2	4
PLEVER			4	4
CITSTI		2	1	3
DORPET			3	3
MENUND		3		3
PORNOT		1	2	3
PHAFUR		1	1	2
ZAPEXA		2		2
GIBMET		1		1
HETFRA			1	1
MEDCAL	1			1
PARVET		1		1
RIMMUS		1		1
TRITRI	1			1
MULDEN			1	1
Grand Total	104739	359851	32754	497344

Table 11. Total abundance of fish species taken from San Diego Bay over the five years of the study, July 1994 to April 1999 by quarterly sampling period.

SCIENTIFIC NAME	COMMON NAME	SPCODE	MONTHS, 1994-1999 Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	TOTAL	%
Engraulis mordax	northern anchovy	ENGMOR	1697	1		9	52380	5461	2	12	147161		61	3				7	8366	27	2	429	215618	43.35
Atherinops affinis	topsmelt	ATHAFF	5043	2369	1006	13045	12227	4883	2300	27918	5997	2177	2780	10064	2853	1333	547	1996	7236	2129	3775	5902	115580	23.24
Anchoa delicatissima	slough anchovy	ANCDEL	1813	4245	159	1652	15169	2530		1408	15208	10250	62	8879	2150	4340	58	14944	12846	817	203	88	96821	19.47
Sardinops sagax	Pacific sardine	SARSAG	1	84	9		2300	359	2		5391	3641		19	566	64	130	11	773	1357	145	1	14853	2.99
Cymatogaster aggregata	shiner surfperch	CYMAGG	31	44	13	3305	693	180	5	2672	550	287	7	2540	254	23	1	213	123	115	8	193	11257	2.26
Atherinopsis californiensis	jacksmelt	ATHCAL		2	532	2		4	9	1	2	18	160	3	9	4	7903	15		4	80		8748	1.76
Leuresthes tenuis	California grunion	LEUTEN									739	404		1969	1167			6	1117	190			5592	1.12
Heterostichus rostratus	giant kelpfish	HETROS	322	395	23	697	605	332	94	868	536	186	41	227	150	33	2	2	69	15	2	89	4688	0.94
Urolophus halleri	round stingray	UROHAL	89	155	123	481	82	77	121	164	151	414	117	237	241	162	88	72	50	480	379	183	3866	0.78
Syngnathus leptorhynchus	bay pipefish	SYNLEP	225	255	189	219	131	287	495	248	135	295	183	224	131	18	33	8	69	23	97	162	3427	0.69
Syngnathus auliscus	barred pipefish	SYNAUL	550	112	100	506	482	134	22	79	117	197	45	83	29	8	10	2	54	2	64	86	2682	0.54
Clevelandia ios	arrow goby	CLEIOS	306	115	23	161	240	145	16	100	239	18	28	2	93	33	280	12	61	19	16	387	2294	0.46
Paralabrax nebulifer	barred sand bass	PARNEB	81	187	55	386	317	124	25	56	42	19	11	132	97	101	17	26	33	28	44	66	1847	0.37
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	23	50	57	100	73	43	74	59	77	94	77	77	89	147	68	131	69	88	56	25	1477	0.30
Ilypnus gilberti	cheekspot goby	ILYGIL	950	62	43	47	5		33		27	2	2	65	40	5	59	12	15	25	20	10	1422	0.29
Paralichthys californicus	California halibut	PARCAL	159	25	29	45	52	24	44	29	46	52	60	45	29	22	44	29	25	33	72	69	933	0.19
Quietula ycauda	shadow goby	QUIYCA	1	31	62	9	1	17	13	30	4	58	13	97	6	2	116	27	42	9	60	44	642	0.13
Fundulus parvipinnis	California killifish	FUNPAR	5	11	94	21	5	8	13	1	86	17	65		60	24			123	43	58	3	637	0.13
Mugil cephalus	striped mullet	MUGCEP		1	9	1		2		1							273	231	1	1			520	0.10
Hyporhamphus rosae	California halfbeak	HYPROS	13	39	1	1		5	61	8	9	49	3	15	24	25			3	149	5		410	0.08
Anchoa compressa	deepbody anchovy	ANCCOM	7		22	12	57	10		219	2			29				1	4			3	366	0.07
Paralabrax clathratus	kelp bass	PARCLA	1	192	4	8	4	3	1	1	8	10	7	5	20	15			1	13	5		298	0.06
Embiotoca jacksoni	black surfperch	EMBJAC	4	19		34	97	22		16	30	47		8	1	1			1				280	0.06
Hypsoblennius gentilis	bay blenny	HYPGEN	26	21	2	15	19	8	4	9	13	41	5	34	10	41	2	1	11	4		1	267	0.05
Hypsopsetta guttulata	diamond turbot	HYPGUT	33	4	17	26	18	9	3	7	16	16	11	8	20	15	6	15	4	5	12	12	257	0.05
Micrometrus minimus	dwarf surfperch	MICMIN	52	14	2	53	49		2	2	12	42				21							249	0.05
Seriphus politus	queenfish	SERPOL				6	10	42			157							4	5	4			228	0.05
Xenistius californiensis	salema	XENCAL		79		8	7	1				25		6	82	10							218	0.04
Pleuronichthys ritteri	spotted turbot	PLERIT	13	6	3	9	11	6	13	11	7	4	23	24	13	9	13	1	6	5	21	19	217	0.04
Cheilotrema saturnum	black croaker	CHESAT	3	9	3	21	10	16		6	16	2	1	11	42	5	6	20	1	4		2	178	0.04
Albula vulpes	bonefish	ALBVUL					1										2	115	15	36	5	1	175	0.04
Scomber japonicus	Pacific mackerel	SCOJAP				19	5				64	1			37	1	1						128	0.03
Umbrina roncador	yellowfin croaker	UMBRON	9	4	1	2	6	3		16				2	2	11		5	6	38	4	1	110	0.02
Gibbonsia elegans	spotted kelpfish	GIBELE	52			8	17	2			16				2						1		98	0.02
Symphurus atricauda	California tonguefish	SYMATR	12	3		5	2		3	1	18	2	4	10	1	13	5	8	1	3	2	5	98	0.02
Porichthys myriaster	specklefin midshipman	PORMYR	9			1	3	1			27		1	9	9	7	1	1	3	4	2	1	79	0.02
Xystreurys liolepis	fantail sole	XYSLIO	9	1	1	5	2	1	2	2	3	1		1		33	1	1	1		6	2	72	0.01
Synodus lucioceps	California lizardfish	SYNLUC	8		2	17	10			1	15		1	7			1	2	2	2	1		69	0.01
Myliobatis californica	bat ray	MYLCAL	1			3	4			5	1								1	27	15		57	0.01
Sphyraena argentea	California barracuda	SPHARG	2	1											1	51		1		1			57	0.01
Scorpaena guttata	spotted scorpionfish	SCOGUT	22	4	2	2	6	1		2	1	1	1	1				1		1	2		47	0.01
Post-larval anchovy	Post-larval anchovy	PLVENG	45																				45	0.01
Strongylura exilis	California needlefish	STREXI	1	1	1	1		1	2	2	1			3	3	16		1	2	5	1	1	42	0.01
Syngnathus californiensis	kelp pipefish	SYNCAL	1		11	1	27	1		1													42	0.01
Leptocottus armatus	staghorn sculpin	LEPARM	9		2	8	2			1	1			2								11	36	0.01
Acanthogobius flavimanus	yellowfin goby	ACAFLA	1	2	3	8	6	3	1	1		4			1				4				34	0.01
Cynoscion parvipinnis	shortfin corvina	CYNPAR								1	1			1	2	3		4	3	6	9		30	0.01
Syngnathus exilis	barcheek pipefish	SYNEXI	1			13	11																25	0.01
Halichoeres semicinctus	rock wrasse	HALSEM	2	13				6	1										1	1			24	0.00
Oxyjulis californica	senorita	OXYCAL	2				19				1		2										24	0.00
Gillichthys mirabilis	longjaw mudsucker	GILMIR	1				16									1			1				19	0.00
Trachurus symmetricus	jack mackerel	TRASYM									18												18	0.00
Bryx arctos	snubnose pipefish	BRYARC		2	1	2			1											4	2	2	14	0.00
Genyonemus lineatus	white croaker	GENLIN					2				2								9				13	0.00
Hippocampus ingens	Pacific seahorse	HIPING		1			2				1	1	1	3	1	1	1		1				13	0.00
Mustelus californicus	grey smoothhound	MUSCAL	3	1						1			1			1		1	1		1	2	12	0.00
Post-larval goby	Post-larval goby	PLGOBY												9									9	0.00
Anisotremus davidsoni	sargo	ANIDAV		6		1																	7	0.00
Atractoscion nobilis	white sea bass	ATRNOB				2					3					1			1				7	0.00
Rhinobatis productus	shovelnose guitarfish	RHIPRO					1							1			1			4			7	0.00
Girella nigricans	opaleye	GIRNIG		2			2												2				6	0.00
Mustelus henlei	brown smoothhound	MUSHEN								1										5			6	0.00
Paraclinus integripinnis	reef finspot	PARINT		3												3							6	0.00
Pleuronichthys coenosus	CO turbot	PLECOE	5							1													6	0.00
Roncador stearnsii	spotfin croaker	RONSTE		2					3							1							6	0.00
Gymnura marmorata	California butterfly ray	GYMMAR																1	1	1	1		4	0.00
Pleuronichthys verticalis	hornyhead turbot	PLEVER		4																			4	0.00
Citharichthys stigmaeus	speckled sand dab	CITSTI								1			2										3	0.00
Dorosoma petenense	threadfin shad	DORPET														3							3	0.00
Menticirrhus undulatus	California corbina	MENUND																1	1			1	3	0.00
Porichthys notatus	plainfin midshipman	PORNOT	1									1							1				3	0.00
Phanerodon furcatus	white surfperch	PHAFUR					1			1													2	0.00
Zapteryx exasperata	banded guitarfish	ZAPEXA				1											1						2	0.00
Gibbonsia metzi	striped kelpfish	GIBMET								1													1	0.00
Heterodontus francisi	California hornshark	HETFRA									1												1	0.00
Medialuna californica	halfmoon	MEDCAL	1																				1	0.00
Pseudupeneus grandisquamous	red goatfish	PSEGRA																	1				1	0.00
Parophrys vetulus	English sole	PARVET	1																				1	0.00
Rimicola muscarum	kelp clingfish	RIMMUS	1																				1	0.00
Tridentiger trigonocephalus	chameleon goby	TRITRI			1																		1	0.00
TOTAL			11647	8577	2605	20978	85189	14751	3365	33964	176952	18376	3775	24855	8235	6607	9670	17928	31166	5727	5176	7801	497344	

Table 12. Total biomass (g) of fish species taken from San Diego Bay over the five years of the study, July 1994 to April 1999 by quarterly sampling period.

SCIENTIFIC NAME	COMMON NAME	SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	TOTAL	%
			MONTHS, 1994-1999																					
Urolophus halleri	round stingray	UROHAL	12381	30696	31286	61684	17442	15403	31497	31268	32279	33250	34497	40221	36984	28559	18874	11895	13982	107036	67849	29985	687070	24.76
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	7775	16747	20801	34148	25781	11273	25851	14555	15194	25807	20252	16163	17347	21454	21073	27270	14930	20556	17894	7335	382206	13.77
Engraulis mordax	northern anchovy	ENGMOR	882	5		7	49694	18688	1	20	178879		2	8				1	9471	32	13	597	258297	9.31
Myliobatis californica	bat ray	MYLCAL	4333			13000	3902			36750	484								450	173398	22250		254568	9.17
Atherinops affinis	topsmelt	ATHAFF	7977	16520	5897	4293	18574	27166	13467	8012	12486	9567	13532	36868	7509	9025	6225	9686	10787	8142	20455	5359	251547	9.06
Anchoa delicatissima	slough anchovy	ANCDEL	1552	2531	139	6314	39389	4750		3215	26894	8146	90	16476	2833	2681	69	40052	25989	973	214	153	182456	6.57
Paralabrax nebulifer	barred sand bass	PARNEB	2851	4650	535	15774	22494	7748	1928	35562	4600	2453	754	2409	8157	4629	267	2773	1914	1779	372	1282	122931	4.43
Paralichthys californicus	California halibut	PARCAL	23469	7463	4408	3832	9932	2396	10467	4645	4584	4959	5347	3792	1938	982	8508	4928	1184	1357	4339	3843	112373	4.05
Cymatogaster aggregata	shiner surfperch	CYMAGG	188	544	371	15863	5247	2335	42	22838	3958	1640	221	16371	1566	153	40	1179	687	1964	187	541	75933	2.74
Sardinops sagax	Pacific sardine	SARSAG	1	362	75		5467	2919	19		18644	11783		198	1837	6523	9021	883	1549	4248	922	17	64467	2.32
Atherinopsis californiensis	jacksmelt	ATHCAL		365	3500	1		328	830	113	635	2850	5666	312	279	647	20595	1096		777	6429		44424	1.60
Heterostichus rostratus	giant kelpfish	HETROS	2315	7168	208	1898	5357	5685	2564	1649	5238	2940	143	517	793	319	1	0	272	186	0	51	37303	1.34
Hypsopsetta guttulata	diamond turbot	HYPGUT	3009	612	1622	2400	2458	1781	666	2483	2739	1784	1246	1482	2715	3002	1096	1607	114	1047	2675	2170	36707	1.32
Leuresthes tenuis	California grunion	LEUTEN									885	1162		29380	1925			101	2123	480			36053	1.30
Cheilotrema saturnum	black croaker	CHESAT	133	1266	20	1948	2164	3094		1510	1289	18	242	1543	1892	692	1300	4264	13	894		475	22756	0.82
Rhinobatis productus	shovelnose guitarfish	RHIPRO					4598							1997			3757			10150			20502	0.74
Scomber japonicus	Pacific mackerel	SCOJAP				3147	726				8848	51			5740	168	500						19180	0.69
Umbrina roncador	yellowfin croaker	UMBRON	486	258	514	64	877	239		1500				242	91	2202		2358	635	4952	1650	400	16469	0.59
Pleuronichthys ritteri	spotted turbot	PLERIT	733	408	36	546	1482	969	1064	1626	938	393	1331	1613	847	494	657	20	465	397	1023	907	15948	0.57
Embiotoca jacksoni	black surfperch	EMBJAC	79	1091		963	5155	2024		460	676	2891		731	28	91			14				14202	0.51
Cynoscion parvipinnis	shortfin corvina	CYNPAR								750	1089			726	2	440		4540	3500	91	800		11937	0.43
Gymnura marmorata	California butterfly ray	GYMMAR																1114	7500	227	1600		10441	0.38
Xystreurys liolepis	fantail sole	XYSLIO	1622	198	336	729	30	500	393	514	1331	363		363		320	180	480	160		1048	470	9036	0.33
Scorpaena guttata	spotted scorpionfish	SCOGUT	3102	352	334	416	908	500		484	30	242	182	363				500		22	459		7893	0.28
Seriphus politus	queenfish	SERPOL				137	354	71			5392							342	25	71			6392	0.23
Mustelus californicus	grey smoothhound	MUSCAL	272	227						968			242			336		1500	115		737	1650	6047	0.22
Mustelus henlei	brown smoothhound	MUSHEN								813										4536			5349	0.19
Porichthys myriaster	specklefin midshipman	PORMYR	78			9	485	63			637		15	1341	1185	114	15	40	484	53	1	225	4744	0.17
Trachurus symmetricus	jack mackerel	TRASYM									4095												4095	0.15
Strongylura exilis	California needlefish	STREXI	1	1	109	26		133	393	605	182			516	325	474		33	163	501	250	42	3753	0.14
Micrometrus minimus	dwarf surfperch	MICMIN	201	133	22	265	1716		34	37	84	379				166							3037	0.11
Paralabrax clathratus	kelp bass	PARCLA	15	881	65	70	650	79	3	17	228	64	69	80	317	125			100	19	136		2917	0.11
Xenistius californiensis	salema	XENCAL		52		56	111	8				9		182	2419	4							2840	0.10
Sphyraena argentea	California barracuda	SPHARG	1	1											20	958		150		1700			2830	0.10
Menticirrhus undulatus	California corbina	MENUND																1100	1500			150	2750	0.10
Anchoa compressa	deepbody anchovy	ANCCOM	89		349	210	1044	62		643	4			29				14	67			15	2527	0.09
Heterodontus francisi	California hornshark	HETFRA									2420												2420	0.09
Symphurus atricauda	California tonguefish	SYMATR	308	47		172	121		91	30	695	30	212	182	20	196	98	9	5	10	43	85	2354	0.08
Hypsoblennius gentilis	bay blenny	HYPGEN	304	215	3	87	355	46	3	22	225	195	35	158	235	259	0	1	170	14		2	2329	0.08
Syngnathus leptorhynchus	bay pipefish	SYNLEP	254	138	683	60	82	151	153	98	131	147	47	83	84	11	9	4	33	39	37	59	2304	0.08
Mugil cephalus	striped mullet	MUGCEP		182	2	196		768		281							664	112	17	48			2272	0.08
Albula vulpes	bonefish	ALBVUL					2										0	28	96	823	750	100	1799	0.06
Girella nigricans	opaleye	GIRNIG		21			575												1200				1796	0.06
Atractoscion nobilis	white seabass	ATRNOB				318					909					250			250				1727	0.06
Synodus lucioceps	California lizardfish	SYNLUC	28		0	62	514			30	726		30	138			0	5	50	30	31		1645	0.06
Syngnathus auliscus	barred pipefish	SYNAUL	227	49	30	305	413	76	8	32	91	221	11	41	22	4	3	1	40	1	18	23	1615	0.06
Fundulus parvipinnis	California killifish	FUNPAR	15	19	250	160	62	7	26	7	43	42	269		80	42			115	87	220	11	1454	0.05
Roncador stearnsii	spotfin croaker	RONSTE		316					847							102							1265	0.05
Zapteryx exasperata	banded guitarfish	ZAPEXA				993											74						1067	0.04
Hyporhamphus rosae	California halfbeak	HYPROS	135	74	1	2		14	90	21	25	115	8	25	23	59			14	441	13		1059	0.04
Pleuronichthys coenosus	CO turbot	PLECOE	746							121													867	0.03
Acanthogobius flavimanus	yellowfin goby	ACAFLA	10	35	120	21	70	65	29	1		424			15				41				830	0.03
Halichoeres semicinctus	rock wrasse	HALSEM	2	10				629	83										20	0			743	0.03
Oxyjulis californica	senorita	OXYCAL	2				664				0		1										667	0.02
Genyonemus lineatus	white croaker	GENLIN					484				118								8				610	0.02
Phanerodon furcatus	white surfperch	PHAFUR					121			484													605	0.02
Anisotremus davidsoni	sargo	ANIDAV		18		579																	597	0.02
Pleuronichthys verticalis	hornyhead turbot	PLEVER		597																			597	0.02
Hippocampus ingens	Pacific seahorse	HIPING		27			61				8	30	61	121	30	25	60		65				487	0.02
Leptocottus armatus	staghorn sculpin	LEPARM	147		0	79	44			3	7			91								50	420	0.02
Gibbonsia elegans	spotted kelpfish	GIBELE	128			40	61	19			95				10						0		352	0.01
Quietula ycauda	shadow goby	QUIYCA	0	96	30	1	1	4	2	2	3	14	8	18	3	6	19	4	19	3	9	29	268	0.01
Ilypnus gilberti	cheekspot goby	ILYGIL	101	11	5	5	1		5		34	0	0	5	10	25	8	1	10	6	2	1	231	0.01
Clevelandia ios	arrow goby	CLEIOS	47	17	3	9	16	17	3	7	19	2	2	5	13	3	19	1	16	6	1	21	227	0.01
Dorosoma petenense	threadfin shad	DORPET														224							224	0.01
Syngnathus californiensis	kelp pipefish	SYNCAL	0		10	1	38	63		30													142	0.01
Pseudupeneus grandisquamous	red goatfish	PSEGRA																	100				100	0.00
Porichthys notatus	plainfin midshipman	PORNOT	9									61							0				69	0.00
Gillichthys mirabilis	longjaw mudsucker	GILMIR	11				23									10			8				51	0.00
Citharichthys stigmaeus	speckled sand dab	CITSTI								30			7										37	0.00
Bryx arctos	snubnose pipefish	BRYARC		0	0	0			0											29	1	0	31	0.00
Post-larval goby	Post-larval goby	PLGOBY												30									30	0.00
Syngnathus exilis	barcheek pipefish	SYNEXI	1			16	11																27	0.00
Parophrys vetulus	English sole	PARVET	5																				5	0.00
Paraclinus integripinnis	reef finspot	PARINT		3												1							5	0.00
Tridentiger trigonocephalus	chameleon goby	TRITRI			4																		4	0.00
Post-larval anchovy	Post-larval anchovy	PLVENG	1																				1	0.00
Gibbonsia metzi	striped kelpfish	GIBMET								0													0	0.00
Medialuna californica	halfmoon	MEDCAL	0																				0	0.00
Rimicola muscarum	kelp clingfish	RIMMUS	0																				0	0.00
TOTAL			76023	94405	71769	170905	229755	110071	90557	172237	337869	112032	84522	174817	97290	85773	93134	118092	100467	347120	152425	56048	2775311	

Table 13. Total abundance of fish species taken from San Diego Bay, July 1994 to April 1999 by vegetated, non-vegetated, and channel areas.

SPCODE	Non-vegetated	Vegetated	Channel	TOTAL
ENGMOR	112913	91879	10826	215618
ATHAFF	54678	57431	3471	115580
ANCDEL	37351	50988	8482	96821
SARSAG	5941	4773	4139	14853
CYMAGG	3946	7298	13	11257
ATHCAL	464	8169	115	8748
LEUTEN	2201	3281	110	5592
HETROS	1731	2929	28	4688
UROHAL	766	859	2241	3866
SYNLEP	1038	2383	6	3427
SYNAUL	625	2054	3	2682
CLEIOS	280	2012	2	2294
PARNEB	228	545	1074	1847
PARMAC	401	726	350	1477
ILYGIL	560	820	42	1422
PARCAL	135	78	720	933
QUIYCA	309	332	1	642
FUNPAR	6	631		637
MUGCEP	10	509	1	520
HYPROS	117	273	20	410
ANCCOM	331	30	5	366
PARCLA	82	205	11	298
EMBJAC	66	211	3	280
HYPGEN	69	194	4	267
HYPGUT	40	33	184	257
MICMIN	25	224		249
SERPOL	163	17	48	228
XENCAL	47	169	2	218
PLERIT	7	19	191	217
CHESAT	36	24	118	178
ALBVUL	19	136	20	175
SCOJAP	106	2	20	128
UMBRON	14	14	82	110
GIBELE	18	80		98
SYMATR	6	3	89	98
PORMYR	6	4	69	79
XYSLIO	4	28	40	72
SYNLUC	1	3	65	69
MYLCAL	10	15	32	57
SPHARG	50	6	1	57
SCOGUT	1	7	39	47
PLVENG	45			45
STREXI	20	17	5	42
SYNCAL	21	19	2	42
LEPARM	12	23	1	36
ACAFLA	7	27		34
CYNPAR	12	12	6	30
SYNEXI		25		25
HALSEM	7	12	5	24
OXYCAL	5	17	2	24
GILMIR	4	15		19
TRASYM	18			18
BRYARC	5	9		14
GENLIN	1	10	2	13
HIPING	1	4	8	13
MUSCAL	6	1	5	12
PLGOBY			9	9
ANIDAV	5	2		7
ATRNOB	2	1	4	7
RHIPRO	1		6	7
GIRNIG	2	4		6
MUSHEN	1		5	6
PARINT		6		6
PLECOE			6	6
RONSTE			6	6
GYMMAR		2	2	4
PLEVER			4	4
CITSTI	2		1	3
DORPET			3	3
MENUND	2	1		3
PORNOT	1		2	3
PHAFUR	1		1	2
ZAPEXA		2		2
GIBMET	1			1
HETFRA			1	1
MEDCAL		1		1
PARVET		1		1
RIMMUS		1		1
TRITRI		1		1
MULDEN			**1**	**1**
TOTAL	**224983**	**239607**	**32754**	**497344**

Table 14. Estimated percent of juveniles in the catch of the top 35 species of fish from San Diego Bay, July 1994 - April 1999.

SCIENTIFIC NAME	COMMON NAME	SPCODE	%JUV
Engraulis mordax	northern anchovy	ENGMOR	100
Gibbonsia elegans	spotted kelpfish	GIBELE	100
Heterostichus rostratus	giant kelpfish	HETROS	100
Paralabrax clathratus	kelp bass	PARCLA	100
Paralichthys californicus	California halibut	PARCAL	99
Albula vulpes	bonefish	ALBVUL	99
Paralabrax nebulifer	barred sand bass	PARNEB	97
Sardinops sagax	Pacific sardine	SARSAG	96
Mugil cephalus	striped mullet	MUGCEP	95
Xenistius californiensis	salema	XENCAL	94
Clevelandia ios	arrow goby	CLEIOS	79
Syngnathus auliscus	barred pipefish	SYNAUL	78
Syngnathus leptorhynchus	bay pipefish	SYNLEP	76
Atherinops affinis	topsmelt	ATHAFF	73
Seriphus politus	queenfish	SERPOL	73
Fundulus parvipinnis	California killifish	FUNPAR	72
Quietula ycauda	shadow goby	QUIYCA	71
Atherinopsis californiensis	jacksmelt	ATHCAL	69
Porichthys myriaster	specklefin midshipman	PORMYR	67
Ilypnus gilberti	cheekspot goby	ILYGIL	67
Embiotoca jacksoni	black surfperch	EMBJAC	66
Leuresthes tenuis	California grunion	LEUTEN	66
Umbrina roncador	yellowfin croaker	UMBRON	66
Micrometrus minimus	dwarf surfperch	MICMIN	63
Xystreurys liolepis	fantail sole	XYSLIO	61
Urolophus halleri	round stingray	UROHAL	53
Cymatogaster aggregata	shiner surfperch	CYMAGG	51
Anchoa delicatissima	slough anchovy	ANCDEL	43
Hypsoblennius gentilis	bay blenny	HYPGEN	37
Cheilotrema saturnum	black croaker	CHESAT	36
Pleuronichthys ritteri	spotted turbot	PLERIT	35
Anchoa compressa	deepbody anchovy	ANCCOM	23
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	22
Hypsopsetta guttulata	diamond turbot	HYPGUT	18
		TOTAL	69

Table 15. Percent number (%N), percent biomass (%WT), percent frequency of occurrence, and ecologival index (EI = (%N + %WT) %FREQ) of San Diego Bay fishes, July 1994 - April 1999.

RANK	SPCODE	%N	%WT	%FREQ	E.I.
1	ATHAFF	23.24	9.06	100.00	3230.32
2	UROHAL	0.78	24.76	100.00	2553.38
3	ENGMOR	43.35	9.31	45.00	2369.74
4	ANCDEL	19.47	6.57	68.75	1790.38
5	PARMAC	0.30	13.77	96.25	1354.10
6	PARNEB	0.37	4.43	96.25	462.08
7	PARCAL	0.19	4.05	100.00	423.66
8	CYMAGG	2.26	2.74	72.50	362.46
9	SARSAG	2.99	2.32	40.00	212.37
10	HETROS	0.94	1.34	75.00	171.50
11	MYLCAL	0.01	9.17	13.75	126.28
12	ATHCAL	1.76	1.60	36.25	121.79
13	HYPGUT	0.05	1.32	86.25	118.53
14	SYNLEP	0.69	0.08	91.25	70.45
15	SYNAUL	0.54	0.06	85.00	50.78
16	LEUTEN	1.12	1.30	20.00	48.47
17	CHESAT	0.04	0.82	52.50	44.93
18	PLERIT	0.04	0.57	55.00	34.00
19	CLEIOS	0.46	0.01	67.50	31.69
20	UMBRON	0.02	0.59	31.25	19.23
21	ILYGIL	0.29	0.01	61.25	18.02
22	EMBJAC	0.06	0.51	21.25	12.07
23	XYSLIO	0.01	0.33	27.50	9.35
24	SCOJAP	0.03	0.69	11.25	8.06
25	QUIYCA	0.13	0.01	53.75	7.46
26	SCOGUT	0.01	0.28	22.50	6.61
27	PORMYR	0.02	0.17	35.00	6.54
28	HYPROS	0.08	0.04	53.75	6.48
29	FUNPAR	0.13	0.05	33.75	6.09
30	HYPGEN	0.05	0.08	43.75	6.02
31	CYNPAR	0.01	0.43	13.75	6.00
32	PARCLA	0.06	0.11	36.25	5.98
33	STREXI	0.01	0.14	28.75	4.13
34	ANCCOM	0.07	0.09	23.75	3.91
35	RHIPRO	0.00	0.74	5.00	3.70
36	SYMATR	0.02	0.08	28.75	3.01
37	SERPOL	0.05	0.23	10.00	2.76
38	MUSCAL	0.00	0.22	12.50	2.75
39	MUGCEP	0.10	0.08	13.75	2.56
40	XENCAL	0.04	0.10	17.50	2.56
41	MICMIN	0.05	0.11	15.00	2.39
42	GYMMAR	0.00	0.38	5.00	1.89
43	SYNLUC	0.01	0.06	21.25	1.55
44	ALBVUL	0.04	0.06	15.00	1.50
45	SPHARG	0.01	0.10	8.75	0.99
46	ACAFLA	0.01	0.03	20.00	0.73
47	GIBELE	0.02	0.01	17.50	0.57
48	HIPING	0.00	0.02	27.50	0.55
49	MUSHEN	0.00	0.19	2.50	0.48
50	LEPARM	0.01	0.02	20.00	0.45
51	MENUND	0.00	0.10	3.75	0.37
52	ATRNOB	0.00	0.06	5.00	0.32
53	GIRNIG	0.00	0.06	3.75	0.25
54	HALSEM	0.00	0.03	7.50	0.24
55	TRASYM	0.00	0.15	1.25	0.19
56	RONSTE	0.00	0.05	3.75	0.18
57	SYNCAL	0.01	0.01	12.50	0.17
58	OXYCAL	0.00	0.02	5.00	0.14
59	HETFRA	0.00	0.09	1.25	0.11
60	ZAPEXA	0.00	0.04	2.50	0.10
61	GENLIN	0.00	0.02	3.75	0.09
62	PLECOE	0.00	0.03	2.50	0.08
63	ANIDAV	0.00	0.02	2.50	0.06
64	PHAFUR	0.00	0.02	2.50	0.06
65	SYNEXI	0.01	0.00	7.50	0.05
66	BRYARC	0.00	0.00	10.00	0.04
67	GILMIR	0.00	0.00	5.00	0.03
68	PLEVER	0.00	0.02	1.25	0.03
69	PORNOT	0.00	0.00	3.75	0.01
70	PLVENG	0.01	0.00	1.25	0.01
71	DORPET	0.00	0.01	1.25	0.01
72	PARINT	0.00	0.00	3.75	0.01
73	CITSTI	0.00	0.00	2.50	0.00
74	PSEGRA	0.00	0.00	1.25	0.00
75	PLGOBY	0.00	0.00	1.25	0.00
76	PARVET	0.00	0.00	1.25	0.00
77	TRITRI	0.00	0.00	1.25	0.00
78	GIBMET	0.00	0.00	1.25	0.00
79	MEDCAL	0.00	0.00	1.25	0.00
80	RIMMUS	0.00	0.00	1.25	0.00

Table 16. Two-way table of ordinated species groups by depth strata (I = intertidal, N = nearshore, C = channel), station, and month of capture for the San Diego Bay fishes captured between July 1994 and April 1999.

SPPGRPS			1	1	1	1	1	2	2	2	3	3	4	4	5	5	5	6	6	7	7	7	7	7	8	8	9	9	10	10	10	11	11	11	12	12	12	12	13	13	13	13
DEP	STA	Mo	ATHAFF	LEUTEN	SERPOL	SARSAG	ENGMOR	SCOJAP	CYMAGG	ANCDEL	HYPROS	FUNPAR	XENCAL	PARCLA	UMBRON	MYLCAL	CYNPAR	PARMACr	ANCCOM	SYNLEP	SYNAUL	HYPGEN	HETROS	GIBELE	MICMIN	EMBJAC	QUIYCA	CLEIOS	PARCALr	ILYGIL	HYPGUTr	ATHCAL	MUGCEP	ALBVUL	SYMATR	PLERIT	PARCAL	HYPGUT	UROHAL	PARNEB	PARMAC	CHESAT
I	1	1	1166			96	2													8	1		2		4		3	2		10	1	237	8				2		1			
I	1	4	17980						28											48	21		37	1	49	11	8	7	10	22	2	1		2		2	14	1	2			
I	1	7	7066				16		12	5	1								1	4	5		3			1		5	4		1						1	1	3			
I	1	10	2001	157		138	1		7	32	17									58	10	3	50		27	4		1		6		2		8						1		
I	2	1	2483			1				12		6								46	21		3				46	20		14	1	7259	1	2								
I	2	4	29677				1		20											37	102	2	95		1		82	49	1	30	6			55			2	3		17		
I	2	7	3805		5		1007		55	2283	1	8			3		1		2	3	8		24				1	116	1	469	2	1		10			1	3	1	4	2	
I	2	10	1576			2			1	518	14	15							1	11	12	1	45				6	43	1	38				28					123			
I	3	1	692								6	9								53	34						14	5	2	14		649	1				2		4	1		
I	3	4	5120	360					161	91	2									85	75	1	42				19	57	3	9	2							1	2	15	10	
I	3	7	2862				12		3	1418	7			1						27	52	1	69						1	15				4			1	1	2	2	1	
I	3	10	1051							422	164	1	1		1				1	21	12		30	1			4	7		9									2	4		
I	4	1	680								37	213								8	1						87	308		33	6	82	271									
I	4	4	2223							1177	20	25							1		2						27	222		26			232	38		3		2	2		1	
I	4	7	1001							772	30	271					1		1	2	6						42	552		71			1	1					3			
I	4	10	1145				42			971	32	87					4				3						49	250		1			1								1	
N	1	1	1572			76			4					4						139	36	9	65	1			7	5	2	4		55				11	5		4	5	6	
N	1	4	2386	608		20	1		2388					5				1		39	60	3	391		3	42	14	27		37					8	4	10	1	27	8	15	
N	1	7	7693	2983	166	7151	116156	10	616	3026				24			1	8		155	170	19	742	54	111	130		3	9	469		2			1	3	22	1	79	32	54	17
N	1	10	2311	368	2	1422	3		135	823			74	227	6			1		248	86	93	386		50	81	8		3	4		18					16	2	109	113	70	2
N	2	1	2332			3	1		5	58				5				1		296	56	3	29				20	14		16		6				2	4		20	11	98	
N	2	4	680	766	7		2		2831	2893			1	6			4	10	209	316	131	53	755	6	2	5	27	239		1							6	3	45	127	125	
N	2	7	7393			1191	83032	96	432	16256			86	8				5		303	193	53	643	29		2	4			3		8					3	2	27	160	110	16
N	2	10	1984			188	38	1	466	2332			29	3			2	7		381	254	14	383			1	7	3		11		1					3	3	102	130	112	5
N	3	1	320					1	3		2				1			1		408	63		59				18	6	2	7		7				1	7	2	131	10	57	
N	3	4	376	240			7		2469	7430			13	3	4	1	2	8		176	147	1	463				16	2		1							12	1	84	69	82	13
N	3	7	1675			327	3524		522	15372	7		1					1	19	111	149	6	160	1	2			3		3							20	4	56	20	48	4
N	3	10	383			29	2		35	2105	14		9		1			3	1	157	66		54	1			13	1	1			1					8	3	80	18	47	2
N	4	1	896			69			22	412	5	2		1	4	15	9	1	22	33	28	1	2				68	3	2	47		280	1	5			10	2	340	2	63	
N	4	4	267				405		1024	12566	2				3	7			49	160	218		96	1			14	58		8		18		1			4	2	196	8	55	
N	4	7	1028			1	65			3005	3		2			1			47	86	649		29	3			7	259	1	1	2			1			10	8	73	7	20	
N	4	10	285				475		5	14360	26				5	1			7	2	8		3				30	25		1		6	3				9	4	106	9	74	1
C	1	1	50			16	1							5						2			1									81			11	36	43	9	6	10	4	
C	1	4	9		3		5		1	3																		1				1			19	29	46	14	41	14	5	13
C	1	7	596	40	1	353	5672			337						1	3						3							4					27	21	107	30	14	67	24	14
C	1	10	1226	69	44	3692	31	1		89			2	3	36	26	2				1	1	7			3				24		2			21	14	22	6	429	61	4	9
C	2	1	48			22								1						1												15			3	20	63	16	80	56	14	1
C	2	4	93	1		10	3			1173					1								3											20	2	23	47	8	401	228	20	4
C	2	7	120				1		11	1				1									9												6	25	38	10	158	146	35	10
C	2	10	849				4840										1					3														14	30	14	103	75	29	3
C	3	1	160			3					1							1		2			1						1	12		6				1	37	5	19	12	18	
C	3	4	81			1	6	19	1	1233					16				2													1				2	18	11	91	97	24	8
C	3	7	53			4	5			3798					12	1												1			5						31	5	95	75	14	2
C	3	10	18			34				5					2			1					3													1	23	8	154	19	19	2
C	4	1	9				61				19			1				1		1	1						1					7				2	69	7	222	45	67	9
C	4	4	33				30			405					2				3				1										1			1	46	12	246	83	32	22
C	4	7	64			4	114			913					8	4													1	2						1	62	21	102	57	9	9
C	4	10	62				57			525					5			2			1											2				1	39	9	80	29	20	12

Table 17. Indigenous Bay/Estuarine species captured in San Diego Bay from July 1994 to April 1999.
Note the increasing total abundance of these 12 species from north to south in the bay.

			STATIONS, 1994-1999					
Scientific Name	**Common Name**	**SPCODE**	**1**	**2**	**3**	**4**	**TOTAL**	**%**
Anchoa delicatissima	slough anchovy	ANCDEL	4,315	25,526	31,874	35,106	96,821	19.47
Syngnathus leptorhynchus	bay pipefish	SYNLEP	701	1,394	1,040	292	3,427	0.69
Syngnathus auliscus	barred pipefish	SYNAUL	390	777	598	917	2,682	0.54
Clevelandia ios	arrow goby	CLEIOS	51	484	82	1,677	2,294	0.46
Paralabrax maculatofasciatus	spotted sand bass	PARMAC	226	570	334	347	1,477	0.30
Ilypnus gilberti	cheekspot goby	ILYGIL	580	582	70	190	1,422	0.29
Quietula ycauda	shadow goby	QUIYCA	40	193	84	325	642	0.13
Fundulus parvipinnis	California killifish	FUNPAR		29	10	598	637	0.13
Mugil cephalus	striped mullet	MUGCEP	8	1	1	510	520	0.10
Anchoa compressa	deepbody anchovy	ANCCOM	1	212	23	130	366	0.07
Hypsoblennius gentilis	bay blenny	HYPGEN	128	129	9	1	267	0.05
Gillichthys mirabilis	longjaw mudsucker	GILMIR				19	19	0.00
		TOTAL	6,440	29,897	34,125	40,112	110,574	

Table 18. Pearson correlation coefficients (r) for PC Factors versus log-transformed (log10(x+1)) measures of abundance (No.) and biomass (Wt.) of all fishes and the 35 most abundant individual species taken in each quarterly sampling from San Diego Bay, July 1994-April 1999 (Critical $r_{[.05]}$ = 0.217; *df* = 78). Bold r-values are statistically significant.

VAR	TEMP	SAL	PH	DO
TEMP	1.000			
SAL	**0.477**	1.000		
PH	0.165	-0.016	1.000	
DO	**-0.412**	-0.175	**0.316**	1.000
NUMBER	**0.230**	-0.003	-0.075	0.041
WEIGHT	0.013	-0.031	-0.109	0.002
ALBVUL	0.072	**-0.376**	-0.098	-0.161
ANCCOM	**0.302**	0.168	-0.008	-0.077
ANCDEL	**0.590**	0.067	-0.097	**-0.257**
ATHAFF	-0.009	0.050	-0.025	0.119
ATHCAL	**-0.425**	**-0.326**	-0.096	0.173
CHESAT	**0.263**	0.061	0.019	-0.087
CLEIOS	0.173	0.134	-0.117	0.006
CYMAGG	0.070	-0.086	-0.098	0.012
EMBJAC	-0.064	0.110	0.032	**0.231**
ENGMOR	**0.332**	0.216	-0.053	-0.055
FUNPAR	**0.257**	**0.280**	-0.108	-0.137
GIBELE	0.159	0.006	0.160	**0.239**
HETROS	0.065	0.193	0.164	**0.290**
HYPGEN	0.062	0.053	0.087	0.043
HYPGUT	0.056	-0.170	0.012	0.131
HYPROS	**0.366**	**0.450**	**0.278**	-0.137
ILYGIL	0.056	-0.141	**0.227**	**0.238**
LEUTEN	-0.001	-0.070	-0.120	-0.205
MICMIN	-0.029	0.025	0.200	**0.388**
MUGCEP	-0.051	**-0.372**	-0.016	0.100
PARCAL	-0.193	-0.201	**0.221**	0.157
PARCLA	-0.150	0.046	-0.018	0.057
PARMAC	0.047	-0.125	-0.075	-0.058
PARNEB	0.195	0.138	-0.013	0.120
PLERIT	**-0.383**	-0.083	0.017	0.184
QUIYCA	-0.207	-0.133	-0.141	0.013
SARSAG	-0.020	0.079	**-0.233**	-0.070
SCOJAP	0.061	0.027	-0.114	0.083
SERPOL	-0.046	0.005	-0.101	0.031
SYMATR	-0.167	-0.156	0.085	0.168
SYNAUL	0.088	0.200	0.121	0.309
SYNLEP	**-0.220**	0.037	0.141	0.329
UMBRON	**0.323**	0.039	-0.058	-0.182
UROHAL	0.128	0.099	-0.025	0.000
XENCAL	0.123	0.194	0.070	0.055

Table 19. Results of canonical correlation analysis for three PC factors (Station, Temperature, Salinity) versus log-abundance of the 35 most abundant individual species taken in each quarterly sampling from San Diego Bay, July 1994-April 1999.

Chi-Square Tests with Successive Roots Removed

	Canonicl R	Canonicl R-sqr.	Chi-sqr.	df	p
0	**.972146**	**.945067**	**276.2583**	**105**	**<.000001**
1	**.870738**	**.758184**	**126.8233**	**68**	**.000021**
2	.804741	.647607	53.7150	33	.012859

Canonical Weights, Physical-chemical factors

	Root 1	Root 2	Root 3
STA	**-.972589**	-.464462	-.041815
TEMP	-.088730	**1.174309**	-.282786
SAL	.053029	-.264008	**1.105841**

Canonical Weights, Species Abundance

	Root 1	Root 2	Root 3
ALBVUL	.072762	.326370	-.112312
ANCCOM	-.170416	.198004	.119276
ANCDEL	-.178392	.415636	-.206895
ATHAFF	.164063	-.012951	.012806
ATHCAL	.062673	-.159520	-.174205
CHESAT	.055596	-.128776	-.037180
CLEIOS	-.081509	.127028	-.060966
CYMAGG	-.031083	-.306681	-.395605
EMBJAC	.027063	.496893	.153325
ENGMOR	-.107116	.341653	.166010
FUNPAR	-.063239	-.300980	.152874
GIBELE	-.184535	.033863	.119680
HETROS	.117846	.319537	.377163
HYPGEN	.092414	.437677	-.214244
HYPGUT	.039425	.222010	-.261625
HYPROS	-.137804	.312276	.266588
ILYGIL	.018649	.183977	-.202793
LEUTEN	-.007627	.204012	-.066741
MICMIN	.055329	-.148224	-.041154
MUGCEP	-.121896	-.003371	-.424312
PARCAL	-.087943	-.004801	-.283348
PARCLA	.036199	-.083927	.123655
PARMAC	-.078613	-.293735	-.105029
PARNEB	.104044	.198307	-.057796
PLERIT	.125127	-.323445	.042643
QUIYCA	-.152645	-.053751	.211329
SARSAG	.287976	-.157575	.265101
SCOJAP	-.041543	.060542	-.025331
SERPOL	-.038112	-.475700	-.071546
SYMATR	.243482	.160277	-.134889
SYNAUL	-.112012	-.349485	.233725
SYNLEP	.139487	-.138421	-.290744
UMBRON	-.038107	.129125	-.163258
UROHAL	-.127331	-.183647	.232350
XENCAL	-.143905	.049938	.025328

Table 20. Total abundance of fish species taken from San Diego Bay, July 1994 to April 1999 by sampling method (gear).

Sum of TOTAL#						SAMPLING GEAR											
SQUARE ENCLOSURE			SMALL SEINE			LARGE SEINE			BEAM TRAWL			PURSE SEINE			OTTER TRAWL		
SPCODE	No.	%	SPCODE	No.	%	SPCODE	No.	%	SPCODE	No.	%	SPCODE	No.	%	SPCODE	No.	%
CLEIOS	659	41.50	ATHAFF	52697	82.04	ATHAFF	28535	71.10	HETROS	3233	22.19	ENGMOR	214222	57.84	UROHAL	2225	34.56
ATHAFF	508	31.99	ATHCAL	7964	12.40	ANCDEL	7050	17.57	SYNLEP	2971	20.40	ANCDEL	88179	23.81	PARNEB	1063	16.51
QUIYCA	228	14.36	CLEIOS	866	1.35	ENGMOR	648	1.61	SYNAUL	2245	15.41	ATHAFF	33795	9.12	ANCDEL	773	12.00
ILYGIL	123	7.75	ANCDEL	656	1.02	LEUTEN	517	1.29	CYMAGG	1324	9.09	SARSAG	14610	3.94	PARCAL	719	11.17
SYNAUL	16	1.01	ILYGIL	590	0.92	FUNPAR	400	1.00	UROHAL	1034	7.10	CYMAGG	9643	2.60	ENGMOR	311	4.83
SYNLEP	15	0.94	ENGMOR	433	0.67	MUGCEP	389	0.97	CLEIOS	647	4.44	LEUTEN	5075	1.37	PARMAC	286	4.44
ATHCAL	11	0.69	FUNPAR	227	0.35	HETROS	378	0.94	ILYGIL	611	4.19	HETROS	1051	0.28	PLERIT	191	2.97
FUNPAR	8	0.50	SYNLEP	198	0.31	HYPROS	322	0.80	PARNEB	499	3.43	PARMAC	848	0.23	HYPGUT	184	2.86
PARCAL	7	0.44	SYNAUL	171	0.27	CYMAGG	281	0.70	PARMAC	339	2.33	ATHCAL	515	0.14	CHESAT	118	1.83
HYPGEN	3	0.19	MUGCEP	126	0.20	ATHCAL	256	0.64	QUIYCA	248	1.70	UROHAL	462	0.12	SYMATR	89	1.38
HYPGUT	3	0.19	QUIYCA	117	0.18	SARSAG	235	0.59	HYPGEN	246	1.69	ANCCOM	325	0.09	UMBRON	76	1.18
LEPARM	2	0.13	ALBVUL	57	0.09	SYNLEP	198	0.49	PARCLA	235	1.61	PARNEB	241	0.07	PORMYR	69	1.07
ACAFLA	1	0.06	PLVENG	30	0.05	SYNAUL	178	0.44	ANCDEL	163	1.12	SERPOL	219	0.06	SYNLUC	64	0.99
ALBVUL	1	0.06	HETROS	21	0.03	UROHAL	145	0.36	PARCAL	134	0.92	EMBJAC	174	0.05	ILYGIL	42	0.65
BRYARC	1	0.06	LEPARM	14	0.02	CLEIOS	119	0.30	MICMIN	116	0.80	XENCAL	166	0.04	XYSLIO	40	0.62
CYMAGG	1	0.06	MICMIN	11	0.02	ALBVUL	90	0.22	GIBELE	95	0.65	SCOJAP	127	0.03	SCOGUT	39	0.61
HETROS	1	0.06	HYPGUT	10	0.02	MICMIN	70	0.17	EMBJAC	88	0.60	HYPROS	72	0.02	MYLCAL	28	0.43
			HYPROS	9	0.01	ILYGIL	54	0.13	XENCAL	51	0.35	SYNAUL	70	0.02	PARCLA	9	0.14
			CYMAGG	6	0.01	PARNEB	43	0.11	ATHAFF	37	0.25	SPHARG	55	0.01	PLGOBY	9	0.14
			EMBJAC	6	0.01	QUIYCA	43	0.11	CHESAT	32	0.22	PARCLA	53	0.01	ATHAFF	8	0.12
			PARCAL	5	0.01	PARCAL	34	0.08	SYNCAL	31	0.21	MICMIN	52	0.01	HIPING	6	0.09
			CYNPAR	4	0.01	HYPGUT	20	0.05	ANCCOM	29	0.20	SYNLEP	44	0.01	PLECOE	6	0.09
			GILMIR	4	0.01	ACAFLA	18	0.04	HYPGUT	28	0.19	PARCAL	34	0.01	RHIPRO	6	0.09
			STREXI	3	0.00	LEPARM	18	0.04	SYNEXI	20	0.14	XYSLIO	32	0.01	RONSTE	6	0.09
			ACAFLA	2	0.00	PLVENG	15	0.04	HALSEM	16	0.11	UMBRON	30	0.01	SARSAG	6	0.09
			GIRNIG	2	0.00	STREXI	12	0.03	BRYARC	12	0.08	MYLCAL	29	0.01	ANCCOM	5	0.08
			SARSAG	2	0.00	EMBJAC	10	0.02	PLERIT	11	0.08	CHESAT	28	0.01	HALSEM	5	0.08
			ANCCOM	1	0.00	ANCCOM	6	0.01	GILMIR	10	0.07	ALBVUL	27	0.01	MUSHEN	5	0.08
			BRYARC	1	0.00	GILMIR	5	0.01	SYMATR	9	0.06	STREXI	27	0.01	HETROS	4	0.06
			PARNEB	1	0.00	HYPGEN	5	0.01	HYPROS	7	0.05	CYNPAR	22	0.01	HYPGEN	4	0.06
			SYNCAL	1	0.00	PLERIT	5	0.01	PORMYR	7	0.05	TRASYM	18	0.00	MUSCAL	4	0.06
						SERPOL	5	0.01	PARINT	6	0.04	OXYCAL	17	0.00	PLEVER	4	0.06
						SYNEXI	5	0.01	ANIDAV	5	0.03	ACAFLA	13	0.00	SERPOL	4	0.06
						PARMAC	4	0.01	OXYCAL	5	0.03	HYPGUT	12	0.00	ATRNOB	3	0.05
						SYNCAL	4	0.01	ENGMOR	4	0.03	GENLIN	11	0.00	CLEIOS	2	0.03
						UMBRON	4	0.01	SCOGUT	4	0.03	PLERIT	10	0.00	CYMAGG	2	0.03
						MUSCAL	3	0.01	HIPING	3	0.02	HYPGEN	9	0.00	CYNPAR	2	0.03
						CYNPAR	2	0.00	SYNLUC	3	0.02	MUGCEP	5	0.00	EMBJAC	2	0.03
						GIBELE	2	0.00	FUNPAR	2	0.01	MUSCAL	5	0.00	GENLIN	2	0.03
						SPHARG	2	0.00	ATHCAL	1	0.01	QUIYCA	5	0.00	GYMMAR	2	0.03
						MEDCAL	1	0.00	GIBMET	1	0.01	ATRNOB	4	0.00	OXYCAL	2	0.03
						PARCLA	1	0.00	LEPARM	1	0.01	GIRNIG	4	0.00	PORNOT	2	0.03
						TRITRI	1	0.00	PARVET	1	0.01	HIPING	4	0.00	SYNAUL	2	0.03
						XENCAL	1	0.00	PORNOT	1	0.01	SCOGUT	4	0.00	SYNCAL	2	0.03
									RIMMUS	1	0.01	SYNCAL	4	0.00	ATHCAL	1	0.02
									ZAPEXA	1	0.01	DORPET	3	0.00	CITSTI	1	0.02
												HALSEM	3	0.00	HETFRA	1	0.02
												MENUND	3	0.00	LEPARM	1	0.02
												PORMYR	3	0.00	PHAFUR	1	0.02
												ANIDAV	2	0.00	QUIYCA	1	0.02
												CITSTI	2	0.00	SCOJAP	1	0.02
												GYMMAR	2	0.00	SYNLEP	1	0.02
												ILYGIL	2	0.00			
												SYNLUC	2	0.00			
												CLEIOS	1	0.00			
												GIBELE	1	0.00			
												MULDEN	1	0.00			
												MUSHEN	1	0.00			
												PHAFUR	1	0.00			
												RHIPRO	1	0.00			
												ZAPEXA	1	0.00			
TOTAL	1588			64235			40134			14567			370381			6439	
No.Spp.	17			31			44			46			61			52	

Table 21. Total biomass (g) of fish species taken from San Diego Bay, July 1994 to April 1999 ranked by sampling method.

Sum of TOTALWT								SAMPLING GEAR									
SQUARE ENCLOSURE			SMALL SEINE			LARGE SEINE			BEAM TRAWL			PURSE SEINE			OTTER TRAWL		
SPCODE	Wt (g)	%	SPCODE	Wt (g)	%	SPCODE	Wt (g)	%	SPCODE	Wt (g)	%	SPCODE	Wt (g)	%	SPCODE	Wt (g)	%
ATHAFF	91	29.74	ATHAFF	6382	78.26	ATHAFF	71281	67.09	UROHAL	178764	57.53	ENGMOR	256550	18.90	UROHAL	413992	41.71
CLEIOS	54	17.74	ANCDEL	281	3.45	ANCDEL	7739	7.28	PARMAC	66114	21.28	PARMAC	250779	18.47	MYLCAL	175731	17.71
HYPGUT	38	12.59	HETROS	235	2.88	LEUTEN	6228	5.86	HETROS	25075	8.07	ANCDEL	173526	12.78	PARNEB	104724	10.55
QUIYCA	30	9.77	FUNPAR	185	2.27	UROHAL	5354	5.04	PARCAL	13011	4.19	ATHAFF	173178	12.76	PARCAL	92214	9.29
FUNPAR	22	7.21	ENGMOR	143	1.75	HETROS	3548	3.34	PARNEB	6243	2.01	UROHAL	88960	6.55	PARMAC	64617	6.51
CYMAGG	20	6.56	SYNAUL	136	1.67	CYMAGG	1525	1.44	CYMAGG	5815	1.87	MYLCAL	78836	5.81	HYPGUT	32794	3.30
PARCAL	15	4.85	ATHCAL	128	1.57	FUNPAR	1243	1.17	EMBJAC	2768	0.89	CYMAGG	68424	5.04	CHESAT	19905	2.01
ILYGIL	11	3.72	LEPARM	125	1.53	ENGMOR	1060	1.00	HYPGEN	1932	0.62	SARSAG	63228	4.66	RHIPRO	16745	1.69
SYNAUL	6	2.00	CLEIOS	80	0.98	SARSAG	1000	0.94	HYPGUT	1904	0.61	ATHCAL	43677	3.22	PLERIT	15043	1.52
HYPGEN	6	1.93	SYNLEP	65	0.79	ALBVUL	909	0.86	SYNLEP	1492	0.48	LEUTEN	29825	2.20	XYSLIO	9016	0.91
LEPARM	3	1.02	HYPGUT	62	0.76	PARMAC	696	0.65	SYNAUL	1314	0.42	SCOJAP	19012	1.40	GYMMAR	7727	0.78
SYNLEP	3	0.98	MICMIN	61	0.74	HYPROS	672	0.63	PARCLA	1244	0.40	CYNPAR	11845	0.87	UMBRON	7568	0.76
HETROS	3	0.95	ACAFLA	41	0.50	PARNEB	653	0.61	ZAPEXA	993	0.32	PARNEB	11307	0.83	SCOGUT	7399	0.75
ACAFLA	2	0.66	ILYGIL	38	0.47	ATHCAL	617	0.58	MICMIN	864	0.28	EMBJAC	10631	0.78	MUSHEN	4536	0.46
ATHCAL	1	0.23	EMBJAC	35	0.42	PARCAL	487	0.46	PLERIT	687	0.22	UMBRON	8750	0.64	PORMYR	4341	0.44
BRYARC	0.3	0.10	MUGCEP	30	0.37	ACAFLA	472	0.44	ATHAFF	529	0.17	HETROS	8381	0.62	HETFRA	2420	0.24
ALBVUL	0.1	0.03	PARCAL	30	0.37	MUGCEP	409	0.39	GIBELE	341	0.11	PARCAL	6617	0.49	SYMATR	2339	0.24
			QUIYCA	27	0.33	STREXI	348	0.33	PORMYR	212	0.07	SERPOL	6033	0.44	SYNLUC	1642	0.17
			GIRNIG	21	0.25	EMBJAC	331	0.31	CHESAT	196	0.06	MUSCAL	4233	0.31	MUSCAL	1542	0.16
			GILMIR	19	0.23	MICMIN	326	0.31	QUIYCA	174	0.06	TRASYM	4095	0.30	RONSTE	1265	0.13
			CYMAGG	10	0.12	MUSCAL	272	0.26	HIPING	152	0.05	RHIPRO	3757	0.28	PLECOE	867	0.09
			ALBVUL	9	0.12	LEPARM	195	0.18	SCOGUT	134	0.04	STREXI	3404	0.25	ANCDEL	858	0.09
			HYPROS	5	0.06	HYPGUT	177	0.17	HYPROS	127	0.04	SPHARG	2829	0.21	PLEVER	597	0.06
			PARNEB	4	0.05	UMBRON	151	0.14	ILYGIL	121	0.04	XENCAL	2814	0.21	ATRNOB	568	0.06
			ANCCOM	2	0.03	HYPGEN	108	0.10	HALSEM	113	0.04	MENUND	2750	0.20	ENGMOR	544	0.05
			STREXI	1	0.02	SYNLEP	101	0.09	CLEIOS	69	0.02	GYMMAR	2714	0.20	HALSEM	533	0.05
			CYNPAR	1	0.01	SYNAUL	91	0.09	ANCDEL	52	0.02	CHESAT	2654	0.20	GENLIN	484	0.05
			SYNCAL	1	0.01	ANCCOM	77	0.07	OXYCAL	41	0.01	ANCCOM	2374	0.17	EMBJAC	438	0.04
			PLVENG	1	0.01	ILYGIL	49	0.05	SYNCAL	40	0.01	MUGCEP	1832	0.13	SERPOL	334	0.03
			SARSAG	0.2	0.00	GILMIR	29	0.03	LEPARM	37	0.01	MICMIN	1787	0.13	SARSAG	238	0.02
			BRYARC	0.1	0.00	SERPOL	25	0.02	BRYARC	30	0.01	GIRNIG	1775	0.13	HIPING	214	0.02
						QUIYCA	24	0.02	ANCCOM	29	0.01	HYPGUT	1732	0.13	PARCLA	199	0.02
						CLEIOS	18	0.02	XENCAL	26	0.01	PARCLA	1474	0.11	SCOJAP	168	0.02
						GIBELE	12	0.01	SYNEXI	22	0.01	ATRNOB	1159	0.09	CYMAGG	140	0.01
						PLERIT	10	0.01	SYMATR	15	0.00	ALBVUL	880	0.06	PHAFUR	121	0.01
						SYNEXI	5	0.00	ANIDAV	15	0.00	MUSHEN	813	0.06	SYNCAL	93	0.01
						TRITRI	4	0.00	PARVET	5	0.00	SYNLEP	643	0.05	CYNPAR	90	0.01
						CYNPAR	1	0.00	PARINT	5	0.00	OXYCAL	625	0.05	ATHAFF	87	0.01
						SYNCAL	1	0.00	FUNPAR	4	0.00	ANIDAV	582	0.04	PORNOT	69	0.01
						SPHARG	1	0.00	GILMIR	4	0.00	PHAFUR	484	0.04	HETROS	62	0.01
						MEDCAL	0.3	0.00	SYNLUC	2	0.00	SCOGUT	360	0.03	LEPARM	61	0.01
						PLVENG	0.3	0.00	ENGMOR	1	0.00	ACAFLA	315	0.02	ANCCOM	44	0.00
						PARCLA	0.1	0.00	GIBMET	0.3	0.00	HYPROS	256	0.02	CITSTI	30	0.00
						XENCAL	0.1	0.00	ATHCAL	0.2	0.00	HYPGEN	254	0.02	PLGOBY	30	0.00
									PORNOT	0.1	0.00	DORPET	224	0.02	HYPGEN	28	0.00
									RIMMUS	0.1	0.00	PLERIT	208	0.02	ILYGIL	10	0.00
												PORMYR	191	0.01	CLEIOS	6	0.00
												GENLIN	126	0.01	OXYCAL	2	0.00
												HIPING	121	0.01	ATHCAL	1	0.00
												MULDEN	100	0.01	SYNLEP	1	0.00
												HALSEM	98	0.01	QUIYCA	1	0.00
												ZAPEXA	74	0.01	SYNAUL	0.3	0.00
												SYNAUL	66	0.00			
												XYSLIO	20	0.00			
												QUIYCA	13	0.00			
												SYNCAL	7	0.00			
												CITSTI	7	0.00			
												ILYGIL	1	0.00			
												SYNLUC	0.3	0.00			
												CLEIOS	0.1	0.00			
												GIBELE	0.1	0.00			
TOTAL	305			8155			106248			310717			1357409			992475	

Table 22. Comparison of mean numerical and biomass densities calculated by gear type for three, comparable studies on bay and estuarine fish populations.

Upper Newport Bay 1978-79			**Upper Newport Bay 1986-87**			**San Diego Bay 1994-1999**	
GEAR	**(No./m^2)**		**GEAR**	**(No./m^2)**		**GEAR**	**(No./m^2)**
BS	2.974		**BS**	0.554		**LS**	0.369
SS	2.505		**SS**	2.735		**SS**	2.338
SE	1.762		**SE**	3.605		**SE**	3.583
DN	1.315					**BT**	0.080
						PS	1.770
OT	0.018		**OT**	0.005		**OT**	0.009
Grand Mean	**1.846**		**Grand Mean**	**1.725**		**Grand Mean**	**1.358**
GEAR	**(g/m^2)**		**GEAR**	**(g/m^2)**		**GEAR**	**(g/m^2)**
BS	6.893		**BS**	1.864		**LS**	1.051
SS	1.428		**SS**	0.708		**SS**	0.272
SE	1.790		**SE**	1.284		**SE**	0.636
DN	2.523					**BT**	2.232
						PS	6.306
OT	1.145		**OT**	0.084		**OT**	1.678
Grand Mean	**2.535**		**Grand Mean**	**0.985**		**Grand Mean**	**2.029**

Table 23. Best estimate of numerical densities and estimated stock size for Fish species taken from San Diego Bay, as a whole, from July 1994 to April 1999.

	MEAN DENSITY (No/m^2)							BEST ESTIMATE OF DENSITY				
			GEAR						STRATA			
SPCODE	SE	SS	LS	PSN	BT	PSC	OT	I	N	C	WTD MEAN	STOCK Est. No.
ENGMOR	0.00000	0.01446	0.00614	1.43375	0.00003	0.14802	0.00054	0.01446	1.43375	0.14802	0.87554	42,533,776
ANCDEL	0.00000	0.02190	0.06676	0.56637	0.00117	0.10852	0.00133	0.06676	0.56637	0.10852	0.36782	17,868,784
ATHAFF	1.12340	1.74966	0.25957	0.21228	0.00027	0.04875	0.00001	1.74966	0.21228	0.04875	0.21000	10,201,738
SARSAG	0.00000	0.00007	0.00223	0.07374	0.00000	0.05818	0.00001	0.00223	0.07374	0.05818	0.06481	3,148,496
CLEIOS	1.41425	0.02891	0.00113	0.00001	0.00465	0.00000	0.00000	1.41425	0.00465	0.00000	0.05922	2,876,938
CYMAGG	0.00216	0.00020	0.00266	0.06737	0.00951	0.00015	0.00000	0.00266	0.06737	0.00015	0.03857	1,873,634
LEUTEN	0.00000	0.00000	0.00490	0.03495	0.00000	0.00155	0.00000	0.00490	0.03495	0.00155	0.02072	1,006,501
QUIYCA	0.48522	0.00391	0.00041	0.00004	0.00178	0.00000	0.00000	0.48522	0.00178	0.00000	0.02043	992,253
SYNLEP	0.03250	0.00661	0.00188	0.00027	0.02120	0.00007	0.00000	0.03250	0.02120	0.00007	0.01341	651,421
HETROS	0.00216	0.00070	0.00358	0.00723	0.02295	0.00034	0.00001	0.00358	0.02295	0.00034	0.01335	648,728
ATHCAL	0.02299	0.26589	0.00242	0.00282	0.00001	0.00158	0.00000	0.26589	0.00282	0.00158	0.01286	624,777
ILYGIL	0.25432	0.01970	0.00051	0.00001	0.00411	0.00000	0.00007	0.25432	0.00411	0.00007	0.01254	609,349
SYNAUL	0.03432	0.00566	0.00169	0.00049	0.01611	0.00001	0.00000	0.03432	0.01611	0.00001	0.01056	513,060
UROHAL	0.00000	0.00000	0.00137	0.00309	0.00729	0.00023	0.00383	0.00137	0.00729	0.00383	0.00570	277,119
PARMAC	0.00000	0.00000	0.00004	0.00550	0.00241	0.00090	0.00049	0.00004	0.00550	0.00090	0.00349	169,452
PARNEB	0.00000	0.00003	0.00040	0.00156	0.00357	0.00015	0.00180	0.00040	0.00357	0.00180	0.00275	133,803
PARCAL	0.01473	0.00017	0.00032	0.00023	0.00096	0.00001	0.00124	0.01473	0.00096	0.00124	0.00162	78,725
ANCCOM	0.00000	0.00003	0.00006	0.00229	0.00021	0.00000	0.00000	0.00006	0.00229	0.00000	0.00131	63,451
HYPGEN	0.00632	0.00000	0.00005	0.00006	0.00168	0.00000	0.00001	0.00632	0.00168	0.00001	0.00121	58,865
PARCLA	0.00000	0.00000	0.00001	0.00036	0.00169	0.00003	0.00001	0.00001	0.00169	0.00003	0.00097	47,300
SERPOL	0.00000	0.00000	0.00005	0.00123	0.00000	0.00062	0.00001	0.00005	0.00123	0.00062	0.00095	45,933
FUNPAR	0.01667	0.00758	0.00379	0.00000	0.00001	0.00000	0.00000	0.01667	0.00001	0.00000	0.00067	32,785
XENCAL	0.00000	0.00000	0.00001	0.00115	0.00037	0.00003	0.00000	0.00001	0.00115	0.00003	0.00067	32,514
EMBJAC	0.00000	0.00020	0.00009	0.00095	0.00063	0.00001	0.00000	0.00020	0.00095	0.00001	0.00056	26,967
SCOJAP	0.00000	0.00000	0.00000	0.00076	0.00000	0.00027	0.00000	0.00000	0.00076	0.00027	0.00054	26,116
HYPGUT	0.00639	0.00033	0.00019	0.00008	0.00020	0.00000	0.00032	0.00639	0.00020	0.00032	0.00049	24,004
HYPROS	0.00000	0.00030	0.00305	0.00037	0.00005	0.00028	0.00000	0.00305	0.00037	0.00028	0.00044	21,394
MICMIN	0.00000	0.00037	0.00066	0.00037	0.00069	0.00000	0.00000	0.00066	0.00069	0.00000	0.00042	20,286
ALBVUL	0.00231	0.00190	0.00085	0.00005	0.00000	0.00028	0.00000	0.00231	0.00005	0.00028	0.00023	11,196
SPHARG	0.00000	0.00000	0.00002	0.00038	0.00000	0.00001	0.00000	0.00002	0.00038	0.00001	0.00022	10,828
CHESAT	0.00000	0.00000	0.00000	0.00020	0.00023	0.00000	0.00020	0.00000	0.00023	0.00020	0.00021	10,220
MUGCEP	0.00000	0.00421	0.00368	0.00003	0.00000	0.00001	0.00000	0.00421	0.00003	0.00001	0.00019	9,221
LEPARM	0.00431	0.00042	0.00017	0.00000	0.00001	0.00000	0.00000	0.00431	0.00001	0.00000	0.00018	8,607
PLERIT	0.00000	0.00000	0.00005	0.00007	0.00008	0.00000	0.00033	0.00005	0.00008	0.00033	0.00017	8,470
GIBELE	0.00000	0.00000	0.00001	0.00001	0.00030	0.00000	0.00000	0.00001	0.00030	0.00000	0.00017	8,373
GIBMON	0.00000	0.00000	0.00001	0.00000	0.00029	0.00000	0.00000	0.00001	0.00029	0.00000	0.00017	8,174
XYSLIO	0.00000	0.00000	0.00000	0.00023	0.00000	0.00000	0.00007	0.00000	0.00023	0.00007	0.00016	7,543
UMBRON	0.00000	0.00000	0.00004	0.00017	0.00000	0.00008	0.00013	0.00004	0.00017	0.00013	0.00015	7,135
ACAFLA	0.00208	0.00007	0.00017	0.00009	0.00000	0.00000	0.00000	0.00208	0.00009	0.00000	0.00014	6,582
BRYARC	0.00216	0.00003	0.00000	0.00000	0.00009	0.00000	0.00000	0.00216	0.00009	0.00000	0.00014	6,575
SYNCAL	0.00000	0.00003	0.00004	0.00003	0.00022	0.00000	0.00000	0.00004	0.00022	0.00000	0.00013	6,306
MYLCAL	0.00000	0.00000	0.00000	0.00018	0.00000	0.00006	0.00005	0.00000	0.00018	0.00006	0.00012	5,939
STREXI	0.00000	0.00010	0.00011	0.00015	0.00000	0.00007	0.00000	0.00011	0.00015	0.00007	0.00012	5,842
CYNPAR	0.00000	0.00013	0.00002	0.00013	0.00000	0.00006	0.00000	0.00013	0.00013	0.00006	0.00010	4,834
SYMATR	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00015	0.00000	0.00006	0.00015	0.00010	4,697
SYNEXI	0.00000	0.00000	0.00005	0.00000	0.00014	0.00000	0.00000	0.00005	0.00014	0.00000	0.00008	4,071
PORMYR	0.00000	0.00000	0.00000	0.00002	0.00005	0.00000	0.00012	0.00000	0.00005	0.00012	0.00008	3,646
TRASYM	0.00000	0.00000	0.00000	0.00013	0.00000	0.00000	0.00000	0.00000	0.00013	0.00000	0.00007	3,508
OXYCAL	0.00000	0.00000	0.00000	0.00012	0.00004	0.00000	0.00000	0.00000	0.00012	0.00000	0.00007	3,379
HALSEM	0.00000	0.00000	0.00000	0.00002	0.00011	0.00000	0.00001	0.00000	0.00011	0.00001	0.00007	3,346
SYNLUC	0.00000	0.00000	0.00000	0.00001	0.00002	0.00001	0.00011	0.00000	0.00002	0.00011	0.00005	2,638
GILMIR	0.00000	0.00013	0.00005	0.00000	0.00007	0.00000	0.00000	0.00013	0.00007	0.00000	0.00005	2,249
GENLIN	0.00000	0.00000	0.00000	0.00008	0.00000	0.00000	0.00000	0.00000	0.00008	0.00000	0.00005	2,209
SCOGUT	0.00000	0.00000	0.00000	0.00003	0.00003	0.00000	0.00007	0.00000	0.00003	0.00007	0.00004	2,069
PARINT	0.00000	0.00000	0.00000	0.00000	0.00004	0.00000	0.00000	0.00000	0.00004	0.00000	0.00002	1,194
HIPING	0.00000	0.00000	0.00000	0.00001	0.00002	0.00003	0.00001	0.00000	0.00002	0.00003	0.00002	1,130
MUSCAL	0.00000	0.00000	0.00003	0.00003	0.00000	0.00001	0.00001	0.00003	0.00003	0.00001	0.00002	1,101
ANIDAV	0.00000	0.00000	0.00000	0.00001	0.00004	0.00000	0.00000	0.00000	0.00004	0.00000	0.00002	995
GIRNIG	0.00000	0.00007	0.00000	0.00003	0.00000	0.00000	0.00000	0.00007	0.00003	0.00000	0.00002	909
ATRNOB	0.00000	0.00000	0.00000	0.00002	0.00000	0.00001	0.00000	0.00000	0.00002	0.00001	0.00002	851
DORPET	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004	0.00000	0.00000	0.00000	0.00004	0.00002	800
MENUND	0.00000	0.00000	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000	0.00002	0.00000	0.00001	585
GYMMAR	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00001	455
CITSTI	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00001	422
MUSHEN	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000	0.00001	0.00001	0.00001	358
PSEGRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00001	267
PHAFUR	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	228
GIBMET	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	199
PARVET	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	199
RIMMUS	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	199
ZAPEXA	0.00000	0.00000	0.00000	0.00001	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	199
PLECOE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000	196
RHIPRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000	196
RONSTE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000	196
PLEVER	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000	131
PORNOT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	65
HETFRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	33
MEDCAL	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	18
TRITRI	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	18
TOTAL	**3.42629**	**2.13378**	**0.36926**	**2.41961**	**0.10341**	**0.37040**	**0.01103**	**4.39648**	**2.49412**	**0.37843**	**1.74510**	**84,776,769**

Table 24. Best estimates of biomass densities and standing stocks for all fish species, forage species only and fisheries species only. Estimates are for each depth strata within each Ecoregion of the San Diego Bay.

ALL FISH SPECIES							
	BEST ESTIMATE OF DENSITY (g/m2)						
		STRATA			**WTD**	**STAND.**	
ECOREGION	**I**	**N**	**C**		**MEAN**	**STOCK (kg)**	**mt**
NORTH	1.14	11.82	5.87		**7.49**	73,549	74
NORTH-CENTRAL	1.78	11.09	4.86		**7.07**	57,141	57
SOUTH-CENTRAL	1.18	6.40	2.23		**4.74**	95,129	95
SOUTH	1.51	8.45	2.07		**7.42**	78,994	79
TOTAL	**1.38**	**9.75**	**3.68**		**7.05**	**304,813**	**305**
FORAGE FISH SPECIES							
	BEST ESTIMATE OF DENSITY (g/m2)						
		STRATA			**WTD**	**STAND.**	
ECOREGION	**I**	**N**	**C**		**MEAN**	**STOCK (kg)**	**mt**
NORTH	0.8976	8.5278	2.4428		4.3337	42,557	43
NORTH-CENTRAL	1.0586	6.4966	2.9132		4.1821	33,792	34
SOUTH-CENTRAL	0.8767	2.5911	1.2028		2.0399	40,899	41
SOUTH	0.7618	2.3416	0.3697		2.0454	21,763	22
				TOTAL		**139,011**	**139**
RECREATIONAL/COMMERCIAL FISH SPECIES							
	BEST ESTIMATE OF DENSITY (g/m2)						
		STRATA			**WTD**	**STAND.**	
ECOREGION	**I**	**N**	**C**		**MEAN**	**STOCK (kg)**	**mt**
NORTH	0.08256	5.98068	2.01888		3.18991	31,325	31
NORTH-CENTRAL	0.08203	6.47010	1.98423		3.59375	29,038	29
SOUTH-CENTRAL	0.08484	1.85872	0.90180		1.46101	29,293	29
SOUTH	0.01123	1.52618	0.68564		1.37157	14,594	15
				TOTAL		**104,249**	**104**

Table 25. Best estimates of biomass densities and standing stocks for forage species. Estimates are for each depth strata within each Ecoregion of the San Diego Bay.

ECOREGION				MEAN DENSITY (g/m^2)						BEST ESTIMATE OF DENSITY						
					GEAR						STRATA			WTD	STAND.	
NORTH	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN	STOCK (kg)	mt
	ENGMOR	0.00000	0.00000	0.00086	3.71428	0.00000	0.39093	0.00021		0.00086	3.71428	0.39093		1.46032	14,340	14.3
	ATHAFF	0.61516	0.23727	0.65067	2.17069	0.00064	0.45515	0.00000		0.65067	2.17069	0.45515		1.02846	10,099	10.1
	SARSAG	0.00000	0.00000	0.03771	0.84824	0.00000	0.87413	0.00000		0.03771	0.84824	0.87413		0.80666	7,921	7.9
	ATHCAL	0.00336	0.00087	0.02118	0.33634	0.00000	0.65292	0.00000		0.02118	0.33634	0.65292		0.50401	4,949	4.9
	CYMAGG	0.17241	0.00000	0.02210	0.67171	0.05886	0.00000	0.00076		0.17241	0.67171	0.00076		0.23246	2,283	2.3
	LEUTEN	0.00000	0.00000	0.01345	0.41277	0.00000	0.01284	0.00000		0.01345	0.41277	0.01284		0.14473	1,421	1.4
	ANCDEL	0.00000	0.00000	0.00128	0.26229	0.00000	0.05488	0.00048		0.00128	0.26229	0.05488		0.11956	1,174	1.2
	SCOJAP	0.00000	0.00000	0.00000	0.11148	0.00000	0.00000	0.00116		0.00000	0.11148	0.00116		0.03748	368	0.4
NORTH Total		0.79094	0.23813	0.74725	8.52780	0.05950	2.44084	0.00261		0.89756	8.52780	2.44276		4.33368	42,557	42.6
NORTH-CENTRAL	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN	STOCK (kg)	mt
	ENGMOR	0.00000	0.01904	0.03820	2.70162	0.00002	1.02890	0.00000		0.03820	2.70162	1.02890		1.61500	13,049	13.0
	ATHAFF	0.09733	0.45692	0.88330	1.17989	0.01356	0.50980	0.00000		0.88330	1.17989	0.50980		0.78311	6,328	6.3
	ANCDEL	0.00000	0.03424	0.10654	1.07709	0.00004	1.11716	0.00001		0.10654	1.07709	1.11716		1.05141	8,495	8.5
	CYMAGG	0.00000	0.00000	0.01636	0.75723	0.02087	0.00444	0.00000		0.01636	0.75723	0.00444		0.29110	2,352	2.4
	SCOJAP	0.00000	0.00000	0.00000	0.32109	0.00000	0.00000	0.00000		0.00000	0.32109	0.00000		0.12201	986	1.0
	LEUTEN	0.00000	0.00000	0.00000	0.30364	0.00000	0.00091	0.00000		0.00000	0.30364	0.00091		0.11590	936	0.9
	SARSAG	0.00000	0.00003	0.00018	0.09251	0.00000	0.11893	0.00099		0.00018	0.09251	0.11893		0.10295	832	0.8
	ATHCAL	0.00250	0.01082	0.00186	0.04834	0.00000	0.13304	0.00000		0.01082	0.04834	0.13304		0.09474	766	0.8
	ANCCOM	0.00000	0.00000	0.00207	0.01514	0.00000	0.00000	0.00000		0.00207	0.01514	0.00000		0.00585	47	0.0
	HYPROS	0.00000	0.00000	0.00111	0.00000	0.00000	0.00000	0.00000		0.00111	0.00000	0.00000		0.00006	0	0.0
NO-CEN Total		0.09983	0.52105	1.04963	6.49655	0.03449	2.91318	0.00100		1.05858	6.49655	2.91318		4.18213	33,792	33.8
SOUTH-CENTRAL	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN	STOCK (kg)	mt
	ANCDEL	0.00000	0.00000	0.08095	1.48046	0.00008	0.61304	0.00053		0.08095	1.48046	0.61304		1.12620	22,580	22.6
	ATHAFF	0.04200	0.08824	0.53313	0.32131	0.00086	0.17197	0.00060		0.53313	0.32131	0.17197		0.27390	5,492	5.5
	CYMAGG	0.00000	0.00128	0.01931	0.42104	0.05806	0.00000	0.00021		0.01931	0.42104	0.00021		0.25749	5,163	5.2
	LEUTEN	0.00000	0.00000	0.22245	0.11639	0.00000	0.00000	0.00000		0.22245	0.11639	0.00000		0.07767	1,557	1.6
	SARSAG	0.00000	0.00000	0.00000	0.10410	0.00000	0.21227	0.00063		0.00000	0.10410	0.21227		0.13992	2,805	2.8
	SCOJAP	0.00000	0.00000	0.00000	0.01408	0.00000	0.17722	0.00000		0.00000	0.01408	0.17722		0.07239	1,451	1.5
	ATHCAL	0.00000	0.00522	0.00009	0.04795	0.00000	0.02731	0.00001		0.00522	0.04795	0.02731		0.03924	787	0.8
	ENGMOR	0.00000	0.00000	0.00029	0.06941	0.00000	0.00071	0.00000		0.00029	0.06941	0.00071		0.04260	854	0.9
	HYPROS	0.00000	0.00067	0.01506	0.00418	0.00364	0.00005	0.00000		0.01506	0.00418	0.00005		0.00302	61	0.1
	ANCCOM	0.00000	0.00000	0.00026	0.01219	0.00000	0.00000	0.00000		0.00026	0.01219	0.00000		0.00744	149	0.1
SO-CEN Total		0.04200	0.09541	0.87155	2.59110	0.06264	1.20256	0.00197		0.87668	2.59110	1.20277		2.03987	40,899	40.9
SOUTH	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN	STOCK (kg)	mt
	ANCDEL	0.00000	0.00329	0.10438	1.11504	0.00137	0.11578	0.00490		0.10438	1.11504	0.11578		0.95586	10,170	10.2
	ATHAFF	0.01556	0.06985	0.63295	0.54399	0.00015	0.18231	0.00000		0.63295	0.54399	0.18231		0.50597	5,384	5.4
	ATHCAL	0.00000	0.00015	0.00025	0.36579	0.00001	0.04921	0.00000		0.00025	0.36579	0.04921		0.31367	3,337	3.3
	SARSAG	0.00000	0.00000	0.00000	0.13256	0.00000	0.00000	0.00001		0.00000	0.13256	0.00001		0.11135	1,185	1.2
	CYMAGG	0.00000	0.00000	0.00000	0.07415	0.02930	0.00000	0.00000		0.00000	0.07415	0.00000		0.06229	663	0.7
	MUGCEP	0.00000	0.00401	0.01544	0.04366	0.00000	0.01584	0.00000		0.01544	0.04366	0.01584		0.03935	419	0.4
	ANCCOM	0.00000	0.00000	0.00060	0.03951	0.00084	0.00000	0.00000		0.00060	0.03951	0.00000		0.03321	353	0.4
	ENGMOR	0.00000	0.00000	0.00079	0.02488	0.00002	0.00448	0.00354		0.00079	0.02488	0.00448		0.02152	229	0.2
	HYPROS	0.00000	0.00040	0.00735	0.00198	0.00000	0.00202	0.00000		0.00735	0.00198	0.00202		0.00222	24	0.0
SOUTH Total		0.01556	0.07768	0.76175	2.34155	0.03170	0.36964	0.00845		0.76175	2.34155	0.36966		2.04543	21,763	21.8

Table 26. Best estimates of biomass densities and standing stocks for fisheries species only. Estimates are for each depth strata within each Ecoregion of the San Diego Bay.

		MEAN DENSITY (g/m^2)							BEST ESTIMATE OF DENSITY					
ECOREGION					GEAR					STRATA		WTD	STAND.	
	SPCODE	SE	SS	LS	PSN	BT	PSC	OT	I	N	C	MEAN	STOCK (kg)	mt
NORTH	ENGMOR	0.00000	0.00000	0.00086	3.71428	0.00000	0.39093	0.00021	0.00086	3.71428	0.39093	1.46032	14,340	14.3
	SARSAG	0.00000	0.00000	0.03771	0.84824	0.00000	0.87413	0.00000	0.03771	0.84824	0.87413	0.80666	7,921	7.9
	PARMAC	0.00000	0.00000	0.00000	1.02517	0.43024	0.16351	0.07822	0.00000	1.02517	0.16351	0.43642	4,286	4.3
	PARCAL	0.04397	0.00401	0.01108	0.10560	0.14367	0.00000	0.19955	0.04397	0.14367	0.19955	0.16978	1,667	1.7
	CYNPAR	0.00000	0.00000	0.00000	0.03066	0.00000	0.19707	0.00062	0.00000	0.03066	0.19707	0.12836	1,261	1.3
	PARNEB	0.00000	0.00000	0.00003	0.05791	0.03129	0.00256	0.16541	0.00003	0.05791	0.16541	0.11836	1,162	1.2
	SCOJAP	0.00000	0.00000	0.00000	0.11148	0.00000	0.00000	0.00116	0.00000	0.11148	0.00116	0.03748	368	0.4
	UMBRON	0.00000	0.00000	0.00000	0.04927	0.00000	0.00000	0.02713	0.00000	0.04927	0.02713	0.03253	319	0.3
NORTH Total		**0.04397**	**0.00401**	**0.04968**	**5.94262**	**0.60520**	**1.62820**	**0.47230**	**0.08256**	**5.98068**	**2.01888**	**3.18991**	**31,325**	**31.3**
NORTH-CENTRAL	**SPCODE**	**SE**	**SS**	**LS**	**PSN**	**BT**	**PSC**	**OT**	**I**	**N**	**C**	**MEAN**	**STOCK (kg)**	**mt**
	ENGMOR	0.00000	0.01904	0.03820	2.70162	0.00002	1.02890	0.00000	0.03820	2.70162	1.02890	1.61500	13,049	13.0
	PARMAC	0.00000	0.00000	0.00772	2.96502	0.58988	0.50228	0.11956	0.00772	2.96502	0.50228	1.41339	11,420	11.4
	PARNEB	0.00000	0.00000	0.00959	0.16921	0.11533	0.00699	0.17203	0.00959	0.16921	0.17203	0.16284	1,316	1.3
	SCOJAP	0.00000	0.00000	0.00000	0.32109	0.00000	0.00000	0.00000	0.00000	0.32109	0.00000	0.12201	986	1.0
	PARCAL	0.02250	0.00001	0.00227	0.00978	0.08439	0.00000	0.13168	0.02250	0.08439	0.13168	0.10825	875	0.9
	SARSAG	0.00000	0.00003	0.00018	0.09251	0.00000	0.11893	0.00099	0.00018	0.09251	0.11893	0.10295	832	0.8
	CYNPAR	0.00000	0.00009	0.00000	0.13626	0.00000	0.00788	0.00000	0.00009	0.13626	0.00788	0.05628	455	0.5
	UMBRON	0.00000	0.00000	0.00375	0.00000	0.00000	0.02252	0.00000	0.00375	0.00000	0.02252	0.01303	105	0.1
NO-CEN Total		**0.02250**	**0.01918**	**0.06170**	**6.39550**	**0.78961**	**1.68751**	**0.42427**	**0.08203**	**6.47010**	**1.98423**	**3.59375**	**29,038**	**29.0**
SOUTH-CENTRAL	**SPCODE**	**SE**	**SS**	**LS**	**PSN**	**BT**	**PSC**	**OT**	**I**	**N**	**C**	**MEAN**	**STOCK (kg)**	**mt**
	PARMAC	0.00000	0.00000	0.00917	1.40603	0.43353	0.31030	0.11187	0.00917	1.40603	0.31030	0.96966	19,442	19.4
	SARSAG	0.00000	0.00000	0.00000	0.10410	0.00000	0.21227	0.00063	0.00000	0.10410	0.21227	0.13992	2,805	2.8
	PARCAL	0.05833	0.00000	0.00508	0.04644	0.09872	0.00003	0.10975	0.05833	0.09872	0.10975	0.10148	2,035	2.0
	SCOJAP	0.00000	0.00000	0.00000	0.01408	0.00000	0.17722	0.00000	0.00000	0.01408	0.17722	0.07239	1,451	1.5
	PARNEB	0.00000	0.00049	0.01510	0.04278	0.03050	0.00338	0.07206	0.01510	0.04278	0.07206	0.05249	1,052	1.1
	UMBRON	0.00000	0.00000	0.00195	0.08205	0.00000	0.00000	0.01950	0.00195	0.08205	0.01950	0.05713	1,145	1.1
	ENGMOR	0.00000	0.00000	0.00029	0.06941	0.00000	0.00071	0.00000	0.00029	0.06941	0.00071	0.04260	854	0.9
	CYNPAR	0.00000	0.00000	0.00000	0.04155	0.00000	0.00000	0.00000	0.00000	0.04155	0.00000	0.02535	508	0.5
SO-CEN		**0.05833**	**0.00049**	**0.03159**	**1.80644**	**0.56275**	**0.70390**	**0.31381**	**0.08484**	**1.85872**	**0.90180**	**1.46101**	**29,293**	**29.3**
SOUTH	**SPCODE**	**SE**	**SS**	**LS**	**PSN**	**BT**	**PSC**	**OT**	**I**	**N**	**C**	**MEAN**	**STOCK (kg)**	**mt**
	PARMAC	0.00000	0.00000	0.00947	1.15733	0.44618	0.03726	0.13592	0.00947	1.15733	0.13592	0.99020	10,536	10.5
	SARSAG	0.00000	0.00000	0.00000	0.13256	0.00000	0.00000	0.00001	0.00000	0.13256	0.00001	0.11135	1,185	1.2
	UMBRON	0.00000	0.00000	0.00000	0.08687	0.00000	0.03378	0.00556	0.00000	0.08687	0.03378	0.07736	823	0.8
	PARNEB	0.00000	0.00000	0.00000	0.03039	0.00227	0.02311	0.31263	0.00000	0.03039	0.31263	0.06617	704	0.7
	PARCAL	0.00000	0.00000	0.00000	0.02446	0.04710	0.00000	0.19489	0.00000	0.04710	0.19489	0.06490	691	0.7
	ENGMOR	0.00000	0.00000	0.00079	0.02488	0.00002	0.00448	0.00354	0.00079	0.02488	0.00448	0.02152	229	0.2
	ALBVUL	0.00093	0.00055	0.00016	0.02452	0.00000	0.00000	0.00000	0.00093	0.02452	0.00000	0.02064	220	0.2
	CYNPAR	0.00000	0.00004	0.00004	0.02252	0.00000	0.00000	0.00000	0.00004	0.02252	0.00000	0.01892	201	0.2
	ATRNOB	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00392	0.00000	0.00000	0.00392	0.00051	5	0.0
SOUTH Total		**0.00093**	**0.00059**	**0.01047**	**1.50354**	**0.49557**	**0.09864**	**0.65647**	**0.01123**	**1.52618**	**0.68564**	**1.37157**	**14,594**	**14.6**

Table 27. Abundance of southern or "Panamic" species utilizing San Diego Bay as a warm water refuge, July 1994 - April 1999.

									MONTHS, 1994-1999													
Scientific Name	**Common Name**	**SPCODE**	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**	**Jan-96**	**Apr-96**	**Jul-96**	**Oct-96**	**Jan-97**	**Apr-97**	**Jul-97**	**Oct-97**	**Jan-98**	**Apr-98**	**Jul-98**	**Oct-98**	**Jan-99**	**Apr-99**	**TOTAL**
Hyporhamphus rosae	California halfbeak	HYPROS	13	39	1	1		5	61	8	9	49	3	15	24	25			3	149	5		410
Albula vulpes	bonefish	ALBVUL					1										2	115	15	36	5	1	175
Strongylura exilis	California needlefish	STREXI	1	1	1	1		1	2	2	1			3	3	16		1	2	5	1	1	42
Cynoscion parvipinnis	shortfin corvina	CYNPAR								1	1			1	2	3		4	3	6	9		30
Hippocampus ingens	Pacific seahorse	HIPING		1			2				1	1	1	3	1	1	1		1				13
Gymnura marmorata	California butterfly ray	GYMMAR																1	1	1	1		4
Zapteryx exasperata	banded guitarfish	ZAPEXA				1											1						2
Pseudupeneus grandisquamous	red goatfish	PSEGRA																	1				1
		TOTAL	14	41	2	3	3	6	63	11	12	50	4	22	30	45	4	121	26	197	21	2	677

Figure 1a. Map of San Diego Bay illustrating the locations of the 4 sampling stations. (N = Non-vegetated site; V = Vegetated site; C = Channel site)

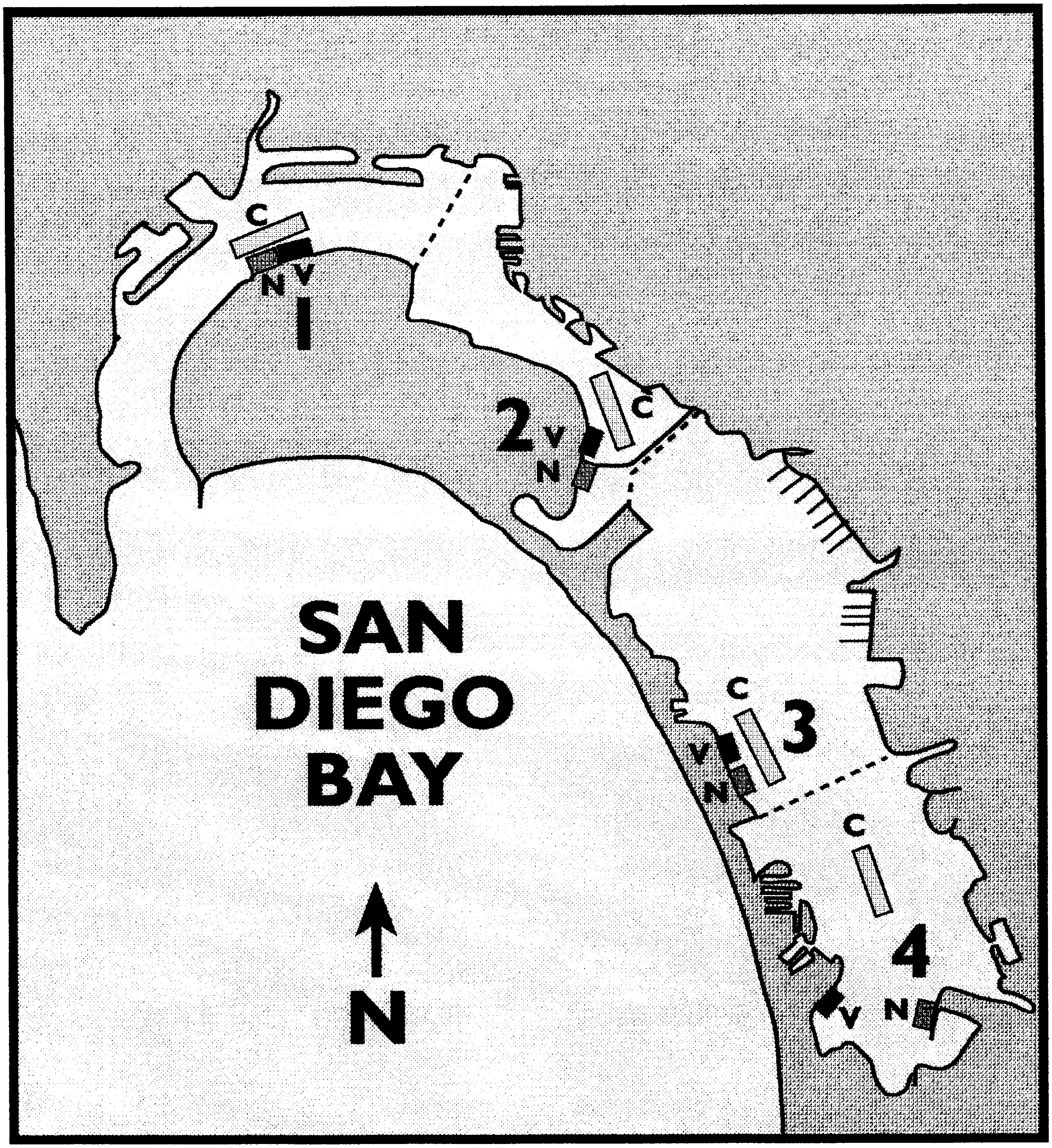
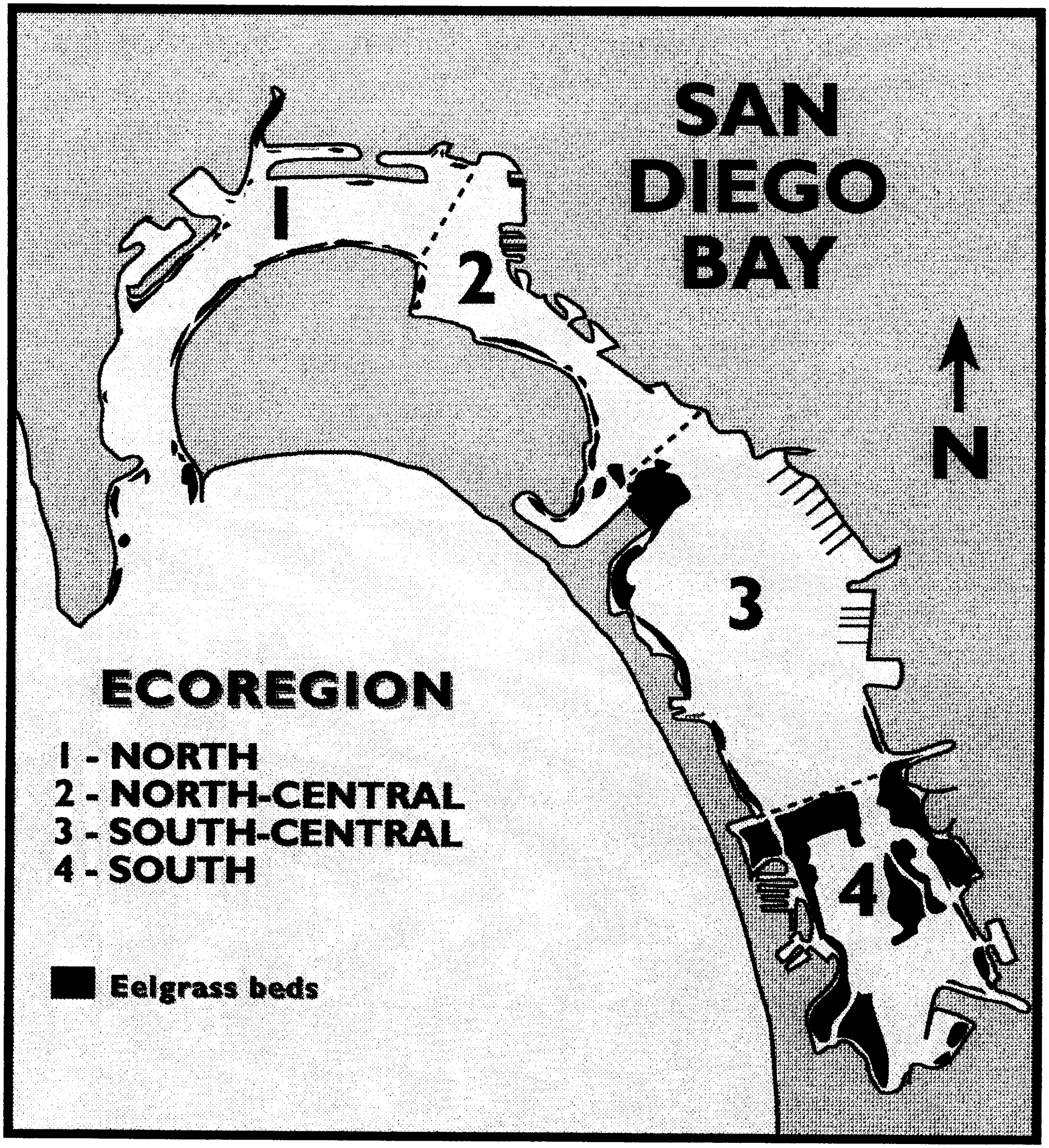


Figure 1b. San Diego Bay - Ecological Regions and Distribution of Eelgrass.



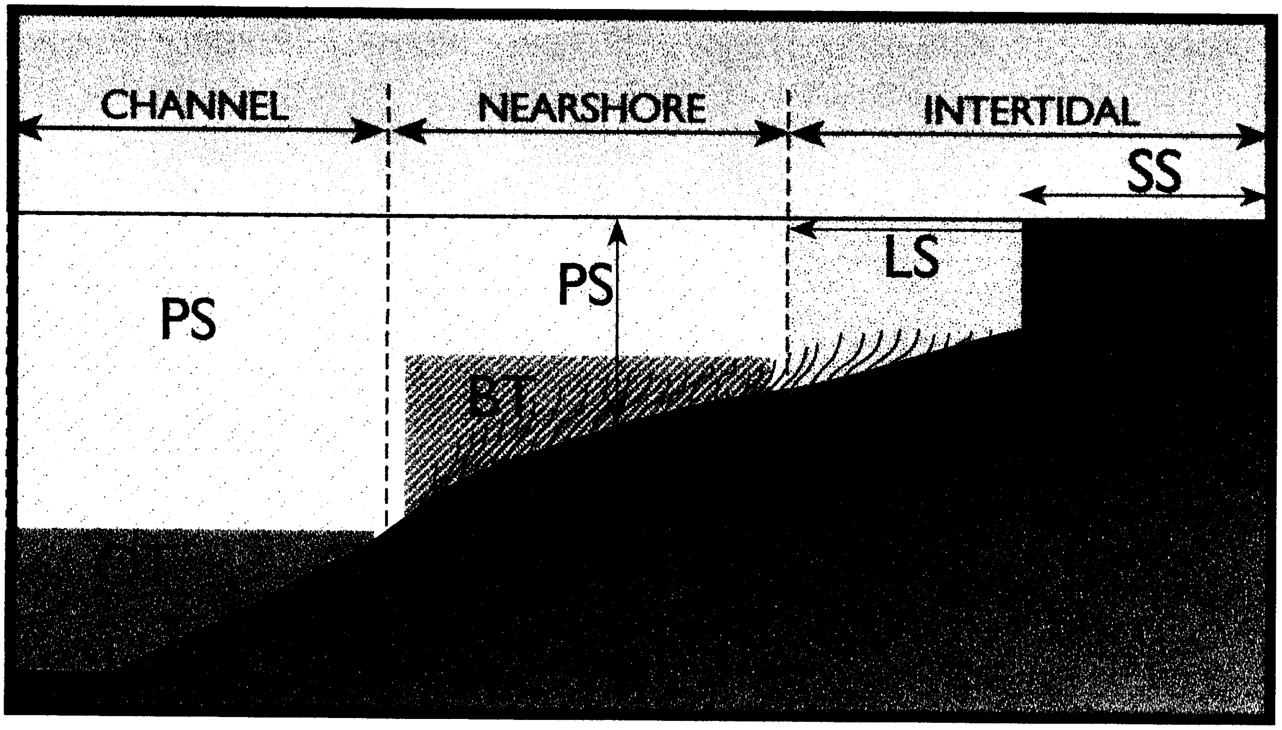


Figure 2. Diagrammatic representation of the vertical coverage of each of seven sampling gears with respect to depth strata. (BT = beam trawl; LS = large seine; OT = otter trawl; PS = purse seine; SS = small seine; SE = square enclosure).

Figure 3. Abundance of San Diego Bay Fishes by Station, 1994 - 1999.

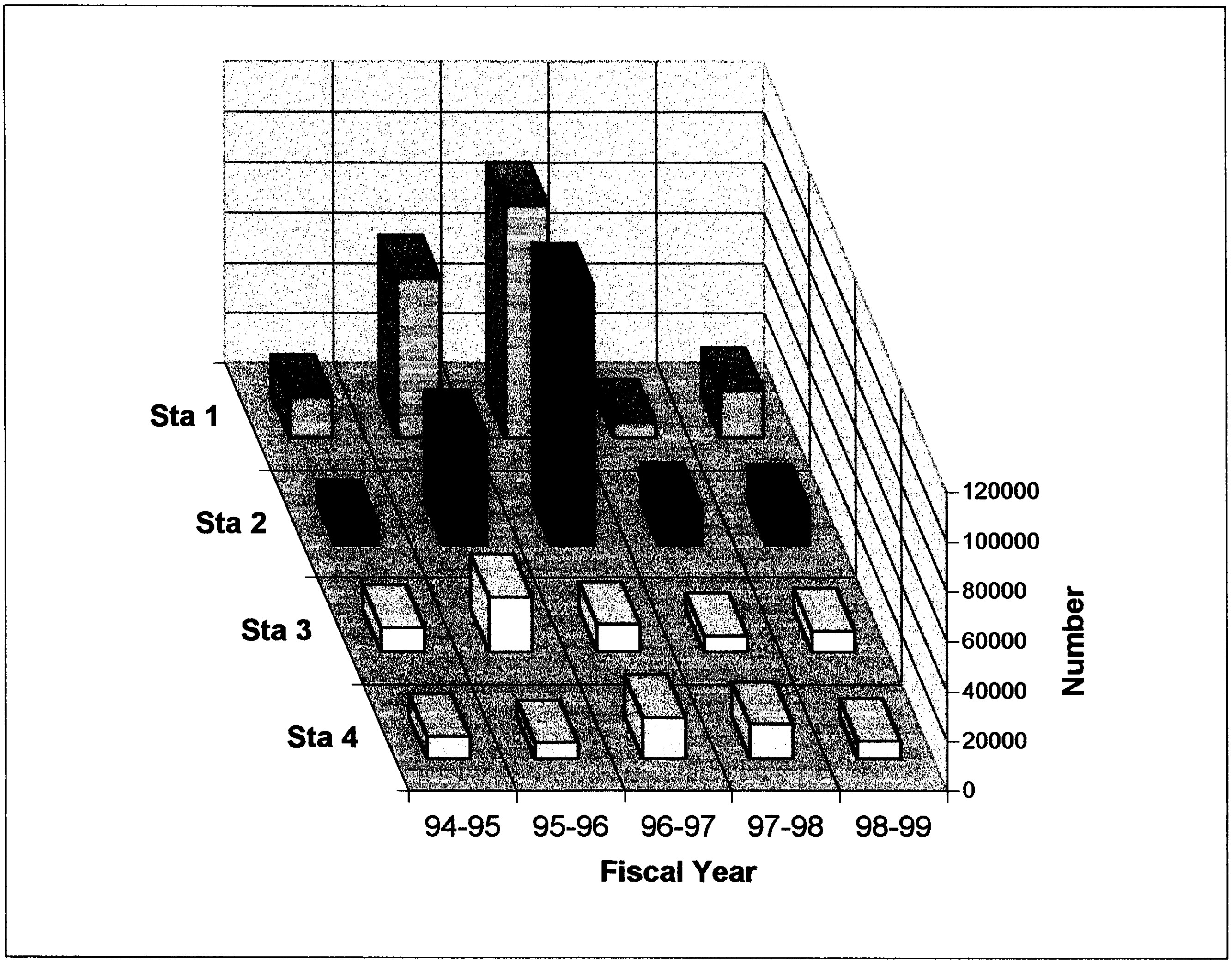


Figure 4. Abundance of the four numerically dominate species by station in San Diego Bay, July 1994 to April 1999.

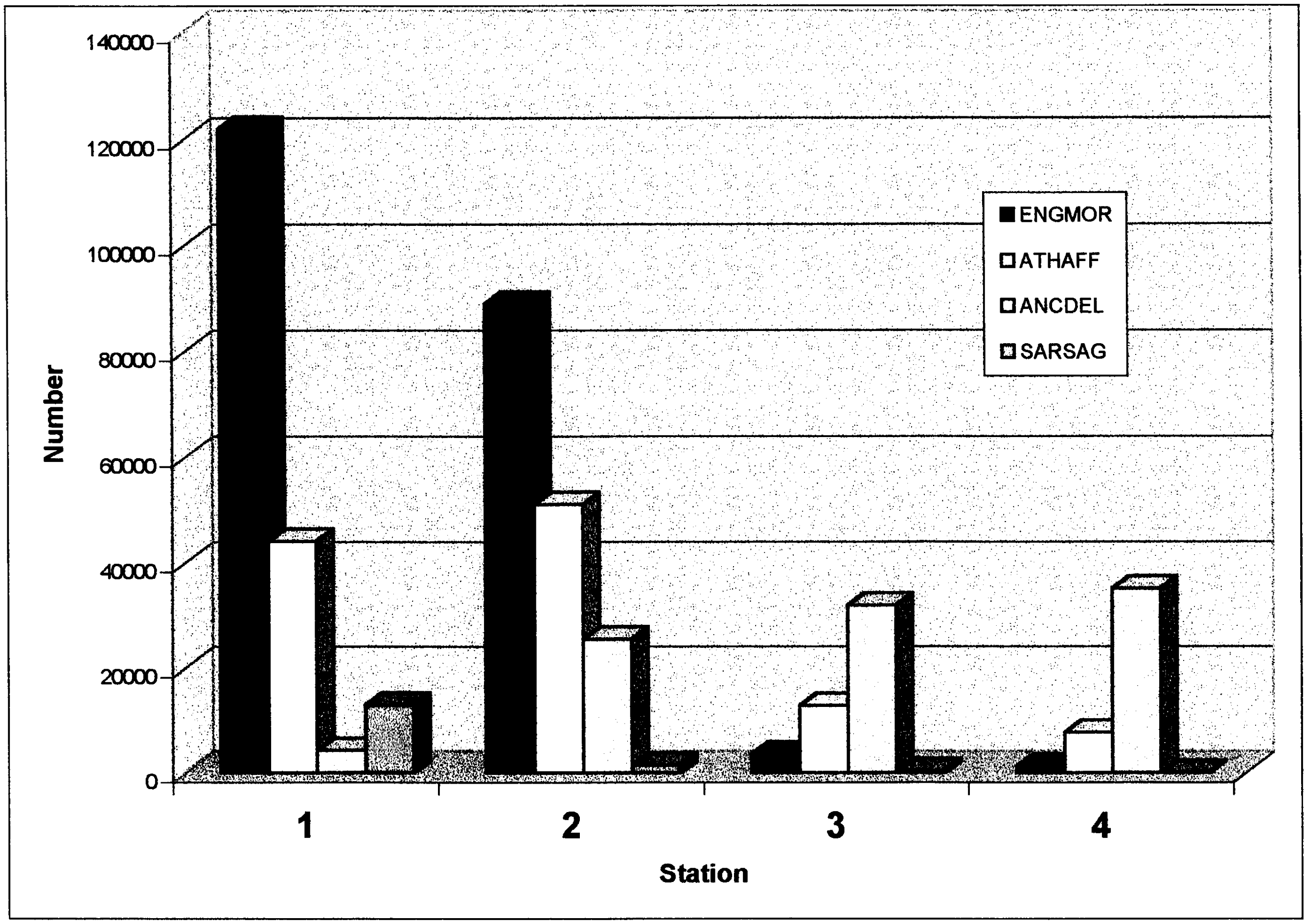
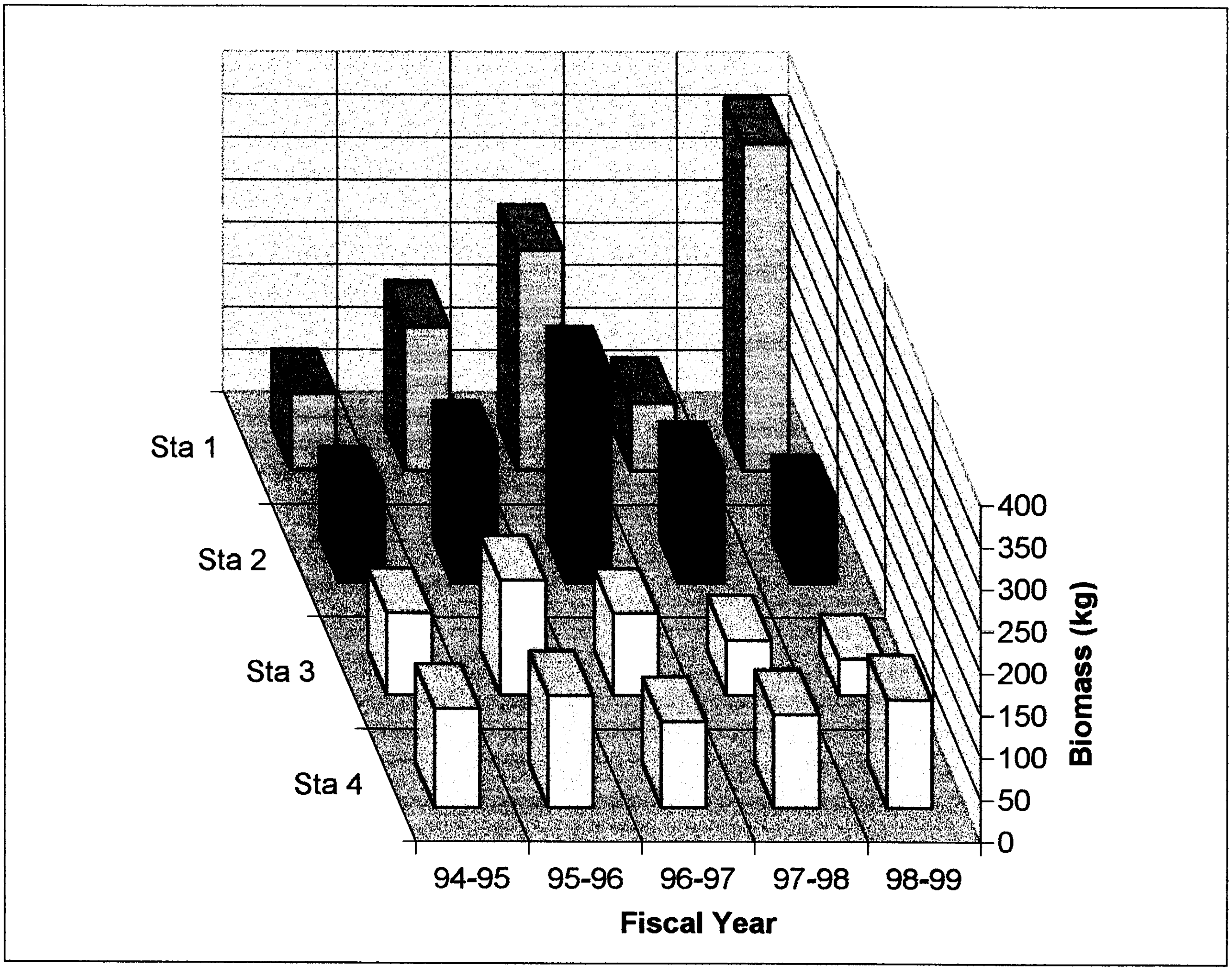
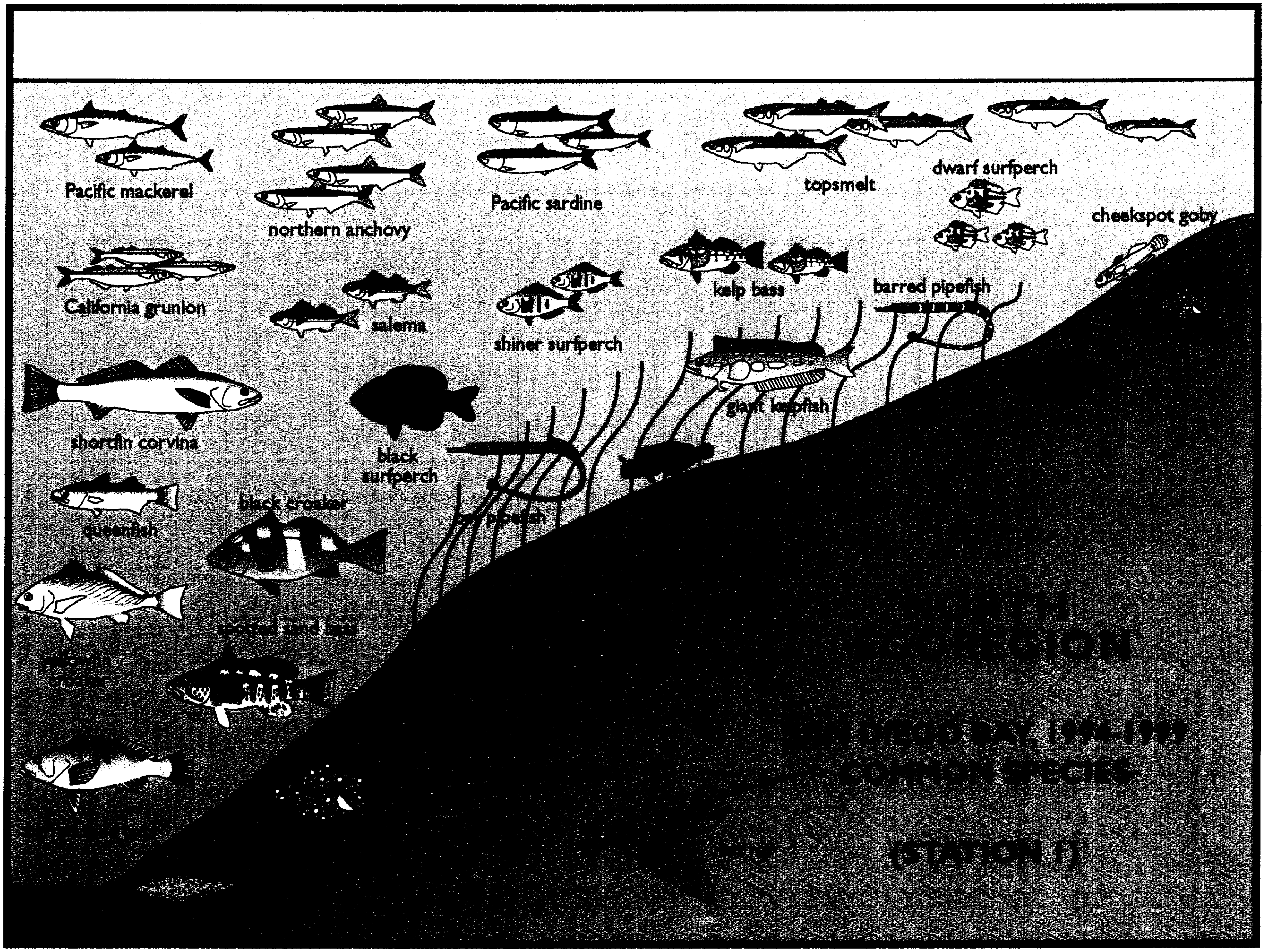
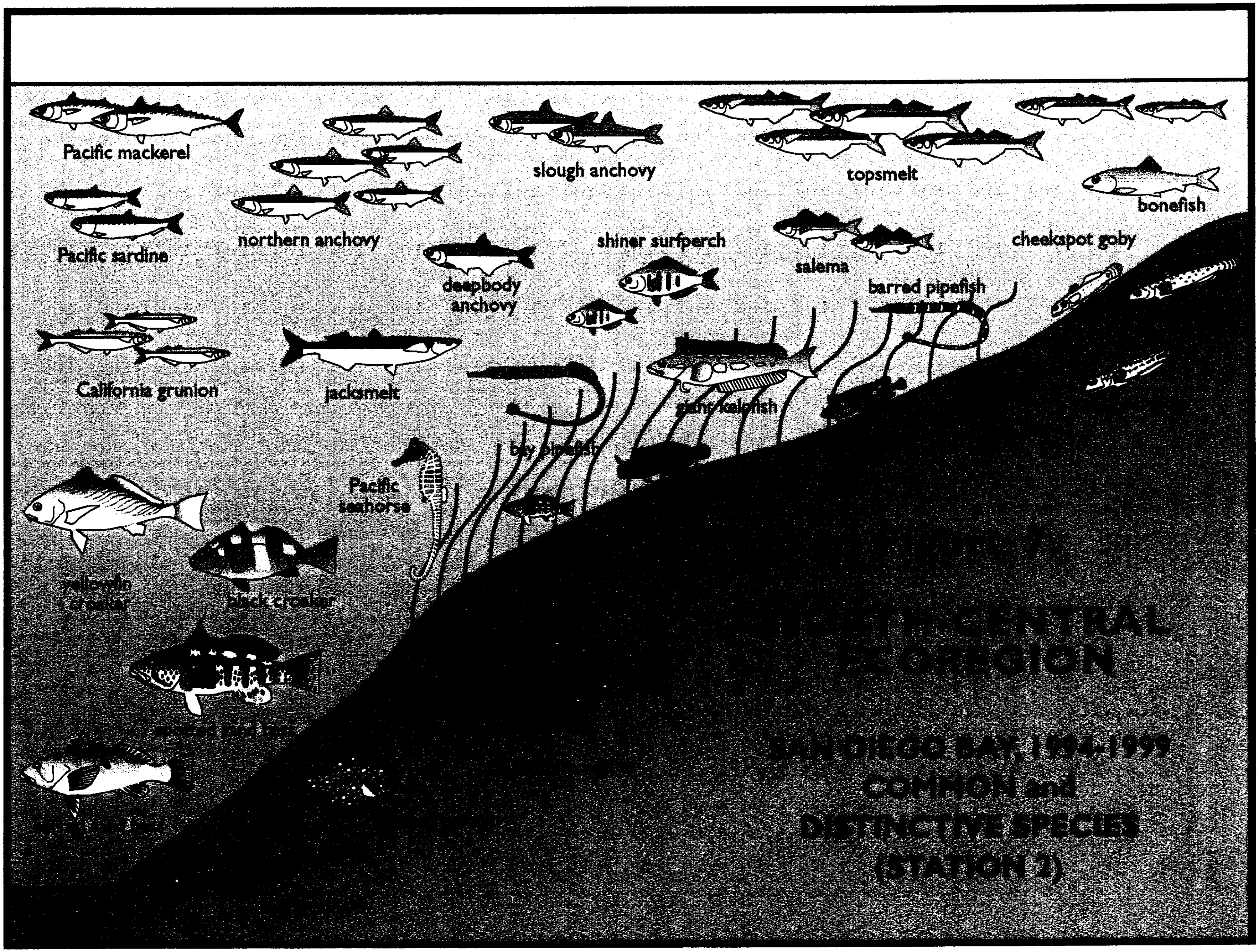
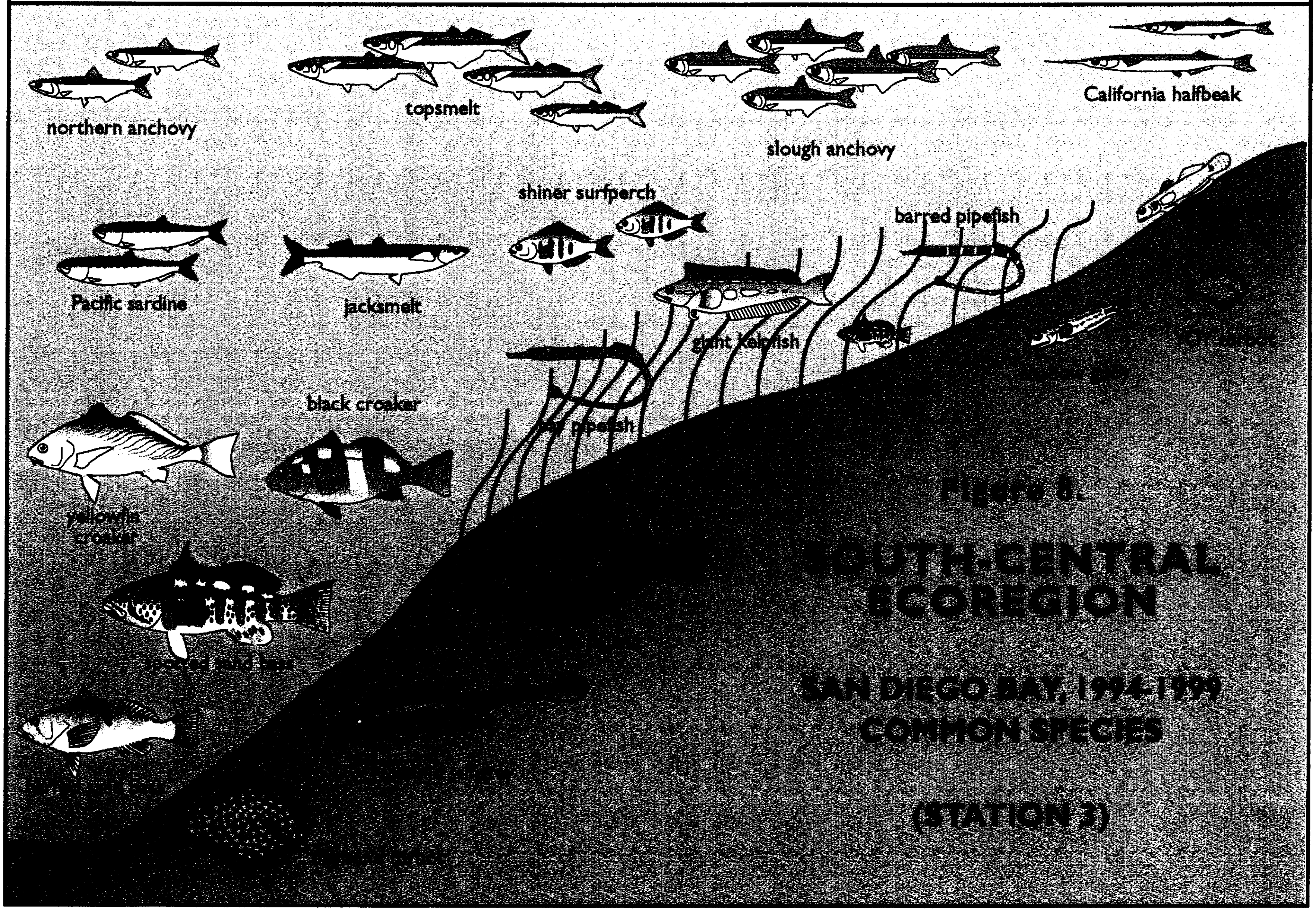


Figure 5. Biomass (kg) of San Diego Bay Fishes by Station, 1994 - 1999.




Pacific mackerel
northern anchovy
Pacific sardine
topsmelt
dwarf surfperch
cheekspot goby
California grunion
salema
shiner surfperch
kelp bass
barred pipefish
shortfin corvina
black surfperch
giant kelpfish
queenfish
black croaker
ECOREGION
COMMON SPECIES
(STATION 1)


Pacific mackerel
slough anchovy
topsmelt
bonefish
Pacific sardine
northern anchovy
shiner surfperch
salema
cheekspot goby
deepbody anchovy
barred pipefish
California grunion
jacksmelt
Pacific seahorse
ECOREGION
SAN DIEGO BAY 1994-1999
COMMON and
DISTINCTIVE SPECIES
(STATION 2)


northern anchovy
topsmelt
slough anchovy
California halfbeak
shiner surfperch
barred pipefish
Pacific sardine
jacksmelt
giant kelpfish
black croaker
yellowfin croaker
Figure 8.
SOUTH-CENTRAL ECOREGION
SAN DIEGO BAY, 1994-1999
COMMON SPECIES
(STATION 3)

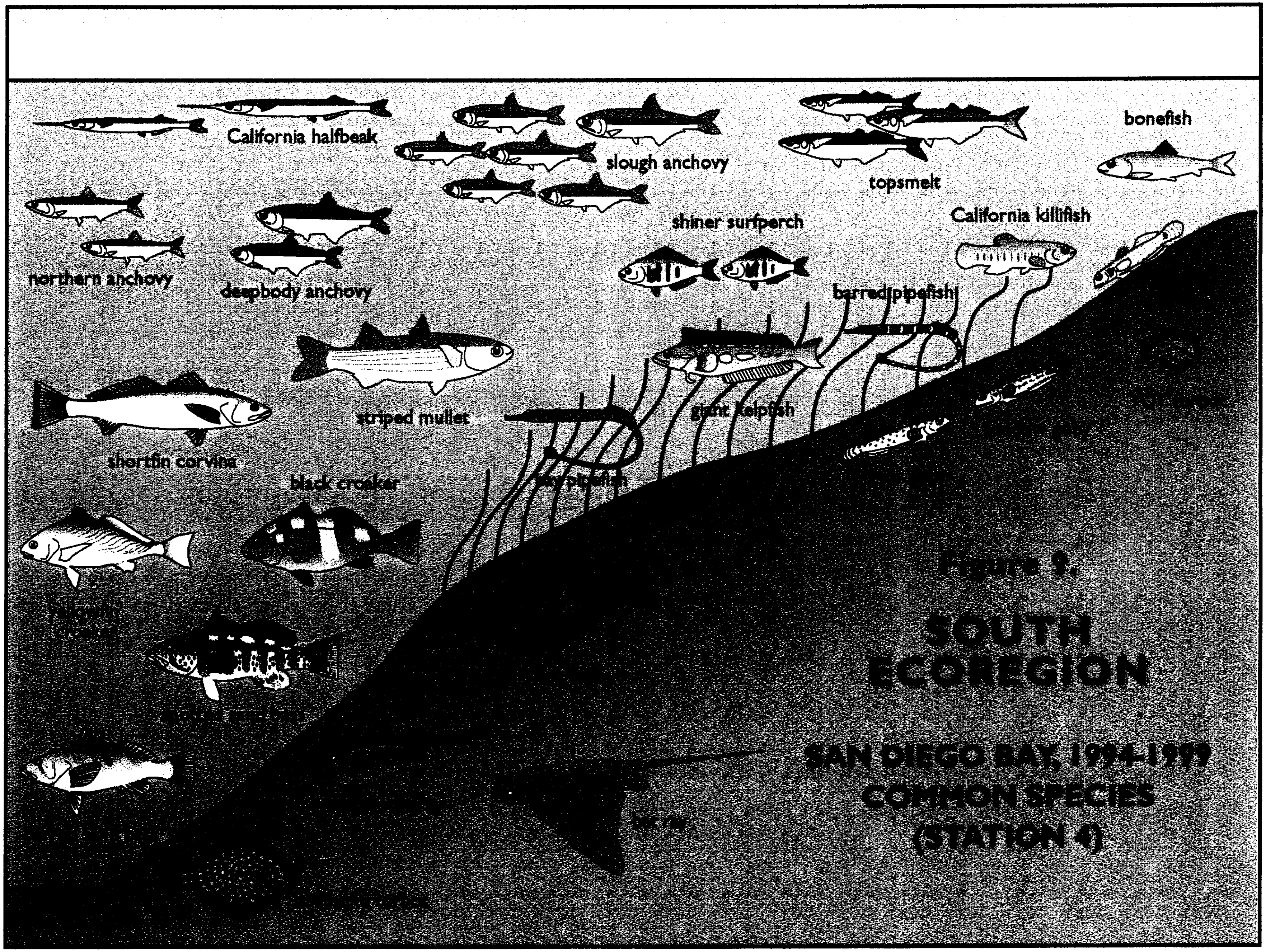

California halfbeak
slough anchovy
bonefish
topsmelt
northern anchovy
deepbody anchovy
shiner surfperch
California killifish
barred pipefish
striped mullet
giant kelpfish
shortfin corvina
black croaker
bay pipefish
Figure 9.
SOUTH
ECOREGION
SAN DIEGO BAY, 1994-1999
COMMON SPECIES
(STATION 4)

Figure 10. Abundance of San Diego Bay Fishes by Sampling Month, 1994-1999.

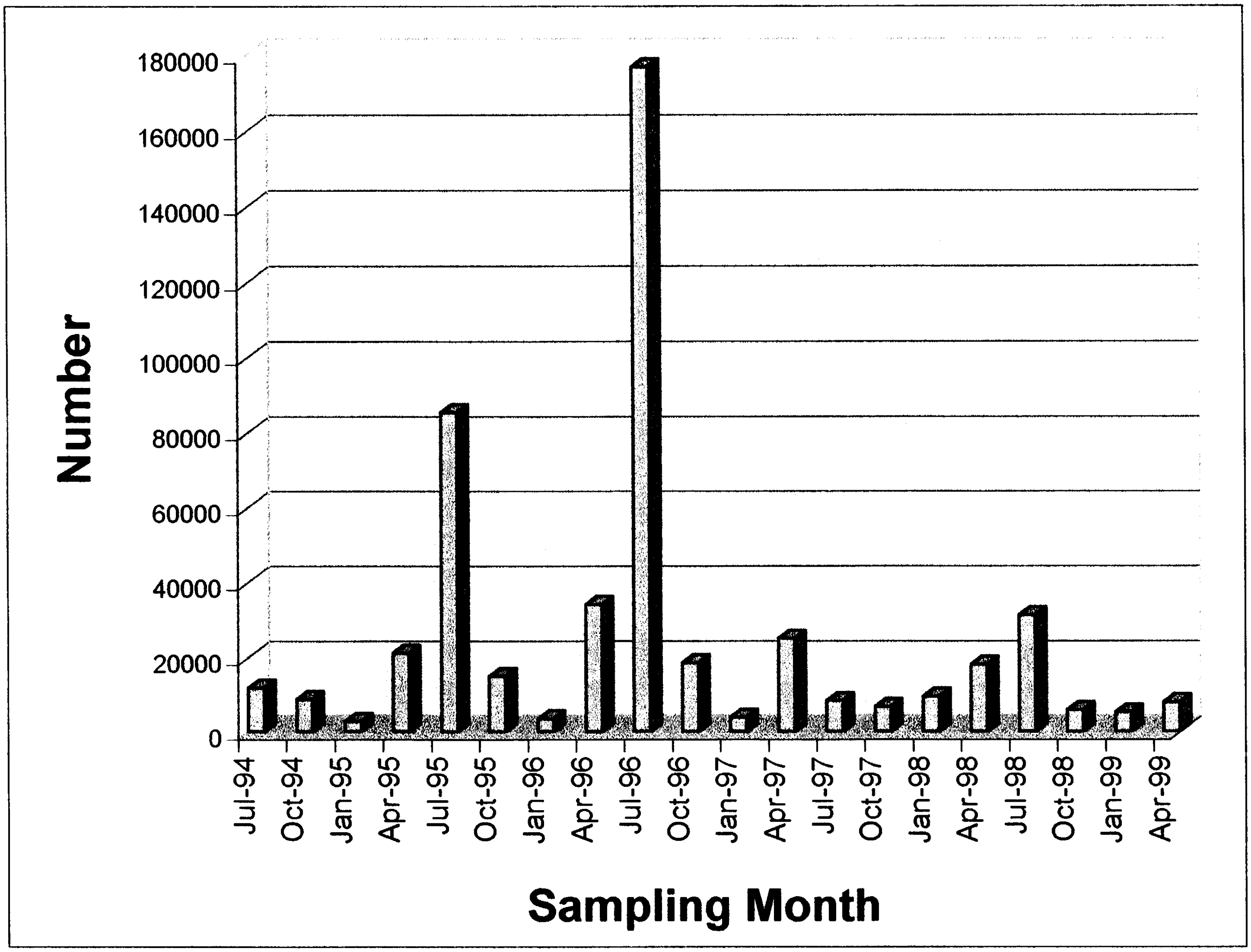


Figure 11. Abundance of San Diego Bay Fishes by Station over Sampling Months, 1994-1999.

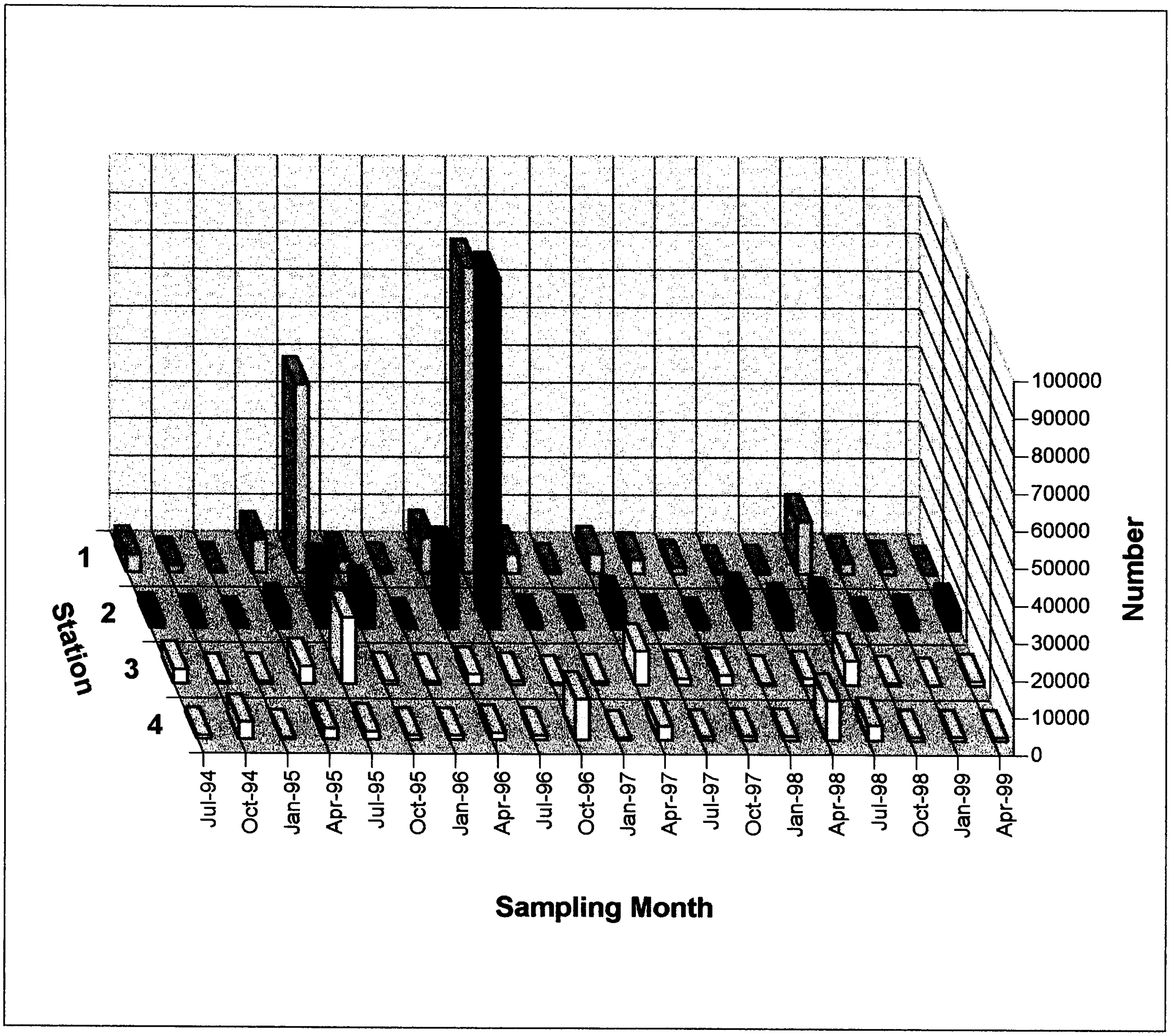


Figure 12. Biomass (kg) of San Diego Bay Fishes by Sampling Month, 1994 - 1999.

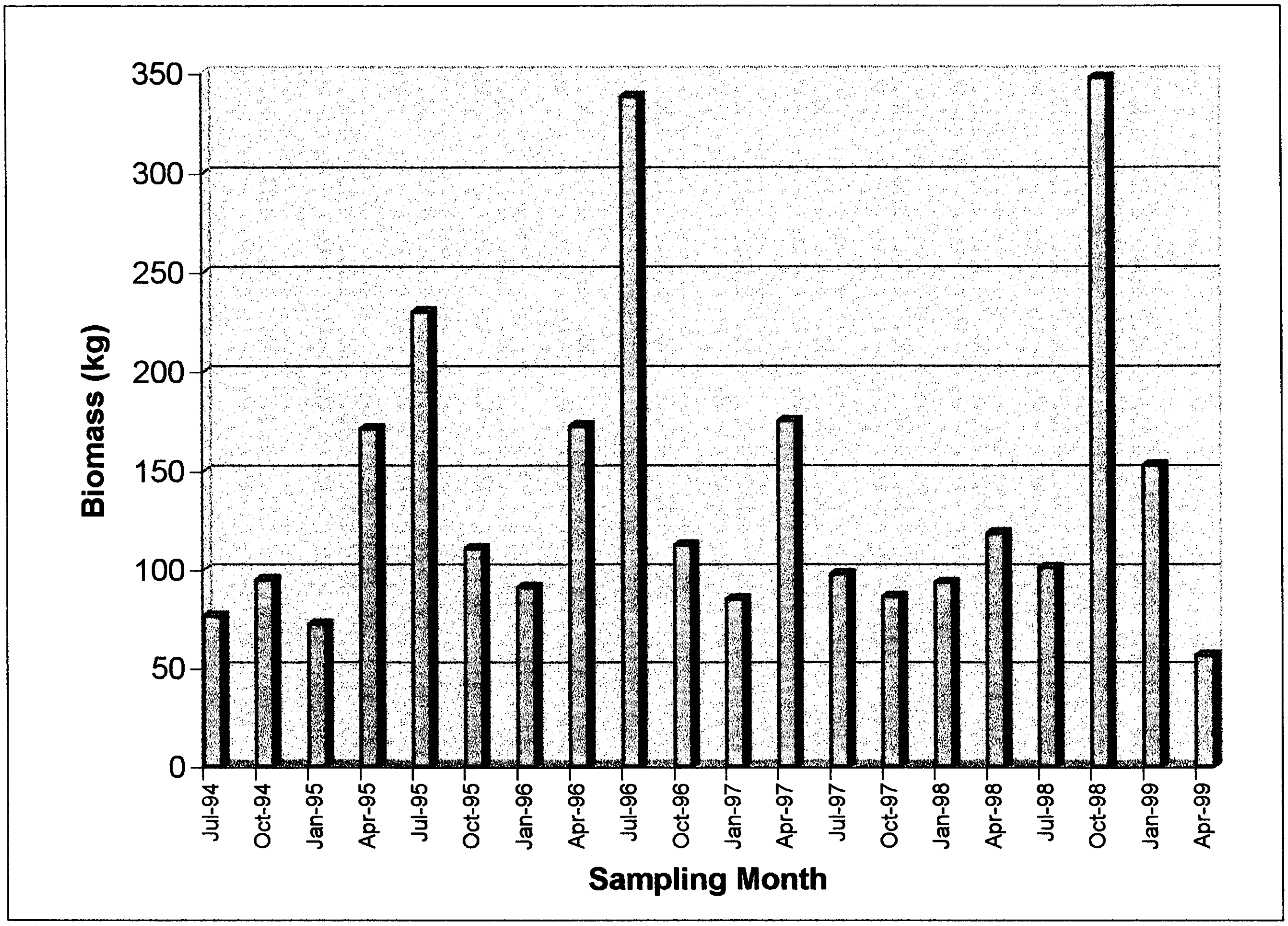


Figure 13. Biomass (kg) of San Diego Bay Fishes by Station over Sampling Months, 1994-1999.

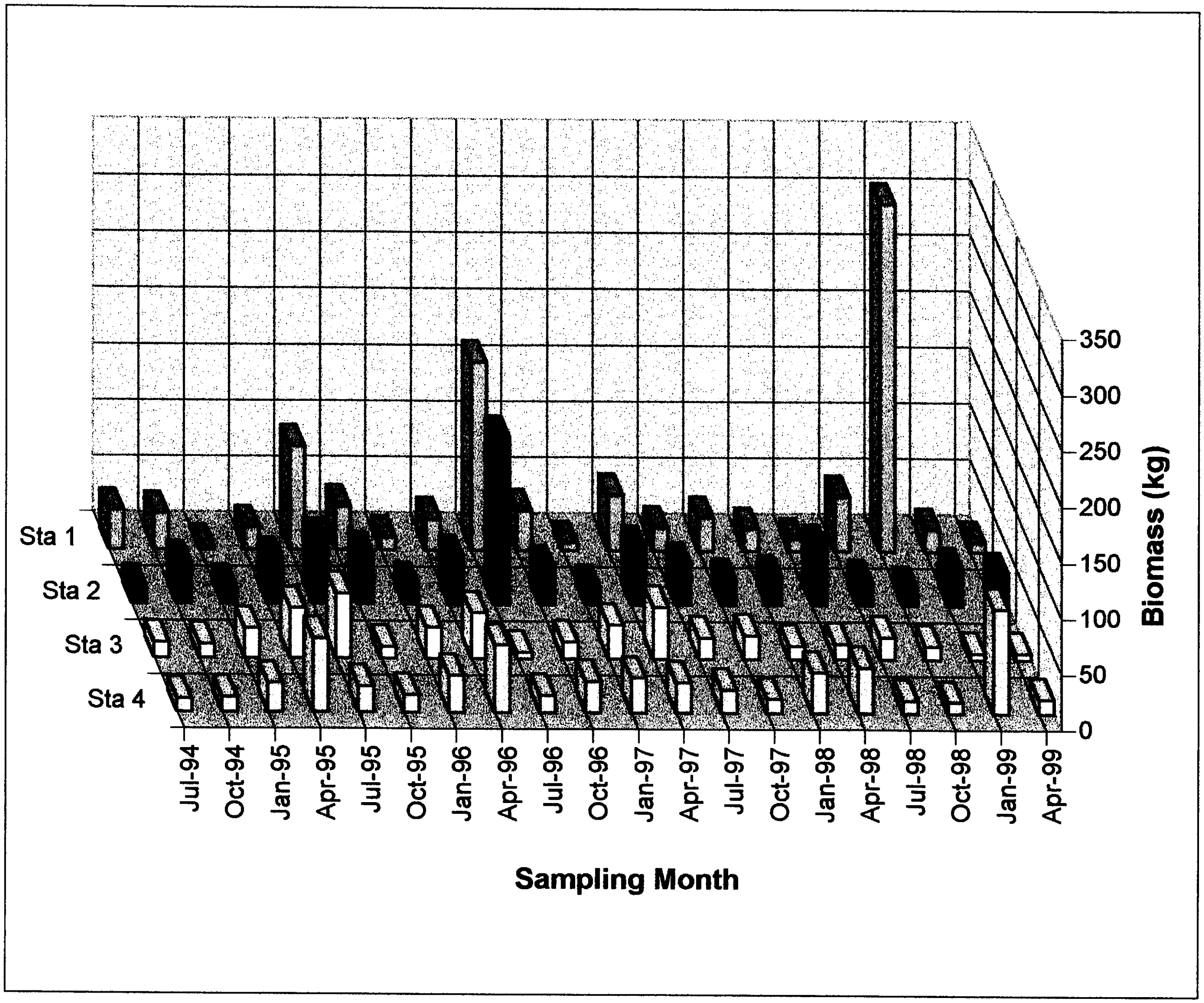
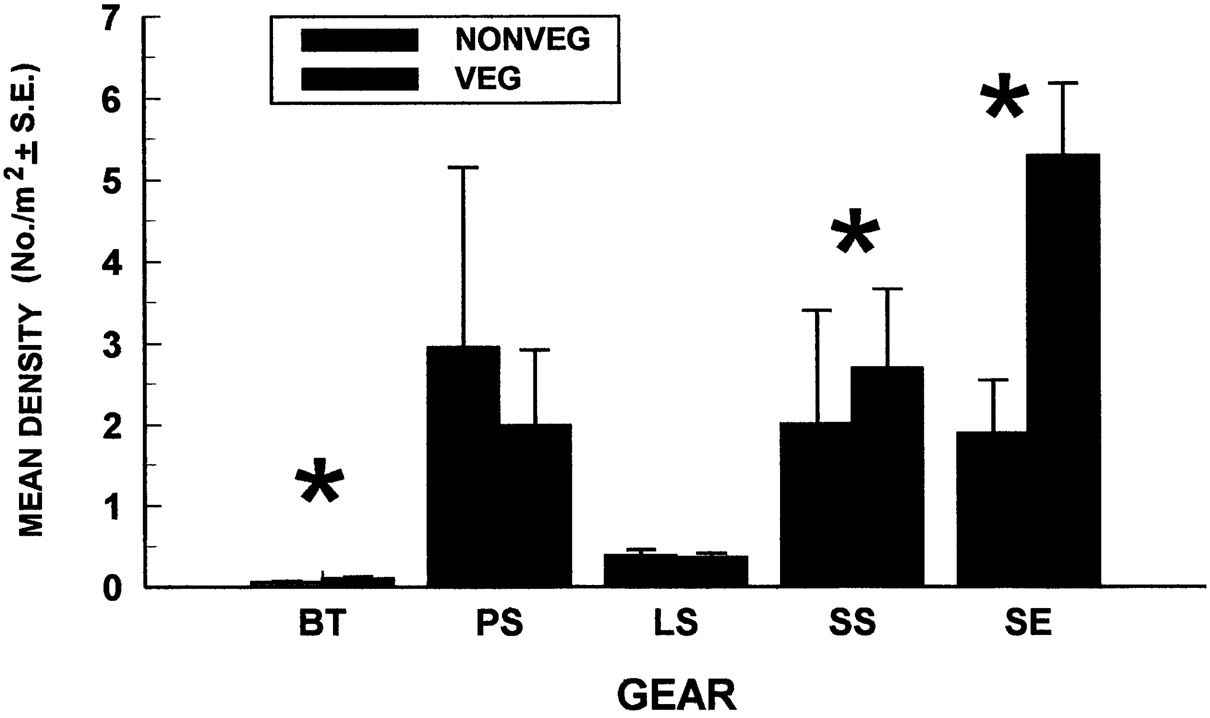


Figure 14. COMPARISON OF FISH DENSITY
VEGETATED VS NON-VEGETATED SITES (n=80)



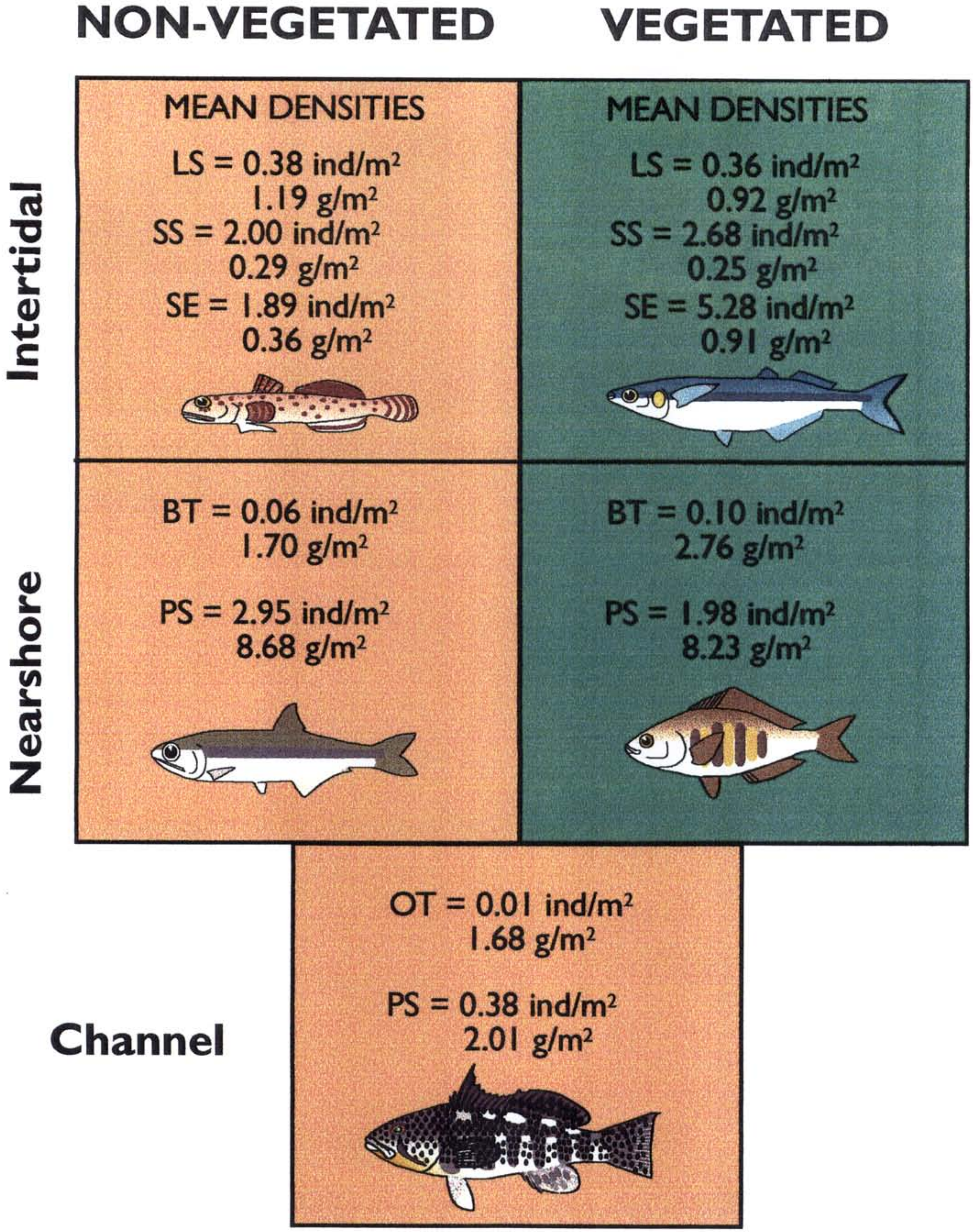
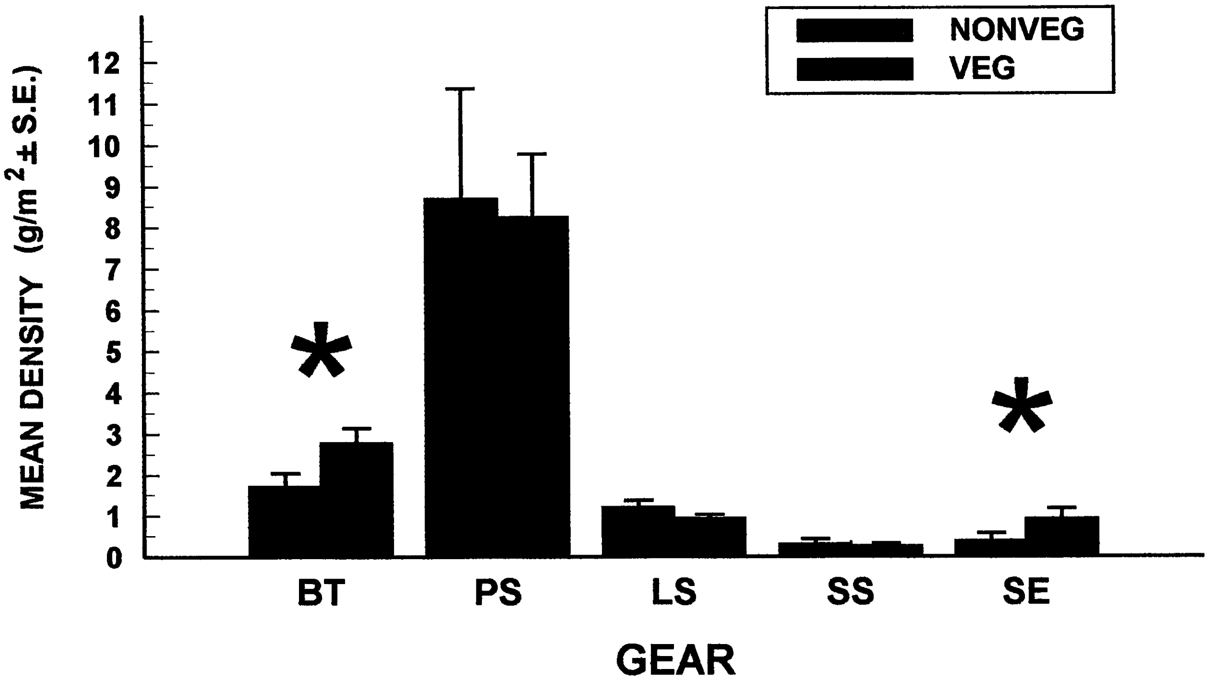


Figure 15. Comparison of numerical and biomass densities by gear type for each of the five subhabitats in San Diego Bay, July 1994 - April 1999.

Figure 16. COMPARISON OF FISH BIOMASS DENSITY
VEGETATED VS NON-VEGETATED SITES (n=80)



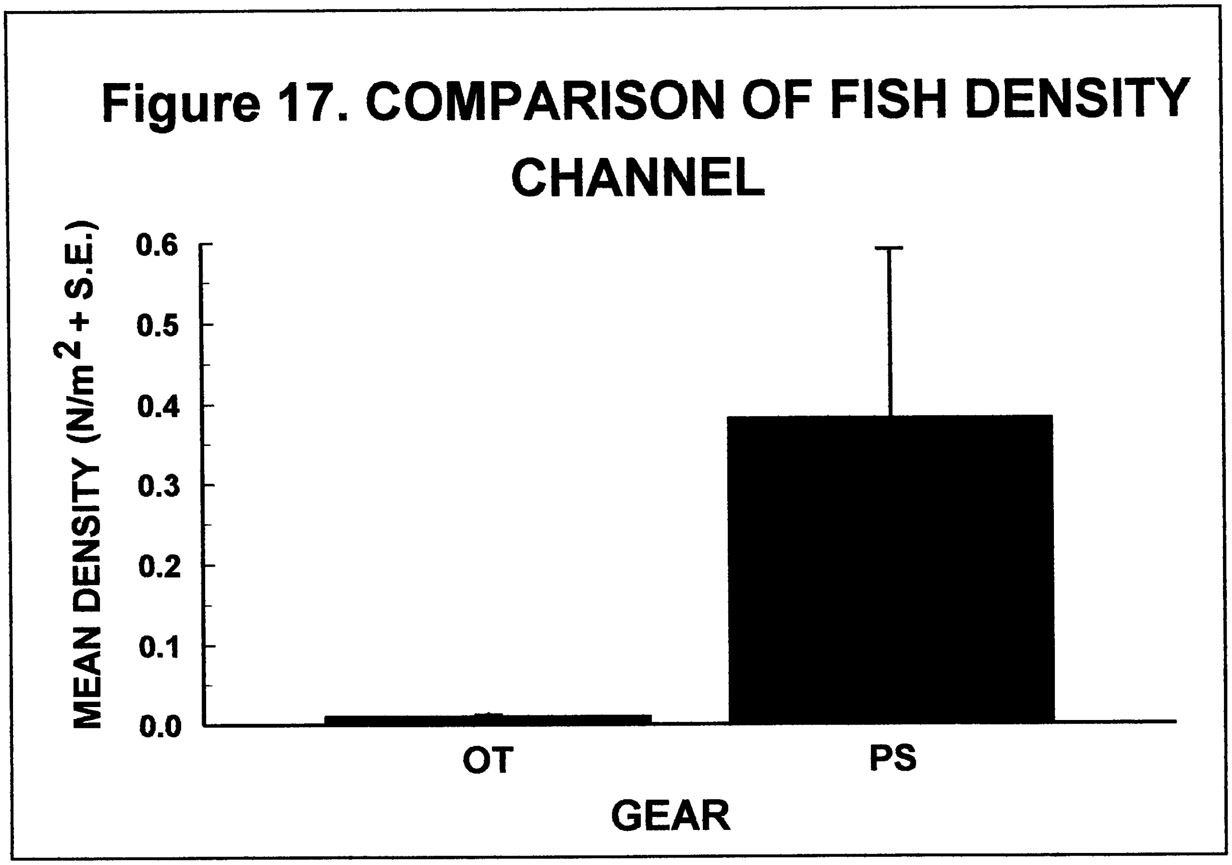


Figure 17. COMPARISON OF FISH DENSITY
CHANNEL
MEAN DENSITY (N/m2 + S.E.)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
OT
PS
GEAR

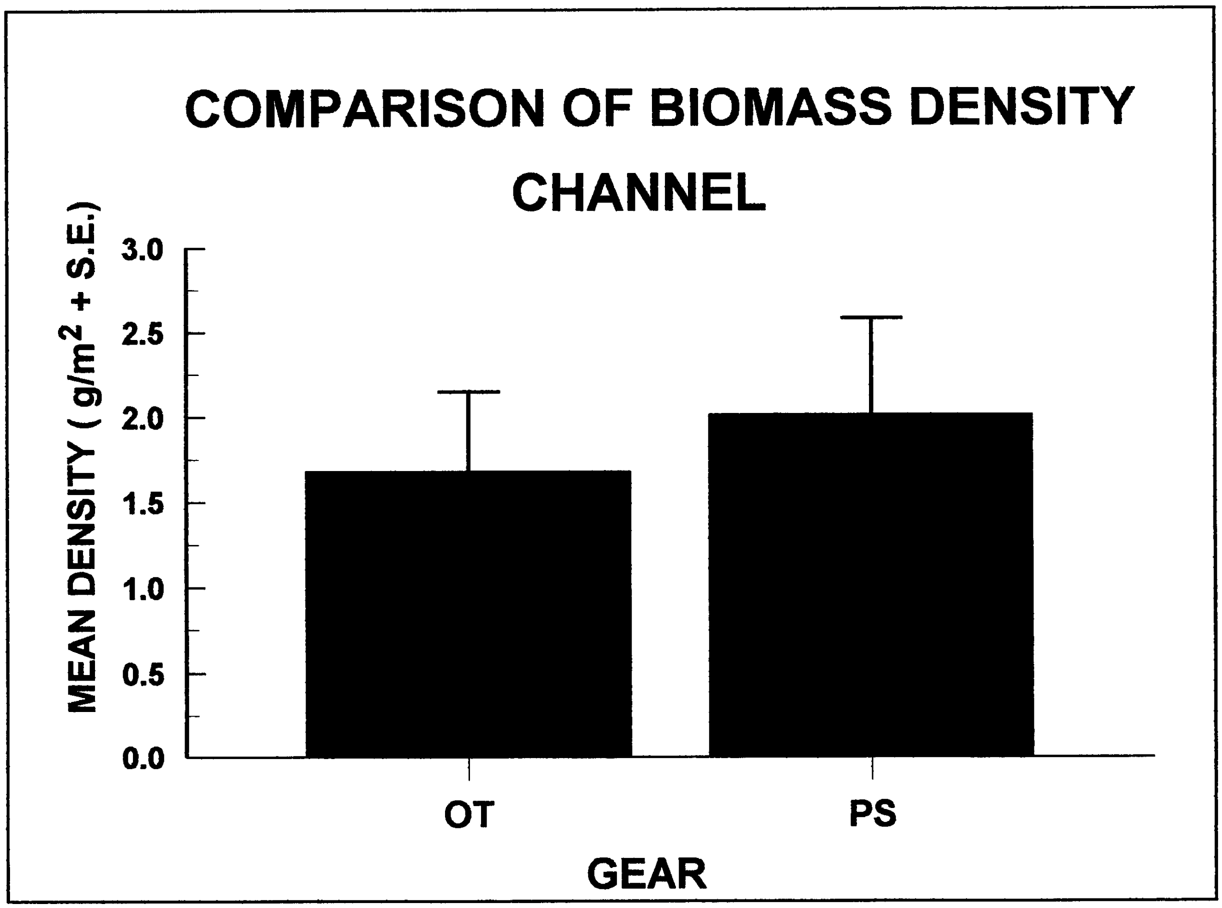

COMPARISON OF BIOMASS DENSITY
CHANNEL
MEAN DENSITY (g/m2 + S.E.)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
OT
PS
GEAR

Figure 18. Top 20 species of San Diego Bay fishes ranked by Ecological Index, July 1994-April 1999.

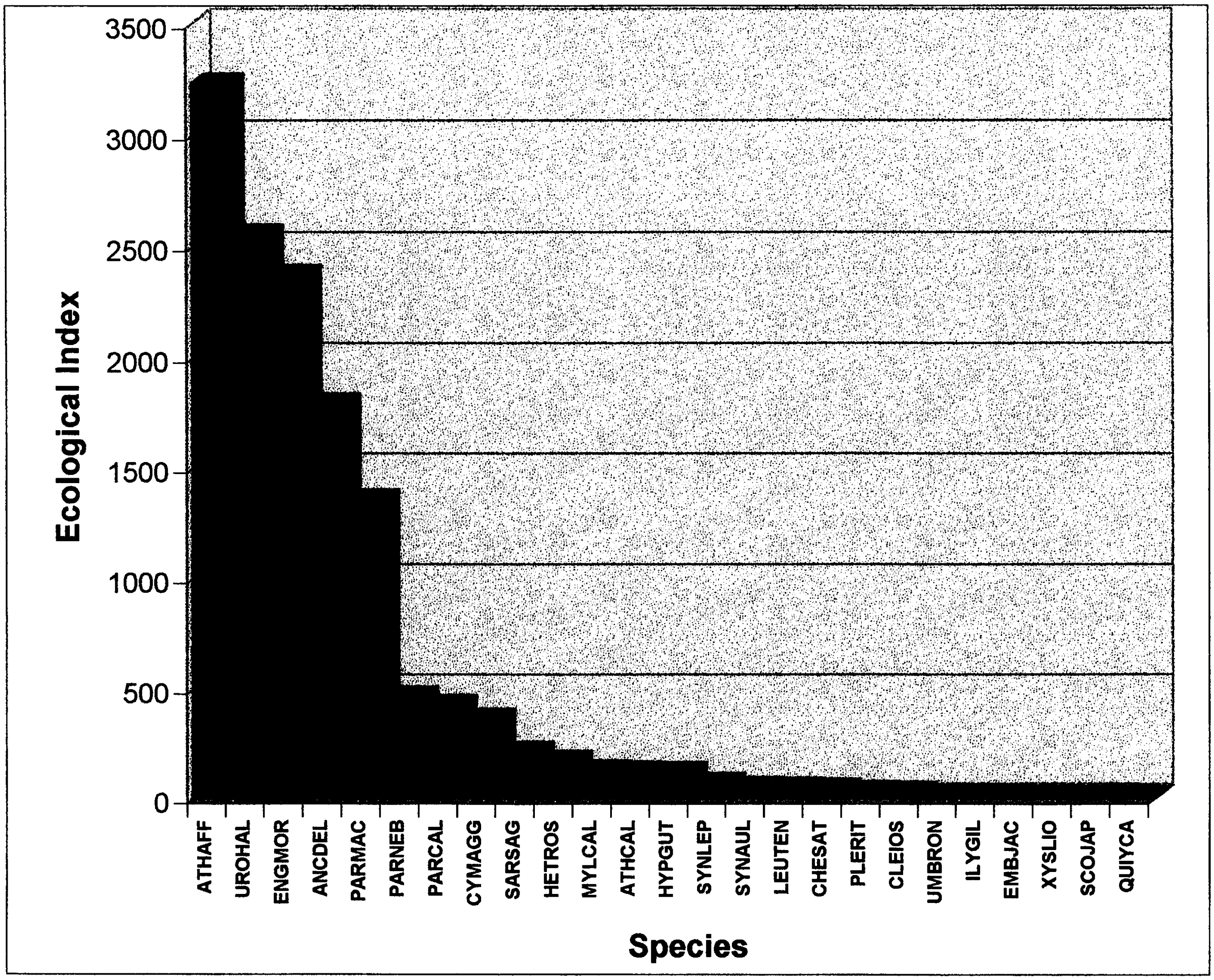


Figure 19. Number of species (species richness) and Shannon-Weiner Diversity (H') of fishes in San Diego Bay by station, July 1994 - April 1999.

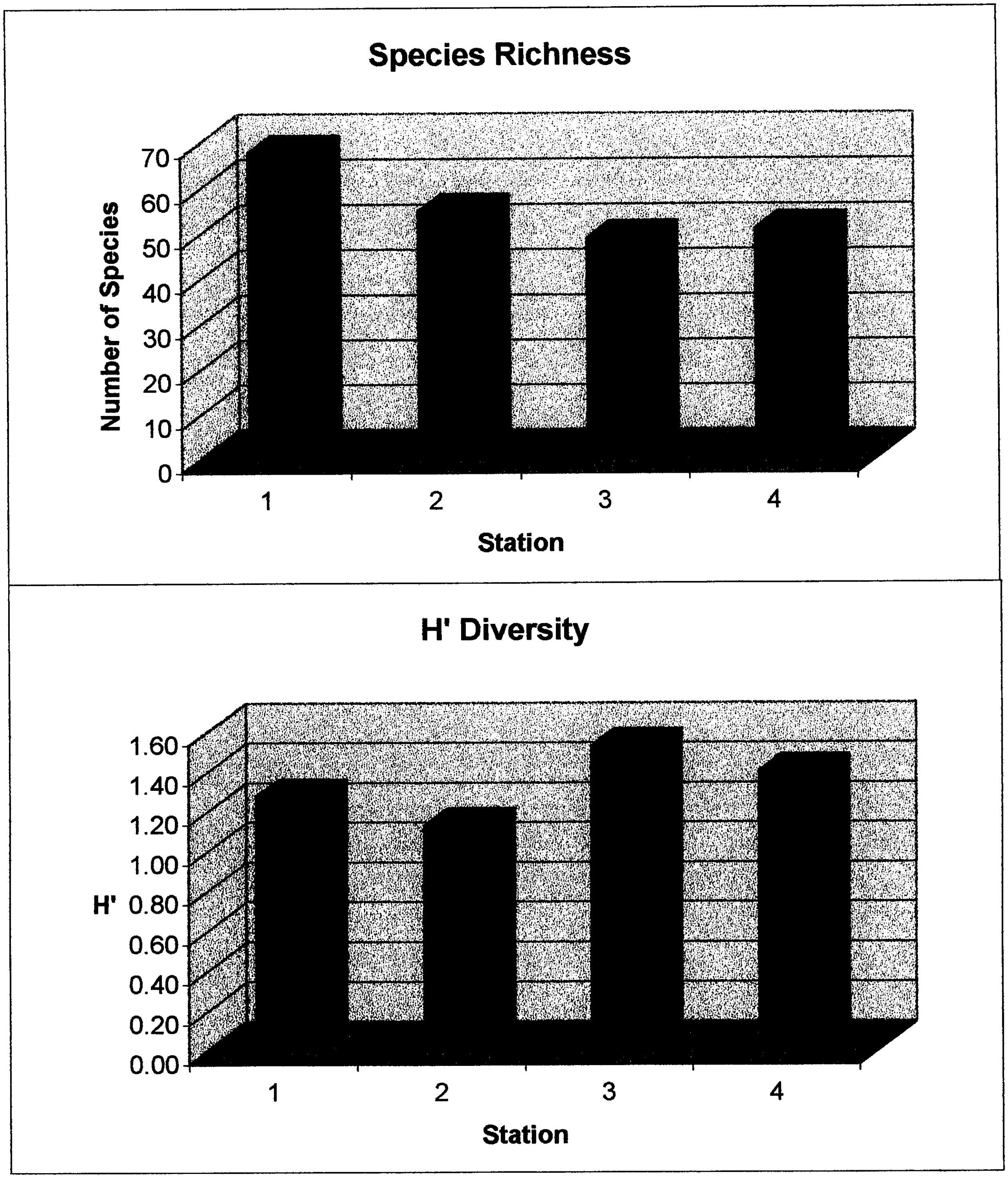
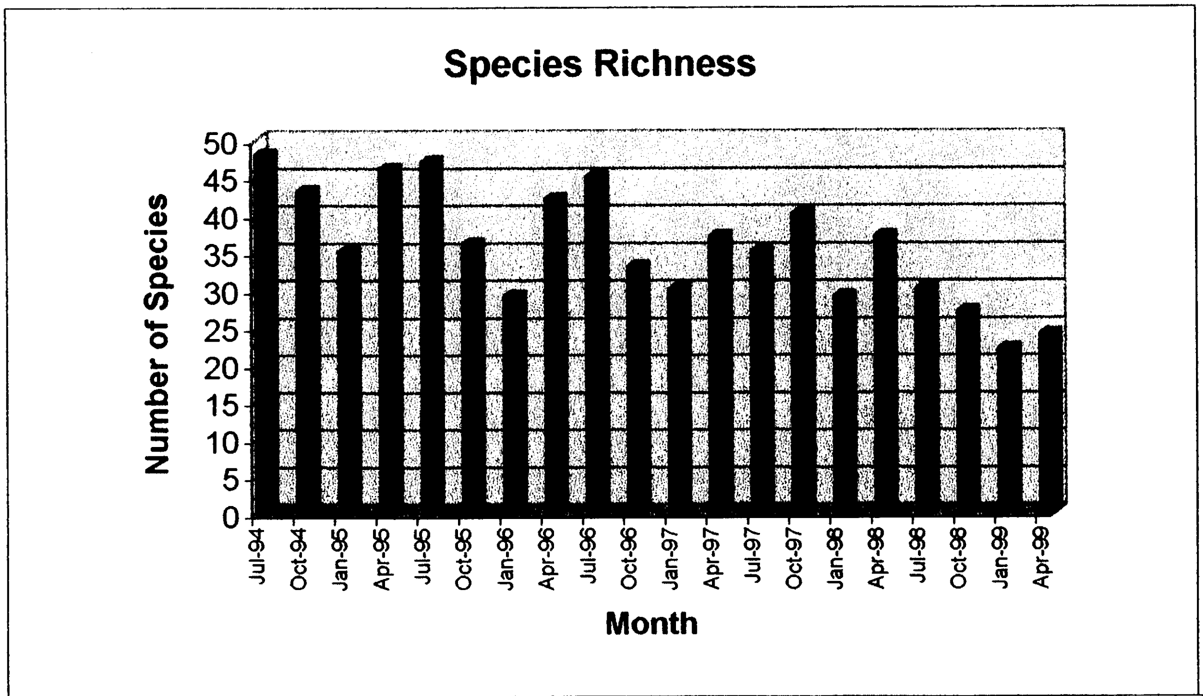


Figure 20. Number of species (species richness) and Shannon-Weiner Diversity (H') of fishes in San Diego Bay by sampling month, July 1994 - April 1999.



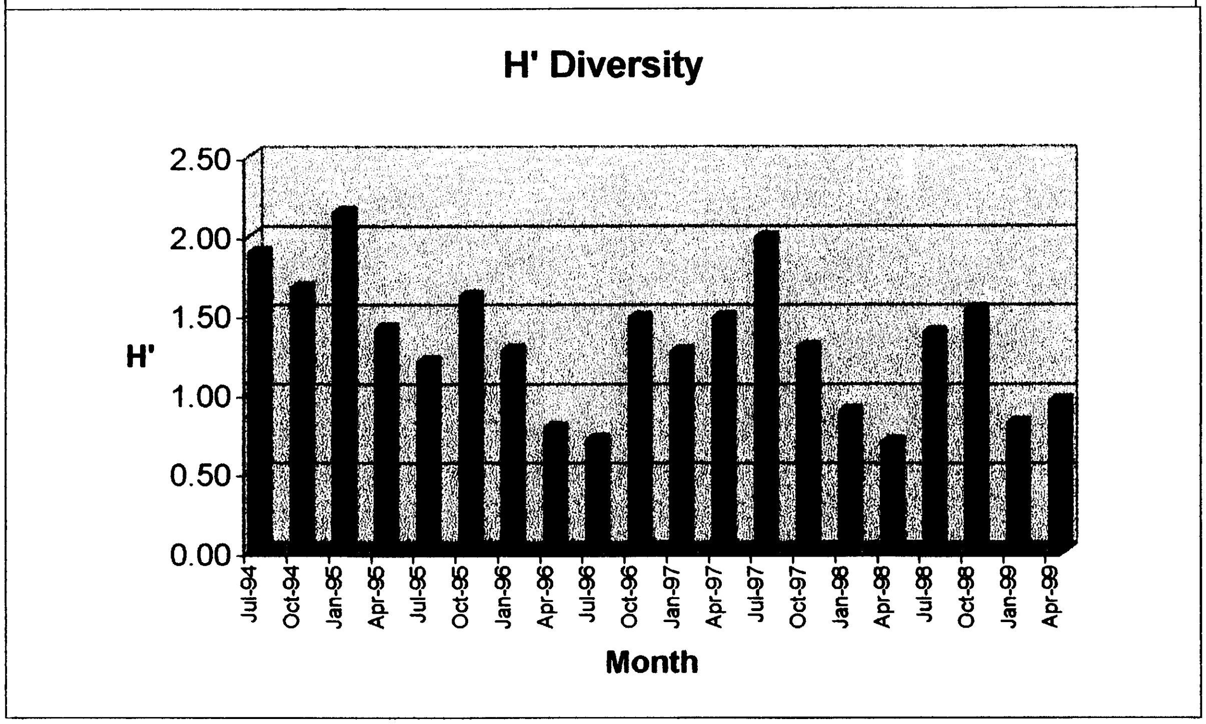
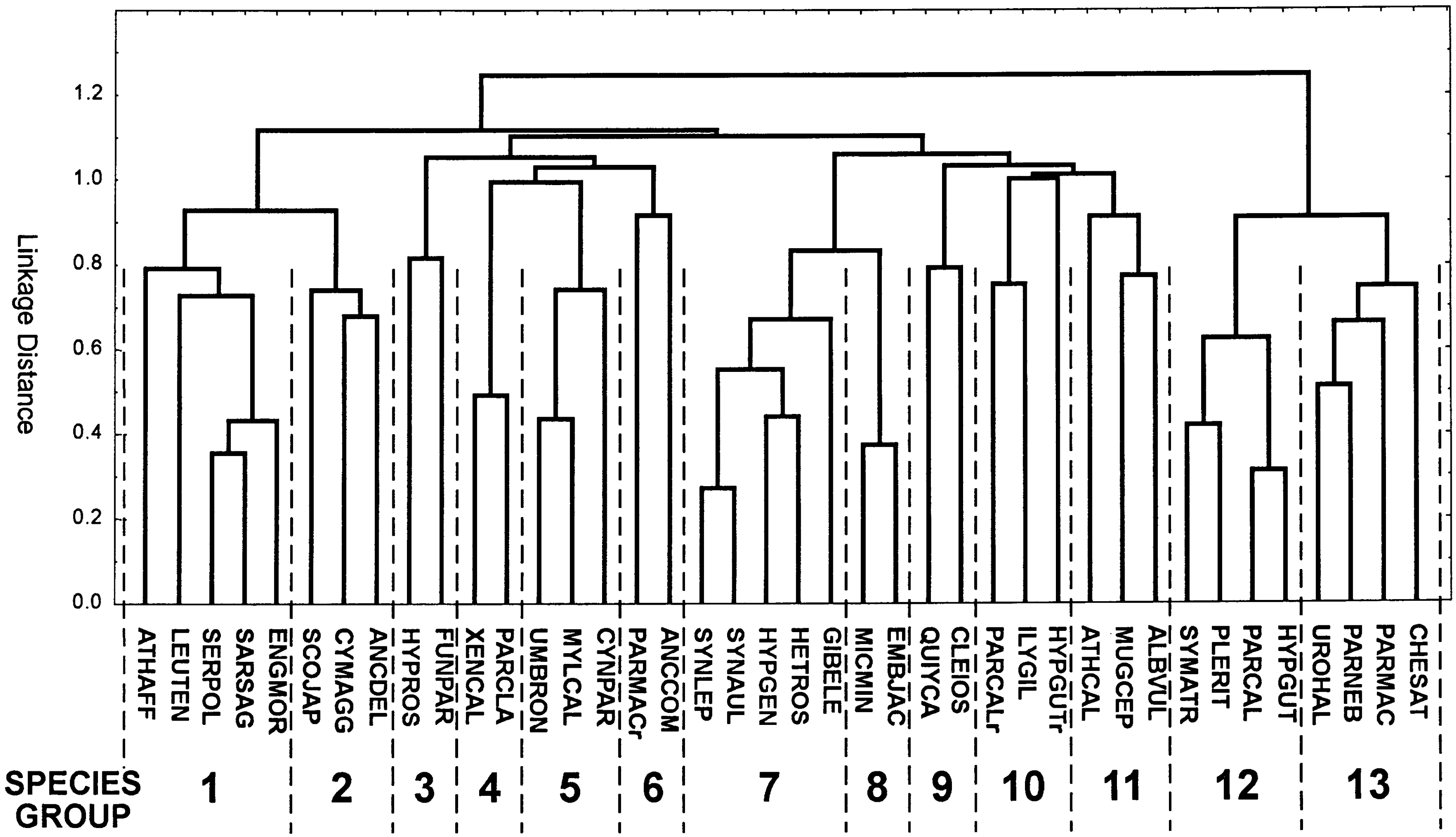


Figure 21. Dendrogram depicting species groups based on the square-root transformed abundance of the 37 fish species (and three size classes) from San Diego Bay from July 1994 to April 1999. Clustering was based on co-occurrence (correlation coefficients) of species pairs within samples. Species codes ending in "r" indicate new recruited juveniles of the that species. To be included species had to rank in the top 35 in numerical abundance *or* the top 20 in biomass abundance.



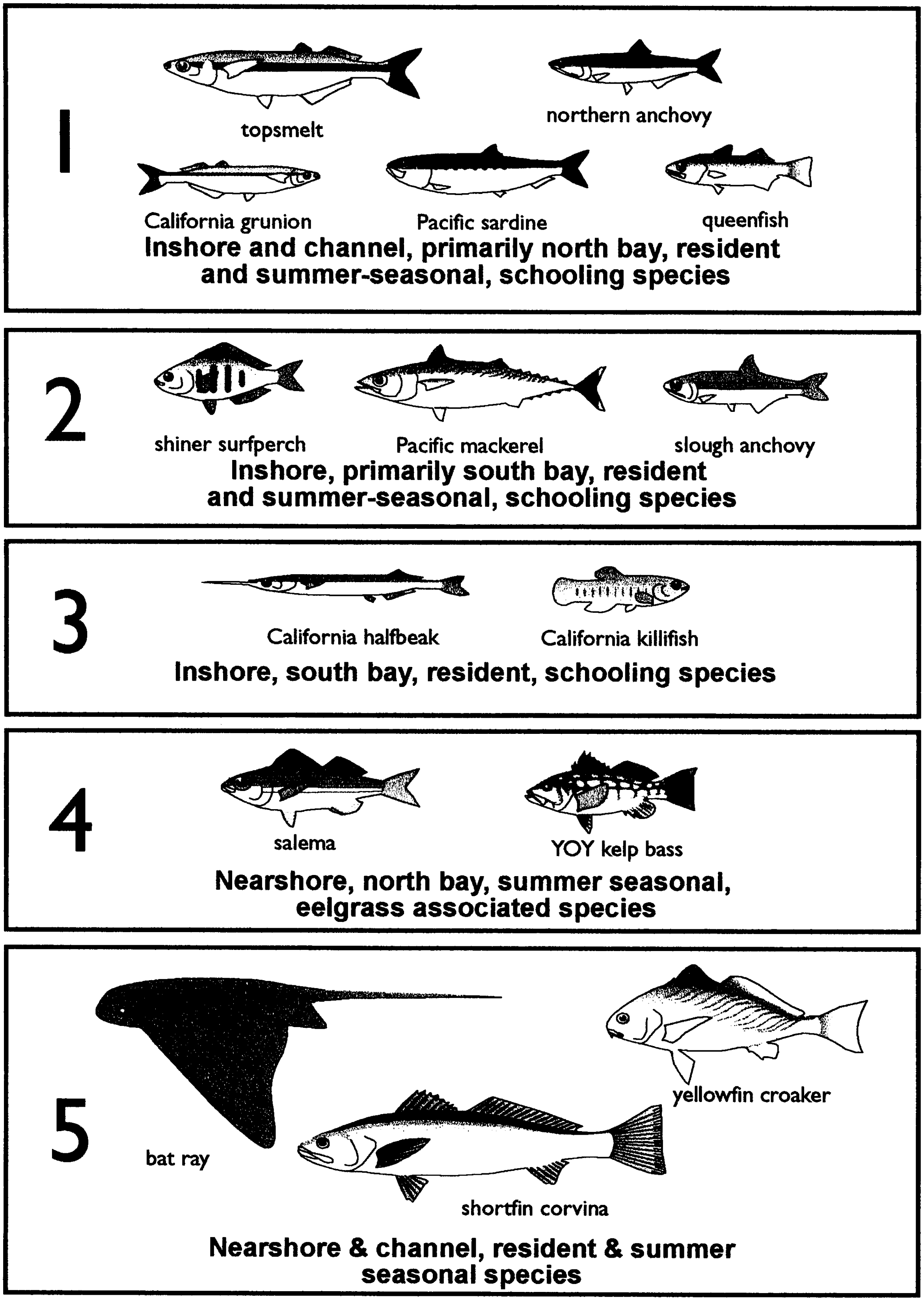


Figure 22. Species composition of Species Groups 1 - 5 as determined by cluster analysis of catch data from San Diego Bay, July 1994 to April 1999.

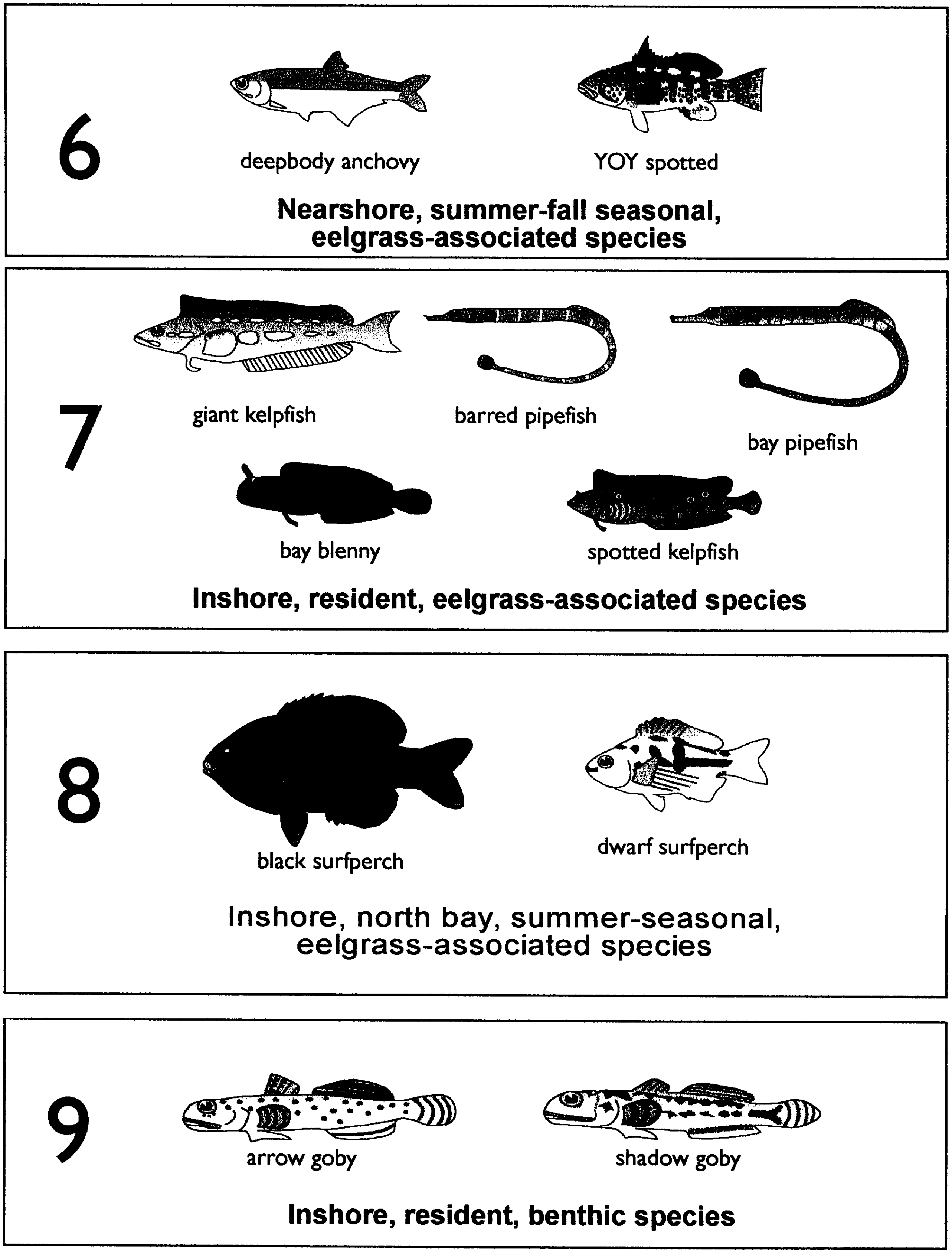


Figure 23. Species composition of Species Groups 6 - 9 as determined by cluster analysis of catch data from San Diego, July 1994 to April 1999.

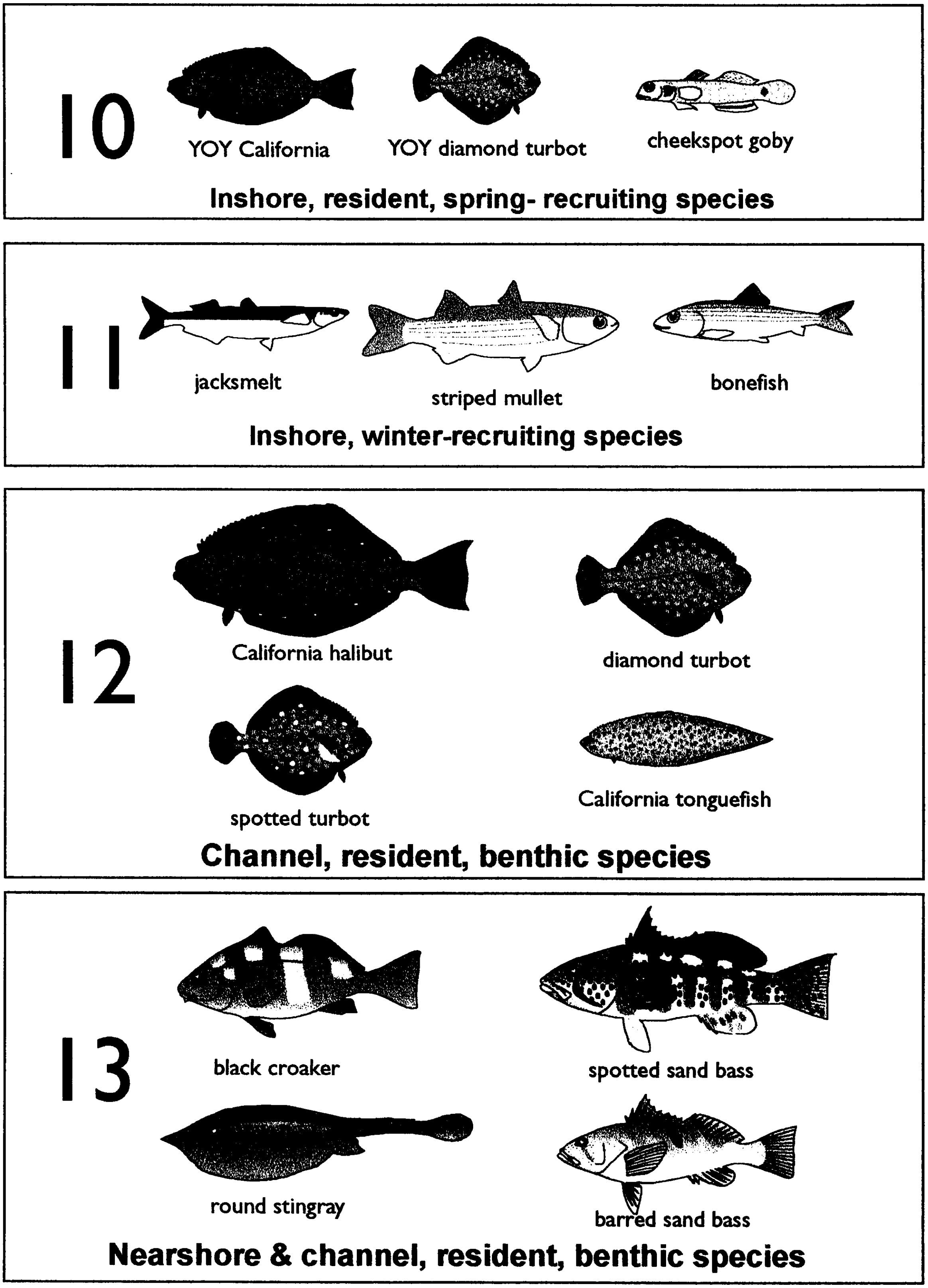


Figure 24. Species composition of Species Groups 10-13 as determined by cluster analysis of catch data from San Diego Bay, July 1994 to April 1999.

Figure 25. Cluster of Southern Californian harbor, bay and estuarine habitats based on fish faunal relationships. (Cabrillo = Cabrillo Beach, Los Angeles Harbor; POLAMEC = Port of Los Angeles; Mugu = Mugu Lagoon; NB7475 = Newport Bay study 1974-75; UNB = upper Newport Bay study 1978; UNB8687 = upper Newport Bay study 1986-87; SDB9499S = Present study for stations 1 - 4). See text for further details on studies.

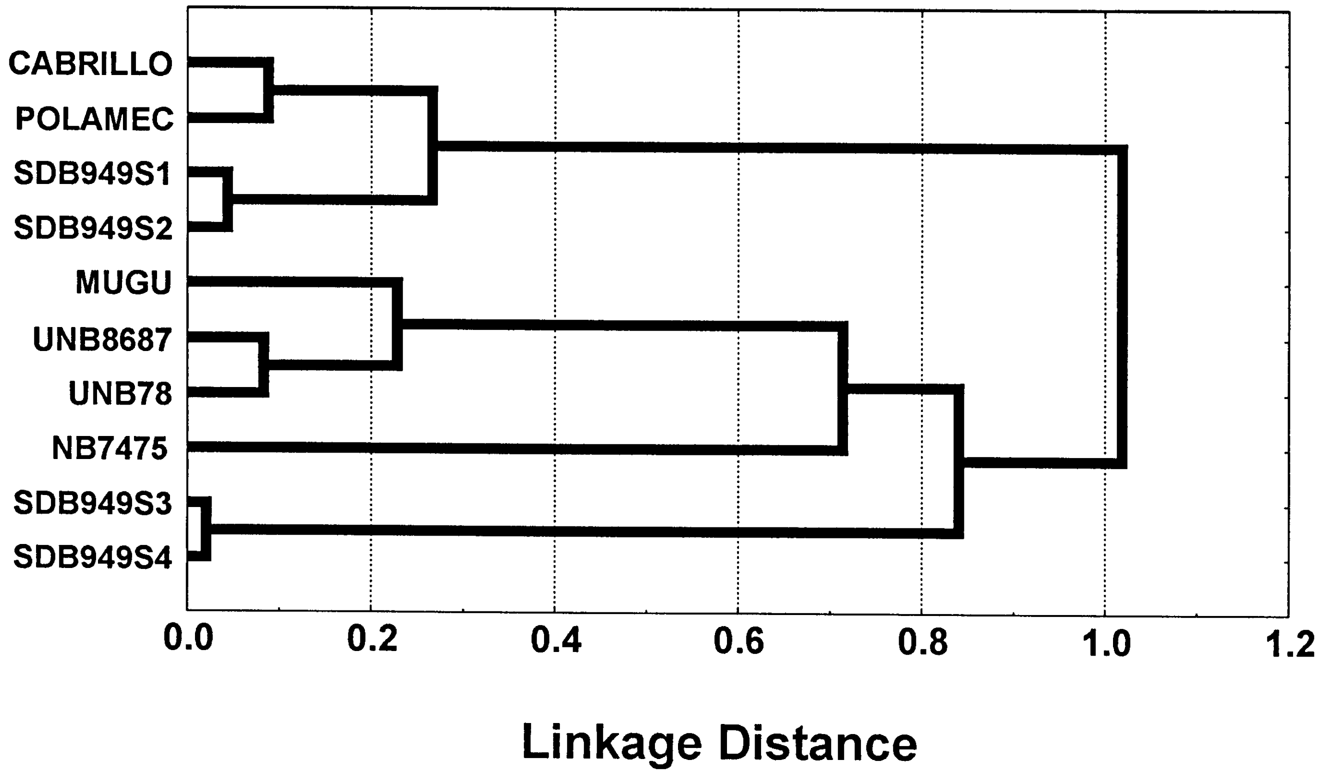


Figure 26. Comparison of numerical and biomass densities, number of species, and H' diversity among the six different sampling gears used to assess the fish assemblages of San Diego Bay, July 1994 - April 1999.

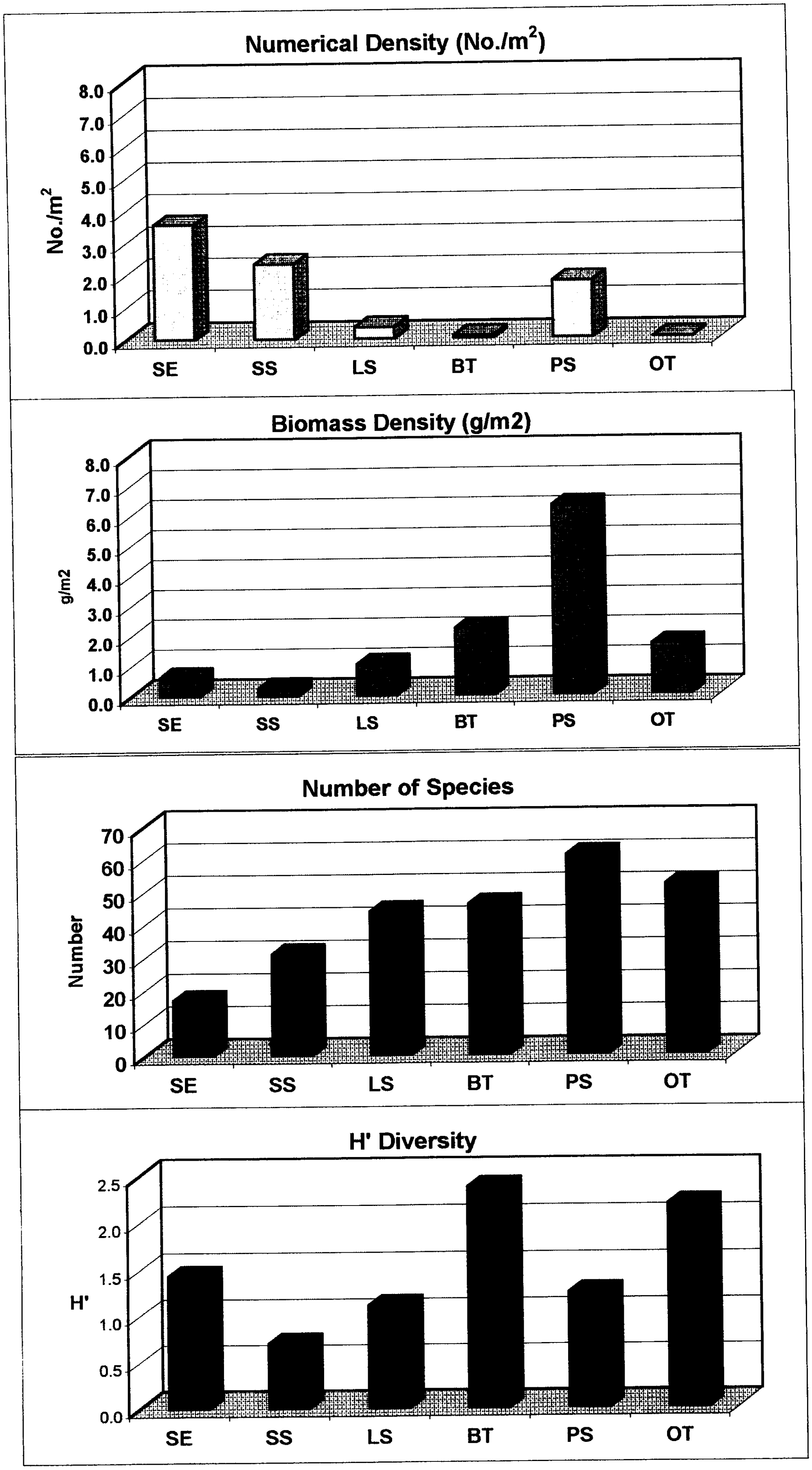
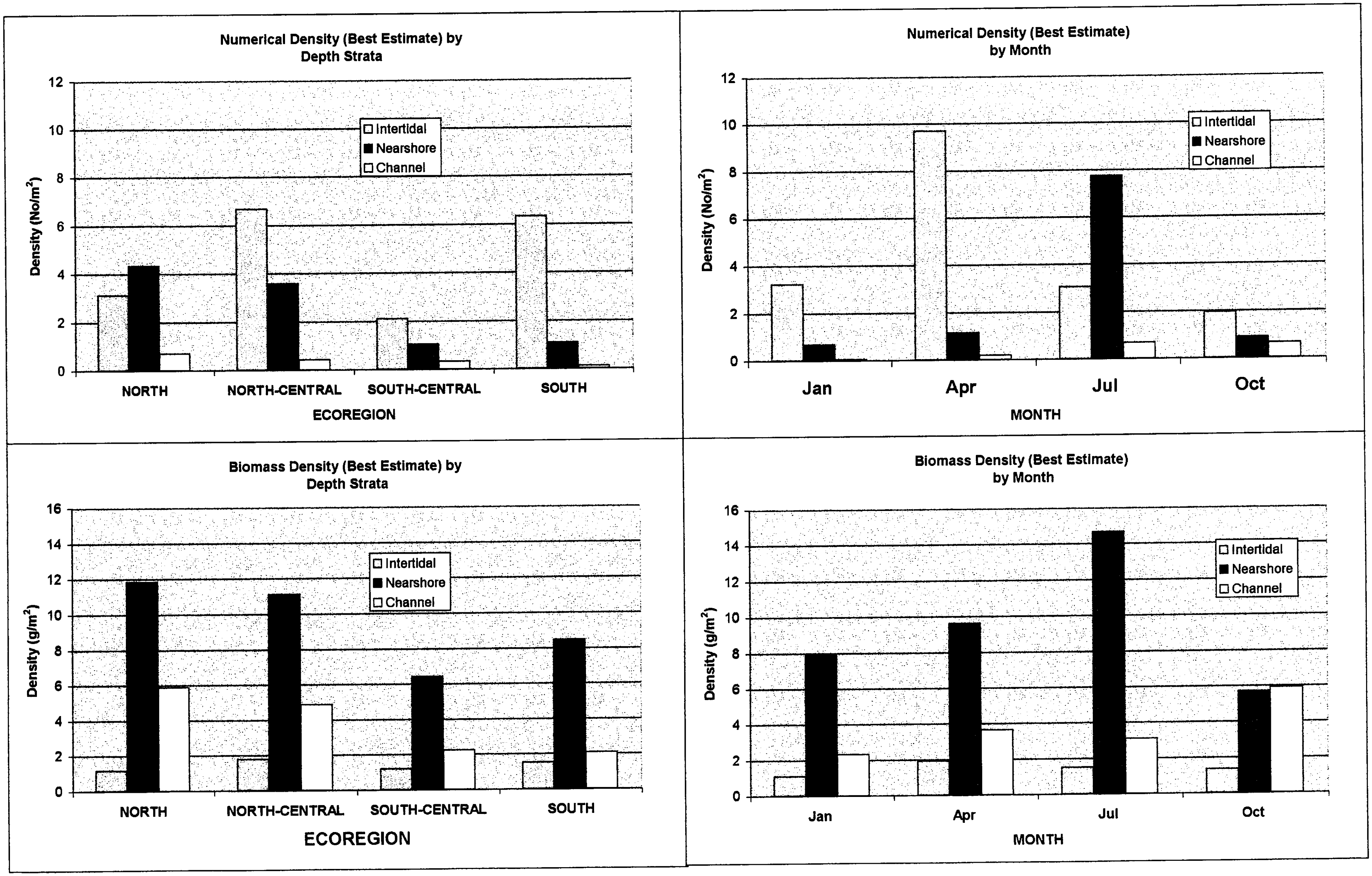


Figure 27. Comparison of best estimates of numerical and biomass densities for each depth stratum within each Ecoregion of San Diego Bay and within season (sample month).



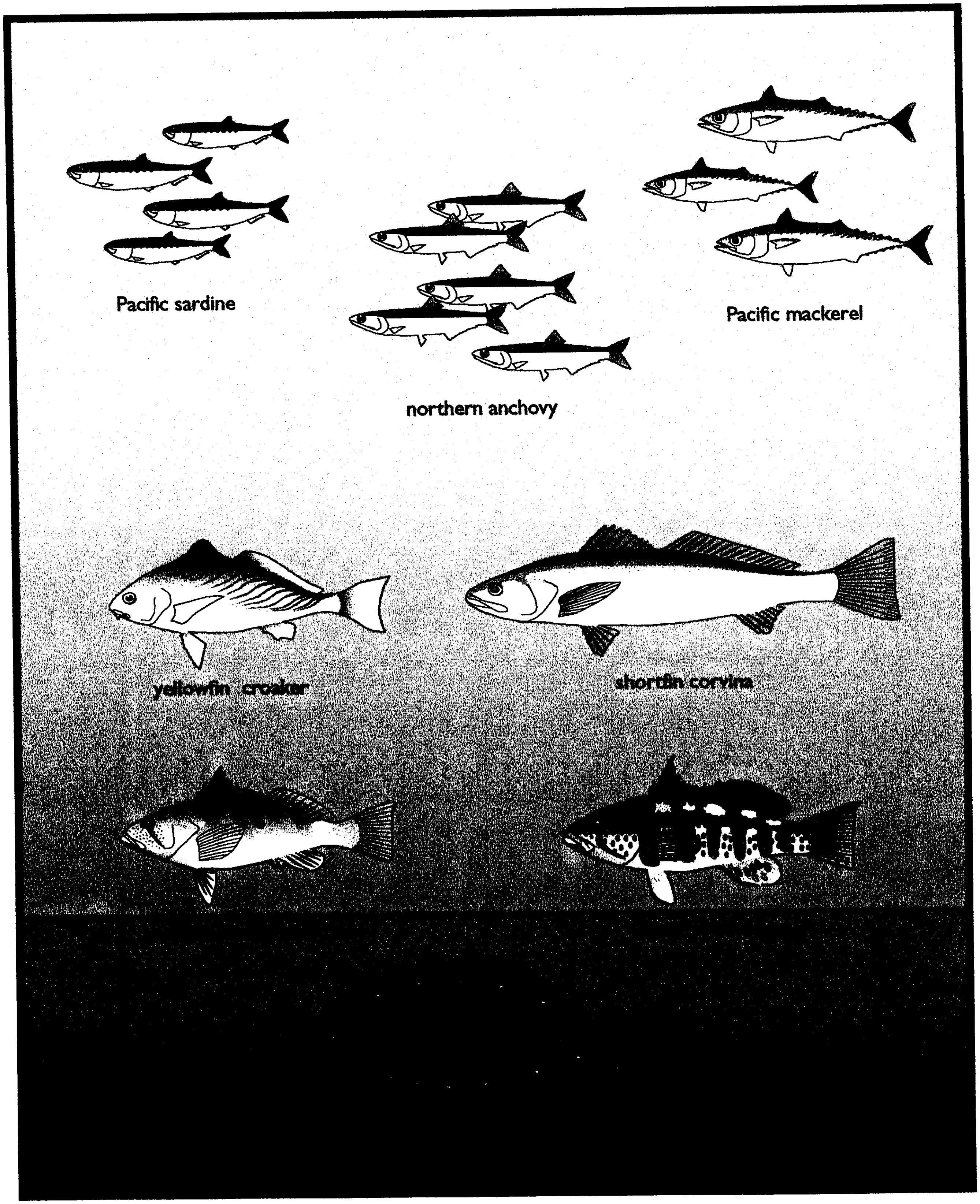


Figure 28. Most abundant recreational/commercial fish species captured in San Diego Bay from July 1994 to April 1999.

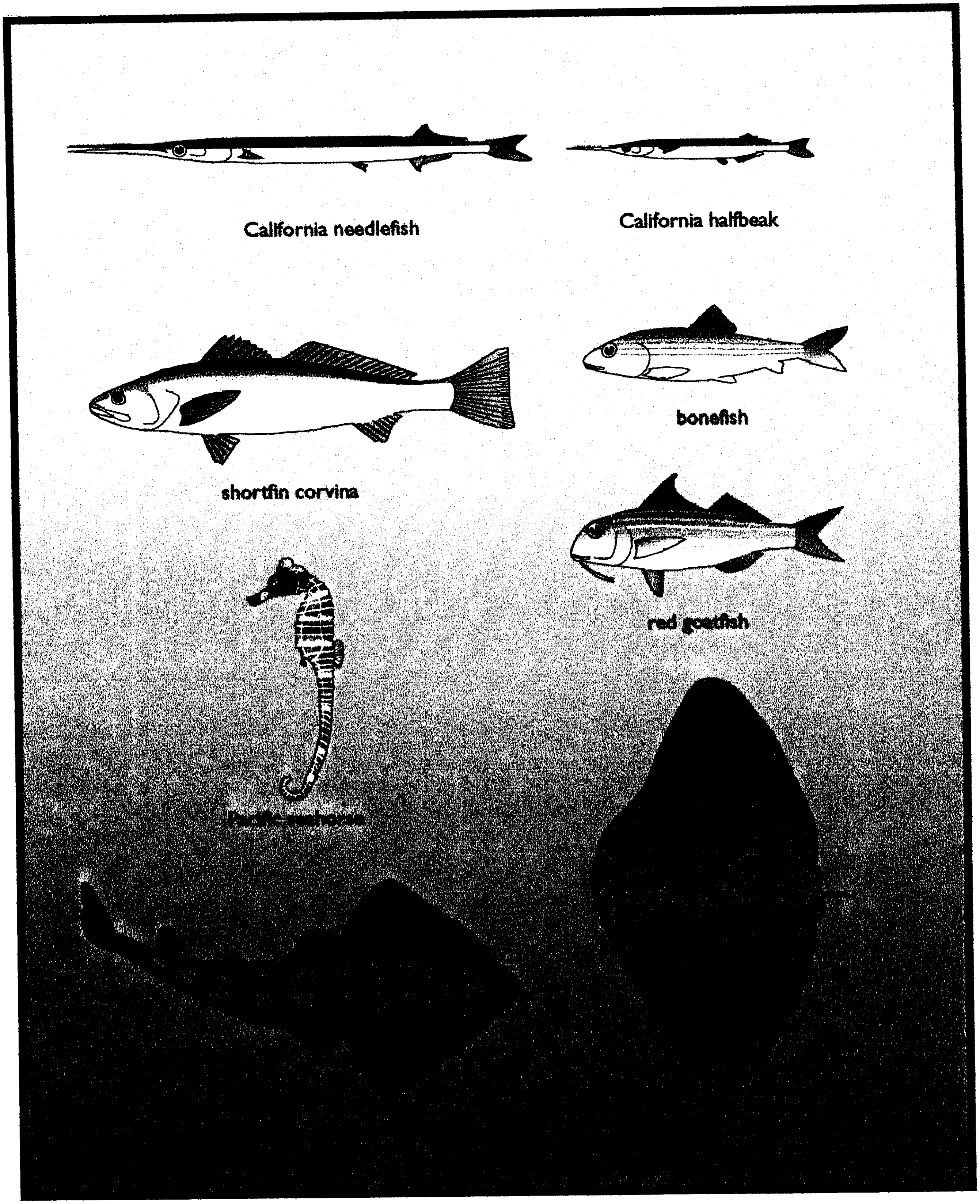
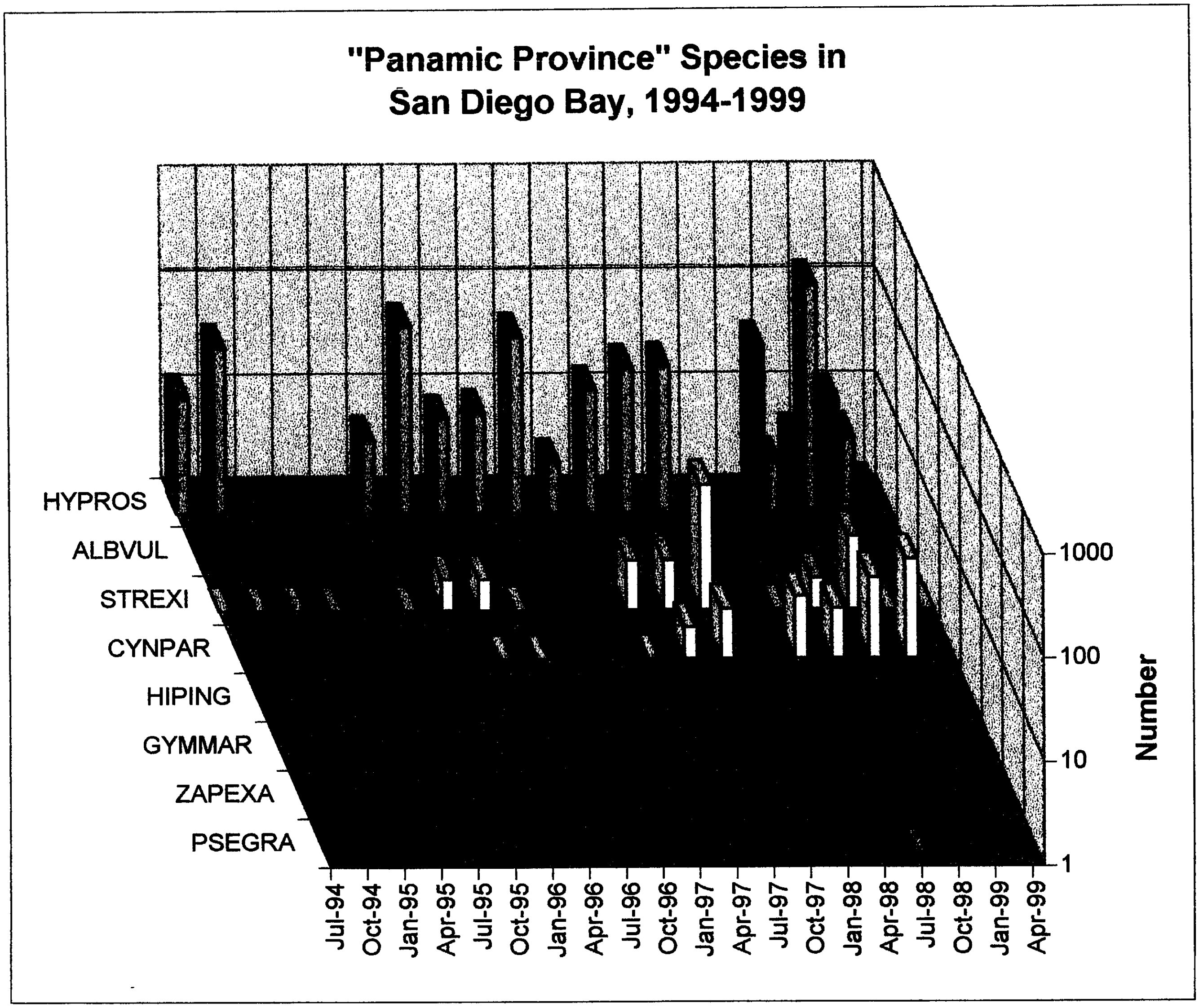
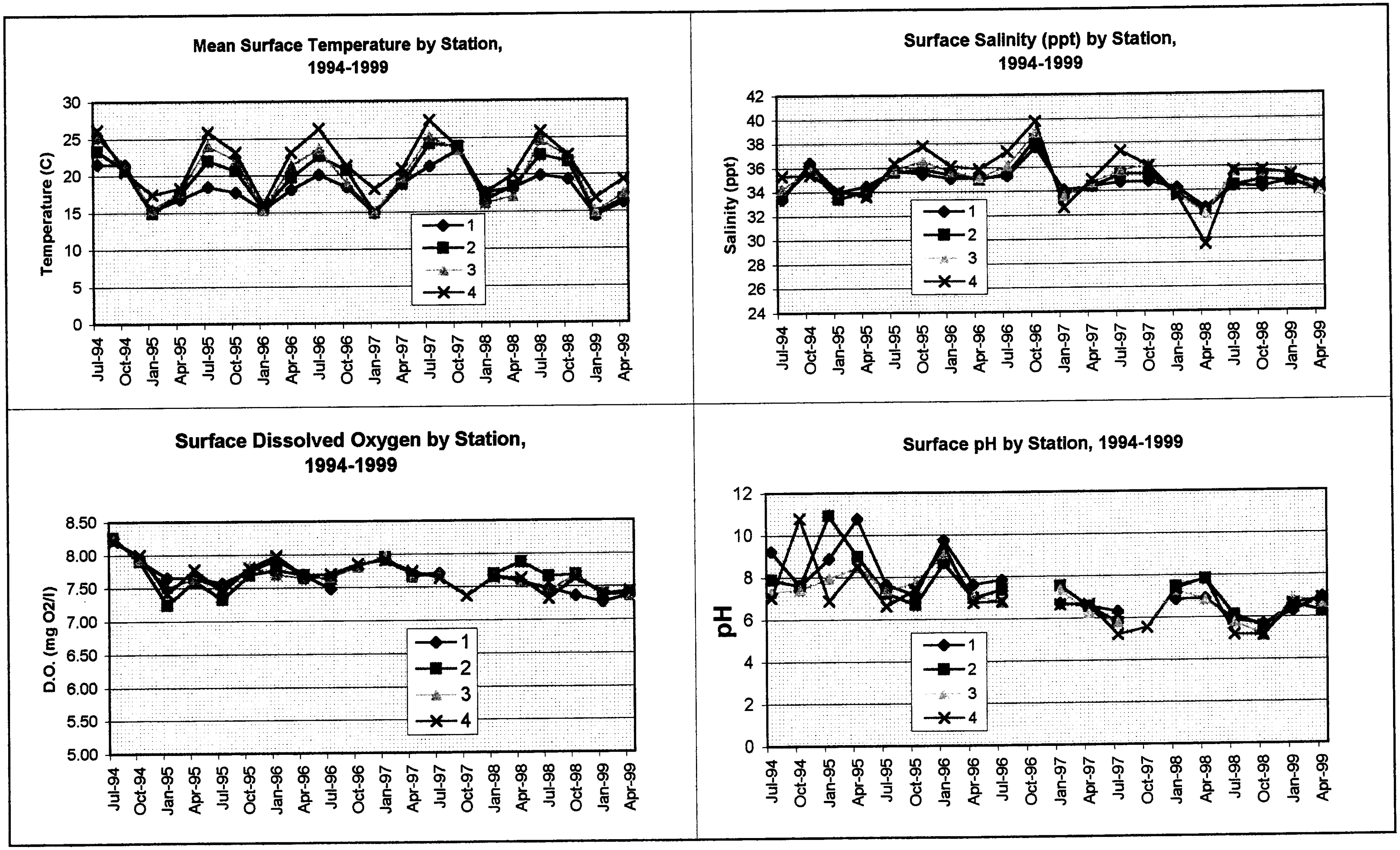


Figure 29. "Panamic Province" or southern species occurring in San Diego Bay from July 1994 to April 1999.

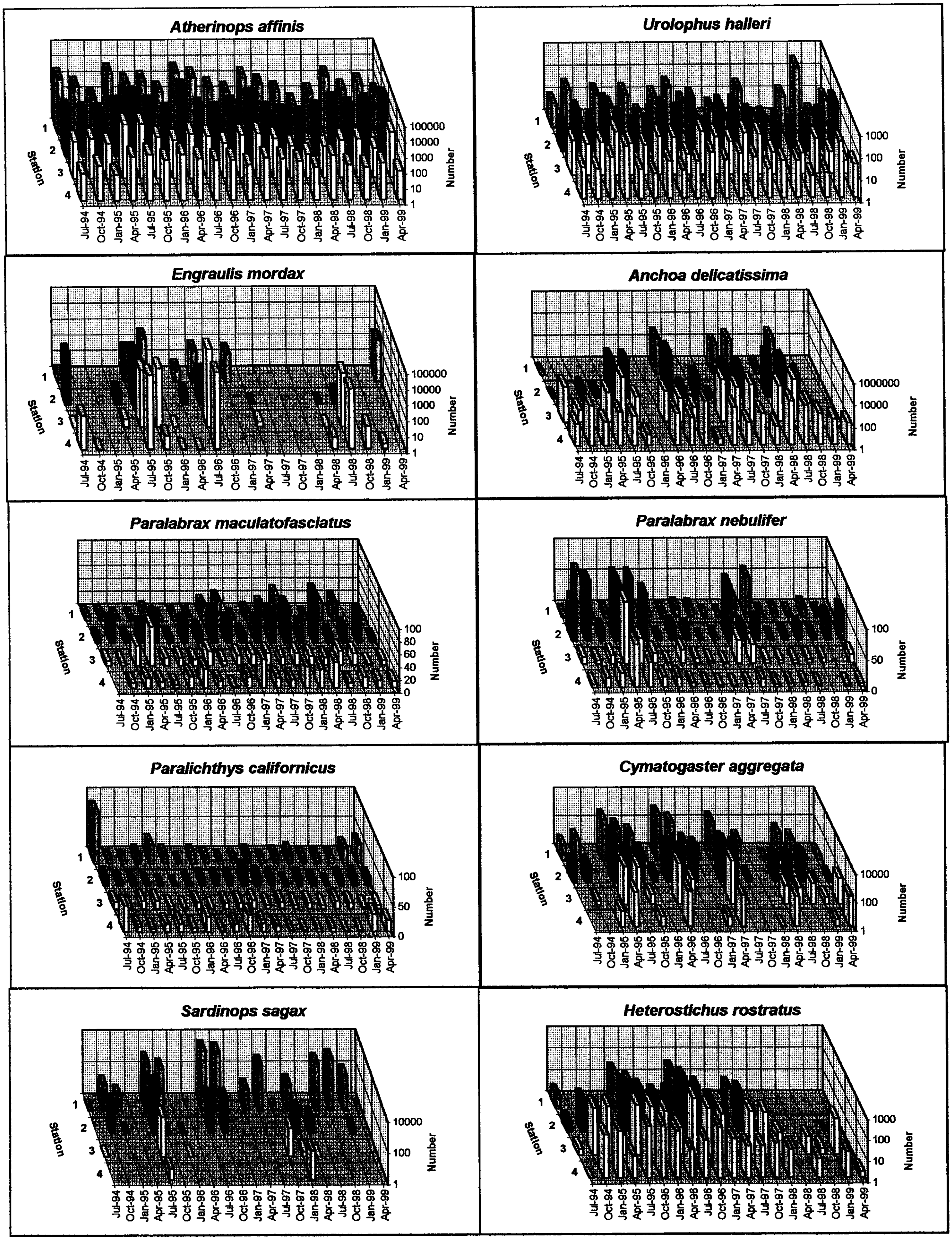
Figure 30. Abundance of "Panamic Province" or southern species occurring in San Diego Bay from July 1994 to April 1999.



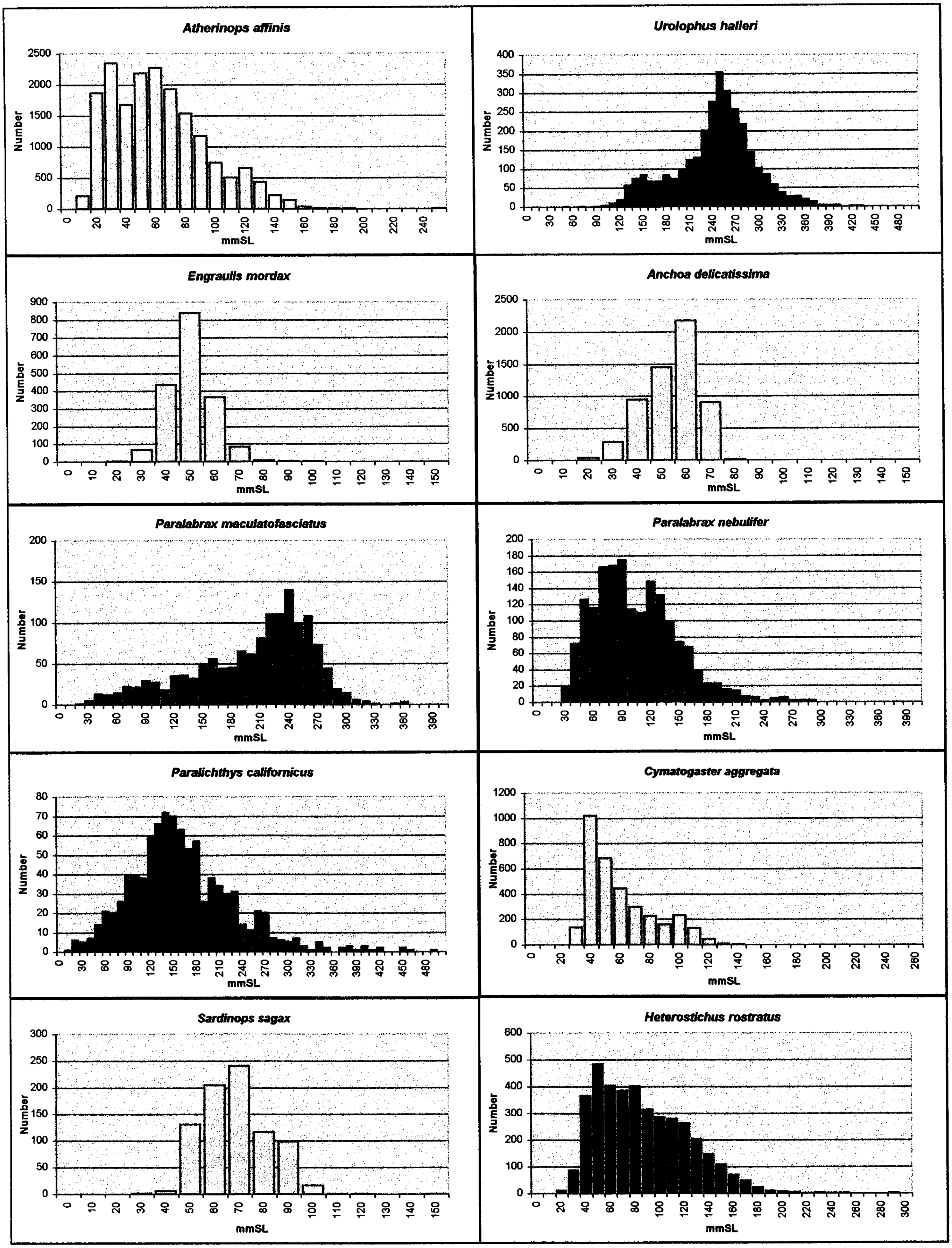
Appendix Figure 1. Summary of Mean Physical-Chemical measurements by Station over the Sampling Months, July 1994 to April 1999.



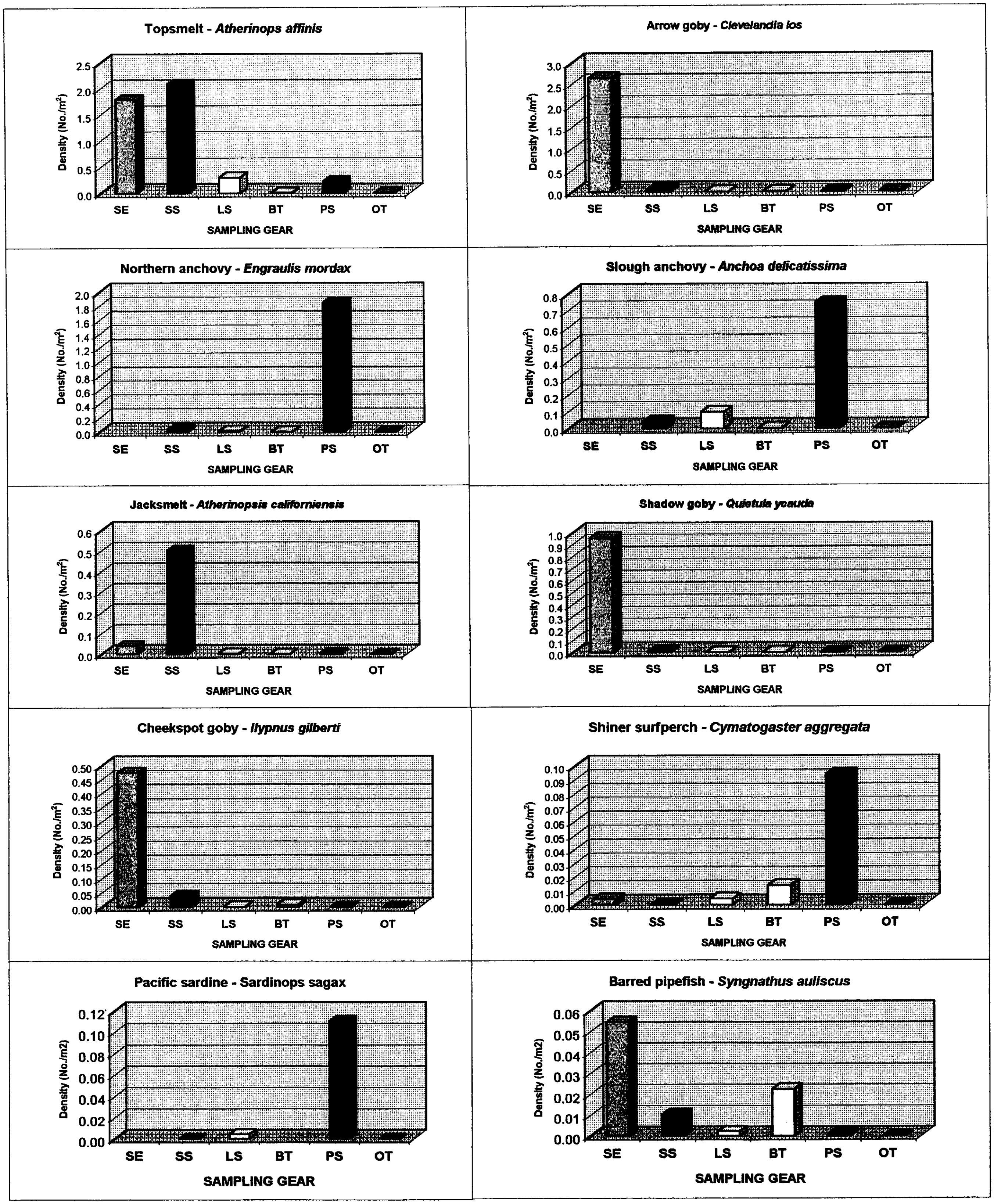
Appendix Figure 2. Abundance of the top 10 species ranked by Ecological Index (EI) by station over sampling month for the study period July 1994 to April 1999.



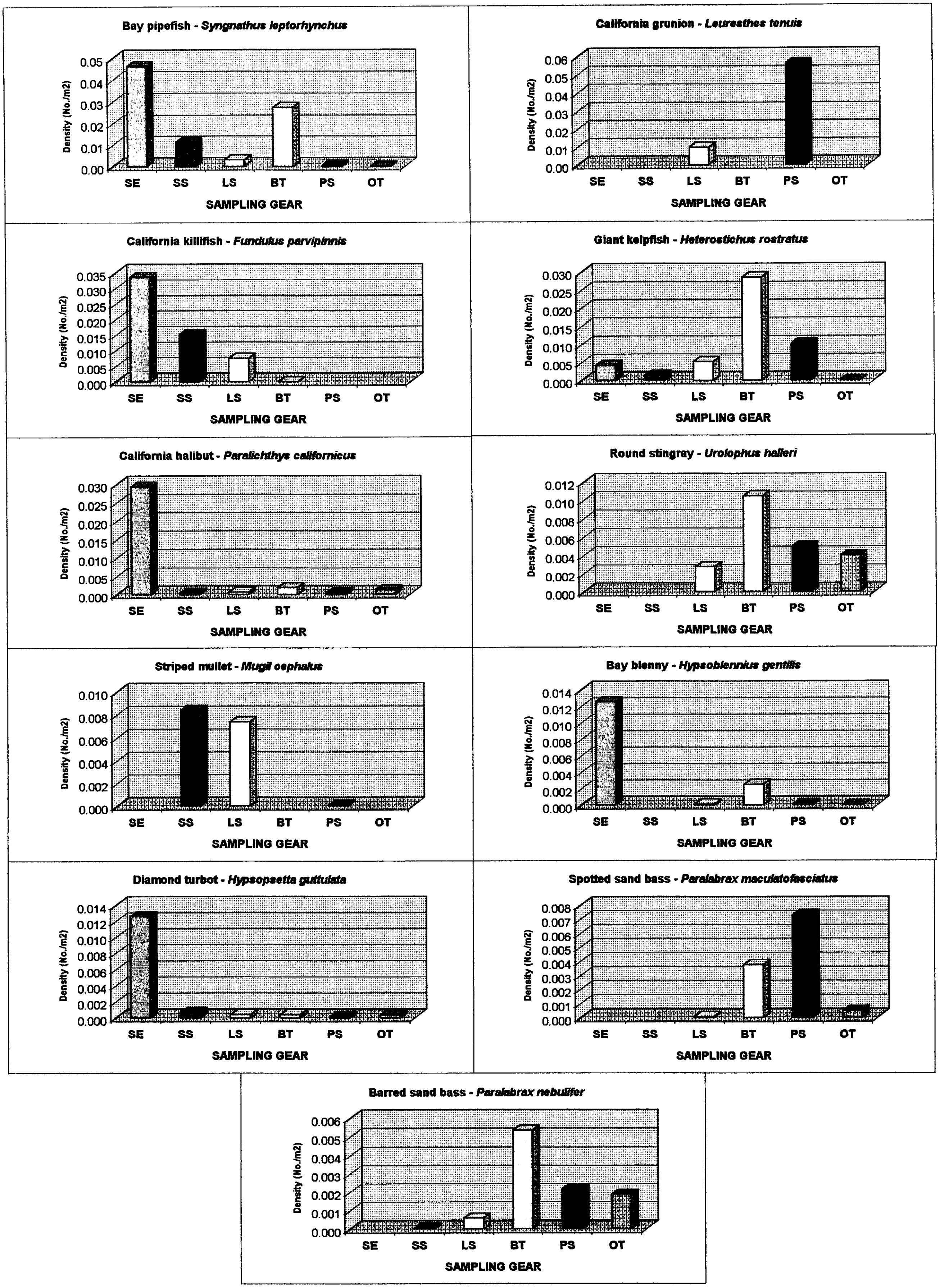
Appendix Figure 3. Length frequencies of the top 10 species ranked by Ecological Index (EI) captured in San Diego Bay from July 1994 to April 1999.



Appendix Figure 4. Comparison of numerical densities by gear type of the top 10 most abundant fish species taken in San Diego Bay from July 1994 to April 1999.



Appendix Figure 5. Comparison of numerical densities by gear type of the 11 - 21th most abundant fish species taken in San Diego Bay from July 1994 to April 1999.



Appendix Table 1. Total abundance of fish species taken from Station 1, July 1994 to April 1999.

STATION 1 - NUMBER OF INDIVIDUALS									MONTH												
SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	36069	Jan-99	Apr-99	TOTAL	%
ENGMOR	132	1			46669	7	1	1	68969							5	6074	27	2		121888	61.52
ATHAFF	3773	1130	221	7599	1770	2390	520	8105	3912	959	448	3996	1406	467	74	367	4494	592	1524	308	44055	22.23
SARSAG		34	8		922	358			5243	3502		19	566	1	37		773	1357	143	1	12964	6.54
ANCDEL						3			1593				363	941		3	1412				4315	2.18
LEUTEN									739	404		604	1167			4	1117	190			4225	2.13
CYMAGG	11	26		674	160	59	1	1279	377	14	2	461	13	21		1	67	22	1	2	3191	1.61
HETROS	117	177	11	284	311	163	21	63	259	73	34	34	44	22			17	8	2	47	1687	0.85
UROHAL	12	47	1	30	7	28	3	20	55	11	2	6	2	41	2	1	20	411	3	13	715	0.36
SYNLEP	44	132	32	59	37	59	57	7	49	98	52	4	27	12	4		2	5	4	17	701	0.35
ILYGIL	471	6	13	8	1				1			42		3	1	8		25		1	580	0.29
ATHCAL			189	1				1	2	14	13			4	147			4	24		399	0.20
SYNAUL	11	28	6	52	104	29	3	20	47	30	26	3	12	8			1	2	2	6	390	0.20
PARCAL	88	6	4	13	31	13	1	14	10	4	6	13	5	11	16	7	9	9	25	31	316	0.16
PARNEB	3	70	1	8	46	16	4	6	13	11	2	1	33	64	4	7	4	14	4		311	0.16
EMBJAC	4	19		30	96	22		16	29	46		7	1	1			1				272	0.14
PARCLA		192	2	1	3	3	1	1	8	7	5	3	12	15			1	13	1		268	0.14
MICMIN	50	14	2	52	49		2		12	42				21							244	0.12
PARMAC	7	6	3	3	13	2	5	5	22	30	2	11	20	38		2	26	29		2	226	0.11
SERPOL					10	42			157							3		4			216	0.11
HYPGEN		15			5	7	4	3	9	34	5		4	38			1	3			128	0.06
PLERIT	11	4		7	7	5	9	4	2	4	16	15		1	8		4		14	9	120	0.06
SYMATR	10	3		4	2		3		15	2	2	10		13	4	8	1	3	2	5	87	0.04
XENCAL		66												10							76	0.04
HYPGUT	15		2	4	7	3	2	1	8			4	2	2	3	3	1	3	3	6	69	0.03
XYSLIO	9	1		4	2		2	2	2			1		32	1		1		4	1	62	0.03
GIBELE	30			1	8				14				2						1		56	0.03
SYNLUC	8			15	10			1	15			4						2	1		56	0.03
CHESAT		4			2	3			5				24	3		13		1			55	0.03
CLEIOS				10		1		13	5		5	1	1		2	2	2			9	51	0.03
UMBRON														8				34			42	0.02
QUIYCA				5		1	2			7	4	16			3				1	1	40	0.02
SCOGUT	22	2			6	1		1		1		1				1		1	1		37	0.02
MYLCAL	1																	26			27	0.01
PORMYR	1								1		1	3	4	7	1	1	2	4	1	1	27	0.01
HALSEM	2	13				6	1										1	1			24	0.01
OXYCAL	2				19				1		2										24	0.01
HYPROS		4				3			1					10							18	0.01
SYNCAL	1		9		7	1															18	0.01
TRASYM									18												18	0.01
SPHARG	2	1												9		1		1			14	0.01
GENLIN					2				2								9				13	0.01
SCOJAP									9				1	1							11	0.01
ALBVUL																2		8			10	0.01
BRYARC		2	1	2														3		2	10	0.01
LEPARM	4		1		1			1												2	9	0.00
PLGOBY												9									9	0.00
MUGCEP			8																		8	0.00
ANIDAV		6																			6	0.00
CYNPAR									1								3	2			6	0.00
GIRNIG		2			2												2				6	0.00
PLECOE	5							1													6	0.00
MUSHEN																		5			5	0.00
RHIPRO																		4			4	0.00
ATRNOB									3												3	0.00
CITSTI								1			2										3	0.00
STREXI												1						2			3	0.00
GYMMAR																	1	1			2	0.00
PHAFUR					1			1													2	0.00
SYNEXI	1			1																	2	0.00
ZAPEXA				1											1						2	0.00
ANCCOM									1												1	0.00
MEDCAL	1																				1	0.00
PSEGRA																	1				1	0.00
MUSCAL														1							1	0.00
PARINT		1																			1	0.00
PARVET	1																				1	0.00
PORNOT	1																				1	0.00
RIMMUS	1																				1	0.00
RONSTE														1							1	0.00
Total	4851	2012	514	8868	50310	3225	642	9567	81609	5293	629	5269	3709	1806	308	439	14047	2816	1763	464	198141	

Appendix Table 2. Total biomass (g) taken from Station 1, July 1994 to April 1999.

STATION 1 - BIOMASS (g)																						
						MONTH																
SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	TOTAL	%
UROHAL	1776	13688	122	4429	2420	8906	1089	5708	14325	1664	842	1694	363	9708	690	250	4980	98492	1124	3478	175747	17.83
MYLCAL	4333																	171398			175731	17.83
ENGMOR	30	5			44413	18	1	8	86878							0	7530	32	13		138927	14.10
ATHAFF	3633	6594	1083	1910	1469	14058	3165	3154	7093	3148	1931	27463	3788	2255	628	2129	6150	2174	10798	1614	104236	10.58
PARMAC	2533	2451	1525	1656	8343	446	1997	873	4795	7898	1119	3610	3822	7455		1050	7530	7961		570	65634	6.66
SARSAG		181	67		2282	2909			18316	11427		198	1837	4	2700		1549	4248	914	17	46650	4.73
PARCAL	12835	680	228	1530	7966	1454	2420	1936	2537	348	393	1033	492	344	762	453	644	206	1092	663	38017	3.86
PARNEB	111	1406	5	613	7063	1486	484	575	1634	1697	106	15	5172	3839	60	1900	199	806	11		27180	2.76
CYMAGG	33	303		5388	1458	668	14	12351	1784	122	11	3452	56	135		110	363	336	35	2	26621	2.70
ATHCAL			8	0				113	635	2420	1664			647	13833			777	4012		24109	2.45
LEUTEN									885	1162		8609	1925			63	2123	480			15245	1.55
HETROS	758	3142	41	621	1972	2661	204	196	2501	1384	81	125	208	203			65	84	0	28	14273	1.45
EMBJAC	79	1091		735	5115	2024		460	657	2836		728	28	91			14				13858	1.41
HYPGUT	1732		214	439	1785	844	484	242	2118			847	484	400	525	477	20	934	907	1150	13600	1.38
ANCDEL						6			4914				863	738		7	3867				10395	1.05
RHIPRO																		10150			10150	1.03
PLERIT	620	385		443	817	875	877	651	454	393	605	333		125	216		325		411	300	7829	0.79
GYMMAR																	7500	227			7727	0.78
SCOGUT	3102	68			908	500		242		242		363				500		22	454		6400	0.65
SERPOL					354	71			5392							334		71			6222	0.63
UMBRON														1782				3902			5684	0.58
CHESAT		631			484	656			12				340	160		3000		250			5533	0.56
CYNPAR									1089								3500	90			4679	0.47
XYSLIO	1622	198		541	30		393	514	605			363		20	180		160		27	20	4674	0.47
MUSHEN																		4536			4536	0.46
SCOJAP									3933				27	168							4128	0.42
TRASYM									4095												4095	0.42
MICMIN	173	133	22	265	1716		34		84	379				166							2971	0.30
PARCLA		881	61	5	624	79	3	17	228	13	65	20	14	125			100	19	55		2309	0.23
PORMYR	9								15		15	222	1058	114	15	40	274	53	0	225	2040	0.21
SPHARG	1	1												157		150		1700			2009	0.20
SYMATR	253	47		148	121		91		605	30	61	182		196	90	9	5	10	43	85	1976	0.20
GIRNIG		21			575												1200				1796	0.18
SYNLUC	28			52	514			30	726			62						30	31		1473	0.15
ZAPEXA				993											74						1067	0.11
HYPGEN		156			108	44	3	14	94	150	35		38	244			15	9			911	0.09
ATRNOB									909												909	0.09
PLECOE	746							121													867	0.09
HALSEM	2	10				629	83										20	0			743	0.08
OXYCAL	2				664				0		1										667	0.07
GENLIN					484				118								8				610	0.06
PHAFUR					121			484													605	0.06
SYNLEP	84	93	25	29	30	41	19	2	53	66	18	1	23	7	1		0	3	3	13	512	0.05
STREXI												183						300			483	0.05
MUSCAL														336							336	0.03
SYNAUL	6	16	3	37	107	25	1	14	48	20	7	10	9	4			1	1	1	4	313	0.03
GIBELE	46			3	20				87				10						0		165	0.02
ALBVUL																1		133			133	0.01
LEPARM	68		0		35			3												13	119	0.01
ILYGIL	79	1	1	1	0				0			2		24	0	1		6		0	115	0.01
RONSTE														102							102	0.01
PSEGRA																	100				100	0.01
SYNCAL	0		9		15	63															86	0.01
HYPROS		12				8			0					31							51	0.01
XENCAL		40												4							44	0.00
CITSTI								30			7										37	0.00
PLGOBY												30									30	0.00
QUIYCA				0		0	0			2	3	11			1				1	0	18	0.00
ANIDAV		18																			18	0.00
PORNOT	9																				9	0.00
CLEIOS				1		0		1	0		0	5	0		0	0	0			1	8	0.00
PARVET	5																				5	0.00
SYNEXI	1			4																	5	0.00
ANCCOM									2												2	0.00
MUGCEP			2																		2	0.00
BRYARC		0	0	0														0		0	2	0.00
PARINT		1																			1	0.00
MEDCAL	0																				0	0.00
RIMMUS	0																				0	0.00
Total	34706	32253	3414	19842	92014	38471	11361	27738	167620	35403	6964	49560	20557	29585	19775	10474	48241	309438	19931	8183	985530	

Appendix Table 3. Total Abundance of fish species taken from Station 2, July 1994 to April 1999.

STATION 2 - NUMBER OF INDIVIDUALS																					
									MONTH												
SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	36069	Jan-99	Apr-99	TOTAL	%
ENGMOR	1			3	3740	4878	1		78011			2				1	2288				88925	47.26
ATHAFF	954	686	562	1692	6304	1634	517	18536	1169	603	1546	4776	600	408	304	755	2291	1078	1935	4691	51041	27.13
ANCDEL	1	1	7	3	3172	2329			13168	6	58	1	482	426	5	4062	1717	88			25526	13.57
ATHCAL			83			1					3		9		7194						7290	3.87
CYMAGG	20	16		1825	81	111	4	287	116	273		690	239	2		47	42	65	1	2	3821	2.03
HETROS	175	205	9	238	190	119	20	463	156	86	1	120	104	11	2	2	51	7		30	1989	1.06
SARSAG		50	1		1043	1	1		148	139					22	10			2		1417	0.75
SYNLEP	88	118	78	67	15	86	139	166	65	179	61	89	101	6	21	2	37	3	44	29	1394	0.74
UROHAL	14	60	17	124	28	13	15	75	41	203	10	94	92	36	27	20	11	16	31	133	1060	0.56
PARNEB	62	96	18	207	191	75	4	22	17	1	5	88	20	27	3	8	20	6	37	47	954	0.51
SYNAUL	88	66	24	190	43	42	1	4	41	158	6	26	16		7	1	13		39	12	777	0.41
LEUTEN												765				2					767	0.41
ILYGIL	465	48	14	28	4				2		1		1	1	14	1			1	2	582	0.31
PARMAC	8	30	7	25	41	9	29	20	46	30	13	31	43	56	24	76	12	23	42	5	570	0.30
CLEIOS		1	3	44	116	5	2	28		9	13	1		31	4	2			12	213	484	0.26
ANCCOM	2					1		209													212	0.11
PARCAL	15	8	7	5	2	1	6	12	13	11	26	16	11	3	13	10	2	11	15	13	200	0.11
QUIYCA	1	8	5					28	4		5	81			35			5	21		193	0.10
HYPGEN	25	6	1	14	13	1		6	3	7		34	6	3	2	1	6	1			129	0.07
XENCAL		12		1	4	1				16			82								116	0.06
ALBVUL															2	75	10	28			115	0.06
SCOJAP					5				55	1			36								97	0.05
PLERIT	2		3	1	3	1	2	6	5		7	8	13	8	4	1	2	5	6	7	84	0.04
HYPGUT	8	3	8	4	1	2		6	2	5	5	1	5	6	2	6	1	1	2	3	71	0.04
SPHARG													1	42							43	0.02
CHESAT	1	2			3	1		3	11	2	1		11	2				1		1	39	0.02
GIBELE	22			6	5				2												35	0.02
FUNPAR		7	4		2	1	2			7			6								29	0.02
PARCLA	1		1	4	1					3	2	2	7						3		24	0.01
STREXI		1				1		2				1	2	15				1			23	0.01
HYPROS		7											1	7							15	0.01
LEPARM	5			3	1				1											2	12	0.01
SERPOL				6												1	5				12	0.01
SYMATR	2			1				1	3		2		1		1						11	0.01
XYSLIO			1			1			1	1				1		1			2	1	9	0.00
CYNPAR													1	3		4					8	0.00
EMBJAC				4	1				1	1		1									8	0.00
SCOGUT		2	1	2				1	1										1		8	0.00
SYNCAL			2		5			1													8	0.00
HIPING		1			2					1				1	1		1				7	0.00
SYNEXI				7																	7	0.00
PORMYR	2				1				1				1								5	0.00
PLEVER		4																			4	0.00
SYNLUC															1	1	2				4	0.00
UMBRON	3															1					4	0.00
BRYARC																		1	2		3	0.00
MICMIN				1				2													3	0.00
PARINT														3							3	0.00
ACAFLA	1				1																2	0.00
MENUND																1	1				2	0.00
ATRNOB														1							1	0.00
GIBMET								1													1	0.00
HETFRA									1												1	0.00
MUGCEP															1						1	0.00
MUSCAL								1													1	0.00
Grand Total	1966	1438	856	4505	15018	9314	743	19880	93084	1742	1765	6827	1891	1099	7689	5091	6512	1340	2196	5191	188147	

Appendix Table 4. Total biomass (g) taken from Station 2, July 1994 to April 1999.

STATION 2 - BIOMASS (g)																						
										MONTH												
SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Total	%
UROHAL	2259	10512	6059	8041	6020	2438	4175	15401	8119	15984	2420	20449	11403	7043	6394	4370	4970	2694	7561	20722	167033	22.00
PARMAC	2606	9769	2336	9848	12962	2552	10516	6704	9143	9801	3554	7853	8474	6281	10650	15600	2770	5394	13917	1580	152308	20.06
ENGMOR	1			1	3638	18363	0		91442			6				0	1937				115387	15.20
ATHAFF	3465	6174	2487	954	10828	8445	1218	3710	2074	1201	5517	3349	1177	3472	3041	2732	3550	3935	8126	2733	78188	10.30
ANCDEL	3	1	6	5	8487	4529			21514	8	77	3	785	337	3	21065	4155	192			61171	8.06
PARNEB	2070	1912	73	11623	6582	3985	157	1636	1785	61	340	1104	1004	369	51	230	1030	188	357	793	35350	4.66
CYMAGG	156	214		7846	596	1510	29	6761	1927	1518		4454	1504	18		261	223	1116	2	2	28134	3.71
PARCAL	2128	2273	658	362	575	0	1785	1709	943	2239	1543	1581	508	50	1755	940	320	667	1024	1385	22443	2.96
HETROS	1164	3701	84	559	1695	2025	286	562	1438	1071	0	67	523	117	1	0	187	101		9	13589	1.79
HYPGUT	538	542	976	90	15	531		2241	454	696	817	121	1210	1612	401	764	5	57	510	620	12198	1.61
SCOJAP					726				4915	51			5713								11405	1.50
LEUTEN												10764				37					10801	1.42
PLERIT	113		36	61	605	94	151	968	484		726	1250	847	369	416	20	140	397	567	600	7843	1.03
SARSAG		180	8		2395	9	7		328	356					1465	791			8		5547	0.73
CYNPAR													1	440		4540					4981	0.66
CHESAT	114	110			666	188		817	1277	18	242		281	532				2		275	4520	0.60
ATHCAL			2297			28					664		279		942						4210	0.55
XYSLIO			336			500			726	363				300		480			1021	450	4175	0.55
MENUND																1100	1500				2600	0.34
XENCAL		11		2	61	8				7			2419								2508	0.33
HETFRA									2420												2420	0.32
STREXI		1				133		605				242	144	446				200			1771	0.23
HYPGEN	266	59	0	83	237	2		9	55	44		158	197	15	0	1	80	5			1210	0.16
SCOGUT		284	183	416				242	30										5		1161	0.15
MUSCAL								968													968	0.13
SPHARG													20	801							821	0.11
ALBVUL															0	21	33	690			744	0.10
SYNLEP	99	44	17	14	13	44	35	57	66	76	11	37	58	4	6	1	14	28	17	8	650	0.09
PLEVER		597																			597	0.08
ANCCOM	49					6		538													592	0.08
UMBRON	99															400					499	0.07
PARCLA	15		2	36	25					50	4	60	303						1		496	0.07
SYNAUL	65	26	7	70	41	21	0	1	24	95	2	10	11		3	0	18		11	3	406	0.05
PORMYR	17				363				1				3								384	0.05
SYMATR	55			24				30	90		151		20		8						379	0.05
EMBJAC				228	39				19	55		3									344	0.05
HIPING		27			61					30				25	60		65				267	0.04
ATRNOB														250							250	0.03
SERPOL				137												8	25				169	0.02
GIBELE	82			37	23				8												150	0.02
LEPARM	79			24	9				7											1	119	0.02
FUNPAR		7	17		61	0	5			16			5								111	0.01
SYNLUC															0	3	50				54	0.01
SYNCAL			1		7			30													38	0.01
MICMIN				0				37													38	0.00
ILYGIL	20	10	2	2	0				1		0		0	0	2	0			0	0	37	0.00
QUIYCA	0	6	3					2	3		2	7			4			2	2		30	0.00
HYPROS		16											1	13							29	0.00
BRYARC																		28	1		29	0.00
CLEIOS		0	0	2	5	1	0	2		2	0	0		3	1	0			1	10	26	0.00
ACAFLA	10				12																22	0.00
SYNEXI				7																	7	0.00
PARINT														1							1	0.00
GIBMET								0													0	0.00
MUGCEP															0						0	0.00
Grand Total	15471	36475	15586	40470	56742	45413	18363	43031	149291	33739	16070	51518	36888	22496	25203	53365	21070	15696	33131	29191	759210	

Appendix Table 5. Total abundance of fish species taken from Station 3, July 1994 to April 1999.

STATION 3 - NUMBER OF INDIVIDUALS																					
								MONTH													
SPCODE	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**	**Jan-96**	**Apr-96**	**Jul-96**	**Oct-96**	**Jan-97**	**Apr-97**	**Jul-97**	**Oct-97**	**Jan-98**	**Apr-98**	**Jul-98**	**Oct-98**	**Jan-99**	**Apr-99**	**TOTAL**	**%**
ANCDEL	1714	12		457	11496	188		594	122	21		6102	1185	2272		1601	6071	39			31874	55.06
ATHAFF	257	371	179	3131	3189	449	292	753	517	190	588	752	355	119	35	111	272	323	78	830	12791	22.09
ENGMOR	1561			6	1896	2		5	80			1				1	4				3556	6.14
CYMAGG		2		518	452	5		806	57			1226	2			20	14	28	3	61	3194	5.52
SYNLEP	70	4	66	41	27	142	293	65	15	18	66	76	3		8	2	23	14	30	77	1040	1.80
HETROS	30	12	3	135	88	48	51	293	108	27	6	65	2				1			12	881	1.52
UROHAL	36	25	30	91	26	22	54	50	8	86	50	31	74	64	10	1	9	39	10	4	720	1.24
ATHCAL		1	249	1											413						664	1.15
LEUTEN												600									600	1.04
SYNAUL	95	10	52	114	53	60	13	32	14	8	13	24			3	1	39		16	51	598	1.03
SARSAG	1				330		1							63	2	1					398	0.69
PARNEB	11	6	14	102	41	17	2	22	8	4	2	38	31	6	5	5	6	8		14	342	0.59
PARMAC	8	5	31	62	13	13	10	23	7	16	17	19	13	19	14	12	23	19	2	8	334	0.58
HYPROS	7	23	1				6	2	2	18	2		5	4				133			203	0.35
PARCAL	12	3	13	14	5	3	11	1	10	10	14	6	11	6	10	6	13	10	3	6	167	0.29
QUIYCA		11	6			6		2							22	2			4	31	84	0.15
CLEIOS					2	2	1			6	1		1		9		1			59	82	0.14
ILYGIL	12	7	14	4						2			6		6				13	6	70	0.12
HYPGUT	3		2	8	1	3	1		1	5	1	2	4	3	1	5	1		2		43	0.07
UMBRON	6		1		5	2		16						1		3	1	1		1	37	0.06
CHESAT	2	2		13	3	1		2				1				5	1	1			31	0.05
XENCAL		1		7	1					9		6									24	0.04
ANCCOM	4				15	2		1								1					23	0.04
SCOJAP				19											1						20	0.03
SYNCAL				1	13																14	0.02
LEPARM			1	2								1								7	11	0.02
FUNPAR		1	8				1														10	0.02
PORMYR									2			4	3				1				10	0.02
HYPGEN	1			1	1				1								4			1	9	0.02
STREXI	1			1								1	1	1		1	1	2			9	0.02
SYNEXI				5	3																8	0.01
ACAFLA		1			2	1				3											7	0.01
PLERIT		1		1								1			1				1		5	0.01
ALBVUL																	4				4	0.01
HIPING									1			3									4	0.01
PARCLA				3									1								4	0.01
GIBELE					1	2															3	0.01
CYNPAR								1				1									2	0.00
MICMIN	2																				2	0.00
MYLCAL					1			1													2	0.00
PARINT		2																			2	0.00
RHIPRO					1							1									2	0.00
SYNLUC											1	1									2	0.00
ANIDAV				1																	1	0.00
MUGCEP			1																		1	0.00
MUSCAL																				1	1	0.00
MUSHEN								1													1	0.00
SCOGUT			1																		1	0.00
TRITRI			1																		1	0.00
Total	**3833**	**500**	**673**	**4738**	**17665**	**968**	**736**	**2670**	**953**	**423**	**761**	**8962**	**1697**	**2558**	**540**	**1778**	**6489**	**617**	**162**	**1169**	**57892**	

Appendix Table 6. Total biomass (g) of fish species taken from Station 3, July 1994 to April 1999.

STATION 3 - BIOMASS (g)																					
									MONTH												
SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Total	%
UROHAL	4944	3427	9408	10616	4908	2033	16069	7500	806	8667	17424	4780	10441	8112	3200	400	1585	4053	3857	780	123010	27.94
PARMAC	2636	1718	11395	19652	2818	3469	4937	3977	984	3051	6111	2408	3246	3020	4655	2510	3670	3906	180	2660	87005	19.77
ANCDEL	1424	16		1488	29749	197		1502	128	19		13172	1095	1344		3123	12363	68			65690	14.92
ATHAFF	796	2536	1684	1133	4658	1494	2314	646	667	686	4959	1385	1455	865	169	1258	689	1030	523	377	29324	6.66
PARCAL	1463	3486	2222	1002	230	625	1876	750	423	877	1415	543	846	532	991	2425	202	344	703	190	21142	4.80
CYMAGG		27		1762	3193	74		3066	247			8134	7			220	101	511	84	101	17525	3.98
MYLCAL								17500													17500	3.98
PARNEB	432	107	70	2151	2040	1007	77	1784	789	302	187	827	1466	392	20	443	495	786		119	13494	3.07
LEUTEN												10007									10007	2.27
HETROS	394	303	82	549	1298	971	1953	733	1187	484	62	294	63				20			14	8407	1.91
SARSAG	1				786		12							6519	150	92					7560	1.72
RHIPRO					4598							1997									6595	1.50
UMBRON	387		514		787	114		1500						56		1700	35	300		400	5793	1.32
HYPGUT	370		424	943	42	250	182		10	605	34	454	257	206	170	316	70		350		4681	1.06
CHESAT	18	334		1211	591	0		443				91				1000	13	500			4202	0.95
SCOJAP				3147											500						3647	0.83
ENGMOR	850			6	1561	1		6	53			2				1	5				2486	0.56
ATHCAL		236	9	1											1985						2231	0.51
CYNPAR								750				726									1476	0.34
PORMYR									182			998	3				210				1394	0.32
SYNLEP	55	1	636	9	27	66	97	35	9	5	17	25	3		1	1	17	6	13	20	1042	0.24
MUSCAL																				950	950	0.22
MUSHEN								813													813	0.18
HYPROS	127	43	1				12	6	0	49	6		3	7				423			676	0.15
ANIDAV				579																	579	0.13
ANCCOM	32				393	15		0								14					454	0.10
ACAFLA		26			35	25				303											388	0.09
SYNAUL	35	5	15	147	73	30	6	12	9	4	3	9			1	0	21		5	7	378	0.09
STREXI	1			26								91	182	28		33	2	1			363	0.08
XENCAL		1		54	22					2		182									260	0.06
HYPGEN	38			5	10				76								75			2	205	0.05
PLERIT		11		42								30			25				45		154	0.03
SCOGUT			151																		151	0.03
HIPING									8			121									129	0.03
LEPARM			0	25								61								37	123	0.03
QUIYCA		84	2			1		0							3	0			0	26	117	0.03
SYNLUC											30	15									45	0.01
ALBVUL																	42				42	0.01
PARCLA				29									0								29	0.01
MICMIN	28																				28	0.01
GIBELE					9	19															28	0.01
FUNPAR		4	19				2														25	0.01
SYNCAL				1	14																15	0.00
SYNEXI				4	4																8	0.00
ILYGIL	1	1	2	0						0			1		1				1	1	7	0.00
CLEIOS					0	0	0			0	0		1		0		1			2	6	0.00
TRITRI			4																		4	0.00
PARINT		3																			3	0.00
MUGCEP			0																		0	0.00
Total	14032	12369	26637	44581	57844	10391	27536	41022	5576	15055	30248	46350	19068	21082	11870	13536	19614.3	11927.6	5761	5686	440185	

Appendix Table 7. Total abundance of fish species taken from Station 4, July 1994 to April 1999.

STATION 4 - NUMBER OF INDIVIDUALS																					
										MONTH											
SPCODE	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	TOTAL	%
ANCDEL	98	4232	152	1192	501	10		814	325	10223	4	2776	120	701	53	9278	3646	690	203	88	35106	66.03
ATHAFF	59	182	44	623	964	410	971	524	399	425	198	540	492	339	134	763	179	136	238	73	7693	14.47
CLEIOS	306	114	20	107	122	137	13	59	234	3	9		91	2	265	8	58	19	4	106	1677	3.15
UROHAL	27	23	75	236	21	14	49	19	47	114	55	106	73	21	49	50	10	14	335	33	1371	2.58
ENGMOR	3				75	574		6	101		61									429	1249	2.35
CYMAGG			13	288		5		300			5	163			1	145			3	128	1051	1.98
SYNAUL	356	8	18	150	282	3	5	23	15	1		30	1				1		7	17	917	1.72
FUNPAR	5	3	82	21	3	7	10	1	86	10	65		54	24			123	43	58	3	598	1.12
MUGCEP		1		1		2		1							272	231	1	1			510	0.96
ATHCAL		1	11			3	9			4	144	3			149	15			56		395	0.74
PARMAC		9	16	10	6	19	30	11	2	18	45	16	13	34	30	41	8	17	12	10	347	0.65
QUIYCA		12	51	4	1	10	11			51	4		6	2	56	25	42	4	34	12	325	0.61
SYNLEP	23	1	13	52	52		6	10	6		4	55				4	7	1	19	39	292	0.55
PARCAL	44	8	5	13	14	7	26	2	13	27	14	10	2	2	5	6	1	3	29	19	250	0.47
PARNEB	5	15	22	69	39	16	15	6	4	3	2	5	13	4	5	6	3		3	5	240	0.45
ILYGIL	2	1	2	7			33		24		1	23	33	1	38	3	15		6	1	190	0.36
HYPROS	6	5		1		2	55	6	6	31	1	15	18	4			3	16	5		174	0.33
HETROS		1		40	16	2	2	49	13			8									131	0.25
ANCCOM	1		22	12	42	7		9	1			29					4			3	130	0.24
HYPGUT	7	1	5	10	9	1			5	6	5	1	9	4		1	1	1	5	3	74	0.14
SARSAG					5										69						74	0.14
CHESAT		1	3	8	2	11		1				10	7		6	2		1		1	53	0.10
ALBVUL					1											38	1		5	1	46	0.09
PLVENG	45																				45	0.08
PORMYR	6			1	2	1			23			2	1						1		37	0.07
MYLCAL				3	3			4	1								1	1	15		28	0.05
UMBRON		4		2	1	1						2	2	2		1	5	3	4		27	0.05
ACAFLA		1	3	8	3	2	1	1		1			1				4				25	0.05
GILMIR	1				16									1			1				19	0.04
CYNPAR													1					4	9		14	0.03
MUSCAL	3	1									1					1	1		1	1	9	0.02
PLERIT		1			1		2	1												3	8	0.02
SYNEXI					8																8	0.02
STREXI			1				2		1								1		1	1	7	0.01
SYNLUC			2	2								2				1					7	0.01
RONSTE		2					3														5	0.01
GIBELE				1	3																4	0.01
LEPARM				3								1									4	0.01
ATRNOB				2													1				3	0.01
DORPET														3							3	0.01
GYMMAR																1			1		2	0.00
HIPING											1		1								2	0.00
PARCLA			1																1		2	0.00
PORNOT										1							1				2	0.00
SYNCAL					2																2	0.00
XENCAL					2																2	0.00
BRYARC							1														1	0.00
HYPGEN			1																		1	0.00
MENUND																				1	1	0.00
RHIPRO															1						1	0.00
SCOGUT											1										1	0.00
XYSLIO				1																	1	0.00
Grand Total	997	4627	562	2867	2196	1244	1244	1847	1306	10918	620	3797	938	1144	1133	10620	4118	954	1055	977	53164	

Appendix Table 8. Total biomass (g) of fish species taken from Station 4, July 1994 to April 1999.

STATION 4 - BIOMASS (g)																					
										MONTH											
SPCODE	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**	**Jan-96**	**Apr-96**	**Jul-96**	**Oct-96**	**Jan-97**	**Apr-97**	**Jul-97**	**Oct-97**	**Jan-98**	**Apr-98**	**Jul-98**	**Oct-98**	**Jan-99**	**Apr-99**	**Total**	**%**
UROHAL	3402	3069	15697	38599	4095	2026	10165	2659	9030	6936	13811	13298	14777	3696	8590	6875	2447	1797	55306	5005	221280	37.48
PARMAC		2809	5546	2991	1659	4806	8401	3000	272	5058	9468	2292	1804	4698	5768	8110	960	3295	3797	2525	77259	13.09
MYLCAL				13000	3902			19250	484								450	2000	22250		61336	10.39
PARNEB	237	1225	387	1387	6809	1270	1210	31568	393	393	121	463	515	28	136	200	190		4	370	46907	7.95
ANCDEL	125	2513	133	4821	1153	18		1712	338	8119	13	3301	89	261	66	15857	5605	712	214	153	45201	7.66
ATHAFF	84	1216	643	297	1619	3168	6770	503	2653	4533	1125	4671	1090	2432	2388	3566	397	1003	1008	635	39800	6.74
PARCAL	7042	1024	1301	938	1161	317	4386	250	681	1496	1997	635	91	56	5000	1110	18	141	1520	1605	30770	5.21
ATHCAL		129	1186			299	830			430	3338	312			3836	1096			2418		13875	2.35
CHESAT		191	20	737	424	2250		250				1452	1271		1300	264		142		200	8500	1.44
HYPGUT	370	70	9	929	617	156			158	483	395	61	764	784		50	19	57	907	400	6228	1.05
SARSAG					5										4706						4711	0.80
UMBRON		258		64	91	125						242	91	364		258	600	750	1650		4492	0.76
MUSCAL	272	227									242					1500	115		737	700	3793	0.64
RHIPRO															3757						3757	0.64
CYMAGG			371	868		83		660			210	331			40	589			66	436	3653	0.62
GYMMAR																1114			1600		2714	0.46
MUGCEP		182		196		768		281							664	112	17	48			2270	0.38
ENGMOR	1				82	306		5	506		2									597	1498	0.25
ANCCOM	9		349	210	651	41		105	2			29					67			15	1479	0.25
FUNPAR	15	8	214	160	2	6	19	7	43	26	269		75	42			115	87	220	11	1318	0.22
RONSTE		316					847														1163	0.20
STREXI			109				393		182								161		250	42	1137	0.19
HETROS		22		169	392	29	121	158	113			31									1034	0.18
PORMYR	52			9	122	63			439			121	121						1		926	0.16
ALBVUL					2											7	21		750	100	880	0.15
CYNPAR													1					1	800		801	0.14
ATRNOB				318													250				568	0.10
SYNAUL	120	2	5	52	192	0	1	6	10	102		13	2				1		2	10	519	0.09
ACAFLA		9	120	21	24	39	29	1		121			15				41				420	0.07
HYPROS	9	3		2		6	78	16	25	66	2	25	19	8			14	17	13		303	0.05
DORPET														224							224	0.04
XYSLIO				188																	188	0.03
CLEIOS	47	17	3	7	12	16	2	4	19	0	1		12	0	18	1	15	6	0	8	187	0.03
SCOGUT											182										182	0.03
MENUND																				150	150	0.03
PLERIT		12			61		35	7												6	121	0.02
QUIYCA		6	25	0	1	3	2			12	4		3	6	12	4	19	2	5	2	103	0.02
SYNLEP	17	0	6	7	12		2	4	3		2	20				3	3	1	5	18	101	0.02
HIPING											61		30								91	0.02
PARCLA			3																80		83	0.01
SYNLUC			0	11								61				2					73	0.01
ILYGIL	1	0	0	3			5		34		0	2	9	0	6	0	10		0	0	71	0.01
PORNOT										61							0				61	0.01
LEPARM				30								30									60	0.01
GILMIR	11				23									10			8				51	0.01
XENCAL					27																27	0.00
GIBELE				0	9																9	0.00
SYNEXI					7																7	0.00
SYNCAL					3																3	0.00
HYPGEN			3																		3	0.00
PLVENG	1																				1	0.00
BRYARC							0														0	0.00
Grand Total	11814	13309	26131	66011	23154	15796	33297	60446	15382	27835	31240	27389	20777	12610	36285	40717	11542	10058	93603	12989	590386	

Appendix Table 9. Summary of t-test comparisons of catches by type of sampling gear, July 1994 - April 1999.

NUMERICAL ABUNDANCE ($\log_{10}(x+1)$)

SMALL SEINE

t-Test: Paired Two Sample for Means

	LOGN	LOGV	
	non-vegetated	*vegetated*	
Mean	1.3780	1.7056	
Variance	0.9818	0.8440	
Observations	80	80	
df	79		
t Stat	-3.1633		
P(T<=t) two-tail	**0.0022**	***	
t Critical two-tail	1.9905		

SQUARE ENCLOSURE

t-Test: Paired Two Sample for Means

	LOGN	LOGV	
	non-vegetated	*vegetated*	
Mean	0.3517	0.7332	
Variance	0.2870	0.4004	
Observations	80	80	
df	79		
t Stat	-4.1123		
P(T<=t) two-tail	**0.0001**	***	
t Critical two-tail	1.9905		

LARGE SEINE

t-Test: Paired Two Sample for Means

	LOGN	LOGV	
	non-vegetated	*vegetated*	
Mean	1.9811	2.1204	
Variance	0.4361	0.3013	
Observations	80	80	
df	79		
t Stat	-1.6429		
P(T<=t) two-tail	0.1044	NS	
t Critical two-tail	1.9905		

BEAM TRAWL

t-Test: Paired Two Sample for Means

	LOGN	LOGV	
	non-vegetated	*vegetated*	
Mean	1.4620	1.7647	
Variance	0.3414	0.3997	
Observations	80	80	
df	79		
t Stat	-4.0497		
P(T<=t) two-tail	**0.0001**	***	
t Critical two-tail	1.9905		

PURSE SEINE

t-Test: Paired Two Sample for Means

	LOGN	LOGV	
	non-vegetated	*vegetated*	
Mean	2.2762	2.4078	
Variance	0.9055	0.8643	
Observations	80	80	
df	79		
t Stat	-1.2922		
P(T<=t) two-tail	0.2001	NS	
t Critical two-tail	1.9905		

BIOMASS ABUNDANCE ($\log_{10}(x+1)$)

SMALL SEINE WT

t-Test: Paired Two Sample for Means

	LOGN	LOGV
	non-vegetated	*vegetated*
Mean	0.9637	1.1398
Variance	0.6152	0.4594
Observations	80	80
df	79	
t Stat	-1.9157	
P(T<=t) two-tail	**0.06**	
t Critical two-tail	1.9905	

SQUARE ENCLOSURE WT

t-Test: Paired Two Sample for Means

	LOGN	LOGV
	non-vegetated	*vegetated*
Mean	0.1214	0.3333
Variance	0.0782	0.1556
Observations	80	80
df	79	
t Stat	-4.0250	
P(T<=t) two-tail	**0.0001**	***
t Critical two-tail	1.9905	

LARGE SEINE WT

t-Test: Paired Two Sample for Means

	LOGN	LOGV
	non-vegetated	*vegetated*
Mean	2.4032	2.4825
Variance	0.6359	0.3487
Observations	80	80
df	79	
t Stat	-0.7210	
P(T<=t) two-tail	0.4730	NS
t Critical two-tail	1.9905	

BEAM TRAWL WT

t-Test: Paired Two Sample for Means

	LOGN	LOGV
	non-vegetated	*vegetated*
Mean	2.5696	2.9426
Variance	0.9270	0.7222
Observations	80	80
df	79	
t Stat	-3.3783	
P(T<=t) two-tail	**0.0011**	***
t Critical two-tail	1.9905	

PURSE SEINE WT

t-Test: Paired Two Sample for Means

	LOGN	LOGV
	non-vegetated	*vegetated*
Mean	3.4464	3.5293
Variance	0.6276	0.5626
Observations	80	80
df	79	
t Stat	-0.8145	
P(T<=t) two-tail	0.4178	NS
t Critical two-tail	1.9905	

Appendix Table 10. Area of coverage by different sampling gears used to calculate numerical and biomass density.

Gear	Rep Area (m^2)
SS	62.4
LS	220
SE	1
BT	290
PS	296
OT	2417

Appendix Table 11. Summary of numerical density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
INTERTIDAL	NON-VEG	LS	1	1	0.00	0.49	0.19	0.03	0.01	0.41	0.00	0.34	0.17	0.00	0.18	0.10	2.96	0.13	0.30	0.13	0.16	0.27	0.00	0.07		
				2	0.00	0.01	0.03	0.11	0.44	1.19	0.16	0.60	0.13	0.91	0.01	0.47	0.14	0.02	0.00	0.03	0.44	0.03	0.00	0.00		
				3	0.00	0.05	0.04	0.08	0.25	0.83	0.02	0.08	0.16	0.99	0.00	0.55	0.14	0.00	0.00	0.00	0.35	0.23	0.66	0.40		
			1 Mean		0.00	0.18	0.08	0.07	0.23	0.81	0.06	0.34	0.15	0.63	0.06	0.37	1.08	0.05	0.10	0.05	0.32	0.18	0.22	0.16		
			2	1	0.24	0.07	0.15	0.32	1.27	0.13	0.01	0.02	3.79	0.20	0.00	0.16	0.21	0.56	0.02	0.13	3.46	0.20	0.67	0.15		
				2	0.00	0.21	0.12	0.30	0.13	0.14	0.00	0.02	2.68	0.15	0.01	0.04	1.67	0.05	0.06	0.08	0.52	0.24	0.52	0.10		
				3	0.00	0.13	0.05	0.11	0.17	0.05	0.00	0.26	1.18	0.09	0.02	0.05	1.95	0.02	0.13	0.01	1.55	0.35	3.58	0.03		
			2 Mean		0.08	0.14	0.11	0.24	0.52	0.10	0.00	0.10	2.55	0.15	0.01	0.08	1.28	0.21	0.07	0.07	1.84	0.26	1.59	0.09		
			3	1	0.00	0.01	0.09	0.11	1.92	0.03	0.00	0.04	0.20	0.08	0.00	0.03	3.75	0.13	0.05	0.30	0.29	0.70	0.06	0.27		
				2	0.05	0.23	0.08	0.52	1.78	0.42	0.00	0.04	0.62	0.04	0.00	0.02	0.20	0.55	0.17	0.05	0.05	0.15	0.01	0.34		
				3	0.02	0.25	0.05	0.00	2.99	0.32	0.00	0.10	0.31	0.13	0.00	1.64	1.30	0.00	0.00	0.11	0.39	0.13	0.32	0.15		
			3 Mean		0.02	0.16	0.07	0.21	2.23	0.26	0.00	0.06	0.38	0.08	0.00	0.56	1.75	0.23	0.07	0.16	0.73	0.98	0.39	0.76		
			4	1	0.02	0.10	0.00	0.22	0.38	0.15	0.09	0.02	0.74	1.17	0.15	0.01	0.16	0.53	0.24	5.47	1.50	0.46	0.00	0.04		
				2	0.14	0.26	0.00	0.08	0.28	0.03	0.02	0.08	0.27	0.16	0.04	0.04	0.12	0.17	0.00	0.29	0.29	0.59	0.01	0.04		
				3	0.04	0.40	0.00	0.01	0.13	0.16	0.17	0.04	0.17	0.57	0.37	0.00	0.03	1.07	0.25	0.17	0.84	0.68	0.13	0.28		
			4 Mean		0.07	0.25	0.00	0.10	0.26	0.11	0.09	0.05	0.39	0.63	0.18	0.02	0.10	0.59	0.16	1.98	0.88	0.58	0.05	0.12		
		LS Grand Mean			**0.04**	**0.19**	**0.07**	**0.16**	**0.81**	**0.32**	**0.04**	**0.14**	**0.87**	**0.38**	**0.07**	**0.26**	**1.05**	**0.27**	**0.10**	**0.57**	**0.94**	**0.50**	**0.56**	**0.28**	**0.38**	**0.08**
		SE	1	1	0.00	0.00	1.00	78.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	37.00	0.00	0.00	0.00	1.00		
				2	0.00	0.00	1.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				3	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00		
			1 Mean		0.00	0.00	0.67	29.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33	0.00	0.00	0.33	12.67	0.00	0.00	0.33	0.33		
			2	1	0.00	1.00	2.00	3.00	0.00	0.00	0.00	5.00	0.00	0.00	2.00	27.00	0.00	0.00	6.00	0.00	0.00	0.00	6.00	3.00		
				2	1.00	0.00	6.00	26.00	0.00	1.00	0.00	44.00	0.00	0.00	1.00	33.00	0.00	0.00	4.00	1.00	0.00	0.00	3.00	18.00		
				3	0.00	1.00	3.00	5.00	0.00	0.00	7.00	19.00	0.00	0.00	0.00	12.00	0.00	0.00	2.00	1.00	0.00	0.00	10.00	42.00		
			2 Mean		0.33	0.67	3.67	11.33	0.00	0.33	2.33	22.67	0.00	0.00	1.00	24.00	0.00	0.00	4.00	0.67	0.00	0.00	6.33	21.00		
			3	1	0.00	4.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00		
				2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	5.00		
				3	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	2.00		
			3 Mean		0.00	2.00	0.00	1.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00	2.00	2.33		
			4	1	1.00	5.00	2.00	7.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				2	1.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				3	0.00	0.00	2.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			4 Mean		0.67	1.67	2.33	2.33	1.33	0.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		SE Grand Mean			**0.25**	**1.08**	**1.67**	**11.00**	**0.33**	**0.17**	**0.58**	**5.83**	**0.00**	**0.00**	**0.25**	**7.08**	**0.00**	**0.00**	**1.17**	**3.42**	**0.00**	**0.00**	**2.17**	**5.92**	**1.89**	**0.65**
		SS	1	1	16.46	0.05	0.40	57.77	0.48	0.00	0.00	48.25	0.45	0.00	0.93	18.53	0.96	0.00	0.03	0.00	0.00	0.00	0.02	0.02		
				2	1.36	0.05	1.27	6.39	0.38	0.00	0.00	43.59	0.27	0.00	0.13	0.05	0.13	0.00	0.00	0.05	0.00	0.00	0.00	0.03		
				3	0.34	0.11	0.22	52.53	0.42	0.00	0.00	27.44	0.22	0.05	0.48	2.07	0.69	0.00	0.05	0.99	0.00	0.00	0.00	0.00		
			1 Mean		6.05	0.07	0.63	38.90	0.43	0.00	0.00	39.76	0.32	0.02	0.51	6.88	0.59	0.00	0.03	0.35	0.00	0.00	0.01	0.02		
			2	1	6.88	0.14	0.48	15.88	0.03	0.00	0.03	73.80	0.75	0.27	0.51	1.11	0.19	0.00	0.14	1.55	0.00	0.03	0.02	2.48		
				2	0.37	0.16	0.42	3.97	0.00	0.00	0.03	4.90	1.23	0.00	0.10	12.42	0.03	0.00	0.10	2.40	0.00	0.00	0.05	3.46		
				3	0.82	0.00	0.54	2.82	0.34	0.08	0.48	53.94	1.09	0.00	0.00	3.04	0.06	0.00	0.11	0.90	0.05	0.00	0.14	1.75		
			2 Mean		2.69	0.10	0.48	7.56	0.12	0.03	0.18	44.21	1.03	0.09	0.20	5.52	0.10	0.00	0.12	1.62	0.02	0.01	0.07	2.56		
			3	1	0.00	0.02	0.14	1.28	0.02	0.00	0.00	0.79	0.00	0.03	0.19	0.08	0.00	0.00	0.64	0.05	0.14	0.11	0.00	0.74		
				2	0.02	0.00	0.16	0.29	0.03	0.00	0.00	0.16	0.00	0.00	0.10	0.30	0.19	0.00	0.10	0.00	0.00	0.00	0.00	4.47		
				3	0.00	0.14	0.67	0.11	0.22	0.00	0.00	0.75	0.03	0.02	0.02	0.24	0.02	0.00	0.02	0.03	0.05	0.21	0.02	2.85		
			3 Mean		0.01	0.05	0.33	0.56	0.09	0.00	0.00	0.57	0.01	0.02	0.10	0.21	0.07	0.00	0.25	0.03	0.06	0.11	0.01	2.69		
			4	1	0.50	0.00	0.06	0.66	0.03	0.22	0.00	0.06	0.00	0.26	0.43	0.27	0.05	0.00	0.00	1.36	0.03	0.00	0.00	0.13		
				2	0.03	0.00	0.00	0.05	0.05	0.00	0.00	0.18	1.04	0.00	0.00	0.00	0.64	0.35	0.00	0.11	0.00	0.03	0.00	0.03		
				3	0.06	0.00	0.00	3.27	0.08	0.00	0.00	0.00	0.38	0.02	0.43	0.96	0.05	0.02	0.02	0.22	0.00	0.02	3.23	0.08		
			4 Mean		0.20	0.00	0.02	1.32	0.05	0.07	0.00	0.08	0.48	0.09	0.29	0.41	0.25	0.12	0.01	0.57	0.01	0.02	1.08	0.08		
		SS Grand Mean			**2.24**	**0.06**	**0.36**	**12.09**	**0.17**	**0.03**	**0.05**	**21.16**	**0.46**	**0.05**	**0.28**	**3.26**	**0.25**	**0.03**	**0.10**	**0.64**	**0.02**	**0.03**	**0.29**	**1.34**	**2.00**	**1.40**

Appendix Table 11. Summary of numerical density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
INTERTIDAL	VEG	LS	1	1	5.05	0.12	0.42	0.45	0.07	0.04	0.33	0.00	0.74	0.44	0.00	0.16	0.90	0.10	0.02	0.02	0.04	0.95	0.00	0.44		
				2	3.44	0.35	0.05	0.04	2.59	0.51	0.07	0.06	0.33	0.97	0.00	0.05	0.48	0.13	0.00	0.00	0.03	0.44	0.06	0.08		
				3	1.76	0.41	0.01	0.30	1.52	0.13	0.01	0.24	0.93	0.64	0.07	0.20	0.14	0.08	0.00	0.01	0.09	0.20	1.66	0.03		
			1 Mean		3.42	0.29	0.16	0.26	1.39	0.23	0.13	0.10	0.67	0.68	0.02	0.14	0.51	0.10	0.01	0.01	0.05	0.53	0.57	0.18		
			2	1	0.30	0.00	0.11	0.39	0.51	0.16	0.25	3.92	1.65	0.00	0.02	0.85	0.13	0.79	0.16	0.07	0.13	1.87	0.49	2.01		
				2	1.40	0.07	0.03	0.57	0.73	0.00	0.12	5.07	1.02	0.35	0.05	0.78	0.20	0.53	0.08	0.17	0.18	0.41	0.88	0.05		
				3	1.99	0.00	0.02	0.33	1.83	0.23	0.02	0.79	2.40	0.55	0.03	1.03	0.76	1.30	0.15	0.05	0.02	0.56	0.03	0.02		
			2 Mean		1.23	0.02	0.05	0.43	1.02	0.13	0.13	3.26	1.69	0.30	0.03	0.88	0.36	0.87	0.13	0.10	0.11	0.95	0.47	0.69		
			3	1	0.11	0.13	0.03	0.68	1.03	0.63	0.02	0.08	0.34	0.47	0.69	0.11	0.16	0.33	0.06	0.04	0.30	0.20	0.00	1.01		
				2	0.10	0.63	0.03	2.72	0.20	0.37	0.00	0.05	0.44	0.03	0.03	0.13	0.77	0.11	0.02	0.04	0.23	0.42	0.01	0.07		
				3	0.30	0.20	0.02	0.62	0.92	0.06	0.13	0.11	0.17	0.15	0.04	0.12	0.52	0.23	0.03	0.03	0.16	0.29	0.01	0.01		
			3 Mean		0.17	0.32	0.03	1.34	0.72	0.36	0.05	0.08	0.32	0.22	0.25	0.12	0.48	0.22	0.04	0.03	0.23	0.30	0.01	0.37		
			4	1	0.11	0.06	0.05	0.12	0.19	0.04	0.02	0.21	0.12	0.01	0.30	0.02	1.39	0.72	0.15	0.42	0.30	0.10	0.06	0.00		
				2	0.02	0.01	0.26	0.05	0.18	0.64	0.35	0.20	0.24	0.04	0.07	0.20	0.41	0.38	0.67	0.25	0.29	0.03	0.20	0.05		
				3	0.05	0.03	0.07	0.29	0.35	0.43	0.02	0.35	0.08	0.02	0.01	0.18	0.13	0.84	0.23	1.28	0.15	0.18	0.05	0.05		
			4 Mean		0.06	0.03	0.13	0.15	0.24	0.37	0.13	0.25	0.15	0.02	0.13	0.13	0.65	0.65	0.35	0.65	0.24	0.10	0.10	0.04		
		LS Grand Mean			**1.22**	**0.17**	**0.09**	**0.55**	**0.84**	**0.27**	**0.11**	**0.92**	**0.70**	**0.31**	**0.11**	**0.32**	**0.50**	**0.46**	**0.13**	**0.20**	**0.16**	**0.47**	**0.29**	**0.32**	**0.36**	**0.06**
		SE	1	1	2.00	0.00	4.00	1.00	0.00	0.00	0.00	1.00	0.00	11.00	1.00	2.00	0.00	1.00	2.00	13.00	0.00	0.00	0.00	10.00		
				2	0.00	2.00	2.00	0.00	0.00	1.00	0.00	0.00	4.00	9.00	0.00	12.00	0.00	0.00	6.00	21.00	0.00	0.00	0.00	10.00		
				3	0.00	3.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	2.00	0.00	0.00	0.00	3.00	0.00	0.00	1.00	3.00		
			1 Mean		0.67	1.67	2.33	0.67	0.00	0.33	0.00	0.33	1.67	6.67	0.67	5.33	0.00	0.33	2.67	12.33	0.00	0.00	0.33	7.67		
			2	1	5.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	2.00	0.00	11.00	0.00	12.00	0.00	0.00	0.00	1.00		
				2	0.00	3.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1.00	10.00	0.00	1.00	0.00	2.00		
				3	7.00	0.00	0.00	3.00	0.00	0.00	1.00	0.00	0.00	10.00	2.00	0.00	0.00	15.00	1.00	15.00	1.00	0.00	0.00	4.00		
			2 Mean		4.00	1.33	0.67	2.00	0.00	0.00	0.33	0.00	0.00	3.33	2.00	0.67	0.00	10.67	0.67	12.33	0.33	0.33	0.00	2.33		
			3	1	1.00	0.00	4.00	0.00	0.00	3.00	0.00	86.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	8.00		
				2	0.00	0.00	3.00	7.00	1.00	1.00	0.00	2.00	0.00	2.00	0.00	0.00	3.00	0.00	3.00	0.00	0.00	0.00	0.00	12.00		
				3	10.00	0.00	3.00	3.00	0.00	0.00	0.00	1.00	0.00	3.00	1.00	2.00	1.00	0.00	2.00	0.00	0.00	0.00	0.00	10.00		
			3 Mean		3.67	0.00	3.33	3.33	0.33	1.33	0.00	29.67	0.00	1.67	0.33	0.67	1.33	0.00	2.00	0.00	0.00	0.00	0.00	10.00		
			4	1	16.00	6.00	1.00	2.00	0.00	16.00	6.00	7.00	31.00	18.00	0.00	3.00	27.00	0.00	24.00	11.00	24.00	0.00	5.00	6.00		
				2	4.00	11.00	2.00	11.00	0.00	18.00	3.00	23.00	24.00	15.00	3.00	8.00	30.00	0.00	26.00	7.00	14.00	0.00	9.00	46.00		
				3	6.00	0.00	2.00	7.00	0.00	31.00	6.00	18.00	39.00	9.00	5.00	12.00	13.00	0.00	24.00	7.00	13.00	0.00	10.00	11.00		
			4 Mean		8.67	5.67	1.67	6.67	0.00	21.67	5.00	16.00	31.33	14.00	2.67	7.67	23.33	0.00	24.67	8.33	17.00	0.00	8.00	21.00		
		SE Grand Mean			**4.25**	**2.17**	**2.00**	**3.17**	**0.08**	**5.83**	**1.33**	**11.50**	**8.25**	**6.42**	**1.42**	**3.58**	**6.17**	**2.75**	**7.50**	**8.25**	**4.33**	**0.08**	**2.08**	**10.25**	**5.28**	**0.89**
		SS	1	1	2.56	0.16	0.50	0.21	1.89	0.00	0.10	1.88	0.53	0.00	2.77	0.45	0.14	0.00	0.00	0.02	0.02	0.00	0.00	0.02		
				2	2.34	0.30	0.11	0.03	0.13	0.00	0.46	0.90	0.16	0.00	0.21	8.17	0.00	0.02	0.00	0.00	0.02	0.00	0.02	0.03		
				3	0.40	0.24	0.03	0.90	0.53	0.00	1.12	0.11	0.42	0.06	0.32	0.51	0.34	0.00	0.05	0.02	0.00	0.00	0.03	0.03		
			1 Mean		1.77	0.24	0.21	0.38	0.85	0.00	0.56	0.96	0.37	0.02	1.10	3.04	0.16	0.01	0.02	0.01	0.01	0.00	0.02	0.03		
			2	1	0.00	0.82	0.26	0.03	0.13	0.51	0.37	36.57	1.35	0.10	1.28	30.80	0.34	0.00	113.03	1.09	0.03	0.00	0.46	12.05		
				2	0.00	0.02	0.19	0.10	2.02	0.63	3.21	12.40	8.91	0.02	1.67	2.53	0.32	0.00	0.48	0.06	0.00	0.22	2.50	38.37		
				3	0.00	0.96	0.75	0.50	0.79	0.00	0.34	73.65	5.95	1.14	2.37	14.63	0.02	0.00	0.16	2.28	0.06	0.00	0.21	6.59		
			2 Mean		0.00	0.60	0.40	0.21	0.98	0.38	1.30	40.88	5.40	0.42	1.77	15.99	0.22	0.00	37.89	1.14	0.03	0.07	1.06	19.00		
			3	1	0.19	0.22	0.93	9.97	0.48	0.08	0.00	1.71	0.19	0.26	0.30	2.72	0.03	0.00	0.18	0.06	0.02	0.02	0.02	1.99		
				2	0.37	0.11	1.59	0.72	0.11	0.02	0.38	1.38	0.05	0.00	2.47	2.53	0.00	0.00	0.18	0.05	0.00	0.00	0.03	0.05		
				3	0.18	0.02	1.35	21.39	0.05	0.02	0.67	1.99	0.06	0.00	1.27	3.48	0.00	0.00	5.10	0.27	0.00	0.02	0.06	0.63		
			3 Mean		0.25	0.12	1.29	10.69	0.21	0.04	0.35	1.69	0.10	0.09	1.35	2.91	0.01	0.00	1.82	0.13	0.01	0.01	0.04	0.89		
			4	1	0.00	0.00	0.02	0.66	0.03	0.43	0.14	2.02	0.72	0.00	0.02	0.02	0.40	0.00	1.20	1.39	0.11	0.35	0.11	0.27		
				2	0.05	0.56	0.18	1.60	1.03	0.24	0.24	1.03	0.34	0.00	0.11	1.33	0.32	0.34	1.55	1.28	0.83	0.13	0.00	0.16		
				3	0.59	0.87	0.21	1.81	0.34	0.03	0.75	1.54	1.70	0.05	0.00	1.55	0.24	0.03	3.29	2.95	0.72	0.26	0.03	0.14		
			4 Mean		0.21	0.48	0.13	1.36	0.46	0.24	0.38	1.53	0.92	0.02	0.04	0.97	0.32	0.12	2.01	1.88	0.56	0.25	0.05	0.19		
		SS Grand Mean			**0.56**	**0.36**	**0.51**	**3.16**	**0.63**	**0.16**	**0.65**	**11.26**	**1.70**	**0.13**	**1.07**	**5.73**	**0.18**	**0.03**	**10.43**	**0.79**	**0.15**	**0.08**	**0.29**	**5.03**	**2.68**	**0.98**

Appendix Table 11. Summary of numerical density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
NEARSHORE	NON-VEG	BT	1	1	0.00	0.17	0.02	0.02	0.42	0.08	0.04	0.00	0.18	0.08	0.00	0.01	0.02	0.03	0.00	0.00	0.01	0.07	0.00	0.00		
				2	0.00	0.16	0.02	0.09	0.10	0.02	0.00	0.03	0.24	0.01	0.10	0.00	0.04	0.05	0.00	0.01	0.04	0.01	0.00	0.01		
				3	0.00	0.07	0.01	0.25	0.01	0.01	0.08	0.00	0.31	0.11	0.05	0.00	0.10	0.04	0.00	0.04	0.05	0.03	0.01	0.16		
			1 Mean		0.00	0.13	0.02	0.12	0.18	0.04	0.04	0.01	0.24	0.07	0.05	0.00	0.05	0.04	0.00	0.01	0.04	0.04	0.00	0.06		
			2	1	0.03	0.01	0.08	0.25	0.13	0.00	0.02	0.49	0.46	0.28	0.07	0.22	0.01	0.01	0.01	0.00	0.07	0.00	0.00	0.15		
				2	0.15	0.09	0.02	0.09	0.00	0.02	0.06	0.28	0.06	0.22	0.10	0.01	0.18	0.02	0.06	0.00	0.10	0.00	0.06	0.18		
				3	0.14	0.21	0.01	0.26	0.01	0.07	0.06	0.50	0.01	0.19	0.03	0.01	0.13	0.01	0.03	0.01	0.00	0.01	0.01	0.07		
			2 Mean		0.11	0.10	0.04	0.20	0.05	0.03	0.05	0.43	0.18	0.23	0.07	0.08	0.11	0.01	0.03	0.00	0.06	0.00	0.02	0.13		
			3	1	0.01	0.02	0.12	0.15	0.07	0.15	0.24	0.34	0.00	0.08	0.09	0.01	0.01	0.01	0.01	0.00	0.04	0.00	0.00	0.01		
				2	0.10	0.01	0.02	0.12	0.07	0.17	0.17	0.24	0.09	0.04	0.03	0.08	0.00	0.00	0.01	0.01	0.01	0.06	0.00	0.00		
				3	0.05	0.03	0.02	0.02	0.07	0.11	0.04	0.36	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.01		
			3 Mean		0.06	0.02	0.06	0.10	0.07	0.14	0.15	0.31	0.04	0.04	0.04	0.03	0.00	0.00	0.02	0.01	0.02	0.02	0.00	0.01		
			4	1	0.00	0.02	0.14	0.09	0.03	0.01	0.01	0.00	0.07	0.04	0.02	0.00	0.13	0.08	0.02	0.00	0.01	0.01	0.16	0.00		
				2	0.00	0.01	0.20	0.14	0.06	0.02	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.11	0.24	0.00		
				3	0.08	0.02	0.00	0.10	0.07	0.09	0.03	0.00	0.14	0.06	0.01	0.10	0.00	0.11	0.05	0.01	0.01	0.01	0.03	0.00		
			4 Mean		0.03	0.02	0.11	0.11	0.05	0.04	0.02	0.00	0.08	0.03	0.01	0.04	0.04	0.07	0.03	0.01	0.01	0.04	0.14	0.00		
		BT Grand Mean			0.05	0.07	0.06	0.13	0.09	0.06	0.06	0.19	0.13	0.09	0.04	0.04	0.05	0.03	0.02	0.01	0.03	0.03	0.04	0.05	0.06	0.01
		PS	1	1	0.00	0.42	0.00	0.79	19.15	0.28	0.00	0.18	52.01	0.05	0.01	3.97	1.39	0.17	0.00	0.00	1.37	0.25	3.37	0.00		
				2	0.00	0.34	0.00	0.25	0.21	1.17	0.00	2.65	77.95	0.01	0.01	0.25	1.56	0.69	0.00	0.12	2.38	0.33	0.01	0.00		
				3	0.07	1.05	0.42	1.38	0.16	0.05	0.00	0.03	18.53	0.04	0.30	4.21	0.01	0.13	0.00	0.10	1.88	0.07	0.01	0.00		
			1 Mean		0.02	0.60	0.14	0.81	6.50	0.50	0.00	0.95	49.50	0.03	0.11	2.81	0.99	0.33	0.00	0.07	1.88	0.22	1.13	0.00		
			2	1	0.17	0.01	0.00	0.05	2.74	0.04	0.02	0.21	2.57	1.66	0.21	3.95	0.26	0.01	0.02	0.06	6.39	0.01	0.02	0.02		
				2	0.01	1.31	0.01	0.02	2.37	0.02	0.03	0.15	76.80	0.85	1.24	0.03	0.03	0.56	0.46	0.26	0.57	0.04	0.67	0.01		
				3	0.01	0.02	0.39	0.03	3.95	8.12	0.12	1.34	171.09	0.01	0.02	0.01	0.14	0.03	0.00	0.14	1.95	1.22	0.07	0.00		
			2 Mean		0.06	0.45	0.13	0.03	3.02	2.73	0.06	0.56	83.49	0.84	0.49	1.33	0.14	0.20	0.16	0.15	2.97	0.42	0.25	0.01		
			3	1	0.00	0.00	0.03	1.05	3.82	0.16	0.04	0.53	0.02	0.08	0.07	4.77	0.04	0.47	0.01	1.25	5.19	0.03	0.00	0.00		
				2	0.02	0.00	0.03	0.13	2.21	0.07	0.06	0.40	0.49	0.01	0.06	7.33	0.01	0.09	0.01	0.08	0.26	0.17	0.00	0.01		
				3	0.07	0.06	0.03	0.04	4.46	0.03	0.01	0.70	0.52	0.01	0.33	6.24	0.06	0.02	0.00	0.56	0.83	0.01	0.00	0.00		
			3 Mean		0.03	0.02	0.03	0.41	3.50	0.08	0.04	0.54	0.34	0.03	0.15	6.11	0.04	0.20	0.01	0.63	2.09	0.07	0.00	0.00		
			4	1	0.03	0.13	0.15	0.08	0.23	0.15	0.00	0.74	0.08	0.31	0.03	0.56	0.06	0.42	0.02	0.02	0.11	0.63	0.19	0.98		
				2	0.12	12.19	0.33	2.56	0.60	0.56	0.01	0.57	0.18	0.56	0.02	0.66	0.03	0.02	0.07	2.34	0.29	0.08	0.00	0.08		
				3	0.00	0.18	0.17	1.58	0.21	0.20	0.05	0.58	0.10	0.15	0.03	5.23	0.08	0.06	0.21	0.18	0.78	0.63	0.07	0.10		
			4 Mean		0.05	4.17	0.22	1.41	0.34	0.30	0.02	0.63	0.12	0.34	0.03	2.15	0.06	0.17	0.10	0.85	0.39	0.44	0.09	0.39		
		PS Grand Mean			0.04	1.31	0.13	0.66	3.34	0.90	0.03	0.67	33.36	0.31	0.20	3.10	0.31	0.22	0.07	0.42	1.83	0.29	0.37	0.10	2.95	2.20
NEARSHORE	VEG	BT	1	1	0.47	0.60	0.12	0.02	0.15	0.13	0.10	0.16	0.24	0.44	0.13	0.11	0.13	0.09	0.00	0.00	0.00	0.00	0.00	0.11		
				2	1.07	0.37	0.00	0.51	0.21	0.24	0.03	0.21	0.19	0.11	0.02	0.03	0.20	0.13	0.00	0.00	0.01	0.02	0.01	0.00		
				3	0.97	0.64	0.00	0.60	0.33	0.26	0.05	0.09	0.31	0.38	0.13	0.03	0.02	0.06	0.00	0.00	0.00	0.06	0.00	0.00		
			1 Mean		0.83	0.53	0.04	0.38	0.23	0.21	0.06	0.16	0.25	0.31	0.09	0.06	0.12	0.10	0.00	0.00	0.00	0.03	0.00	0.04		
			2	1	0.35	0.28	0.09	0.18	0.21	0.29	0.07	0.37	0.19	0.33	0.00	0.37	0.21	0.14	0.00	0.03	0.07	0.04	0.06	0.34		
				2	0.34	0.42	0.13	0.19	0.20	0.27	0.17	0.34	0.14	0.24	0.03	0.31	0.20	0.04	0.02	0.07	0.06	0.00	0.05	0.16		
				3	0.44	0.49	0.06	0.10	0.23	0.26	0.16	0.41	0.17	0.28	0.05	0.55	0.11	0.04	0.03	0.04	0.02	0.01	0.09	0.16		
			2 Mean		0.38	0.40	0.10	0.16	0.22	0.27	0.13	0.37	0.17	0.28	0.03	0.41	0.17	0.07	0.02	0.05	0.05	0.02	0.06	0.22		
			3	1	0.09	0.07	0.03	0.36	0.10	0.18	0.32	0.60	0.01	0.00	0.11	0.41	0.02	0.01	0.02	0.01	0.15	0.02	0.01	0.00		
				2	0.14	0.01	0.04	0.18	0.09	0.13	0.23	0.19	0.04	0.00	0.04	0.02	0.02	0.01	0.01	0.00	0.09	0.00	0.09	0.04		
				3	0.16	0.03	0.08	0.39	0.09	0.11	0.39	0.33	0.02	0.00	0.12	0.72	0.01	0.02	0.01	0.00	0.06	0.03	0.02	0.07		
			3 Mean		0.13	0.04	0.05	0.31	0.09	0.14	0.31	0.37	0.02	0.00	0.09	0.38	0.02	0.01	0.01	0.00	0.10	0.02	0.04	0.04		
			4	1	0.74	0.00	0.00	0.41	0.84	0.02	0.03	0.12	0.02	0.01	0.01	0.12	0.01	0.00	0.09	0.14	0.00	0.01	0.11	0.28		
				2	0.81	0.02	0.05	0.28	0.08	0.01	0.06	0.07	0.04	0.03	0.02	0.23	0.01	0.00	0.08	0.22	0.03	0.00	0.15	0.27		
				3	0.50	0.02	0.00	0.36	0.28	0.01	0.02	0.00	0.03	0.02	0.01	0.19	0.01	0.01	0.01	0.28	0.00	0.01	0.16	0.02		
			4 Mean		0.68	0.01	0.02	0.35	0.40	0.01	0.04	0.07	0.03	0.02	0.01	0.18	0.01	0.00	0.06	0.22	0.01	0.01	0.14	0.19		
		BT Grand Mean			0.51	0.25	0.05	0.30	0.24	0.16	0.14	0.24	0.12	0.15	0.06	0.26	0.08	0.05	0.02	0.07	0.04	0.02	0.06	0.12	0.10	0.02
		PS	1	1	0.01	0.26	0.00	0.00	5.25	0.89	0.01	1.73	34.43	0.57	0.00	0.04	1.91	1.25	0.02	0.25	2.63	0.07	0.52	0.23		
				2	0.18	0.08	0.00	0.00	49.91	0.98	0.00	0.01	22.90	2.86	0.03	0.00	0.85	0.51	0.04	0.19	13.93	0.04	0.00	0.05		
				3	0.00	0.98	0.00	0.00	89.36	0.51	0.95	0.29	64.74	1.99	0.00	1.42	2.12	1.34	0.18	0.00	2.32	1.09	0.01	0.01		
			1 Mean		0.06	0.44	0.00	0.00	48.17	0.79	0.32	0.68	40.69	1.81	0.01	0.49	1.63	1.03	0.08	0.15	6.29	0.40	0.18	0.10		
			2	1	0.04	0.32	0.01	2.24	9.17	0.12	0.45	0.17	49.17	0.21	2.32	0.53	0.01	0.00	0.42	9.63	2.67	0.00	0.23	0.01		
				2	0.04	0.33	0.02	1.52	11.90	1.77	0.01	0.93	0.04	0.02	0.32	0.60	0.01	0.10	0.01	0.24	0.50	0.20	0.50	0.01		
				3	0.06	0.31	0.93	2.77	15.11	0.44	0.00	0.10	0.06	0.01	0.01	0.07	0.77	0.00	0.00	0.18	4.75	0.09	0.02	0.01		
			2 Mean		0.04	0.32	0.32	2.18	12.06	0.78	0.15	0.40	16.42	0.08	0.88	0.40	0.27	0.03	0.14	3.35	2.64	0.10	0.25	0.01		
			3	1	9.11	0.10	0.02	1.24	1.15	0.17	0.16	0.51	0.13	0.05	0.02	1.48	0.03	0.10	0.04	0.07	0.21	0.10	0.01	0.01		
				2	1.54	0.03	0.16	0.78	10.78	0.22	0.10	0.15	0.03	0.02	0.03	4.36	0.07	0.11	0.01	0.18	0.23	0.02	0.01	0.00		
				3	0.75	0.01	0.00	0.29	29.73	0.33	0.11	0.35	0.09	0.05	0.10	1.19	0.10	6.43	0.00	1.04	0.92	0.02	0.00	0.00		
			3 Mean		3.80	0.05	0.06	0.77	13.89	0.24	0.12	0.34	0.08	0.04	0.05	2.34	0.07	2.22	0.02	0.43	0.45	0.05	0.01	0.00		
			4	1	0.00	0.01	0.05	0.26	0.74	0.10	2.70	0.36	0.25	0.23	0.07	3.82	0.06	0.03	0.09	1.23	3.79	0.03	0.05	0.18		
				2	0.19	0.04	0.08	0.37	1.52	0.53	0.01	0.50	0.24	0.06	0.32	0.08	0.07	0.06	0.24	20.98	1.14	0.01	0.15	0.31		
				3	0.01	0.02	0.14	0.39	0.56	0.51	0.08	0.50	0.32	33.49	0.09	0.08	0.12	0.00	0.10	2.33	2.18	0.02	0.69	0.23		
			4 Mean		0.07	0.02	0.09	0.34	0.94	0.38	0.93	0.45	0.27	11.26	0.16	1.32	0.08	0.03	0.14	8.18	2.37	0.02	0.29	0.24		
		PS Grand Mean			0.99	0.21	0.12	0.82	18.77	0.55	0.38	0.47	14.37	3.30	0.28	1.14	0.51	0.83	0.10	3.03	2.94	0.14	0.18	0.09	1.98	0.94

Appendix Table 11. Summary of numerical density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
CHANNEL	CHANNEL	OT	1	1	0.05	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00		
				2	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.18	0.01	0.01		
				3	0.06	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.02	0.00	0.01	0.00	0.02	0.01	0.01		
			1 Mean		0.04	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.00	0.07	0.01	0.00		
			2	1	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.03		
				2	0.01	0.01	0.01	0.08	0.01	0.00	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.02		
				3	0.01	0.01	0.01	0.04	0.03	0.00	0.00	0.02	0.01	0.01	0.01	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.03		
			2 Mean		0.01	0.01	0.01	0.04	0.02	0.00	0.00	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.02		
			3	1	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00		
				2	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00		
				3	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00		
			3 Mean		0.01	0.00	0.01	0.02	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00		
			4	1	0.01	0.00	0.00	0.04	0.04	0.00	0.02	0.02	0.01	0.01	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.03	0.00		
				2	0.01	0.01	0.01	0.03	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.01		
				3	0.02	0.22	0.01	0.02	0.04	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01		
			4 Mean		0.01	0.08	0.01	0.03	0.03	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.01		
		OT Grand Mean			0.02	0.02	0.00	0.03	0.02	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.01	0.00
		PS	1	1	0.04	0.22	0.00	0.00	0.00	2.72	0.00	0.03	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.02	0.00	0.00		
				2	0.00	0.08	0.01	0.00	0.00	0.89	0.03	0.00	0.00	0.18	0.00	0.00	0.00	0.04	0.00	0.00	2.22	0.34	0.00	0.00		
				3	0.00	0.00	0.00	0.00	0.00	0.15	0.01	0.00	0.50	7.97	0.04	0.00	0.00	0.74	0.00	0.00	19.59	3.82	0.04	0.00		
			1 Mean		0.01	0.10	0.00	0.00	0.00	1.25	0.01	0.01	0.41	2.72	0.01	0.00	0.00	0.26	0.00	0.00	7.32	1.40	0.01	0.00		
			2	1	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.38	0.04	0.01	0.22		
				2	0.00	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00		
				3	0.00	0.00	0.00	0.01	0.06	19.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	4.00	0.00	0.00	0.00	0.00		
			2 Mean		0.00	0.00	0.01	0.01	0.05	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.13	0.01	0.00	0.07		
			3	1	0.10	0.00	0.01	0.00	0.02	0.00	0.00	0.64	0.01	0.00	0.00	0.04	0.01	0.00	0.00	1.47	5.57	0.00	0.00	0.01		
				2	0.00	0.00	0.03	0.09	0.06	0.00	0.25	0.03	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.02	3.60	0.00	0.00	0.00		
				3	0.00	0.02	0.26	0.00	0.00	0.00	0.01	1.51	0.04	0.06	0.02	0.00	0.00	0.01	0.00	0.73	3.60	0.00	0.01	0.00		
			3 Mean		0.03	0.01	0.10	0.03	0.03	0.00	0.08	0.72	0.02	0.02	0.01	0.01	0.00	0.04	0.00	0.74	4.26	0.00	0.00	0.00		
			4	1	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.06	0.02	0.00	0.00	0.06		
				2	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.17	0.48	0.00	0.02	0.05		
				3	0.00	0.00	0.01	0.00	0.01	0.19	0.00	0.70	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.35	2.32	0.00	0.00	0.05		
			4 Mean		0.00	0.00	0.00	0.00	0.00	0.13	0.02	0.23	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.19	0.94	0.00	0.01	0.05		
		PS Grand Mean			0.01	0.03	0.03	0.01	0.02	1.95	0.03	0.24	0.12	0.69	0.01	0.01	0.00	0.08	0.00	0.58	3.16	0.35	0.01	0.03	0.38	0.21

Appendix Table 12. Summary of biomass density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
INTERTIDAL	NON-VEG	LS	1	1	0.00	2.54	0.12	0.63	0.04	0.91	0.00	0.08	0.07	0.00	0.41	1.06	1.60	0.09	0.41	0.21	0.28	1.33	0.00	1.29		
				2	0.00	0.01	0.00	0.38	0.61	2.09	0.34	0.64	0.12	2.29	0.01	0.90	0.14	0.09	0.00	0.01	0.42	0.05	0.91	0.01		
				3	0.00	0.73	0.16	0.19	0.70	2.85	0.01	0.11	0.11	2.58	0.00	0.29	0.71	0.00	0.00	0.10	0.34	1.34	3.19	1.58		
			1 Mean		0.00	1.09	0.09	0.40	0.45	1.95	0.12	0.28	0.10	1.62	0.14	0.75	0.82	0.06	0.14	0.11	1.04	2.73	4.10	2.88		
			2	1	1.25	0.29	0.50	0.56	2.87	0.64	0.00	0.00	9.85	0.37	0.00	0.34	0.32	3.46	0.64	0.22	5.21	3.79	3.08	0.02		
				2	0.00	0.79	0.33	0.35	0.31	0.04	0.00	0.00	5.67	0.60	0.06	0.32	3.33	1.49	0.05	1.18	0.63	0.91	1.82	0.01		
				3	0.00	1.02	0.29	0.36	0.34	0.23	0.00	0.07	2.78	0.19	0.07	0.36	3.76	0.03	0.07	0.00	2.46	1.78	17.79	0.02		
			2 Mean		0.42	0.70	0.37	0.42	1.18	0.30	0.00	0.02	6.10	0.39	0.04	0.34	2.47	1.66	0.25	0.47	2.77	2.16	7.56	0.02		
			3	1	0.00	0.02	0.32	0.11	2.02	0.31	0.00	0.23	0.27	0.08	0.00	0.14	3.19	0.04	0.01	0.89	0.45	1.94	3.36	0.69		
				2	0.04	0.43	0.67	0.07	1.92	1.57	0.00	0.08	0.42	0.09	0.00	0.22	0.17	0.25	0.77	0.10	0.05	0.70	0.00	0.90		
				3	0.05	0.54	0.40	0.00	5.42	0.70	0.02	0.35	0.55	0.33	0.00	26.69	1.67	0.00	0.00	0.60	0.74	0.27	1.09	0.39		
			3 Mean		0.03	0.33	0.47	0.06	3.12	0.86	0.01	0.22	0.41	0.17	0.00	9.02	1.68	0.10	0.26	0.53	0.41	0.97	1.48	0.66		
			4	1	0.00	0.29	0.00	1.55	0.90	0.56	0.55	0.56	1.59	10.39	2.10	0.05	0.46	5.71	3.89	16.59	2.10	3.59	0.00	0.89		
				2	0.52	0.53	0.00	0.13	1.06	0.20	0.14	0.17	0.23	0.78	0.43	0.80	0.35	1.96	0.00	1.19	0.50	1.67	0.32	0.87		
				3	0.88	0.31	0.00	0.23	0.44	0.23	3.60	0.44	0.34	2.50	2.47	0.07	0.12	0.95	4.13	0.18	0.50	1.05	0.08	0.71		
			4 Mean		0.47	0.37	0.00	0.64	0.80	0.33	1.43	0.39	0.72	4.56	1.67	0.31	0.31	2.87	2.67	5.99	1.03	2.16	0.13	0.82		
		LS Grand Mean			0.23	0.62	0.23	0.38	1.39	0.86	0.39	0.23	1.83	1.68	0.46	2.60	1.32	1.17	0.83	1.77	1.31	1.99	3.32	1.09	1.19	0.19
		SE	1	1	0.00	0.00	0.10	5.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.10	8.60	0.00	0.00	0.00	5.00		
				2	0.00	0.00	0.10	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				3	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.10	0.00	0.00	0.10	0.00		
			1 Mean		0.00	0.00	0.07	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.03	2.90	0.00	0.00	0.03	1.67		
			2	1	0.00	0.10	0.70	0.10	0.00	0.00	0.00	0.20	0.00	0.00	0.10	2.30	0.00	0.00	0.50	0.00	0.00	0.00	0.40	0.10		
				2	0.10	0.00	1.40	39.20	0.00	0.10	0.00	3.70	0.00	0.00	0.05	2.80	0.00	0.00	0.10	0.10	0.00	0.00	0.10	0.30		
				3	0.00	0.10	1.40	4.00	0.00	0.00	1.10	1.00	0.00	0.00	0.00	0.80	0.00	0.00	0.10	0.10	0.00	0.00	0.50	0.60		
			2 Mean		0.03	0.07	1.17	14.43	0.00	0.03	0.37	1.63	0.00	0.00	0.05	1.97	0.00	0.00	0.23	0.07	0.00	0.00	0.33	0.33		
			3	1	0.00	0.30	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10	0.00		
				2	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.10	0.20		
				3	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.20		
			3 Mean		0.00	0.17	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.40	0.13		
			4	1	0.10	0.50	0.10	0.10	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				2	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				3	0.00	0.00	0.10	0.00	0.00	0.20	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			4 Mean		0.07	0.17	0.10	0.03	0.07	0.07	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		SE Grand Mean			0.03	0.10	0.33	4.13	0.02	0.03	0.09	0.43	0.00	0.00	0.01	0.52	0.00	0.00	0.08	0.75	0.00	0.00	0.19	0.53	0.36	0.20
		SS	1	1	2.87	0.39	0.01	2.42	0.08	0.00	0.00	4.15	0.07	0.00	0.03	0.82	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				2	0.17	0.04	0.06	0.98	0.06	0.00	0.00	3.84	0.13	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.24		
				3	0.06	0.17	0.01	6.19	0.20	0.00	0.00	2.36	0.13	0.43	0.02	0.11	0.22	0.00	0.00	0.07	0.00	0.00	0.00	0.00		
			1 Mean		1.03	0.20	0.03	3.20	0.11	0.00	0.00	3.45	0.11	0.14	0.02	0.31	0.19	0.00	0.00	0.02	0.00	0.00	0.00	0.08		
			2	1	0.91	0.28	0.13	0.42	0.01	0.00	0.00	9.45	0.59	0.15	0.06	0.07	0.06	0.00	0.02	0.05	0.00	0.01	0.00	0.15		
				2	1.24	0.20	0.06	0.56	0.00	0.00	0.00	0.78	0.49	0.00	0.01	1.88	0.02	0.00	0.02	0.02	0.00	0.00	0.02	0.28		
				3	0.10	0.00	0.04	0.28	0.41	0.04	0.02	10.57	0.61	0.00	0.00	0.22	0.08	0.00	0.02	0.01	0.02	0.00	0.00	0.10		
			2 Mean		0.75	0.16	0.08	0.42	0.14	0.01	0.01	6.93	0.56	0.05	0.02	0.72	0.05	0.00	0.02	0.03	0.01	0.00	0.01	0.18		
			3	1	0.00	0.00	0.01	0.51	0.01	0.00	0.00	0.18	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.10	0.12	0.18	0.00	0.09		
				2	0.01	0.00	0.00	1.48	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.19	0.00	0.00	0.00	0.00	0.00	0.00	1.10		
				3	0.00	0.22	0.03	0.01	0.12	0.00	0.00	0.07	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.05	0.01	0.37	0.00	0.40		
			3 Mean		0.00	0.07	0.01	0.67	0.05	0.00	0.00	0.09	0.00	0.00	0.01	0.01	0.07	0.00	0.01	0.05	0.04	0.19	0.00	0.53		
			4	1	0.07	0.00	0.00	0.24	0.08	1.07	0.00	0.02	0.00	1.87	0.26	0.02	0.14	0.00	0.00	0.42	0.06	0.00	0.00	0.03		
				2	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.04	0.17	0.00	0.00	0.00	1.20	0.10	0.00	0.01	0.00	0.00	0.00	0.01		
				3	0.05	0.00	0.00	0.81	0.13	0.00	0.00	0.00	0.05	0.06	0.10	0.15	0.13	0.00	0.00	0.07	0.00	0.00	0.21	0.00		
			4 Mean		0.04	0.00	0.00	0.36	0.07	0.36	0.00	0.02	0.07	0.64	0.12	0.06	0.49	0.04	0.00	0.17	0.02	0.00	0.07	0.01		
		SS Grand Mean			0.46	0.11	0.03	1.16	0.09	0.09	0.00	2.62	0.19	0.21	0.04	0.27	0.20	0.01	0.01	0.07	0.02	0.05	0.02	0.20	0.29	0.14

Appendix Table 12. Summary of biomass density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
INTERTIDAL	VEG	LS	1	1	6.37	1.94	2.23	0.47	0.20	0.49	2.69	0.00	1.36	1.90	0.00	0.57	0.61	0.61	0.06	0.27	0.14	2.15	0.00	2.94		
				2	3.54	2.19	0.05	0.14	2.22	1.04	0.01	0.01	1.00	2.44	0.00	0.49	0.34	1.01	0.00	0.00	0.09	1.02	0.15	0.71		
				3	2.30	2.37	0.06	1.96	0.63	0.18	1.10	0.07	1.47	1.58	0.41	2.14	0.18	0.49	0.10	0.04	0.27	2.16	11.70	0.07		
			1 Mean		4.07	2.17	0.78	0.86	1.02	0.57	1.27	0.03	1.28	1.97	0.14	1.06	0.38	0.70	0.06	0.10	0.17	1.78	3.95	1.24		
			2	1	1.43	0.00	0.14	0.51	0.34	0.04	0.05	1.98	1.00	0.01	0.13	6.32	0.16	2.47	0.05	0.02	0.49	1.72	1.93	0.51		
				2	4.61	0.45	0.04	1.51	0.57	0.02	0.10	1.01	1.03	0.16	0.38	0.19	0.25	2.63	0.13	0.10	0.83	4.21	2.24	0.01		
				3	4.00	0.00	0.03	0.48	1.69	0.88	0.01	0.16	2.74	1.30	0.00	0.68	2.33	2.88	0.07	0.00	0.02	2.20	0.00	0.00		
			2 Mean		3.35	0.15	0.07	0.83	0.87	0.31	0.05	1.05	1.59	0.49	0.17	2.40	0.91	2.66	0.08	0.04	0.45	2.71	1.39	0.17		
			3	1	0.09	1.36	0.04	0.71	1.05	1.17	0.18	0.04	0.95	2.18	15.75	0.95	1.11	0.61	0.01	0.51	1.35	0.50	0.01	0.36		
				2	0.09	3.83	0.04	1.75	0.28	0.74	0.00	0.15	1.81	0.06	0.52	0.80	1.29	0.25	2.74	0.31	0.44	0.98	0.00	0.35		
				3	1.36	2.05	0.03	0.54	1.32	1.35	1.97	0.11	1.99	0.79	0.12	1.64	2.02	0.33	0.01	0.53	0.19	1.14	0.01	1.39		
			3 Mean		0.51	2.42	0.04	1.00	0.88	1.09	0.72	0.10	1.58	1.01	5.46	1.13	1.47	0.39	0.92	0.45	0.66	0.87	0.01	0.70		
			4	1	0.11	0.10	0.01	0.80	0.15	0.03	0.15	0.08	0.17	0.02	0.94	0.02	2.17	1.40	0.03	0.22	0.59	0.35	0.16	0.02		
				2	0.01	0.06	1.03	0.04	0.14	1.90	0.20	0.29	0.26	0.09	0.25	0.15	0.43	0.50	0.15	1.01	2.65	0.05	0.77	0.03		
				3	0.07	0.10	0.15	0.24	0.21	1.34	0.03	0.15	0.04	0.58	0.04	0.17	0.14	0.74	0.05	0.58	3.01	0.25	0.11	0.04		
			4 Mean		0.06	0.08	0.40	0.36	0.17	1.09	0.12	0.17	0.16	0.23	0.41	0.11	0.92	0.88	0.08	0.60	2.08	0.22	0.35	0.03		
		LS Grand Mean			2.00	1.20	0.32	0.76	0.73	0.76	0.54	0.34	1.15	0.92	1.54	1.18	0.92	1.16	0.28	0.30	0.84	1.39	1.42	0.54	0.92	0.10
		SE	1	1	20.56	0.00	0.10	20.00	0.00	0.00	0.00	2.80	0.00	18.10	0.01	0.20	0.00	0.10	0.30	0.20	0.00	0.00	0.00	0.20		
				2	0.00	1.70	0.20	0.00	0.00	0.01	0.00	0.00	0.20	19.70	0.00	0.80	0.00	0.00	0.50	0.20	0.00	0.00	0.00	0.10		
				3	0.00	0.30	0.20	0.30	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.20	0.00	0.00	0.00	0.10	0.00	0.00	0.10	0.10		
			1 Mean		6.85	0.67	0.17	6.77	0.00	0.00	0.00	0.93	0.10	12.60	0.00	0.40	0.00	0.03	0.27	0.17	0.00	0.00	0.03	0.13		
			2	1	3.00	0.10	0.20	5.70	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.70	0.00	0.20	0.00	0.00	0.00	0.10		
				2	0.00	0.40	0.10	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.10	0.10	0.00	3.00	0.00	0.40		
				3	0.70	0.00	0.00	1.20	0.00	0.00	0.40	0.00	0.00	16.70	0.10	0.00	0.00	1.40	0.10	0.10	0.10	0.00	0.00	1.50		
			2 Mean		1.23	0.17	0.10	2.40	0.00	0.00	0.13	0.00	0.00	5.57	0.07	0.03	0.00	0.87	0.07	0.13	0.03	1.00	0.00	0.67		
			3	1	0.10	0.00	0.60	0.00	0.00	0.10	0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.70		
				2	0.00	0.00	0.50	0.80	1.20	0.10	0.00	0.60	0.00	0.10	0.00	0.00	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.20		
				3	0.40	0.00	5.10	0.10	0.00	0.00	0.00	0.40	0.00	0.10	0.30	0.10	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.10		
			3 Mean		0.17	0.00	2.07	0.30	0.40	0.07	0.00	1.27	0.00	0.07	0.10	0.03	0.10	0.00	0.13	0.00	0.00	0.00	0.00	0.33		
			4	1	1.90	0.60	0.10	0.10	0.00	1.30	1.00	0.30	2.30	3.70	0.00	0.30	2.90	0.00	0.80	1.00	5.50	0.00	0.30	0.40		
				2	0.60	1.30	0.30	0.90	0.00	1.40	0.50	1.40	1.70	2.50	5.90	0.60	3.70	0.00	1.20	0.80	5.20	0.00	1.20	3.30		
				3	0.60	0.00	0.20	0.40	0.00	3.10	1.00	1.20	1.90	1.00	0.10	1.20	3.00	0.00	1.70	1.20	5.30	0.00	1.60	0.20		
			4 Mean		1.03	0.63	0.20	0.47	0.00	1.93	0.83	0.97	1.97	2.40	2.00	0.70	3.20	0.00	1.23	1.00	5.33	0.00	1.03	1.30		
		SE Grand Mean			2.32	0.37	0.63	2.48	0.10	0.50	0.24	0.79	0.52	5.16	0.54	0.29	0.83	0.23	0.43	0.33	1.34	0.25	0.27	0.61	0.91	0.27
		SS	1	1	0.32	0.04	0.04	0.09	0.32	0.00	0.00	0.16	0.07	0.00	0.18	0.02	0.07	0.00	0.00	0.00	0.01	0.00	0.00	0.11		
				2	0.21	0.07	0.00	0.03	0.04	0.00	0.08	0.08	0.04	0.00	0.01	0.42	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00		
				3	0.18	0.04	0.28	3.72	0.14	0.00	0.05	0.01	0.13	0.05	0.02	0.05	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.24		
			1 Mean		0.24	0.05	0.11	1.28	0.17	0.00	0.04	0.08	0.08	0.02	0.07	0.16	0.10	0.01	0.00	0.00	0.01	0.00	0.00	0.12		
			2	1	0.00	0.46	0.02	0.00	0.00	0.06	0.04	8.48	0.40	0.02	0.06	3.45	0.09	0.00	1.27	0.06	0.00	0.00	0.04	0.92		
				2	0.00	0.00	0.04	0.00	0.10	0.10	0.80	1.84	4.26	0.00	0.09	0.24	0.41	0.00	0.02	0.02	0.00	0.11	0.30	2.46		
				3	0.00	0.91	0.03	0.04	0.04	0.00	0.01	3.54	1.99	0.23	0.13	2.19	0.00	0.00	0.06	0.11	0.02	0.00	0.03	0.40		
			2 Mean		0.00	0.46	0.03	0.01	0.05	0.06	0.28	4.62	2.22	0.08	0.10	1.96	0.17	0.00	0.45	0.07	0.01	0.04	0.12	1.26		
			3	1	0.07	0.08	0.16	2.09	0.04	0.21	0.00	0.10	0.13	0.57	0.03	0.17	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.13		
				2	0.36	0.28	0.08	0.07	0.22	0.00	0.07	0.13	0.05	0.00	0.23	0.15	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00		
				3	0.12	0.06	0.15	2.55	0.01	0.05	0.03	0.20	0.04	0.00	0.13	0.17	0.00	0.00	0.45	0.13	0.00	0.01	0.00	0.03		
			3 Mean		0.18	0.14	0.13	1.57	0.09	0.09	0.03	0.14	0.08	0.19	0.13	0.16	0.01	0.00	0.15	0.09	0.00	0.00	0.00	0.06		
			4	1	0.00	0.00	0.01	0.06	0.06	0.21	0.02	0.13	0.09	0.00	0.00	0.48	0.08	0.00	0.05	0.12	0.06	0.19	0.00	0.01		
				2	0.01	0.05	0.86	0.09	0.16	0.02	0.07	0.07	0.06	0.00	0.01	0.05	0.17	0.28	0.15	0.10	0.54	0.04	0.00	0.01		
				3	0.31	0.17	0.38	0.10	0.09	0.00	0.13	0.05	0.14	0.00	0.00	0.06	0.10	0.17	0.59	0.28	0.15	0.19	0.00	0.01		
			4 Mean		0.11	0.07	0.42	0.08	0.10	0.08	0.07	0.08	0.10	0.00	0.00	0.20	0.12	0.15	0.26	0.16	0.25	0.14	0.00	0.01		
		SS Grand Mean			0.13	0.16	0.17	0.74	0.10	0.05	0.11	1.23	0.62	0.07	0.08	0.62	0.10	0.04	0.22	0.08	0.07	0.05	0.03	0.36	0.26	0.07

Appendix Table 12. Summary of biomass density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
NEARSHORE	NON-VEG	BT	1	1	0.00	3.41	0.00	2.83	6.62	0.75	0.29	0.57	4.66	1.24	0.00	0.11	0.04	4.51	0.00	0.00	3.04	0.16	0.00	0.00		
				2	0.00	0.75	0.01	1.06	0.45	0.01	0.00	0.16	8.47	0.00	0.30	0.00	3.19	0.41	0.00	0.52	1.94	0.18	0.00	0.00		
				3	0.00	0.16	0.00	1.54	0.02	0.02	0.40	0.00	26.60	5.64	0.42	0.31	0.24	0.31	0.00	0.02	2.60	1.16	0.00	0.14		
			1 Mean		0.00	1.44	0.00	1.81	2.36	0.26	0.23	0.25	13.24	2.29	0.24	0.14	1.16	1.74	0.00	0.18	2.53	0.51	0.00	0.05		
			2	1	1.35	1.17	0.02	0.52	2.65	0.04	0.01	1.17	9.29	3.04	0.01	0.29	0.31	3.97	0.00	0.00	1.58	0.00	0.00	0.01		
				2	2.10	2.89	0.01	0.08	0.03	0.15	0.06	0.92	1.44	1.37	0.01	0.03	2.13	2.13	1.83	0.00	0.33	0.69	0.70	0.20		
				3	1.31	12.49	0.00	0.46	2.61	0.86	1.36	4.67	0.32	3.34	0.02	0.42	3.13	1.40	0.00	2.07	0.01	1.38	0.00	0.32		
			2 Mean		1.59	5.52	0.01	0.35	1.76	0.35	0.48	2.25	3.69	2.58	0.01	0.24	1.86	2.50	0.61	0.69	0.64	0.69	0.23	0.18		
			3	1	0.25	2.71	8.83	0.36	1.30	1.08	8.68	1.65	0.00	3.77	0.23	1.06	0.92	0.69	0.02	0.05	0.50	0.00	0.00	1.00		
				2	1.04	0.71	0.01	0.90	0.29	0.82	7.90	4.25	0.84	0.91	0.53	0.28	0.00	0.34	0.00	0.59	0.40	1.28	0.00	0.00		
				3	0.52	1.13	2.30	0.02	0.43	0.23	6.63	1.09	0.62	0.00	0.00	0.00	0.00	0.00	3.97	0.00	0.21	0.00	0.00	0.17		
			3 Mean		0.60	1.52	3.71	0.43	0.67	0.71	7.74	2.33	0.49	1.56	0.25	0.45	0.31	0.34	1.33	0.21	0.37	0.43	0.00	0.39		
			4	1	0.00	0.31	18.53	5.53	0.96	0.43	1.71	0.00	0.17	2.61	3.14	0.16	0.01	0.60	0.00	0.52	0.00	1.38	20.69	0.00		
				2	0.00	0.11	0.64	21.66	4.10	0.01	0.00	0.00	0.31	1.05	2.09	0.00	0.00	0.20	0.01	0.00	0.01	0.02	27.96	0.00		
				3	1.45	0.01	0.00	16.50	4.69	2.83	1.81	0.00	14.25	5.32	0.83	1.77	0.00	0.05	0.01	1.90	0.13	1.52	4.83	0.38		
			4 Mean		0.48	0.14	6.39	14.56	3.25	1.09	1.17	0.00	4.91	2.99	2.02	0.64	0.00	0.28	0.01	0.80	0.05	0.97	17.83	0.13		
		BT Grand Mean			0.67	2.15	2.53	4.29	2.01	0.60	2.40	1.21	5.58	2.36	0.63	0.37	0.83	1.22	0.49	0.47	0.89	0.65	4.52	0.19	1.70	0.34
		PS	1	1	0.00	5.75	0.00	7.13	34.04	10.12	0.00	1.09	95.96	1.32	0.06	50.76	3.70	5.18	0.00	0.00	5.56	12.06	31.04	0.00		
				2	0.00	3.17	0.00	7.14	1.46	9.32	0.00	30.52	126.11	2.49	0.06	2.64	9.06	16.72	0.00	2.09	6.52	6.63	1.85	0.00		
				3	1.18	5.28	2.19	11.49	0.25	0.63	0.00	1.72	73.77	9.03	5.90	64.31	0.02	6.26	0.84	1.48	5.84	3.16	1.95	1.35		
			1 Mean		0.39	4.73	0.73	8.59	11.92	6.69	0.00	11.11	98.61	4.28	2.01	39.24	4.26	9.39	0.28	1.19	5.97	7.29	11.61	0.45		
			2	1	2.32	3.35	1.31	8.03	8.16	3.85	4.12	7.06	12.75	15.74	3.53	44.03	3.25	0.93	5.24	21.62	6.84	1.52	5.57	0.07		
				2	0.11	7.77	2.66	4.88	14.19	3.38	13.49	10.64	147.16	7.85	9.76	0.32	2.90	15.27	8.13	4.97	2.44	8.28	13.21	1.52		
				3	0.24	9.48	2.10	2.78	13.68	17.99	5.58	5.17	194.03	1.15	6.57	1.53	22.79	0.70	0.00	4.65	11.15	7.55	23.14	1.27		
			2 Mean		0.89	6.87	2.02	5.23	12.01	8.40	7.73	7.62	117.98	8.25	6.62	15.30	9.65	5.63	4.46	10.41	6.81	5.78	13.97	0.95		
			3	1	0.00	0.00	12.06	10.06	11.43	3.39	2.07	6.70	0.04	0.43	5.86	11.51	1.20	4.27	6.25	3.86	12.48	1.18	0.00	1.18		
				2	1.08	0.00	10.36	6.38	11.73	3.87	3.37	6.43	3.55	2.86	13.30	19.60	1.23	1.22	1.88	2.78	1.15	3.90	0.00	0.00		
				3	0.80	1.20	5.42	0.67	13.68	0.54	3.27	60.37	0.53	0.61	6.37	17.34	1.39	0.86	0.00	4.32	2.08	1.70	0.51	0.00		
			3 Mean		0.63	0.40	9.28	5.70	12.28	2.60	2.91	24.50	1.37	1.30	8.51	16.15	1.27	2.11	2.71	3.65	5.24	2.26	0.17	0.40		
			4	1	0.08	0.84	4.79	32.63	0.71	3.80	0.18	55.50	0.24	3.48	1.39	6.37	0.69	0.29	2.15	0.52	2.35	3.33	9.26	5.03		
				2	0.16	8.32	1.70	24.12	13.13	0.62	0.56	15.62	1.69	2.41	2.38	2.53	0.35	1.89	18.66	5.67	0.32	8.18	0.00	0.83		
				3	0.03	2.64	0.58	20.98	1.64	0.79	1.25	2.22	5.73	0.96	1.10	5.99	1.15	1.25	14.58	0.23	2.63	0.97	5.10	0.75		
			4 Mean		0.09	3.93	2.36	25.91	5.16	1.74	0.66	24.45	2.55	2.28	1.62	4.96	0.73	1.15	11.79	2.14	1.77	4.16	4.79	2.20		
		PS Grand Mean			0.50	3.98	3.60	11.36	10.34	4.86	2.82	16.92	55.38	4.03	4.69	18.91	3.98	4.57	4.81	4.35	4.95	4.87	7.64	1.00	8.68	2.68
NEARSHORE	VEG	BT	1	1	1.89	23.14	0.15	0.00	2.55	1.25	0.32	0.72	3.72	6.08	0.38	0.79	2.08	3.24	0.00	0.00	0.00	0.00	0.00	1.27		
				2	0.42	6.22	0.00	8.33	15.87	2.67	0.30	2.18	1.65	1.54	0.04	0.00	5.05	1.15	0.00	0.00	1.31	2.38	0.00	0.00		
				3	2.68	19.68	0.00	5.62	4.50	2.93	8.67	0.50	3.27	5.13	0.08	0.01	0.03	3.05	0.00	0.01	0.12	4.99	0.01	0.12		
			1 Mean		1.66	16.35	0.05	4.65	7.64	2.28	3.10	1.13	2.88	4.25	0.17	0.27	2.39	2.48	0.00	0.00	0.48	2.46	0.00	0.46		
			2	1	3.11	2.70	0.55	3.75	2.76	2.65	2.37	0.68	2.25	0.69	0.00	3.28	1.05	4.10	0.00	0.54	0.71	1.58	1.05	1.35		
				2	6.09	2.54	0.26	0.98	6.41	3.90	0.34	0.48	1.55	0.43	0.00	3.19	1.24	2.97	2.93	7.98	1.00	0.69	0.69	2.51		
				3	2.73	19.25	0.03	2.28	4.04	2.87	2.55	0.73	2.72	1.04	0.01	1.32	2.59	1.05	0.30	5.87	0.27	0.88	3.14	0.01		
			2 Mean		3.98	8.16	0.28	2.34	4.41	3.14	1.75	0.63	2.17	0.72	0.01	2.60	1.63	2.71	1.08	4.80	0.66	1.05	1.62	1.29		
			3	1	1.95	2.62	2.54	5.77	1.48	0.11	8.73	4.68	0.04	0.21	27.35	1.94	0.79	0.56	0.00	1.04	2.98	1.97	0.00	0.02		
				2	2.38	2.27	1.48	7.10	0.39	0.44	11.11	5.77	0.77	0.00	5.95	0.01	3.60	1.90	0.00	0.00	4.64	0.00	2.78	2.27		
				3	2.53	2.09	5.77	8.36	1.98	1.28	17.92	1.03	0.22	0.00	8.79	9.01	0.00	2.59	0.00	0.00	3.51	1.63	1.21	0.07		
			3 Mean		2.29	2.33	3.26	7.08	1.29	0.61	12.59	3.83	0.34	0.07	14.03	3.65	1.46	1.68	0.00	0.35	3.71	1.20	1.33	0.79		
			4	1	0.27	0.00	0.00	1.55	1.11	2.37	0.01	0.25	0.47	2.40	6.47	0.60	1.25	0.00	15.79	5.45	0.00	1.21	12.26	3.74		
				2	0.16	0.75	5.33	0.66	2.29	0.76	0.01	1.26	0.35	2.45	4.80	1.60	1.17	0.00	17.21	4.78	0.40	0.00	20.52	5.53		
				3	0.85	0.21	0.00	1.97	0.49	0.22	0.01	0.00	0.04	0.42	0.00	0.69	0.47	1.74	2.93	19.79	0.49	0.87	27.56	0.00		
			4 Mean		0.42	0.32	1.78	1.39	1.30	1.12	0.01	0.50	0.29	1.76	3.76	0.96	0.97	0.58	11.98	10.01	0.30	0.69	20.12	3.09		
		BT Grand Mean			2.09	6.79	1.34	3.86	3.66	1.79	4.36	1.52	1.42	1.70	4.49	1.87	1.61	1.86	3.26	3.79	1.29	1.35	5.77	1.41	2.76	0.37
		PS	1	1	0.18	3.53	0.00	0.00	15.33	10.91	4.91	18.14	75.47	3.07	1.31	5.05	4.30	13.03	3.27	0.13	9.76	10.05	3.80	2.15		
				2	2.44	0.53	0.00	0.00	66.56	6.08	0.00	0.95	32.28	17.57	3.89	0.00	6.08	9.54	5.43	3.73	30.64	0.25	0.00	1.21		
				3	0.00	5.97	0.00	0.00	97.41	7.20	9.93	3.94	77.60	15.23	1.53	21.69	4.35	11.35	16.66	0.84	17.40	9.16	0.01	0.09		
			1 Mean		0.87	3.34	0.00	0.00	59.77	8.06	4.94	7.68	61.78	11.95	2.24	8.92	4.91	11.31	8.45	1.57	19.27	6.49	1.27	1.15		
			2	1	0.50	6.06	1.75	17.36	24.11	4.48	7.94	8.80	53.33	7.20	10.78	16.00	2.45	0.84	25.65	23.53	8.00	0.66	1.26	0.84		
				2	0.62	10.43	5.40	10.10	31.16	10.52	3.68	15.70	7.10	1.98	3.10	13.79	1.33	6.25	3.21	12.96	3.68	5.16	2.31	1.89		
				3	1.07	11.14	6.48	16.25	27.62	9.11	0.00	2.75	2.15	3.78	0.05	5.82	15.30	0.57	0.00	5.86	8.43	1.53	6.93	1.59		
			2 Mean		0.73	9.21	4.54	14.57	27.63	8.04	3.87	9.09	20.86	4.32	4.65	11.87	6.36	2.55	9.62	14.12	6.70	2.46	3.50	1.44		
			3	1	6.22	2.01	3.78	13.00	3.69	4.45	6.33	10.02	0.58	4.31	5.73	4.93	2.20	11.39	16.79	1.67	1.55	2.23	3.31	2.36		
				2	1.46	0.91	2.57	15.48	23.45	2.42	2.54	1.95	0.01	1.94	5.93	31.44	1.91	0.40	1.99	2.75	0.46	2.22	3.89	1.35		
				3	1.12	0.33	0.00	6.91	78.15	5.65	0.75	6.67	0.13	5.23	4.36	6.95	4.04	5.38	0.00	6.55	2.25	2.70	0.68	1.18		
			3 Mean		2.93	1.08	2.12	11.80	35.10	4.17	3.21	6.21	0.24	3.83	5.34	14.44	2.72	5.72	6.26	3.66	1.42	2.38	2.62	1.63		
			4	1	0.00	0.44	4.55	1.76	2.02	8.55	34.64	6.35	0.55	8.53	4.76	11.91	0.27	5.11	7.38	12.11	8.34	6.77	13.53	2.31		
				2	0.25	1.87	15.02	2.74	2.78	4.54	3.22	1.49	1.18	6.31	10.28	0.62	0.35	4.31	5.24	57.03	2.36	1.89	80.20	1.37		
				3	0.01	4.16	16.22	1.44	1.87	6.47	6.64	1.55	1.64	29.16	8.33	5.41	1.55	0.00	6.18	6.17	4.17	0.19	9.10	0.40		
			4 Mean		0.09	2.16	11.93	1.98	2.22	6.52	14.84	3.13	1.12	14.67	7.79	5.98	0.72	3.14	6.27	25.10	4.96	2.95	34.28	1.36		
		PS Grand Mean			1.16	3.95	4.65	7.09	31.18	6.70	6.71	6.53	21.00	8.69	5.00	10.30	3.68	5.68	7.65	11.11	8.09	3.57	10.42	1.39	8.23	1.54

Appendix Table 12. Summary of biomass density calculations, 1994 - 1999.

DEP	STR	GEAR	STA	REP	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Gr Mean	S.E.
CHANNEL	CHANNEL	OT	1	1	7.35	0.19	0.13	1.31	1.74	2.57	0.50	1.21	0.70	0.07	0.06	0.42	2.01	0.30	0.00	0.22	0.20	0.72	0.05	0.35		
				2	1.25	1.48	0.11	0.25	3.04	1.75	0.44	1.88	1.41	1.03	0.05	0.83	0.88	1.13	0.00	0.65	3.46	112.92	0.82	1.28		
				3	3.40	1.11	0.13	0.47	2.93	2.12	0.34	0.53	1.40	0.33	0.29	0.82	0.63	0.88	0.00	2.31	0.30	4.86	0.64	0.37		
			1 Mean		4.00	0.93	0.12	0.68	2.57	2.15	0.43	1.21	1.17	0.47	0.13	0.69	1.17	0.77	0.00	1.06	1.32	39.50	0.50	0.67		
			2	1	0.24	1.00	0.56	0.01	1.55	0.81	0.76	2.35	2.04	2.25	0.38	3.45	3.33	0.74	0.00	0.11	1.87	0.70	1.38	2.96		
				2	0.99	0.89	1.52	2.16	1.00	0.39	1.01	3.32	2.37	3.75	0.85	3.02	3.21	0.87	0.00	0.41	0.14	0.11	1.48	2.96		
				3	1.48	1.93	0.66	5.93	2.08	0.39	0.49	3.67	1.85	1.89	1.20	2.88	0.49	1.20	0.00	0.45	0.34	0.50	0.80	3.63		
			2 Mean		0.90	1.27	0.91	2.70	1.54	0.53	0.76	3.11	2.09	2.63	0.81	3.12	2.34	0.94	0.00	0.32	0.78	0.44	1.22	3.18		
			3	1	1.36	1.74	0.72	2.21	0.84	0.12	0.35	0.83	0.34	1.14	0.34	1.64	1.38	0.67	0.00	0.40	0.18	0.42	0.00	0.06		
				2	0.68	0.14	1.15	2.72	2.99	0.06	0.50	0.83	0.33	0.94	0.16	1.13	2.25	1.11	0.00	1.05	0.26	0.99	0.40	0.13		
				3	1.15	0.43	0.38	2.10	0.85	0.50	0.34	1.06	0.13	1.10	0.10	0.91	1.20	1.60	0.00	0.34	0.18	0.71	0.00	0.04		
			3 Mean		1.06	0.77	0.75	2.34	1.56	0.23	0.40	0.91	0.26	1.06	0.20	1.22	1.61	1.13	0.00	0.59	0.21	0.71	0.13	0.08		
			4	1	0.67	0.48	0.33	4.87	1.04	0.41	3.88	13.67	0.86	0.40	1.11	2.56	2.57	0.64	0.00	0.24	0.10	0.26	4.11	0.63		
				2	1.76	1.44	1.11	3.97	3.04	0.88	2.03	0.49	0.55	0.59	4.00	3.16	2.39	0.25	0.00	0.26	0.10	0.00	5.79	0.98		
				3	1.91	1.05	0.96	2.18	0.33	0.34	1.30	0.01	0.73	1.14	1.69	0.86	2.28	1.31	0.00	0.57	0.06	0.05	0.53	0.68		
			4 Mean		1.45	0.99	0.80	3.67	1.47	0.54	2.40	4.72	0.71	0.71	2.27	2.19	2.41	0.73	0.00	0.36	0.09	0.10	3.48	0.77		
		OT Grand Mean			1.85	0.99	0.65	2.35	1.79	0.86	1.00	2.49	1.06	1.22	0.85	1.80	1.88	0.89	0.00	0.58	0.60	10.19	1.33	1.17	1.68	0.47
		PS	1	1	0.67	0.73	0.00	0.00	0.00	8.28	0.01	0.85	1.29	1.64	0.00	0.62	0.00	0.00	0.00	0.00	1.06	6.78	0.00	0.00		
				2	0.00	1.62	4.15	0.00	0.00	10.91	0.19	0.00	0.82	0.51	0.00	0.00	0.00	0.13	0.00	0.00	4.72	3.01	0.00	0.00		
				3	0.00	0.00	0.00	0.00	0.00	0.82	0.03	0.00	0.75	29.68	5.62	0.00	0.00	4.74	0.00	0.00	39.19	11.98	4.53	0.00		
			1 Mean		0.22	0.78	1.38	0.00	0.00	6.67	0.08	0.28	0.95	10.61	1.87	0.21	0.00	1.63	0.00	0.00	14.99	7.26	1.51	0.00		
			2	1	0.00	0.00	5.13	0.00	3.60	0.00	0.00	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.85	0.44	1.34	2.87	7.85		
				2	0.00	0.00	1.93	0.00	2.73	0.00	0.02	0.00	0.00	0.00	0.00	0.00	1.28	0.00	0.00	0.00	0.02	0.00	1.18	0.00		
				3	0.00	1.34	1.55	0.00	5.84	79.42	1.84	0.00	0.61	0.00	0.00	0.00	0.00	3.50	0.00	78.68	0.00	0.17	0.00	0.00		
			2 Mean		0.00	0.45	2.87	0.00	4.05	26.47	0.62	0.27	0.20	0.00	0.00	0.00	0.43	1.17	0.00	27.18	0.15	0.50	1.35	2.62		
			3	1	0.82	0.11	2.35	0.00	0.11	0.00	0.00	1.30	0.20	1.02	0.00	0.08	0.11	0.76	0.00	3.50	11.70	0.00	0.00	4.39		
				2	0.00	0.00	6.34	14.94	0.16	0.19	2.66	0.10	0.01	0.00	0.00	0.00	0.61	12.15	0.00	0.14	7.52	0.00	0.00	0.00		
				3	0.00	0.79	6.99	0.00	0.00	0.69	0.95	3.93	0.38	0.96	1.47	0.00	0.00	0.14	0.00	1.69	7.61	0.00	0.61	0.00		
			3 Mean		0.27	0.30	5.23	4.98	0.09	0.29	1.20	1.77	0.20	0.66	0.49	0.03	0.24	4.35	0.00	1.78	8.94	0.00	0.20	1.46		
			4	1	0.00	0.00	0.00	0.00	0.00	5.20	0.00	0.00	0.00	0.00	0.00	0.01	0.72	0.00	0.00	0.04	3.55	0.00	0.00	0.06		
				2	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.06	1.87	0.00	0.00	0.18	0.00	0.76	0.00	0.07	0.87	0.00	1.19	0.26		
				3	0.00	0.00	0.77	0.00	4.36	0.15	0.00	1.92	4.25	0.75	0.00	0.00	0.00	0.00	0.00	0.28	4.12	0.00	0.00	2.71		
			4 Mean		0.00	0.00	0.26	0.00	1.45	1.78	0.04	0.99	2.04	0.25	0.00	0.06	0.24	0.25	0.00	0.13	2.84	0.00	0.40	1.01		
		PS Grand Mean			0.12	0.38	2.43	1.25	1.40	8.80	0.49	0.83	0.85	2.88	0.59	0.07	0.23	1.85	0.00	7.27	6.73	1.94	0.87	1.27	2.01	0.57

Appendix Table 13. Best estimates of numerical densities for all fish species are for each depth strata at each station (Ecoregion) in San Diego Bay.

			MEAN DENSITY (No/m^2)							BEST ESTIMATE OF DENSITY				
				GEAR							STRATA			WTD
STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN
1	ENGMOR	0.00000	0.00000	0.00072	3.27027	0.00000	0.31374	0.00094		0.00072	3.27027	0.31374		1.26748
	ATHAFF	1.73420	2.52871	0.30427	0.39120	0.00014	0.10591	0.00000		2.52871	0.39120	0.10591		0.34436
	SARSAG	0.00000	0.00000	0.00887	0.24406	0.00000	0.22866	0.00000		0.00887	0.24406	0.22866		0.21827
	ILYGIL	0.20402	0.00120	0.00000	0.00000	0.01365	0.00000	0.00019		0.20402	0.01365	0.00019		0.01686
	ANCDEL	0.00000	0.00000	0.00140	0.10836	0.00000	0.01903	0.00063		0.00140	0.10836	0.01903		0.04726
	LEUTEN	0.00000	0.00000	0.00595	0.11146	0.00000	0.00614	0.00000		0.00595	0.11146	0.00614		0.04082
	CLEIOS	0.11839	0.00013	0.00000	0.00000	0.00101	0.00000	0.00001		0.11839	0.00101	0.00001		0.00744
	CYMAGG	0.00862	0.00000	0.00174	0.08038	0.00828	0.00000	0.00001		0.00862	0.08038	0.00001		0.02705
	QUIYCA	0.08563	0.00013	0.00000	0.00006	0.00078	0.00000	0.00000		0.08563	0.00078	0.00000		0.00539
	ATHCAL	0.05862	0.02097	0.00288	0.00211	0.00000	0.00473	0.00000		0.05862	0.00211	0.00473		0.00705
	HETROS	0.00000	0.00093	0.00322	0.01149	0.03290	0.00045	0.00002		0.00322	0.03290	0.00045		0.01132
	SYNLEP	0.00000	0.00988	0.00167	0.00020	0.01591	0.00011	0.00000		0.00988	0.01591	0.00011		0.00591
	SYNAUL	0.01667	0.00321	0.00042	0.00130	0.00872	0.00006	0.00000		0.01667	0.00872	0.00006		0.00391
	PARCAL	0.01724	0.00053	0.00095	0.00034	0.00158	0.00000	0.00150		0.01724	0.00158	0.00150		0.00246
	HYPGEN	0.01667	0.00000	0.00004	0.00017	0.00333	0.00000	0.00001		0.01667	0.00333	0.00001		0.00210
	BRYARC	0.00862	0.00013	0.00000	0.00000	0.00023	0.00000	0.00000		0.00862	0.00023	0.00000		0.00059
	HYPGUT	0.00833	0.00000	0.00019	0.00003	0.00009	0.00000	0.00041		0.00833	0.00009	0.00041		0.00077
	LEPARM	0.00862	0.00040	0.00019	0.00000	0.00000	0.00000	0.00000		0.00862	0.00000	0.00000		0.00052
	UROHAL	0.00000	0.00000	0.00023	0.00262	0.00362	0.00000	0.00338		0.00023	0.00362	0.00338		0.00324
	SERPOL	0.00000	0.00000	0.00000	0.00473	0.00000	0.00248	0.00003		0.00000	0.00473	0.00248		0.00305
	PARCLA	0.00000	0.00000	0.00000	0.00110	0.00635	0.00011	0.00003		0.00000	0.00635	0.00011		0.00216
	MICMIN	0.00000	0.00147	0.00261	0.00135	0.00274	0.00000	0.00000		0.00261	0.00274	0.00000		0.00106
	EMBJAC	0.00000	0.00080	0.00038	0.00363	0.00247	0.00006	0.00001		0.00080	0.00363	0.00006		0.00128
	PARNEB	0.00000	0.00000	0.00004	0.00101	0.00330	0.00006	0.00104		0.00004	0.00330	0.00104		0.00172
	PARMAC	0.00000	0.00000	0.00000	0.00369	0.00144	0.00039	0.00026		0.00000	0.00369	0.00039		0.00145
	XENCAL	0.00000	0.00000	0.00000	0.00132	0.00078	0.00011	0.00000		0.00000	0.00132	0.00011		0.00050
	XYSLIO	0.00000	0.00000	0.00000	0.00090	0.00000	0.00000	0.00021		0.00000	0.00090	0.00021		0.00042
	PLERIT	0.00000	0.00000	0.00008	0.00028	0.00023	0.00000	0.00068		0.00008	0.00028	0.00068		0.00050
	SYMATR	0.00000	0.00000	0.00000	0.00000	0.00026	0.00000	0.00054		0.00000	0.00026	0.00054		0.00041
	CHESAT	0.00000	0.00000	0.00000	0.00006	0.00049	0.00000	0.00025		0.00000	0.00049	0.00025		0.00031
	GIBELE	0.00000	0.00000	0.00004	0.00003	0.00069	0.00000	0.00000		0.00004	0.00069	0.00000		0.00023
	HYPROS	0.00000	0.00013	0.00064	0.00000	0.00000	0.00000	0.00000		0.00064	0.00000	0.00000		0.00004
	GIBMON	0.00000	0.00000	0.00000	0.00000	0.00052	0.00000	0.00000		0.00000	0.00052	0.00000		0.00017
	TRASYM	0.00000	0.00000	0.00000	0.00051	0.00000	0.00000	0.00000		0.00000	0.00051	0.00000		0.00017
	SYNCAL	0.00000	0.00000	0.00015	0.00003	0.00034	0.00000	0.00001		0.00015	0.00034	0.00001		0.00013
	HALSEM	0.00000	0.00000	0.00000	0.00008	0.00046	0.00000	0.00003		0.00000	0.00046	0.00003		0.00017
	OXYCAL	0.00000	0.00000	0.00000	0.00048	0.00014	0.00000	0.00001		0.00000	0.00048	0.00001		0.00017
	SPHARG	0.00000	0.00000	0.00008	0.00031	0.00000	0.00006	0.00000		0.00008	0.00031	0.00006		0.00014
	SYNLUC	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00036		0.00000	0.00006	0.00036		0.00024
	UMBRON	0.00000	0.00000	0.00000	0.00017	0.00000	0.00000	0.00025		0.00000	0.00017	0.00025		0.00020
	GIRNIG	0.00000	0.00027	0.00000	0.00011	0.00000	0.00000	0.00000		0.00027	0.00011	0.00000		0.00005
	GENLIN	0.00000	0.00000	0.00000	0.00031	0.00000	0.00000	0.00001		0.00000	0.00031	0.00001		0.00011
	SCOGUT	0.00000	0.00000	0.00000	0.00006	0.00009	0.00000	0.00022		0.00000	0.00009	0.00022		0.00016
	ALBVUL	0.00000	0.00027	0.00030	0.00000	0.00000	0.00000	0.00000		0.00030	0.00000	0.00000		0.00002
	SCOJAP	0.00000	0.00000	0.00000	0.00028	0.00000	0.00000	0.00001		0.00000	0.00028	0.00001		0.00010
	MUGCEP	0.00000	0.00013	0.00027	0.00000	0.00000	0.00000	0.00000		0.00027	0.00000	0.00000		0.00002
	PORMYR	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00017		0.00000	0.00006	0.00017		0.00012
	CYNPAR	0.00000	0.00000	0.00000	0.00003	0.00000	0.00017	0.00001		0.00000	0.00003	0.00017		0.00011
	MYLCAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00019		0.00000	0.00000	0.00019		0.00011
	STREXI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00017	0.00000		0.00000	0.00000	0.00017		0.00010
	ANIDAV	0.00000	0.00000	0.00000	0.00003	0.00014	0.00000	0.00000		0.00000	0.00014	0.00000		0.00005
	ANCCOM	0.00000	0.00013	0.00000	0.00000	0.00000	0.00000	0.00000		0.00013	0.00000	0.00000		0.00001
	ATRNOB	0.00000	0.00000	0.00000	0.00006	0.00000	0.00006	0.00000		0.00000	0.00006	0.00006		0.00005
	CITSTI	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00001		0.00000	0.00006	0.00001		0.00002
	SYNEXI	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000		0.00000	0.00006	0.00000		0.00002
	PSEGRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000		0.00000	0.00000	0.00006		0.00003
	PLECOE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004		0.00000	0.00000	0.00004		0.00002
	MEDCAL	0.00000	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000		0.00004	0.00000	0.00000		0.00000
	PHAFUR	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00001		0.00000	0.00003	0.00001		0.00001
	MUSHEN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003		0.00000	0.00000	0.00003		0.00002
	PARINT	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	PARVET	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	RIMMUS	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	ZAPEXA	0.00000	0.00000	0.00000	0.00003	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	RHIPRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003		0.00000	0.00000	0.00003		0.00002
	GYMMAR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00001
	MUSCAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	PORNOT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	RONSTE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
STA 1 TOTAL		2.28563	2.56944	0.33734	4.24469	0.11096	0.68255	0.01157		3.11586	4.32221	0.69212		2.02855

Appendix Table 13. Best estimates of numerical densities for all fish species are for each depth strata at each station (Ecoregion) in San Diego Bay.

STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN
2	ATHAFF	1.62701	3.66190	0.40792	0.31216	0.00080	0.06250	0.00000		3.66190	0.31216	0.06250		0.33734
	ENGMOR	0.00000	0.05783	0.02178	2.33874	0.00003	0.27275	0.00000		0.05783	2.33874	0.27275		1.04708
	ATHCAL	0.03333	0.95526	0.00390	0.00042	0.00000	0.00073	0.00000		0.95526	0.00042	0.00073		0.04834
	ANCDEL	0.00000	0.07198	0.08633	0.60622	0.00003	0.06605	0.00001		0.08633	0.60622	0.06605		0.27233
	QUIYCA	0.74397	0.00614	0.00008	0.00000	0.00167	0.00000	0.00000		0.74397	0.00167	0.00000		0.03783
	CLEIOS	0.62471	0.01963	0.00019	0.00000	0.00736	0.00000	0.00000		0.62471	0.00736	0.00000		0.03403
	ILYGIL	0.23362	0.06944	0.00011	0.00000	0.00089	0.00000	0.00000		0.23362	0.00089	0.00000		0.01202
	SYNLEP	0.08333	0.00387	0.00220	0.00028	0.03695	0.00006	0.00000		0.08333	0.03695	0.00006		0.01824
	SYNAUL	0.08563	0.00461	0.00367	0.00000	0.01822	0.00000	0.00000		0.08563	0.01822	0.00000		0.01120
	CYMAGG	0.00000	0.00000	0.00292	0.09848	0.00503	0.00062	0.00000		0.00292	0.09848	0.00062		0.03792
	FUNPAR	0.05833	0.00200	0.00027	0.00000	0.00000	0.00000	0.00000		0.05833	0.00000	0.00000		0.00292
	HETROS	0.00862	0.00040	0.00617	0.00805	0.04379	0.00068	0.00000		0.00862	0.04379	0.00068		0.01746
	SARSAG	0.00000	0.00027	0.00004	0.03891	0.00000	0.00175	0.00001		0.00027	0.03891	0.00175		0.01579
	LEUTEN	0.00000	0.00000	0.00000	0.02157	0.00000	0.00006	0.00000		0.00000	0.02157	0.00006		0.00823
	PARCAL	0.01667	0.00013	0.00011	0.00006	0.00040	0.00000	0.00123		0.01667	0.00040	0.00123		0.00169
	HYPGUT	0.01724	0.00080	0.00027	0.00011	0.00011	0.00000	0.00033		0.01724	0.00011	0.00033		0.00109
	UROHAL	0.00000	0.00000	0.00470	0.00201	0.00345	0.00045	0.00506		0.00470	0.00345	0.00506		0.00443
	PARNEB	0.00000	0.00000	0.00076	0.00355	0.00859	0.00023	0.00334		0.00076	0.00859	0.00334		0.00521
	HYPGEN	0.00862	0.00000	0.00008	0.00008	0.00315	0.00000	0.00002		0.00862	0.00315	0.00002		0.00164
	PARMAC	0.00000	0.00000	0.00008	0.00963	0.00362	0.00191	0.00043		0.00008	0.00963	0.00191		0.00475
	LEPARM	0.00862	0.00073	0.00011	0.00000	0.00003	0.00000	0.00000		0.00862	0.00003	0.00000		0.00044
	ANCCOM	0.00000	0.00000	0.00011	0.00588	0.00000	0.00000	0.00000		0.00011	0.00588	0.00000		0.00224
	ALBVUL	0.00000	0.00481	0.00223	0.00000	0.00000	0.00113	0.00000		0.00481	0.00000	0.00113		0.00088
	XENCAL	0.00000	0.00000	0.00000	0.00282	0.00046	0.00000	0.00000		0.00000	0.00282	0.00000		0.00107
	SCOJAP	0.00000	0.00000	0.00000	0.00273	0.00000	0.00000	0.00000		0.00000	0.00273	0.00000		0.00104
	SPHARG	0.00000	0.00000	0.00000	0.00121	0.00000	0.00000	0.00000		0.00000	0.00121	0.00000		0.00046
	STREXI	0.00000	0.00013	0.00034	0.00037	0.00000	0.00000	0.00000		0.00034	0.00037	0.00000		0.00016
	GIBMON	0.00000	0.00000	0.00000	0.00000	0.00063	0.00000	0.00000		0.00000	0.00063	0.00000		0.00024
	PLERIT	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00057		0.00000	0.00006	0.00057		0.00034
	HYPROS	0.00000	0.00000	0.00057	0.00000	0.00000	0.00000	0.00000		0.00057	0.00000	0.00000		0.00003
	CHESAT	0.00000	0.00000	0.00000	0.00023	0.00037	0.00000	0.00012		0.00000	0.00037	0.00012		0.00021
	PARCLA	0.00000	0.00000	0.00000	0.00023	0.00040	0.00000	0.00001		0.00000	0.00040	0.00001		0.00016
	SERPOL	0.00000	0.00000	0.00019	0.00020	0.00000	0.00000	0.00000		0.00019	0.00020	0.00000		0.00008
	GIBELE	0.00000	0.00000	0.00000	0.00000	0.00037	0.00000	0.00000		0.00000	0.00037	0.00000		0.00014
	CYNPAR	0.00000	0.00013	0.00000	0.00017	0.00000	0.00006	0.00000		0.00013	0.00017	0.00006		0.00010
	SYNCAL	0.00000	0.00013	0.00000	0.00000	0.00017	0.00000	0.00001		0.00013	0.00017	0.00001		0.00008
	SYNEXI	0.00000	0.00000	0.00019	0.00000	0.00006	0.00000	0.00000		0.00019	0.00006	0.00000		0.00003
	HIPING	0.00000	0.00000	0.00000	0.00003	0.00009	0.00011	0.00001		0.00000	0.00009	0.00011		0.00010
	UMBRON	0.00000	0.00000	0.00011	0.00000	0.00000	0.00006	0.00000		0.00011	0.00000	0.00006		0.00004
	EMBJAC	0.00000	0.00000	0.00000	0.00017	0.00006	0.00000	0.00000		0.00000	0.00017	0.00000		0.00006
	MICMIN	0.00000	0.00000	0.00004	0.00006	0.00000	0.00000	0.00000		0.00004	0.00006	0.00000		0.00002
	SCOGUT	0.00000	0.00000	0.00000	0.00006	0.00003	0.00000	0.00003		0.00000	0.00006	0.00003		0.00004
	BRYARC	0.00000	0.00000	0.00000	0.00000	0.00009	0.00000	0.00000		0.00000	0.00009	0.00000		0.00003
	PARINT	0.00000	0.00000	0.00000	0.00000	0.00009	0.00000	0.00000		0.00000	0.00009	0.00000		0.00003
	SYMATR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00008		0.00000	0.00000	0.00008		0.00004
	ACAFLA	0.00000	0.00000	0.00008	0.00000	0.00000	0.00000	0.00000		0.00008	0.00000	0.00000		0.00000
	XYSLIO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006		0.00000	0.00000	0.00006		0.00004
	PORMYR	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00003		0.00000	0.00003	0.00003		0.00003
	MENUND	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000		0.00000	0.00006	0.00000		0.00002
	SYNLUC	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00002		0.00000	0.00003	0.00002		0.00002
	MUGCEP	0.00000	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000		0.00004	0.00000	0.00000		0.00000
	GIBMET	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	ATRNOB	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	MUSCAL	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000		0.00000	0.00003	0.00000		0.00001
	PLEVER	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003		0.00000	0.00000	0.00003		0.00002
	HETFRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
STA 2 TOTAL		**3.54971**	**4.86022**	**0.54557**	**3.45454**	**0.13705**	**0.40912**	**0.01140**		**6.66614**	**3.56691**	**0.41939**		**1.92779**

Appendix Table 13. Best estimates of numerical densities for all fish species are for each depth strata at each station (Ecoregion) in San Diego Bay.

STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN
3	ATHAFF	1.05000	0.55556	0.20682	0.07610	0.00009	0.01712	0.00006		1.05000	0.07610	0.01712		0.08408
	ANCDEL	0.00000	0.00000	0.07314	0.70113	0.00009	0.28288	0.00008		0.07314	0.70113	0.28288		0.53172
	ILYGIL	0.31667	0.00134	0.00000	0.00003	0.00029	0.00000	0.00008		0.31667	0.00029	0.00008		0.00971
	CLEIOS	0.30833	0.00441	0.00015	0.00000	0.00034	0.00000	0.00001		0.30833	0.00034	0.00001		0.00946
	QUIYCA	0.11500	0.00187	0.00038	0.00003	0.00132	0.00000	0.00000		0.11500	0.00132	0.00000		0.00426
	ENGMOR	0.00000	0.00000	0.00045	0.09947	0.00000	0.00062	0.00000		0.00045	0.09947	0.00062		0.06091
	ATHCAL	0.00000	0.08427	0.00068	0.00023	0.00000	0.00034	0.00001		0.08427	0.00023	0.00034		0.00279
	CYMAGG	0.00000	0.00080	0.00598	0.06976	0.01583	0.00000	0.00001		0.00598	0.06976	0.00001		0.04274
	SYNLEP	0.04667	0.01175	0.00352	0.00042	0.02405	0.00011	0.00000		0.04667	0.02405	0.00011		0.01611
	SYNAUL	0.02667	0.01416	0.00242	0.00028	0.01193	0.00000	0.00000		0.02667	0.01193	0.00000		0.00807
	PARCAL	0.02500	0.00000	0.00023	0.00020	0.00124	0.00006	0.00073		0.02500	0.00124	0.00073		0.00177
	LEUTEN	0.00000	0.00000	0.01364	0.00676	0.00000	0.00000	0.00000		0.01364	0.00676	0.00000		0.00453
	HETROS	0.00000	0.00147	0.00492	0.00681	0.01397	0.00017	0.00001		0.00492	0.01397	0.00017		0.00873
	SARSAG	0.00000	0.00000	0.00000	0.01002	0.00000	0.00231	0.00001		0.00000	0.01002	0.00231		0.00694
	UROHAL	0.00000	0.00000	0.00038	0.00296	0.00698	0.00039	0.00243		0.00038	0.00698	0.00243		0.00514
	HYPROS	0.00000	0.00067	0.00659	0.00045	0.00020	0.00006	0.00000		0.00659	0.00045	0.00006		0.00049
	PARMAC	0.00000	0.00000	0.00004	0.00455	0.00264	0.00107	0.00039		0.00004	0.00455	0.00107		0.00316
	PARNEB	0.00000	0.00013	0.00080	0.00101	0.00230	0.00006	0.00139		0.00080	0.00230	0.00139		0.00193
	SCOJAP	0.00000	0.00000	0.00000	0.00003	0.00000	0.00107	0.00000		0.00000	0.00003	0.00107		0.00040
	HYPGUT	0.00000	0.00040	0.00004	0.00008	0.00020	0.00000	0.00020		0.00040	0.00020	0.00020		0.00021
	FUNPAR	0.00000	0.00067	0.00019	0.00000	0.00000	0.00000	0.00000		0.00067	0.00000	0.00000		0.00002
	ANCCOM	0.00000	0.00000	0.00004	0.00056	0.00000	0.00000	0.00000		0.00004	0.00056	0.00000		0.00034
	CHESAT	0.00000	0.00000	0.00000	0.00048	0.00006	0.00000	0.00008		0.00000	0.00048	0.00008		0.00032
	STREXI	0.00000	0.00027	0.00008	0.00008	0.00000	0.00011	0.00000		0.00027	0.00008	0.00011		0.00010
	XENCAL	0.00000	0.00000	0.00004	0.00042	0.00023	0.00000	0.00000		0.00004	0.00042	0.00000		0.00026
	LEPARM	0.00000	0.00040	0.00027	0.00000	0.00000	0.00000	0.00001		0.00040	0.00000	0.00001		0.00001
	UMBRON	0.00000	0.00000	0.00004	0.00017	0.00000	0.00000	0.00019		0.00004	0.00017	0.00019		0.00017
	SYNCAL	0.00000	0.00000	0.00000	0.00003	0.00037	0.00000	0.00000		0.00000	0.00037	0.00000		0.00023
	HYPGEN	0.00000	0.00000	0.00008	0.00000	0.00020	0.00000	0.00000		0.00008	0.00020	0.00000		0.00012
	SYNEXI	0.00000	0.00000	0.00000	0.00000	0.00023	0.00000	0.00000		0.00000	0.00023	0.00000		0.00014
	ACAFLA	0.00000	0.00000	0.00008	0.00014	0.00000	0.00000	0.00000		0.00008	0.00014	0.00000		0.00009
	ALBVUL	0.00000	0.00000	0.00015	0.00000	0.00000	0.00000	0.00000		0.00015	0.00000	0.00000		0.00000
	PORMYR	0.00000	0.00000	0.00000	0.00003	0.00011	0.00000	0.00003		0.00000	0.00011	0.00003		0.00008
	MUGCEP	0.00000	0.00013	0.00000	0.00000	0.00000	0.00000	0.00000		0.00013	0.00000	0.00000		0.00000
	PARCLA	0.00000	0.00000	0.00004	0.00008	0.00000	0.00000	0.00000		0.00004	0.00008	0.00000		0.00005
	GIBMON	0.00000	0.00000	0.00004	0.00000	0.00003	0.00000	0.00000		0.00004	0.00003	0.00000		0.00002
	PARINT	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000		0.00000	0.00006	0.00000		0.00004
	PLERIT	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00003		0.00000	0.00003	0.00003		0.00003
	CYNPAR	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000		0.00000	0.00006	0.00000		0.00003
	MICMIN	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000		0.00000	0.00006	0.00000		0.00003
	MUSCAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000		0.00000	0.00000	0.00006		0.00002
	TRITRI	0.00000	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000		0.00004	0.00000	0.00000		0.00000
	MYLCAL	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00001		0.00000	0.00003	0.00001		0.00002
	GIBELE	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00002
	ANIDAV	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000		0.00000	0.00003	0.00000		0.00002
	MUSHEN	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000		0.00000	0.00003	0.00000		0.00002
	HIPING	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003		0.00000	0.00000	0.00003		0.00001
	RHIPRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	SYNLUC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	SCOGUT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
STA 3 TOTAL		**1.88833**	**0.67829**	**0.32125**	**0.98250**	**0.08282**	**0.30642**	**0.00580**		**2.08095**	**1.03430**	**0.31117**		**0.80537**

Appendix Table 13. Best estimates of numerical densities for all fish species are for each depth strata at each station (Ecoregion) in San Diego Bay.

STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN
4	ANCDEL	0.00000	0.01563	0.10617	0.84976	0.00457	0.06610	0.00461		0.10617	0.84976	0.06610		0.72664
	CLEIOS	4.60556	0.09148	0.00417	0.00003	0.00989	0.00000	0.00000		4.60556	0.00989	0.00000		0.19253
	ATHAFF	0.08241	0.25248	0.11928	0.06968	0.00003	0.00946	0.00000		0.25248	0.06968	0.00946		0.06986
	QUIYCA	0.99630	0.00748	0.00117	0.00006	0.00336	0.00000	0.00001		0.99630	0.00336	0.00001		0.04268
	ENGMOR	0.00000	0.00000	0.00159	0.02652	0.00009	0.00495	0.00120		0.00159	0.02652	0.00495		0.02298
	SYNAUL	0.00833	0.00067	0.00023	0.00037	0.02557	0.00000	0.00001		0.00833	0.02557	0.00001		0.02182
	CYMAGG	0.00000	0.00000	0.00000	0.02086	0.00891	0.00000	0.00000		0.00000	0.02086	0.00000		0.01752
	UROHAL	0.00000	0.00000	0.00019	0.00477	0.01510	0.00006	0.00447		0.00019	0.01510	0.00447		0.01327
	ILYGIL	0.26296	0.00681	0.00193	0.00003	0.00161	0.00000	0.00001		0.26296	0.00161	0.00001		0.01187
	ATHCAL	0.00000	0.00307	0.00223	0.00854	0.00003	0.00051	0.00000		0.00307	0.00854	0.00051		0.00736
	SYNLEP	0.00000	0.00093	0.00011	0.00020	0.00787	0.00000	0.00001		0.00093	0.00787	0.00001		0.00665
	PARMAC	0.00000	0.00000	0.00004	0.00414	0.00193	0.00023	0.00088		0.00004	0.00414	0.00088		0.00359
	ANCCOM	0.00000	0.00000	0.00008	0.00270	0.00083	0.00000	0.00000		0.00008	0.00270	0.00000		0.00227
	HETROS	0.00000	0.00000	0.00000	0.00256	0.00112	0.00006	0.00000		0.00000	0.00256	0.00006		0.00216
	SARSAG	0.00000	0.00000	0.00000	0.00197	0.00000	0.00000	0.00003		0.00000	0.00197	0.00003		0.00166
	HYPROS	0.00000	0.00040	0.00439	0.00101	0.00000	0.00107	0.00000		0.00439	0.00101	0.00107		0.00117
	FUNPAR	0.00833	0.02764	0.01470	0.00000	0.00006	0.00000	0.00000		0.02764	0.00006	0.00000		0.00115
	MUGCEP	0.00000	0.01656	0.01443	0.00011	0.00000	0.00006	0.00000		0.01656	0.00011	0.00006		0.00076
	PARNEB	0.00000	0.00000	0.00000	0.00065	0.00009	0.00028	0.00144		0.00000	0.00065	0.00144		0.00073
	PARCAL	0.00000	0.00000	0.00000	0.00034	0.00063	0.00000	0.00149		0.00000	0.00063	0.00149		0.00072
	MYLCAL	0.00000	0.00000	0.00000	0.00068	0.00000	0.00023	0.00000		0.00000	0.00068	0.00023		0.00060
	ALBVUL	0.00926	0.00254	0.00072	0.00020	0.00000	0.00000	0.00000		0.00926	0.00020	0.00000		0.00054
	ACAFLA	0.00833	0.00027	0.00053	0.00023	0.00000	0.00000	0.00000		0.00833	0.00023	0.00000		0.00052
	HYPGUT	0.00000	0.00013	0.00027	0.00011	0.00040	0.00000	0.00033		0.00027	0.00040	0.00033		0.00039
	UMBRON	0.00000	0.00000	0.00000	0.00034	0.00000	0.00028	0.00007		0.00000	0.00034	0.00028		0.00032
	GILMIR	0.00000	0.00053	0.00019	0.00000	0.00029	0.00000	0.00000		0.00053	0.00029	0.00000		0.00026
	CYNPAR	0.00000	0.00040	0.00008	0.00025	0.00000	0.00000	0.00000		0.00040	0.00025	0.00000		0.00023
	SYNEXI	0.00000	0.00000	0.00000	0.00000	0.00023	0.00000	0.00000		0.00000	0.00023	0.00000		0.00019
	STREXI	0.00000	0.00000	0.00004	0.00017	0.00000	0.00000	0.00000		0.00004	0.00017	0.00000		0.00014
	GIBELE	0.00000	0.00000	0.00000	0.00000	0.00011	0.00000	0.00000		0.00000	0.00011	0.00000		0.00010
	PORMYR	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00024		0.00000	0.00006	0.00024		0.00008
	MUSCAL	0.00000	0.00000	0.00011	0.00008	0.00000	0.00000	0.00002		0.00011	0.00008	0.00002		0.00008
	CHESAT	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00036		0.00000	0.00003	0.00036		0.00007
	GYMMAR	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000		0.00000	0.00006	0.00000		0.00005
	SYNCAL	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000		0.00000	0.00006	0.00000		0.00005
	XENCAL	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000		0.00000	0.00006	0.00000		0.00005
	SYNLUC	0.00000	0.00000	0.00000	0.00000	0.00003	0.00006	0.00003		0.00000	0.00003	0.00006		0.00003
	HIPING	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00001		0.00000	0.00003	0.00001		0.00002
	PARCLA	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00001		0.00000	0.00003	0.00001		0.00002
	BRYARC	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00002
	HYPGEN	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000		0.00000	0.00003	0.00000		0.00002
	MENUND	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000		0.00000	0.00003	0.00000		0.00002
	DORPET	0.00000	0.00000	0.00000	0.00000	0.00000	0.00017	0.00000		0.00000	0.00000	0.00017		0.00002
	PLERIT	0.00000	0.00000	0.00011	0.00000	0.00000	0.00000	0.00003		0.00011	0.00000	0.00003		0.00001
	LEPARM	0.00000	0.00013	0.00011	0.00000	0.00000	0.00000	0.00000		0.00013	0.00000	0.00000		0.00001
	RONSTE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003		0.00000	0.00000	0.00003		0.00000
	ATRNOB	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	PORNOT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	SCOGUT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
	XYSLIO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001		0.00000	0.00000	0.00001		0.00000
STA 4 TOTAL		**5.98148**	**0.42716**	**0.27288**	**0.99669**	**0.08280**	**0.08350**	**0.01534**		**6.30549**	**1.05601**	**0.09236**		**1.15127**

Appendix Table 14. Best estimates of biomass densities and standing stocks for all fish species for each depth strata within each station (Ecoregion) of San Diego Bay.

				MEAN DENSITY (g/m²)					BEST ESTIMATE OF DENSITY					
					GEAR					STRATA		WTD	STAND.	
STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT	I	N	C	MEAN	STOCK (kg)	mt
1	ENGMOR	0.00000	0.00000	0.00086	3.71428	0.00000	0.39093	0.00021	0.00086	3.71428	0.39093	1.46032	14,340	14.3
	ATHAFF	0.61516	0.23727	0.65067	2.17069	0.00064	0.45515	0.00000	0.65067	2.17069	0.45515	1.02846	10,099	10.1
	SARSAG	0.00000	0.00000	0.03771	0.84824	0.00000	0.87413	0.00000	0.03771	0.84824	0.87413	0.80666	7,921	7.9
	UROHAL	0.00000	0.00000	0.03822	0.67383	0.84003	0.00000	0.83831	0.03822	0.84003	0.83831	0.78249	7,684	7.7
	MYLCAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.21177	0.00000	0.00000	1.21177	0.72706	7,140	7.1
	PARMAC	0.00000	0.00000	0.00000	1.02517	0.43024	0.16351	0.07822	0.00000	1.02517	0.16351	0.43642	4,286	4.3
	ATHCAL	0.00336	0.00087	0.02118	0.33634	0.00000	0.65292	0.00000	0.02118	0.33634	0.65292	0.50401	4,949	4.9
	CYMAGG	0.17241	0.00000	0.02210	0.67171	0.05886	0.00000	0.00076	0.17241	0.67171	0.00076	0.23246	2,283	2.3
	LEUTEN	0.00000	0.00000	0.01345	0.41277	0.00000	0.01284	0.00000	0.01345	0.41277	0.01284	0.14473	1,421	1.4
	PARCAL	0.04397	0.00401	0.01108	0.10560	0.14367	0.00000	0.19955	0.04397	0.14367	0.19955	0.16978	1,667	1.7
	HETROS	0.00000	0.01878	0.04418	0.08659	0.28079	0.00413	0.00000	0.04418	0.28079	0.00413	0.09779	960	1.0
	ANCDEL	0.00000	0.00000	0.00128	0.26229	0.00000	0.05488	0.00048	0.00128	0.26229	0.05488	0.11956	1,174	1.2
	EMBJAC	0.00000	0.00461	0.01253	0.28863	0.07893	0.00319	0.00302	0.01253	0.28863	0.00319	0.09791	961	1.0
	CYNPAR	0.00000	0.00000	0.00000	0.03066	0.00000	0.19707	0.00062	0.00000	0.03066	0.19707	0.12836	1,261	1.3
	PARNEB	0.00000	0.00000	0.00003	0.05791	0.03129	0.00256	0.16541	0.00003	0.05791	0.16541	0.11836	1,162	1.2
	SERPOL	0.00000	0.00000	0.00000	0.16173	0.00000	0.00807	0.00230	0.00000	0.16173	0.00807	0.05821	572	0.6
	TRASYM	0.00000	0.00000	0.00000	0.11529	0.00000	0.00000	0.00000	0.00000	0.11529	0.00000	0.03804	374	0.4
	SCOJAP	0.00000	0.00000	0.00000	0.11148	0.00000	0.00000	0.00116	0.00000	0.11148	0.00116	0.03748	368	0.4
	SPHARG	0.00000	0.00000	0.00003	0.00867	0.00000	0.09572	0.00000	0.00003	0.00867	0.09572	0.06030	592	0.6
	HYPGUT	0.00083	0.00000	0.00314	0.00845	0.00902	0.00000	0.08897	0.00314	0.00902	0.08897	0.05655	555	0.6
	UMBRON	0.00000	0.00000	0.00000	0.04927	0.00000	0.00000	0.02713	0.00000	0.04927	0.02713	0.03253	319	0.3
	RHIPRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06999	0.00000	0.00000	0.06999	0.04200	412	0.4
	PLERIT	0.00000	0.00000	0.00012	0.00586	0.01227	0.00000	0.04959	0.00012	0.01227	0.04959	0.03381	332	0.3
	MICMIN	0.00000	0.00811	0.01233	0.04844	0.02483	0.00000	0.00000	0.01233	0.04844	0.00000	0.01673	164	0.2
	GYMMAR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.05328	0.00000	0.00000	0.05328	0.03197	314	0.3
	GIRNIG	0.00000	0.00275	0.00000	0.04997	0.00000	0.00000	0.00000	0.00275	0.04997	0.00000	0.01666	164	0.2
	SCOGUT	0.00000	0.00000	0.00000	0.00208	0.00299	0.00000	0.04290	0.00000	0.00299	0.04290	0.02673	262	0.3
	CHESAT	0.00000	0.00000	0.00000	0.00018	0.00271	0.00000	0.03746	0.00000	0.00271	0.03746	0.02337	229	0.2
	XYSLIO	0.00000	0.00000	0.00000	0.00056	0.00000	0.00000	0.03209	0.00000	0.00056	0.03209	0.01944	191	0.2
	PARCLA	0.00000	0.00000	0.00000	0.02938	0.02994	0.00248	0.00124	0.00000	0.02994	0.00248	0.01137	112	0.1
	ATRNOB	0.00000	0.00000	0.00000	0.01877	0.00000	0.01363	0.00000	0.00000	0.01877	0.01363	0.01437	141	0.1
	MUSHEN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.03128	0.00000	0.00000	0.03128	0.01877	184	0.2
	ZAPEXA	0.00000	0.00000	0.00000	0.00209	0.02854	0.00000	0.00000	0.00000	0.02854	0.00000	0.00942	92	0.1
	STREXI	0.00000	0.00000	0.00000	0.00000	0.00000	0.02718	0.00000	0.00000	0.00000	0.02718	0.01631	160	0.2
	LEPARM	0.02414	0.00341	0.00342	0.00000	0.00000	0.00000	0.00000	0.02414	0.00000	0.00000	0.00145	14	0.0
	ILYGIL	0.02046	0.00013	0.00000	0.00000	0.00301	0.00000	0.00005	0.02046	0.00301	0.00005	0.00225	22	0.0
	HYPGEN	0.00167	0.00000	0.00013	0.00546	0.01992	0.00000	0.00014	0.00167	0.01992	0.00014	0.00676	66	0.1
	SYNAUL	0.01417	0.00107	0.00063	0.00135	0.00680	0.00008	0.00000	0.01417	0.00680	0.00008	0.00315	31	0.0
	OXYCAL	0.00000	0.00000	0.00000	0.01758	0.00117	0.00000	0.00001	0.00000	0.01758	0.00001	0.00581	57	0.1
	SYNLEP	0.00000	0.00422	0.00158	0.00027	0.01223	0.00018	0.00000	0.00422	0.01223	0.00018	0.00440	43	0.0
	PHAFUR	0.00000	0.00000	0.00000	0.01363	0.00000	0.00000	0.00083	0.00000	0.01363	0.00083	0.00500	49	0.0
	PORMYR	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.01406	0.00000	0.00001	0.01406	0.00844	83	0.1
	SYMATR	0.00000	0.00000	0.00000	0.00000	0.00044	0.00000	0.01352	0.00000	0.00044	0.01352	0.00826	81	0.1
	SYNLUC	0.00000	0.00000	0.00000	0.00000	0.00005	0.00000	0.01015	0.00000	0.00005	0.01015	0.00610	60	0.1
	CLEIOS	0.00778	0.00001	0.00000	0.00000	0.00007	0.00000	0.00003	0.00778	0.00007	0.00003	0.00051	5	0.0
	HALSEM	0.00000	0.00000	0.00000	0.00274	0.00324	0.00000	0.00367	0.00000	0.00324	0.00367	0.00327	32	0.0
	GENLIN	0.00000	0.00000	0.00000	0.00356	0.00000	0.00000	0.00334	0.00000	0.00356	0.00334	0.00318	31	0.0
	PLECOE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00598	0.00000	0.00000	0.00598	0.00359	35	0.0
	PSEGRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00563	0.00000	0.00000	0.00000	0.00563	0.00338	33	0.0
	QUIYCA	0.00506	0.00001	0.00000	0.00032	0.00018	0.00000	0.00000	0.00506	0.00032	0.00000	0.00041	4	0.0
	ALBVUL	0.00000	0.00007	0.00502	0.00000	0.00000	0.00000	0.00000	0.00502	0.00000	0.00000	0.00030	3	0.0
	GIBELE	0.00000	0.00000	0.00010	0.00000	0.00336	0.00000	0.00000	0.00010	0.00336	0.00000	0.00112	11	0.0
	BRYARC	0.00259	0.00001	0.00000	0.00000	0.00003	0.00000	0.00000	0.00259	0.00003	0.00000	0.00017	2	0.0
	MUSCAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00232	0.00000	0.00000	0.00232	0.00139	14	0.0
	HYPROS	0.00000	0.00013	0.00194	0.00000	0.00000	0.00000	0.00000	0.00194	0.00000	0.00000	0.00012	1	0.0
	GIBMON	0.00000	0.00000	0.00000	0.00000	0.00131	0.00000	0.00000	0.00000	0.00131	0.00000	0.00043	4	0.0
	SYNCAL	0.00000	0.00000	0.00004	0.00010	0.00054	0.00000	0.00043	0.00004	0.00054	0.00043	0.00044	4	0.0
	XENCAL	0.00000	0.00000	0.00000	0.00074	0.00050	0.00003	0.00000	0.00000	0.00074	0.00003	0.00027	3	0.0
	RONSTE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00070	0.00000	0.00000	0.00070	0.00042	4	0.0
	ANIDAV	0.00000	0.00000	0.00000	0.00008	0.00044	0.00000	0.00000	0.00000	0.00044	0.00000	0.00014	1	0.0
	CITSTI	0.00000	0.00000	0.00000	0.00019	0.00000	0.00000	0.00021	0.00000	0.00019	0.00021	0.00019	2	0.0
	ANCCOM	0.00000	0.00032	0.00000	0.00000	0.00000	0.00000	0.00000	0.00032	0.00000	0.00000	0.00002	0	0.0
	HETFRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00032	0.00000	0.00000	0.00032	0.00019	2	0.0
	PARVET	0.00000	0.00000	0.00000	0.00000	0.00015	0.00000	0.00000	0.00000	0.00015	0.00000	0.00005	0	0.0
	SYNEXI	0.00000	0.00000	0.00000	0.00000	0.00014	0.00000	0.00000	0.00000	0.00014	0.00000	0.00005	0	0.0
	MUGCEP	0.00000	0.00001	0.00006	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000	0	0.0
	PORNOT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00006	0.00004	0	0.0
	PARINT	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000	0.00003	0.00000	0.00001	0	0.0
	MEDCAL	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0	0.0
STA 1 Total		0.91159	0.28578	0.88183	11.34296	2.02837	2.96431	2.99157	1.14242	11.82062	5.86722	7.48968	73,549	73.5

Appendix Table 14. Best estimates of biomass densities and standing stocks for all fish species for each depth strata within each station (Ecoregion) of San Diego Bay.

STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN	STOCK (kg)	mt
2	ENGMOR	0.00000	0.01904	0.03820	2.70162	0.00002	1.02890	0.00000		0.03820	2.70162	1.02890		1.61500	13,049	13.0
	PARMAC	0.00000	0.00000	0.00772	2.96502	0.58988	0.50228	0.11956		0.00772	2.96502	0.50228		1.41339	11,420	11.4
	ATHAFF	0.09733	0.45692	0.88330	1.17989	0.01356	0.50980	0.00000		0.88330	1.17989	0.50980		0.78311	6,328	6.3
	ANCDEL	0.00000	0.03424	0.10654	1.07709	0.00004	1.11716	0.00001		0.10654	1.07709	1.11716		1.05141	8,495	8.5
	UROHAL	0.00000	0.00000	0.03045	0.42278	0.56267	0.12467	0.89241		0.03045	0.56267	0.89241		0.72401	5,850	5.8
	CYMAGG	0.00000	0.00000	0.01636	0.75723	0.02087	0.00444	0.00000		0.01636	0.75723	0.00444		0.29110	2,352	2.4
	HYPGUT	0.33017	0.00598	0.00232	0.01952	0.01156	0.00000	0.07557		0.33017	0.01952	0.07557		0.06700	541	0.5
	PARNEB	0.00000	0.00000	0.00959	0.16921	0.11533	0.00699	0.17203		0.00959	0.16921	0.17203		0.16284	1,316	1.3
	HETROS	0.02500	0.00788	0.03064	0.06756	0.29544	0.00209	0.01669		0.03064	0.29544	0.01669		0.12331	996	1.0
	SCOJAP	0.00000	0.00000	0.00000	0.32109	0.00000	0.00000	0.00000		0.00000	0.32109	0.00000		0.12201	986	1.0
	LEUTEN	0.00000	0.00000	0.00000	0.30364	0.00000	0.00091	0.00000		0.00000	0.30364	0.00091		0.11590	936	0.9
	PARCAL	0.02250	0.00001	0.00227	0.00978	0.08439	0.00000	0.13168		0.02250	0.08439	0.13168		0.10825	875	0.9
	SARSAG	0.00000	0.00003	0.00018	0.09251	0.00000	0.11893	0.00099		0.00018	0.09251	0.11893		0.10295	832	0.8
	ATHCAL	0.00250	0.01082	0.00186	0.04834	0.00000	0.13304	0.00000		0.01082	0.04834	0.13304		0.09474	766	0.8
	CYNPAR	0.00000	0.00009	0.00000	0.13626	0.00000	0.00788	0.00000		0.00009	0.13626	0.00788		0.05628	455	0.5
	HYPGEN	0.04914	0.00000	0.00106	0.00170	0.03185	0.00000	0.00005		0.04914	0.03185	0.00005		0.01459	118	0.1
	MENUND	0.00000	0.00000	0.00000	0.07320	0.00000	0.00000	0.00000		0.00000	0.07320	0.00000		0.02782	225	0.2
	QUIYCA	0.07167	0.00135	0.00004	0.00000	0.00028	0.00000	0.00000		0.07167	0.00028	0.00000		0.00369	30	0.0
	XENCAL	0.00000	0.00000	0.00000	0.07042	0.00020	0.00000	0.00000		0.00000	0.07042	0.00000		0.02676	216	0.2
	PLERIT	0.00000	0.00000	0.00000	0.00000	0.00618	0.00000	0.05260		0.00000	0.00618	0.05260		0.03233	261	0.3
	STREXI	0.00000	0.00008	0.01150	0.04130	0.00000	0.00000	0.00000		0.01150	0.04130	0.00000		0.01627	131	0.1
	CLEIOS	0.04204	0.00097	0.00002	0.00000	0.00037	0.00000	0.00000		0.04204	0.00037	0.00000		0.00224	18	0.0
	SYNAUL	0.03072	0.00176	0.00151	0.00000	0.01003	0.00000	0.00000		0.03072	0.01003	0.00000		0.00535	43	0.0
	CHESAT	0.00000	0.00000	0.00000	0.00664	0.00253	0.00000	0.02894		0.00000	0.00664	0.02894		0.01902	154	0.2
	SYNLEP	0.01667	0.00077	0.00064	0.00014	0.01777	0.00007	0.00000		0.01667	0.01777	0.00007		0.00763	62	0.1
	XYSLIO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02879		0.00000	0.00000	0.02879		0.01641	133	0.1
	ALBVUL	0.00000	0.00064	0.02767	0.00000	0.00000	0.00051	0.00000		0.02767	0.00000	0.00051		0.00167	14	0.0
	MUSCAL	0.00000	0.00000	0.00000	0.02725	0.00000	0.00000	0.00000		0.00000	0.02725	0.00000		0.01036	84	0.1
	UMBRON	0.00000	0.00000	0.00375	0.00000	0.00000	0.02252	0.00000		0.00375	0.00000	0.02252		0.01303	105	0.1
	SPHARG	0.00000	0.00000	0.00000	0.02311	0.00000	0.00000	0.00000		0.00000	0.02311	0.00000		0.00878	71	0.1
	ILYGIL	0.02295	0.00370	0.00003	0.00000	0.00016	0.00000	0.00000		0.02295	0.00016	0.00000		0.00121	10	0.0
	ANCCOM	0.00000	0.00000	0.00207	0.01514	0.00000	0.00000	0.00000		0.00207	0.01514	0.00000		0.00585	47	0.0
	SCOGUT	0.00000	0.00000	0.00000	0.00806	0.00087	0.00000	0.00582		0.00000	0.00806	0.00582		0.00638	52	0.1
	EMBJAC	0.00000	0.00000	0.00000	0.00907	0.00062	0.00000	0.00000		0.00000	0.00907	0.00000		0.00345	28	0.0
	LEPARM	0.00259	0.00710	0.00107	0.00000	0.00106	0.00000	0.00000		0.00710	0.00106	0.00000		0.00076	6	0.0
	PARCLA	0.00000	0.00000	0.00000	0.00782	0.00580	0.00000	0.00011		0.00000	0.00782	0.00011		0.00304	25	0.0
	HIPING	0.00000	0.00000	0.00000	0.00085	0.00436	0.00341	0.00017		0.00000	0.00436	0.00341		0.00360	29	0.0
	ATRNOB	0.00000	0.00000	0.00000	0.00704	0.00000	0.00000	0.00000		0.00000	0.00704	0.00000		0.00267	22	0.0
	SERPOL	0.00000	0.00000	0.00094	0.00407	0.00000	0.00000	0.00000		0.00094	0.00407	0.00000		0.00159	13	0.0
	FUNPAR	0.00000	0.00166	0.00311	0.00000	0.00000	0.00000	0.00000		0.00311	0.00000	0.00000		0.00016	1	0.0
	PORMYR	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00264		0.00000	0.00003	0.00264		0.00152	12	0.0
	SYMATR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00261		0.00000	0.00000	0.00261		0.00149	12	0.0
	GIBMON	0.00000	0.00000	0.00000	0.00000	0.00236	0.00000	0.00000		0.00000	0.00236	0.00000		0.00090	7	0.0
	GIBELE	0.00000	0.00000	0.00000	0.00000	0.00194	0.00000	0.00000		0.00000	0.00194	0.00000		0.00074	6	0.0
	HYPROS	0.00000	0.00000	0.00111	0.00000	0.00000	0.00000	0.00000		0.00111	0.00000	0.00000		0.00006	0	0.0
	MICMIN	0.00000	0.00000	0.00002	0.00105	0.00000	0.00000	0.00000		0.00002	0.00105	0.00000		0.00040	3	0.0
	BRYARC	0.00000	0.00000	0.00000	0.00000	0.00083	0.00000	0.00000		0.00000	0.00083	0.00000		0.00032	3	0.0
	ACAFLA	0.00000	0.00000	0.00081	0.00000	0.00000	0.00000	0.00000		0.00081	0.00000	0.00000		0.00004	0	0.0
	SYNCAL	0.00000	0.00012	0.00000	0.00000	0.00020	0.00000	0.00021		0.00012	0.00020	0.00021		0.00020	2	0.0
	SYNLUC	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00037		0.00000	0.00001	0.00037		0.00021	2	0.0
	SYNEXI	0.00000	0.00000	0.00019	0.00000	0.00007	0.00000	0.00000		0.00019	0.00007	0.00000		0.00004	0	0.0
	PARINT	0.00000	0.00000	0.00000	0.00000	0.00004	0.00000	0.00000		0.00000	0.00004	0.00000		0.00001	0	0.0
	GIBMET	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000		0.00000	0.00001	0.00000		0.00000	0	0.0
	MUGCEP	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000		0.00001	0.00000	0.00000		0.00000	0	0.0
STA 2 Total		0.71326	0.55318	1.18497	10.56842	1.78130	3.58361	1.53126		1.77813	11.08563	4.86038		7.07186	57,141	57.1

Appendix Table 14. Best estimates of biomass densities and standing stocks for all fish species for each depth strata within each station (Ecoregion) of San Diego Bay.

STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT	I	N	C	MEAN	STOCK (kg)	mt
3	ANCDEL	0.00000	0.00000	0.08095	1.48046	0.00008	0.61304	0.00053	0.08095	1.48046	0.61304	1.12620	22,580	22.6
	UROHAL	0.00000	0.00000	0.07606	0.58994	1.33665	0.08157	0.35914	0.07606	1.33665	0.35914	0.94693	18,986	19.0
	PARMAC	0.00000	0.00000	0.00917	1.40603	0.43353	0.31030	0.11187	0.00917	1.40603	0.31030	0.96966	19,442	19.4
	ATHAFF	0.04200	0.08824	0.53313	0.32131	0.00086	0.17197	0.00060	0.53313	0.32131	0.17197	0.27390	5,492	5.5
	MYLCAL	0.00000	0.00000	0.00000	0.49268	0.00000	0.00000	0.00000	0.00000	0.49268	0.00000	0.30053	6,026	6.0
	CYMAGG	0.00000	0.00128	0.01931	0.42104	0.05806	0.00000	0.00021	0.01931	0.42104	0.00021	0.25749	5,163	5.2
	LEUTEN	0.00000	0.00000	0.22245	0.11639	0.00000	0.00000	0.00000	0.22245	0.11639	0.00000	0.07767	1,557	1.6
	SARSAG	0.00000	0.00000	0.00000	0.10410	0.00000	0.21227	0.00063	0.00000	0.10410	0.21227	0.13992	2,805	2.8
	PARCAL	0.05833	0.00000	0.00508	0.04644	0.09872	0.00003	0.10975	0.05833	0.09872	0.10975	0.10148	2,035	2.0
	HETROS	0.00000	0.00473	0.05957	0.05702	0.13389	0.00552	0.00000	0.05957	0.13389	0.00552	0.08545	1,713	1.7
	SCOJAP	0.00000	0.00000	0.00000	0.01408	0.00000	0.17722	0.00000	0.00000	0.01408	0.17722	0.07239	1,451	1.5
	PARNEB	0.00000	0.00049	0.01510	0.04278	0.03050	0.00338	0.07206	0.01510	0.04278	0.07206	0.05249	1,052	1.1
	UMBRON	0.00000	0.00000	0.00195	0.08205	0.00000	0.00000	0.01950	0.00195	0.08205	0.01950	0.05713	1,145	1.1
	ATHCAL	0.00000	0.00522	0.00009	0.04795	0.00000	0.02731	0.00001	0.00522	0.04795	0.02731	0.03924	787	0.8
	CHESAT	0.00000	0.00000	0.00000	0.06087	0.00039	0.00000	0.01397	0.00000	0.06087	0.01397	0.04216	845	0.8
	ENGMOR	0.00000	0.00000	0.00029	0.06941	0.00000	0.00071	0.00000	0.00029	0.06941	0.00071	0.04260	854	0.9
	MUSCAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.05349	0.00000	0.00000	0.00000	0.05349	0.01926	386	0.4
	RHIPRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.04547	0.00000	0.00000	0.04547	0.01637	328	0.3
	HYPGUT	0.00000	0.00214	0.00038	0.01156	0.01405	0.00000	0.02590	0.00214	0.01405	0.02590	0.01796	360	0.4
	CYNPAR	0.00000	0.00000	0.00000	0.04155	0.00000	0.00000	0.00000	0.00000	0.04155	0.00000	0.02535	508	0.5
	SYNLEP	0.00950	0.00330	0.00156	0.01742	0.01021	0.00006	0.00000	0.00950	0.01742	0.00006	0.01093	219	0.2
	ILYGIL	0.02283	0.00017	0.00000	0.00000	0.00003	0.00000	0.00001	0.02283	0.00003	0.00001	0.00071	14	0.0
	MUSHEN	0.00000	0.00000	0.00000	0.02287	0.00000	0.00000	0.00000	0.00000	0.02287	0.00000	0.01395	280	0.3
	SYNAUL	0.00567	0.01517	0.00118	0.00019	0.00649	0.00000	0.00000	0.01517	0.00649	0.00000	0.00441	89	0.1
	HYPROS	0.00000	0.00067	0.01506	0.00418	0.00364	0.00005	0.00000	0.01506	0.00418	0.00005	0.00302	61	0.1
	ANIDAV	0.00000	0.00000	0.00000	0.01630	0.00000	0.00000	0.00000	0.00000	0.01630	0.00000	0.00994	199	0.2
	PORMYR	0.00000	0.00000	0.00000	0.00511	0.00606	0.00000	0.00690	0.00000	0.00606	0.00690	0.00618	124	0.1
	ANCCOM	0.00000	0.00000	0.00026	0.01219	0.00000	0.00000	0.00000	0.00026	0.01219	0.00000	0.00744	149	0.1
	ACAFLA	0.00000	0.00000	0.00554	0.00682	0.00000	0.00000	0.00000	0.00554	0.00682	0.00000	0.00433	87	0.1
	CLEIOS	0.01200	0.00023	0.00001	0.00000	0.00005	0.00000	0.00000	0.01200	0.00005	0.00000	0.00039	8	0.0
	STREXI	0.00000	0.00009	0.00009	0.00845	0.00000	0.00334	0.00000	0.00009	0.00845	0.00334	0.00636	128	0.1
	QUIYCA	0.00717	0.00107	0.00016	0.00001	0.00298	0.00000	0.00000	0.00717	0.00298	0.00000	0.00203	41	0.0
	XENCAL	0.00000	0.00000	0.00000	0.00727	0.00005	0.00000	0.00000	0.00000	0.00727	0.00000	0.00443	89	0.1
	HYPGEN	0.00000	0.00000	0.00292	0.00000	0.00366	0.00000	0.00000	0.00292	0.00366	0.00000	0.00232	47	0.0
	LEPARM	0.00000	0.00208	0.00178	0.00000	0.00000	0.00000	0.00042	0.00208	0.00000	0.00042	0.00021	4	0.0
	PLERIT	0.00000	0.00000	0.00000	0.00000	0.00129	0.00000	0.00075	0.00000	0.00129	0.00075	0.00106	21	0.0
	FUNPAR	0.00000	0.00182	0.00044	0.00000	0.00000	0.00000	0.00000	0.00182	0.00000	0.00000	0.00005	1	0.0
	ALBVUL	0.00000	0.00000	0.00159	0.00000	0.00000	0.00000	0.00000	0.00159	0.00000	0.00000	0.00005	1	0.0
	SCOGUT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00104	0.00000	0.00000	0.00104	0.00038	8	0.0
	HIPING	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00089	0.00000	0.00000	0.00089	0.00032	6	0.0
	PARCLA	0.00000	0.00000	0.00000	0.00082	0.00000	0.00000	0.00000	0.00000	0.00082	0.00000	0.00050	10	0.0
	MICMIN	0.00000	0.00000	0.00000	0.00080	0.00000	0.00000	0.00000	0.00000	0.00080	0.00000	0.00049	10	0.0
	GIBMON	0.00000	0.00000	0.00034	0.00000	0.00028	0.00000	0.00000	0.00034	0.00028	0.00000	0.00018	4	0.0
	SYNCAL	0.00000	0.00000	0.00000	0.00002	0.00041	0.00000	0.00000	0.00000	0.00041	0.00000	0.00025	5	0.0
	SYNLUC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00031	0.00000	0.00000	0.00031	0.00011	2	0.0
	GIBELE	0.00000	0.00000	0.00000	0.00000	0.00027	0.00000	0.00000	0.00000	0.00027	0.00000	0.00016	3	0.0
	SYNEXI	0.00000	0.00000	0.00000	0.00000	0.00023	0.00000	0.00000	0.00000	0.00023	0.00000	0.00014	3	0.0
	TRITRI	0.00000	0.00000	0.00013	0.00000	0.00000	0.00000	0.00000	0.00013	0.00000	0.00000	0.00000	0	0.0
	HETFRA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00011	0.00000	0.00000	0.00011	0.00004	1	0.0
	PARINT	0.00000	0.00000	0.00000	0.00000	0.00007	0.00000	0.00000	0.00000	0.00007	0.00000	0.00004	1	0.0
	MUGCEP	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000	0	0.0
STA 3 Total		0.15750	0.12673	1.05460	5.50809	2.14244	1.66024	0.77007	1.18023	6.40293	2.23170	4.74461	95,129	95.1

Appendix Table 14. Best estimates of biomass densities and standing stocks for all fish species for each depth strata within each station (Ecoregion) of San Diego Bay.

STA	SPCODE	SE	SS	LS	PSN	BT	PSC	OT		I	N	C		MEAN	STOCK (kg)	mt
4	UROHAL	0.00000	0.00000	0.05806	0.71443	2.39756	0.00085	0.76486		0.05806	2.39756	0.76486		2.11571	22,511	22.5
	MYLCAL	0.00000	0.00000	0.00000	1.66560	0.00000	0.12243	0.00000		0.00000	1.66560	0.12243		1.41502	15,056	15.1
	PARMAC	0.00000	0.00000	0.00947	1.15733	0.44618	0.03726	0.13592		0.00947	1.15733	0.13592		0.99020	10,536	10.5
	ANCDEL	0.00000	0.00329	0.10438	1.11504	0.00137	0.11578	0.00490		0.10438	1.11504	0.11578		0.95586	10,170	10.2
	ATHAFF	0.01556	0.06985	0.63295	0.54399	0.00015	0.18231	0.00000		0.63295	0.54399	0.18231		0.50597	5,384	5.4
	RHIPRO	0.00000	0.00000	0.00000	0.42309	0.00000	0.00000	0.00000		0.00000	0.42309	0.00000		0.35539	3,781	3.8
	ATHCAL	0.00000	0.00015	0.00025	0.36579	0.00001	0.04921	0.00000		0.00025	0.36579	0.04921		0.31367	3,337	3.3
	SARSAG	0.00000	0.00000	0.00000	0.13256	0.00000	0.00000	0.00001		0.00000	0.13256	0.00001		0.11135	1,185	1.2
	UMBRON	0.00000	0.00000	0.00000	0.08687	0.00000	0.03378	0.00556		0.00000	0.08687	0.03378		0.07736	823	0.8
	PARNEB	0.00000	0.00000	0.00000	0.03039	0.00227	0.02311	0.31263		0.00000	0.03039	0.31263		0.06617	704	0.7
	PARCAL	0.00000	0.00000	0.00000	0.02446	0.04710	0.00000	0.19489		0.00000	0.04710	0.19489		0.06490	691	0.7
	GYMMAR	0.00000	0.00000	0.00000	0.07641	0.00000	0.00000	0.00000		0.00000	0.07641	0.00000		0.06418	683	0.7
	CYMAGG	0.00000	0.00000	0.00000	0.07415	0.02930	0.00000	0.00000		0.00000	0.07415	0.00000		0.06229	663	0.7
	MUSCAL	0.00000	0.00000	0.01031	0.06517	0.00000	0.00000	0.00832		0.01031	0.06517	0.00832		0.05624	598	0.6
	MUGCEP	0.00000	0.00401	0.01544	0.04366	0.00000	0.01584	0.00000		0.01544	0.04366	0.01584		0.03935	419	0.4
	ANCCOM	0.00000	0.00000	0.00060	0.03951	0.00084	0.00000	0.00000		0.00060	0.03951	0.00000		0.03321	353	0.4
	STREXI	0.00000	0.00000	0.00159	0.03082	0.00000	0.00000	0.00000		0.00159	0.03082	0.00000		0.02595	276	0.3
	HYPGUT	0.00000	0.00011	0.00088	0.00923	0.02008	0.00000	0.03570		0.00088	0.02008	0.03570		0.02154	229	0.2
	ENGMOR	0.00000	0.00000	0.00079	0.02488	0.00002	0.00448	0.00354		0.00079	0.02488	0.00448		0.02152	229	0.2
	ALBVUL	0.00093	0.00055	0.00016	0.02452	0.00000	0.00000	0.00000		0.00093	0.02452	0.00000		0.02064	220	0.2
	CYNPAR	0.00000	0.00004	0.00004	0.02252	0.00000	0.00000	0.00000		0.00004	0.02252	0.00000		0.01892	201	0.2
	CLEIOS	0.39917	0.00943	0.00067	0.00000	0.00149	0.00000	0.00000		0.39917	0.00149	0.00000		0.01722	183	0.2
	HETROS	0.00000	0.00000	0.00000	0.01800	0.01042	0.00182	0.00000		0.00000	0.01800	0.00182		0.01535	163	0.2
	CHESAT	0.00000	0.00000	0.00000	0.00704	0.00000	0.00000	0.05689		0.00000	0.00704	0.05689		0.01331	142	0.1
	SYNAUL	0.00167	0.00021	0.00014	0.00029	0.01445	0.00000	0.00000		0.00167	0.01445	0.00000		0.01220	130	0.1
	QUIYCA	0.16824	0.00112	0.00072	0.00005	0.00155	0.00000	0.00000		0.16824	0.00155	0.00000		0.00803	85	0.1
	MENUND	0.00000	0.00000	0.00000	0.00422	0.00000	0.00000	0.00000		0.00000	0.00422	0.00000		0.00355	38	0.0
	ACAFLA	0.01667	0.00544	0.01153	0.00205	0.00000	0.00000	0.00000		0.01667	0.00205	0.00000		0.00239	25	0.0
	SYNLEP	0.00000	0.00032	0.00003	0.00012	0.00265	0.00000	0.00001		0.00032	0.00265	0.00001		0.00224	24	0.0
	HYPROS	0.00000	0.00040	0.00735	0.00198	0.00000	0.00202	0.00000		0.00735	0.00198	0.00202		0.00222	24	0.0
	PARCLA	0.00000	0.00000	0.00000	0.00225	0.00000	0.00000	0.00002		0.00000	0.00225	0.00002		0.00189	20	0.0
	FUNPAR	0.00000	0.02127	0.04352	0.00000	0.00012	0.00000	0.00000		0.04352	0.00012	0.00000		0.00184	20	0.0
	DORPET	0.00000	0.00000	0.00000	0.00000	0.00000	0.01261	0.00000		0.00000	0.00000	0.01261		0.00164	17	0.0
	ILYGIL	0.03111	0.00111	0.00182	0.00002	0.00028	0.00000	0.00001		0.03111	0.00028	0.00001		0.00148	16	0.0
	RONSTE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00802		0.00000	0.00000	0.00802		0.00104	11	0.0
	PORMYR	0.00000	0.00000	0.00000	0.00026	0.00000	0.00000	0.00632		0.00000	0.00026	0.00632		0.00104	11	0.0
	HIPING	0.00000	0.00000	0.00000	0.00085	0.00000	0.00000	0.00042		0.00000	0.00085	0.00042		0.00077	8	0.0
	XENCAL	0.00000	0.00000	0.00000	0.00077	0.00000	0.00000	0.00000		0.00000	0.00077	0.00000		0.00065	7	0.0
	ATRNOB	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00392		0.00000	0.00000	0.00392		0.00051	5	0.0
	GIBELE	0.00000	0.00000	0.00000	0.00000	0.00027	0.00000	0.00000		0.00000	0.00027	0.00000		0.00023	2	0.0
	GILMIR	0.00000	0.00250	0.00109	0.00000	0.00011	0.00000	0.00000		0.00250	0.00011	0.00000		0.00019	2	0.0
	SYNEXI	0.00000	0.00000	0.00000	0.00000	0.00020	0.00000	0.00000		0.00000	0.00020	0.00000		0.00017	2	0.0
	XYSLIO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00129		0.00000	0.00000	0.00129		0.00017	2	0.0
	SCOGUT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00125		0.00000	0.00000	0.00125		0.00016	2	0.0
	LEPARM	0.00000	0.00404	0.00112	0.00000	0.00000	0.00000	0.00000		0.00404	0.00000	0.00000		0.00016	2	0.0
	PLERIT	0.00000	0.00000	0.00024	0.00000	0.00000	0.00000	0.00079		0.00024	0.00000	0.00079		0.00011	1	0.0
	SYNCAL	0.00000	0.00000	0.00000	0.00009	0.00000	0.00000	0.00000		0.00000	0.00009	0.00000		0.00008	1	0.0
	SYNLUC	0.00000	0.00000	0.00000	0.00000	0.00001	0.00001	0.00050		0.00000	0.00001	0.00050		0.00007	1	0.0
	HYPGEN	0.00000	0.00000	0.00000	0.00000	0.00008	0.00000	0.00000		0.00000	0.00008	0.00000		0.00007	1	0.0
	PORNOT	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00042		0.00000	0.00000	0.00042		0.00005	1	0.0
	BRYARC	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000		0.00000	0.00001	0.00000		0.00000	0	0.0
STA 4 Total		0.63333	0.12382	0.90316	6.70839	2.97653	0.60152	1.54619		1.51051	8.44575	2.07247		7.42427	78,994	79.0