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THE MARINE ENVIRONMENT OF MARINA DEL REY, CALIFORNIA IN 1984

A REPORT TO

THE DEPARTMENT OF BEACHES AND HARBORS
COUNTY OF LOS ANGELES

BY

HARBORS ENVIRONMENTAL PROJECTS
DOROTHY F. SOULE AND MIKIHIKO OGURI, EDITORS

Published by
Allan Hancock Foundation and Office of Sea Grant Programs
Institute for Marine and Coastal Studies
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MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA PART 20

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EXECUTIVE SUMMARY

A program of sampling and environmental measurements in Marina Del Rey, California was carried out by Harbors Environmental Projects (HEP) of the University of Southern California during the months of May through July and September through November of 1984. The results were compared with data from earlier HEP studies conducted in the Marina in 1976 through 1979, insofar as possible, and are summarized below.

Water temperatures and salinities in the Marina were generally higher in 1984 than during the earlier period. This was probably a result of the lingering effects of the 1982-83 El Niño (ENSO) event, a large scale oceanographic phenomenon which affected much of the Pacific Basin and brought tropical waters to southern California. A record high temperature of 25.5°C (78°F) was recorded in the Marina, more than 2°C higher than that recorded in earlier studies. Peak salinities were almost 2 parts per thousand higher as well. As in the past, the 1984 data showed that the warmest and most saline waters were those farthest from the open sea, both at the innermost stations of the Marina and in Ballona Creek.

Dissolved oxygen (DO) levels were similar to those of the earlier period, both in concentration and in distribution within the Marina and in Ballona Creek, although there was a wider range of values. The highest concentrations of dissolved oxygen were usually at stations nearest the breakwater, with trends toward lower levels as distance increased from the open sea. With a few exceptions in limited areas, there was adequate oxygen to support a diverse biota.

Turbidity, as shown by beam transmittance measurements, was higher in the shallow waters of the inner Marina and tended to be lower toward the ocean. Measurements of pH lay within the normal range of such values for coastal marine water.

Analyses of the nutrients nitrite, nitrate, phosphate, silicate and total ammonia were performed, and silicate was measured for the first time. The highest nutrient concentrations occurred in November, followed by October, while the lowest were for the most part in June and July. With few exceptions there were higher concentrations in the waters of the inner stations and in Ballona Creek. The lowest values were found at the two stations by the breakwater except for nitrate-nitrite in September, when it was high at Station 1 as well as Station 12. At times the inner station concentrations indicated eutrophic conditions, as did the occurrence of red tides observed visually.

The percent of toxic un-ionized ammonia in total ammonia varies with temperature, salinity and pH. The peak concentrations were found at Station 13 in June and Station 8 in November. None of the levels approached EPA limits for chronic exposure or limits of the Ocean Plan.

Biochemical Oxygen Demand (BOD) was measured in June and November of 1984 and showed a range of values similar to coastal data. The higher values, indicative of biodegradable organic loading, were found at the innermost stations and at the Ballona Creek area. Station 3 near the Ballona Lagoon tidegate also showed high values, suggesting an increase in the input of organic debris from that source since the previous investigations.

Chemical analysis of sediment samples from the various stations indicated that with few exceptions sediment samples from stations 10, 11 and 13, in Basin E and the Oxford Flood Control Basin, had the highest concentrations of pollutants including metals and chlorinated hydrocarbons. The chlorinated hydrocarbons were also high at Station 2, a location that suggests deposition from Ballona Creek. No effects from the former Dow Iodine Recovery Plant site in Ballona Lagoon could be identified. Findings suggest that a relatively minor amount of pollutant burden originates in the Marina itself.

The biological sampling results differed dramatically from those of prior years, presumably due to effects of the lingering El Niño event.

In 1984, 53 species were recorded in biannual surveys by otter trawl, beach seine, gill net, diver observation and ichthyoplankton tow, as compared with 35 species in 1977-1979. However, there were extensive changes in species composition between those periods as well as between spring and autumn 1984. Cool-temperate species disappeared as did some warm temperate species that require cooler water for reproduction. There was a drop in mean number of species collected by otter trawl of an order of magnitude or greater. Such a severe drop was not attributed by the investigators to degradation in the Marina because of the results of benthic sampling.

The number of benthic species showed a slight decrease as compared to earlier studies but showed an order of magnitude increase in number of species. The mean for all stations of more than 90,000 individuals per square meter far exceeds the numbers in the richest stations found previously by the investigators in any southern California location. This was attributed to the order of magnitude decrease in fish, which reduced the grazing pressure on the benthic food organisms. Since nutrients are not limited, the benthic populations burgeoned.

Forage fish decreased throughout the Southern California Bight during the El Niño event, reducing grazing pressure but no data are available on whether similar effects on benthic organisms occurred elsewhere. The association of the phenomena must therefore remain conjectural although it is provocative.

RECOMMENDATIONS

The major threats to water quality in Marina Del Rey are the Oxford Flood Control Basin, Ballona Creek and to a lesser extent Ballona Lagoon. Engineering solutions are needed to divert the Oxford Flood Control Basin drainage from the Inner Marina, an area with very low flushing capability. Pollutant input from Ballona Creek can probably only be remedied by better upstream point source and non-point source control. Ballona Lagoon, which caused increases in most pollutants at the Marina tide gates, is a non-point source requiring clean-up and subsequent enforcement for control.

Structural modifications to produce better flushing would alleviate most problems and are essential if the Marina is to be enlarged.

Further monitoring is urgently needed to determine the more normal biological conditions in the Marina following those attributed to the warm water El Niño events. The large increase in benthic organisms in 1984 could have provided an excellent habitat for fish populations during 1985 if the area was restocked from coastal currents after return to more normal conditions. Such information is essential to understanding and enhancing the role of the Marina as a biological resource.

INTRODUCTION

HISTORICAL BACKGROUND

Marina del Rey, California is an entirely manmade, small craft recreational harbor which was created in 1960-1962 from lands that were at one time a part of the Ballona Creek wetlands. Wetlands once extended through the communities of Venice, southwest through La Ballona, inland to Machado (a stop on the Santa Monica Railroad, later the Pacific Electric Railway), and south approximately to the present area of Culver Boulevard (Figure 1). The area was irregularly furrowed with small drainage channels, filled to support oil field development and farming, and used as a dumping ground without appreciable control. At the time, filling achieved a measure of public health control of the mosquitoes and black gnats that abounded, and little concern was evidenced over any decline of the area as a habitat for resident or migratory birds, or other wildlife.

Because of the severe flooding that often occurred in southern California during heavy winter rains, Ballona Creek and other southland drainage systems were concretized to maintain permanent channels in the 1930s. Ballona Creek now drains much of the downtown Los Angeles area as well as west Los Angeles.

Ballona Lagoon lies parallel to the sandy barrier beach and separates the beach from the Marina. It was formerly connected to Ballona Creek by tide gates at the southern (eastern) end and to the Venice Canal system by tide gates at the northern (western) end. From there, the lagoon turned inland and branched, one arm extending to a drainage basin called Lake Los Angeles, where the beach area of Basin D now lies. The other branch extended back toward Ballona Creek, roughly parallel to Ballona Lagoon, through areas now occupied by the Marina (Soule and Oguri, 1977, 1980).

PREVIOUS INVESTIGATIONS

The history of construction design and funding was discussed by the County of Los Angeles Department of Small Craft Harbors (now a part of the Department of Beaches and Harbors) in 1976. Reish, in Soule and Oguri (1977) provided information on the biological succession during and after construction of the Marina. Physical variables in the area were discussed by Bowerman and Chen (1971), Brandsma, Lee and Bowerman (1973), and Chen (1974). Information on Ballona Lagoon was reviewed by Bakus (1975), Ford and Collier (1976) and BCL Associates (1984).

In July 1976, Harbors Environmental Projects of the University of Southern California initiated investigations on the physical, chemical and biological conditions at 13 stations in the Marina (Figure 2). Funded by the County of Los Angeles, with participation of the federal Sea Grant Program at the University, the studies continued to June 1979 (Soule and Oguri, 1977; 1980), providing a long term baseline to evaluate the environmental health of the Marina. The scope of work in the 1976-1979 studies included the following:

> Monthly monitoring of temperature, salinity, dissolved oxygen and pH at one meter intervals through the water column using a Martek remote probe instrument; water transparency measurements with transmissometer or Secchi disc; water samples taken for nutrient chemistry analysis, phytoplankton productivity, chlorophyll *a* and assimilation ratio determination; plankton tows in surface waters to determine the species and numbers of zooplankton per cubic meter;

Settling racks were suspended for two month intervals to determine the nature and quantity of the meroplankton-fouling community;

Benthic fauna were sampled seasonally with a Campbell grab, which takes a 0.1 square meter areal sample, for identification and enumeration of the epifauna and infauna; numbers were then calculated to the square meter;

Fish surveys were made twice a year by otter trawl, gill netting, diver transects and other visual sightings;

Sediment samples were analyzed for grain size; chemical analysis of sediments was performed once a year, and water samples were analyzed for trace metals and pesticides during storm sequences.

<u>Conclusions of Earlier Studies</u>

Results of the 1976-1979 investigations by Harbors Environmental Projects were published in <u>Marine Studies of San Pedro Bay, California</u>, Parts 13 and 18 (Soule and Oguri, 1977; 1980). These studies demonstrated the impacts of storm water flow and drainage into the Marina, documenting the entry of pollutants from Ballona Creek and through the large storm drains in the Basins. Drainage from the "Bird Sanctuary" seemed to be an ongoing, chronic problem.

Phytoplankton productivity was quite variable but not high, so that few instances of eutrophic extremes or bioinhibition were observed. Zooplankton abundance was high, but was 95% composed of a single species, *Acartia californiensis*. Either this species is not attractive to fish, or the fish populations in the Marina were too low to harvest this stock adequately. The warmth of the waters, the episodes of freshwater input and a number of occurrences of low dissolved oxygen in bottom waters limit the diversity of plankton species.

More than 115,400 individuals and 300 taxa were enumerated in ten benthic sampling periods in 1976-1979. There was a clear delineation between groups of stations in terms of species composition and numbers; Stations 1-4 at the mouth of Ballona Creek or on the Marina entrance channel differed from Stations 5-7 on the main channel and in Basin H, and these differed in turn from Stations 8-11, the inner Marina stations. In general, there were decreases in both numbers and species among these groups.

Fish surveys indicated that the Marina had reduced numbers of species and individuals as compared with nearby King Harbor. This was attributed to several factors: the influx of storm waters, the sediment - and waterborne pollutants, the warming of the shallow waters, the lack of sloped rocky banks, and reduced circulation and flushing in the Marina.

Because protection of vessels and maximized public access have higher priorities in marina construction, with the consequent reduction of sea forces and the creation of a low energy environment, the value of the small craft harbor as a marine biological habitat may be reduced. The vertical walls and pilings, the flat, unconsolidated, fine sediment bottom and the limited flushing from tidal action do not provide for as diverse a habitat as, for example, an open rocky coast. Nevertheless, the Marina has been shown to be a productive habitat for soft bottom benthic organisms and their associated predators. Certain species are able to tolerate periodic influxes of freshwater runoff, deposition of high levels of organic debris and detritus, periodic reductions in dissolved oxygen and high summertime water temperatures while others are not.

SCOPE OF PRESENT STUDIES

The Department of Beaches and Harbors, recognizing that approximately five years had elapsed since the completion of the baseline for the Marina, requested that an abbreviated survey be undertaken to update that baseline. The following parameters were included in the baseline update:

Monthly measurements of water quality were made in May, June and July, and in September, October and November of 1984. Parameters included temperature, salinity, dissolved oxygen and pH measured by remote probe Martek instrument, and light transmission. Water samples were taken by a remote closing PVC sampler for analysis of biochemical oxygen demand and nutrients, performed in the University laboratories. Los Angeles County lifeguard boats were used in these surveys.

Two seasonal surveys of benthic organisms were made, in April and October, 1984. Single Campbell grabs which sample 0.10 square meter of benthos were taken from the University research vessel *Golden West*. Subsamples were taken from the October grabs for chemical analysis of pollutants. Comparisons of the data were made with data obtained from the County under a program of test borings on land bordering Ballona Lagoon.

Two seasonal fish surveys were performed, in April and October. These included otter trawls, gill netting, beach seine and diver transects.

All data were compared with the 1977-1979 data base from the surveys conducted by the University, and with other relevant available data.

STATION LOCATIONS AND DESCRIPTIONS

MDR-1. Located at the mouth of Ballona Creek flood control channel, inside the breakwater at the east entrance to the Marina. The area is subjected to discharges from the creek, to severe impacts from storm water flow and to deposition or erosion from storm wave action. Depth 6-7 meters.

MDR-2. At the entrance of the Marina, midway between the two jetties. The area is protected from most storm waves but subject to weak coastal currents; sands are blown from the adjacent beach and deposited in the channel; heavy flow in Ballona Creek flood control channel carries sediment and debris into the mouth of the Marina. Depths to 6 meters.

MDR-3. On the north (west) side of the entrance channel, in front of the tide gates to Ballona Lagoon and the Venice Canal system. Protected from all but severe storm waves, subjected to discharge of waters from the canal system. Shell mounds present in earlier surveys have been reduced, replaced with finer organic sediments. Depths 5-6 meters.

MDR-4. At the Administration dock on the south (east) side of the entrance channel at junction with main channel. Subject to heavy boat use. Protected from most surge but area heavily damaged by 1983 storms. Depth 6 meters.

MDR-5. In the center of the main channel, subject to heavy boat traffic. Depth 5 meters.

MDR-6. At the innermost end of Basin B; protected from westerly winds by seawall, circulation reduced. Depth 4-5 meters.

MDR-7. At the end of Basin H near the work yard dock. Large storm drain present; exposed to afternoon westerly winds. Depth 4 meters.

MDR-8. Off the swimming beach in Basin D near first slips. Exposed to afternoon winds; depth 4 meters.

MDR-9. At the innermost end of Basin F. Large storm drain present; protected by slips and sea wall. Depth 4 meters.

MDR-10. Innermost end of Basin E; subject to daily flushing from the Bird Sanctuary through tide gates and to storm water runoff; depth to 4 meters.

MDR-11. At end of main channel; subjected to storm drain flow and to influx from Station 10; impacted by reduced flushing due to increased slip capacity. Depth 4 meters.

MDR-12. Ballona Creek sampled from the Pacific Avenue foot bridge. Subject to tidal flushing and continuing freshwater discharge into the flood control channel; also subjected to illegal dumping of trash upstream and to sewage overflow. Depth 4 meters.

MDR-13. Inside tide gates of Oxford Flood Control Basin; subject to minimal daily tidal flushing, storm water runnoff and drainage. Depth 3 meters or less. Inaccessible at times.

Depths vary according to a number of factors including tidal stage and irregularities in the substrate due to storms, runoff, tide gate flow, and propellor wash.

Figure 1. Study Site, Marina del Rey, California
(base map, courtesy of Automobile Club of Southern California)

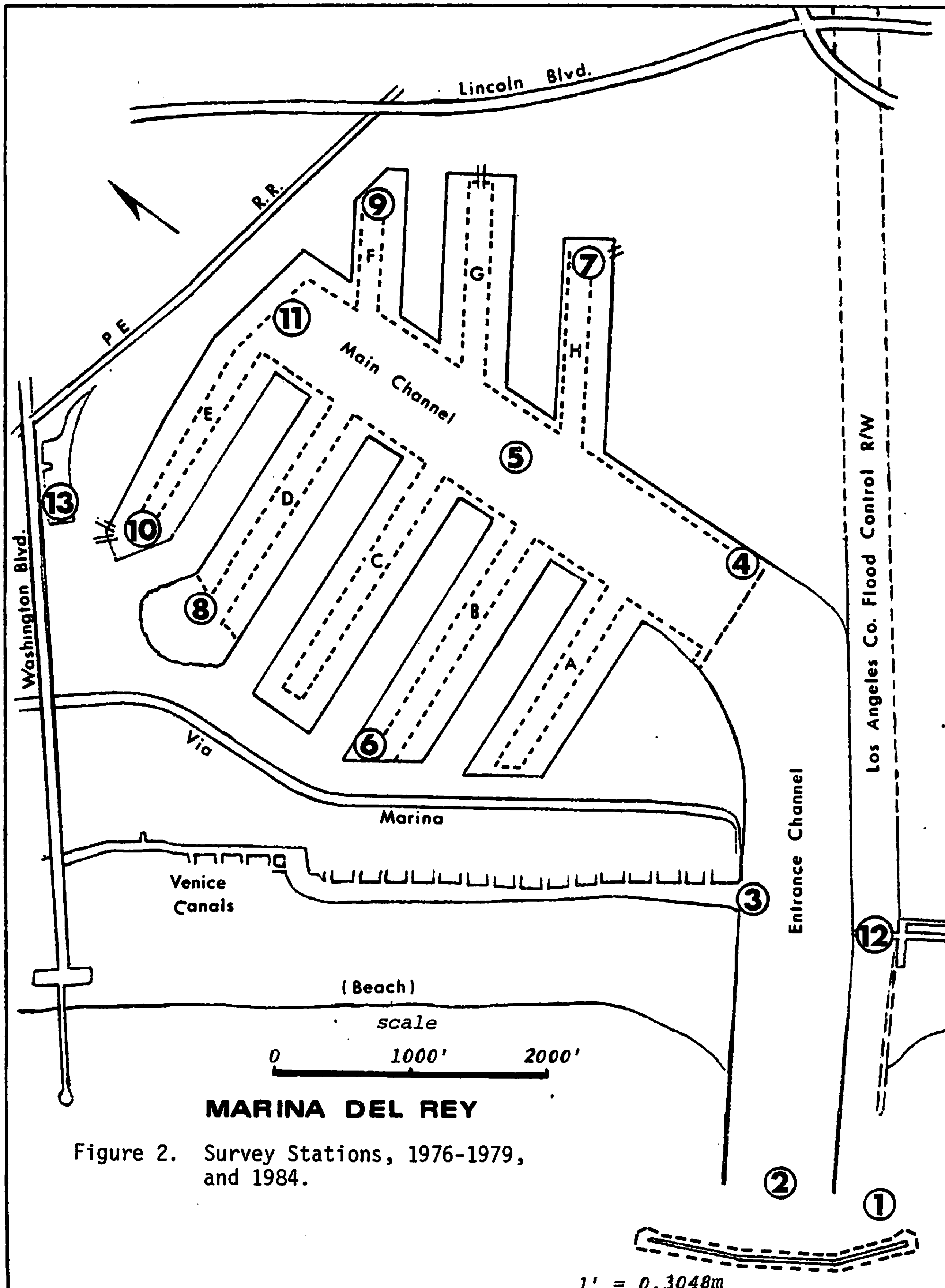

Figure 2. Survey Stations, 1976-1979, and 1984.

PHYSICAL WATER QUALITY

OCEANOGRAPHY OF THE SOUTHERN CALIFORNIA BIGHT

The physical environment of the water of Marina del Rey is governed in large measure by the oceanographic conditions in the Southern California Bight. Major changes in these conditions probably have greater impacts on the Marina than factors such as storms, drainage and pollutant input.

California coastal nearshore waters are influenced by several dynamic systems. These include the California Current, which flows southward from the Gulf of Alaska along the coasts of Washington, Oregon and California carrying remnants of waters from the northward-flowing Japanese Current, the northern mid-Pacific gyre and some subarctic waters from the counter-clockwise gyre of the Gulf of Alaska (Reid, 1960).

The California Current largely flows outside the Channel Islands, bringing cooler waters of lower salinity to the area of the Southern California Bight. A portion of the flow forms a series of small counter-cockwise gyres along the coast (Jones, 1971), which bring northern waters to the shores, participating in the littoral drift.

The Davidson Countercurrent (undercurrent) originates from the eastward flowing equatorial countercurrents which form a gyre in the Gulf of Panama. A portion of the flow moves upcoast along Baja California, for variable lengths of time and variable distances, particularly in the winter months. Generally the flow surfaces in the Bight south of Pt. Conception, but in some years, the flow may extend northward to British Columbia. The normal winter flow brings warmer waters of higher salinity and lower nutrients to the Bight, so that surface waters may be warmer during November - January than in March - May, after the countercurrent flow decreases.

El Niño

The phenomenon in which the Davidson Countercurrent flow extends far northward is a part of the El Niño-Southern Oscillation (ENSO) event which occurs periodically, bringing an influx of southern pelagic species and impacting local forage fish stocks. While ENSO events have been recorded periodically in the past, the strongest one in history, and the best documented, occurred in 1982-1983 (e.g., Breaker and Lewis, 1984; Dayton and Tegner, 1948; Halpern, 1983; McGowan, 1984).

Although the effects of El Niño on the southern hemisphere subsided after 1983, large pools of warmer water remained in southern California through most of 1984. McGowan (1984) noted the major reduction in nutrients and zooplankton in the Bight, which deprived the pelagic mackerel, anchovy and hake of food. He also remarked on the influx of subtropical red crabs, albacore and yellowfin tuna, marlin and dorado, and the drop in California commercial catch: chinook salmon (down 86%), market squid (down 74%), crab (down 70%) and shrimp (down 74%).

Higher water temperatures than previously reported by commercial fishermen, up to 25.5 ^{o}C, extended from the Los Angeles area shoreline to Santa Catalina Island in September 1984. Northern anchovy and mackerel that normally school in the Bight had disappeared.

The profound influence of the El Niño on Marina del Rey fauna is documented in the sections on fish fauna and benthic fauna in the present report. Given the magnitude of these impacts, it may be difficult to locate the signals from impacts of manmade activities.

MARINA DEL REY WATERS

Marina del Rey opens into Santa Monica Bay, which is a part of the southern California Bight. Santa Monica Bay is a broad, shallow and relatively unprotected embayment bounded to the north and south by submarine canyons. Conditions in the Marina are governed by those in the Bay, as well as the factors of insolation and poor flushing in the shallow Marina basins, stormwater runoff and inland drainage with various pollutant loadings, and the usual input of oil, grease and trash associated with recreational boating and public access.

TEMPERATURE AND SALINITY IN THE MARINA

Temperature

Average annual temperatures and seasonal temperatures for each station in the Marina were calculated and plotted for the 1976-1979 period and reported in Soule and Oguri (1977, 1980). Since the 1984 monitoring did not encompass a full year, comparable data treatment is not possible.

As noted in the above citations, mean temperatures were higher in 1976-1977 than in 1977-1978, and were considerably lower in 1978-1979. However, those years were part of a general trend of rising temperatures in southern California during the last decade following a series of cool years. Winter temperatures were cool between 1972-1975 and in 1978, but have otherwise been warmer than normal. Annual average temperatures off the south coast (off Los Angeles Harbor) rose in 1981 and 1982 reaching a record average of 24.4°C.

The range of temperatures for the seasonal periods in Marina del Rey provides a good indication of the seasonal and annual variation to which the Marina is subjected, as follows:

Range(°C)	1976	1977	1978	1979	1984
Spring		15.7-18.3	17.1-20.7	16.4-18.4	17.7-20.2[1]
Summer	20.3-23.0	19.8-22.0	18.9-22.6	19.3-20.9	19.4-23.3[2]
Autumn	19.2-20.9	16.1-19.7	18.2-19.7		16.8-25.5
Winter[3]	16.0-18.3	15.0-15.9	12.8-14.1		

[1] one month only; [2] two months only; [3] includes January and February of the following year.

The spring season consists of the months of March, April and May, while the summer quarter includes June, July and August, autumn consists of the months of September, October and November, and winter includes December, January and February. While these periods are generally more consistent than calendar quarters in the marine environment, this may not be true in some years. In 1984 the September temperatures were so excessive (Table 1) that they were quite different from those of October and November, exemplifying well the unusually high readings associated with the lingering El Niño event.

Record High Temperatures

The lingering El Niño produced 25°C water from the shorelines to Santa Catalina, according to local commercial fishermen, and the anchovy brought in from cooler waters to the north for bait died in the bait tanks as the local water was circulated over them. There seems little doubt that these temperatures exerted a profound effect of the already depauperate fish fauna in the Marina, leaving the benthic fauna without predators to harvest their numbers as usual.

The highest temperature recorded in the 1976-1979 investigations was 23.0°C at the Oxford Flood Control Basin in the summer of 1976. In contrast in 1984, fifteen stations recorded temperatures above 23°C in July and September, with the highest occurring again in the shallow Oxford Flood

Control Basin, at 25.5°C. Figures 3 through 8 illustrate the temperature trends within the Marina, plotted linearly as distances from the breakwater. Stations 1, 2, 3, 4, 5, 11, 10 and 13 form a continuum, while Stations 6, 7, 8, 9 and 12 are partially isolated from the continuum. Station 12, in Ballona Creek, and Station 1 are graphed to the left hand side of the plots since they are in a different direction from remaining the linear and non-linear array of stations. Comparisons are made with data from the prior studies.

The general trend is for rising temperatures as distance from the breakwater increases; the only deviation from this occurred in November (Figure 8) when waters throughout the Marina were apparently well mixed. The plots for May showed similar trends in 1978, 1979 and 1984, as did those for June in 1978 and 1984 (Figures 3, 4). The July temperatures (Figure 5) showed considerable difference between the years, with 1978 lower than 1977, and 1984 much higher than in either of the prior years.

September 1984 temperatures (Figure 6) illustrate the dichotomy between the usual pattern for that month, when air temperatures in the daytime can be quite high as well as water temperatures. There is a consistent difference of about 4°C elevation in water temperature over those in the prior years shown. October temperatures (Figure 7) still remained elevated over the normal range, although there were greater differences between 1977 and 1978. Whereas 1978 was warmer in October than 1977, it was colder in November (Figure 8). The November 1984 temperatures were lower at the Marina entrance, indicating the return of colder water, but the inner Marina stations remained warm.

Salinities

Ocean salinities generally range from about 33 parts per thousand (ppt) to about 37 ppt, with an average of 35 ppt used for convenience (Sverdrup et al., 1946). Off southern California, salinities are likely to range between 33.0 and 34.5 ppt, changing with the seasonal shifts in water masses. Inshore waters are more likely to be affected by heavy rainfall, and Marina waters reflect the input of freshwater from drainage as well.

Seasonal and annual average salinities were figured in Soule and Oguri (1980). Heavy rains depress the Marina salinities, especially at the surface. Otherwise, the lowest salinities are usually recorded when readings are taken on a falling tide at Station 12 on Ballona Creek, or at Station 13, the Oxford Flood Control Basin, when freshwater flow is mixed with Marina waters. Comparison of salinity ranges is as follows:

Range (ppt)	1976	1977	1978	1979	1984
Spring		27.9-31.7	25.5-30.9	31.2-33.4	31.1-31.9[1]
Summer	30.0-33.5	21.7-31.5	28.0-30.7		28.7-34.6[2]
Autumn	30.5-32.7	32.0-33.8	29.5-32.2		31.5-35.5
Winter[3]	30.9-34.3	16.2-28.2	18.5-31.2		

[1] one month only; [2] two months only; [3] includes January and February of the following year.

In September 1984, salinities had climbed to a mean of 34.51 ppt while the temperatures hit record highs, indicating the return of tropical waters. The range was from 32.3 ppt in the Oxford Flood Control Basin to 35.5 ppt at Station 2. If the three autumn months are averaged, the mean of 32.82 ppt is similar to that of 1976, 1977 and 1979 but higher than that of 1978.

Table 1. Mean Temperatures by Station in 1984

Station	May	June	July	Sept	Oct	Nov
1	18.2	20.2	19.7	22.3	20.6	16.8
2	17.7	20.1	19.4	22.2	19.9	16.8
3	19.0	20.5	21.0	23.2	20.6	17.1
4	19.0	20.7	24.0	23.8	21.1	17.0
5	19.7	21.2	22.7	23.9	21.6	17.5
6	19.9	21.5	23.2	23.9	21.7	17.5
7	19.9	21.9	23.3	24.1	22.0	17.7
8	20.2	22.2	23.2	24.3	22.3	17.4
9	19.8	22.1	22.9	24.2	22.2	17.9
10	20.1	22.2	23.3	24.3	22.3	18.0
11	20.1	22.0	23.3	24.3	22.1	17.7
12	----	----	----	22.9	20.8	16.8
13	----	----	----	25.5	22.6	17.4

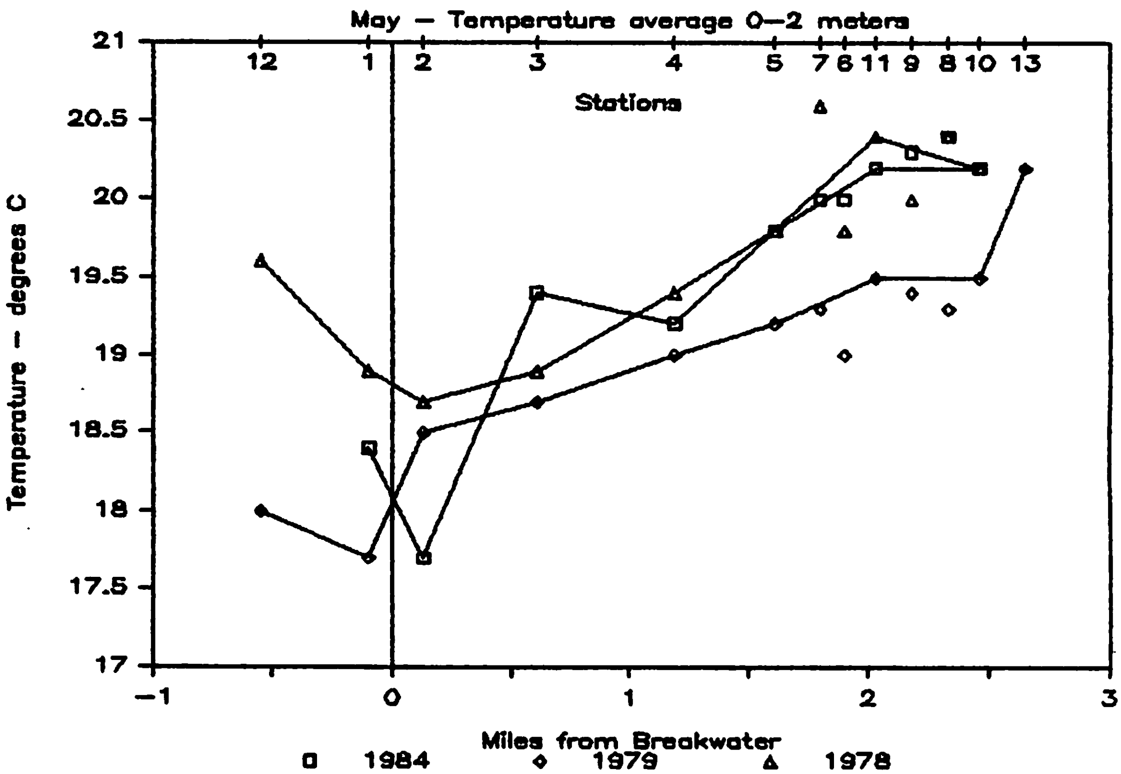

Figure 3. May Temperatures in Surface to 2m Depth. Stations are Plotted Linearly in Distance from Breakwater (mi). Stations 6, 7, 8, 9 and 10 lie off direct linear line plot in side basins.

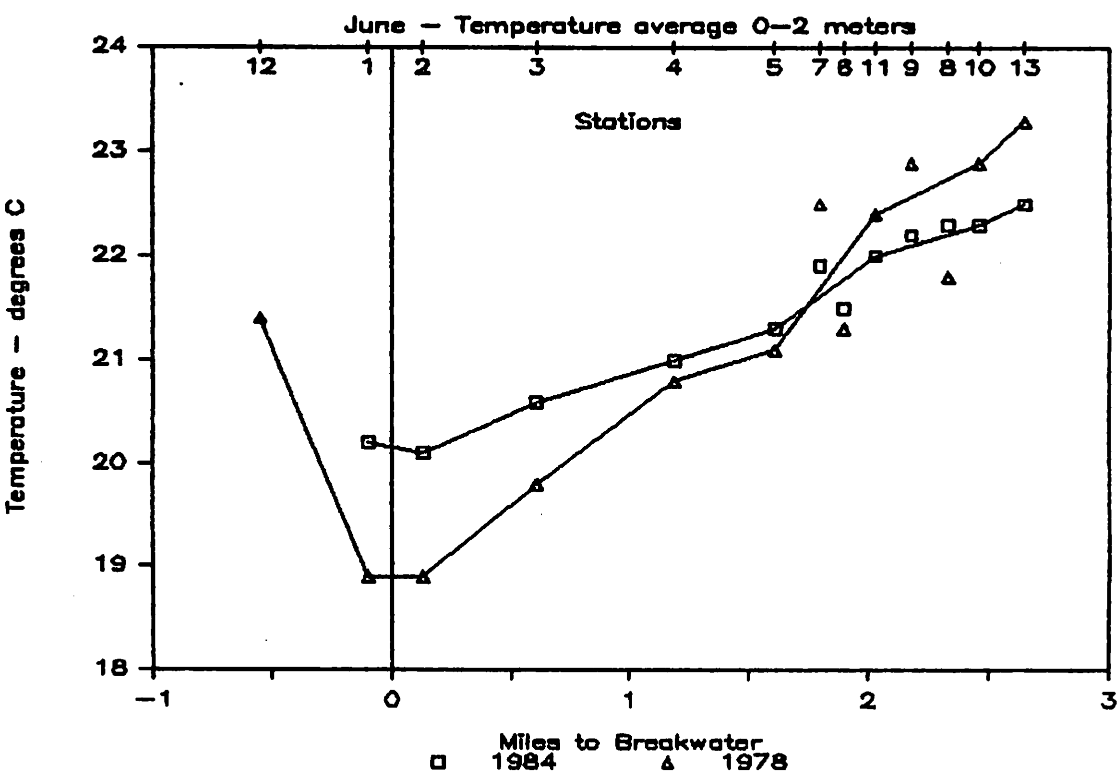

Figure 4. June Temperatures in Surface to 2m Depths.

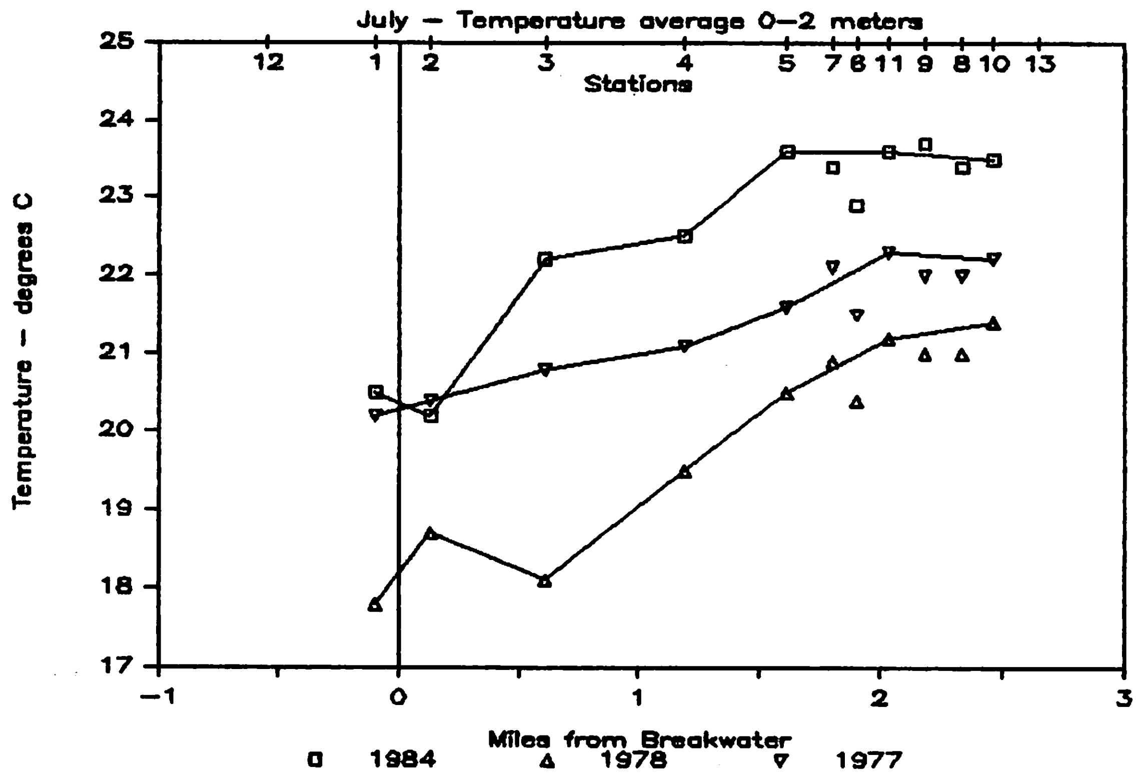

Figure 5. July Temperatures in Surface to 2m Depth. Stations are Plotted Linearly in Distance from Breakwater. Stations 6, 7, 8, 9, and 10 lie off linear plot in side basins.

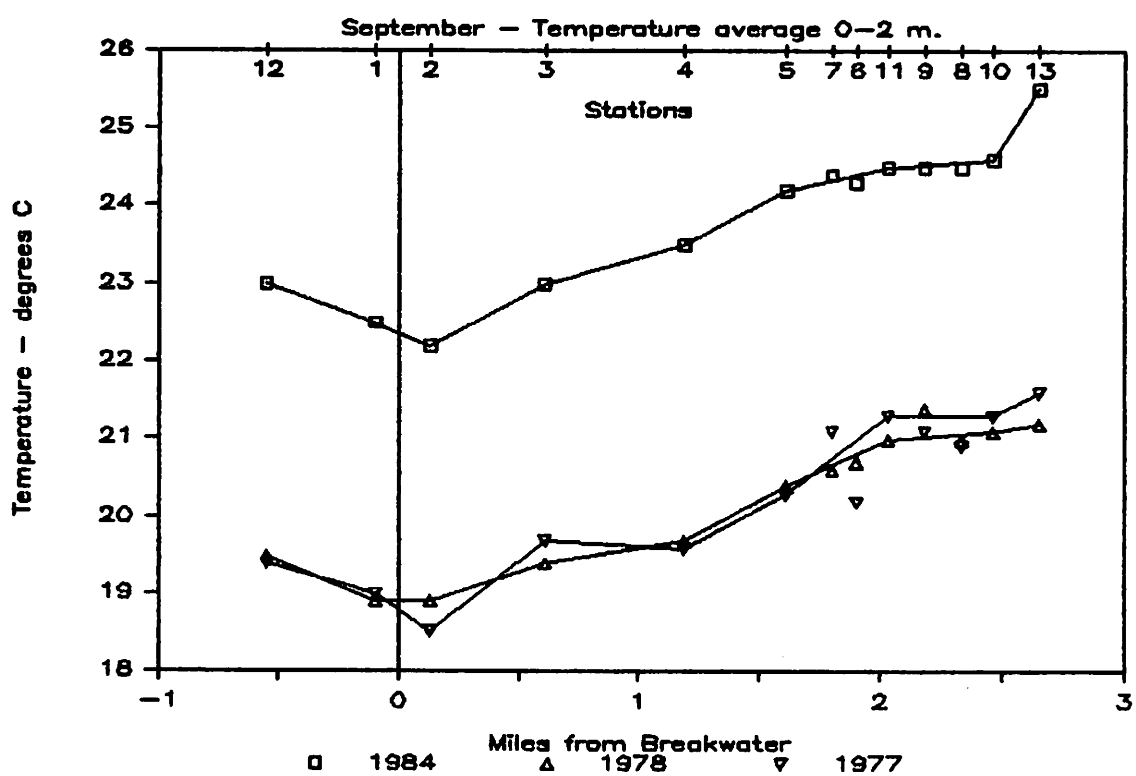

Figure 6. SeptemberTemperatures in Surface to 2m Depth.

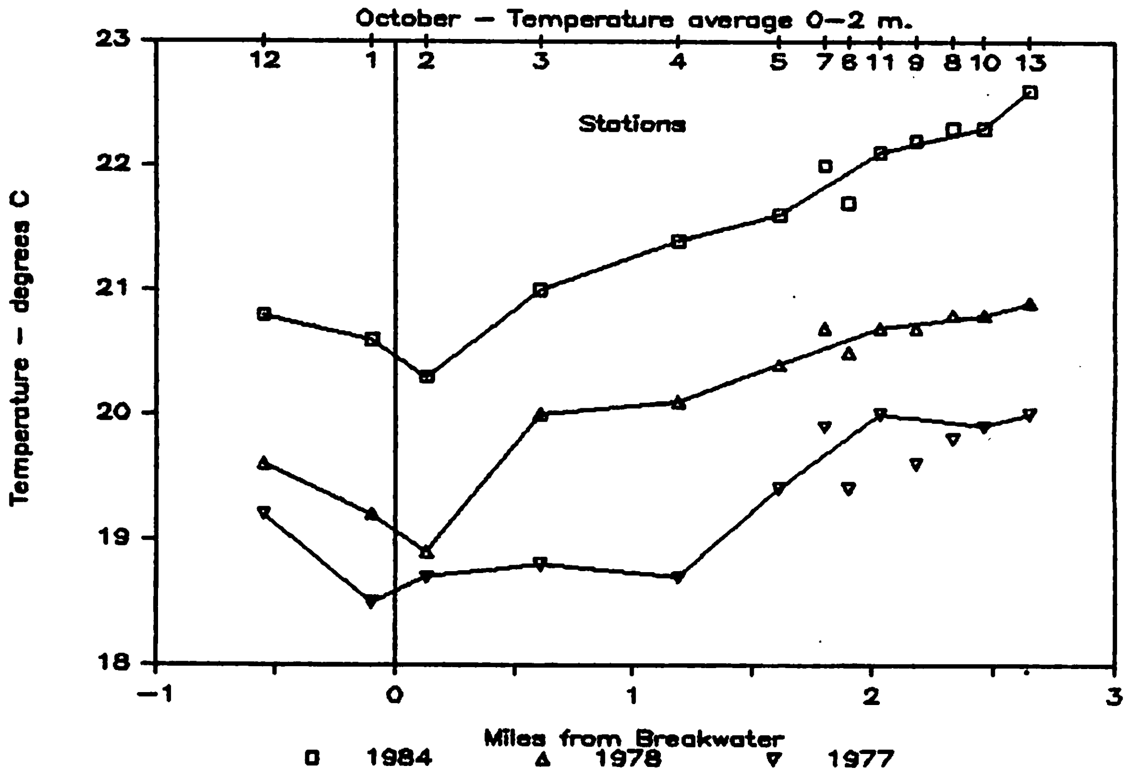

Figure 7. October Temperatures in Surface to 2m Depth. Stations are plotted linearly in distance (mi) from Breakwater. Stations 6, 7, 8, 9 and 10 lie off linear plot in side basins.

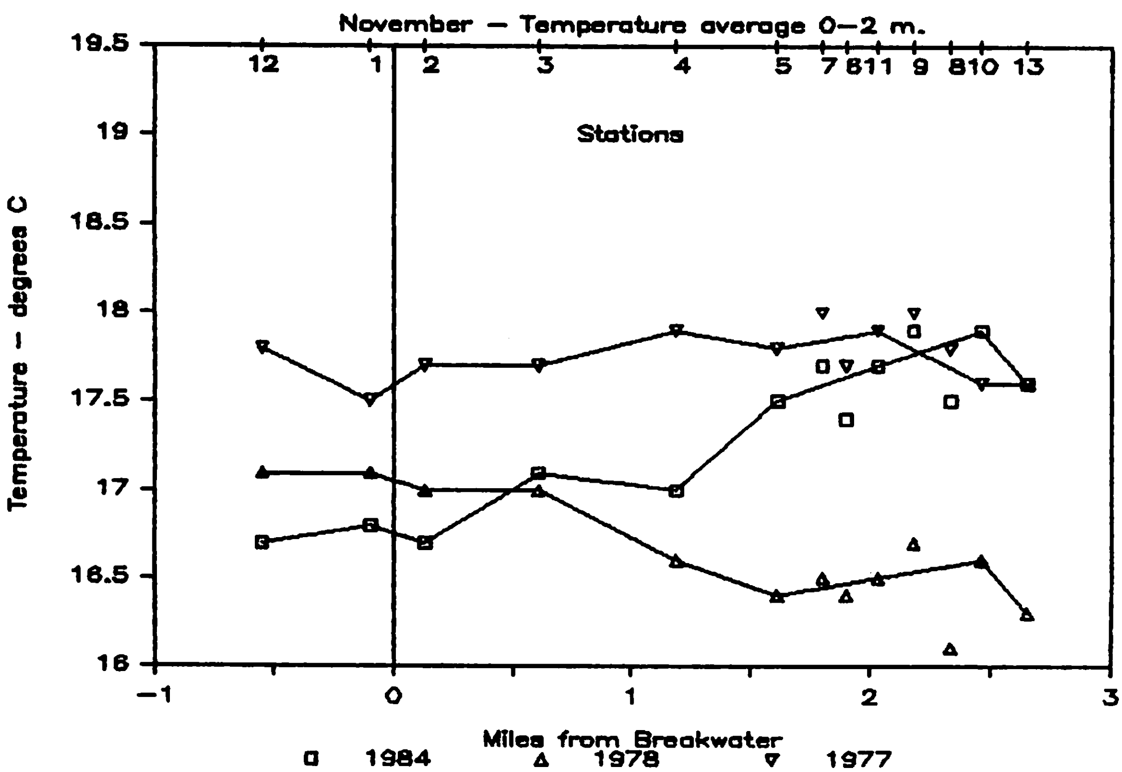

Figure 8. November Temperatures in Surface to 2 m Depth.

DISSOLVED OXYGEN, pH AND LIGHT TRANSMITTANCE

Dissolved oxygen (DO) along the open coast generally ranges from between 6.0 and 8.5 ppm, although the saturation point is dependent upon temperature and salinity. The presence of phytoplankton can increase DO greatly (Sverdrup et al., 1946) during photosynthesis while aeration from turbulent mixing in the surf zone also increases DO. Decreases in DO may be due to biological activity, to the biochemical oxygen demand from the bacterial degradation of organic matter or to the chemical oxygen demand due to oxidation of chemical pollutants. The die-off of a phytoplankton bloom can exert oxygen demand sufficient to render the waters anoxic immediately following very high DO values.

Regulatory agencies such as the California State Water Quality Control Board and the Department of Fish and Game have arbitrarily set 5 ppm. as the minimum dissolved oxygen for acceptable water quality for fish but many invertebrates are capable of surviving in much lower concentrations. Fish will show considerable stress below 3 ppm but some worms exist at levels below 1 ppm.

The ranges in dissolved oxygen in 1984 can be compared with those from prior surveys as follows:

Range(ppm)	1976	1977	1978	1979	1984
Spring		7.43-9.53	7.07-8.60	5.97-8.10	4.10-9.10[1]
Summer	7.25-9.10	5.40-9.37	5.00-8.23		4.00-11.3[2]
Autumn	3.27-7.57	6.70-9.37	3.03-6.40		1.00-10.5
Winter	2.20-5.70	6.15-9.33	4.37-7.17		

[1] one month only; [2] two months only; winter includes January and February of the following year.

Dissolved oxygen (in ppm) averaged throughout the water column for all stations produced to following means for 1984:

May	June	July	Sept.	Oct.	Nov.
6.05	7.86	9.48	7.27	8.51	7.52

These would seem to be adequate levels as compared with means for earlier periods, suggesting an improvement in conditions in the Marina. However, episodes of DO below 5 ppm can seriously affect fish in the Marina at that time, regardless of the good average levels.

In Figures 9 to 14, the 1984 dissolved oxygen data are plotted with those from comparable periods in the earlier studies. Separate plots give values for DO at the surface to 2m average (a), and values at the bottom of the water column (b). The Marina stations are graphed as a linearly arranged series from the breakwater; values for stations in the side basins may lie off the line to some degree. Station 12, in Ballona Creek lies to the left of the plot since it is in a different direction.

It appears that 1984 dissolved oxygen levels were higher in most instances. The progression is, in general, one of decreasing DO from the entrance to the inner basins, with some notable exceptions.

In May 1984 (Figure 9), bloom conditions were present at Station 3, flanked by low DO at Stations 2 and 4; DO was below 5 ppm except on the surface at Station 7. In June (Figure 10), a bloom was measured at Station 1, at the mouth of Ballona Creek, and the only places where DO hovered as low as 5 ppm was at the bottom at Stations 10 and 11. In July 1984, DO data suggested that most of the Marina was eutrophic, with blooms producing high oxygen levels (Figure 11). The only exception was at Station 10, where bottom oxygen dropped to 4 ppm, but even this level was higher than that in 1978.

September 1984 (Figure 12) showed generally high levels throughout the water column at Stations 1 through 5. At most of the other stations surface values were high but bottom DO levels were quite low. Thus bottom readings reached 1.0 ppm at Station 6, 2.1 ppm at Station 8, and 2.5 ppm at Station 9. These values may well indicate that the bloom was dying off in the bottom waters, or that the extremely warm waters have decreased the saturation point for DO, exerting further stress on the system.

High oxygen levels continued into October 1984 (Figure 13) but no very low DO values were recorded at that time. Such conditions are transitory, however, and monitoring a day or two later might have created a different picture if a bloom had started to die. High oxygen levels continued into November as well (Figure 14) at Stations 1, 4, and 6, and were slightly below normal at Stations 2, 3, 5, and 11. The remainder of the stations clustered around 5-6 ppm, except at Stations 12 and 13, where values dropped below 5 ppm.

Although low oxygen episodes have been associated with periods following heavy rains, which bring in debris with high oxygen demand, no particular factors have been associated with the patchy phytoplankton blooms that occur in the Marina during much of the warm weather. The low circulation and flushing tend to keep the phytoplankton concentrated, and nutrients are plentiful, so that blooms may be maximized.

<u>Hydrogen Ion Concentration (pH)</u>

The usual range of pH in the ocean is approximately 7.5 to 8.4 (Sverdrup et al., 1946). The higher values occur near the surface and in areas of high photosynthetic activity. High pH levels may be found in bays and estuaries unless hydrogen sulfide is present produced by anoxic sediments, in which case the pH may fall below 7.0. Phytoplankton utilization of carbon dioxide may also reduce pH.

The pH levels were within the normal range throughout the 1984 study. The only month that showed any deviation was June where levels down to 7.2 were recorded. This was during a period of phytoplankton bloom but conditions were not greatly different from those that occurred at other periods. The possibility exists that this could have been a probe malfunction as well, although instruments are calibrated against pH standards before each cruise.

Light Transmittance

Light transmittance is measured with a modified Hydroproducts transmissometer which measures the passage of a beam from a self-contained light source through the water as the tube is lowered through the water column. Waters offshore along the coast may range from a transmittance of 95 percent down to 80 percent but waters in the Marina would not show that degree of clarity due to suspended sediments and phytoplankton. Waters at Station 1 and 2 and in the entrance channel measured in the 80 to 95 percent range except during May and June when the range at Stations 3, 4, and 5 was 60 to 80 percent. Transparency ranged downward from about 70 percent at the inner stations, and as might be expected, reached as low as 28 percent near the bottom.

Many of the normal Marina organisms including fish species would not occur in the area if the waters were not turbid, but other species will avoid such waters. Turbidity offers juvenile fish protection from visibility to predators as well as providing the suspended plankton on which they may feed.

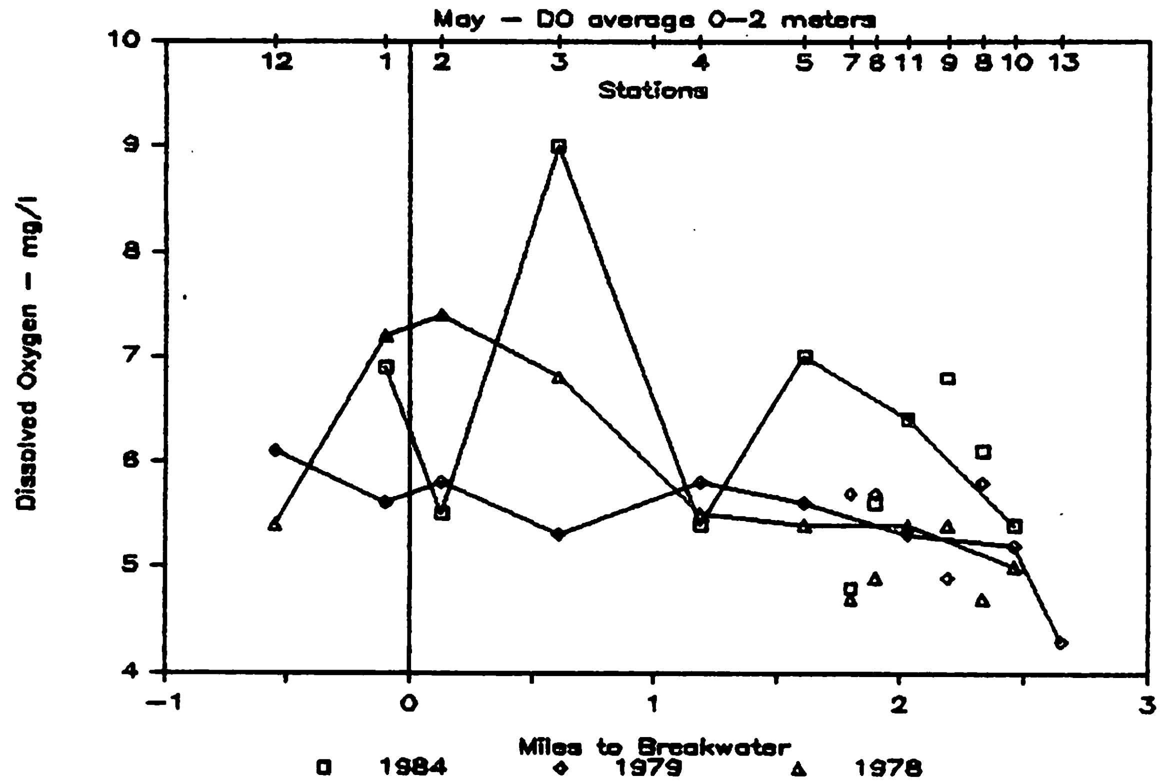

FIGURE 9A. MAY DISSOLVED OXYGEN IN SURFACE TO 2M DEPTH, AVERAGED. STATIONS ARE PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE OFF PLOT IN SIDE BASINS.

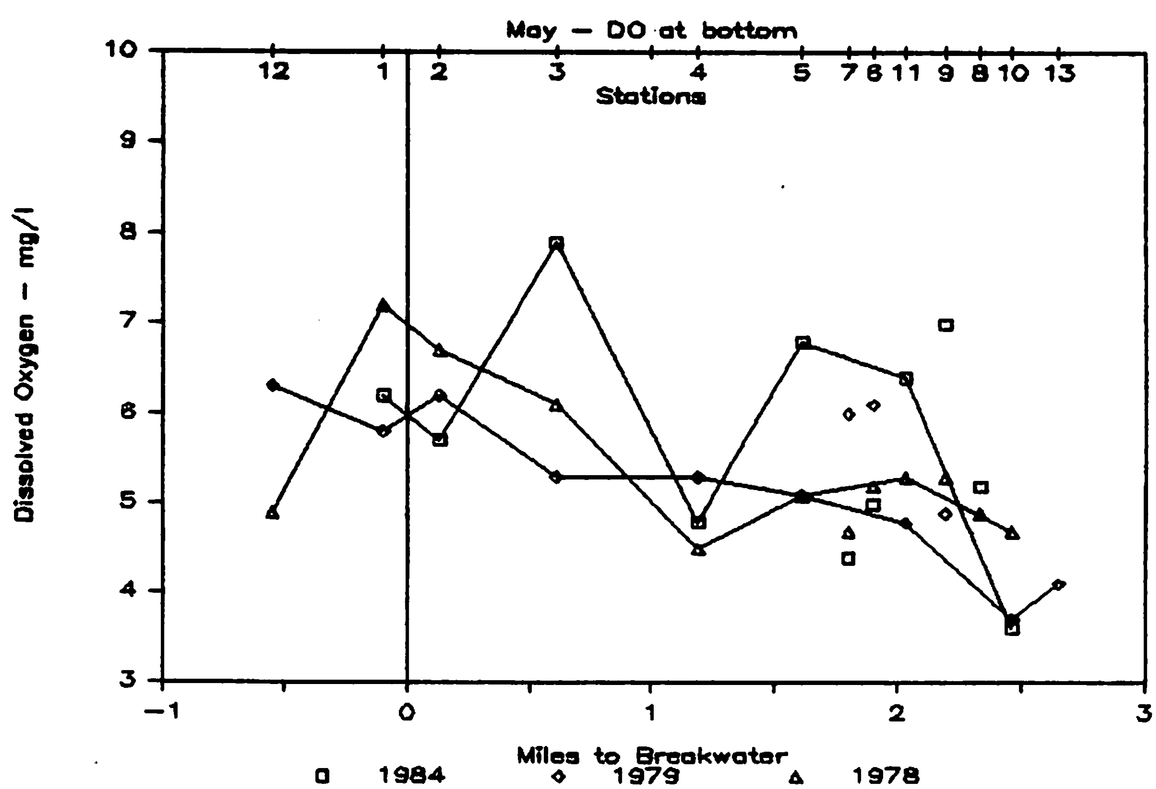

FIGURE 9B. MAY DISSOLVED OXYGEN IN BOTTOM WATERS.

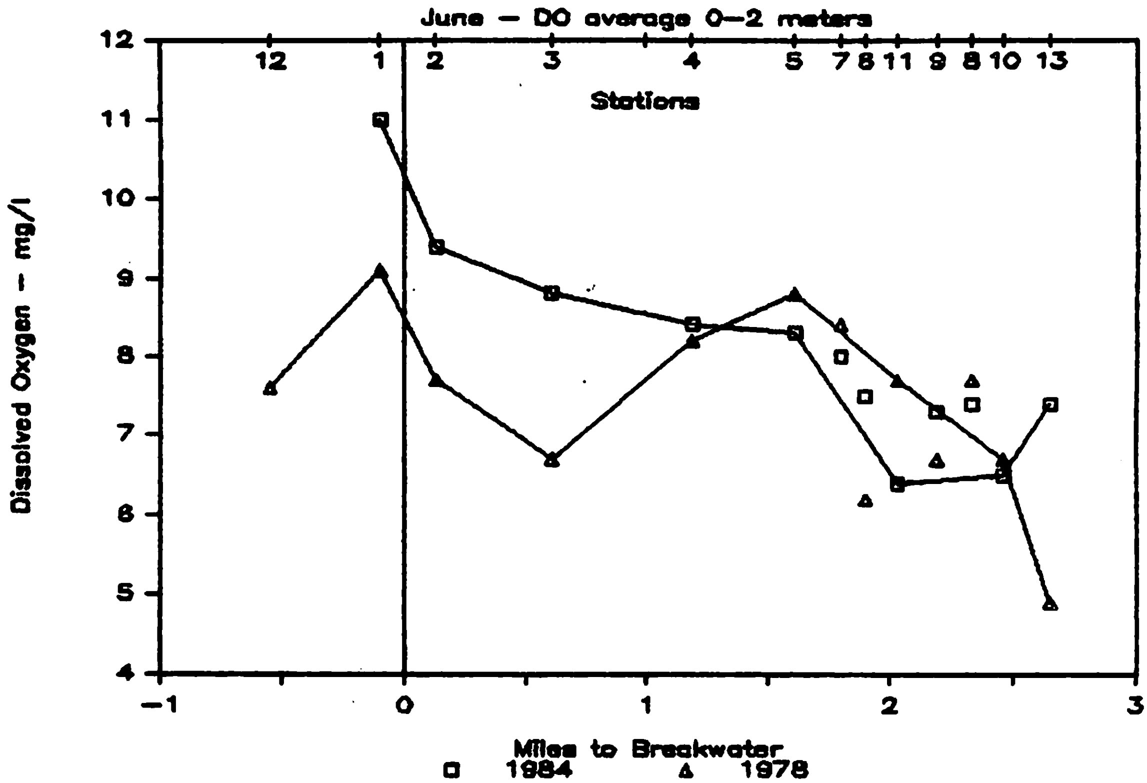

FIGURE 10A. JUNE DISSOLVED OXYGEN IN SURFACE TO 2M DEPTHS AVERAGED. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE IN SIDE BASINS OFF LINEAR PLOT.

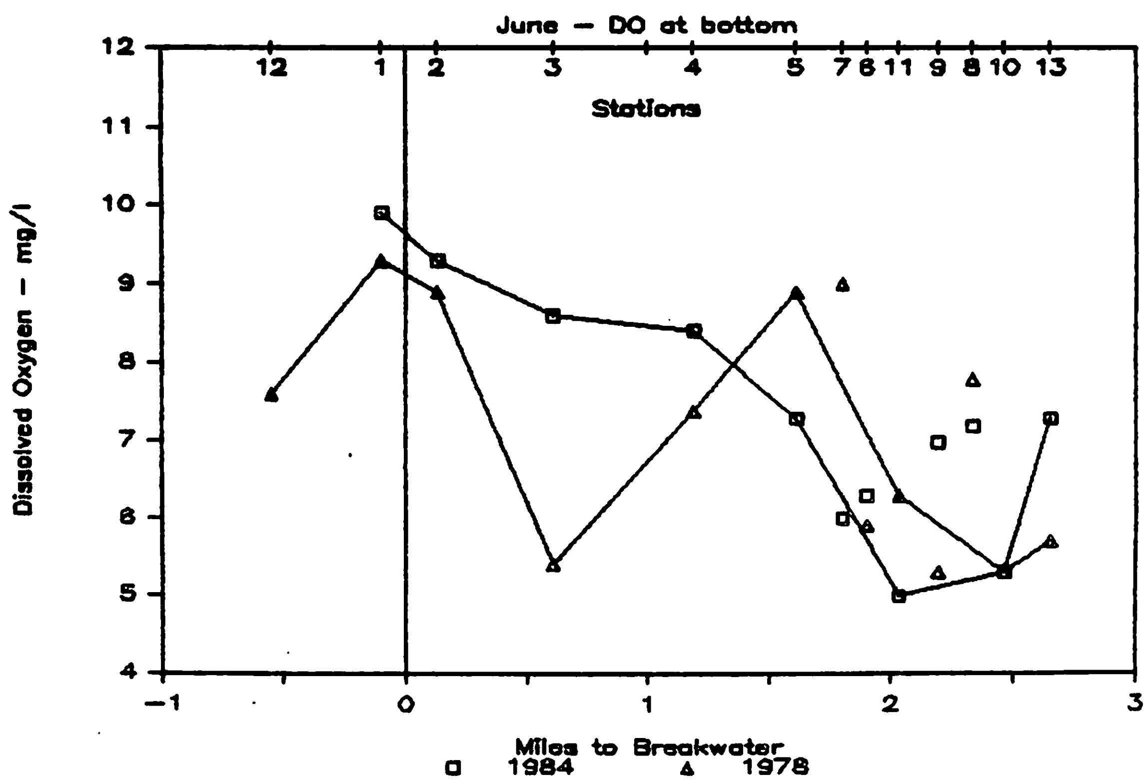

FIGURE 10B. JUNE DISSOLVED OXYGEN IN BOTTOM WATERS.

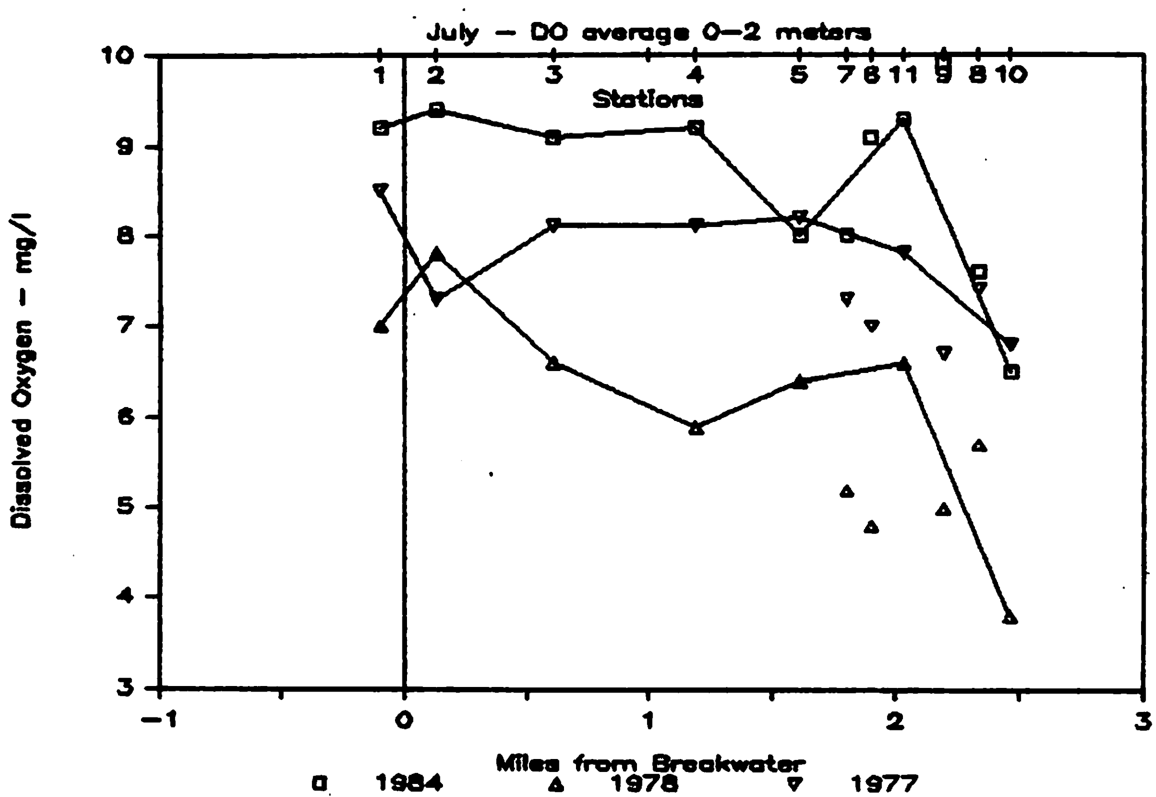

FIGURE 11A. JULY DISSOLVED OXYGEN IN SURFACE TO 2M DEPTHS AVERAGED. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE OFF LINEAR PLOT IN SIDE BASINS.

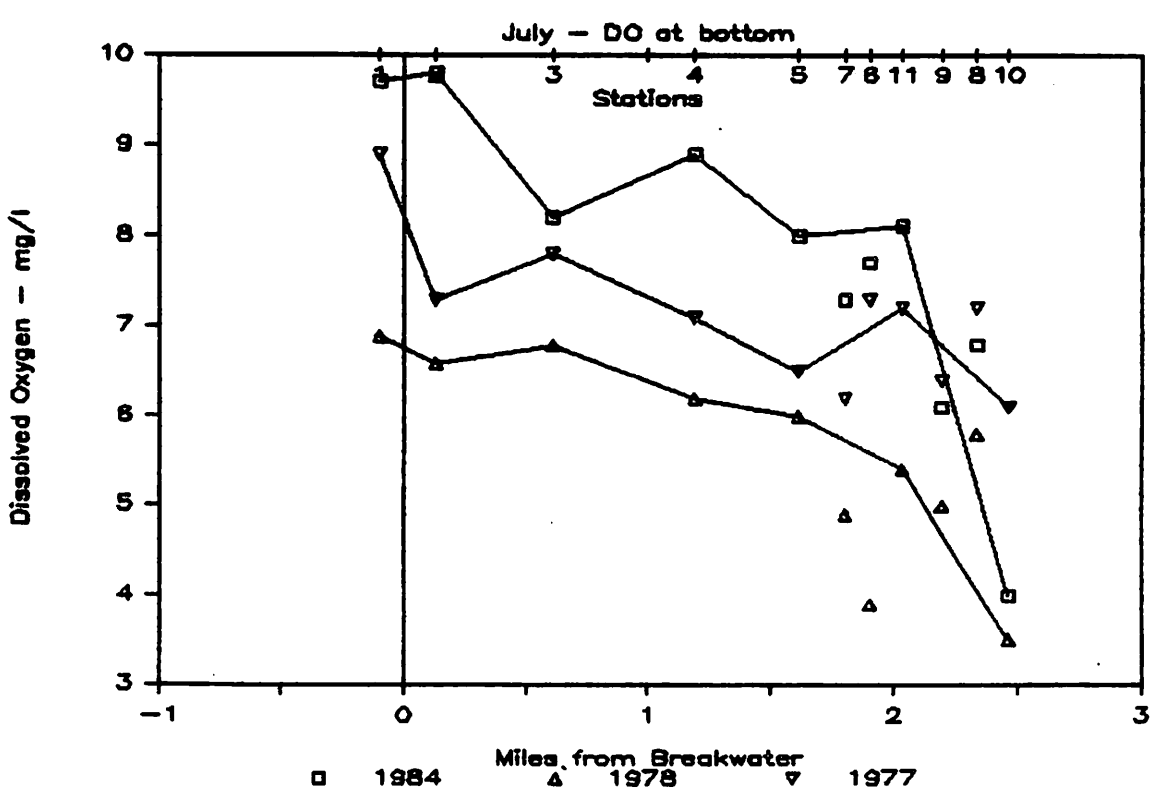

FIGURE 11B. JULY DISSOLVED OXYGEN IN BOTTOM WATERS.

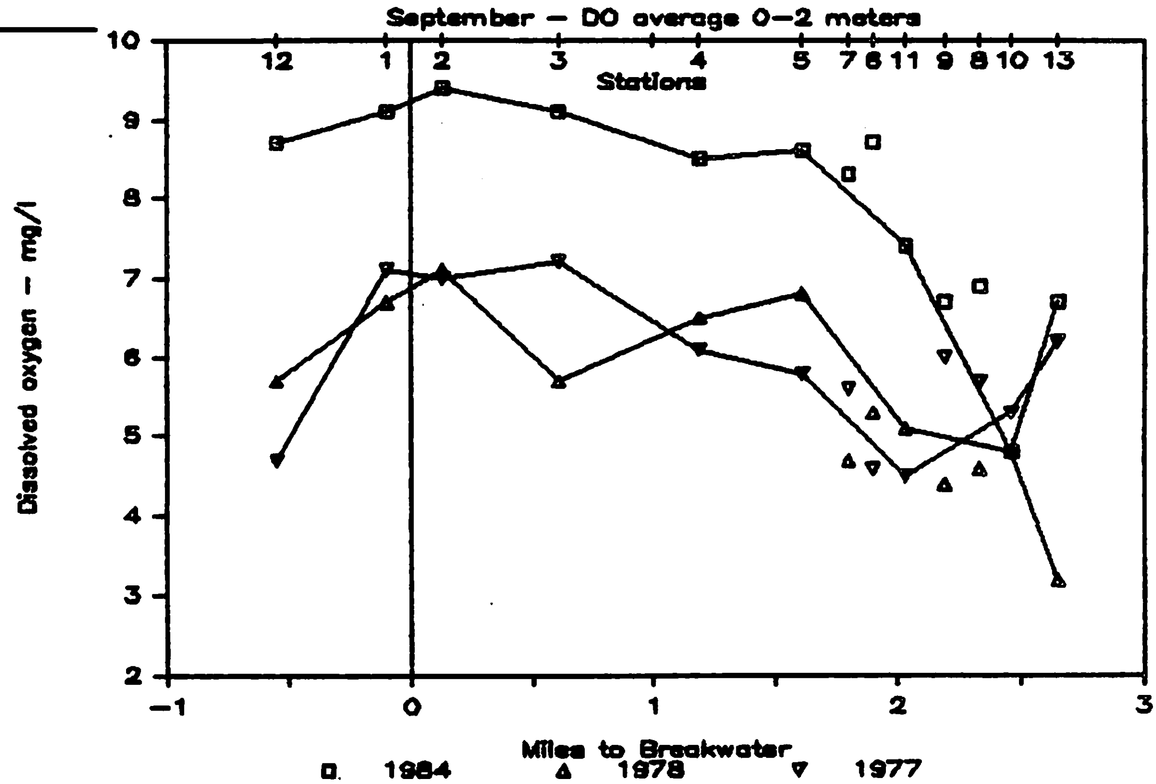

FIGURE 12A. SEPTEMBER DISSOLVED OXYGEN IN SURFACE TO 2M DEPTHS, AVERAGED. STATIONS ARE PLOTTED IN DISTANCE FROM BREAKWATER, STATIONS 6,7,8,9 AND 10 LIE OFF LINEAR PLOT IN SIDE BASINS.

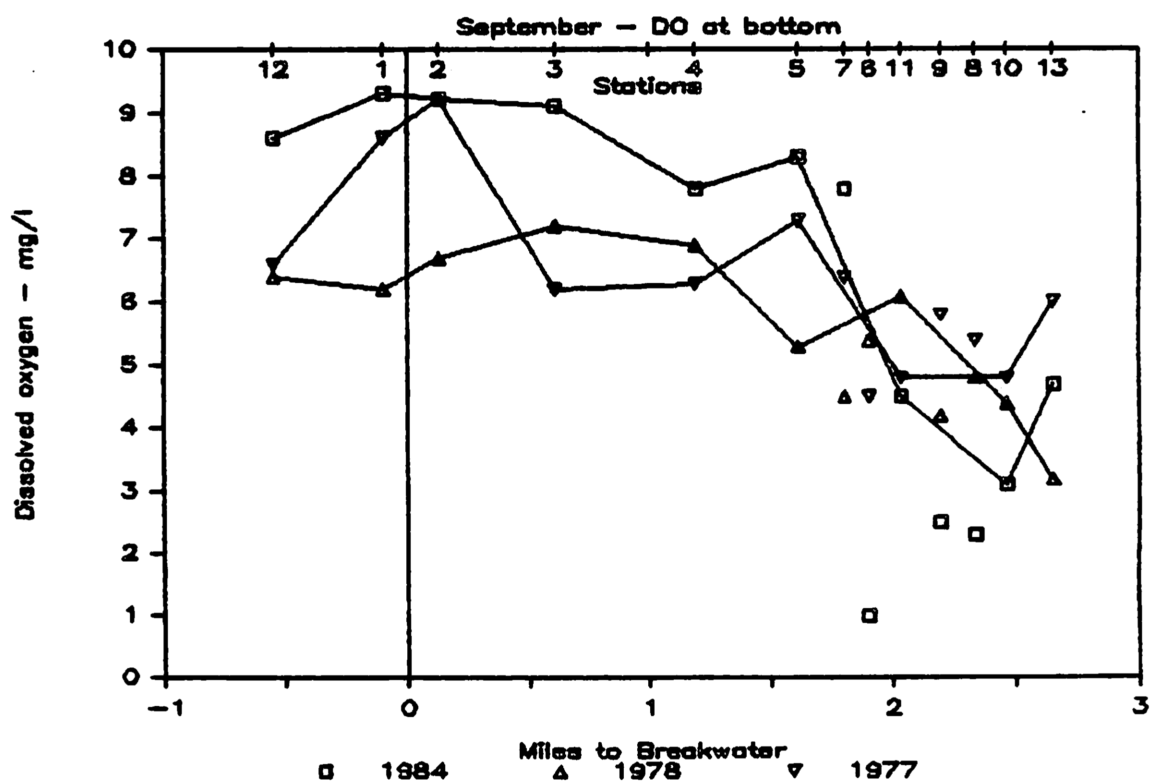

FIGURE 12B. SEPTEMBER DISSOLVED OXYGEN IN BOTTOM WATERS.

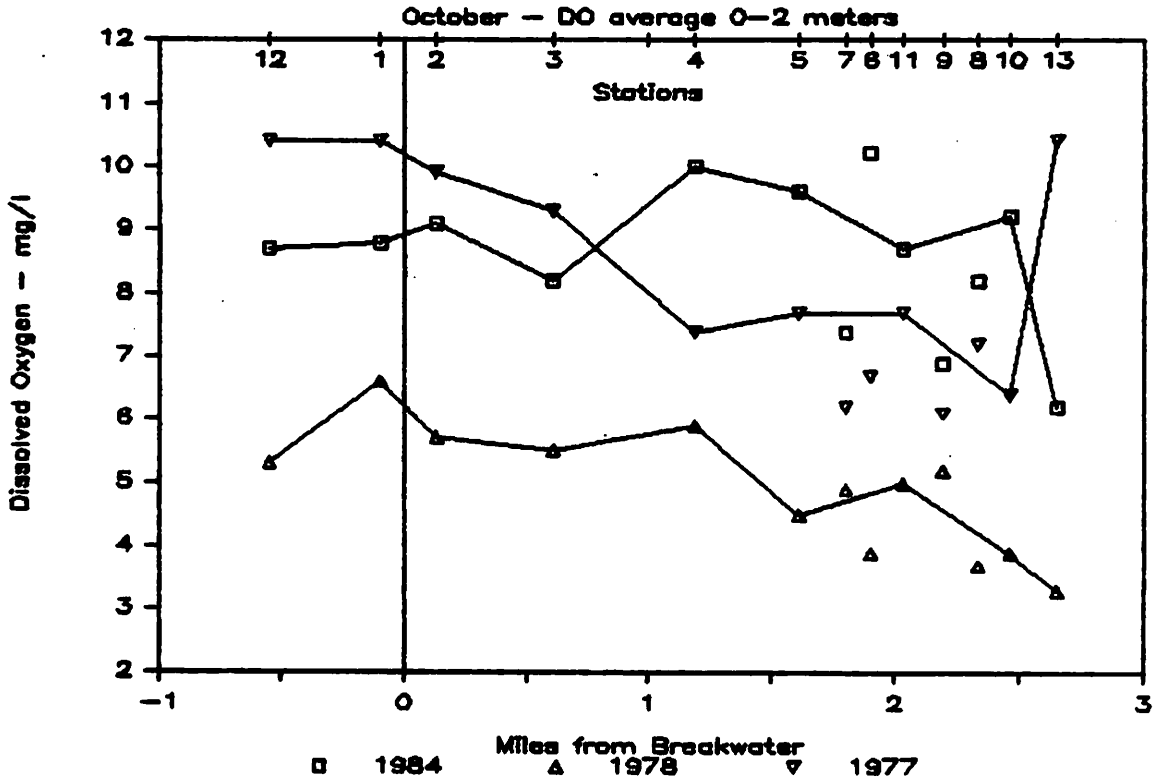

FIGURE 13A. OCTOBER DISSOLVED OXYGEN IN SURFACE TO 2M DEPTHS, AVERAGED. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE IN SIDE BASINS OFF PLOT.

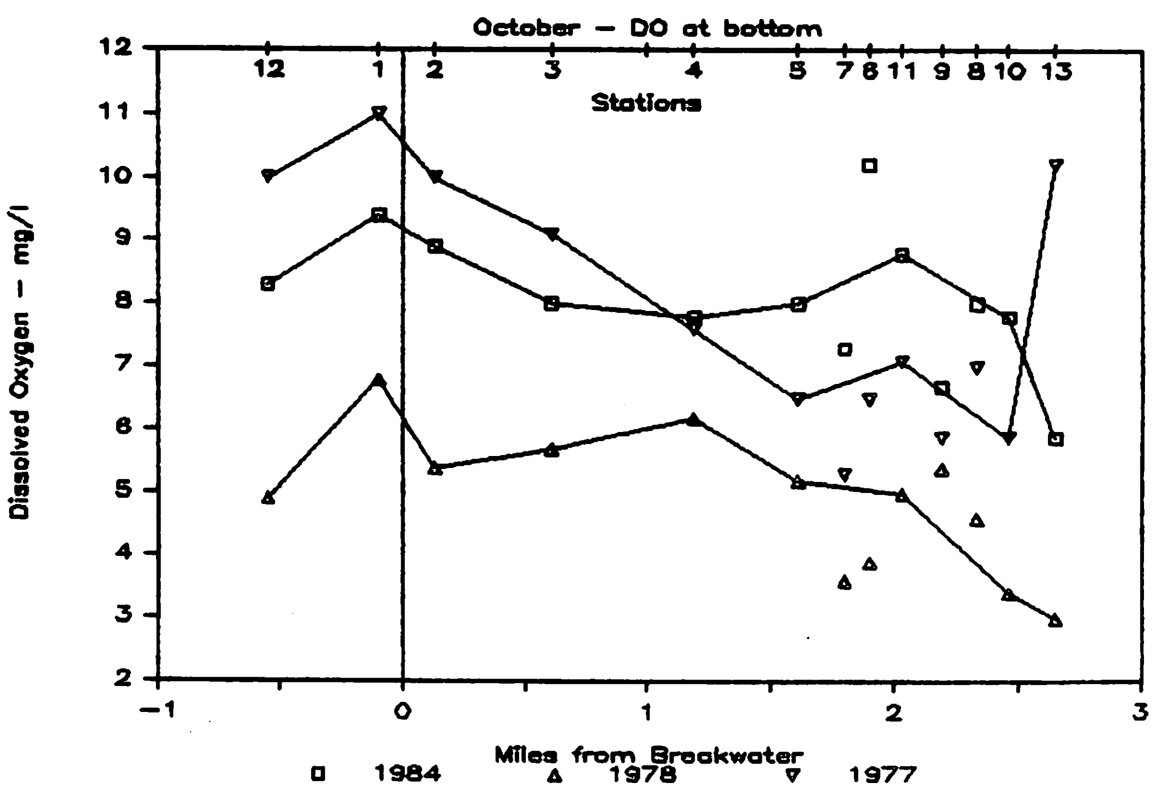

FIGURE 13B. OCTOBER DISSOLVED OXYGEN IN BOTTOM WATERS.

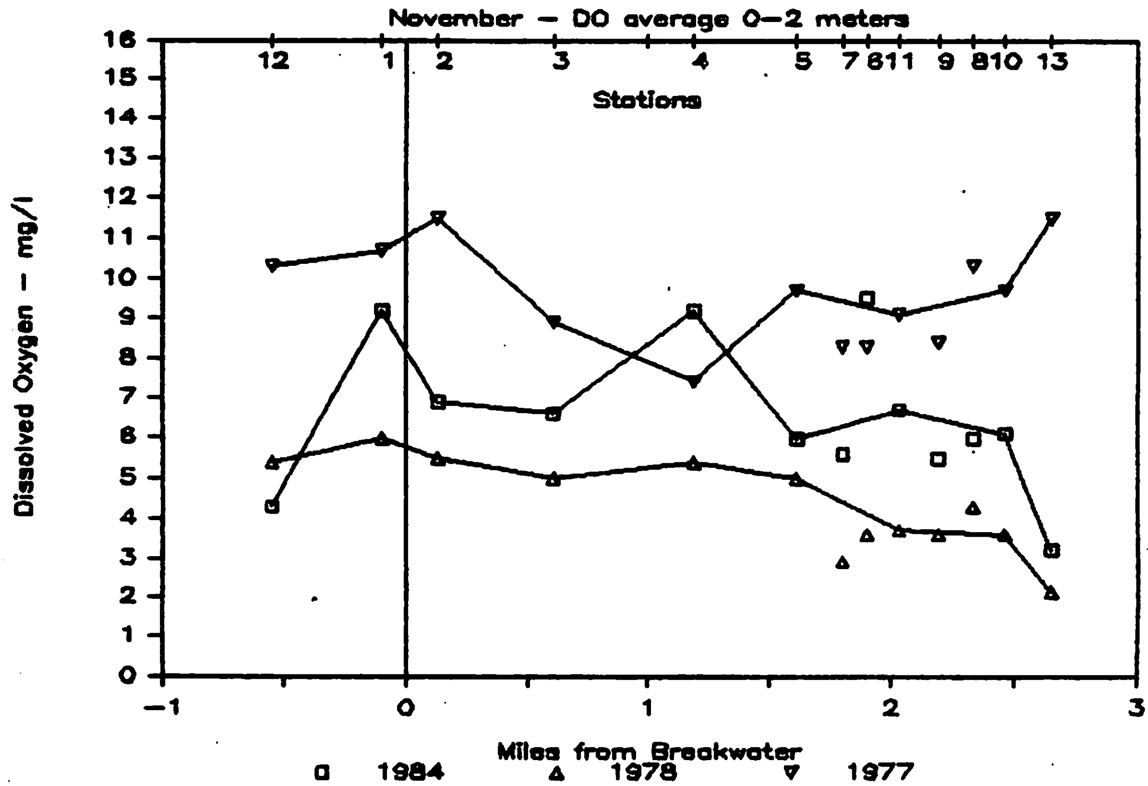

FIGURE 14A. NOVEMBER DISSOLVED OXYGEN IN SURFACE TO 2M DEPTHS, AVERAGED. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM THE BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE IN SIDE BASINS OFF PLOT.

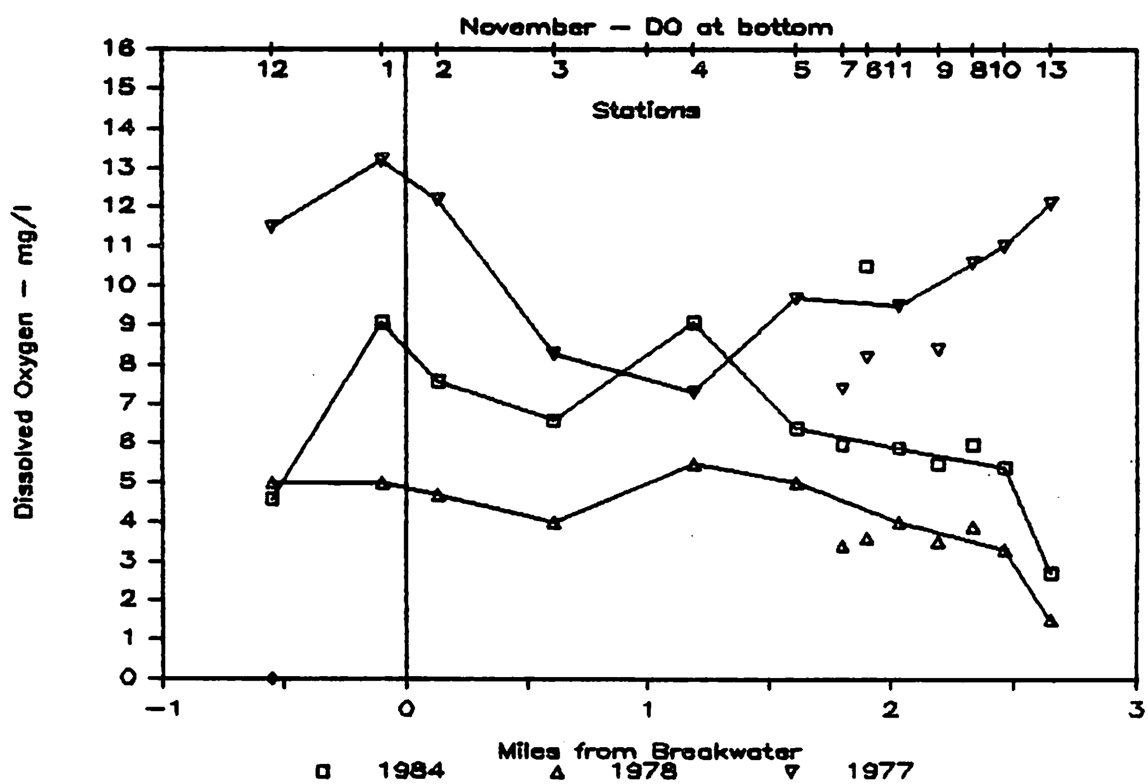

FIGURE 14B. NOVEMBER DISSOLVED OXYGEN IN BOTTOM WATERS.

NUTRIENTS

Nitrate, nitrite and ammonia are soluble inorganic forms of nitrogen that are essential nutrients in the sea, along with phosphate and silicate. Nitrogen and phosphate are utilized by phytoplankton in the upper layers of the photic zone whereas silicate is used by diatoms to build their exoskeletons (tests).

In earlier marine studies only surface samples were analyzed for nutrients but in the present study, water samples were taken at surface, 2m and 4m. Ammonia samples were acidified with concentrated hydrochloric acid to fix the unionized ammonia, chilled and returned to the laboratory for analysis. There, samples were treated with sodium hydroxide and immediately read with an Orion specific ion probe for total ammonia. Other water samples were iced in the field and frozen in the laboratory until thawed for filtration and analysis of nitrite, nitrate, phosphate and silicate using a Technicon AutoAnalyzer. The AutoAnalyzer data are tabulated in Tables 2 through 6 and ammonia data are given in Appendix A.

Ammonia

About 95 percent of the ammonia in the sea is in the ionized form (NH_4^+) at pH 8, with the un-ionized toxic form (NH_3) as the remaining five percent (Morel and Schiff, 1983). The toxic form is about 40 percent lower in seawater than in fresh water. Increasing pH by one unit causes nearly a tenfold increase in NH_3 and a 5°C temperature rise increases NH_3 by 40-50 percent.

Most marine algae preferentially take up NH_4^+ over nitrate (NO_3^-), switching to NO_3^- when ammonia is depleted. This may be due to lower amount of energy needed since ammonia can be directly incorporated into proteins while nitrate must be converted to the amino form (Valiela, 1984). Ammonia is measured in microgram-atoms of nitrogen per liter, written as ug-at/L or ug-at/L^{-1}. This is equal to 0.017 milligrams/L of ammonia nitrogen. In open ocean the level may range from 0.1 to 0.5 ug-at/L and in Santa Monica Bay near the Hyperion sewage outfall it ranges from about 2.0 to 5.0 ug-at/L (Morel and Schiff, 1983). The highest levels found in the Marina were around 30 ug-at/L (about 0.5 mg/L). The sources of the ammonium are in the bacterial degradation of organic wastes such as sewage and decay of plant and animal debris or hydrocarbons. Marine animals also excrete ammonia but this source is minimal as compared with wastes.

Surface ammonia levels averaged slightly higher in 1984 compared to 1976-1978, and higher concentrations were found below the surface. A change to the Orion probe from wet chemical methods used previously did not seem to produce notable differences in values. Ammonium concentrations tend to be higher at Ballona Creek and the mouth of the Marina (Stations 1 and 2), with relatively low levels in the entrance channel. Levels rise in the main channel, and are usually highest in the basins and at the Oxford Flood Control Basin. In May 1984, this trend was evident (Figure 15) at the 2m and 4m depths while surface ammonia was low. The oxygen profile had suggested a phytoplankton bloom in progress in the entrance channel, which might explain the lower ammonia as due to phytoplankton uptake.

The June ammonia values were higher than in May; DO readings (Figure 10) suggesting a bloom at Station 1 and ammonia was low there (Figure 16). As the DO decreased toward the interior of the Marina, ammonia showed a steep rise, especially at the surface. This suggests die-off of a bloom but could also indicate input of wastes that were being degraded. July ammonia values were generally low (Figure 17; note lower scale than in June). This corresponds well with the generally high dissolved oxygen levels indicative of phytoplankton activity, except for bottom waters at

Station 10 (Figure 11b).

September ammonia values were the lowest of the year, below 8 ug-at/L except at Station 13 (Figure 18). Dissolved oxygen, however, was high in surface waters throughout most of the Marina except at Station 10, but in bottom waters the DO dropped radically inward from Station 7. October ammonia values (Figure 19) were similar to that of June and relatively uniform except for peaks at the surface at Station 4, at 2m at Station 7, and at 4m at Station 8. The October DO profile (Figure 13a,b) showed high levels with a peak at Station 6 and a drop at Station 13. November ammonia levels (Figure 20) gave the highest mean of the year but were fairly uniform throughout the water column, except at Station 8, which had 29.2 ug.at/L. Oxygen levels were high only at Station 3 (Figure 9a,b), which also had the lowest level of ammonia.

The ammonia levels found in the Marina were well below EPA limits for chronic exposure and California Ocean Plan limits for effluents.

Nitrate and Nitrite

Nitrate is generally the most abundant form of inorganic nitrogen in the open ocean (Valiela, 1984), but it may disappear in the photic zone during phytoplankton blooms. In winter the amounts may rise if phytoplankton production is low. Although nitrate is readily taken up by phytoplankton, ammonia is preferred over nitrate. Nitrite is present only in small quantities, since it is an intermediate product in the nitrification - denitrification processes. The AutoAnalyzer measures a combined value for nitrate and nitrite and a separate value for nitrite, so that nitrate is determined by subtracting nitrite value from the combined NO_3 & NO_2 values. Figures 21 to 25 display the Marina data for 1984.

The highest amounts of nitrate - nitrite were found in June 1984 at Station 10 with 17.7 ug-at/L, and in November, when it reached 24.1 ug-at/L in Ballona Creek at Station 12. The other readings are for the most part low, with especially low values in July. This pattern is similar to that of ammonia, which suggest that phytoplankton probably are utilizing the nitrogen as rapidly as it is generated in the summer but the phytoplankton are depleted in November, allowing nitrogen increases.

Total Inorganic Nitrogen

Total inorganic nitrogen is determined by adding the values for NO_2 and NO_3 obtained from the AutoAnalyzer to the ammonia as measured using the Orion electrode method. Figures 26 to 30 display those results. In most cases the curves are very similar to the curves for ammonia by itself (Figures 15-20) except for the peaks that were noted in nitrate, which otherwise occurred at low levels.

Phosphate - Phosphorus

The chemistry of phosphorus in seawater is complex since under aerobic conditions it adsorbs to calcium carbonate and clay particles, tends to form insoluble salts with heavy metals and occurs in marine organisms in organic compounds such as proteins and nucleic acids. Phosphates will rapidly be regenerated by the decomposition of organisms and phytoplankton and excretory products. In anaerobic environments, hydrogen sulfide can reduce iron in complex forms resulting in an increase in solubility of phosphates (Jeffries, 1966; Valiela, 1984). Phosphates occur in the seas at approximately 1.0 to 2.0 mg-at/m^3. Bacteria and primary producers take phosphorus up rapidly, keeping levels low.

Figures 31 to 35 illustrate the profiles for phosphates in the Marina in 1984. Levels are low with the exception of Station 12, in Ballona Creek, where peaks were recorded in September, October and November, with a high of almost 4 ug-at/L in November. The general trend was for rising levels in the Inner Marina, with some exceptions. Whether any of these peaks represent phosphate detergents is unknown. More likely they represent the amount of decaying organic matter, and possibly the increased solubility of phosphate in the sulfide anaerobic muds.

Silicate

Silicate is present principally as the degradation product of diatoms and radiolarians when their tests are dissolved. Those that pass through the digestive tracts of other animals tend to break down more rapidly.

The silicate concentrations in the Marina ranged from less than 2 ug-at/L to more than 60 ug-at/L (Figures 36 to 40). There was a general trend of rising values in the Inner Marina, with high values at Station 10, and at times at Station 13. The other peaks were at Station 1, Ballona Creek.

Comparison of 1984 Nutrient Data with Earlier Information

Nutrient salt concentrations are non-conservative in the marine environment and consequently can vary considerably in local concentrations because of biological cycling and changes in rates of natural replenishment. In Marina Del Rey, their presence also reflects not only varying natural conditions of weather and tide, which affect runoff, but also artificial inputs stemming from patterns of land use in the area which may affect one or more sampling stations but not all of them. Consequently direct numerical comparison of concentrations from month to month or year to year are difficult since the data may vary by one or two orders of magnitude at the same station on consecutive monthly samplings.

Patterns of distribution, however, can yield information on factors affecting all or part of the waters of the Marina either as a temporary disturbance or as a relatively constant feature of the environment. Figures 15 through 42 show some of these patterns for the data collected in 1984. The data suggest that the Oxford Flood Control Basin is a constant source of eutrophic enrichment for the Marina while Ballona Creek and Ballona Lagoon are less constant sources but do significantly contribute substantial quantities of nutrients.

Quantitative comparison of 1984 data with data from 1977-1979 mean values shows that summer levels of nutrients are rapidly utilized but levels are high in November and December also, by ranking the data in order of magnitude, comparisons can be made which indicate that the patterns of enrichment are, for the most part, consistent throughout the Marina from year to year.. The earlier data do not include samples from Stations 12 in Ballona Creek, and 13, the Oxford Flood Control Basin, but do support the conclusions based on the 1984 data regarding the sources of nutrient input to the waters of Marina del Rey.

BIOCHEMICAL OXYGEN DEMAND (BOD)

Biochemical oxygen demand was measured in water samples twice in 1984, in June and November. Figures 41 and 42 illustrate the data. The range of values are not greatly different from those obtained offshore along the coast, which may be considered ambient levels. There were peaks at Station 3, adding to the other indications that the Ballona Lagoon system introduces pollutant loadings to the Marina. Other high values occurred in similar locations of pollutant inputs, at Stations 10 and 13. The high BOD levels at Station 3 were inversely related to the low dissolved oxygens recorded there (Figure 10 a,b). If BOD were measured immediately after a rainfall, the readings would no doubt be much higher due to the high oxygen demand of debris and pollutants. Also, during storms the resuspension of anoxic sediments can cause high oxygen demand because of changes in the chemical state of metals, organics and minerals.

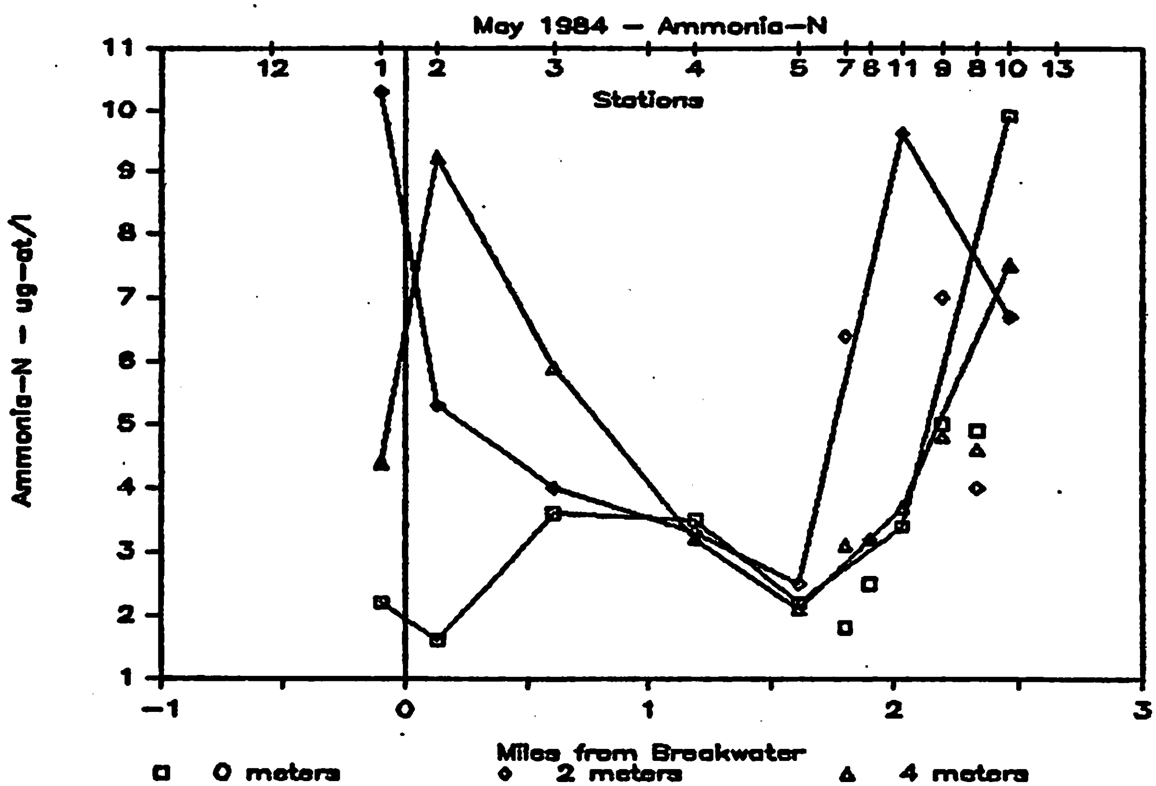

FIGURE 15. AMMONIA-NITROGEN (UG-AT/L) IN MAY AT SURFACE, 2 AND 4M. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9, AND 10 LIE OFF LINEAR PLOT IN SIDE BASINS. (UG-AT NH_4/L = 0.017 MG NH_4/L)

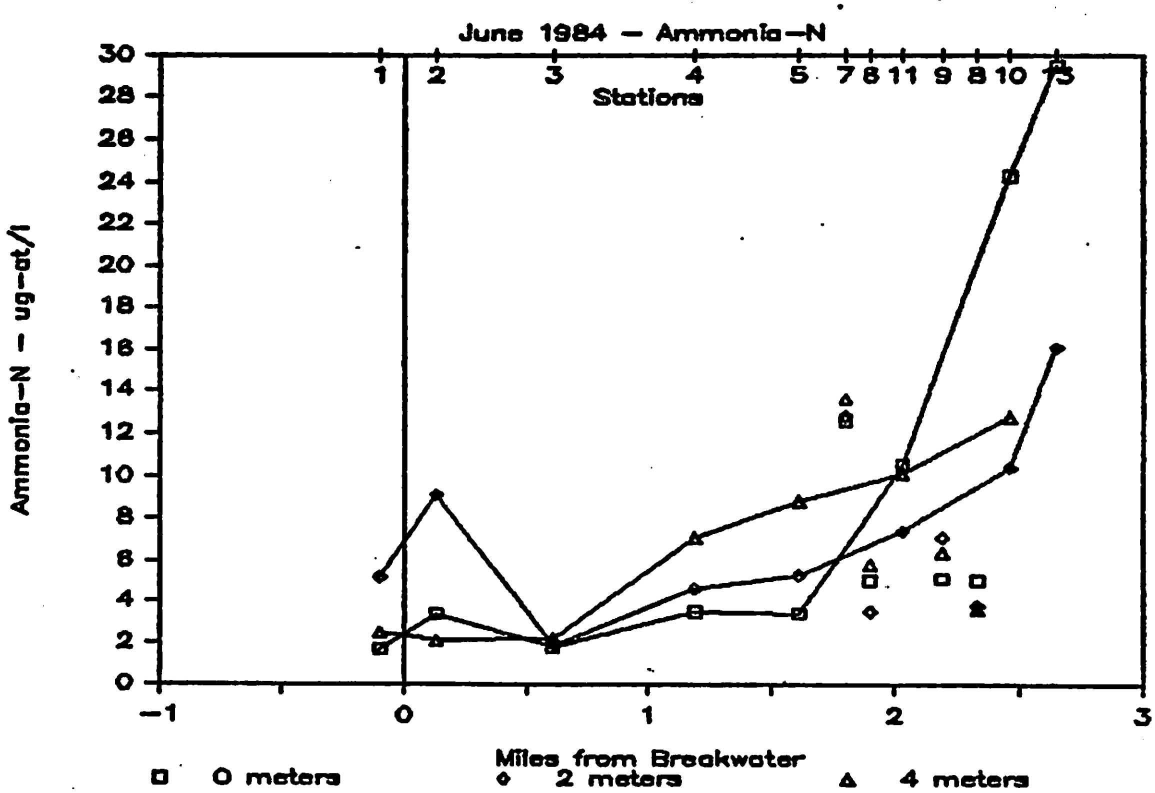

FIGURE 16. AMMONIA-NITROGEN (UG-AT/L) IN JUNE 1984.

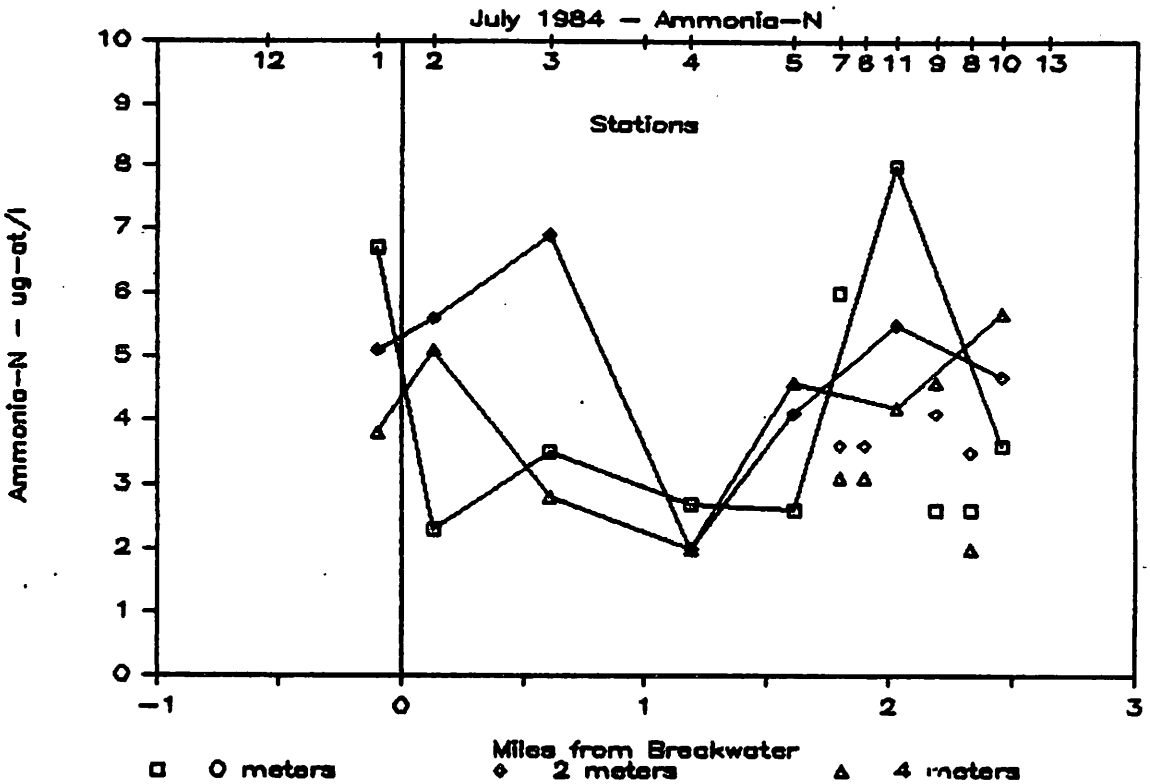

FIGURE 17. AMMONIA-NITROGEN IN UG-AT4/L, JULY 1984, AT SURFACE, 2 AND 4M. STATIONS ARE PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER. STATIONS 6,7,8,9, AND 10 LIE OFF LINEAR PLOT IN SIDE BASINS. (1 UG-AT NH_4/L = 0.017 MG NH_4/L)

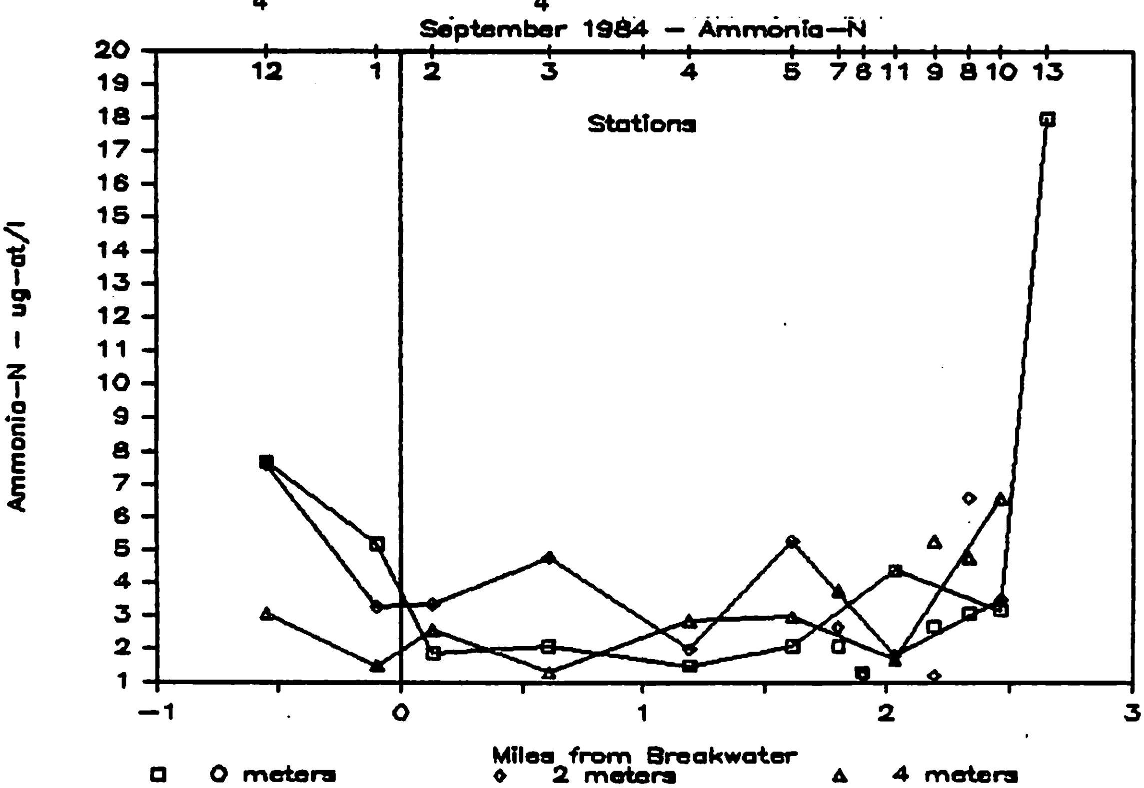

FIGURE 18. AMMONIA-NITROGEN IN SEPTEMBER 1984 (UG-AT/L)

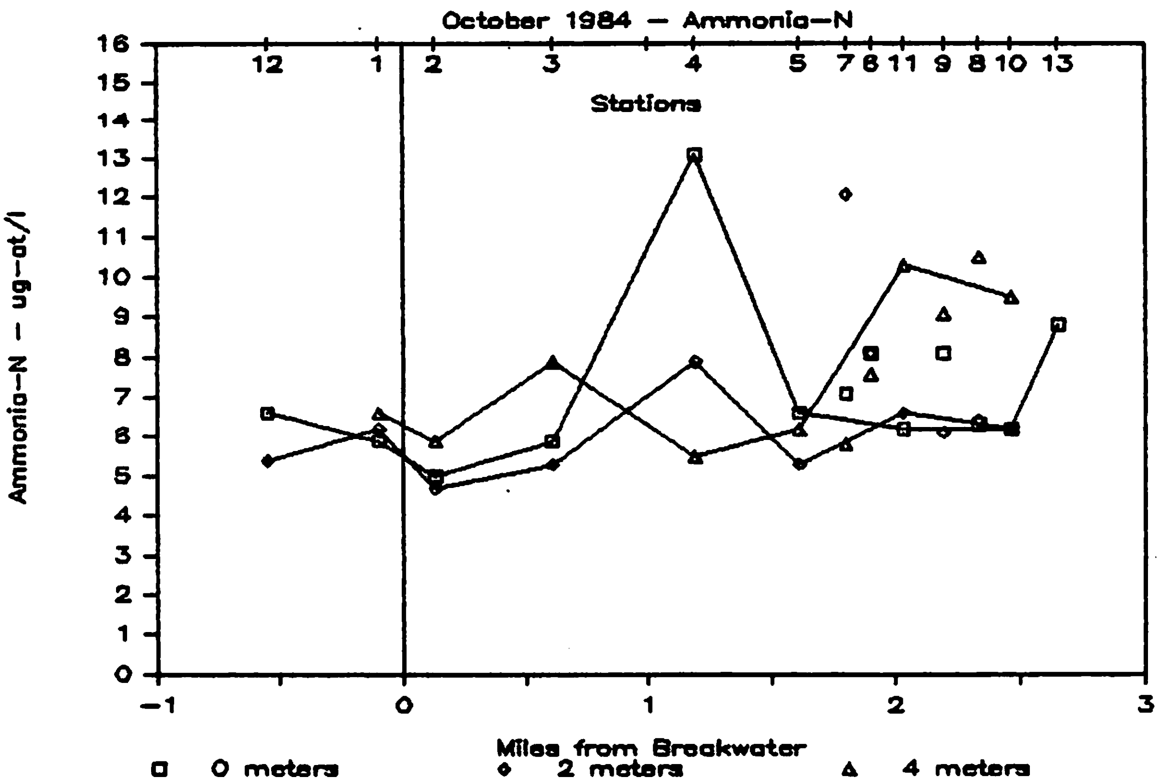

FIGURE 19. AMMONIA-NITROGEN (UG-AT NH_4/L IN OCTOBER 1984, AT SURFACE, 2 AND 4M. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9, AND 10 LIE OFF PLOT IN SIDE BASINS. (1UG-AT NH_4/L - 0.027 MG NH_4/L)

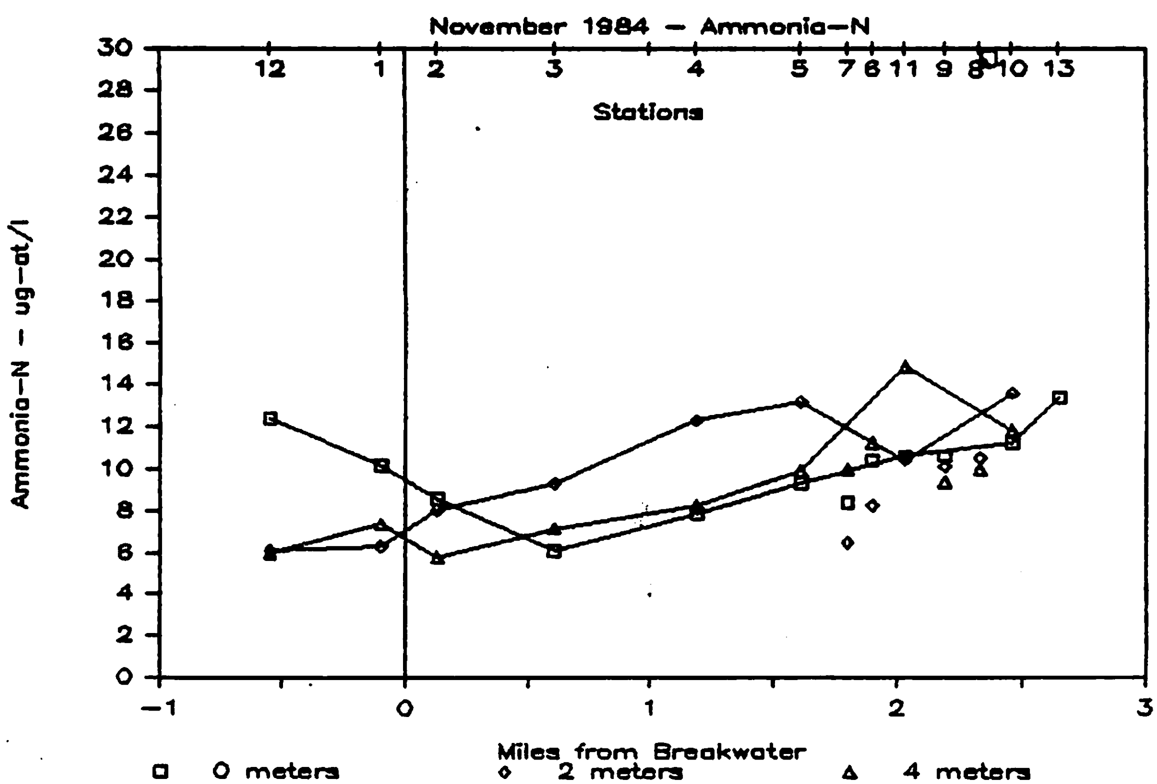

FIGURE 20. AMMONIA-NITROGEN IN NOVEMBER 1984 (UG-AT/L). NOTE PEAK AT STATION 8 AT THE SURFACE.

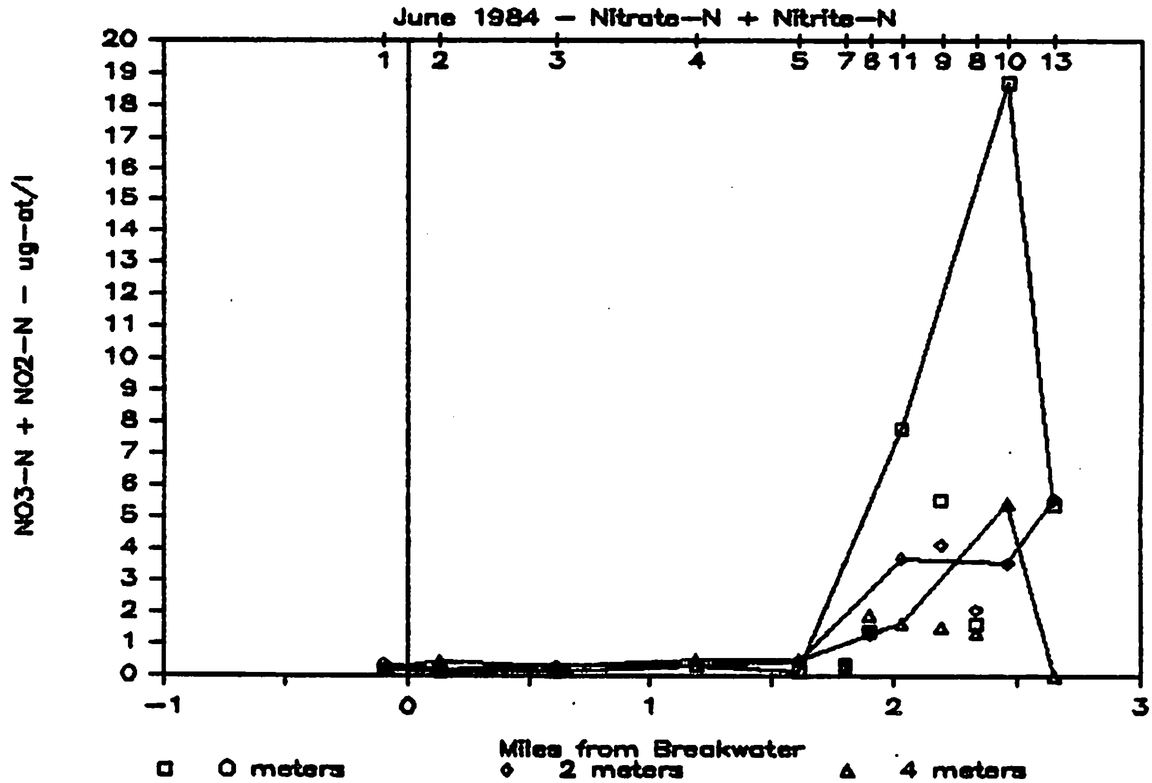

FIGURE 21. NITRATE AND NITRITE TOTALED (UG-AT/L) JUNE, 1984. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM THE BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE OFF PLOT IN SIDE BASINS.

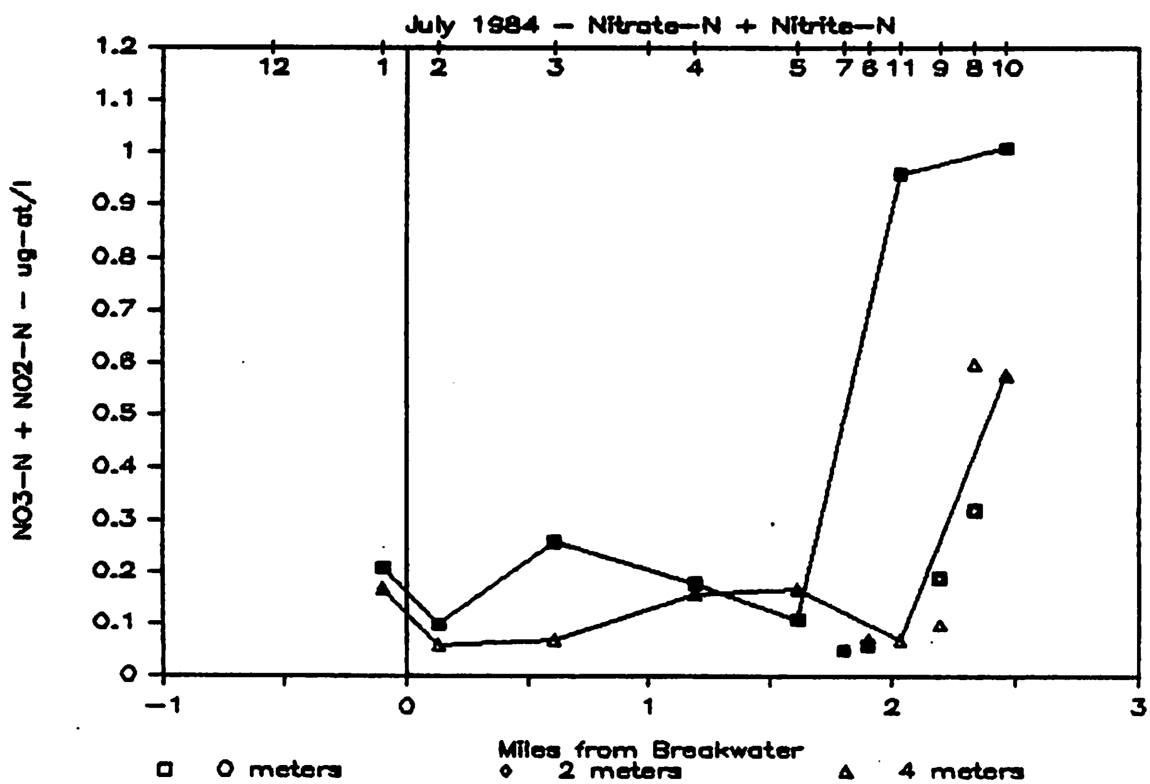

FIGURE 22. NITRATE AND NITRITE TOTALED (UG-AT/L) JULY 1984.

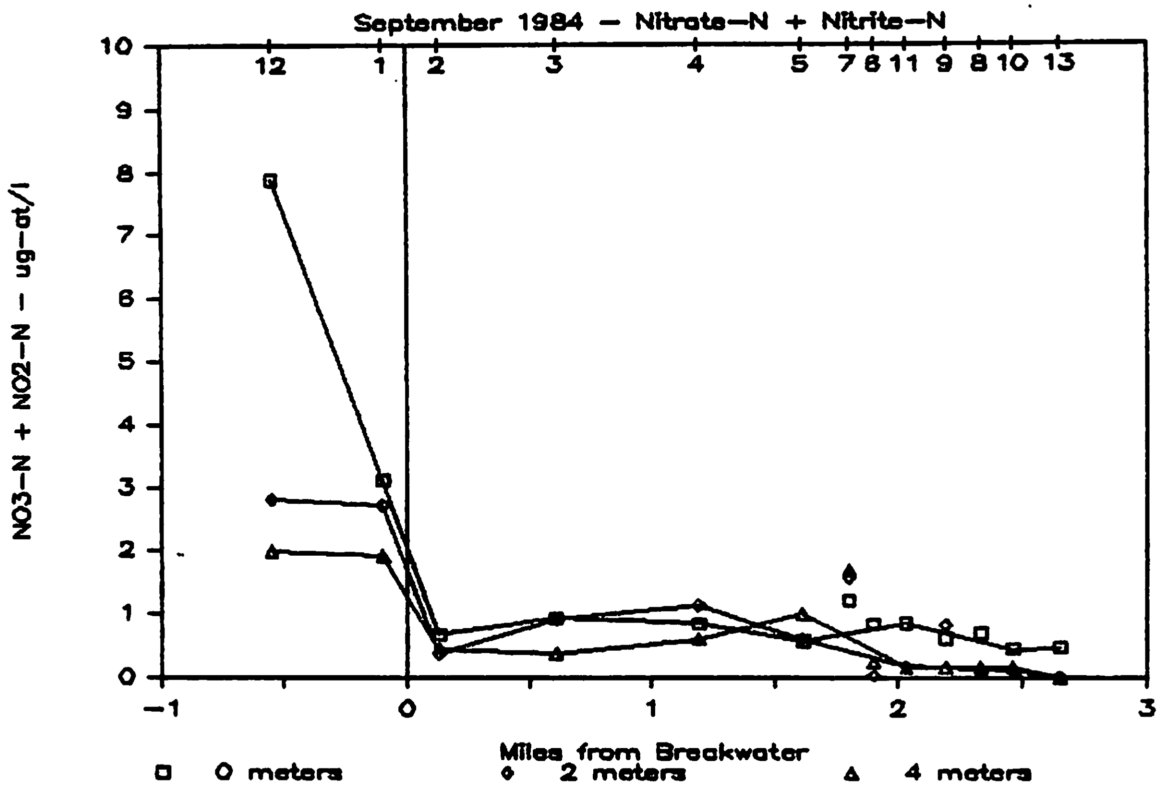

FIGURE 23. NITRATE AND NITRITE TOTALED (UG-AT/L) SEPTEMBER 1984. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9, AND 10 LIE OFF PLOT IN SIDE BASINS.

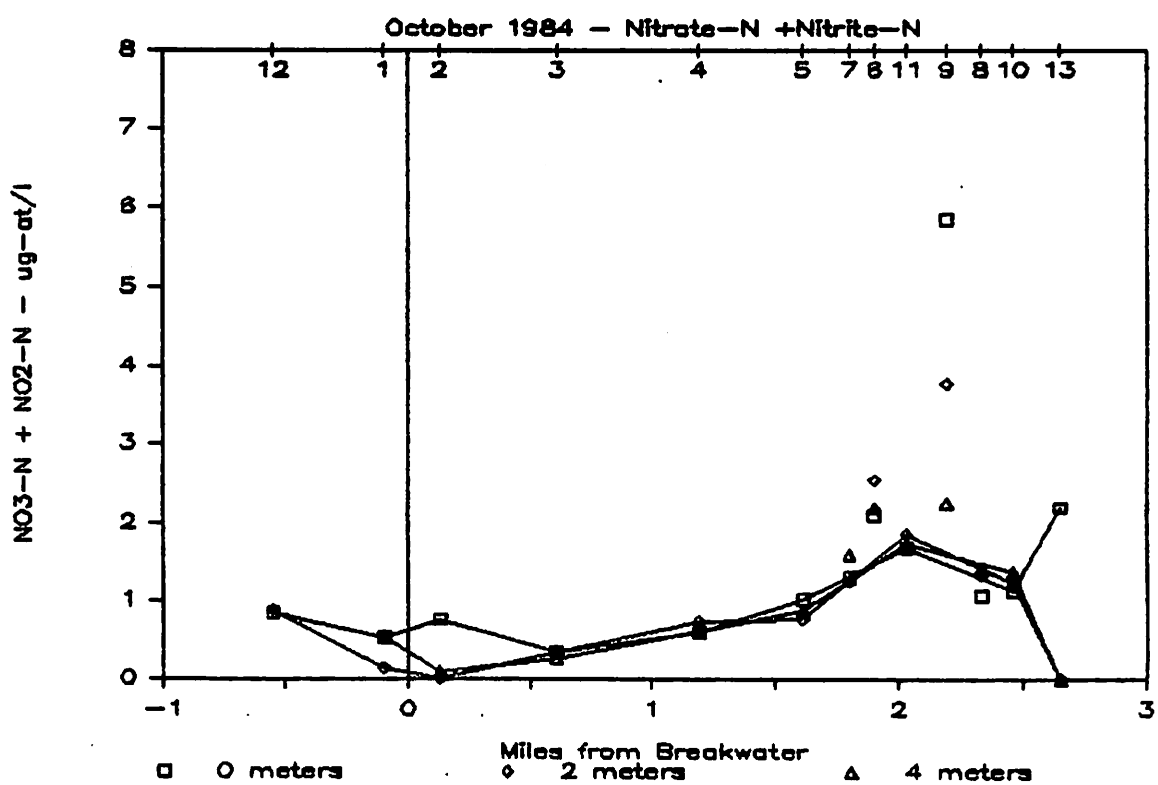

FIGURE 24. NITRATE AND NITRITE TOTALED (UG-AT/L) OCTOBER 1984.

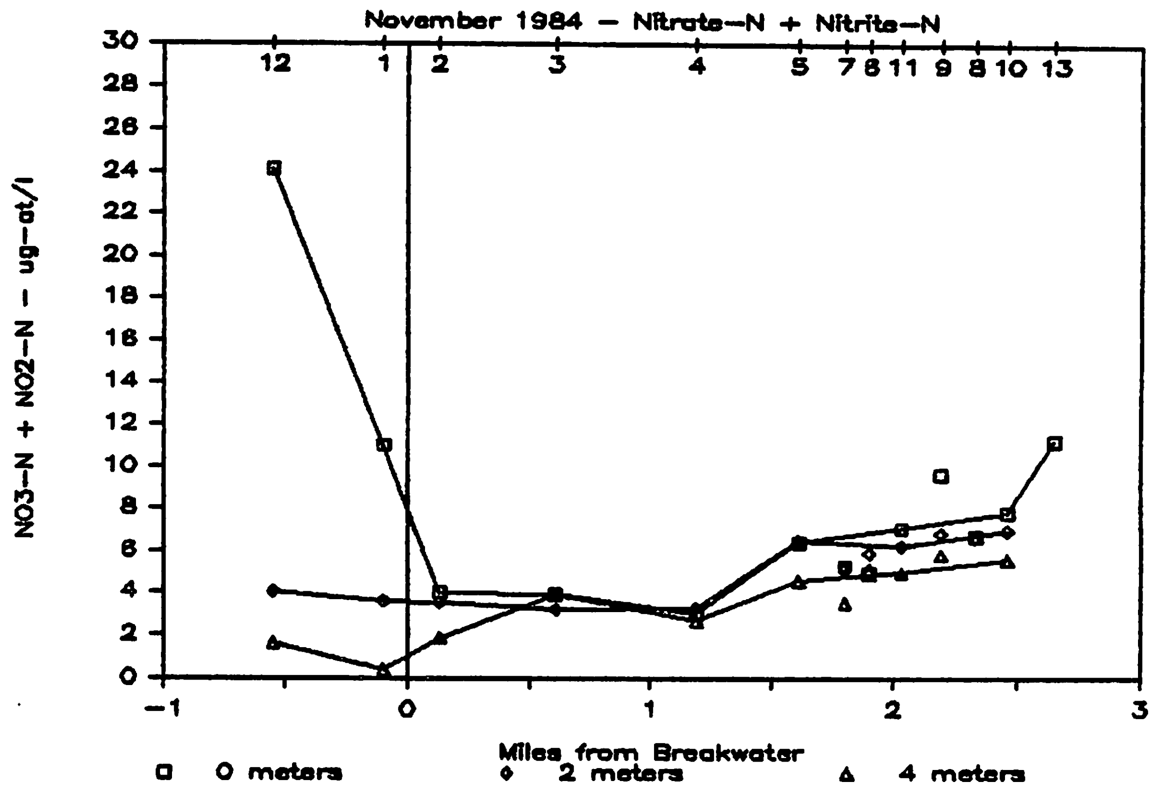

FIGURE 25. NITRATE AND NITRITE TOTALED (UG-AT/L) NOVEMBER 1984. STATIONS ARE PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER. STATIONS 6,7,8,9 AND 10 LIE OFF PLOT IN SIDE BASINS.

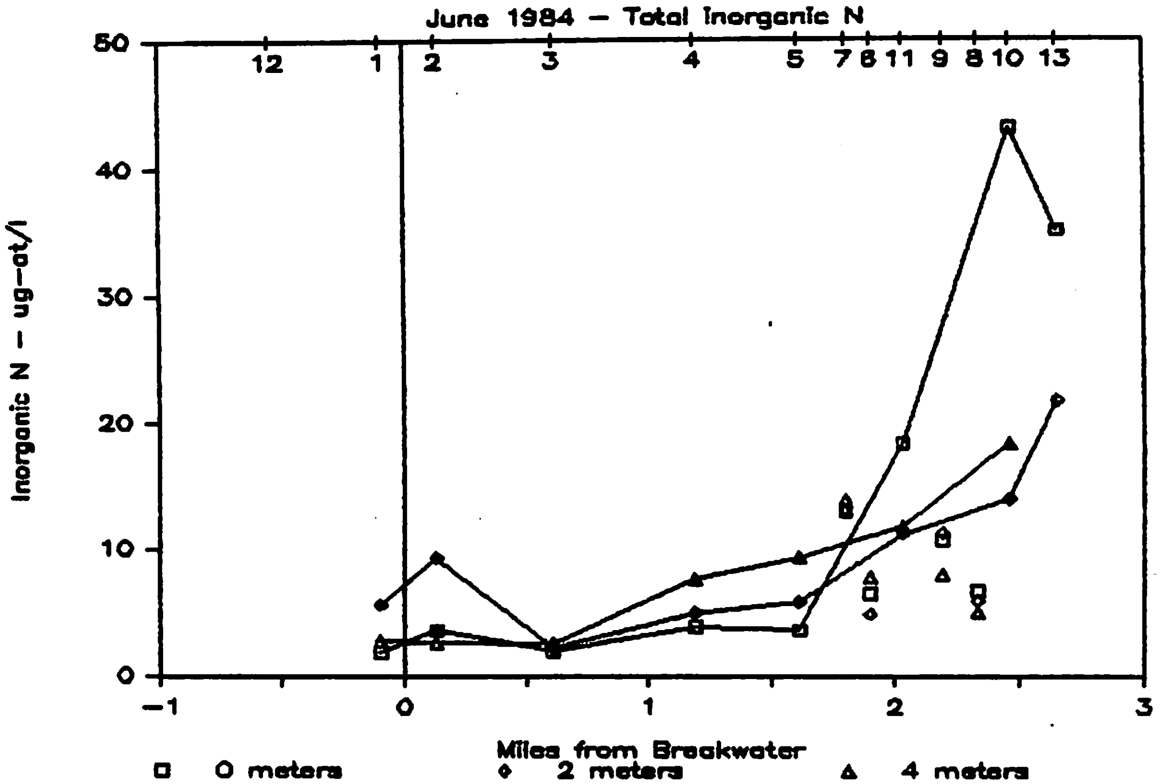

FIGURE 26. INORGANIC NITROGEN CALCULATED AS SUM OF NITRATE AND NITRITE DATA FROM AUTOANALYZER AND ORION PROBE AMMONIA VALUES. STATIONS PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER, JUNE 1984

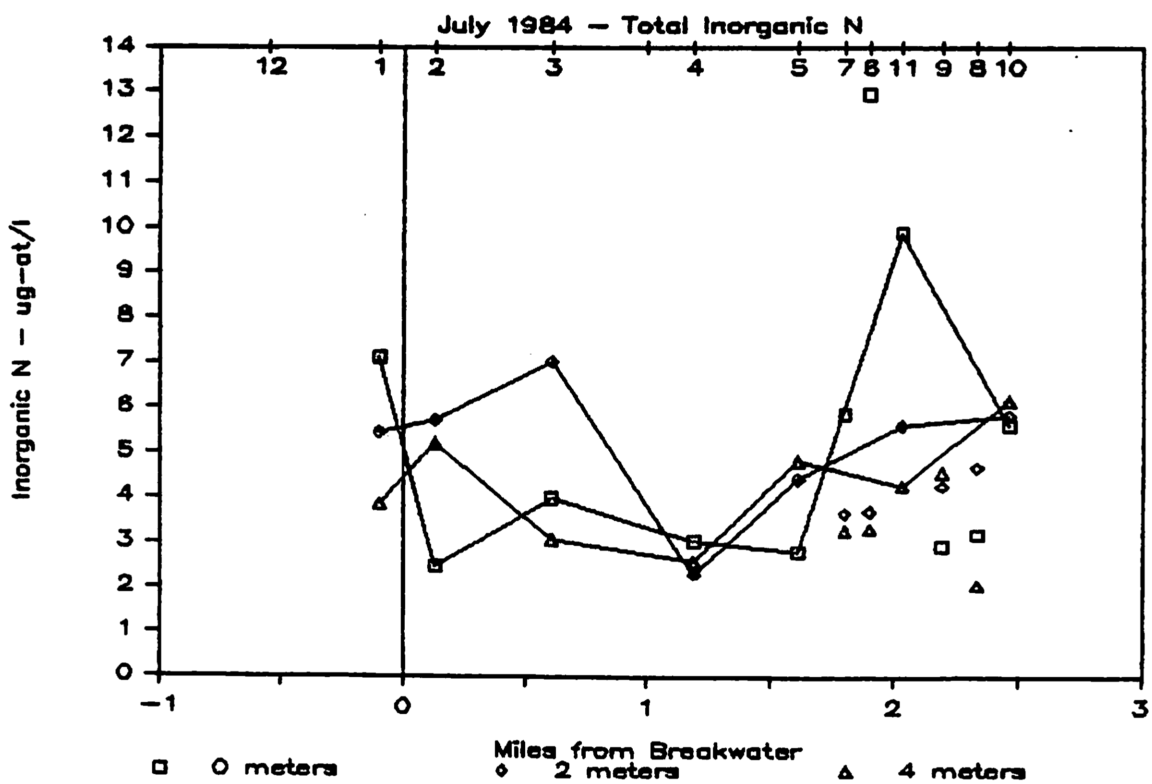

FIGURE 27. INORGANIC NITROGEN IN JULY 1984.

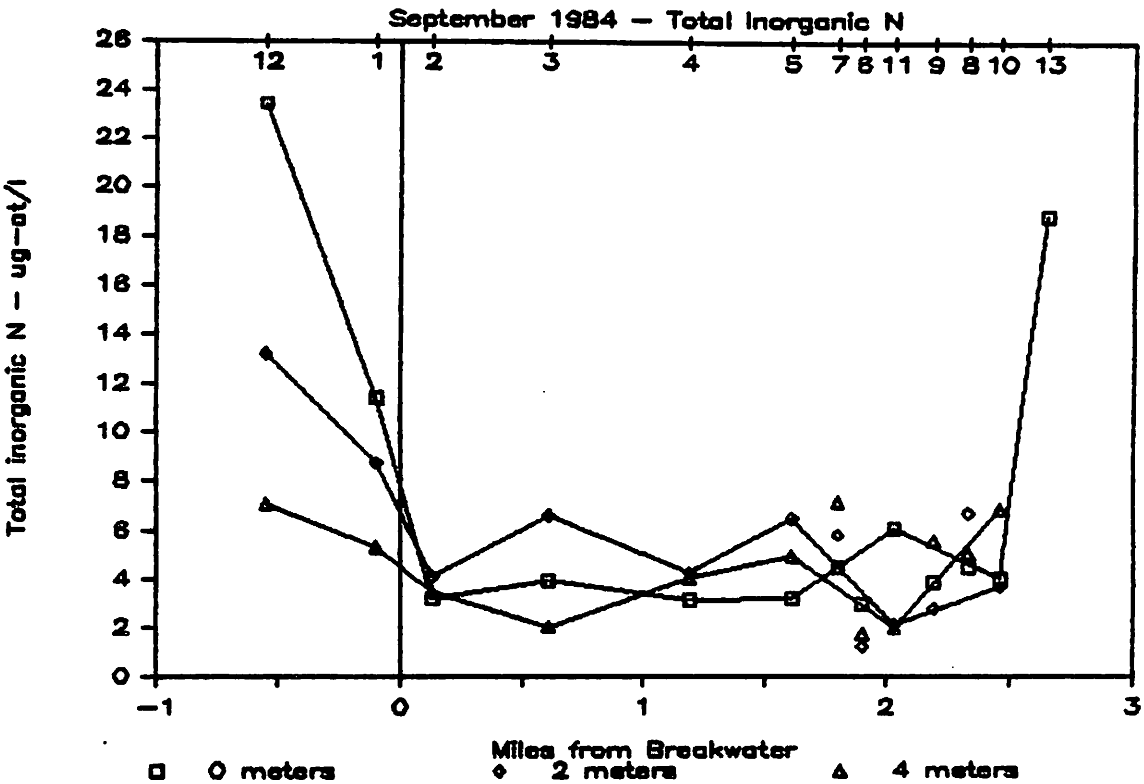

FIGURE 28. INORGANIC NITROGEN CALCULATED AS SUM OF NITRATE AND NITRITE DATA FROM AUTOANALYZER AND ORION PROBE AMMONIA VALUES. STATIONS PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER, SEPTEMBER 1984.

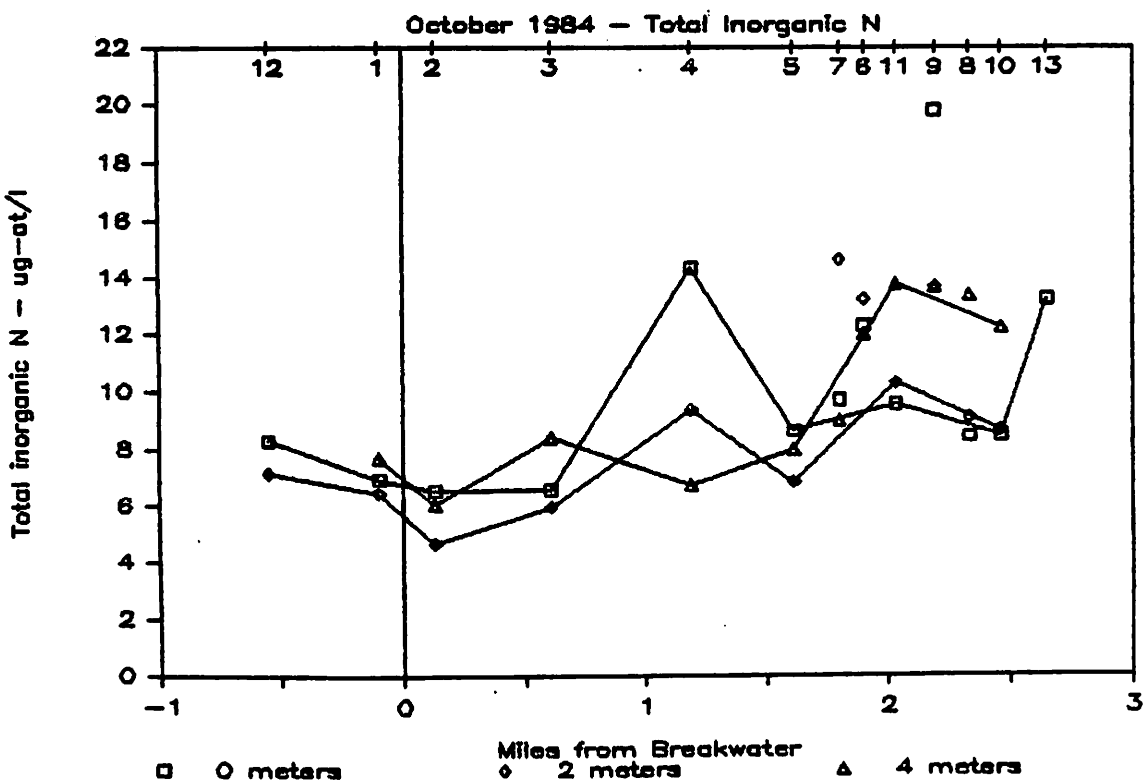

FIGURE 29. INORGANIC NITROGEN IN OCTOBER 1984.

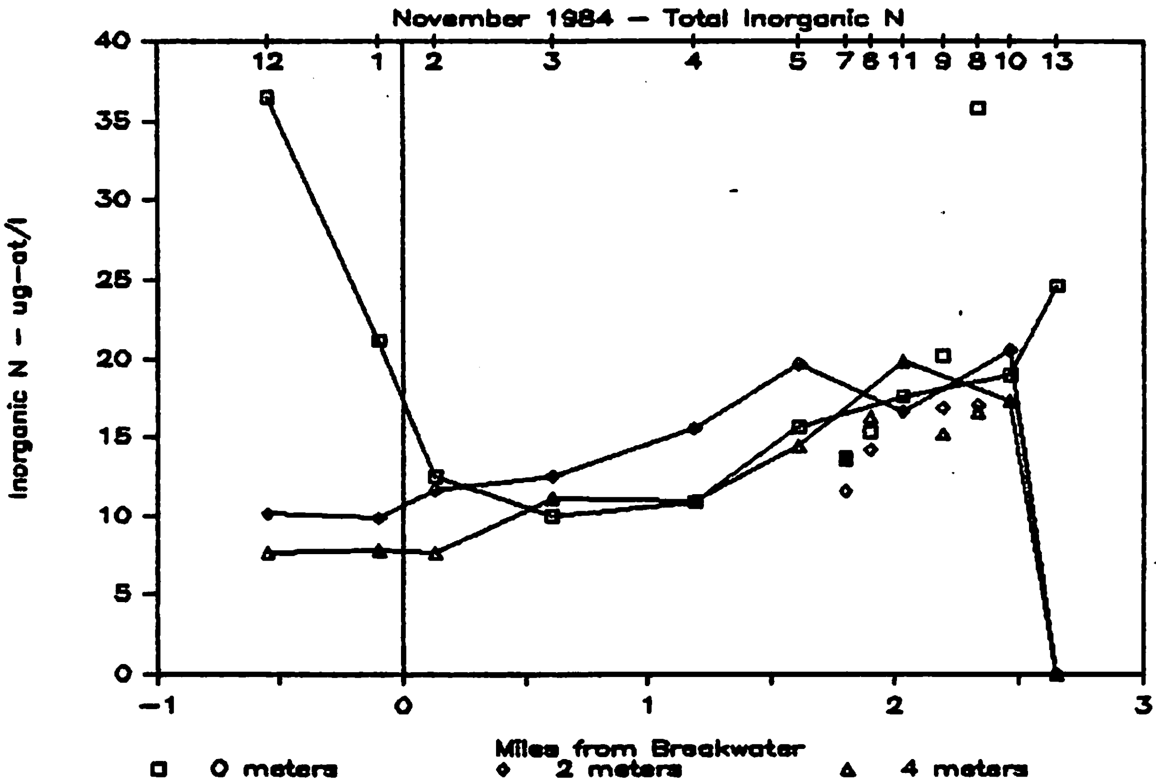

FIGURE 30. INORGANIC NITROGEN CALCULATED AS SUM OF NITRATE AND NITRITE DATA FROM AUTOANALYZER AND AMMONIA VALUES OF ORION PROBE. STATIONS PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER, NOVEMBER 1984

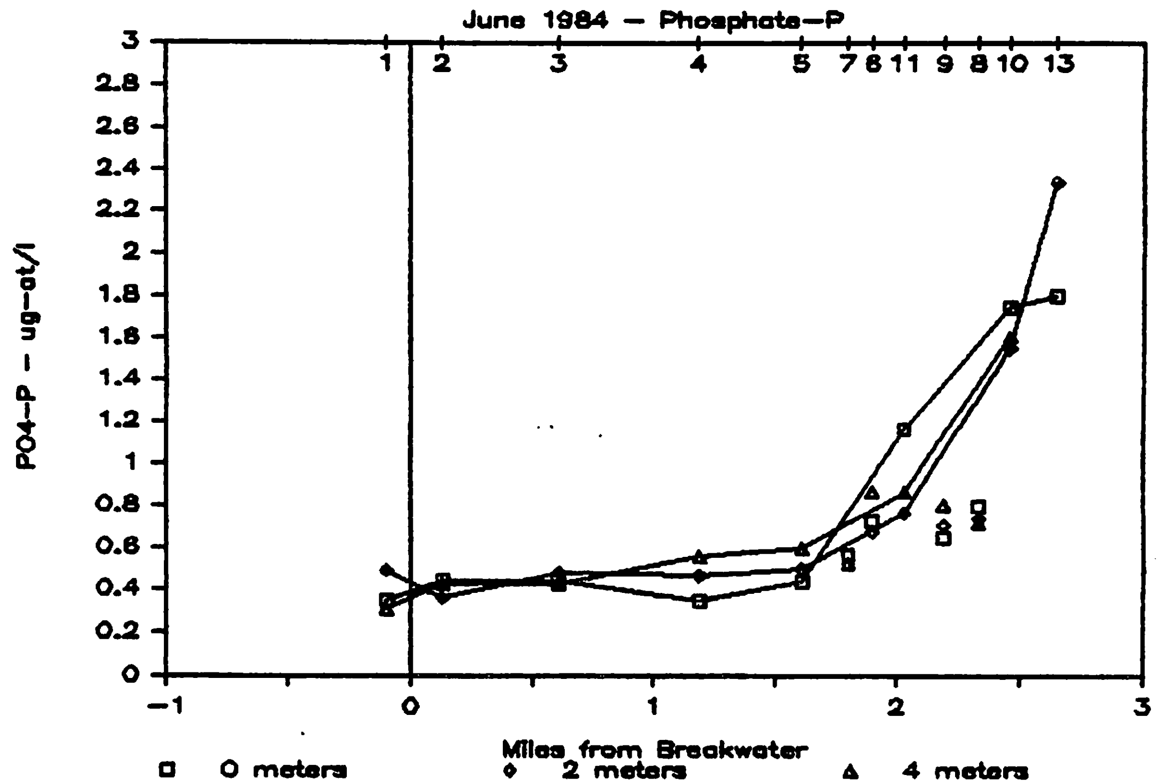

FIGURE 31. PHOSPHATE - PHOSPHORUS IN JUNE 1984. STATIONS PLOTTED LINEARLY IN DISTANCE (MI) FROM BREAKWATER.

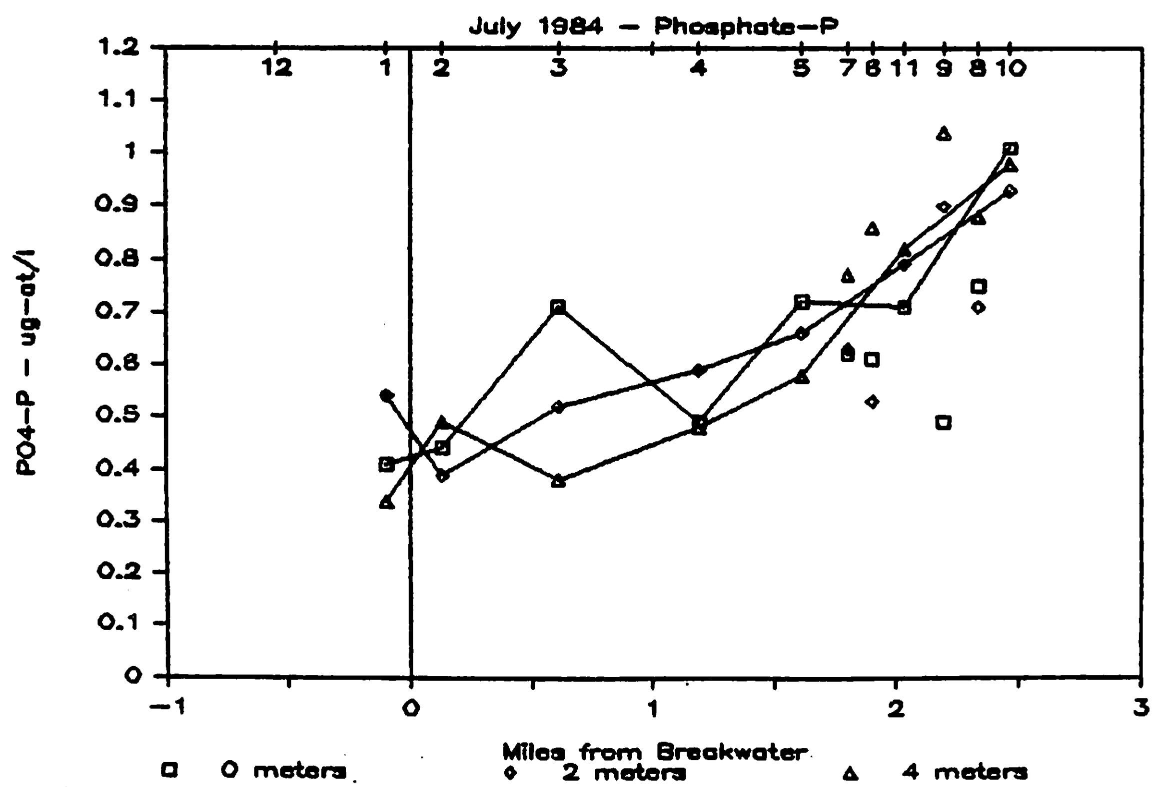

FIGURE 32. PHOSPHATE - PHOSPHORUS, JULY 1984.

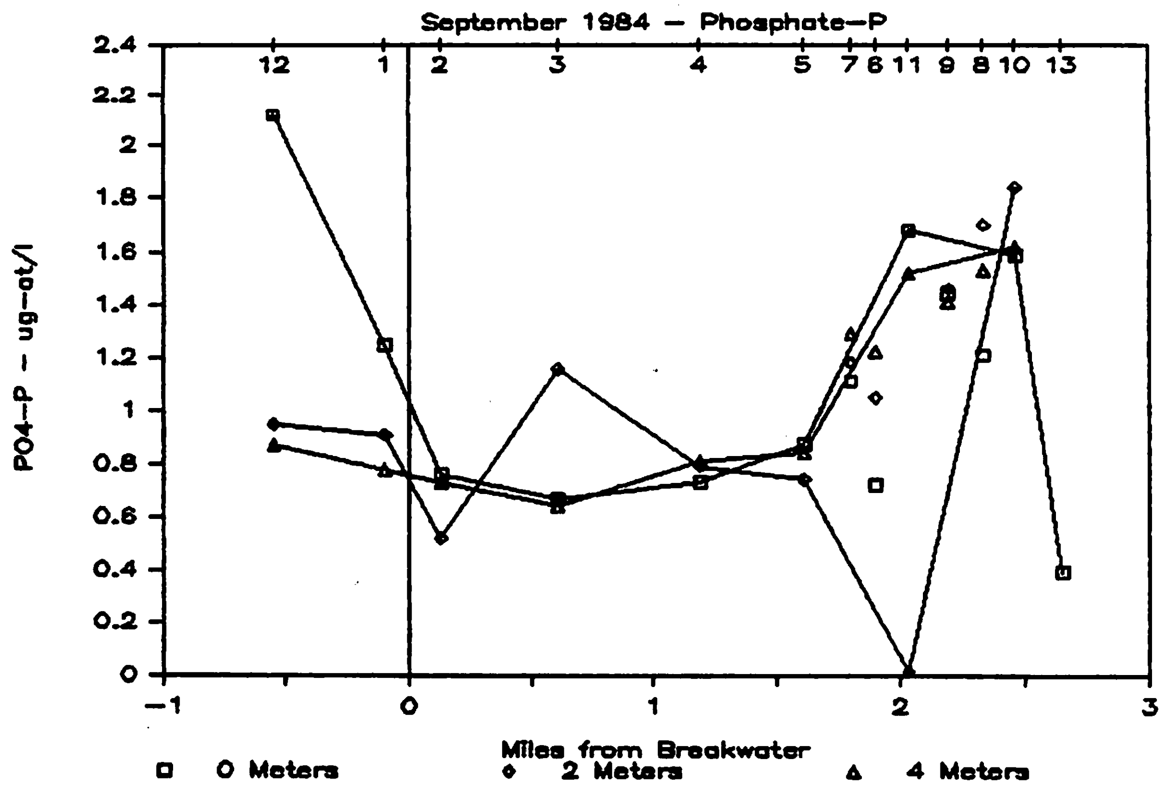

FIGURE 33. PHOSPHATE - PHOSPHORUS IN SEPTEMBER 1984. STATIONS PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER.

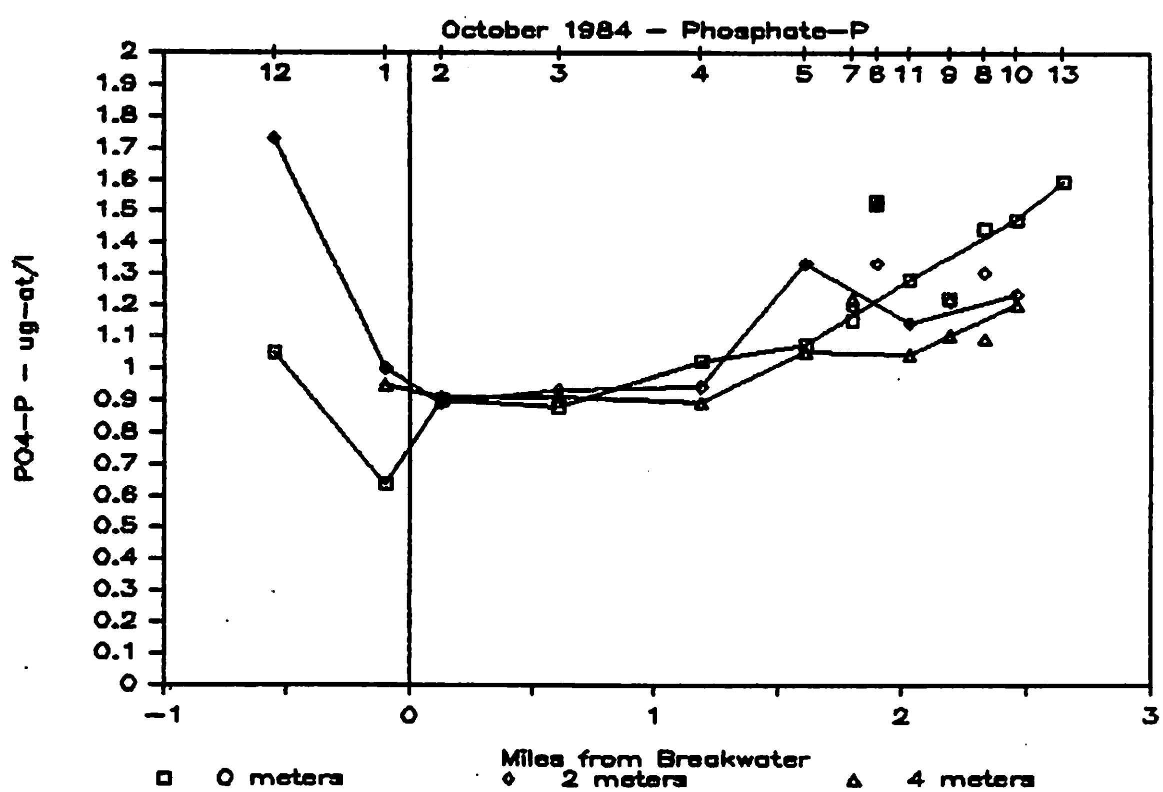

FIGURE 34. PHOSPHATE - PHOSPHORUS IN OCTOBER 1984.

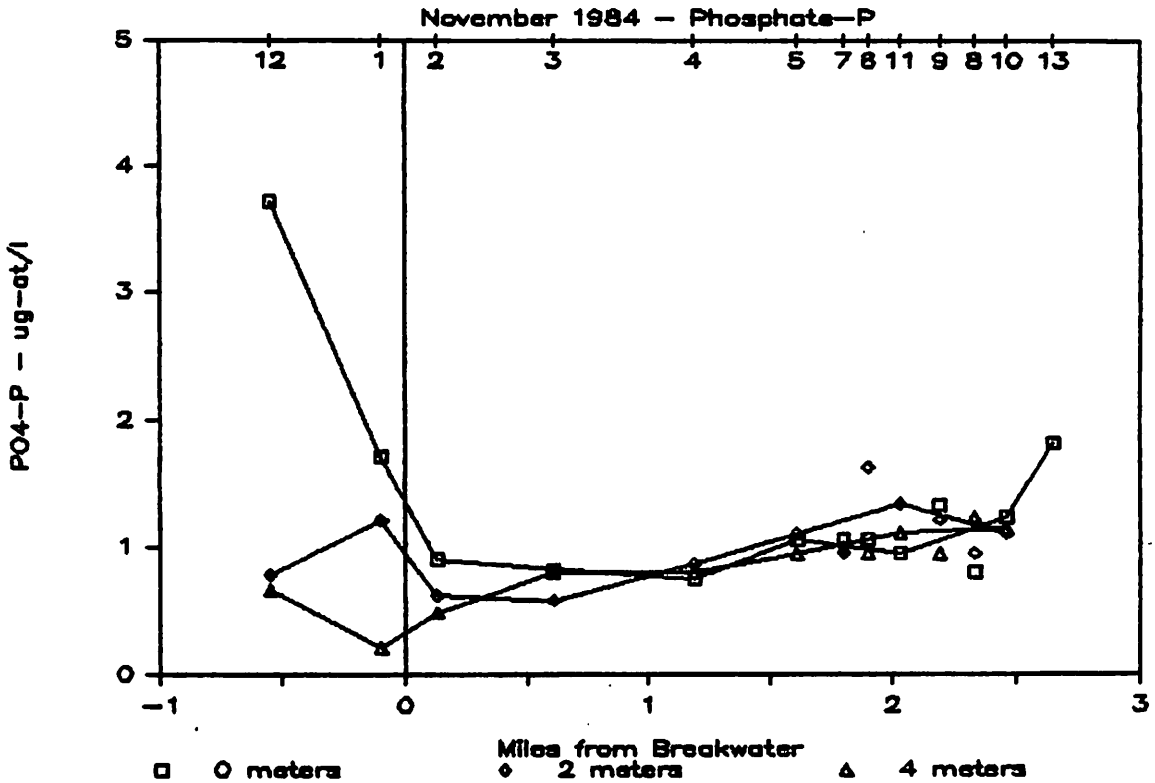

FIGURE 35. PHOSPHATE - PHOSPHORUS IN NOVEMBER 1984. STATIONS PLOTTED LINEARLY IN DISTANCE FROM BREAKWATER.

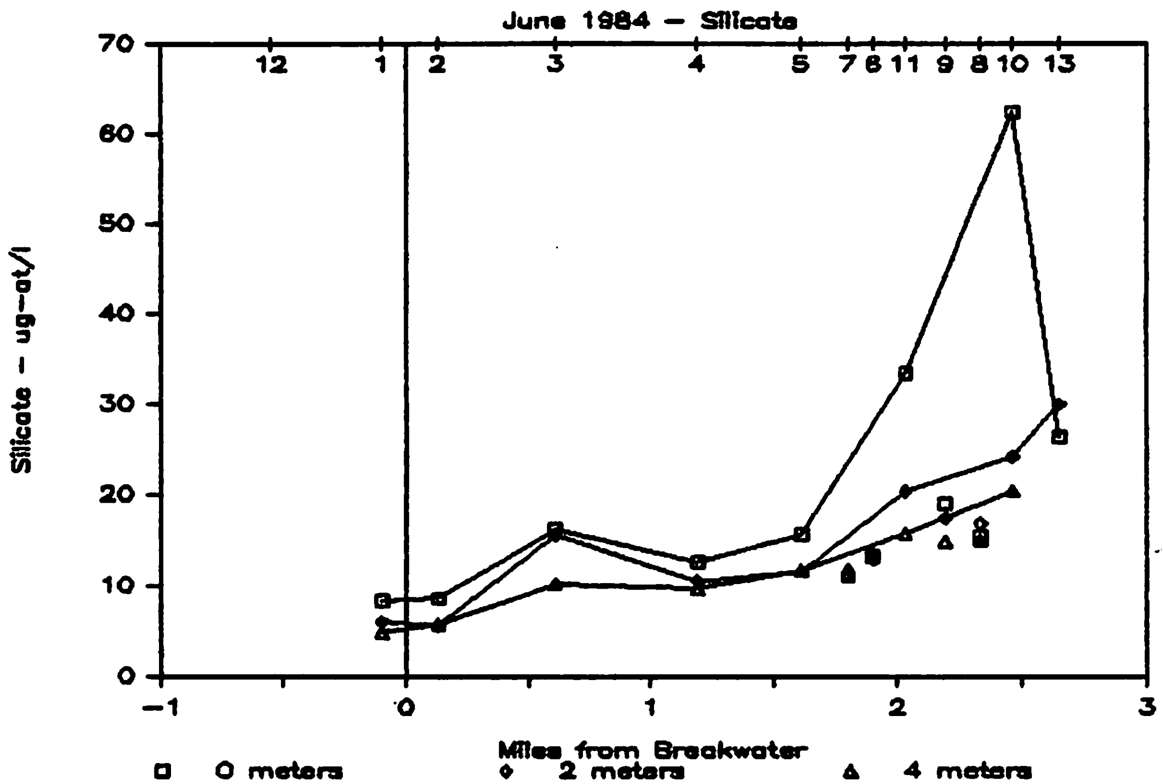

FIGURE 36. SILICATE IN JUNE 1984.

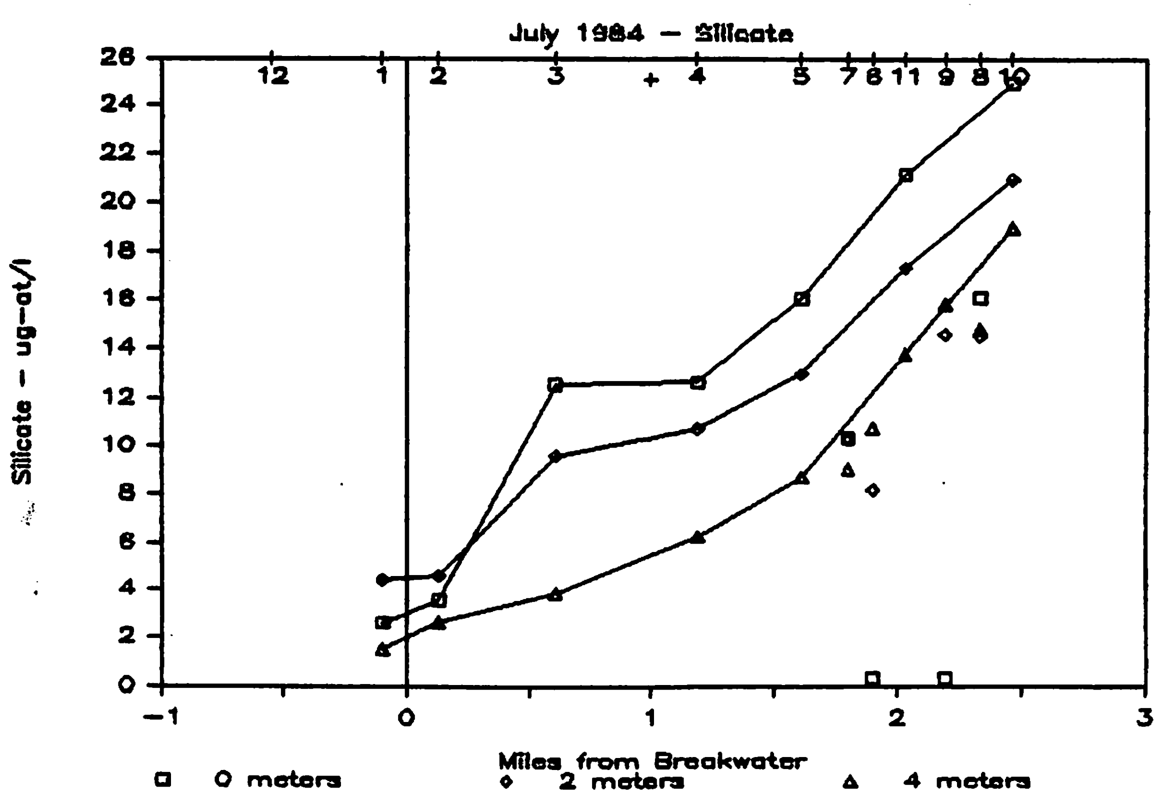

FIGURE 37. SILICATE IN JULY 1984.

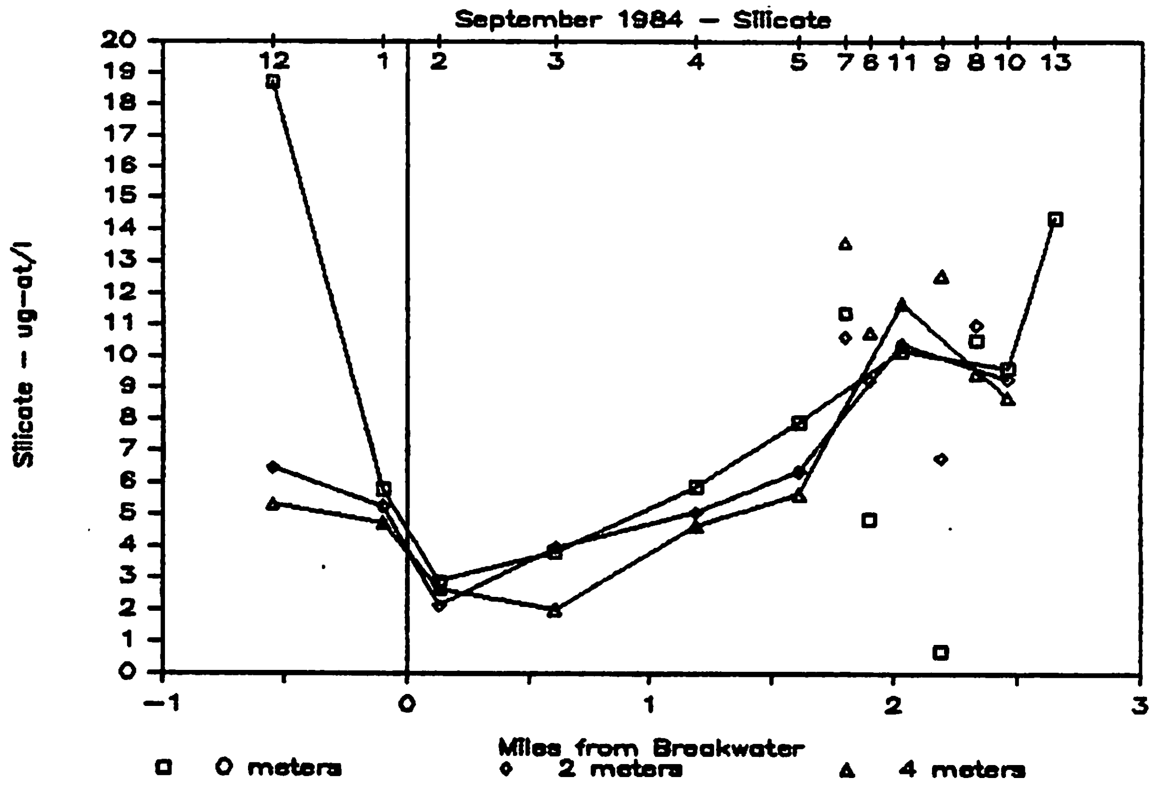

FIGURE 38. SILICATE IN SEPTEMBER 1984.

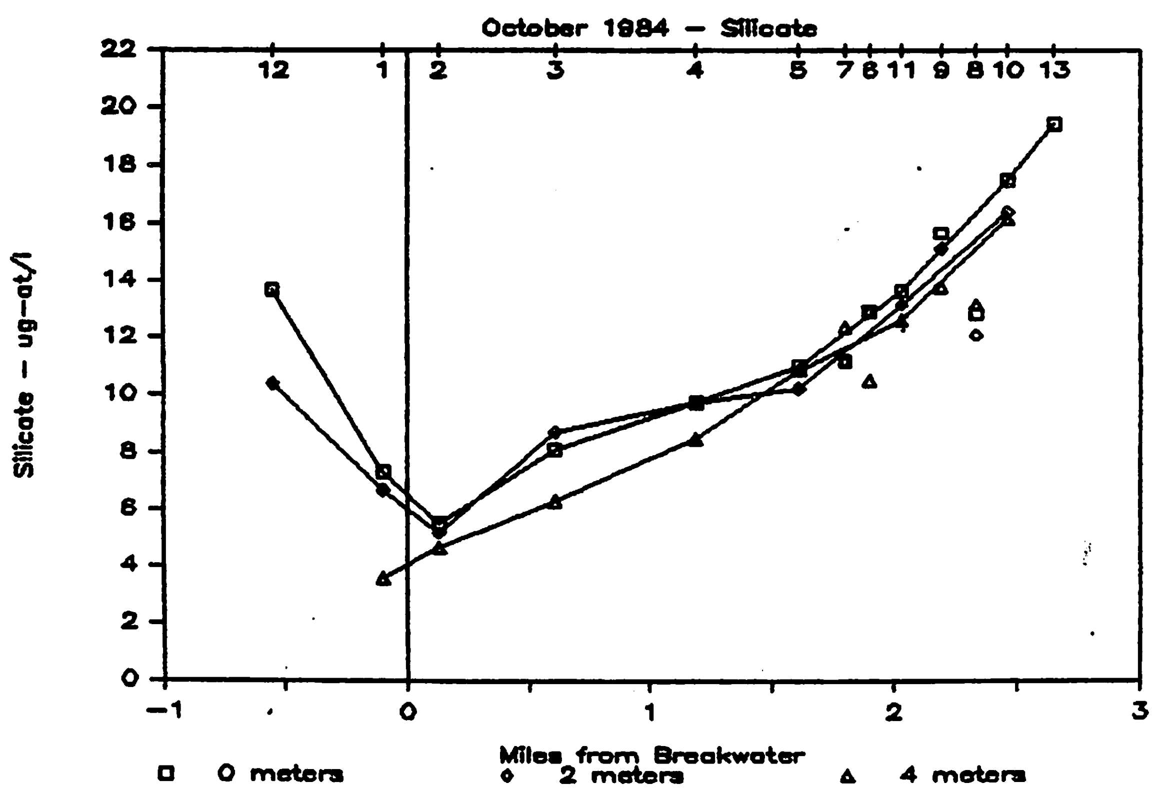

FIGURE 39. SILICATE IN OCTOBER 1984.

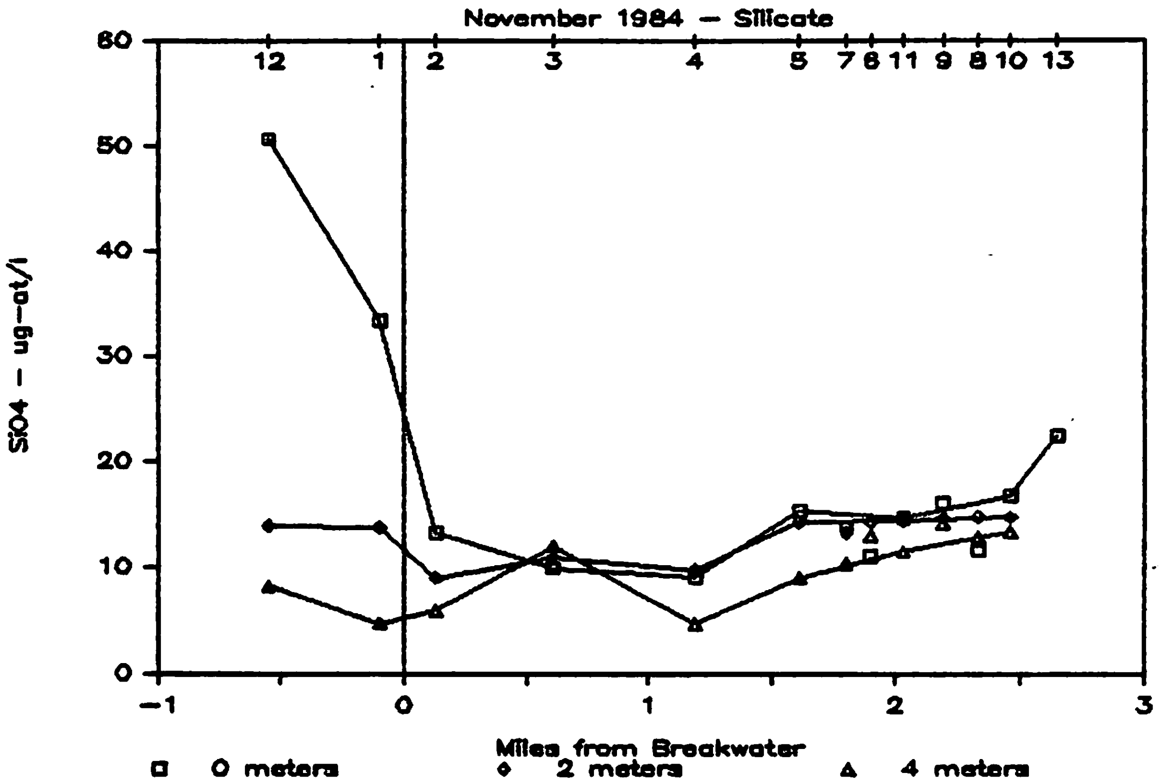

FIGURE 40. SILICATE IN NOVEMBER 1984.

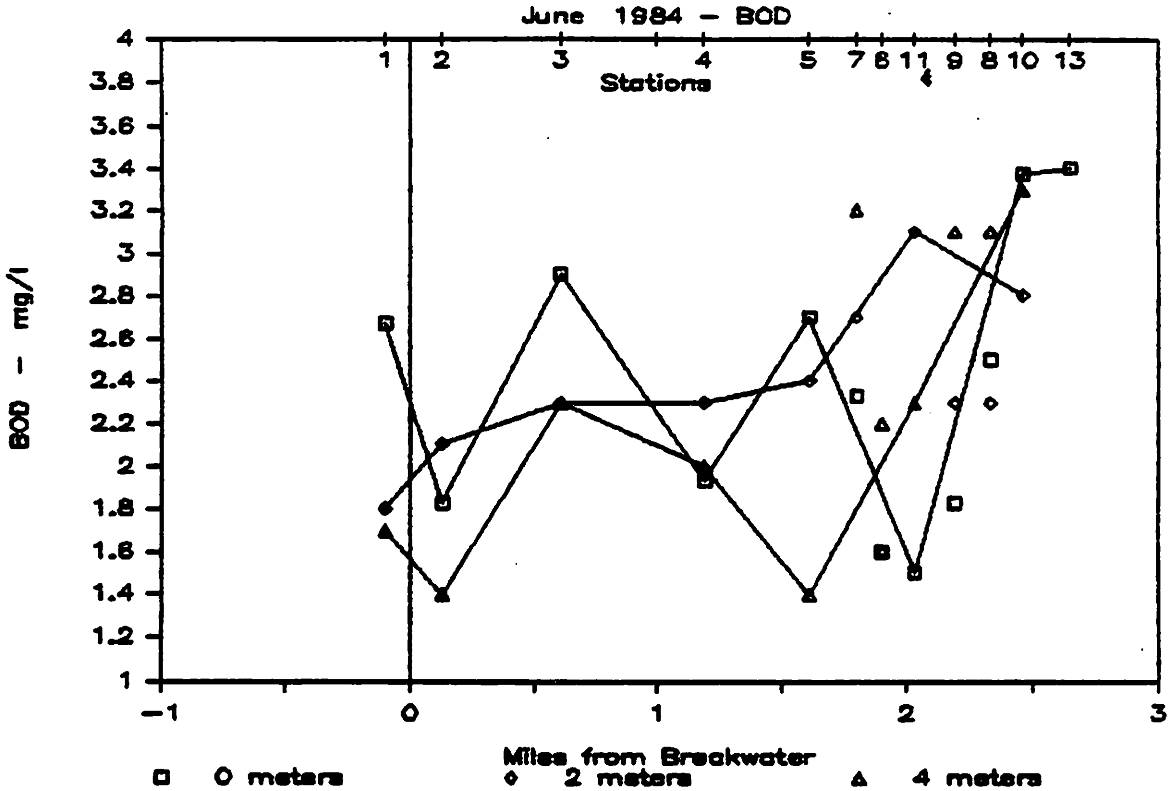

FIGURE 41. BIOCHEMICAL OXYGEN DEMAND (BOD) IN JUNE 1984.

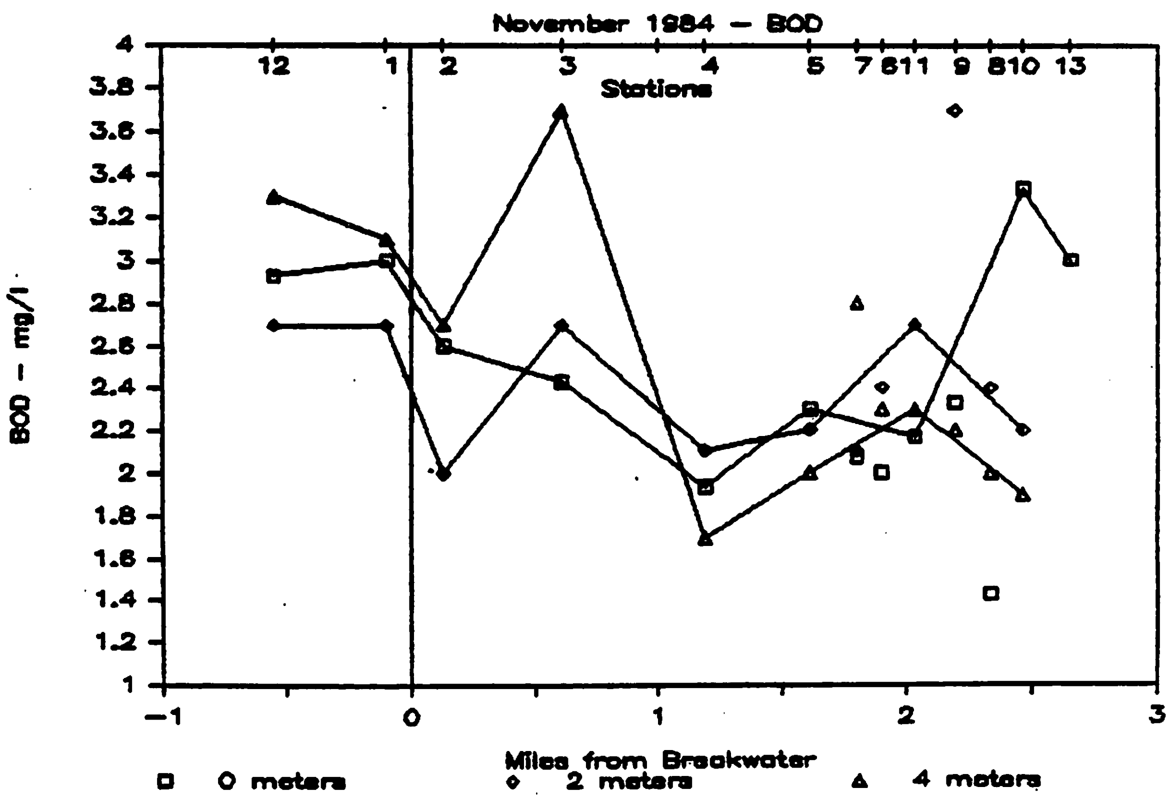

FIGURE 42. BIOCHEMICAL OXYGEN DEMAND (BOD) IN NOVEMBER 1984.

Table 2. Nutrient Chemistry Data, June 1984 (in ug-at/L)*

STA	DEPTH	PO4	SiO4	NO3+NO2	NO2	NO3
1	0	0.35	8.32	0.07	0.08	-
	2	0.49	5.97	0.25	0.10	0.15
	4	0.31	4.83	0.10	0.08	0.02
	6	0.35	5.31	0.13	0.07	0.06
2	0	0.44	8.58	0.04	0.06	-
	2	0.36	5.56	0.09	0.08	0.01
	4	0.43	5.78	0.32	0.12	0.20
3	0	0.44	16.27	0.08	0.04	0.04
	2	0.48	15.68	0.20	0.07	0.13
	4	0.43	10.22	0.19	0.06	0.13
4	0	0.35	12.58	0.24	0.05	0.19
	2	0.47	10.53	0.18	0.09	0.09
	4	0.56	9.67	0.37	0.08	0.29
5	0	0.44	15.66	0.05	0.05	-
	2	0.50	11.59	0.31	0.12	0.19
	4	0.60	11.64	0.33	0.13	0.20
6	0	0.73	13.21	1.20	0.18	1.02
	2	0.68	12.90	1.10	0.19	0.91
	4	0.87	13.52	1.69	0.20	1.49
7	0	0.57	11.03	0.28	0.06	0.22
	2	0.53	11.24	0.20	0.05	0.15
	4	0.53	11.92	0.18	0.07	0.11
8	0	0.80	15.49	1.39	0.22	1.17
	2	0.74	16.83	1.84	0.22	1.62
	4	0.72	15.01	1.12	0.20	0.92
9	0	0.65	19.00	5.33	0.21	5.12
	2	0.71	17.53	3.91	0.20	3.71
	4	0.81	14.87	1.32	0.18	1.14
10	0	1.75	62.36	17.73	0.96	16.77
	2	1.55	24.15	3.23	0.31	2.92
	4	1.61	20.46	5.12	0.31	4.81
11	0	1.17	33.30	7.29	0.48	6.81
	2	0.77	20.33	3.44	0.27	3.17
	4	0.87	15.79	1.46	0.19	1.27
13	0	1.80	26.33	4.79	0.61	4.18

* Samples are pre-filtered

Table 3. Nutrient Chemistry, July 1984 (in ug-at/L)

STA	DEPTH	PO4	SiO4	NO3+NO2	NO2	NO3
1	0	0.41	2.61	0.16	0.05	0.11
	2	0.54	4.40	0.08	0.09	-
	4	0.34	1.51	ND	0.04	-
	6	0.30	0.31	0.13	0.04	0.09
2	0	0.44	3.56	0.05	0.05	-
	2	0.39	4.57	ND	0.06	-
	4	0.49	2.66	ND	0.05	-
	6	0.38	1.04	0.10	0.05	0.05
3	0	0.71	12.51	0.18	0.08	0.10
	2	0.52	9.58	ND	0.07	-
	4	0.38	3.84	0.10	0.05	0.05
	6	0.51	6.37	0.04	0.06	-
4	0	0.49	12.59	0.11	0.07	0.04
	2	0.59	10.69	0.09	0.07	0.02
	4	0.48	6.24	0.25	0.05	0.20
	6	0.59	5.67	0.14	0.07	0.07
5	0	0.72	15.99	0.06	0.05	0.01
	2	0.66	12.93	0.12	0.05	0.07
	4	0.58	8.67	0.08	0.04	0.04
6	0	0.61	0.32	ND	0.06	-
	2	0.53	8.15	0.02	0.05	-
	4	0.86	10.71	0.07	0.06	0.01
7	0	0.62	10.30	ND	0.05	-
	2	0.63	10.23	ND	0.05	-
	4	0.77	8.97	0.07	0.04	0.03
8	0	0.75	16.07	0.23	0.09	0.14
	2	0.71	14.51	0.56	0.04	0.52
	4	0.88	14.77	ND	0.04	-
9	0	0.49	0.33	0.12	0.07	0.05
	2	0.90	14.54	0.05	0.05	-
	4	1.04	15.81	ND	0.04	-
10	0	1.01	24.88	0.86	0.15	0.71
	2	0.93	20.95	0.50	0.08	0.42
	4	0.98	18.95	0.17	0.07	0.10
11	0	0.71	21.14	0.82	0.14	0.68
	2	0.79	17.30	ND	0.07	-
	4	0.82	13.75	ND	0.05	-

Table 4. Nutrient Chemistry Data, September 1984 (in ug-at/L)

STA	DEPTH	PO4	SiO4	NO3+NO2	NO2	NO3
1	0	1.25	5.78	2.32	0.80	1.52
	2	0.91	5.25	2.00	0.72	1.28
	3	0.78	4.73	1.47	0.44	1.03
	6	0.63	2.89	1.09	0.43	0.66
2	0	0.76	2.89	0.49	0.17	0.32
	2	0.52	2.10	0.27	0.09	0.18
	4	0.73	2.63	0.33	0.11	0.22
	6	0.51	1.97	0.31	0.12	0.19
3	0	0.67	3.81	0.72	0.20	0.52
	2	1.16	3.94	0.70	0.21	0.49
	4	0.64	2.00	0.31	0.06	0.25
	6	0.56	2.50	0.30	0.10	0.20
4	0	0.73	5.85	0.73	0.10	0.63
	2	0.79	5.07	0.81	0.32	0.49
	4	0.81	4.66	0.41	0.18	0.23
	6	0.72	4.88	0.61	0.22	0.39
5	0	0.87	7.88	0.37	0.19	0.18
	2	0.74	6.36	0.45	0.14	0.31
	4	0.84	5.66	0.81	0.18	0.63
	6	0.90	7.62	0.61	0.23	0.38
6	0	0.72	4.88	0.61	0.22	0.39
	2	1.05	9.23	0.00	0.02	-
	4	1.22	10.78	0.09	0.13	-
7	0	1.11	11.38	1.11	0.09	1.02
	2	1.18	10.61	1.31	0.26	1.05
	4	1.29	13.61	1.46	0.22	1.24
8	0	1.21	10.53	0.59	0.10	0.49
	2	1.70	11.00	ND	0.07	-
	4	1.53	9.44	0.06	0.08	-
9	0	1.44	0.68	0.50	0.10	0.40
	2	1.46	6.76	0.74	0.08	0.66
	4	1.41	12.59	ND	0.15	-
10	0	1.59	9.61	0.32	0.12	0.20
	2	1.84	9.28	0.01	0.09	-
	4	1.62	8.71	0.08	0.07	0.01

Table 4. cont'd.

STA	DEPTH	PO4	SiO4	NO3+NO2	NO2	NO3
11	0	1.68	10.19	0.70	0.15	0.55
	2	0.02	10.40	0.07	0.09	-
	4	1.52	11.72	ND	0.15	-
12	0	2.12	18.68	7.88	ND	7.88
	2	0.95	6.46	2.17	0.64	1.53
	4	0.87	5.33	1.47	0.51	0.96
13	0	0.39	14.38	0.24	0.22	0.02

Table 5. Nutrient Chemistry Data, October 1984 (in ug-at/L)

STA	DEPTH	PO4	SI04	NO3+NO2	NO2	NO3
1	0	0.64	7.32	0.45	0.08	0.37
	2	1.00	6.69	0.09	0.05	0.04
	4	0.95	3.58	0.52	0.03	0.49
	6	0.96	4.11	0.22	0.04	0.18
2	0	0.90	5.54	0.64	0.13	0.51
	2	0.89	5.19	ND	ND	-
	4	0.91	4.67	ND	0.08	-
	6	0.86	3.94	0.37	0.09	0.28
3	0	0.88	8.09	0.22	0.13	0.09
	2	0.93	8.73	0.22	0.13	0.09
	4	0.91	6.32	0.14	0.11	0.03
4	0	1.02	9.72	0.42	0.18	0.24
	2	0.94	9.72	0.56	0.18	0.38
	4	0.89	8.46	0.45	0.17	0.28
	6	0.96	6.57	0.15	0.14	0.01
5	0	1.07	10.96	0.85	0.17	0.68
	2	1.33	10.19	0.64	0.14	0.50
	4	1.05	10.84	0.67	0.22	0.45
	6	0.88	9.56	0.76	0.16	0.60
6	0	1.53	12.87	1.77	0.33	1.44
	2	1.33	12.86	2.26	0.29	1.97
	4	1.52	10.48	1.93	0.27	1.66
7	0	1.15	11.16	1.07	0.23	0.84
	2	1.19	11.16	1.04	0.22	0.82
	4	1.22	12.35	1.35	0.25	1.10
8	0	1.44	12.80	0.86	0.21	0.65
	2	1.30	12.09	1.10	0.24	0.86
	4	1.09	13.14	1.16	0.27	0.89
9	0	1.22	15.63	5.49	0.36	5.13
	2	1.21	15.08	3.53	0.24	3.29
	4	1.10	13.74	1.98	0.28	1.70
10	0	1.47	17.46	0.88	0.25	0.63
	2	1.23	16.37	0.96	0.27	0.69
	4	1.20	16.11	1.10	0.27	0.83

Table 5. cont'd.

STA	DEPTH	PO4	SIO4	NO3+NO2	NO2	NO3
11	0	1.28	13.61	1.46	0.22	1.24
	2	1.14	13.14	1.59	0.27	1.32
	4	1.04	12.61	1.48	0.25	1.23
12	0	1.05	13.66	0.64	0.21	0.43
	2	1.73	10.38	0.72	0.17	0.55
13	0	1.59	19.44	1.85	0.35	1.50

Table 6. Nutrient Chemistry, November 1984 (in ug-at/L)

STA	DEPTH	PO4	SIO4	NO3+NO2	NO2	NO3
1	0	1.72	33.41	10.99	0.91	10.08
	2	1.21	13.77	3.56	0.34	3.22
	4	0.20	4.73	0.39	0.09	0.30
2	0	0.90	13.26	3.94	0.41	3.53
	2	0.62	9.02	3.51	0.46	3.05
	4	0.48	5.93	1.83	0.18	1.65
3	0	0.82	9.94	3.87	0.38	3.49
	2	0.58	10.99	3.21	0.36	2.85
	4	0.80	12.03	3.92	0.38	3.54
4	0	0.75	9.11	2.99	0.33	2.66
	2	0.87	9.78	3.27	0.32	2.95
	4	0.80	4.65	2.64	0.06	2.58
5	0	1.05	15.41	6.35	0.54	5.81
	2	1.10	14.37	6.48	0.53	5.95
	4	0.94	9.05	4.54	0.45	4.09
6	0	1.05	11.04	4.87	0.52	4.35
	2	1.63	14.36	5.85	0.77	5.08
	4	0.95	13.06	5.05	0.47	4.58
7	0	1.06	13.80	5.25	0.48	4.77
	2	0.95	13.32	5.08	0.59	4.49
	4	0.99	10.44	3.53	0.35	3.18
8	0	0.80	11.66	6.65	0.63	6.02
	2	0.95	14.88	6.58	0.59	5.99
	4	1.23	12.90	6.63	0.60	6.03
9	0	1.33	16.19	9.60	0.75	8.85
	2	1.21	14.69	6.77	0.56	6.21
	4	0.94	14.18	5.76	0.48	5.28
10	0	1.23	16.83	7.75	0.63	7.12
	2	1.10	14.81	6.91	0.57	6.34
	4	1.14	13.46	5.52	0.56	4.96
11	0	0.95	14.72	7.01	0.84	6.17
	2	1.34	14.47	6.20	0.56	5.64
	4	1.11	11.52	4.92	0.43	4.49
12	0	3.71	50.76	24.11	ND	24.11
	2	0.78	14.00	4.03	0.41	3.62
	4	0.66	8.26	1.64	0.18	1.46
13	0	1.82	22.40	11.18	1.19	9.99

SEDIMENT POLLUTANT BURDEN

INTRODUCTION

The sediment composition in the Marina reflects the historic origins of the area as a part of the estuarine wetlands that received the drainage of the Los Angeles River watershed, until it changed course to the south in the early 1800s. Later, Ballona Creek which drains much of the central Los Angeles Basin, fed water to the marshes and numerous streams until it was channelized by the Los Angeles County Flood Control District in the 1930s. The Marina was constructed behind the barrier beach strand in the degraded wetlands, which had been extensively filled and otherwise altered for agriculture, oil production and waste dumping. Ballona Lagoon lies between the strand and the Marina and connects the Venice Canal System to the entrance channel of the Marina. Although it is considered to be the only remaining area of the original wetlands north of Ballona Creek, it has been considerably altered and degraded.

SEDIMENTS

The low energy environment of the Marina lends itself to a buildup of fine silts and clay, with a higher organic content as did the earlier wetlands. The amount of sand in the benthos is directly related to the distance of a site from the beach, the severity of storms that carry sand out to sea or deposit it along the beach, and the recency of channel dredging to remove sand deposited behind the channel entrance barriers.

Soule and Oguri (1980) found extensive amounts of sand at Stations 1 and 3 in 1977-79 as shown in grain size analyses. While grain size analysis was not performed during benthic surveys in 1984, visual examination of sediments at Stations 1, 2 and 3 indicated a shift to fine silts with oily mud lumps. The sediment at main channel stations differed little from those in the basins, except that those at Stations 9, 10 and 11 had strongly sulfide odors.

POLLUTANTS

Sources of pollution in the Marina include tidal flushing of pollutants from Ballona Creek into the entrance channels, storm drains in the Marina runoff from commercial enterprises, and vessel related materials such as oil, trash and wastes.

Pollutants tend to become attached or complexed to the finer sediments and organic materials. In the low energy environment the fine sediments settle out, whereas in the higher energy coastal environment the fines remain suspended and may be widely dispersed.

There are no State criteria for metals levels in sediments in the benthos around waste treatement outfalls under Water Quality Control Board/ National Pollution Discharge Elimination Systems (NPDES) permitting, and the data base for determining sediment toxicities is generally poor.

Initial concerns of regulatory agencies were for potential release of pollutants from sediments into the water column. The release of trace metals from sediments in seawater differs from that in fresh water, and is governed by highly complex reactions influenced by grain size, pH, redox potential, dissolved oxygen and degree of agitation (Chen and Wang, 1976). Release of metals generally is in the ppb range where sediment concentrations are in the ppm range. Metals released initially by stirring may be reprecipitated as metalic sulfides. Some chemical transformations are biologically mediated.

Many metals apparently are not bioavailable in sediments and bioamplification, the increase of contaminants in succeeding levels of the food chain, apparently does not occur. However, mercury, which forms highly toxic methyl mercury in seawater and cadmium are of particular concern. While hexavalent chromium is quite toxic, that form rarely occurs in marine waters

Data on acute and chronic toxicity of metals in seawater were assembled by the California State Water Quality Control Board (1983) in conjunction with preparation of the EIR on revisions of the Ocean Plan. The following data from the EIR illustrate conservative estimates of toxic levels based on literature surveys:

Conservative Estimates of Toxicity in Seawater (ug/L = ppb)

Element in Seawater	Acute (ug/L = ppb) Toxicity	Chronic (ug/L = ppb) Toxicity
Cadmium	200	7.6
Copper	28	6.4
Lead	476	26.0
Mercury	5.8	1.6
Nickel	350	146.0
Silver	8	ND
Zinc	195	56.0

It is emphasized that there is no information as to whether the levels of metals in the sediments of the Marina might lead to acute or chronic toxicity levels of metal pollutants in the interstitial water or in the water column. The lack of bioavailability of many metals in sediments makes determination of potential for toxicity difficult in comparison with the levels found in water.

SAMPLING PROGRAM

Sediment samples for analysis of metals and pesticides were taken during benthic sampling on 26 April and 25 October 1984. A Campbell grab (modified Van Veen) was used on the R.V. Golden West to take a 0.10 m^2 sample of the benthos. Samples were then taken from the grab sample with a plastic syringe and transferred to plastic containers for metals analysis;

samples for pesticide analysis were taken with glass syringes and stored in glass. All samples were iced in the field and frozen for holding until analysis by Associated Laboratories in Orange, California.

RESULTS AND DISCUSSION

For most parameters measured in Marina del Rey in 1984, the highest levels were found at Stations 10 and 11 and at the Oxford Flood Control Basin, Station 13. The data are presented in Tables 7 and 8 for metals and hydrocarbons respectively. Figures 43 to 59 illustrate the levels of the various parameters measured in sediments at Stations 1 - 11 and 13; it was not possible to take a benthic sample in Ballona Creek at Station 12.

The stations showing the highest and lowest values for each parameter are listed in the text table below:

Incidence of Pollutants in Marina del Rey Sediments

Parameter	Range (ppm)	Higher Stations	Lowest Stations	Aver. Background Polluted Areas[1]
% Vol. Solids	9.82 - 4.41	13, 10, 11	4	
TOC	5.9 - 2.6	13, 10, 11	4	
COD (1000s)	10.1 - 72	2, 13	10	
Oil & Grease	180 - 5,350	2, 13	8	
Org-N	1,160 - 2,800	10, 13	4	
Cadmium	<LD			0.43
Chromium	33.7 - 83.3	11, 9, 10	13	25.50
Copper	39.1 - 307	10, 11	1	9.02
Iron (1000s)	13.18 - 51.69	11, 9	1	
Lead	66.1 - 293	10, 13	8	10.50
Mercury	0.27 - 1.64	8, 6	1	
Nickel	12.3 - 40.5	9, 11	1	15.40
Zinc	170 - 469	10, 13	6	44.40
PO_4 (1000s)	70 - 119	10, 7, 13	6	

[1] From Draft EIR, California Ocean Plan, January 1983

The data indicate that the flow from the so-called Oxford Flood Control Basin area (Station 13), is still apparently the source of high levels of organics and metalic pollution as it was in the previous 1977-79 surveys. Coupled with the further reduction in flushing that resulted from expanding Marina capacity, the environmental quality of Stations 10 and 11 appears to have been decreased.

The only parameters listed above which may stem equally from Ballona Creek and the Oxford Flood Control Basin are Chemical Oxygen Demand and Oil and Grease, as suggested by deposition at Station 2 at the entrance to the Marina.

Pesticides

The chlorinated hydrocarbons (Table 8) consisted principally of chlordane, with lesser amounts of some derivatives of DDT. By far the highest levels of chlordane were found at Station 2, as indicated below:

Chlorinated Hydrocarbons in Marina del Rey Sediments

Parameter	Range (ppb)	Higher Stations	Lowest Stations
Chlordane	<Ld* - 721	2, 13, 10, 3, 1, 4	all others <Ld
pp ddd	<Ld - 17	2, 3, 1, 4	all others <Ld
pp dde	20 - 80	7, 9, 13, 5	8

* below the limits of detection

The high total pesticides (as chlordane) found at Station 2 with 721 ppb suggests deposition due to Ballona Creek flow. The other sources in the Marina seemed to be the Oxford Flood Control Basin, with 468 ppb, and the adjacent station 10 with 344 ppb, and Ballona Lagoon with 313 ppb.

Chlordane was used on food crops until 1981, but is still used as a garden insectide and for termite control. It is considered carcinogenic but little is known about it's toxicity to marine organisms. Chlordane does bioaccumulate in fish to over 14,000 times the concentration in water (Draft EIR, State Ocean Plan, January 1983). The EPA criterion for chlordane in seawater is 0.004 ug/L. The estimate for acute toxicity is 0.3 ug/L (in the form of heptachlor).

DDT was used extensively worldwide for public health and agricultural pest control. The peak period for uses in the U.S. was 1959, but it was banned by the EPA in 1972 because it has a high affinity for lipids and thus bioaccumulates in organisms including humans. California State Water Resources Control Board Ocean Plan, Draft EIR, January 1983). It has been associated with decreased reproductive capacity in birds due to shell thinning. DDT and its derivatives persist in the environment and have low water solubility. Although banned in the U.S., illegal importation from Mexico may result in continuing agricultural use, and residual DDTs in stormdrains or other drainage systems may continue input to the ocean. The conservative estimate of acute toxicity in the State Ocean Plan is 10.0 ug/L and the Chronic toxicity estimate is 0.23 ug/L.

The pattern for pp DDD appears to be associated with Ballona Creek and possibly Ballona Lagoon, whereas pp DDE appears to be associated with terrestrial drainage into the Marina from storm drains and the Bird Sanctuary. The lack of DDT in 1984 samples suggests that the material may have been present in the basin sediments for some time.

There are no data from prior years to compare with the 1984 Marina data. Water samples taken from storm flow in 1977 showed no detectable pesticides, but it is possible that sampling during a storm did not intercept the inputs into the Marina.

Comparison of the levels in the Marina with those found in Santa Monica Bay and off Palos Verdes by SCCWRP (Brown et al., 1984) indicate that levels of DDTs and metabolites ranged from about 100-120 ppb in the Santa Monica Bay to about 23,000 ppb off Palos Verdes, whereas the Marina ranged from about 20 ppb to 119 ppb for the DDTs measured. However, they have developed techniques for measuring oxymetabolites that are not generally in use in monitoring. Since the limited Marina baseline survey did not analyze for the oxymetabolites of DDT and PCB the numbers would be somewhat low in comparison with SCCWRP data; levels appear to be about an order of magnitude smaller than those near Hyperion outfall. However difference in techniques (Gossett et al, 1984) make comparison questionable.

Polychlorinated Biphenyls (PCB)

Levels of PCBs ranged from about 18 to 44 ppb in the Santa Monica Bay SCCWRP data. PCBs were below the limits of detection in the Marina study, but might have approached the lower levels found in the SCCWRP study.

The only producer of PCB in the U.S. marketed the chemical for use in electrical systems under the trademark Arochlor. PCBs were also used in plasticizers, hydraulic fluids, in pumps and compressors and as lubricants and other commercial products. It's production was banned by the EPA in 1977 because it is lipophylic and can be bioconcentrated from waters containing concentrations below the limits of detection (Draft EIR, State Ocean Plan, January 1983). Because of the long life of pumps, compressors and other equipment and the persistance of PCBs, the materials still are entering marine waters due to illegal dumping of waste fluids.

The conservative estimate of acute toxicity is 10.0 ug/L and of chronic toxicity is 0.23 ug/L.

Gossett et al. (1984) indicated that the biologically active oxymetabolites of DDTs and PCBs are not found by the usual standard techniques, but they may represent from 35 to 98 percent of the pesticide metabolites and from 89 to 99 percent of the PCB metabolites. Thus the levels of these two important toxicant catagories may have been greatly underestimated in all baseline data wherever it has been gathered in the past.

The Dow Iodine Recovery Plant Site

Because a former Dow Chemical iodine recovery plant was listed as a possible source of soil contamination in Ballona Lagoon, the Los Angeles County Department of Health Services contracted for an investigation of soil borings. The site, now covered by 12 feet of soil from grading of fill from the Marina, lies on Via Dolce, west of Basin B. Samples for chemical analysis were taken every three feet to a depth of 16.5 ft in four cores taken in the area. Results are presented in Table 9.

There were elevated levels of barium in the soils, as well as 14 metals and napthalene, which are listed as toxic, corrosive, irritating, flammable, sensitizing or extremely hazardous. However none of the substances except barium exceeded the total threshold limit concentration (TTLC) for toxicity.

However, leachate tests of the barium in seawater produced levels well below the soluble threshold limit concentration (STLC) and are considered insignificant. Since all other parameters were below the TTLC, no further tests were performed (BCL Associates, June, 1984). The low level of leachate in seawater would also make analysis for barium in Marina sediments unnecessary.

Levels of barium ranged from 896 to 2,020 ug/g (ppb) in the soil borings at the Dow site. Normal background levels would probably be below 300 ug/g). In the 1972-74 period the Los Angeles County Flood Control District recorded up to 1,530 ug/L of barium in fresh water runoff sampled from Ballona Creek at Sawtelle Blvd. From 1976 to 1980 the peaks were at 500 ug/L in 1976, but in February 1980, levles of 900 and 1,160 ug/L were recorded. Since that time levels have rarely been above the limits of detection.

CONCLUSIONS

Comparison of 1977 and 1978 chemical data with 1984 results shows that certain pollutants have increased throughout the Marina, others have clearly decreased, and still others show no consistent trend.

The parameters clearly increased throughout the Marina include chemical oxygen demand, total organic carbon, organic nitrogen, copper, iron, lead and zinc (Table 10).

The parameters showing a consistent decrease were arsenic, cadmium, nickel, and to a lesser extent, chromium and mercury.

Parameters without consistent trends, showing increases at some stations and decreases at others, were oil and grease and total volatile solids.

On a station by station basis, the only station that has shown a clear increase in most parameters is Station 3, at the tide gates from Ballona Lagoon. No reason for this trend can be given, but it involves increases in 12 out of 15 parameters. Lesser increases occurred at Stations 6 and 2.

The only station showing a clear decrease is Station 7, where a major storm drain is located.

The other stations showed mixed results, with increases in some parameters being about as numerous as decreases in others.

The relative importance of the various parameters as toxicants cannot readily be evaluated because the metals that have increased may not be bioavailable in the sediments.

Decreases in cadmium, chromium and mercury, the most likely to be bioavailable, are positive signs of improvement in the Marina.

Increases in organic nitrogen, coupled with high levels of ammonia found in the water column, plus the increases in total organic carbon and chemical oxygen demand indicate a decrease in the quality of the benthos and water column. This is consistent with the sulfide odor of muds and the dark red brown waters showing phytoplankton blooms in the inner slips, particularly at Stations 9, 10 and 11.

The Oxford Flood Control Basin drainage is probably responsible for much of the buildup of organics on the bottom at Stations 9, 10 and 11. Tidal flushing is reduced in the deadend basins, causing deposition of fine sediment and particulate organic matter in the low energy environment.

The increase in organic nitrogen and TOC at the tide gates of Ballona Lagoon suggests an increase in organic detritus originating in that water system.

The high level of chlordane (721 ppb) at the entrance channel, Station 2, indicates deposition from the Ballona Creek flood control channel, while the Oxford Flood Control Basin indicates terrestrial runoff, with 468 ppb chlordane. Chlordane was also high at the Ballona Lagoon entrance. The impact on the biota is unknown.

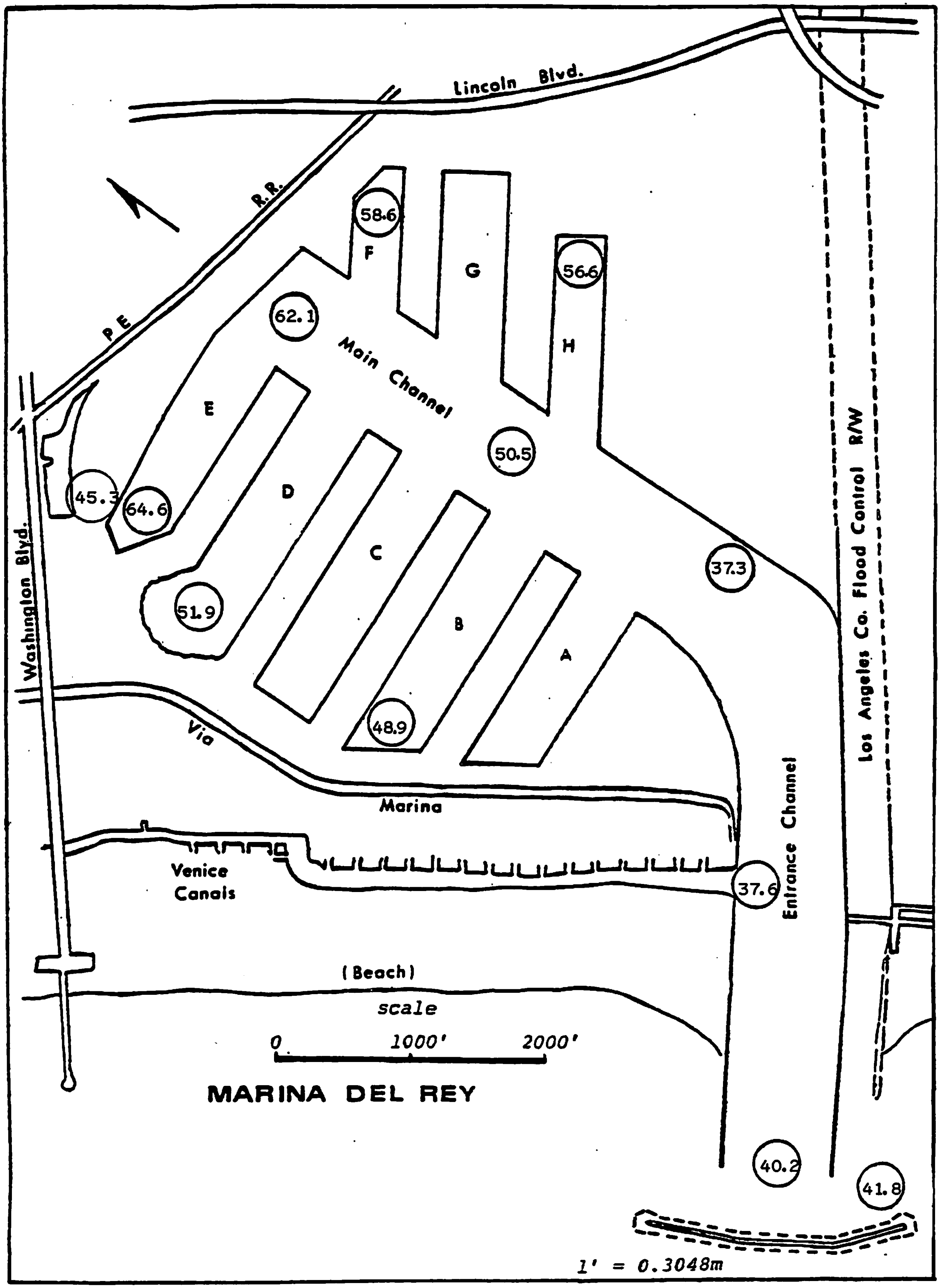

FIGURE 43. PERCENT MOISTURE

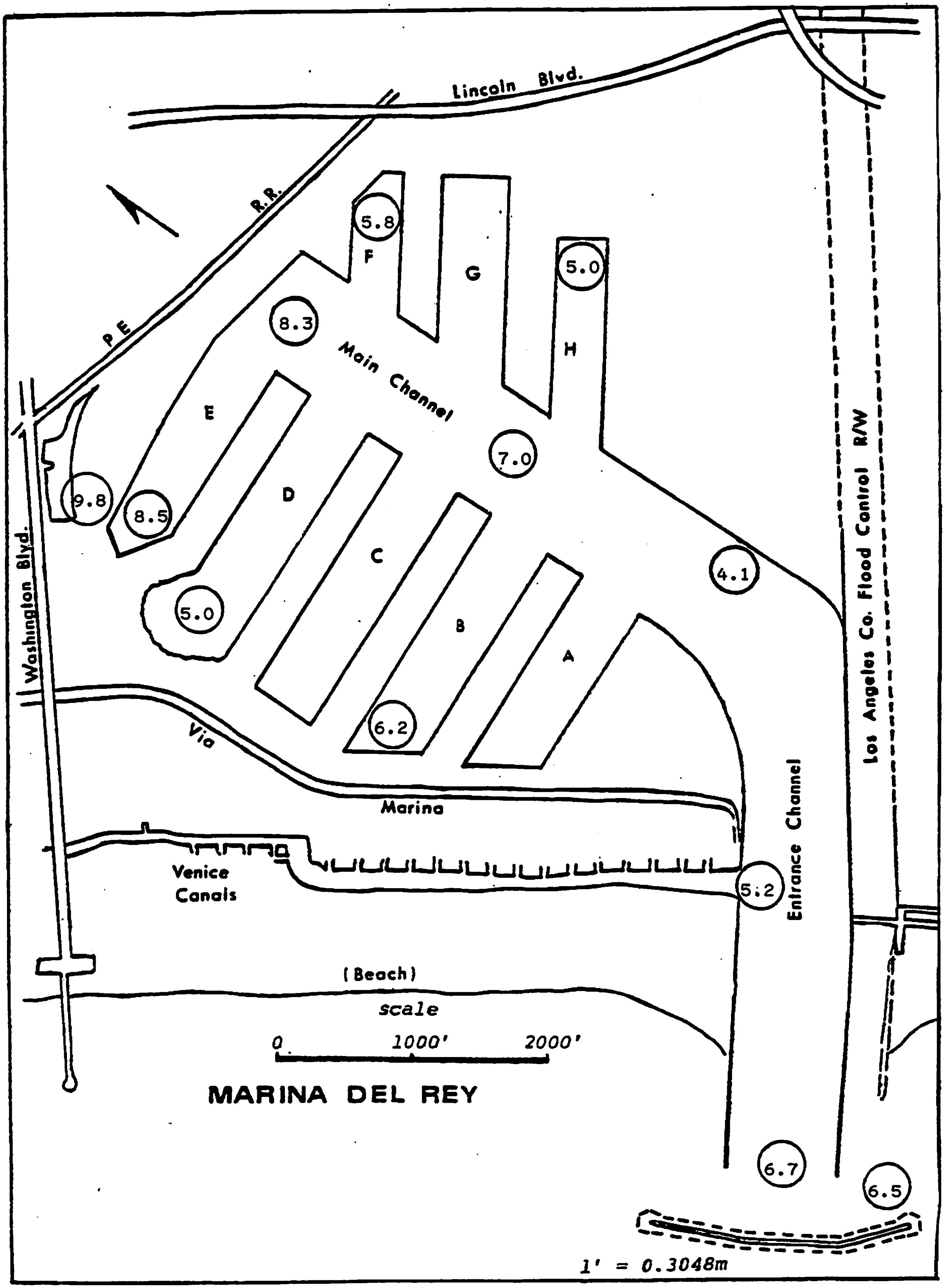

FIGURE 44. PERCENT VOLATILE SOLIDS

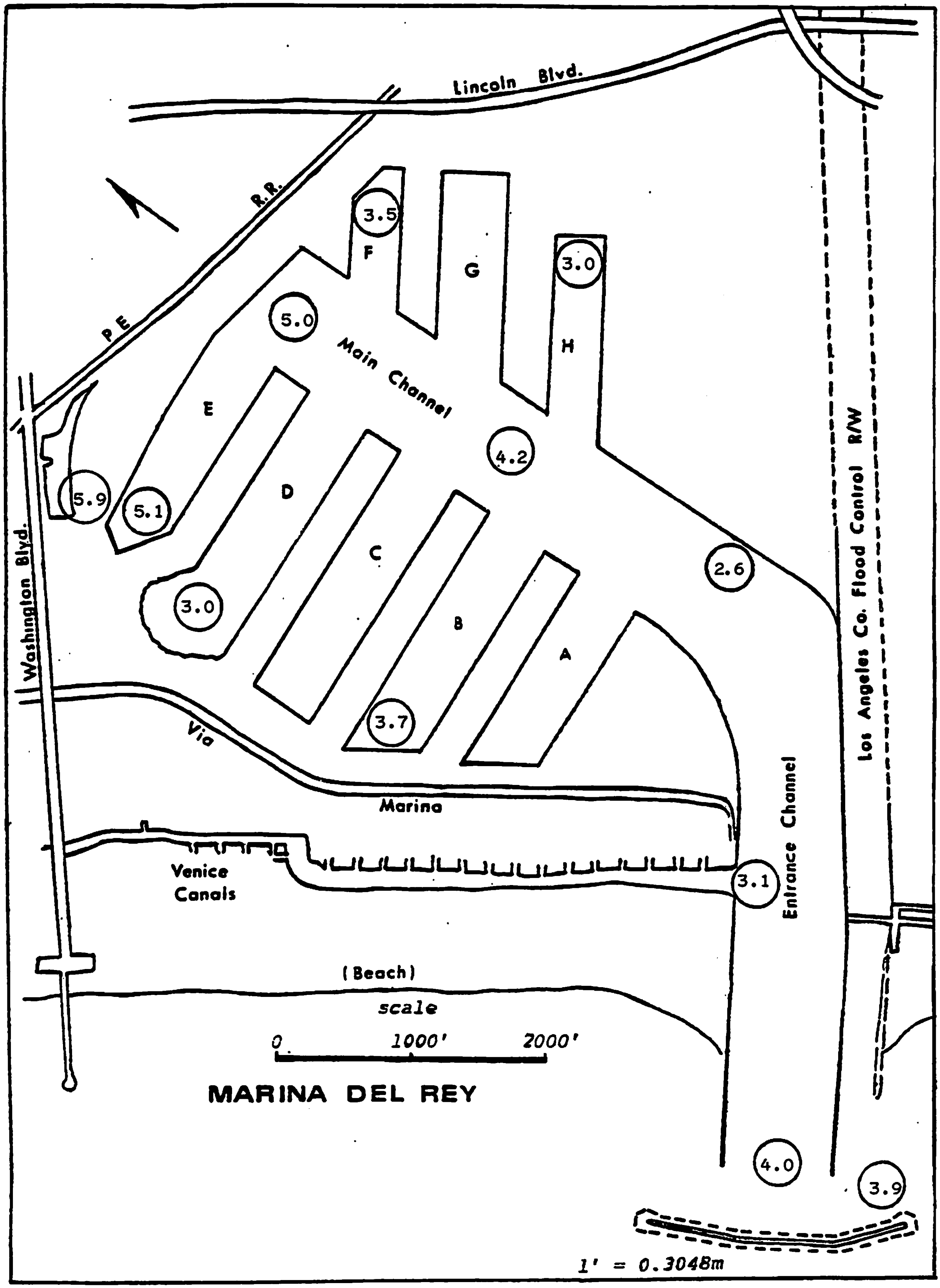

FIGURE 45. PERCENT TOTAL ORGANIC CARBON, MG/KG DRY WEIGHT

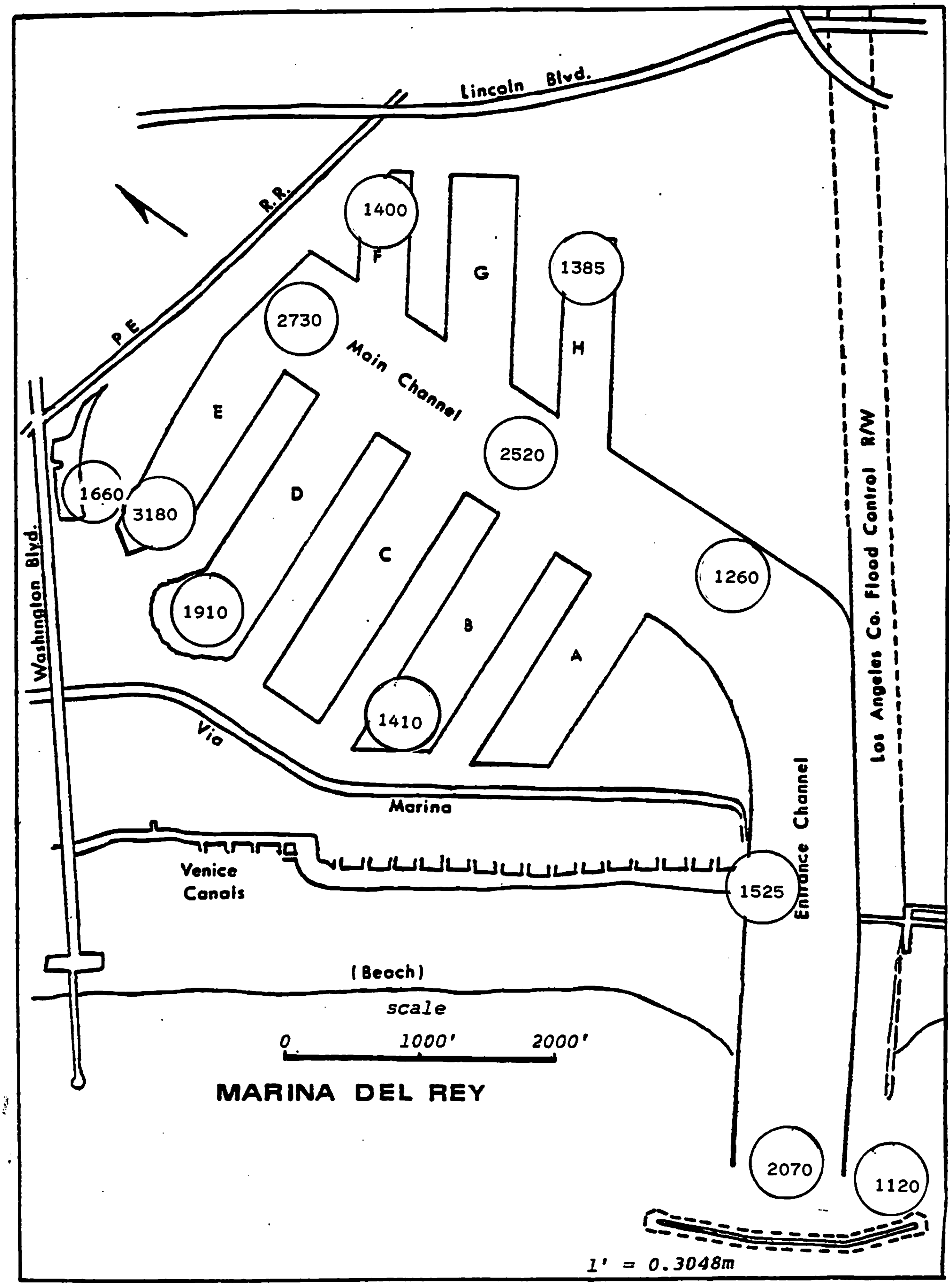

FIGURE 46. SEDIMENT IMMEDIATE OXYGEN, MG/KG DRY WEIGHT BASIS

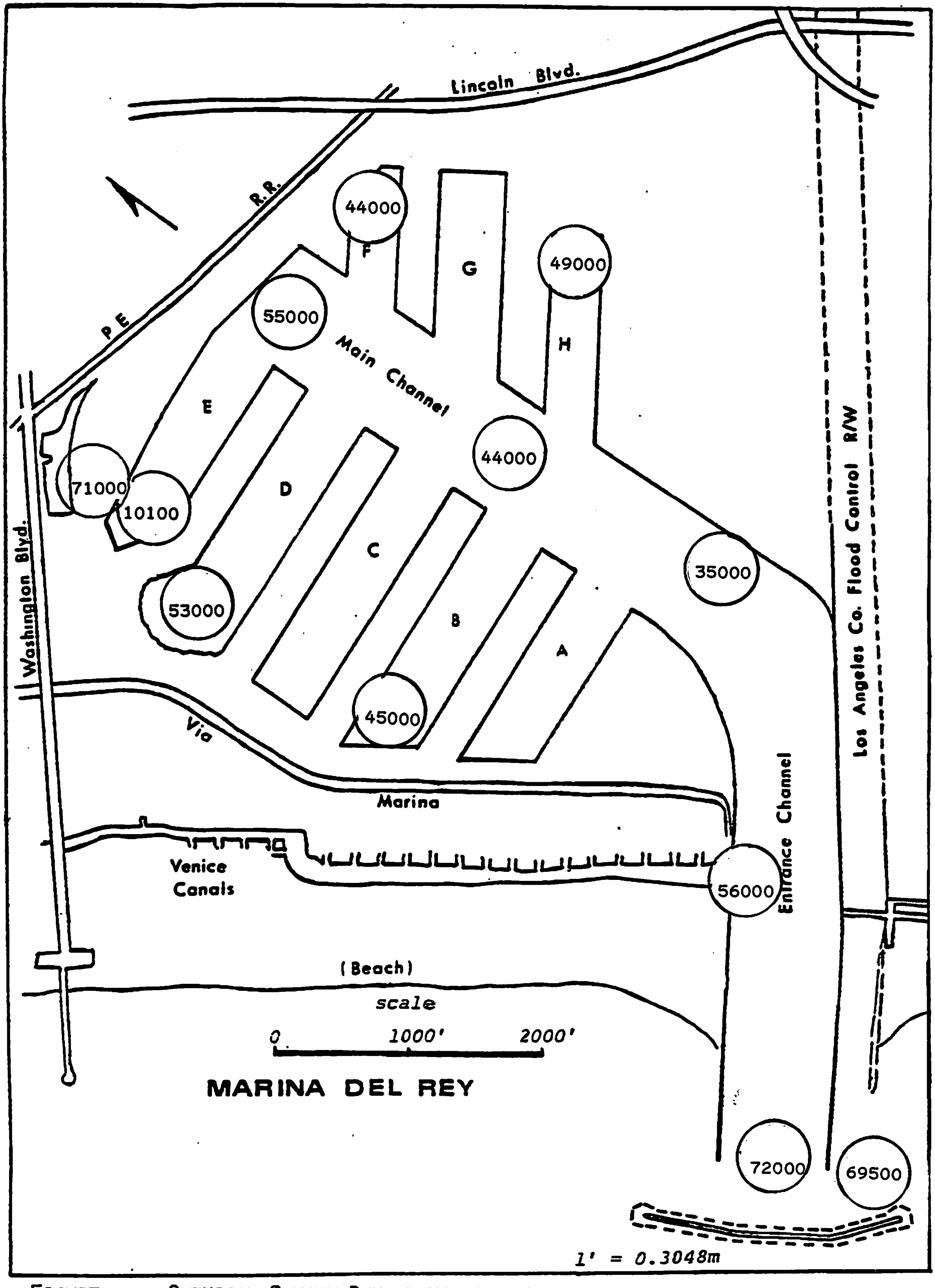

FIGURE 47. CHEMICAL OXYGEN DEMAND, MG/KG DRY WEIGHT BASIS

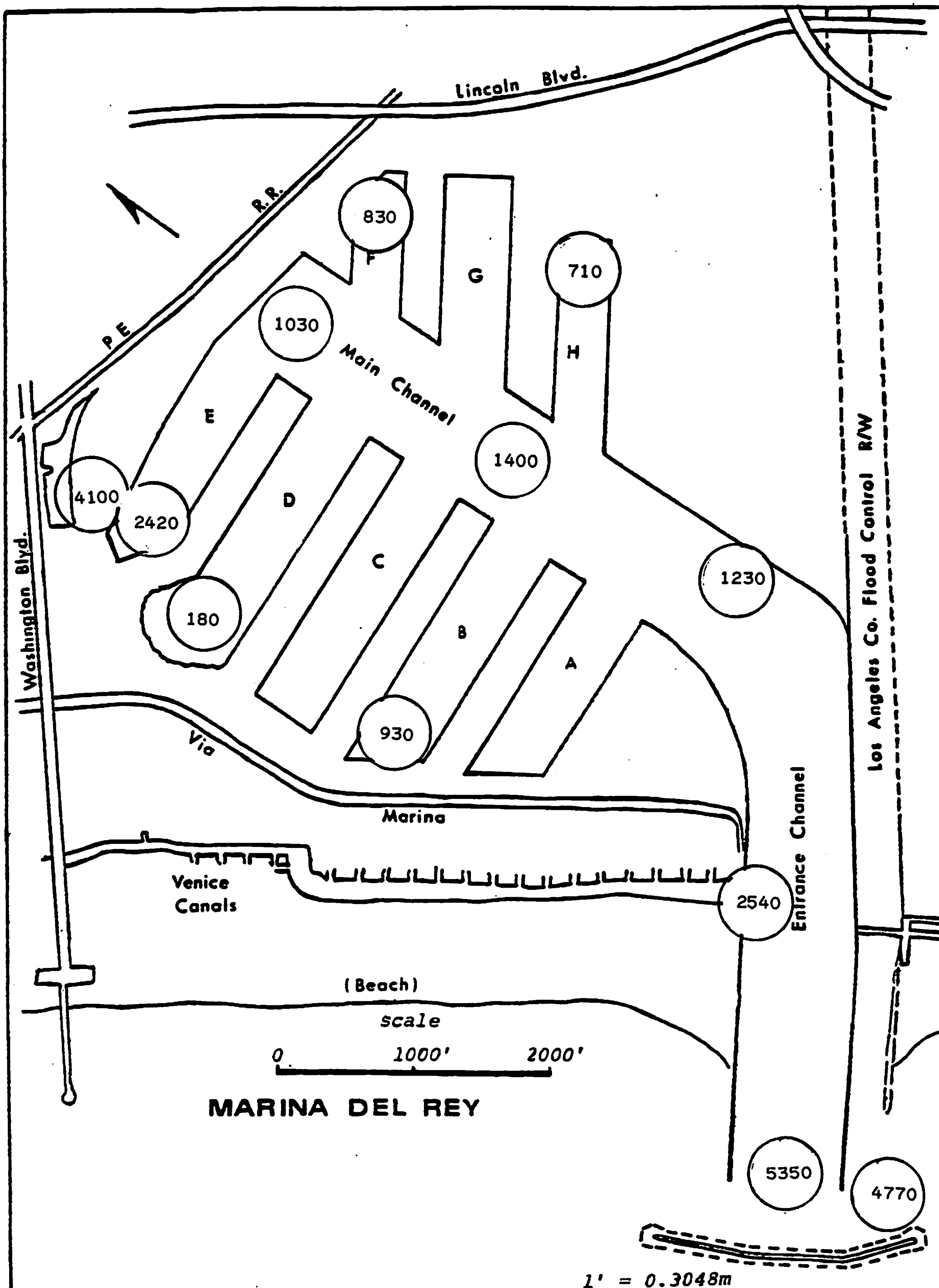

FIGURE 48. OIL & GREASE, MG/KG DRY WEIGHT BASIS

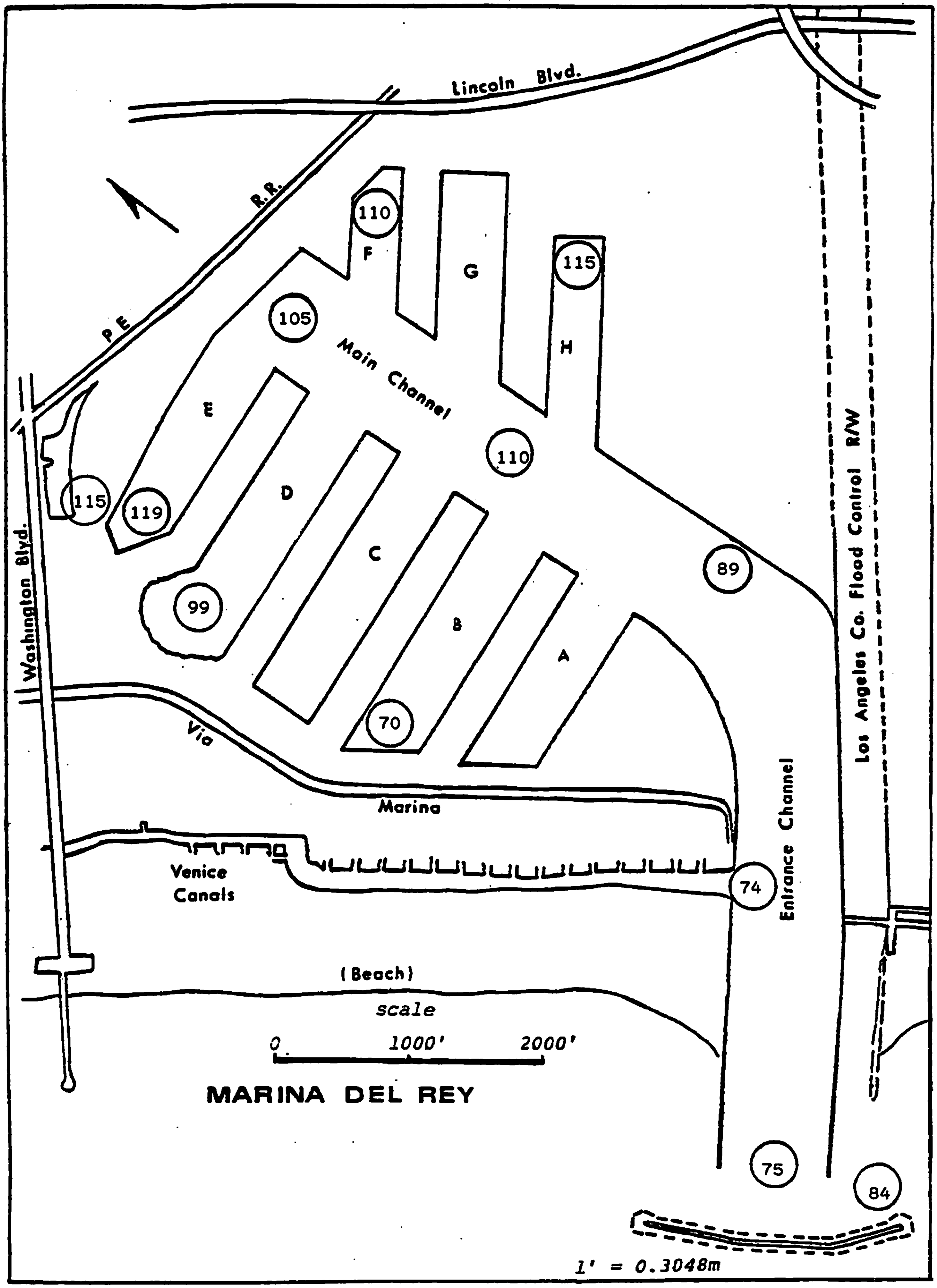

FIGURE 49. SEDIMENT PHOSPHATE, MG/KG DRY WEIGHT (IN 1000'S)

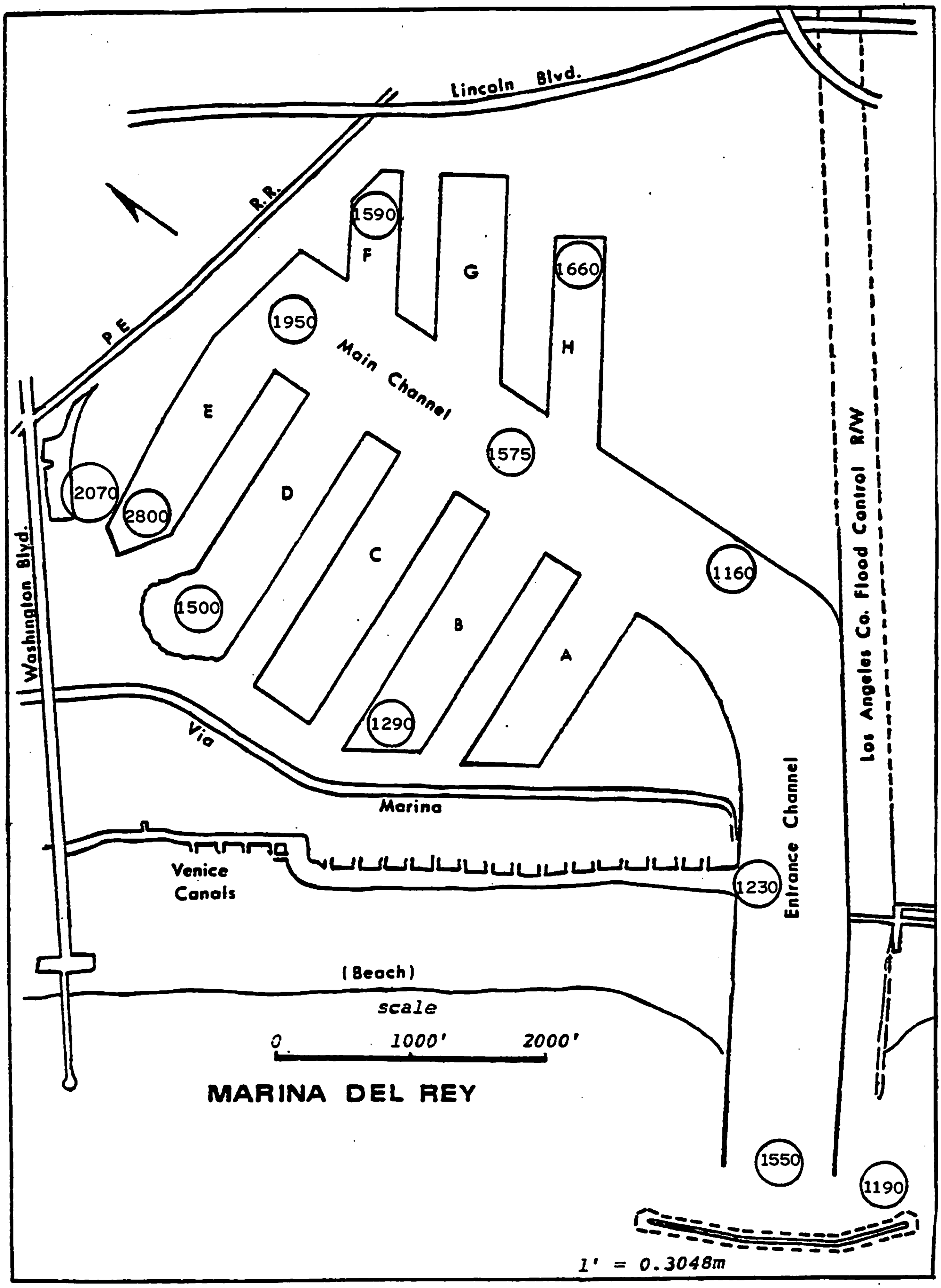

FIGURE 50. ORGANIC NITROGEN, MG/KG DRY WEIGHT

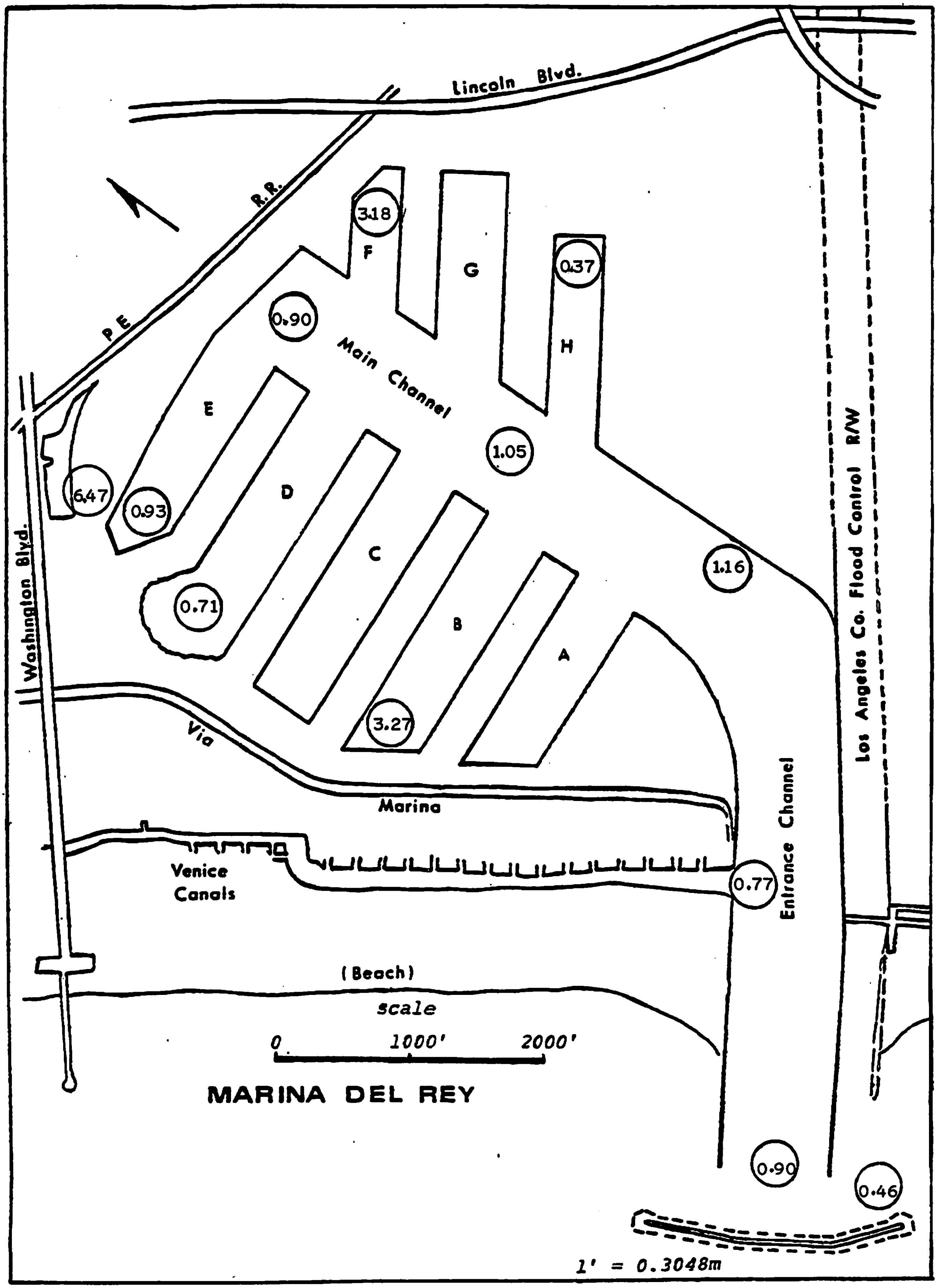

FIGURE 51. SULFIDES, MG/KG DRY WEIGHT (PPM)

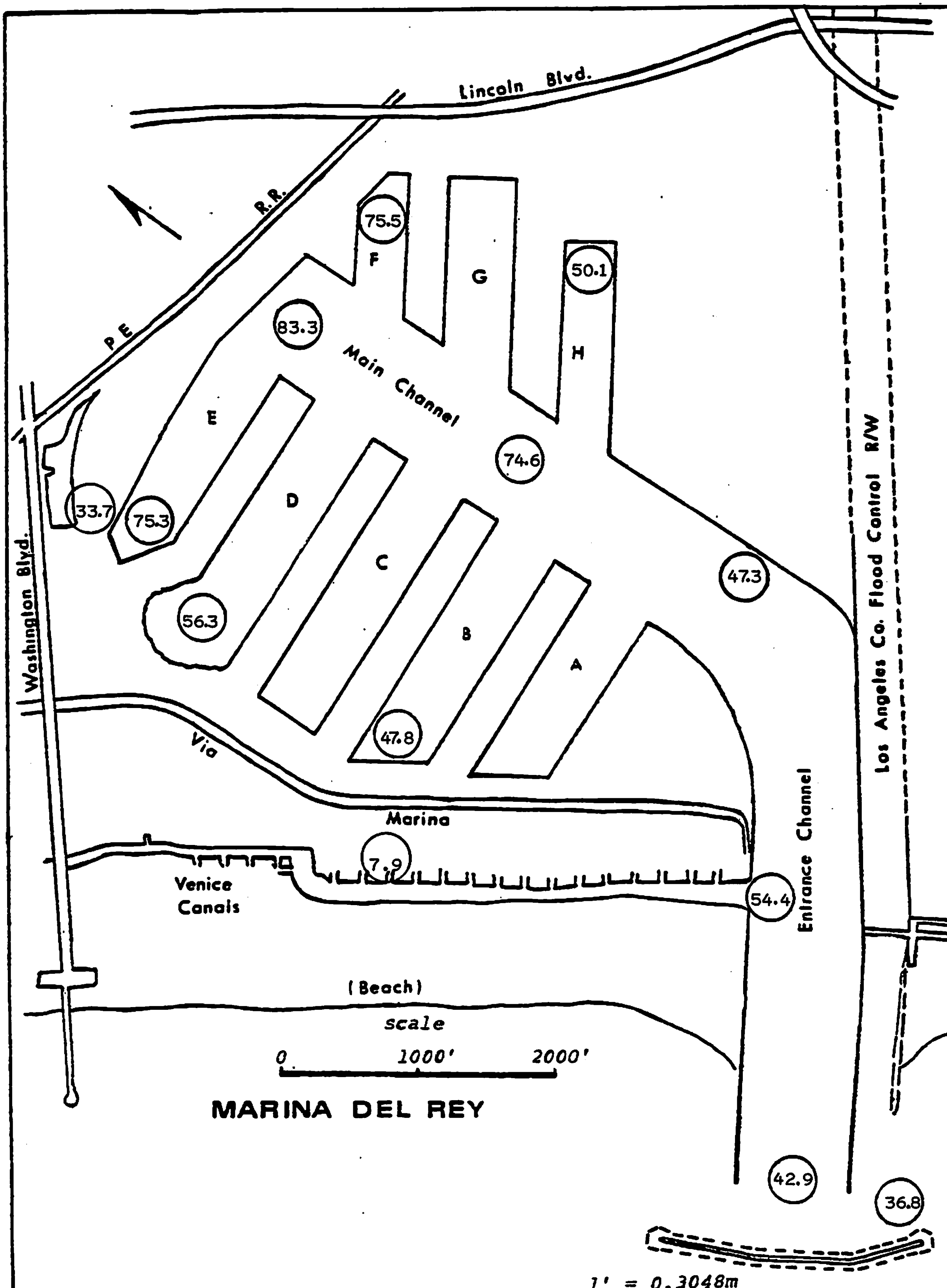

FIGURE 52. SEDIMENT CHROMIUM IN MG/KG DRY WEIGHT (PPM)

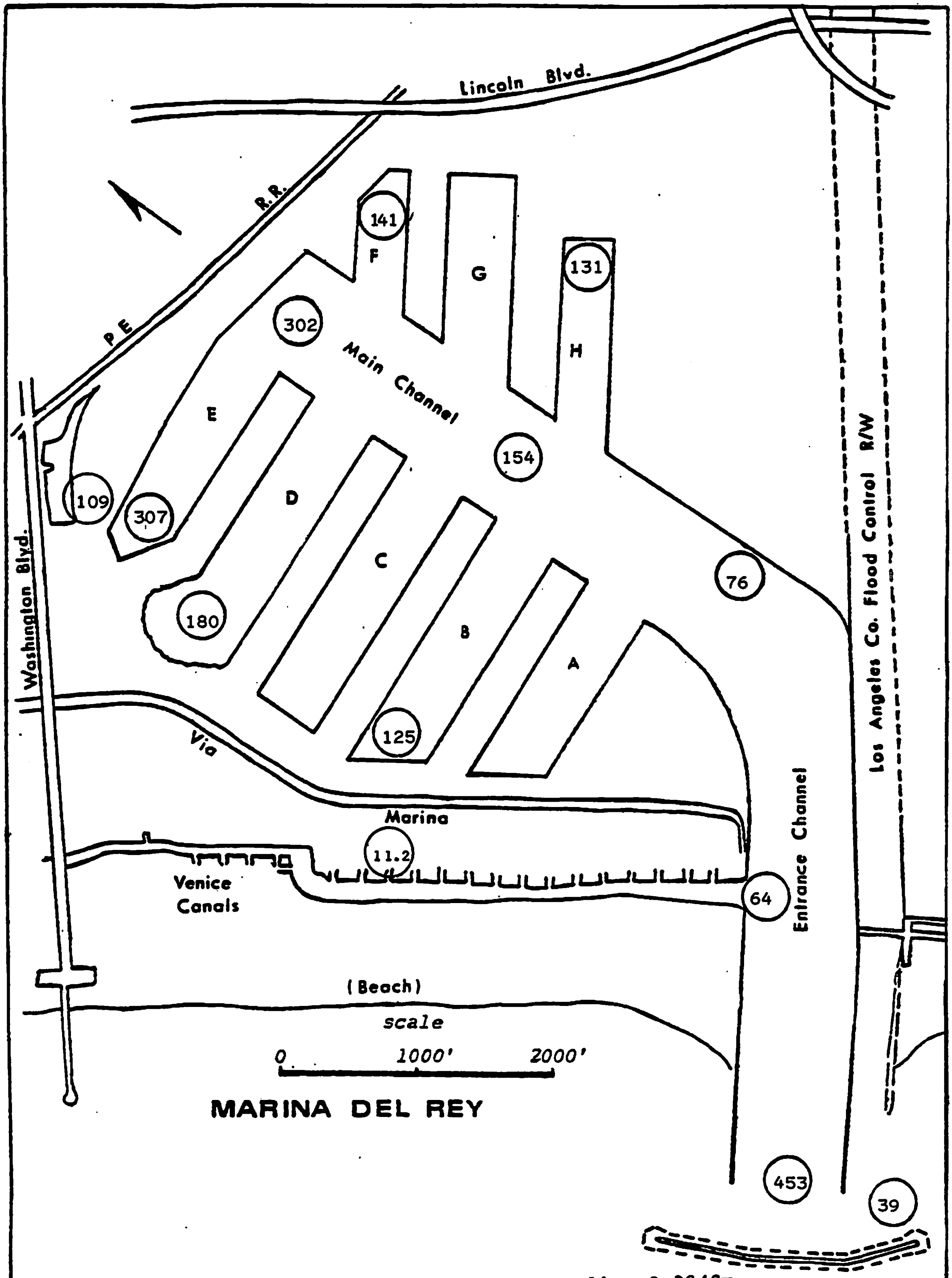

FIGURE 53. SEDIMENT COPPER IN MG/KG DRY WEIGHT (PPM)

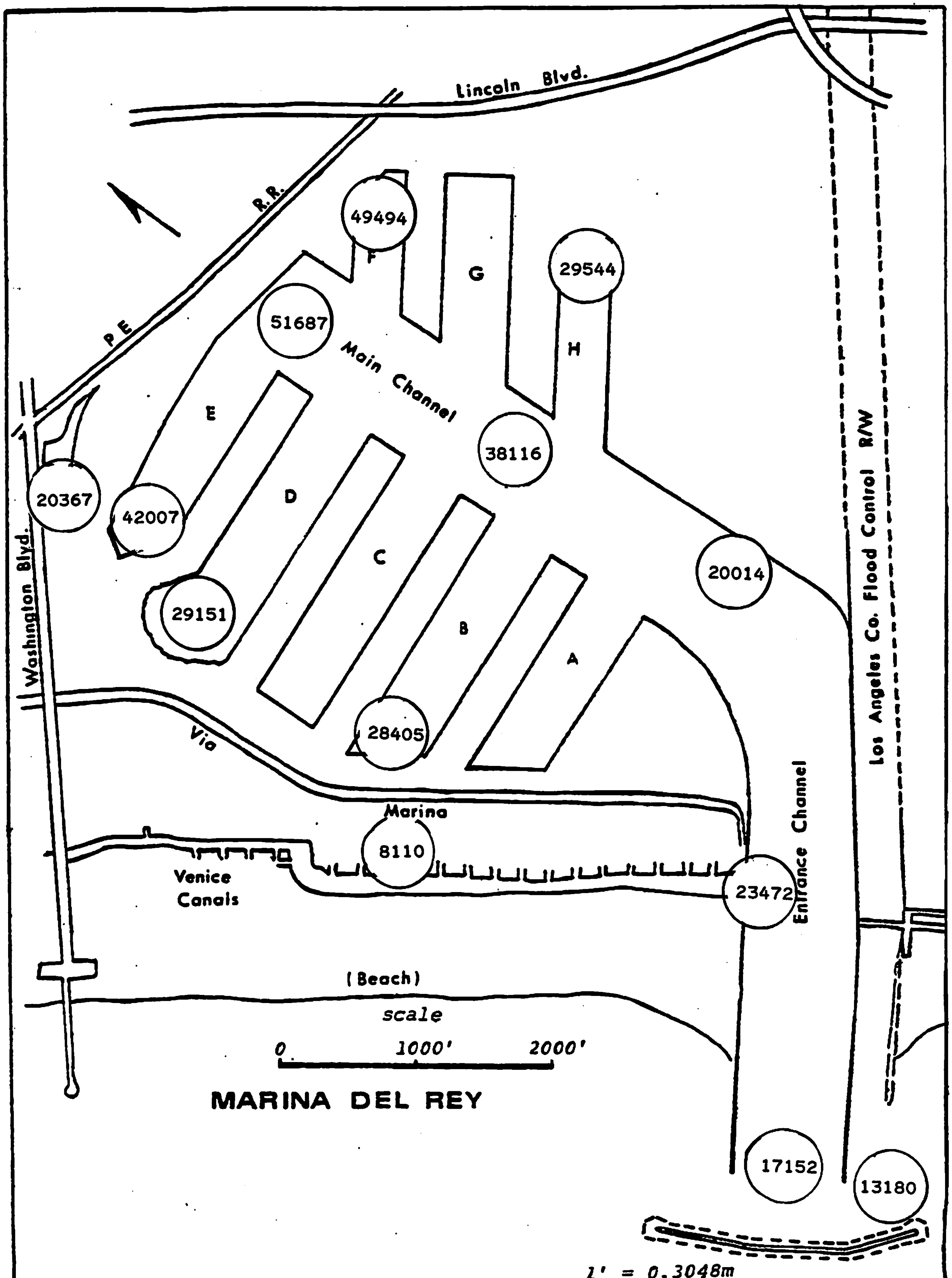

FIGURE 54. SEDIMENT IRON IN MG/KG DRY WEIGHT (PPM)

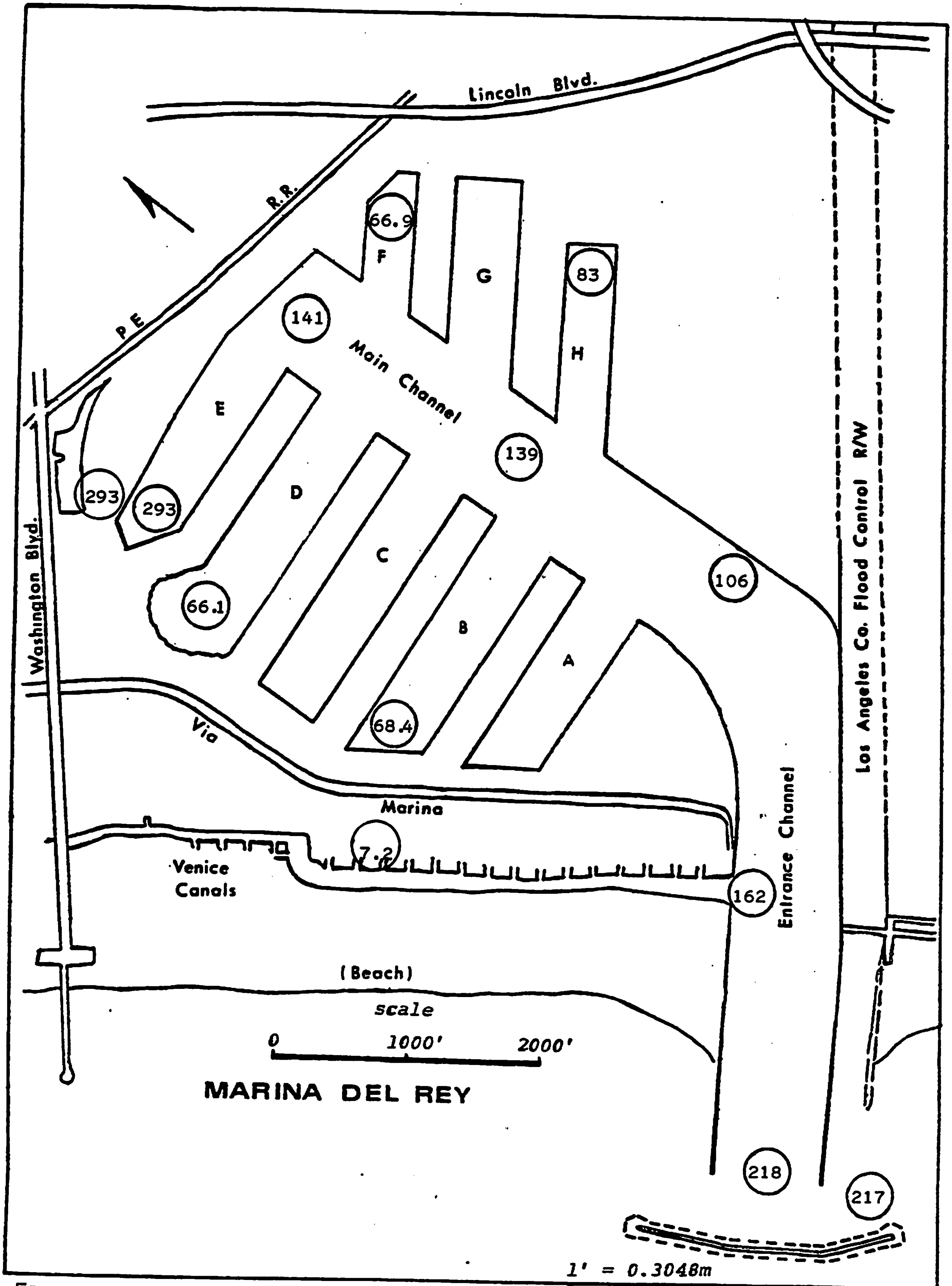

FIGURE 55. SEDIMENT LEAD, MG/KG DRY WEIGHT (PPM)

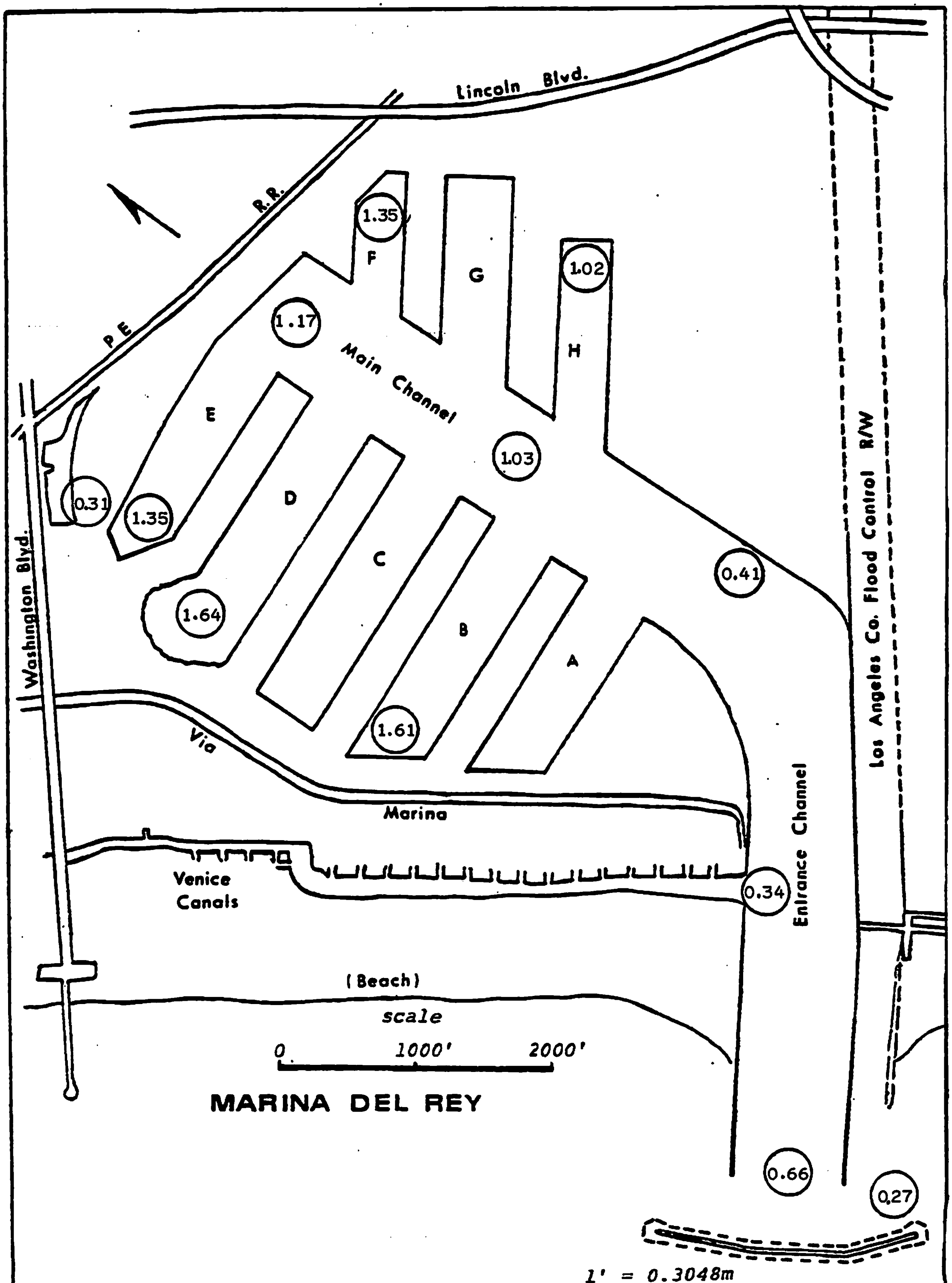

FIGURE 56. SEDIMENT MERCURY IN MG/KG DRY WEIGHT (PPM)

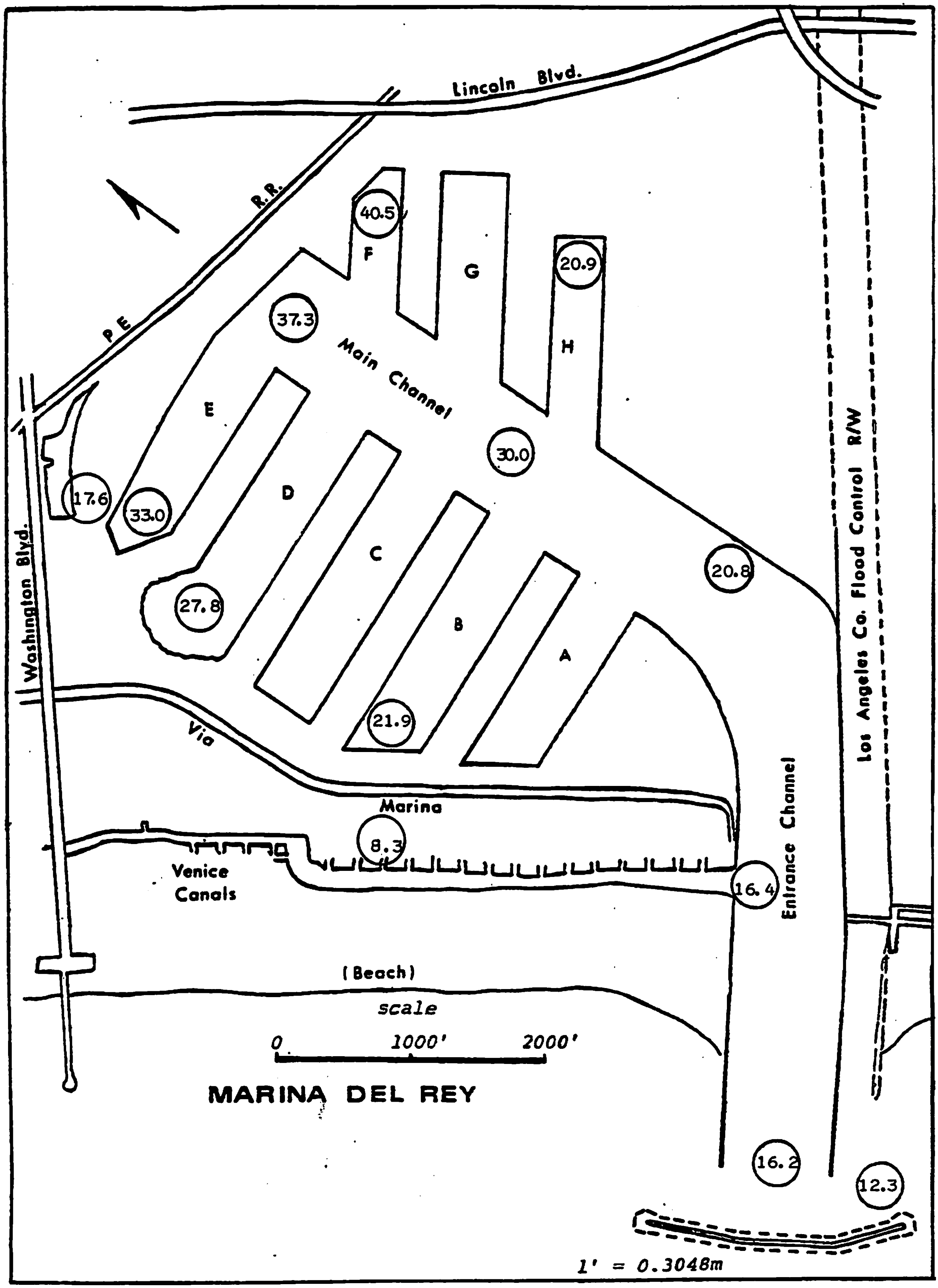

FIGURE 57. SEDIMENT NICKEL IN MG/KG DRY WEIGHT (PPM)

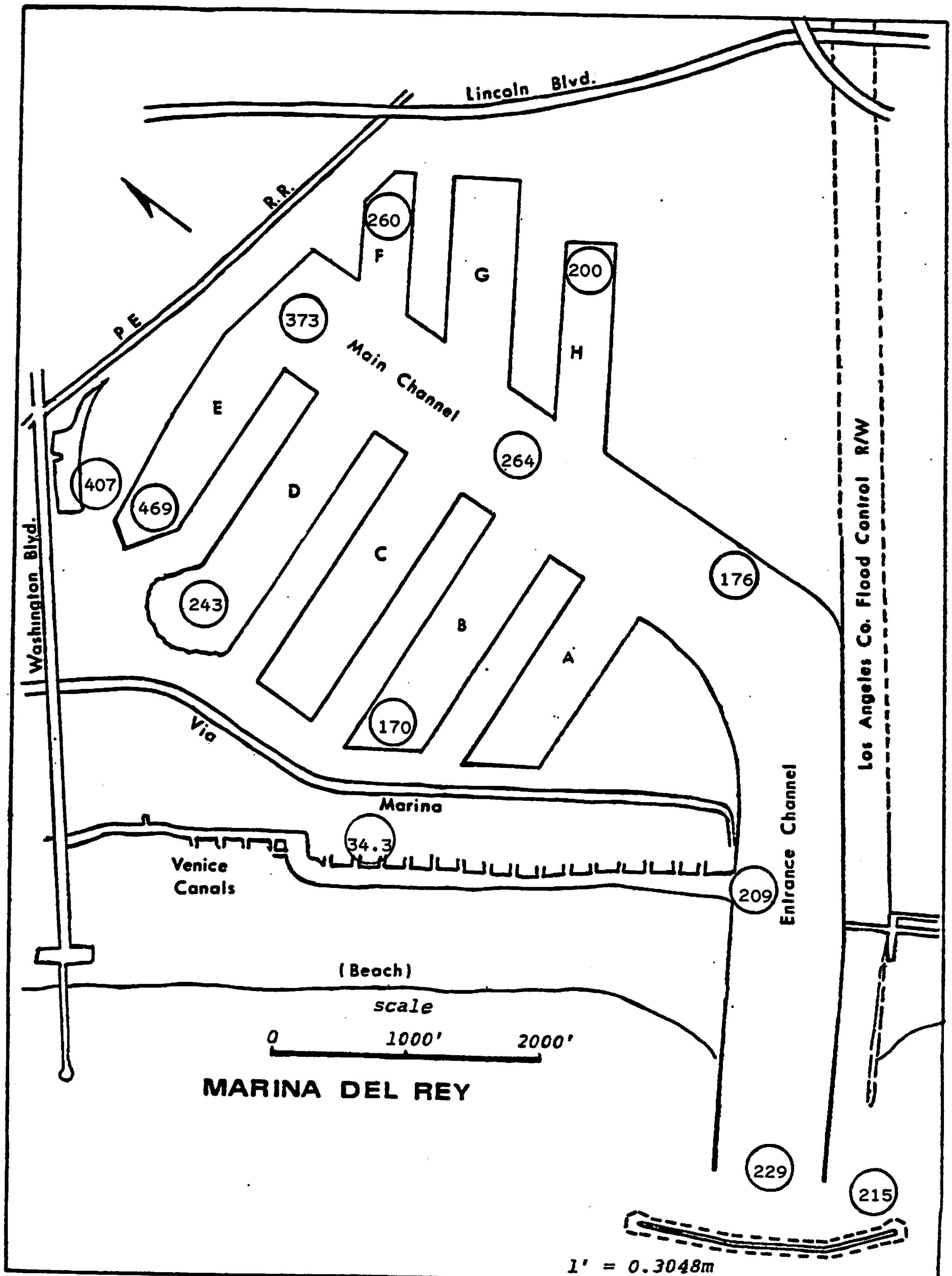

FIGURE 58. SEDIMENT ZINC MG/KG DRY WEIGHT (PPM)

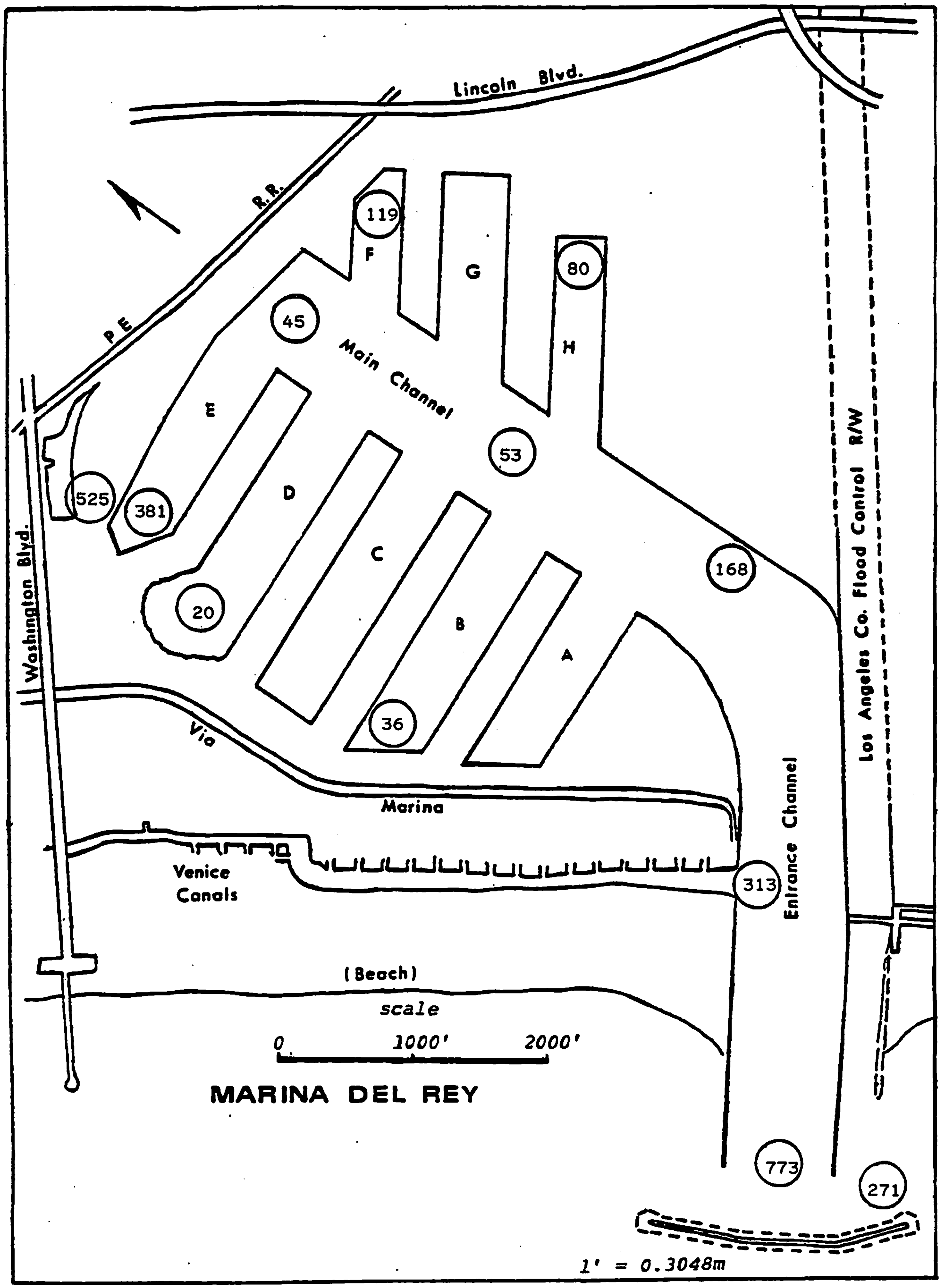

FIGURE 59. SEDIMENT TOTAL CHLORINATED HYDROCARBONS IN UG/L DRY WEIGHT (PPB)

Table 7. Sediment Chemical Analysis, 25 October 1985 Marina del Rey

Station Parameter*	1	2	3	4	5	6	7	8	9	10	11	13
Moisture %	41.84	40.21	37.61	37.30	50.47	48.88	56.61	51.86	58.55	64.63	62.06	45.33
Vol. Solds %	6.49	6.67	5.24	4.41	7.01	6.16	5.00	5.04	5.78	8.45	8.28	9.83
TOC %	3.9	4.0	3.1	2.6	4.2	3.7	3.0	3.0	3.5	5.1	5.0	5.9
IOD	1,120	2,070	1,525	1,260	2,520	1,410	1,385	1,910	1,400	3,180	2,730	1,660
COD	69,500	72,000	56,000	35,000	44,000	45,000	49,000	53,000	44,000	10,100	55,000	71,000
Oil & Grease	4,770	5,350	2,540	1,230	1,400	930	710	180	830	2,420	1,030	4,100
PO_4	84,000	75,000	74,000	89,000	110,000	70,000	115,000	99,000	110,000	119,000	105,000	115,000
Org-N	1,190	1,550	1,230	1,160	1,575	1,290	1,660	1,500	1,590	2,800	1,950	2,070
Sulfide	0.46	0.90	0.77	1.16	1.05	3.27	0.37	0.71	3.18	0.93	0.90	6.47
Arsenic	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Cadmium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	36.8	42.9	54.4	47.8	74.6	47.8	50.1	56.3	75.5	75.3	83.3	33.7
Copper	39.1	45.3	64.1	76.0	154.0	125.0	131.0	180.0	141.0	307.0	302.0	108.7
Iron	13,180	17,152	23,472	20,014	38,116	28,405	29,544	29,151	49,494	42,007	51,687	20,367
Lead	217.0	218.0	162.0	106.0	139.0	68.4	83.0	66.1	66.9	293.0	141.0	293.0
Mercury	0.27	0.66	0.34	0.41	1.03	0.61	1.02	1.64	1.35	1.35	1.17	0.31
Nickel	12.3	16.2	16.4	20.8	30.0	21.9	20.9	27.8	40.5	33.0	37.3	17.6
Zinc	215	229	209	176	264	170	200	243	260	469	373	407

* In mg/kg dry wt. (ppm)
unless otherwise marked

Table 8. Sediment Pesticides and Chlorinated Hydrocarbons Marina del Rey, October 1984

Station Parameter *	1	2	3	4	5	6	7	8	9	10	11	13
Aldrin	<1.52	<2.49	<1.79	<1.76	<2.29	<2.05	<2.17	<1.83	<2.02	<2.46	<3.43	<2.13
Alpha BHC	<1.52	<2.49	<1.79	<1.76	<2.29	<2.05	<2.17	<1.83	<2.02	<2.46	<3.43	<2.13
Beta BHC	<1.52	<2.49	<1.79	<1.76	<2.29	<2.05	<2.17	<1.83	<2.02	<2.46	<3.43	<2.13
Lindane	<1.52	<2.49	<1.79	<1.76	<2.29	<2.05	<2.17	<1.83	<2.02	<2.46	<3.43	<2.13
Chlordane	241	721	269	134	<6.87	<6.15	<2.17	<5.49	<6.06	344	<10.29	468
Dieldrin	<3.04	<4.98	<3.58	<3.52	<4.58	<4.10	<4.34	<3.66	<4.04	<4.92	<6.86	<4.26
Endrin	<3.04	<4.98	<3.58	<3.52	<4.58	<4.10	<4.34	<3.66	<4.04	<4.92	<6.86	<4.26
Heptachlor	<1.52	<2.49	<1.79	<1.76	<2.29	<2.05	<2.17	<1.83	<2.02	<2.46	<3.43	<2.13
Heptachlor Epoxide	<1.52	<2.49	<1.79	<1.76	<2.29	<2.05	<2.17	<1.83	<2.02	<2.46	<3.43	<2.13
pp DDT	<3.04	<4.98	<3.58	<3.52	<4.58	<4.10	<4.34	<3.66	<4.04	<4.92	<6.86	<4.26
pp DDD	8	17	12	5	<4.58	<4.10	<4.34	<3.66	40	<4.92	<6.86	<4.26
pp DDE	22	35	32	29	53	36	80	20	79	37	45	57
Total Pest. Detected	271	773	313	168	53	36	80	20	119	381	45	525
Aroclor 1242	<7.60	<12.45	<8.95	<8.80	<11.45	<10.25	<10.85	<6.83	<10.10	<12.30	<17.15	<10.65
Aroclor 1254	<15.20	<24.90	<17.90	<17.60	<22.90	<20.50	<21.70	<13.68	<20.20	<24.60	<34.30	<21.30
Total Chlor. Hydrocarbon	271	773	313	168	53	36	80	20	119	381	45	525

* In ug/L dry wt. (ppb)
<= limits

Table 9. Soil Sample data from test borings on the Silver Strand, site of a former Dow Chemical iodine recovery plant. (BCL Associates, for the Los Anglels County Department of Health Services, 16 April 1984)

Total Metals (TTLC)	C-1 (ug/g)	C-2 (ug/g)	C-3 (ug/g)	C-4 (ug/g)
Antimony	<2.5	<2.5	<2.5	<2.5
Arsenic	4.7	3.3	3.9	5.3
Barium	896	1128	1945	2020
Beryllium	<1.0	<1.0	<1.0	<1.0
Cadmium	<0.5	<0.5	<0.5	<0.5
Chromium	8.8	5.4	7.9	10.1
Copper	10.4	9.3	11.2	10.5
Iron	10,370	6180	8110	10,660
Lead	3.5	2.4	7.2	12.8
Mercury	<0.05	<0.05	<0.05	<0.05
Nickel	8.4	9.3	8.3	7.8
Selenium	<2.5	<2.5	<2.5	<2.5
Silver	<2.5	<2.5	<2.5	<2.5
Thallium	<2.5	<2.5	<2.5	<2.5
Zinc	28.9	18.5	34.3	35.7
pH	8.4	8.4	IS*	8.0
Electrical Conductivity	3275	3821	IS*	354
Sulfide	<.05	<.05	<.05	<.05
Sulfate	219	213	189	146

LC_{50} 96 Hr Fish Toxicity <800 ppm

*IS = Insufficient Sample

Table 10. Changes in Sediment Pollutant Levels between 1977[1], 1978[2] and 1984

Parameter/Station	1	2	3	4	5	6	7	8	9	10	11
Vol. Solution	+ +	- +	+ +	o +	- +	+ +	- +	- +	o +	- +	o +
TOC	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ +
IOD	- +	+ +	+ +	+ +	+ +	+ -	- -	+ -	- +	+ +	+ +
COD	+ +	- +	+ +	+ +	- +	+ +	- +	+ +	+ +	- -	+ -
Oil & Grease	- +	- +	+ +	+ -	- -	- +	- -	- -	- -	- +	+ -
Org N	+ +	+ +	+ +	+ +	+ +	+ +	- +	+ +	+ +	+ +	+ +
Arsenic	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Cadmium	- o	- o	- o	- o	- o	- o	- o	- o	- o	- o	- o
Chromium	- -	- +	+ -	- -	- -	- +	- -	- o	- +	- +	- +
Copper	- +	- +	+ +	+ +	+ +	+ +	- +	+ -	+ +	+ +	+ +
Iron	- -	+ +	+ +	+ o	+ +	+ +	+ +	- +	+ +	+ +	+ +
Lead	+ +	+ +	+ +	+ +	- +	+ +	- +	+ +	- +	- +	+ +
Mercury	o -	+ +	o -	o -	o +	- -	- -	+ +	- +	- -	- -
Nickel	- -	- -	+ -	- -	- -	- -	- -	- -	- -	- -	- -
Zinc	- +	- +	+ +	+ +	+ +	+ +	- +	+ +	+ +	+ +	- +

[1] Data from Marine Studies of San Pedro Bay, California Part 13 (1977)

[2] Data from Marine Studies of San-Pedro Bay, California Part 18 (1980)

0 = change undetectable - (+ Increase, - Decrease)

FISH FAUNA OF MARINA DEL REY

INTRODUCTION

Marinas and small craft harbors provide some of the only remaining wetlands or shallow water habitats in urban areas of California and elsewhere around the world. However, such waters are heavily impacted by the multiple uses imposed upon them for boating, berthing, and other recreational activities, as well as for drainage of adjacent areas in many cases. It is essential from the point of resource conservation, recreation and esthetics that the waters remain sufficiently unpolluted to sustain fish life and an indigenous biota on which the organisms can feed.

Because of the multiple uses and the attendant potential for pollution, the waters are less likely to sustain resident populations over a long period of time than do waters subjected to less urban impact. Natural threats to stability include the extremes in temperature and salinity to which shallow water biota are subjected. Most of those organisms have a wider range of tolerance than do deeper water species, but mobile shallow water organisms such as fish may adjust to temperature by leaving the area and seeking deeper waters. When long term oceanographic changes occur such as the El Niño events that have produced warmer waters in southern California for the last few years, some species are unable to adjust to the warmer Marina waters and disappear from the area. A return to more normal conditions may still not result in repopulation for a number of years.

The purpose of the present studies was to determine what the current status of the fish populations were in 1984 amd to compare them with the populations of previous years. Two surveys were performed in May and October 1984 by the *Vantuna* Group of Occidental College directed by Dr. John

S. Stephens, Jr. in cooperation with Harbors Environmental Projects of the University of Southern California.

Previous surveys were performed by Harbors Projects on a quarterly basis in Marina del Rey from January 1977 to June 1978 in collaboration with Dr. C.R. Feldmeth of the Claremont Colleges (Soule and Oguri, 1977), and with Dr. Stephens in 1979 (Soule and Oguri, 1980).

PROCEDURES

Fish sampling was conducted for the most part by the methods reported in Soule and Oguri (1980) and in the same station patterns (Fig. 60). A 15 ft semi-balloon otter trawl was towed for 15 minutes to sample benthic fish fauna at the six trawl stations. A 100 ft by 6 ft multimesh size gill net was set at three stations for 45 min each (Stations 2, 5, and 6) to sample non-benthic fish and a beach seine was performed at the sandy beach at Station 8. Diver surveys were carried out on the inner rock face of the entrance breakwater and on the north and south groins adjacent to Station 2.

In addition to the above procedures, several new methods were introduced. Two 5-min isobathic fish counts and a 10-min free swim with a check list were performed at each diver station, while ichthyoplankton tows were taken at each trawl station with a measured meter net at surface and bottom.

Sampling was performed on 24-25 May 1984 and 9-10 October 1984.

RESULTS AND DISCUSSION

In 1984, 53 species of fish were recorded in the biannual survey, (Table 11) compared with 35 species found in 1977-1979 (Soule and Oguri, 1980) (Table 12). This statistic would be misleading alone, however, because there were extensive changes in species composition from the earlier surveys, as well as considerable differences between the two 1984 surveys.

Twenty-eight species on the 1984 list were not on the 1977-79 list, 22 of which were species limited to warm waters by tolerance and do not range northward of central California (Miller and Lea, 1972). In turn, eight species disappeared from the Marina del Rey listing, of which five were warm water species, two were cool tolerant widely ranging species and one was probably cool water limited. Some differences may simply be due to random sampling and the limited numbers of samples taken, but the large number of changes is striking.

Absent in 1984 were *Atherinops californiensis* (jacksmelt), *Leptocottus armatus* (staghorn sculpin), *Mustelus henlei* (brown smoothhound), *Myliobatus californica* (bat ray), *Neoclinus lucioceps* (yellow fringehead), *Phanerodon furcatus* (white surf perch), *Rimicola muscarum* (kelp clingfish) and *Synodus lucioceps* (California lizardfish).

May 1984

A total of 42 species were recorded on 24-25 May 1984. With some overlap in sampling there were seven species from the beach seine, six from gill netting, 14 from otter trawls, 19 from diver transects and two from ichthyoplankton.

Otter Trawls

The otter trawl data, presented in Table 13, generally showed low numbers of species and fish. A total of 14 species and 136 individuals were taken in six 10 min trawls with a mean of 5.17 species and 22.3 individuals in May 1984.

The number of species can be compared with the 1977-1978 Harbors

Environmental Projects data from Marina del Rey in which 18 species were found, with a mean of 5.1 species duals per trawl. However 1977-1978 numbers of individuals were much higher, with a total of 505 fish trawled in June 1977 and 518 in June 1978. The 1977-78 range was from 2 to 508 individuals (mean = 96.5, standard deviation = 145.7). In 1979, trawl data were collected with a small 6 ft trawl which undersampled the fauna but the mean number of species was seven and individuals was 16.7. The higher numbers in 1977-1978 were largely the result of some schooling species, particularly the northern anchovy *Engraulis mordax*, and schools of queen-fish *Seriphus politus*, and white surfperch *Phanerodon furcatus*. Some juvenile *Seriphus* were collected in May trawls but no northern anchovy or white surfperch were collected.

In general, the catches were not impressive for benthic fishes. In May 1984, *Cymatogaster aggregata* and *Engraulis mordax* were absent and *Paralabrax nebulifer* was substituted for *P. maculatofasciatus*.

Gill Netting

May gill net data are shown in Table 14, with a total of six species and 80 individuals taken at three stations. The average catch (three species 26.7 individuals) is higher than that recorded in 1977-1978 (1.6 species, 3.8 individuals). Interestingly in 1984 *Sardinops*, the sardine, was the dominant species, the majority of which were large adults. The largest catch was, surprisingly, at the inner station, No. 8. Generally the gill net catch decreased toward the harbor entrance, but this might also coincide with the change in hour of the day. Nets were first set at Station 8 at 1044, followed by Station 5 at 1156 and Station 2 at 1310 on 24 May. Low tide was at 1148.

None of the species taken in 1984 matched those taken in the earlier gill nettings; since the previous catch corresponded well with otter trawl data of that period the difference appears valid.

The presence in May 1984 of three reasonably large white sea bass (*Atractoscion*), along with bonito (*Sarda*) and the sardine (*Sardinops*), in gill nets were noteworthy. The 1977 gill netting was done with a smaller 20 ft net and gathered only three species, *Atherinopsis californiensis* (jacksmelt), *Genyonemus lineatus* (white croaker) and *Sphyraena argentea* (California barracuda) with only seven individuals. No doubt most fish escaped the small gill net in 1977.

Beach Seine

In the single May 1984 beach seine with the 100 ft net, some extremely interesting species were found (Table 15). There was a large school of bonefish (*Albula*) in the area, a species not previously recorded from Marina del Rey and one not common in southern California. Also present was the mullet (*Mugil*), which is not rare but has not been previously reported in Marina del Rey. Altogether seven species and 186 individuals were gathered in May 1984.

Diver Surveys

In diver transects, visibility was minimal (<2m) and the numbers were, therefore, quite low. The *Vantuna* group divers generally require at least 5 m for quantifiable data in comparable surveys in King Harbor. In May 1984 a total of 20 species were observed, 16 along the entry breakwater; 14 along the southern jetty and six on the northern jetty which is extremely shallow (<1-2m) and sandy (Table 16). If the latter stations are excluded, the fauna is quite similar to that of other breakwaters. Because of the shallow, sand-rock interface (= 3-5m) on the terminal and southern walls, few deeper, colder (below the thermocline) species are present. The diver surveys conducted in January and April 1979 identified only eight and 10 species, respectively. Two of these, *Leptocottus armatus* and *Rhacochilus toxotes* were not seen during the May study.

Ichthyoplankton

The ichthyoplankton collection data and organisms, sorted to the 10 percent level, are presented in Table 17. From the egg samples one genus, two families, and one unknown were identified. From the larvae, four species, *Genyonemus lineatus*, *Seriphus politus*, *Typhlogobius californiensis*, and *Syngnathus leptorhynchus*, were identified, plus one genus, *Hypsoblennius* sp., and three familial groups. All of these eggs and larvae are common in embayments. In 1980, 48 samples which included 39 categories were taken by the *Vantuna* Research Group. For that year, larval rankings in order were: Goby A/C, *Hypsoblennius* sp., Goby D, *Genyonemus*, *Engraulis*, *Typhlogobius*, Atherinidae, Clinid A. and *Seriphus*. As indicated by this year's sample, little change has occurred in this rank order.

October 1984

In the fall fish survey conducted on 9-10 October 1984, 37 species were recorded; five from the beach seine, four from the gill net, four from otter trawls, 24 in diver transects and nine in ichthyoplankton samples. As expected, there was considerable overlap in species. This represented a decrease in total species numbers.

There was a striking shift in species composition, with ten species present in October that were not present in May (Table 11): *Cheilotrema saturnum*, *Chromis punctipinnis*, *Cymatogaster aggregata*, *Engraulis mordax*, *Hermosilla azurea*, *Rhacochilus toxotes*, *Strongylura exilis*, *Sphyraena argentea*, *Symphurus atricauda* and *Xenistius californiensis*. All of these species except *Rhacochilus toxotes* represent warm tolerant or preferring species, but may, like *Cymatogaster* and *Engraulis*, require colder water for breeding.

Conversely, 17 species present in May collections were not recorded in October. The disappearance of *Citharichthys stigmaeus*, *Genyonemus lineatus* and the rockfish (*Sebastes*) probably reflect the warmer waters since they prefer waters in the 11-12^{o}C range. All of these species have been relatively rare in southern California since 1978.

Otter Trawl

The otter trawl data (Table 18) indicated extremely low numbers of species and fish. The species numbered 14 in May and only four in October while the total of individuals was 136 in May and 15 in October. The October 1984 numbers constituted only 2.4 percent of those caught in the October 1977 trawls when 618 individuals were found. It seems probable that the high water temperatures and low water quality in the Marina combined to force most bottom fish out of the area.

Gill Netting

Gill netting produced low yields similar to the otter trawl results, with only four species and 19 individuals in October (Table 19) with six species and 80 individuals in May. None of the species represented in 1977- 1978 were represented in 1984 gill netting.

Beach Seine

Beach seine results for 10 October 1984 showed two fewer species, down from seven in May to five, but the numbers were much larger due to a school of *Atherinops affinis* (top smelt) in the area (Table 20). The oxygen levels were high (see Water Quality Section, this volume) and a phytoplankton bloom appeared to be underway during October based on visual observations.

Diver Surveys

In general, in October the number of species found by diver census at the mouth of the Marina increased (Table 21) while the numbers of species found by the other techniques in the inner Marina decreased. However, the increase at the entry may have been largely due to the increased visibility in October, ranging from up to 5 m as compared with less than 2 m in May. The decrease in the inner harbor may represent seasonal change that was exaggerated by exceptionally high temperatures. In October, a total of 14 species was observed along the entry breakwater, while 18 were observed along the south jetty. At the north jetty, 11 species were seen, as compared with 6 species in May.

Ichthyoplankton

The October 1984 ichthyoplankton data yielded nine species, with many more identifiable eggs and larvae than in the May samples (Table 22). May is early for developmental stages in the majority of southern California fishes, which spawn in the late spring and fall. The greater abundance of developmental stages in October probably represents a normal seasonal change.

CONCLUSIONS

While the number of species had apparently increased in 1984 over those found in the Marina in 1977-1979, the changes in species composition in both May and October, as well as the changes from May to October, suggest that the area has been subjected to stress from natural events. and that the increases do not represent any real change from the carrying capacity noted in the earlier surveys. In either case, numbers of species for fish remain below those expected in a harbor of that size (Horn and Allen, 1976; Soule and Oguri, 1980).

The decreases in numbers of individuals may represent the stressed conditions in the Marina due to the natural increase in temperature or to the increase in man-made impacts, or to both. When old community structure is perturbed and an influx of new colonizers occurs, numbers of individuals would initially be low. If the newly arrived species are at the northern extension of their range, or conditions in the habitat are marginal, numbers of individuals will remain low.

Southern California has been subjected to successively rising temperatures since 1978, with few incursions of cooler water. The El Niño - Southern Oscillation (ENSO) event has been widely documented (e.g., Breaker and Lewis, 1984; Dayton and Tegner, 1984; Halpern, 1983; McGowan, 1984) although most of the emphasis in the literature has been on effects in the southern hemisphere. The warm tropical currents off Peru and Ecuador had largely disappeared by the end of 1983, but warming trends continued in California through 1984 (see Water Quality, this volume).

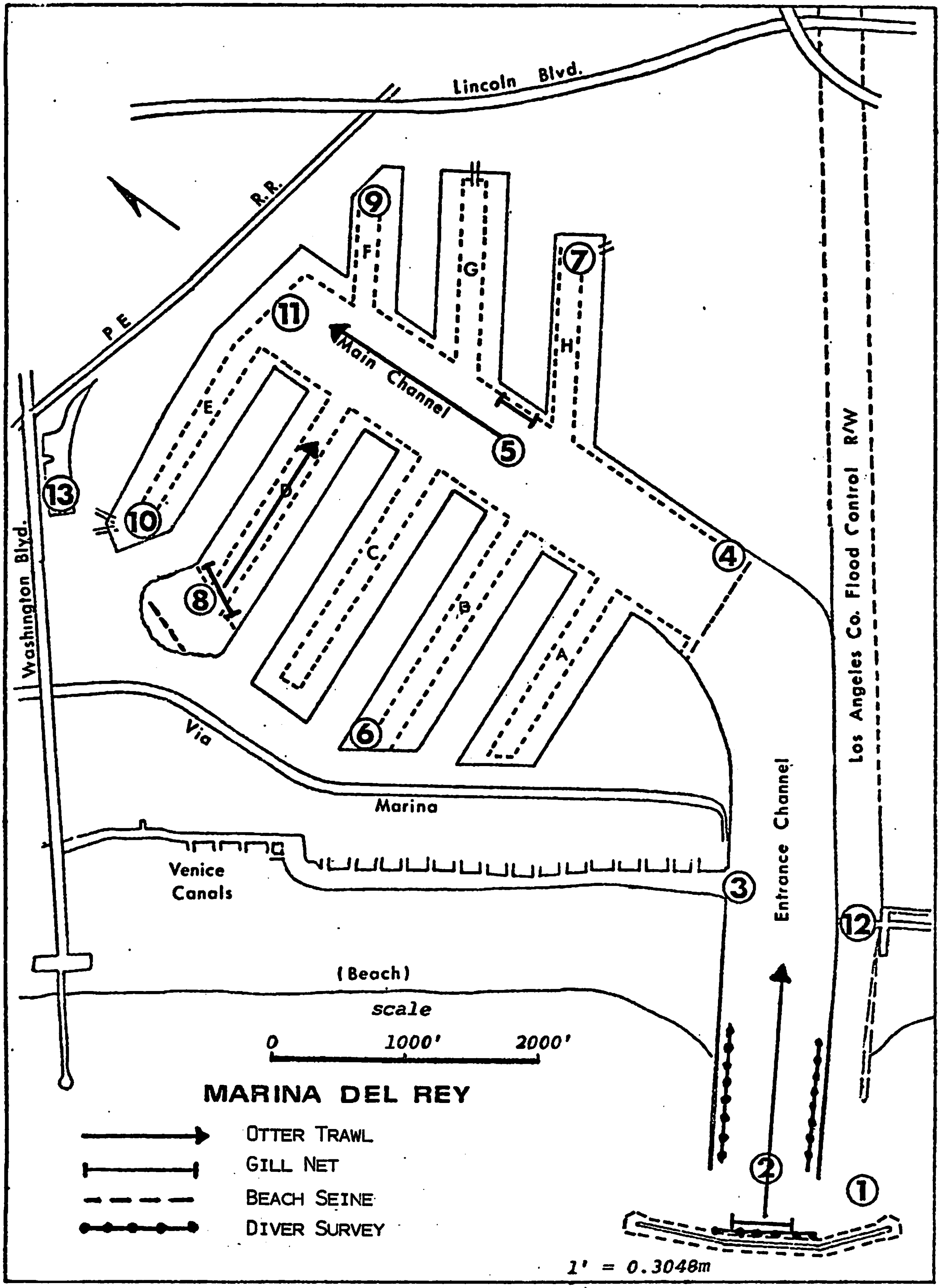

FIGURE 60. FISH SAMPLING STATIONS FOR MARINE DEL REY

Table 11. Fish Species in Marina del Rey, May (M) and October (O), 1984

Species	Month :	Beach Seine M	Beach Seine O	Trawl M	Trawl O	Gill Net M	Gill Net O	Diver Transects M	Diver Transects O	Ichthyo-plankton M	Ichthyo-plankton O	Warm (W) Cool (C) Tolerant/Preferred
Albula vulpes		X		X								W
bonefish												
Anchoa compressa		X		X								W
deepbody anchovy												
Anisotremus davidsoni						X			X			W
sargo												
Atherinops affinis		X	X					X	X			W/C
top smelt												
Atractoscion nobilis						X						W
white sea bass												
Cheilotrema saturnum									X			W/W
black croaker												
Chromis punctipinnis									X			W/W
blacksmith												
Citharichthys stigmaeus								X				W/C
speckled sanddab												
Clevelandia ios				X								W/C
arrow goby												
Clinocottus analis								X				W/C
wooly sculpin												
Cymatogaster aggregata								X				W/C
shiner surfperch												
Embiotoca jacksoni								X	X			W/C
black surfperch												
Engraulis mordax											X	W/C
northern anchovy												
Fundulus parvipinnus		X	X									W
California killifish												
Genyonemus lineatus				X								W/C
white croaker												
Gibbonsia elegans								X				W
spotted kelpfish												
Girella nigricans								X	X			W/C
opaleye												

Table 11. cont'd

Species	Beach Seine		Trawl		Gill Net		Diver Transects		Ichthyo-plankton		Warm (W) Cool (C) Tolerant/Preferred
Month :	M	O	M	O	M	O	M	O	M	O	
*Goby A/C**										X	
*Goby D**										X	
Halichoeres semicinctus rock wrasse							X	X			W
Hermosilla azurea Zebraperch								X			W
Heterodontus francisci horn shark							X	X			W
Heterostichus rostratus giant kelpfish							X				W/C
Hyperprosopon argenteum walleye surfperch								X			W/C
Hypsoblennius jenkensi mussel blenny							X	X			W
Hypsopsetta guttulata diamond turbot	X	X	X	X							W/C
Hypsypops rubicundus garibaldi							X	X			W
Ilypnus gilberti cheekspot goby	X	X									W
Micrometrus minimus dwarf surfperch							X	X			W
Mugil cephalus striped mullet	X	X									W
Oxyjulis californica senorita							X	X	X		W
Paralabrax clathratus kelp bass			X				X	X			W/C
Paralabrax maculatofasciatus spotted sand bass				X				X	X		W
Paralabrax nebulifer barred sand bass			X	X			X	X			W
Paralichthys californicus California halibut			X	X				X			W/C

* Goby A/C and D are complexes of larvae including 3-4 genera: *Clevelandia, Ilypnus, Quietula, Lepidogobius, Tridentiger*

Table 11. cont'd

Species	Month :	Beach Seine M	Beach Seine O	Trawl M	Trawl O	Gill Net M	Gill Net O	Diver Transects M	Diver Transects O	Ichthyo-plankton M	Ichthyo-plankton O	Warm (W) Cool (C) Tolerant/Preferred
Pleuronichthys ritteri				X							X	W
spotted turbot												
Quietula y-cauda				X								W
shadow goby												
Rhacochilus toxotes									X			W/C
rubberlip surfperch												
Rhacochilus vacca								X	X			W/C
surfperch												
Rhinobatos productus				X								W
shovelnose guitarfish												
Sarda chilensis						X	X					W/C
Pacific bonito												
Sardinops sagax						X	X		X		X	W/C
Pacific sardine												
Scorpaenichthys marmoratus								X				W/C
cabezon												
Sebastes auriculatus				X								W/C
brown rockfish												
Sebastes serranoides								X				W
olive rockfish												
Seriphus politus				X		X					X	W/C
queenfish												
Sphyraena argentea									X			C
California barracuda												
Symphurus atricauda										X		W/C
California tonguefish												
Strongylura exilis							X					W
California needlefish												
Syngnathus leptorhynchus										X		W/C
bay pipefish												
Typhlogobius californiensis										X		W
blind goby												
Umbrina roncador						X	X					W
yellowfin croaker												

Table 11. cont'd.

Species	Month :	Beach Seine	Trawl	Gill Net	Diver Transects	Ichthyo-plankton	Warm (W) Cool (C) Tolerant/Preferred
		M O	M O	M O	M O	M O	
Urolophus halleri round stingray			X				W
Xenistius californiensis salema					X		W
Xystreurys liolepis fantail sole			X				W

Table 12. **Fish Caught in Marina del Rey, by Method, 1977 - 1979**

Species	Common Name	Sampling Method: otter trawl	gill net	diver survey	beach seine	visual sighting or creel census
Atherinops affinis	top smelt				X	
Atherinopsis californiensis	jack smelt		X			
Citharichthys stigmaeus	speckled sanddab	X				
Clevelandia ios	arrow goby	X				
Clinocottus analis	wooly sculpin			X		
Cymatogaster aggregata	shiner surfperch	X		X		
Embiotoca jacksoni	black surfperch	X		X		
Engraulis mordax	northern anchovy	X				
Fundulus parvipinnis	California killifish				X	X
Genyonemus lineatus	white croaker	X	X			
Gibbonsia sp.	kelp fish			X		
Girella nigricans	opaleye			X		
Hypsoblennius sp.	blenny			X		
Hypsopsetta guttulata	diamond turbot	X				
Hypsypops rubicundus	garibaldi			X		
Leptocottus armatus	staghorn sculpin	X				
Mustelus henlei	brown smoothhound					X
Myliobatis californica	bat ray	X				
Neoclinus stephensae	yellowfin fringehead			X		
Oxyjulis californica	senorita			X		
Paralabrax clathratus	kelp bass			X		
Paralabrax maculatofasciatus	spotted sand bass	X				
Paralabrax nebulifer	barred sand bass			X		
Paralichthys californicus	California halibut	X				
Phanerodon furcatus	white surfperch	X		X		X
Rhacochilus toxotes	rubberlip surfperch			X		
Rimicola muscarum	kelp clingfish	X				
Sarda chiliensis	Pacific bonito					X
Sebastes serranoides	olive rockfish			X		
Seriphus politus	queenfish	X				
Sphyraena argentea	California barracuda		X			
Symphurus atricauda	California tonguefish	X				
Syngnathus leptorhynchus	bay pipefish	X				
Synodus lucioceps	California lizardfish	X				
Urolophus halleri	round stingray	X				

Table 13. Otter Trawl Data; 24 May 1984. Species number and size (in Millimeters).

	Station #2		Station #5		Station #8		Total
	Initial	Replicate	Initial	Replicate	Initial	Replicate	N
Anchoa compressa			1 (85)				1
Clevelandia ios			1 (55)				1
Genyonemus lineatus	6 [125,135,135, 145,185,176]	1 (205)	2 [(195,255)]				9
Hypsopsetta guttulata	1 (215)	1 (305)	1 (55)				3
Paralabrax clathratus	1(95)						1
Paralabrax nebulifer	20 [64,2(75),80, 5(95),6(105),5(115),5(115)]	9 [45,75,85,95, 2(105),3(115)]	1 (105)	4 [2(53),2(65)]			34
Paralichthys californicus	1 (105)	1 (215)	3 [(155,175,305)]	4 [(35,145,205,265)]	3 [(165,195,245)]	3 [(65,225,245)]	15
Pleuronichthys ritteri	2 [(155,185)]						2
Quietula y-cauda				7 [4(25),3(35)]	4 [(125)3(35])]	2 (35)	13
Rhinobatos productus		1 (370)					1
Sebastes auriculatus						1 (45)	1
Seriphus politus			10 [2(18),3(25) 2(35),3945)]	8 [2(19),4(25),2(35)]	23 [9(15),8(25), 5(35)]	12 [4(15),5(25), 35,95,135]	53
Urolophus halleri					1 (85)		1
Xystreurys liolepis	1 (265)						1
Total Species/Numbers	5/31	5/13	5/16	6/25	6/33	4/18	136

Table 14. Gill Net Data, 24 May, 1984: Station, Species, Number (size in Millimeters)

Species	Station 1	Station 5	Station 8	Total N
Atherinops affinis			14 [85,95,3(105) 125,135,3(145),4(195)]	14
Atractoscion nobilis	2 [360,370]	1 (95)		3
Sarda chilensis	6 [(330),3(340), 350,360]			6
Sardinops sagax	2 [135,165]	17 [5(215),5(225), 5(235),2(245)]	28 [105,115,3(215), 6(225),10(235), 3(245),4(225)]	47
Seriphus politus		1 (145)		
Umbrina roncador			9 [(135),3(225), 3(235),2(245)]	9
Total	10	18	52	80

$\bar{x}_{\#} = 26.67$, S.C. = 22.3 $\bar{x}_{sp} = 3.0$, S.C. = 1.0

Table 15. Beach Seine Data, 25 May 1984

Species	Number (size in Millimeters)
Albula vulpes	8 [(145),2(153),2(165),2(179),(215)]
Anchoa compressa	1 (75)
Atherinops affinis	134 [30(25),85(35),19(45)]
Fundulus parvipinnis	11 [65,9(75),85)]
Hypsopsetta guttulata	3 [(45,2(55)]
Ilypnus gilberti	28 [3(25),14(35),11(45)]
Mugil cephalus	1(255)

N_{sp} = 7 - $N_{\#}$ = 186

Table 16. Diver Transect Data, 25 May 1984.

	Terminal Breakwater			Southern Jetty			Northern Jetty (sand)		
	5 min.	5 min.	Free Swim	5 min.	5 min.	Free Swim	5 min.	5 min.	Free Swim
Anisotremus davidsoni		4J	X	6S	X				
Atherinops affinis				2SA	X				
Citharichthys stigmaeus							A,S	X	
Clinocottus anilis			S			X			X
Embiotoca jacksoni	2J	A	X	J,A	2J,2S	X	J		X
Gibbonsia elegans	A	X				X			
Girella nigricans	2S	A,S	X	3S	X	J	21J	X	
Halichoeres semicinctus					S				
Heterodontus francisci			X						
Heterostichus rostratus			X	J,S					
Hypsoblennius jenkinsi			X			X			
Hypsypops rubicundus	A,2J	A	X						
Micrometrus minimus			X			X,J	3S		X
Oxyjulis californiensis	A,S	3J	X		J	J	X		
Paralabrax clathratus	3A,2S,5J								
Paralabrax maculatofasciatus		J	X	A	J	A			
Paralabrax nebulifer	S,J	S	X	2J	A,2S,2J	X	J		
Rhacochilus vacca			XJ	7J					
Scorpaenichthys marmoratus						X,J			
Sebastes serranoides	S		X	20J	J	X			

A = adult
J = juvenile
S = subadult
X = present

Table 17. Ichthyoplankton Species (based on 10% sorting) 25 May 1984.

Station (S = Surface, B = Bottom)	2S	2B	5S	5B	8S	8B
Species						
Larvae						
Genyonemus lineatus		95				
Seriphus politus						11
Syngnathus leptorhynchus						11
Typhlogobius californiensis		192				
Clupeiform		95				
*Engraulid**	101			814	475	10,329
Gobiidae A/C	101	2,014	864	12,203	139	3,919
Gobiidae D	101	480		712		372
Hypsoblennius	1,720	475	2,098	4,068	190	680
Eggs						
Paralabrax		96			95	
Scaenidae	1,214	480			570	64
Anchovy	4,553		20,483	1,424	29,913	2,784
Unid.**			123			

* *Engraulis mordax or Anchoa delicatissima*
** *perhaps Anchoa compressa*

Table 18. Otter Trawl Data, 9 October 9184. Species number and size (in Millimeters)

	Station#2		Station#5		Station#8		Total
	Initial	Replicate	Initial	Replicate	Initial	Replicate	N
Hypsopsetta guttulata			1 (205)		1 (135)		2
Paralabrax maculatofasciatus	1 (45)		3 (45)	1 (55)			5
Paralabrax nebulifer	1 (135)		1 (125)	1 (155)			3
Paralichthys californicus	1 (175)	1 (125)	1 (125)			1 (35)	4
Total Species/Numbers	3/3	1/1	3/5	3/3	1/1	1/1	14

Table 19. Gill Net Data, 9 October 1984. Station, Species, Number and Size (in Millimeters)

	Station			
Species	1	5	8	Total N
Sarda chilensis	2 [(340,350)]			2
Sardinops sagax	6 [175,2(215),2(225),235]	1 (235)	6 [225,2(235),2(245),255]	13
Strongylura exilis			1 (420)	1
Umbrina roncador	3 [215,245,255]			3
Total	11	1	7	19

$\bar{x}_{\#} = 6.3$ - $\bar{x}_{sp} = 2.0$

Table 20. Beach Seine Data, 10 October 1984

Species	Number (size in millimeters)
Atherinops affinis	285 [3(25),3(35),3(45),6(55),26(65),59(75), 59(95),35(105,14(115),5(125),2(135)]
Fundulus parvipinnus	4 [2(55),65),7.*op*
Hypopsetta guttulata	2 [(55),(75)]
Ilypnus gilberti	3 (35)
Mugil cephalus	9 [1(55),3(65),5(75)]

$N_{sp} = 5$ - $N_{\#} = 303$

Table 21. Diver Transect Data, 10 October 1984

	Terminal Breakwater					Southern Jetty					Northern Jetty (sand)		
	5ft	10ft	5ft	10ft	Free Swim	5ft	10ft	5ft	10ft	Free Swim	5ft	5ft	Free Swim
Anisotremus davidsoni		5S		1A	X				A	X		1J	X
Atherinops affinis										X	50S,30J	40S	X
Cheilotrema saturnum					X,J,S	30S		30S		X,J	7J	5J,5S	X
Chromis punctipinnis	175S			1A	X,J,S		120S			X	20S	15S	X
Cymatogaster aggregata						25A				X			
Embiotoca jacksoni	3A,2S	12A,2S	3A,2S	11A,1S	X	4A	2A,1S	1A	4A	X		2A,1S	X
Gibbonsia elegans					X								
Girella nigricans	7A,3S		4A	XAS							1A,40S,5J	39S,30J	X
Halichoeres semicinctus	3A,19S, 5J	4A,15S, 5J	9A,16S	2A,19S, 6J	X	7S,4J	1J	5S	3S	X		4J	
Hermosilla azurea											1J	3J	
Heterostichus rostratus	2A		1A		X					X			
Hyperprosopon argenteum										X			
Hypsoblennius jenkesi										X			
Hypsopops rubicunda	2A		1A		X,A,J					X,J			
Micrometrus minimus											1A		X
Oxyjulis californica				5A		1A				X			
Paralabrax clathratus	2A,7S,	7A,8S,	3A,9S,	4A,5S,	X	1A,3S,2J		4S,2J		X		1S	
P. maculatofasciatus							1A		1J	X		1J	
P. nebulifer		5S,2J	1A,1S	1A,8S,1J	X	1A,3S	4A,11S,3J	2A,3S	6A,6S,3J	X	15J	3S,3J	X
Paralichthys californicus												XJ	
Rhacochilus toxotes		A	2A	A	X								
R. vacca	A,S				X	1A		1A,2S	1A	X			
Sardinops sagax													
Sphyraena argentea			100A,150S		X	200S	90S	200S,50J	80S	X		80J,30S	X
Xenistius californiensis						50S	70S	30S	7S	X	2S	60J	X
Total No. Species	7	8	9	8	14	10	7	8	8	18	9	12	11

A = adult
B = juvenile
S = subadult
X = present

Table 22. Ichthyoplankton Species* with Numbers of Eggs/Larvae (based on 20% sorting) 10 October 1984

Station (S = Surface, B = Bottom)	2S	2B	5S	5B	8S	8B
Species						
Engraulis mordax	20/5	20/5				
Gobiidae A/C	0/5	0/55	0/10	0/65	0/30	0/205
Gobiidae D	0/0		0/5			
Hypsoblennius spp.	0/5	0/15	0/545	0/265	0/30	0/35
Oxyjulis californica	30/0	15/0				
Pleuronichthys ritteri	40/0	40/0				
Sardinops sagax C.	0/20	5/35				
Seraphus politus		0/5				
Symphurus atricauda	0/10					
unknown	13/5	90/10	5/0	10/0		

*2 min tows, 1m net, 333um mesh

BENTHIC FAUNA

INTRODUCTION

The benthic fauna of Marina del Rey are especially valuable as indicators of the quality of the bottom sediments and thus of the environmental quality of the harbor waters. Benthic infauna and epifauna (in and on the benthos) are considered to be more stable indicators than zooplankton, for example, which can change with the tides, time of day and coastal water masses. Also, many benthic species have short reproductive cycles and some are in reproduction the year around, so that seasonal variation as well as responses to environmental change may be documented.

In shallow water habitats benthic organisms may sustain significant populations of fish that are obligate or facultative benthos feeders as well as omnivores and water column feeders (Soule and Oguri, 1980). The soft bottom habitat with its organically enriched fine sediments can provide for both biomass and species diversity as long as the organic matter, with a high biochemical oxygen demand, does not produce anoxic conditions, and pollutant concentrations do not reach toxic levels.

Nematode worms and oligochaete worms sporadically occur in very large numbers in certain areas of the Marina, but the dominant fauna on which analyses are primarily based are the polychaete worms. The local marine nematodes and oligochaetes are mostly undescribed taxonomically, but the literature on polychaetes is extensive (AHF, 1976; Fauchald, 1977; Hartman, 1968, 1969; Soule and Oguri, 1977, 1979, 1980).

The benthic fauna of Marina del Rey were sampled quarterly by Harbors Environmental Projects from October 1976 through April 1979 (Soule and Oguri, 1977, 1980). It was observed at that time that there were distinct differences between Marina station sites, as indicated by the benthic organisms as well as by the physical water quality data. Station 1 is sujected to the impacts of the drainage from Ballona Creek as rainfall runoff and as pollutant loadings. Stations 2, 3, and 4 showed similar high numbers of species per square meter, while Stations 5, 6, and 7 showed reductions in numbers of species and individuals, and, with some exceptions, Stations 8 - 11 had the fewest numbers of species and individuals.

There were generally slightly higher mean numbers of species and somewhat lower mean numbers of individuals in 1978-1979, as compared with 1976-1977 (mean species/mean numbers in 1976-77 = 35/12,410; 1978-79 = 38/8,513). Variations during those periods appeared to be associated with rainfall as well as with seasonality. Station 7 had exceptionally low numbers in March 1977, probably associated with the large storm drain there. Rainfall in 1984 was low and did not occur at times that might have impacted the biota sufficiently to have reduced the benthic populations.

PROCEDURES

In the present study, two benthic surveys were conducted in 1984, on 26 April and on 25 October. A Campbell grab (modified Van Veen) was used from the University of Southern California R. V. *Golden West* to take a $0.1 m^2$ sample of bottom surface. Muds are washed with running seawater through a 0.5mm screen for recovery of organisms. Organisms are preserved in the field with 10 percent formalin diluted with seawater and transferred to ethanol in the laboratory prior to determination of biomass and identification by taxonomists. In the October survey, subsamples were taken with syringes for chemical analyses.

Data Analysis

More than 204,000 benthic organisms were identified to the species level or the highest practicable taxon in the two 1984 benthic surveys. This compares with the total of 115,400 enumerated in the ten surveys carried out in 1976-1979. After identifications are completed, counts were multiplied by a factor of ten to calculate the number of organisms per square meter.

In the present survey abundant taxa are designated as those which numbered more than $1000/m^2$, and the percent of the fauna calculated to allow comparison with data from the earlier surveys, in which the numbers tended to be much lower.

A modification of Gleason's Index was used to calculate species diversity (Margolef, 1968), although this measure may have little relevance to areas such as harbors:

$$d = \frac{S - 1}{(\log e\ N)}$$

where S = No. of species
N = No. of individuals
d = diversity of sample

In calculating diversity, animals identified at higher taxonomic levels were generally counted as species because of the large numbers of nematodes and oligochaetes at some stations. Furthermore, some "unidentified" taxa consist of fragments of juveniles too immature to identify, so in a few instances they may actually represent adult species that have otherwise been counted. Because nematodes and oligochaetes remain undescribed, the number of species is undoubtedly underestimated. However, if the large numbers of these two groups were eliminated from calculations, the real diversity would be greatly misrepresented as would the evenness of the populations.

RESULTS AND DISCUSSION

The results of the benthic sampling program were very surprising in that the numbers of species present has decreased slightly but the numbers of individuals had increased tremendously, by an order of magnitude at some stations (Table 23), as compared with similar periods in 1977-1978. If the mean numbers of species/individuals for all stations, regardless of periods or sampling frequency, are calculated, the numbers of species will tend to be increased for the years with more sampling periods. Nevertheless, the data may be compared as follows:

1977	1978	1984
35/12,400	38/8,513	33/92,774

The patterns of species numbers at the various stations in 1984 were largely consistent with those of the earlier data (Soule and Oguri, 1980) in that the highest numbers of species were found at Stations 1 - 4, with decreasing species in Stations 5 - 7 and fewer still in Stations 8 - 11. The range in number of species for the March and September periods in 1977 was from 9 to 67 with a mean of 31, whereas the range in 1984 was from 17 to 61 species with a mean of 33.

The data were not as consistent with regard to numbers of individuals, since some of the highest counts were found at Stations 5 and 7 in 1984 (Table 23). There were several instances in which counts virtually exploded, with a peak of 275,000/m^2 at Station 5 in April. At that time, the lowest count occurred at Station 6 with 25,300/m^2. In 1977, the peak number was 75,000 at Station 2 in September, and the lowest was at Station 7 in September, with 1,660 individuals/m^2. The results of all benthic identifications and counts are presented in Appendix B.

The large numbers of worms dominated the wet weight biomass, about equaling the total biomass of molluscs and crustaceans together. Worms including oligochaetes, nematodes, nemerteans and polychaetes) totaled 14.6g for all stations in April and 19.0g in October 1984.

Dominant Species

The patterns of dominant species were characterized by the type of fluctuation that was graphically portrayed in Soule and Oguri (1980). For example, at Station 1, nematodes dominated the fauna in September - October of 1976 and 1977, but were insignificant in 1978. *Capitella capitata* dominated in March of 1977 and 1978, with a lower peak in September 1977, but dropped in percentage thereafter. This may have been associated with the heavy rainfall, and subsequent competition after restabilization.

The dominant species (numbers of 1000 or more/m^2) in 1984 are listed in descending order by total numbers/m^2 for all stations (Table 24). Using the same numerical criterion would have eliminated a number of the "dominant" fauna from the 1977-1979 periods. The dominant taxa, ranked in descending order by station in 1984 (Table 25), can be compared with the dominant fauna from the 1976-1979 studies in Table 26. The actual numbers by taxon (in alpha order) are shoen in Table 27 by station, for April and October 1984. Of particular note is the presence of *Euchone limnicola* in such large with the second highest rank in 1984; it was not in the top 28 taxa in 1976-1979. Twelve of 28 dominant species in the earlier surveys had disappeared from their positions of dominance. Some of the replacing species occurred in very large numbers at only one or two stations, particularly at Station 1. All of the species involved appear to be normal southern California Bight species even though they might not have occurred in large numbers in the Marina in previous surveys.

Inspection of the data shows such large numbers in 1984 that it is difficult to recognize that species diversity was not compromised. Table 27 gives the species diversity indices for comparable periods in 1977 and 1984. As always in such limiting habitats as the soft bottom Marina, with the low energy environment, diversity of higher categories is limited.

The number of polychaete species present in the April and October 1984 periods is compared in Figure 1. The patterns of the stations are remarkably similar, even though the number of species was higher in October. The number of individuals for polychaetes only per m^2 is graphed in Figure 2. There the patterns are similar for the two periods except for the radical difference in numbers at Stations 4, 5, and 7, as noted above.

Station 1

Located at the mouth of Ballona Creek, Station 1 is the deepest of the stations studied, but deposition over the past several years has filled the area somewhat, reducing it from about 9 m depth to about 7 m. Thus the depth is not greatly different from the entrance channel stations although the channel entrance has been dredged recently. It does receive much greater impact from stormwater runoff and pollutant loading in the Ballona Creek flood control channel, but can be cleansed by runoff, ocean storms and redeposition of transported sediments. The degree of impact varies from year to year depending on storm patterns and the amount of illegal dumping that occurs in the flood control channel. Sediments were high in chemical oxygen demand and oil and grease, relatively high in chlorinated hydrocarbons, but lowest in most metals in 1984. It ranked as the cleanest station in 1984 on the basis of sediment analyses performed.

In the 1977-79 surveys, every benthic cruise except those of June and September 1978 was coincidentally preceeded by heavy rains. This may account in part for the dominance seen in the 1977 data, in which *Capitella capitata* comprised 51.3% of the fauna in March; while in September Nematoda comprised 54.3%, with *C. capitata* providing 36%; together they composed more than 90 percent of the population. Capitellids are typically opportunistic species that reproduce most of the year and are tolerant to reduced or variable salinities, high organic or pollutant loadings and low dissolved oxygen.

The April 1984 data showed much more evenness than the 1977 data, with unidentified Gammaridea comprising a maximum of 24% of the fauna. *Capitella capitata* comprised 7.6% as did unidentified Nemertea, and *Platynereis bicanaliculata* comprised 6.7%. Other species with more than 1000 individuals/m^2 were *Caprella californica* (3.8%), the cumacean *Oxyurostylus pacificus* (3.6%), *Prionospio heterobranchia* (3.4%) and *Armandia bioculata* (3.4%).

The October 1984 survey indicated greater evenness, with the largest component provided by *Prionospio heterobranchia* (11.5%), *Mediomastus ambiseta* (2.6%) and *Nereis procera* (2.5%). Twelve other taxa had numbers numbers greater than 1000/m^2, yet these provided less that 2% each of the total population. This station had the highest diversity for October 1984.

<u>Station 2</u>

Station 2 is located at the Marina del Rey entrance channel. It tends to be a depositional area, receiving some pollutants borne by particulates in runoff and tidal flux, as evidenced by the highest levels of chemical oxygen demand, oil and grease and chlorinated hydrocarbons found in the Marina. Station 2 dropped in rank for cleanliness from second to seventh out of 12 stations sampled (see Sediment Pollutant Burden, this volume).

In the earlier surveys, nematodes were the dominant fauna, comprising

71.8% in March 1977, 66% in September 1977, and about 40% in March 1979. They were unimportant, however, in most of 1978.

In April 1984, nematodes comprised 54.6% of the fauna, while oligocheates comprised 30.6%. *Oxyurostylus pacificus* was the next dominant, with 7.6%, followed by *prionospio heterobranchia* with 2.6% of the fauna. Three species with numbers over 1000/m^2 each comprised 1.2%: the nemertean *Tubulanus polymorphus* and polychaetes *Mediomastus ambiseta* and *Prionospio heterobranchia*.

In October 1984. nematodes comprised only 35.6% and oligochaetes 21.5%. The bivalve *Macoma carpenteri* reached 13%, with *Mediomastus ambiseta* at 5.9%, the pycnogonid *Anoplodactylus erectus* at 4.4% and the nemertean *Tubulanus polymorphus* at 3.4%. Others with counts greater than 1000/m^2 were *Prionospio heterobranchia* (2.4%), *Lumbrineris lagunae* (1.3%) and *Oxyurostylus pacificus* (0.9%).

Station 3

Located on the northern (western) side of the entrance channel, Station 3 lies off the tide gates for Ballona Lagoon and the Venice Canal system. Although Station 3 was the cleanest station in 1976-1979, it dropped to fourth ranking in 1984, for it had fairly high levels of chemical oxygen demand, oil and grease, lead and chlordane.

In March 1977, there were no species with counts of more than 1000/m^2, and numbers totaled only 5070. Nematodes and oligochaetes together comprised 32% of the fauna, followed by *Mediomastus ambiseta* (14.6%), *Lumbrineris tetraura* (13.6%) and *Prionospio heterobranchia* (7.6%).

By September 1977, total numbers had increased to 23,420 and the spirorbid worm *Janua brasiliensis* comprised 41.8% of the population. *Hydroides elegans* contributed 20.9%, unidentified Gammaridea. 17.9% and another spirorbid *Pileolaria pseudomilitaris* formed 12%.

In April 1984 *Mediomastus ambiseta* dominated the fauna with 23,500 (30%) of the population and *Euchone limnicola* provided 14%. The nematodes and oligochaetes were insignificant at that time, while other species with numbers greater than 1000/m^2 included *Cossura candida* (7%), *Leitoscoloplos elongatus* (3.4%), *Tubulanus polymorphus* (3.3%), *Chaetozone corona* (2.6%), *Pseudopolydora paucibranchiata* (2.0%), and *Prionospio heterobranchia* (1.9%).

October 1984 showed another large increase in numbers to 122,700, with *Mediomastus ambiseta* continuing to dominate (33%), followed by *Euchone limnicola* (15.7%). *Minuspio cirrifera* comprised 11.4%, followed by *Cossura candida* (5.3%), *Lumbrineris lagunae* (5.1%), *Prionospio heterobranchia* (4.9%), *Chaetozone corona* (4.0%) and *Leitoscoloplos elongatus* (3.3%). The mudflat crab *Hemigrapsis oregonensis* provided a surprising 2.2%, followed by *Scolelepis* sp. *A* (1.9%) and *Laevacardium substriatum* (1.2%).

Station 4

Station 4 is near the Administration Center on the entrance channel at the intersection with the main channel. The site had the second lowest overall pollution when the chemical parameters analyzed are ranked, and the highest species diversity in the 1976-1979 studies.

In March 1977 the fauna was composed of 30% *Mediomastus ambiseta*, with 20.7% *Lumbrineris*, spp. Although they did not have 1000/m^2, *Cossura pygodactylata* and *Prionospio heterobranchiata* furnished 6.8% and 7.7% of the fauna respectively. By September 1977, counts at Station 4 had more than doubled, to 28,700/m^2, with 67 species represented. *Cossura pygodactylata* comprised 24% of the fauna with *Mediomastus ambiseta* adding

13.8%. *Lumbrineris,* spp. provided 11%, followed by *Prionospio heterobranchia* (8%), *Caprellidea* (7.1%), *Gammaridea* (6.7%), *Polydora paucibranchiata* (4.8%) and *Tubulanus subteres* with 3.5%.

In April 1984, counts were very high, with 40 species and 154,000/m^2 *Pseudopolydora paucibranchiata* comprised 52.2% of the fauna with *Mediomastus ambiseta* much lower at 10.6%. *Euchone limnicola* followed with 10%, *Caprella equilibra* comprised 7.2%, *Lumbrineris,* spp. and *Leitoscoloplos elongatus* each provided 4.4%, Ostracoda, spp. and *Corymorpha aurata* each had 1.6% and *Tubulanus polymorphus,* 1.2%.

Counts dropped somewhat in October 1984 but species increased slightly (43/97,500/m^2). *Pseudopolydora paucibranchiata* dropped from 52.2% to 1.1% and the dominant species was *Euchone limnicola,* with 18.6%. Other species were more evenly divided: *Lumbrineris lagunae* (8%), *Prionospio heterobranchia* (7.4%), *Leitoscoloplos elongatus* (6.8%), *Mediomastus ambiseta* (3.7%), *Scolelepis* sp. *A* (2.5%) and *Harmothoe* sp. (2%). With less than 2% but with more than 1000/m^2 were *Chaetozone corona*, *Hemigrapsis,* sp., *Minuspio cirrifera*, *Macoma yoldiformis*, *Cossura candida,* and *Pseudopolydora paucibranchiata*.

Station 5

Although Station 5 is located on the main channel it ranks as the fourth most polluted station based on sediment analyses. In 1977, *Mediomastus ambiseta* comprised 51.5% of the fauna in March and 16% in September, whereas *Pseudopolydora paucibranchiata* comprised 18.5% in March and 46.4% in September. *Lumbrineris,*spp. composed 14.5% of the March fauna but it was well below 1000/m^2 *Prionospio heterobranchiata* (7.5%) and *Streblospio benedicti* (8.8%) completed the dominant species in September 1977.

In March 1984, *Mediomastus ambiseta* comprised only 7% of the fauna, with *Pseudopolydora paucibranchiata* dominating the station at 64.3% and 180,010 individuals. Counts were the highest in the 1984 survey at Station 5, totaling 275,700 for 33 species. Other species with high numbers were *Euchone limnicola* (4.9%), *Exogone*, sp. *A* (2.5%), *Caprella equilibra* (0.6%) and *Prionospio heterobranchiata* 0.4%), all with counts over 1000/m^2.

April 1984 numbers were down to 78,000 wwith species increased to 37. *Pseudopolydora paucibranchiata* still dominated the fauna, but the percentage was down to 22.3% while *Mediomastus ambiseta* had increased to 28%. *Euchone limnicola* increased to 17.3%; others with high numbers included *Caprella equilibra* (5.5%), *Chaetozone corona* (4.5%), *Prionospio heterobranchiata* (3%), and *Cirriformia spirobranchia* (2.3%).

Station 6

Located at the closed end of Basin B, Station 6 is subject to the relatively poor flushing characteristic of the basins. There are no major pollutant sources emptying into Basin 6, and this is reflected by its ranking as the third cleanest station. It is subject to phytoplankton blooms, with concomitant cycling between excessive dissolved oxygen levels and low oxygen episodes.

There were no species in the March 1977 period that numbered as high as 1000/m^2; the total count was 4,760 and 22 species/m^2. *Leitoscoloplos elongatus* and *Lumbrineris*, spp. each comprised 14.5% of the fauna, followed by *Pseudopolydora paucibranchiata* with 12% and *Tharyx*, sp. with 10.3%. In September 1977, numbers had increased to 25 species and 8480 individuals. *Streblspio benedicti* formed 25.9% of the population, *Pseudopolydora paucibranchiata* contributed 24%, and the gastropod mollusc *Cylichnella inculta* with 13%.

In April 1984 the fauna was greatly increased, with 25,300 individuals from 20 species. *Pseudopolydora paucibranchiata* contributed 30%, while *Euchone limnocola* comprised 17% and *Mediomastus ambiseta* 13.4%. *Leitoscoloplos elongatus* and *Lumbrineris lagunae* had 11.1% and 5.9% respectively.

In October 1984, counts had risen to 23 species with 92,900 individuals/m^2, and *Euchone limmicola* had increased almost by an order of magnitude, to form 44% of the population. *Pseudopolydora paucibranchiata* comprised 17.9% of the fauna, followed by *Leitoscoloplos elongatus* (7.3%), *Macoma yoldiformis* (6%), *Mediomastus ambiseta* (5.7%), *Cirriformia spirobrancha* (4.6%), *Chaetozone corona* (3.2%) and *Lumbrineris lagunae* (1.2%).

Station 7

Station 7 is located at the inner end of Basin H, near a major storm drain. It was characterized by low oxygen episodes and the highest mean temperatures in the earlier studies. In the 1984 surveys, low dissolved oxygen (4.6ppm) occurred May but not in September when adjacent stations were depleted. Based on only a single day of measurement, it is possible that the basin was in transition between the rise and fall in oxygen according to the state of phytoplankton blooms. On the basis of sediment pollutants analyzed, the station ranked as the fifth cleanest.

In March 1977, Station 7 had the fewest species and numbers in the Marina (17/1,660/m^2). However, it had improved by September 1977 when it showed 32 species and 32,740 individuals/m^2. The dominant species in March, with numbers below 300, were *Minuspio cirrifera* (17.5%), *Mediomastus ambiseta* (13.2%), *Streblspio benedicti* (9.6%) and *Lumbrineris* sp. (0.6%). The increased numbers in September 1977 consisted of *Cossura pygodactylata* at 52%, followed by *Hydroides elegans* (26%), *Streblospio benedicti* (6.9%) and *Polydora ligni* (5.3%).

April 1984 data show that this station was undergoing a population explosion, with a count of 203,700/m^2 for 26 species. *Pseudopolydora paucibranchiata* composed 53.8%, while *Tharyx* provided 20.2%. THe remainder of the fauna with counts greater than 1000/m^2 include *Mediomastus ambiseta* (3.3%), *Lumbrineris lagunae* (2.3%), *Leitoscoloplos elongatus* (2.2%), *Polydora ligni* (2%), *Exogone* sp. *A* (1.7%), *Corophium acherusicum* (1.4%), *Mysidacea* (1.3%), and *Rhynchospio arenicola* and *Scoliolepis* sp. *A*, each with 0.6%.

Numbers were reduced somewhat to 127,000/m^2 and 31 species by October 1984. *Pseudopolydora paucibranchiata* still dominated, with 33.6% of the fauna and *Tharyx* comprised 29.7%. The remainder of the species with more than 1000/m^2 counts included *Leitoscoloplos elongatus* (4.4%), *Mediomastus ambiseta* (3.6%), *Cylichnella inculta* (3.5%), *Exogone*, sp. *A* (1.9%), *Euchone limnicola* and *Polydora ligni*, each with 1.5%, *Lumbrineris lagunae* (1.3%), and *Scololepis* sp. *A* (0.9%).

Station 8

This station is located at the swimming beach in Basin D, and although it is a recreational area, it is a poor benthic habitat characterized by low numbers of species and individuals, with the lowest diversity index recorded in September 1977 of 0.93. It is ranked about at the mid-point of the stations in scores based on sediment pollutants analyzed in 1984, but had the highest levels of chlordane in the Marina. Beach seining in May was very productive there, however.

In the March 1977 benthic survey, *Prionospio heterobranchia* comprised 13.4% of a population of 3,740 individuals/m^2 and 25 species. *Exogone* *verugera* contributed 11%, followed by *Capitella capitata* (10.7%), *Pseudopolydora paucibranchiata* (10.2%), *Leitoscoloplos elongatus* (7.5%), *Scolelepis acuta* (7.2%), and *Streblospio benedicti* (6.7%). None of these species numbered more than 500 individuals. By September 1977 the number of species had decreased to nine, with an increase in numbers to 5,390. *Pseudopolydora paucibranchiata* provided 83% of that total, with minor numbers of *Capitella capitata* (4.2%) and *Polydora ligni* (0.7%).

Pseudopolydora paucibranchiata again dominated the fauna in April 1984, comprising 32.7% of a population of 22,000 with 18 species. *Cirriformia spirobrancha* followed with 17.3% and *Polydora ligni* with 5%. In October 1984, *Pseudopolydora paucibranchiata* continued to dominate with 24.9% with a population of 40,900 and 19 species. Other major components were *Capitella capitata* (23.7%), *Polydora ligni* (21%), *Caprella equilibra* (19%), and Holothuroidea, sp. (4.2%). This assemblage represents a limiting environment with organic enrichment, and may also reflect the effects of the record high water temperatures and relatively low dissolved oxygen values encountered in the basins in September 1984.

Station 9

Located at the closed end of Basin F, this station also receives storm drain flow. It rated eighth out of twelve stations in increasing amounts of sediment pollutants, and showed indications of periodic low dissolved oxygen followed by high oxygen levels during phytoplankton blooms.

In March 1977, *Capitella capitata* comprised 34.3% of the 12,190 individuals/m^2 with 29 species. *Pseudopolydora paucibranchiata* provided 24% and *Streblospio benedicti* 7.7%. In September 1977, *Streblospio benedicti* had increased to 35% of 8,220 individuals/m^2 and 24 species, with *Pseudopolydora paucibranchiata* composing 30.3% and *Polydora ligni* 12.4%

The same type of dominance was found in March 1984, when *Pseudopolydora paucibranchiata* comprised 64.6% of 26,300 individuals with 17 species, and *Euchone limnicola* with 14.8% provided the only other major numbers. By October 1984, *Euchone limnicola* had increased its dominance to 54.5% of 24,200 individuals/m^2 with 21 species. *Pseudopolydora paucibranchiata* and *Polydora ligni* contributed 6.6% and 4.5% respectively. All other species had counts below 1000/m^2.

Station 10

Located at the closed end of Basin E, Station 10 receives runoff through a drainage gate from the Bird Sanctuary area. It has the second highest sediment pollutant burden. The impacts of storm water runoff and local drainage presumably limits the diversity and numbers.

In March 1977, 44.8% of the 5,690 individuals were *Streblospio benedicti*, while 16% were *Capitella capitata*, 14.8% were Oligochaeta and 5.2% were *Schistomeringos longicornis*. There were 25 species with few numbers. By September the number of species had decreased to 11, and individuals to 2,540. This probably reflects the late summer high temperatures. *Pseudopolydora paucibranchiata* comprised 53% and *Polydora ligni* 30%.

Conditions appeared to be better in April 1984, with increases in numbers of species (27) and about a 20-fold increase in individuals (107,600). *Pseudopolydora paucibranchiata* provided 51.8% of the fauna, followed by *Euchone limnicola* (10.2%), *Polydora ligni* (8%), *Streblospio benedicti* (4.8%) *Capitella capitata* (2.5%), *Cylichnella inculta* (2.2%), *Scolelepis*, sp. *A* (1.5%), *Tellina modesta* (1.3%), and *Mediomastus ambiseta* and *Chaetozone corona* each with 1.1%.

Numbers of species regressed in October 1984 to 21, while individuals decreased to 68,700, still remarkably high. *Cirriformia spirobrancha* comprised 32.6% of the fauna, followed by *Capitella capitata* (25%), *Pseudopolydora paucibranchiata* (22%), *Polydora ligni* (3.4%), *Scolelepis* sp. *A* (3.1%), *Euchone limnicola* (2.3%), and *Rhynchospio arenicola* (1.6%).

Station 11

Station 11, at the inner end of the main channel, ranked highest in sediment pollutants. However it no longer ranked last in species diversity or dissolved oxygen as it did in the previous studies in spite of the increased number of boat slips in the area.

In March 1977 there were 25 species but only 3,630 individuals/m^2. *Streblospio benedicti* provided 35% of the population, followed by *Mediomastus ambiseta* (20%), *Pseudopolydora paucibranchiata* (9.4%), and *Lumbrineris*, spp. (5.8%).

By September 1977 there had been a large increase in numbers of individuals, rising to 20,060 for 28 species/m^2. *Pseudopolydora paucibranchiata* provided 40.4% of the fauna and *Streblospio benedicti* composed 24.2%. Other species with counts greater than 1000/m^2 were *Cylichnella inculta* (8.2%) and *Cossura pygodactylata* (5.4%). *Mediomastus ambiseta* (4%) and *Polydora ligni* (2.7%) fell below the 1000/m^2 level.

In April 1984, *Pseudopolydora paucibranchiata* dominated the population with 55% and *Ciona intestinalis* with 25% appeared among the dominant organisms. *Euchone limnicola* provided 19.3% and *Leitoscoloplos elongatus* added 3.3%. In a period of such high counts, the numbers were relatively low with 22 species and 33,100 individuals; only Stations 8 and 9 had lower counts.

Euchone limnicola dominated the October 1984 collections, with 39.6% while *Cirriformia spirobrancha* and *Streblospio benedicti* each contributed

15%. Others included *Pseudopolydora paucibranchiata* (8%) and *Cylichnella inculta* (4.6%). Counts were again relatively low, with 20 species and 34,320/m^2. The mean for all stations was 34 species and 79,498 individuals/m^2.

Stations 12 and 13 cannot be sampled for benthic fauna with the standard equipment. Station 12 is reached only for water sampling from the footbridge over Ballona Creek, and Station 13 is in the Bird Sanctuary, reached only by road.

CONCLUSIONS

One of the chief characteristics of the benthic fauna has been the large blooms of one or two species followed in most cases by rapid decline. Although seasonality could explain some of this activity, in some cases no seasonality could be detected definitively. Rainfall patterns in past surveys may have also influenced the cyclic nature of the populations. The stimulus to such vastly increased numbers in 1984 might stem from additions to the organic loading from domestic wastes via the storm drains, boats or Ballona Creek, or to the higher temperatures throughout the Marina which may have been sufficient stimulus to reproduction in the presence of already adequate nutrients and a decrease in predators.

Since the Marina is quite shallow, it is impacted more than deeper waters might be by ocean storms, rainfall runoff, and extremes in temperature. Southern California has been in a warming cycle since 1978 which culminated in the El Niño - Southern Oscillation (ENSO) event in 1982 - 1983. This has been well documented in the literature (e.g., McGowan, 1984). The Marina showed unusually high temperatures in September 1984, when mean temperatures, averaged through the water column, exceeded 23.$^{\circ}$C at all stations except Stations 1 and 2 at the Marina entrance. The peak temperature was at Station 13, which reached 25.5 $^{\circ}$C. The peak temperature in the earlier studies was 23°C in the summer of 1976.

The effects of high temperature apparently included reductions in fish populations (see Fish Fauna, this volume), which in turn may have been responsible for the vast increases in benthic numbers due to the loss of predators. Villela (1984) discussed caging studies in which exclusion of predators resulted in a two - to three-fold increase in density of macro-invertebrates (Peterson, 1979). Furthermore, there was little evidence that competitive exclusion occurred when predators were removed from soft bottom habitats. Competitive advantages of one species over another may be slight. Small scale disruptions of soft bottom habitats are more the norm than the exception, especially in such shallow waters. Bottom feeding fish can turn over a large percentage of the bottom, ingesting detritus, algae and benthic fauna, so that a reduction in fishes would result in an increase in numbers if nutrients and living space are not limiting factors.

The fact that the benthic organisms flourished in the warmer waters, and no episodes of zero oxygen occurred, indicates that the drop in numbers of fish is probably not attributable to a decline in environmental quality.

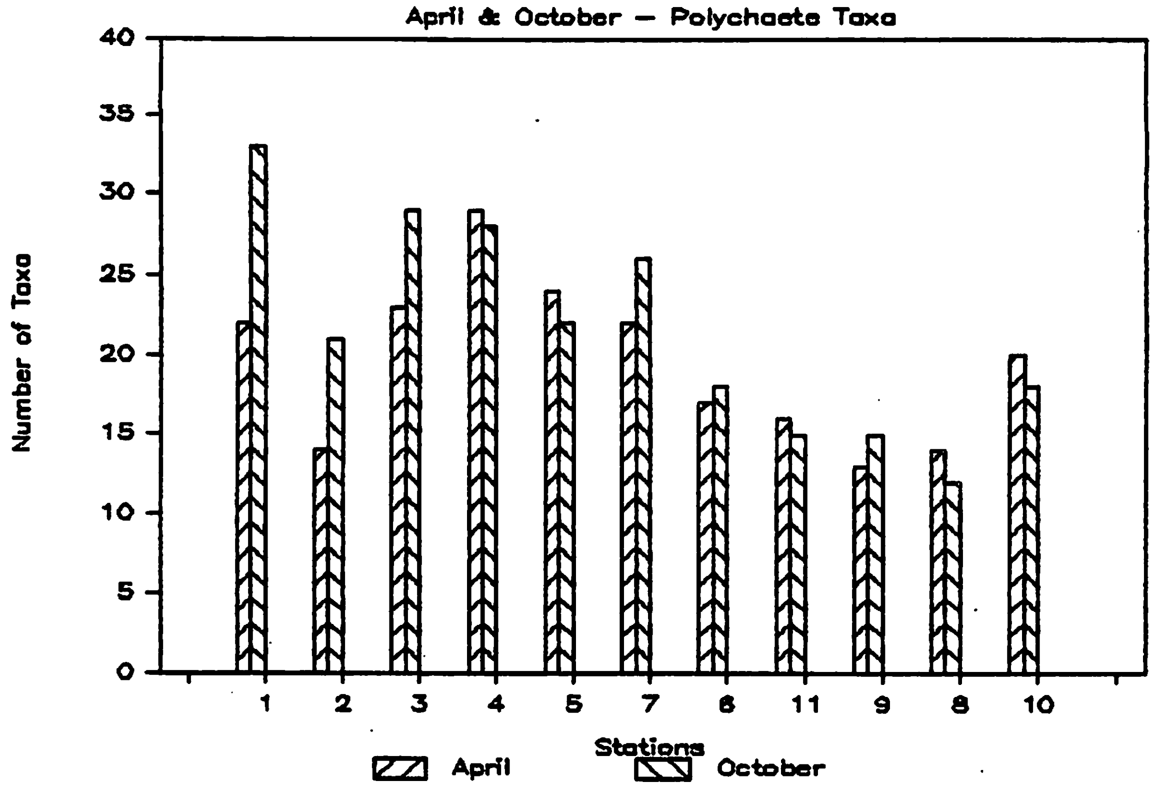

FIGURE 61. COMPARISON OF NUMBERS OF POLYCHAETE TAXA BY STATION IN APRIL AND OCTOBER 1984. STATIONS ARE IN SEQUENCE BY DISTANCE FROM THE BREAKWATER. STATIONS 6,7,8,9, AND 10 ARE IN SIDE BASINS.

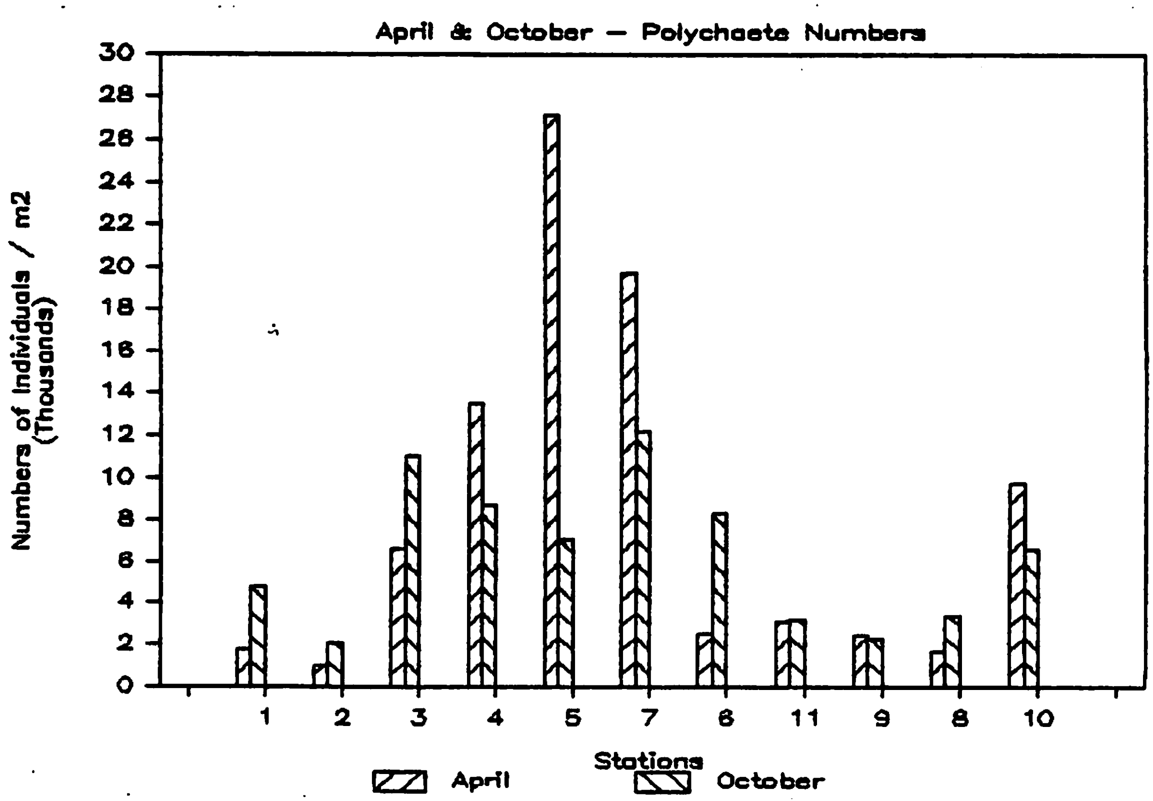

FIGURE 62. COMPARISON OF NUMBERS OF POLYCHAETES/M^2 BY STATION IN APRIL AND OCTOBER 1984.

Table 23. Comparison of Numbers of Benthic Species/Individuals in Similar Seasons of 1977 and 1984

Station	17 Mar 1977	16 Sept 1977	26 Apr 1984	25 Oct 1984
1	47/16,640	31/29,210	39/41,650	60/68,000
2	49/68,630	41/75,060	61/198,700	48/120,260
3	45/5,070	25/23,920	39/78,100	52/122,700
4	46/11,750	69/28,700	40/154,400	43/97,500
5	27/5,180	31/15,740	33/275,700	37/78,000
6	22/4,760	28/8,480	20/25,300	23/92,900
7	17/1,660	32/32,740	26/203,700	31/127,000
8	25/3,740	9/5,390	18/22,000	19/40,900
9	29/12,190	24/8,220	17/26,300	21/24,200
10	25/5,690	11/2,540	27/107,600	21/68,700
11	25/3,630	28/20,060	22/33,100	20/34,320
Mean ($\bar{x}$) =	32/12,631	29/22,733	31/106,050	34/79,498

Mean for all seasons by year

1977 (4 Periods)	1978 (4)	1984 (2)
33/13,116	38/8,201	33/92,774

Table 24. Dominant Species in Marina del Rey in 1984.

Pseudopolydora paucibranchiata	585,710
Euchone limnicola	225,490
Mediomastus ambiseta	160,300
Nematoda*	151,200
Oligochaeta*	87,000
Tharyx, sp.	78,800
Leitoscoloplos elongatus (= *Haploscoloplos*)	58,300
Prionospio heterobranchia	44,800
Cirriformia spirobrancha	37,600
Lumbrineris lagunae	34,000
Capitella capitata	32,900
Polydora ligni	29,100
Caprella equilibra	25,200
Chaetozone corona	18,100
Minuspio cirrifera (= *prionospio cirrifera*)	17,200
Tubulanus polymorpha (= *Prionospio polymorpha*)	16,200
Macoma carpenteri	15,700
Exogone, sp. *A*	13,900
Cossura candida	13,300
Scolelepis, sp. *A*	12,100
Streblospio benedicti	10,400
Gammaridea*	10,100
Cylichnella inculta (= *Acteocina inculta*)	8,400
Ciona intestinalis	8,300

*may include more than one species

Table 25. Spatial Distribution of Dominant Species in 1984

Species	Station 1	2	3	4	5	6	7	8	9	10	11
Pseudopolydora paucibranchiata		X	X	X	X	X	X	X	X	X	X
Euchone limnicola			X	X	X	X	X		X	X	X
Mediomastus ambiseta	X	X	X	X	X	X	X			X	
Nematoda*		X									
Oligochaeta*	X	X									
Tharyx. sp.							X				
Leitoscoloplos elongatus (=*Haploscoloplos*)			X	X	X	X	X				
Prionospio heterobranchia	X	X	X	X	X						
Cirriformia spirobrancha					X	X	X			X	X
Lumbrineris lagunae	X	X	X	X		X	X				
Capitella capitata	X							X		X	
Polydora ligni							X	X	X	X	
Caprella equilibra			X	X							
Chaetozone corona			X	X	X	X				X	
Minuspio cirrifera	X		X	X							
Tubulanus polymorphus	X	X	X	X							
Macoma carpenteri		X									
Exogone sp. *A*					X		X				
Cossura candida			X	X							
Scololepis sp. *A*			X	X	X	X					
Streblospio benedicti										X	X
Gammaridea*	X										
Cyichnella inculta (=*Acteocina*)							X			X	X
Ciona intestinalis											X
Oxyurostylus pacificus	X	X									
Anoplodactylus erectus	X										
Hemigrapsis oregonensis			X	X							
Nereis procera	X										
Gonadia littorea	X										
Nemertea*	X										

* may consist of more than one species

Table 26. Spatial Distribution of Dominant Species in 1976 - 1979*

	MDR Stations										
	1	2	3	4	5	6	7	8	9	10	11
Capitella capitata	X	X					X	X	X	X	
Diastylopsis tenuis	X										
Tellina modesta	X										
Mediomastus californiensis	X	X	X	X	X	X	X		X		X
Nematoda	X	X									
Chaetozone setosa	X										
Peloscolex gabriellae	X										
Oxyurostylus pacificus	X	X									
Armandia bioculata	X	X									
Schistomeringos longicornis		X		X		X				X	
Notomastus tenuis		X		X							
Prionospio heterobranchia		X	X	X	X	X		X		X	X
Macoma nasuta		X									
Oligochaeta		X	X							X	
Pseudopolydora paucibranchiata			X		X	X	X	X	X	X	X
Gammarid			X								
Caprellid			X								
Protodorvillea gracilis			X								
Lumbrineris			X	X	X	X	X				X
Cossura pygodactylata				X		X	X		X	X	
Streblospio benedicti					X	X	X	X	X	X	X
Chaetozone corona					X						
Acteocina inculta						X		X	X	X	X
Haploscoloplos elongatus						X		X			X
Tharyx						X	X	X	X		
Scolelepis acuta								X			
Exogone lourei (spp)								X			
Polydora ligni								X	X	X	X

* (from Soule and Oguri, 1980)

Table 27. Dominant Species (with Numbers Greater than 1000/m^2) by Station in Marina del Rey, 1984
(upper number is April total; lower number is October total)

Station	1	2	3	4	5	6	7	8	9	10	11
Species											
Anoplodactylus erectus		0 5,300									
Armandia bioculata	1,400 1,200										
Capitella capitata	3,200 0							0 9,700		2,700 17,300	
Caprella californica	1,600 0										
Caprella equilibra				11,200 0	1,700 4,300			0 8,000			
Chaetozone corona			2,100 5,000	1,500 1,900	0 3,500	0 3,000				1,100	
Ciona intestinalis											8,300 0
Cirriformia spirobranchia					0 1,800	0 4,300	3,800 0			0 22,400	0 5,300
Corophium acherusicum							3,000 0				
Corymorpha aurata				2,500 0							
Cylichnella inculta = *Acteocina harpa*							0 4,400			2,400 0	0 1,600
Cossura candida			5,600 6,500	0 1,200							
Euchone limnicola			10,900 19,300	15,600 18,200	33,700 13,500	4,300 40,900	17,500 1,890		3,900 13,200	11,000 1,600	6,400 13,600
Exogone, sp. *A*					6,900 1,100		3,500 2,400				
Gammaridea	10,100 0										
Goniada littorea	0 3,200										
Hemigrapsis oregonensis			0 2,800	0 1,800							
Holothuroidea								0 1,700			
Laevacardium substriatum			0 1,500								
Leitoscoloplos elongatus (= *Haploscoloplos*)			2,700 4,100	6,800 6,600	13,400 3,800	2,800 6,800	4,600 5,600				1,100 0
Lumbrineris lagunae	0 1,200	2,400 1,600	0 6,300	6,800 7,800		1,500 1,100	4,700 1,700				
Macoma carpenteri		0 15,700									
Macoma yoldiformis				0 1,200		0 5,600					
Mediomastus ambiseta	0 4,400	2,400 7,100	23,500 40,600	16,400 3,600	19,300 22,000	3,400 5,300	6,700 4,600			1,000 0	

Table 27, cont'd.

Station	1	2	3	4	5	6	7	8	9	10	11
Species											
Minuspio cirrifera	0 1.700		0 14.000	0 1.500							
Mysidacea.							2.700 0				
Nematoda		108.500 42.700									
Nemertea	3.200 0										
Nereis latescens	0 1.800										
Nereis procera	0 4.200										
Oligochaeta	0 1.200	60.700 25.900									
Ostracoda				2.500 0							
Oxyurostylus pacificus	1.520 0	5.000 1.100									
Paraprionospio pinnata	0 2.300										
Platynereis bicanaliculata	2.800 0										
Polycladida	0 1.300										
Polydora ligni							4.000 1.900	1.100 8.600	0 1.100	8.700 3.700	
Prionospio heterobranchia	1.400 19.400	2.800 2.900	1.500 6.100	0 7.200	1.100 2.400						
Pseudopolydora paucibranchiata			1.700	80.400 1.100	180.010 17.400	7.600 16.600	109.600 42.700	7.200 10.200	17.000 1.600	55.800 15.700	18.300 2.800
Pycnogonida	0 1.300										
Rhynchospio arenicola							1.200 0			0 1.100	
Scolelepis, sp. *A*			0 2.300	0 2.500	0 1.100		1.300 1.100			1.700 2.100	
Streblospio benedicti										5.200 0	0 5.200
Tagelus subteres	0 1.900										
Tellina carpenteri	0 2.300										
Tellina modesta										1.400 0	
Tharyx, sp.							41.100 37.700				
Tubulanus polymorphus	0 3.200	2.400 4.200	3.600 1.000	1.800 0							

Table 28. Comparison of Species Diversity Indices in 1977 and 1984

Station	Mar 77	Sept 77	Apr 84	Oct 84
1	4.73	2.92	3.57	5.30
2	4.31	3.56	4.92	4.02
3	5.16	2.38	3.37	4.35
4	4.80	6.43	3.26	3.66
5	3.04	3.10	2.55	3.20
6	2.48	2.65	1.87	1.92
7	2.16	2.98	2.05	2.55
8	2.92	0.93	1.70	1.70
9	2.98	2.55	1.57	1.98
10	2.78	1.28	2.24	1.80
11	2.93	2.73	2.02	1.82

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APPENDIX A

DATA TABLES

TEMPERATURE, SALINITY, DISSOLVED OXYGEN, pH
PERCENT LIGHT TRANSMITTANCE, AMMONIUM AND SEA COLOR

CRUISE: MDR 84 Vessel: Bay Watch Date: 15 May 1984
WEATHER: Mostly clear

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
1	0	0918	18.5	31.8	7.2	8.2	87	2.2	
	1		18.5	31.8	6.9	8.2	86		
	2		18.3	31.9	6.6	8.2	86	10.3	
	3		18.2	31.9	6.6	8.2	85		
	4		18.1	31.9	6.0	8.1	85	4.4	
	5		18.1	31.9	6.2	8.1	82		
	6		18.0	31.9	6.2	8.1	81	4.4	
2	0	0908	17.7	31.9	5.8	8.1	74	1.6	
	1		17.7	31.8	5.3	8.1	73		
	2		17.7	31.8	5.4	8.1	73	5.3	
	3		17.7	31.8	5.1	8.1	73		
	4		17.7	31.8	5.7	8.2	74	9.2	
	5		17.7	31.8	5.7	8.1	74		
3	0	0855	18.7	31.6	9.1	7.9	79	3.6	
	1		19.8	31.6	8.9	7.9	78		
	2		19.6	31.7	9.0	8.0	78	4.0	
	3		18.6	31.7	7.9	8.0	79		
	4		18.4	31.8	7.9	8.0	74	5.9	
4	0	0936	19.3	31.5	6.1	8.0	65	3.5	15
	1		19.2	31.4	5.3	8.0	65		
	2		19.0	31.7	4.8	8.0	68	3.3	
	3		18.9	31.7	4.1	8.0	69		
	4		18.8	31.8	5.3	8.0	73	3.5	
	5		18.7	31.8	4.8	8.0	74	3.2	
5	0	1008	19.9	31.7	7.0	7.9	64	2.2	15
	1		19.9	31.6	7.0	7.9	66		
	2		19.7	31.7	7.0	7.9	65	2.5	
	3		19.6	31.7	6.8	7.9	65		
	4		19.5	31.8	6.8	7.9	62	2.1	

CRUISE: MDR 84 Vessel: Bay Watch Date: 15 May 1984
WEATHER: Mostly clear

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
6	0	1118	20.2	31.5	6.1	7.9	71	2.5	14
	1		20.0	31.7	5.7	7.9	71		
	2		19.8	31.7	5.0	7.9	69	3.2	
	3		19.7	31.8	5.1	7.9	70		
	4		19.6	31.7	5.0	7.9	66	3.2	
7	0	0952	20.0	31.5	5.1	7.9	65	1.8	16
	1		20.0	31.6	4.5	7.9	65		
	2		19.9	31.7	4.7	7.9	65	6.4	
	3		19.9	31.7	4.1	7.9	65		
	4		19.9	31.7	4.4	7.9	28	3.1	
8	0	1057	20.5	31.6	6.2	7.8	68	4.9	14
	1		20.4	31.6	6.1	7.8	67		
	2		20.4	31.6	6.1	7.8	66	4.0	
	3		20.0	31.8	6.0	7.8	67		
	4		19.8	31.9	5.2	7.8	61	4.6	
9	0	1017	20.4	31.1	6.7	7.8	62	5.0	14
	1		20.3	31.5	6.8	7.8	64		
	2		20.2	31.6	6.8	7.9	61	7.0	
	3		20.0	31.7	7.0	7.9	58		
	4		19.9	31.7	7.0	7.9	55	4.8	
10	0	1039	20.4	31.1	5.3	7.7	76	9.9	14
	1		20.2	31.3	5.5	7.7	75		
	2		20.0	31.5	5.4	7.7	71	6.7	
	3		20.0	31.6	5.2	7.7	68		
	4		20.0	31.6	3.6	7.6	60	7.5	
11	0	1028	20.5	31.4	6.3	7.8	57	3.4	16
	1		20.2	31.6	6.4	7.9	58		
	2		20.0	31.7	6.5	7.9	54	9.6	
	3		20.0	31.7	6.4	7.9	54		
	4		19.9	31.7	6.4	7.9	54	3.7	

CRUISE: MDR 84 Vessel: Bay Watch Date: 14 June 1984
WEATHER: Sunny, warm

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU	BOD mg/L
1	0	0842	20.1	31.5	11.3		81	1.7	9	2.7
	1		20.2	31.5	10.9		82			
	2		20.2	31.7	10.8		85	5.2		1.8
	3		20.2	31.7	10.0		85			
	4		20.2	31.8	9.9		40	2.5		1.7
2	0	0854	20.1	31.5	9.4	7.7	73	3.4	11	1.8
	1		20.1	31.5	9.4	7.2	80			
	2		20.2	31.7	9.5	7.4	84	9.1		2.1
	3		20.1	31.8	9.5	7.5	85			
	4		20.1	31.8	9.4	7.5	86	2.1		1.4
	5		20.1	31.8	9.4	--	87			
	6		20.1	31.8	9.3	--	30			
3	0	0907	20.6	31.1	8.8	7.5	74	1.8	12	2.9
	1		20.7	31.1	8.8	7.5	74			
	2		20.7	31.3	8.7	7.5	75	1.9		2.3
	3		20.6	31.6	8.7	7.5	76			
	4		20.4	31.7	8.6	7.5	76	2.2		2.3
	5		20.3	31.8	8.6	7.5	74			
	6		20.2	31.7	8.6	7.5	71			
4	0	1104	21.0	32.1	8.5	7.6	56	3.5	14	1.9
	1		21.3	31.2	8.5	7.5	72			
	2		20.8	31.6	8.2	7.5	73	4.6		2.3
	3		20.7	31.8	8.2	7.5	73			
	4		20.4	31.8	8.7	7.5	75	7.1		2.0
	5		20.4	31.8	8.5	7.5	74			
	6		20.4	31.8	8.4	7.5	73			
5	0	1038	21.2	31.2	8.6	7.7	74	3.4	16	2.7
	1		21.4	31.2	8.4	7.6	70			
	2		21.4	31.5	7.9	7.5	69	5.3		2.4
	3		21.4	31.7	7.8	7.5	70			
	4		21.0	31.9	7.6	7.5	66	8.8		1.4
	5		20.8	31.8	7.3	7.5	61			

CRUISE: MDR 84 Vessel: Bay Watch Date: 14 June 1984
WEATHER: Sunny, warm

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU	BOD mg/L
6	0	0932	21.4	30.9	7.8	7.5	76	5.0	12	1.6
	1		21.6	31.1	7.6	7.4	75			
	2		21.6	31.4	7.3	7.4	77	3.5		1.6
	3		21.6	31.5	7.6	7.4	77			
	4		21.3	31.8	6.3	7.4	61	5.8		2.2
7	0	1048	21.8	31.6	8.1	7.5	75	12.6	16	2.3
	1		21.9	31.5	8.0	7.5	72			
	2		21.9	31.6	8.0	7.5	72	12.8		2.7
	3		21.9	31.7	7.8	7.5	72			
	4		21.8	31.8	6.0	7.4	30	13.6		3.2
8	0	0945	21.9	31.3	7.3	7.4	72	5.0	16	2.5
	1		22.5	31.6	7.3	7.4	71			
	2		22.4	31.7	7.4	7.2	72	3.8		2.3
	3		22.2	31.7	7.5	7.5	71			
	4		22.1	31.7	7.2	7.4	61	3.6		3.1
9	0	1025	22.1	31.3	7.4	7.4	69	5.1	14	1.8
	1		22.2	31.2	7.3	7.4	70			
	2		22.2	31.4	7.3	7.4	62	7.1		2.2
	3		22.1	31.5	6.9	7.4	61			
	4		22.0	31.7	7.0	7.4	57	6.4		1.7
10	0	1002	21.9	29.7	6.8	7.0	60	24.3	16	3.4
	1		22.5	30.3	6.7	7.4	65			
	2		22.4	31.3	6.1	7.3	62	10.4		2.8
	3		22.2	31.5	6.1	7.4	61			
	4		22.1	31.7	5.3	7.4	60	12.8		3.3
11	0	1013	22.1	31.2	6.3	7.5	74	10.5	14	1.5
	1		22.0	31.3	6.3	7.4	75			
	2		22.0	31.5	6.6	7.5	64	7.4		3.1
	3		22.0	31.5	7.0	7.4	62			
	4		22.0	31.6	5.0	7.4	59	10.1		2.3
13	0	1145	22.5	30.7	7.5	7.3		29.5		3.4

CRUISE: MDR 84 Vessel: Bay Watch Date: 12 July 1984
WEATHER: Sunny, Calm

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
1	0	0918	21.5	31.5	8.9	8.2	84	6.7	4
	1		20.3	32.2	9.2	8.2	82		
	2		19.6	32.9	9.6	8.2	87	5.1	
	3		19.2	33.5	9.7	8.2	88		
	4		19.3	33.1	9.8	8.2	88	3.8	
	5		18.5	34.0	9.7	8.2	86		
	6							3.7	
2	0	0928	20.3	31.8	9.3	8.6	84	2.3	4
	1		20.3	31.9	9.3	8.6	84		
	2		20.2	32.1	9.5	8.3	85	5.6	
	3		19.0	33.9	9.6	8.3	87		
	4		18.5	34.3	9.7	8.2	87	5.1	
	5		17.9	34.6	9.8	8.3	86		
	6							5.0	
3	0	0940	22.5	29.3	9.2	8.2	76	3.5	4
	1		22.6	30.0	9.1	8.2	80		
	2		21.4	31.6	9.1	8.2	83	6.9	
	3		20.8	31.9	9.2	8.2	84		
	4		20.2	32.4	9.2	8.2	84	2.8	
	5		18.6	34.3	8.2	8.2	78		
	6							3.8	
4	0	0950	22.9	29.6	9.3	8.7	80	2.7	7
	1		23.0	29.0	9.3	8.4	84		
	2		21.6	31.5	8.9	8.3	83	2.0	
	3		21.3	32.1	9.0	8.2	84		
	4		20.3	32.8	8.7	8.2	78	2.0	
	5		19.5	33.5	8.7	8.2	77		
	6		19.2	33.7	8.9	8.2	78	2.5	
5	0	1112	23.7	29.2	8.3	8.4	74	2.6	19
	1		23.7	29.5	7.8	8.3	86		
	2		23.3	30.0	7.9	8.2	90	4.1	
	3		22.4	31.1	8.6	8.2	82		
	4		21.7	31.8	8.1	8.1	77	4.6	
	5		21.4	31.7	8.0	8.1	64		

CRUISE: MDR 84 Vessel: Bay Watch Date: 12 July 1984
WEATHER: Sunny, warm

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
6	0	1006	23.0	29.5	9.1	8.8	84	13.0	5
	1		22.9	30.1	9.1	8.5	85		
	2		22.9	30.2	9.1	8.4	88	3.6	
	3		22.6	30.6	9.2	8.3	79		
	4		22.1	31.2	7.7	8.2	71	3.1	
7	0	1129	23.5	29.7	8.0	8.1	75	6.0	
	1		23.5	29.7	8.0	8.1	80		
	2		23.3	30.1	8.0	8.1	80	3.6	
	3		22.4	31.0	8.1	8.1	73		
	4		21.8	32.0	7.3	8.0	66	3.1	
8	0	1025	23.2	29.9	7.3	8.7	80	2.6	7
	1		23.5	29.6	7.4	8.4	79		
	2		23.5	29.8	8.2	8.3	85	3.5	
	3		23.4	30.0	8.1	8.2	79		
	4		23.1	30.5	6.8	8.2	71	2.0	
9	0	1101	24.0	28.7	9.7	8.7	72	2.60	18
	1		23.9	29.3	10.1	8.4	74		
	2		23.1	29.9	9.9	8.3	71	4.10	
	3		22.7	30.8	6.9	8.1	71		
	4		22.3	31.0	6.1	8.0	66	4.60	
10	0	1041	23.6	28.9	5.9	8.2	51	3.6	21
	1		23.6	29.1	7.9	8.2	57		
	2		23.4	29.8	5.6	8.0	76	4.7	
	3		23.1	30.2	5.9	7.9	79		
	4		22.8	30.6	4.0	7.8	75	5.7	
11	0	1052	23.6	29.4	9.1	8.6	70	8.0	19
	1		23.8	29.3	9.0	8.4	85		
	2		23.5	29.8	9.7	8.3	82	5.5	
	3		23.0	30.5	9.2	8.3	78		
	4		22.6	30.8	8.1	8.2	76	4.2	

CRUISE: MDR 84 Vessel: Bay Watch Date: 13 September 1984
WEATHER: Overcast

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
1	0	0928	22.6	34.2	9.1	8.2	90	5.2	5
	1		22.5	34.6	9.1	8.2	90		
	2		22.4	34.7	9.1	8.2	93	3.3	
	3		22.1	35.1	9.3	8.2	93		
	4		22.1	35.2	9.3	8.2	93	1.5	
	5		22.1	35.4	9.3	8.2	92		
	6		22.1	35.4	9.3	8.2	97	6.1	
2	0	0940	22.3	35.2	9.6	8.4	90	1.9	5
	1		22.2	35.4	9.4	8.3	90		
	2		22.2	35.4	9.3	8.2	89	3.4	
	3		22.2	35.4	9.2	8.2	89		
	4		22.2	35.4	9.2	8.2	85	2.6	
	5		22.2	35.5	9.2	8.2	85		
	6		22.2	35.5	9.2	8.2	83	4.6	
3	0	0950	23.2	35.0	9.3	8.2	88	2.1	5
	1		22.9	35.1	9.0	8.2	89		
	2		22.9	35.1	9.0	8.2	90	4.8	
	3		22.5	35.3	9.0	8.2	89		
	4		22.4	35.4	9.1	8.2	86	1.3	
	6							1.5	
4	0	1000	23.8	34.7	8.5	8.2	89	1.5	5
	1		23.4	34.8	8.5	8.2	89		
	2		23.3	34.8	8.5	8.2	88	2.0	
	3		23.1	34.9	8.5	8.2	87		
	4		23.0	35.0	8.2	8.1	86	2.9	
	5		22.8	35.2	8.1	8.1	84		
	6		22.7	35.3	7.8	8.1	82	2.4	
5	0	1010	24.4	34.5	8.8	8.2	87	2.1	5
	1		24.1	34.4	8.7	8.1	88		
	2		24.0	34.3	8.2	8.1	86	5.3	
	3		23.6	34.5	8.3	8.1	85		
	4		23.5	34.6	8.4	8.2	87	3.0	
	5		23.0	34.9	8.3	8.1	87		
	6							6.4	
6	0	1020	24.4	34.3	9.3	8.2	80	1.3	5
	1		24.3	34.3	9.3	8.2	75		
	2		24.1	34.3	7.6	8.0	79	1.2	
	3		23.8	34.4	5.4	7.9	88		
	4		23.4	34.6	2.6	7.8	86	1.3	
	5		23.1	34.8	1.0	7.7	83		

CRUISE: MDR 84 Vessel Bay Watch Date: 13 September 1984
WEATHER: Overcast

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
7	0	1037	24.4	34.1	8.2	8.0	80	2.1	5
	1		24.4	34.0	8.3	8.0	91		
	2		24.4	34.0	8.5	8.0	91	2.7	
	3		23.7	34.1	8.5	8.0	86		
	4		23.5	34.2	7.8	8.0	85	3.8	
8	0	1052	24.6	34.0	7.2	8.1	84	3.1	5
	1		24.5	33.9	7.1	8.0	91		
	2		24.4	33.9	6.3	7.9	86	6.6	
	3		24.3	33.9	2.1	7.7	87		
	4		23.7	34.2	2.3	7.7	87	4.8	
9	0	1130	24.7	34.0	9.6	8.1	76	2.7	21
	1		24.5	34.1	8.2	8.1	84		
	2		24.3	34.2	2.2	8.0	82	1.2	
	3		23.7	34.6	3.2	7.8	82		
	4		23.6	34.7	2.5	7.8	87	5.3	
10	0	1109	24.8	33.8	6.5	7.9	85	3.2	5
	1		24.5	33.9	4.8	7.9	85		
	2		24.4	34.0	3.0	7.8	89	3.5	
	3		24.1	34.3	2.6	7.7	89		
	4		23.8	34.3	3.1	7.8	89	6.6	
11	0		24.9	33.8	7.4	8.0	88	4.4	19
	1		24.6	34.0	8.7	8.1	81		
	2		24.1	34.1	6.2	8.0	82	1.8	
	3		23.8	34.5	6.1	7.9	85		
	4		23.7	34.6	4.5	7.9	85	1.7	
12	0	1250	23.7	32.9	8.3	8.1	92	7.7	16
	1		22.8	34.0	9.0	8.1	93		
	2		22.6	34.6	8.8	8.1	95	7.6	
	3		22.6	34.7	8.7	8.1	95		
	4		22.6	35.0	8.6	8.1	94	3.1	
13	0	1214	25.6	32.3	6.7	7.9	72	18.0	
	1		25.4	32.4	4.7	7.8	72		

CRUISE: MDR 84 Vessel: Bay Watch Date: 10 October 1984
WEATHER: Overcast

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
1	0	0902	20.6	31.6	8.8	8.3	77	5.9	5
	1		20.5	32.0	8.8	8.3	84		
	2		20.6	32.4	8.8	8.3	86	6.2	
	3		20.6	32.6	9.3	8.3	89		
	4		20.6	32.6	9.4	8.3	90	6.6	
	5		20.5	32.8	9.4	8.3	90		
	6		20.5	32.8	9.4	8.3	87	6.3	
2	0	0914	20.3	33.0	9.1	8.3	84	5.0	5
	1		20.3	33.0	9.1	8.3	86		
	2		20.3	33.1	9.2	8.3	86	4.7	
	3		20.3	33.1	9.2	8.3	87		
	4		20.2	33.1	9.0	8.3	87	5.9	
	5		19.9	33.1	8.8	8.3	87		
	6		19.7	33.1	8.9	8.3	86	19.3	
3	0	0925	20.9	32.8	8.4	8.3	84	5.9	5
	1		21.0	32.8	8.2	8.3	85		
	2		21.0	32.7	8.1	8.3	84	5.3	
	3		20.3	32.8	8.4	8.3	82		
	4		19.9	33.1	8.0	8.3	83	7.9	
4	0	0936	21.4	32.7	9.8	8.3	81	13.1	5
	1		21.4	32.6	10.4	8.3	84		
	2		21.3	32.7	9.8	8.3	81	7.9	
	3		21.0	32.7	9.8	8.3	82		
	4		20.8	32.8	7.8	8.3	80	5.5	
	5		20.8	32.8		8.3	79		
	6							7.3	
5	0	0947	21.6	32.6	9.7	8.3	79	6.6	5
	1		21.6	32.6	9.8	8.3	82		
	2		21.6	32.5	9.3	8.2	81	5.3	
	3		21.6	32.5	8.9	8.2	82		
	4		21.5	32.5	8.5	8.2	81	6.2	
	5		21.4	32.5	8.0	8.2	81		
	6							8.1	
6	0	0959	21.7	32.6	10.0	8.2	86	8.1	5
	1		21.7	32.5	10.0	8.2	85		
	2		21.8	32.4	10.5	8.2	85	8.1	
	3		21.8	32.4	10.3	8.1	84		
	4		21.7	32.4	10.2	8.1	84	7.6	

CRUISE: MDR 84 Vessel: Bay Watch Date: 10 October 1984
WEATHER: Sunny, warm

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
7	0	1103	22.1	32.1	7.4	8.2	87	7.1	15
	1		22.0	32.1	7.4	8.2	86		
	2		22.0	32.1	7.3	8.2	86	12.1	
	3		22.0	32.1	7.4	8.2	86		
	4		21.9	32.2	7.3	8.2	86	5.8	
8	0	1014	22.3	32.0	8.1	8.1	82	6.3	5
	1		22.4	32.1	8.2	8.1	82		
	2		22.3	32.1	8.4	8.1	83	1.5	
	3		22.3	32.1	8.0	8.1	83		
	4		22.3	32.0	8.0	8.1	82	10.5	
	5		22.3	32.0		7.9	52		
9	0	1049	22.2	32.0	7.1	8.2	85	8.1	5
	1		22.2	31.9	6.9	8.2	87		
	2		22.2	32.0	6.8	8.2	85	6.1	
	3		22.2	32.0	6.6	8.2	82		
	4		22.1	32.0	6.7	8.2	80	9.9	
10	0	1032	22.3	32.0	9.3	8.2	70	6.2	21
	1		22.3	32.0	9.5	8.1	72		
	2		22.3	31.9	8.8	8.1	76	6.2	
	3		22.3	31.9	8.6	8.1	80		
	4		22.2	32.0	7.8	8.1	80	9.5	
11	0	1041	22.1	32.1	8.5	8.2	84	6.2	
	1		22.2	32.0	8.7	8.2	84		
	2		22.1	32.0	9.0	8.2	82	6.6	
	3		22.1	32.0	9.4	8.2	81		
	4		22.0	32.0	8.8	8.2	76	10.3	
12	0	1204	20.9	32.8	8.8	8.4	91	6.6	
	1		20.9	32.0	8.8	8.4	90		
	2		20.7	32.5	8.4	8.4	91	5.4	
	3		20.7	32.8	8.3	8.3	91		
13	0	1137	22.6	31.8	6.2	8.1	86	8.8	16

CRUISE: MDR84 Vessel: Bay Watch Date: November 15 1984
WEATHER: Overcast

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU
1	0	0918	16.7	31.5	9.4	8.2	83	10.2	5
	1		16.8	32.9	9.8	8.2	83		
	2		16.8	33.3	8.5	8.3	85	6.3	
	3		16.8	33.3	8.4	8.3	85		
	4		16.8	33.3	8.8	8.4	84	7.4	
	5		16.8	33.3	8.8	8.3	84		
	6		16.8	33.3	9.1	8.3	82		
2	0	0928	16.5	31.9	7.1	8.2	82	8.6	5
	1		16.8	32.6	6.9	8.2	86		
	2		16.9	32.8	6.8	8.2	86	8.1	
	3		16.8	33.0	7.5	8.3	86		
	4		16.8	33.4	7.6	8.3	87	5.8	
	5		16.8	33.3	7.6	8.3	86		
3	0	0936	17.0	32.7	6.8	8.2	85	6.1	5
	1		17.1	32.6	6.6	8.2	85		
	2		17.1	32.5	6.5	8.2	84	9.3	
	3		17.1	32.6	6.5	8.2	85		
	4		17.1	32.5	6.4	8.2	84	7.2	
	5		16.9	32.6	6.6	8.2	84		
4	0	0945	17.1	32.8	9.4	8.2	83	7.9	5
	1		17.0	32.8	8.5	8.2	81		
	2		16.9	33.0	9.6	8.2	81	12.3	
	3		16.9	33.1	9.6	8.3	81		
	4		17.0	33.1	9.6	8.3	81	8.3	
	5		16.9	33.2	9.1	8.3	83		
5	0	9520	17.4	32.4	6.1	8.2	88	9.3	5
	1		17.5	32.3	5.9	8.2	86		
	2		17.5	32.1	5.9	8.2	87	13.2	
	3		17.4	32.2	5.9	8.2	85		
	4		17.3	32.5	6.1	8.2	84	9.9	
	5		17.3	32.6	6.4	8.2	82		
6	0	1001	17.4	32.5	9.3	8.2	90	10.4	5
	1		17.4	32.4	9.3	8.2	90		
	2		17.4	32.4	9.8	8.2	89	8.3	
	3		17.4	32.4	9.9	8.2	88		
	4		17.6	32.4	10.8	8.2	88	11.2	
	5		17.6	32.5	10.5	8.2	83		

CRUISE: MDR84 Vessel: Bay Watch Date: November 15 1984
WEATHER: Overcast

Station	Depth m	Time	Temp. C	Sal. o/oo	DO mg/L	pH	%T	NH3 ug-at/L	FU	BOD mg/L
7	0	1057	17.7	32.0	5.6	8.2	83	8.4	5	2.1
	1		17.8	32.0	5.5	8.2	87			
	2		17.7	32.0	5.6	8.2	85	6.5		2.8
	3		17.6	32.0	5.7	8.2	83			
	4		17.6	32.2	6.0	8.2	82	10.0		2.2
8	0	1016	17.5	32.1	6.2	8.2	82	29.2	5	1.4
	1		17.5	32.1	5.9	8.2	88			
	2		17.5	32.0	5.9	8.2	87	10.5		2.4
	3		17.2	31.9	5.9	8.2	88			
	4		17.1	32.0	6.0	8.2	90	10.0		2.0
9	0	1045	17.9	31.9	5.6	8.1	83	10.6	14	2.3
	1		17.9	31.9	5.5	8.1	81			
	2		17.9	31.9	5.5	8.2	80	10.1		3.7
	3		17.8	32.0	5.6	8.2	81			
	4		17.8	32.1	5.5	8.2	28	9.4		2.2
10	0	1028	17.7	31.7	6.4	8.1	84	11.2	5	3.3
	1		17.7	31.7	6.1	8.1	91			
	2		18.2	32.1	5.8	8.1	87	13.6		2.2
	3		18.3	32.2	5.4	8.1	84			
	4		18.3	32.2	5.4	8.1	84	11.8		1.9
11	0	1037	17.7	31.9	7.1	8.1	83	10.6	5	2.2
	1		17.7	31.9	6.6	8.1	88			
	2		17.6	32.0	6.3	8.2	87	10.4		2.7
	3		17.6	32.1	6.2	8.2	82			
	4		17.7	32.3	5.9	8.2	38	14.9		2.3
12	0	1207	16.6	*	4.6	8.2	87	12.4	5	2.9
	1		16.8	*	4.1	8.3	88			
	2		16.8	*	4.3	8.3	92	6.1		2.7
	3		16.8	*	4.6	8.3	92			
	4							6.0		3.3
13	0	1138	17.4	*	3.6	8.1	87	13.4	14	3.0

* probe malfunction

APPENDIX B

BENTHIC DATA

CRUISE: MDR84 Date: 4 April 1984 Type: Benthic/Sediment

VESSEL & PERSONNEL:

Soule, D., P.I.
Oguri, M.
Williams, S.
Chaney, H.
Bostick, B.
Bester, R.

R. V. Golden West
Mueller, R., Skipper
Mallonee, W.

SAMPLING STATIONS:

Station	Time	Faunal Observations	Comments
Left Dock 0905			
1	0910	Clear, windy	Three grabs, sulfide mud, hard pack silt. Terrestrial plants, leaves. Four jars of sediment collected.
2	1010		Black mud, no plant life.
3	1030		Lots of plant life. Ghost shrimp and crab.
4	1055		Brownish silt.
5	1245		Black mud, silt & clay.
6	1041		Black mud.
7	1220		Lot of black mud, soft and silty.
8	1220	Becoming very windy, many gulls.	Beach area, detergent in water. Fish bone collected.
9	1110		Mud black and clay.
10	1147		Black mud.
11	1126	Ducks swimming around.	Clay, black silt. Sulfide odor.

CRUISE: MDR84 Date: 25 October 1984 Type: Benthic/Sediment

VESSEL & PERSONNEL:

Soule, D., P.I. Williams. S Webber, R. Bester, R. Nakamura, B	R.V. <u>Golden West</u> Mueller, R., Skipper Mallonee, B.

SAMPLING STATIONS:

Station	Time	Faunal Observations	Comments
Left dock	0900		Campbell Grab used to obtain benthic samples. Samples taken for sediment pollutants.
Sampling Started			
1	0935		Mud Oily, very black and silty.
2	0947		Black with tarry lumps.
3	1002		Lot of little shrimp, larger grab than previous stations, still black, silty with mud balls. Full of shells.
4	1032		Slightly greasy, silty
5	1110		Greasy mud, full of worms.
6	1253		Not many creatures.
7	1050		Black & silty.
8	1225		Same substance, few creatures.
9	1130	Group of ducks floating.	Gasoline smell. Large pregnant crab. Two tiny fish, many shells
10	1202	Wind coming up	Small worms, shells. Very fine silt.

CRUISE: MDR 84 cont'd Date: 25 October 1984 - Benthic/Sediment

Station	Time	Faunal Observations	Comments
11	1145		Very greasy.
13		Bird Sanctuary	Brian and Bob will go over and get samples.

BENTHIC DATA STATION MDR 1

DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	60	120
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops	80	
Amphicteis scaphobranchiata	30	
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata	320	
Mediomastus acutus		10
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	10	440
Notomastus magnus		
Notomastus tenuis		
Chaetopteridae		
Spiochaetopterus costarum		60
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona		30
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.		20
Cossuridae		
Cossura candida		
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 1	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis	70	20
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		40
Pherusa sp., juv.		
Glyceridae		
Glycera americana	40	10
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		320
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia	80	
Ophiodromus pugettensis		
Podarkeopsis glabra		
(= *Gyptis brevipalpa*)	10	
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta	30	
Lumbrineris lagunae	40	120
Lumbrineris limicola		
Lumbrineris ? tetraura	20	90
Lumbrineris spp.		
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides		

POLYCHAETA, Nephtyidae cont'd. Station MDR 1	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana		
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		180
Nereis procera	50	420
Nereis sp., juv.		
? Perinereis monterea		
Platynereis bicanaliculata	280	10
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima	20	50
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata	140	120
Polyophthalmus pictus	30	20
Orbiniidae		
Leitoscoloplos elongatus		
(= *Haploscoloplos elongatus*)		110
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		10
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 1	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea	10	10
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		10
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		20
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops (= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis	10	
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola		
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans (= *Hydroides pacifica*)		
Hydroides gracilis (= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd.	Station MDR 1	26 Apr	25 Oct
Spionidae, unid.			30
Apoprionospio pygmaea			10
(= *Prionospio pygmaeus*)			
Boccardia sp.			
Boccardia basilaria			
Boccardiella hamata			
(= *Boccardia hamata*)			
Caraziella calafia			
(= "*Pseudopolydora* sp.")			
Laonice cirrata			
Microspio pigmentata			20
Microspio maculata			
(= *Spio maculata*;			
= *Nerinides maculata*)			
Minuspio cirrifera		20	170
(= *Prionospio cirrifera*)			
Paraprionospio pinnata			230
Polydora bioccipitalis			
Polydora caulleryi			
(= *P. brachycephala*)			
Polydora ligni			
Polydora socialis			
Polydora sp.			
Prionospio heterobranchia		140	1,940
(= *P. h. newportensis*)			
Prionospio sp. *A*			
(= *Prionospio* "*steenstrupi*";			
= *P.* nr. *malmgreni*)			
Prionospio sp.			
Pseudopolydora paucibranchiata		60	
Rynchospio arenicola			
Rhynchospio sp.			
Scolelepis acuta			
(= *Nerinides acuta*)			
Scolelepis sp. *A*			
Spio ? filicornis			
Spiophanes berkeleyorum			
Spiophanes bombyx			
Spiophanes missionensis			40
Streblospio benedicti			
Spirorbidae			
Janua brasiliensis			
Pileolaria pseudomilitaris			
Syllidae			
Syllidae, unid.			90
Autolytus sp.			
Brania sp.		30	20
Exogone gemmifera			
Exogone lourei			
Exogone verugera			
Exogone sp. *A*			
Exogone sp.			
Odontosyllis phosphorea			

POLYCHAETA, Syllidae cont'd.	Station MDR 1	26 Apr	25 Oct
Sphaerosyllis californiensis			
Sphaerosyllis sp.			
? Syllis sp.			
Typosyllis ? hyalina			
Typosyllis sp.			
Terebellidae			
Terebellidae, unid.			
Amaeana occidentalis			
Pista fasciata			
Pista ? disjuncta			
Pista sp., juv.			
Streblosoma crassibranchia			
ARTHROPODA			
CRUSTACEA			
COPEPODA			
CALANOIDA			
Calanoida, unid.			
CYCLOPOIDEA			
Cyclopoidea, unid.			10
Clausidium vancouverense			
HARPACTICOIDA			
Harpactocoida, unid.			
MALACOSTRACA			
AMPHIPODA			
CAPRELLIDEA			
Caprellidea, unid.		40	
Caprella californica		160	
Caprella equilibra		10	30
GAMMARIDEA			
Gammaridea, unid.		1,010	20
Amphideutopus oculatus			70
Ampelisca cristata			
Argissa hamatipes			
Corophium acherusicum		30	
Ericthonis brasiliensis			
Listriella goleta			
Monoculoides sp.			90
Parapleustes pugettensis			10
Photis sp.			
Podocerus cristatus			
Rudilemboides stenopropodus			100
Westwoodilla caecula			
CUMACEA			
Cumacea, unid.			
Campylaspis sp.			
Cyclaspis sp.			
Diastylis sp.			
Diastylopsis tenuis		20	10
Oxyurostylus pacifica		152	60
DECAPODA			
Decapoda--larval		40	
Anomura			

CRUSTACEA, cont'd. Station MDR 1	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi	80	30
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus	10	
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.	10	
Cyathura sp.		
Edotea sublittoralis	10	
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		40
LEPTOSTRACA		
Epinebalia sp.	30	
MYSIDACEA		
Mysidacea, unid.		
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		10
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd.	Station MDR 1	26 Apr	25 Oct
Philomedes sp.			
Rudiderma rostrata			
Scleroconcha sp.			
CIRRIPEDIA			
Balanus (Balanus) pacificus			
Balanus trigonus			
Balanus sp.			
Megabalanus tintinnabulum californicus (= *Balanus*)			
INSECTA			
Chironomidae, larvae			
Paraclunio alaskensis, larvae			
PYCNOGONIDA			
Anoplodactylus erectus		70	50
Callipallene californiensis			130
Pallenidae, unid.			
Tantystylum intermedium			
ASCHELMINTHES			
Nematoda, unid.			
BRACHIOPODA			
Glottidia albida			
BRYOZOA (No. of colonies)			
Bowerkankia gracilis			
Bugula neritina			
Celleporaria brunnea		1	
Cryptosula pallasiana			
Schizoporella unicornis			
Watersipora arcuata			
Zoobotryon verticillatum			
CHORDATA			
CEPHALOCHORDATA			
Branchiostoma californiense			
UROCHORDATA			
ASCIDACEA			
Ascidacea, unid.			
Botryllus sp.			
Ciona intestinalis			
Mogula pugetiensis			
Styela clava			
Styela plicata			
VERTEBRATA			
OSTEICHTHYS			
Gobiesocidae			
Gobiesox rhessodon			
Gobiidae			
Gobiidae, unid.			

VERTEBRATA, Gobiidae cont'd.	Station MDR 1	26 Apr	25 Oct
Gobiidae, larvae			
Clevelandia ios			
Ilypnus gilberti			
Lepidogobius lepidus			
CNIDARIA (= COELENTERATA)			
ANTHOZOA			
Anthozoa, unid.			
ACTINARIA			
Actinaria, unid.			
Diadumenidae			
Diadumene sp.			
Edwardsiidae			
Edwardsiidae, unid.			
Edwardsia californica			
Edwardsia sp.			
Edwardsia sp., juv.			
Halocliviidae			
Mesacmaea sp. *A*			
PENNATULACEA			
Stylatula elongata			
Acanthoptilum gracile			
CERIANTHARIA			
Ceriantharia, unid.			
HYDROZOA			
HYDROIDA			
Aglaophenia diversidentata			
Aglaophenia nr.*pluma*			
Aglaophenia sp.			present
Corymorpha aurata (= *Euphysa* sp. *A*)			
Obelia sp.			
ECHINODERMATA			
ECHINOIDEA			
Echinoidea, unid. juv.			
Strongylocentrotus purpuratus			
HOLOTHUROIDEA			
Holothuroidea, unid.			
OPHIUROIDEA			
Ophiuroidea, unid. juv.			
ECHIURA			
Listriolobus pelodes			
Urechis caupo			
HEMICHORDATA			
Enteropneusta, unid.			
MOLLUSCA			
GASTROPODA			
Gastropoda, unid. juv.			
OPHISTHOBRANCHIA			

GASTROPODA, cont'd.	Station MDR 1	26 Apr	25 Oct
CEPHALASPIDEA			
Cephalaspidea, unid.			
Acteonidae			
Rictaxis punctocaelatus			
Aglajidae			
Aglaja sp.			
Atyidae			
Haminoea vesicula			
Bullidae			
Bulla gouldiana			
Philinidae			
Woodbridgea sp.			
Retusidae			
Sulcoretusa sp.			
Volvulella panamica			
Scaphandridae			
Cylincha diegensis			
Cylichnella culcitella (= *Acteocina culcitella*)			
Cylichnella harpa (= *Acteocina harpa*)			
Cylichnellainculta (= *Acteocina inculta*)			70
NUDIBRANCHIA			
Nudibranchia, unid.			
Acanthodoris sp.			
Cuthona sp. (= *Trinchesia* sp.)			
PYRAMIDELLIDA			
Pyramidellidae			
Odostomia sp.			
Turbonilla sp.			
PROSOBRANCHIA			
MESOGASTROPODA			
Caecidae			
Caecum sp.			
Fartulum sp.			
Micranellium sp.			
Calypteridae			
Calyptraeidae, unid.			
Crepidula onyx			
Crepidula dorsata (= *Crepepatella lingulata*)			
Crepidula preforans			
Crepidula sp., juv.			
Lamellariidae			
Marseniopsis sharonae (= *Lamellaria sharonae*)			
Naticidae			
Neverita recluziana			
Sinum sp.			
Vitrinellidae			
Vitrinella oldroydi			

GASTROPODA, cont'd.	Station MDR 1	26 Apr	25 Oct
NEOGASTROPODA			
Columbellidae			
Alia carinata (= *Mitrella carinata*)			
Mitrella sp., juv.			
Muricidae			
Pteropurpura festiva			
Nassariidae			
Nassarius mendicus			
Nassarius perpinguis			
Nassarius sp.			
Olividae			
Olivella baetica			
Turridae			
Kurtziella plumbea			
PELECYPODA			
Pelecypoda, unid. juv.			
Cardiidae			
Laevicardium substriatum			30
Cooperellidae			
Cooperella subdiaphana			
Cultellidae			
Ensis myrae			
Siliqua lucida			
Donacidae			
Donax gouldii			
Erycinidae			
Lasaea subviridis			
Hiatellidae			
Hiatella arctica			
Kelliidae			
Kellia laperousi			50
Leptonidae			
Platomgsia meroeum (= *Lepton meroeum*)			
Lucinidae			
Parvilucina approximata			10
Parvilucina tenuisculpta (= *Parvilucina* sp.)			
Lucina nuttalli			
Lyonsiidae			
Lyonsia californica			
Mactridae			
Mactridae, juv.			
Mactra californica			
Mactra sp.			
Spisula catilliformis			
Spisula sp.			
Tresus nuttalli			
Montacutidae			
Mysella grippi			
Mysella pedroana			
Mysella sp.			

PELECYPODA, Montacutidae cont'd. Station MDR 1	26 Apr	25 Oct
Neaeromga sp.		
(= *Orobitella* sp.)		
Myidae		
Cryptomya californica		20
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		190
Solenidae		
Solen rosaceus	20	
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		
Macoma sp., juv.		
Tellina carpenteri		230
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

	Station MDR 1	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.		10	90
Cerebratulus californiensis			60
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*			40
Tubulanua nothus			10
Tubulanus pellucidus			60
Tubulanus polymorphus			320
PHORONIDA			
Phoronis pallida			
Phoronis sp.			20
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			130
SIPUNCULIDA			
Sipunculida, unid.			20

ADDENDUM:

BRYOZOA (No. of colonies)		
Membranipora tuberculata		3
Scrupocellaria diegensis		1
Tubulipora tuba		1

BENTHIC DATA STATION MDR 2

DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA	6,070	2,590
Oligochaeta, unid.		
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		10
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata	10	
Mediomastus acutus		
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	240	710
Notomastus magnus		
Notomastus tenuis	20	10
Chaetopteridae		
Spiochaetopterus costarum		30
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona		20
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.		
Cossuridae		
Cossura candida		
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 2	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis		10
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.		
Glyceridae		
Glycera americana		
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		60
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta	10	
Lumbrineris lagunae	240	160
Lumbrineris limocola		
Lumbrineris ? tetraura		
Lumbrineris spp.		
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides	50	20

POLYCHAETA, Nephtyidae cont'd. Station MDR 2	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana		
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		10
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		10
Nereis sp., juv.		
? Perinereis monterea		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		30
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata	40	80
Polyophthalmus pictus		20
Orbiniidae		
Leitoscoloplos elongatus		70
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 2	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops (= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	10	
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans (= *Hydroides pacifica*)		
Hydroides gracilis (= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd.	Station MDR 2	26 Apr	25 Oct
Spionidae, unid.			
Apoprionospio pygmaea (= *Prionospio pygmaeus*)			
Boccardia sp.			
Boccardia basilaria			
Boccardiella hamata (= *Boccardia hamata*)			
Caraziella calafia (= "*Pseudopolydora* sp.")			
Laonice cirrata			
Microspio pigmentata			
Microspio maculata (= *Spio maculata*; = *Nerinides maculata*)			
Minuspio cirrifera (= *Prionospio cirrifera*)			210
Paraprionospio pinnata			190
Polydora bioccipitalis			
Polydora caulleryi (= *P. brachycephala*)			
Polydora ligni			
Polydora socialis			
Polydora sp.			
Prionospio heterobranchia (= *P. h. newportensis*)		280	290
Prionospio sp. *A* (= *Prionospio* "*steenstrupi*"; = *P.* nr. *malmgreni*)			
Prionospio sp.			
Pseudopolydora paucibranchiata		20	
Rynchospio arenicola			
Rhynchospio sp.			
Scolelepis acuta (= *Nerinides acuta*)			
Scolelepis sp. *A*		10	40
Spio ? filicornis			
Spiophanes berkeleyorum			
Spiophanes bombyx			
Spiophanes missionensis		10	70
Streblospio benedicti			
Spirorbidae			
Janua brasiliensis			
Pileolaria pseudomilitaris			
Syllidae			
Syllidae, unid.			
Autolytus sp.			
Brania sp.			40
Exogone gemmifera			
Exogone lourei			
Exogone verugera			
Exogone sp. *A*			
Exogone sp.		10	
Odontosyllis phosphorea			

	Station MDR 2	26 Apr	25 Oct
POLYCHAETA, Syllidae cont'd.			
Sphaerosyllis californiensis			
Sphaerosyllis sp.			
? *Syllis* sp.			
Typosyllis ? hyalina			
Typosyllis sp.			
Terebellidae			
Terebellidae, unid.			
Amaeana occidentalis			
Pista fasciata			
Pista ? disjuncta			
Pista sp., juv.			
Streblosoma crassibranchia			
ARTHROPODA			
CRUSTACEA			
COPEPODA			
CALANOIDA			
Calanoida, unid.			
CYCLOPOIDEA			
Cyclopoidea, unid.			
Clausidium vancouverense			
HARPACTICOIDA			
Harpacticoida, unid.			20
MALACOSTRACA			
AMPHIPODA			
CAPRELLIDEA			
Caprellidea, unid.			
Caprella californica			
Caprella equilibra		20	40
GAMMARIDEA			
Gammaridea, unid.			
Ampelisca cristata			
Amphideutopus oculatus			70
Argissa hamatipes			
Corophium acherusicum		10	
Ericthonis brasiliensis			
Listriella goleta			
Monoculoides sp.			60
Parapleustes pugettensis			
Photis sp.			10
Podocerus cristatus			
Rudilemboides stenopropodus			60
Westwoodilla caecula		10	
CUMACEA			
Cumacea, unid.			
Campylaspis sp.			
Cyclaspis sp.			
Diastylis sp.			
Diastylopsis tenuis		80	
Oxyurostylus pacifica		1,500	110
DECAPODA			
Decapoda--larval			
Anomura			

CRUSTACEA, cont'd. Station MDR 2	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		20
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		70
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis	20	
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.	10	40
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	10	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.	10	
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd.	Station MDR 2	26 Apr	25 Oct
Philomedes sp.			
Rudiderma rostrata			
Scleroconcha sp.			
CIRRIPEDIA			
Balanus (Balanus) pacificus			
Balanus trigonus			
Balanus sp.			
Megabalanus tintinnabulum californicus (= *Balanus*)			
INSECTA			
Chironomidae, larvae			
Paraclunio alaskensis, larvae			
PYCNOGONIDA			
Anoplodactylus erectus		90	530
Callipallene californiensis			
Pallenidae, unid.			
Tantystylum intermedium			
ASCHELMINTHES			
Nematoda, unid.		10,850	4,270
BRACHIOPODA			
Glottidia albida			
BRYOZOA (= ECTOPROCTA)			
Bowerkankia gracilis			
Bugula neritina			
Celleporaria brunnea			
Cryptosula pallasiana			
Schizoporella unicornis			
Watersipora arcuata			
Zoobotryon verticillatum			
CHORDATA			
CEPHALOCHORDATA			
Branchiostoma californiense			
UROCHORDATA			
ASCIDACEA			
Ascidacea, unid.			
Botryllus sp.			
Ciona intestinalis			
Mogula pugetiensis			
Styela clava			
Styela plicata			
VERTEBRATA			
OSTEICHTHYS			
Gobiesocidae			
Gobiesox rhessodon			
Gobiidae			
Gobiidae, unid.			

Gobiidae, larvae
Clevelandia ios
Ilypnus gilberti
Lepidogobius lepidus

CNIDARIA (= COELENTERATA)
ANTHOZOA
Anthozoa, unid.
ACTINARIA
Actinaria, unid.
Diadumenidae
Diadumene sp.
Edwardsiidae
Edwardsiidae, unid.
Edwardsia californica
Edwardsia sp.
Edwardsia sp., juv.
Halocliviidae
Mesacmaea sp. *A*
PENNATULACEA
Stylatula elongata
Acanthoptilum gracile
CERIANTHARIA
Ceriantharia, unid.
HYDROZOA
HYDROIDA
Aglaophenia diversidentata
Aglaophenia nr.*pluma*
Aglaophenia sp.
Corymorpha aurata
(= *Euphysa* sp. *A*)
Obelia sp.

ECHINODERMATA
ECHINOIDEA
Echinoidea, unid. juv.
Strongylocentrotus purpuratus
HOLOTHUROIDEA
Holothuroidea, unid.
OPHIUROIDEA
Ophiuroidea, unid. juv.

ECHIURA
Listriolobus pelodes
Urechis caupo

HEMICHORDATA
Enteropneusta, unid.

MOLLUSCA
GASTROPODA
Gastropoda, unid. juv.
OPHISTHOBRANCHIA

GASTROPODA, cont'd. Station MDR 2	26 Apr	25 Oct
CEPHALASPIDEA		
Cephalaspidea, unid.		
Acteonidae		
Rictaxis punctocaelatus		
Aglajidae		
Aglaja sp.		
Atyidae		
Haminoea vesicula		
Bullidae		
Bulla gouldiana		
Philinidae		
Woodbridgea sp.		
Retusidae		
Sulcoretusa sp.		
Volvulella panamica		
Scaphandridae		
Cylincha diegensis		
Cylichnella culcitella (= *Acteocina culcitella*)		
Cylichnella harpa (= *Acteocina harpa*)		
Cylichnella inculta (= *Acteocina inculta*)		
NUDIBRANCHIA		
Nudibranchia, unid.		
Acanthodoris sp.		
Cuthona sp. (= *Trinchesia* sp.)		
PYRAMIDELLIDA		
Pyramidellidae		
Odostomia sp.		
Turbonilla sp.		
PROSOBRANCHIA		
MESOGASTROPODA		
Caecidae		
Caecum sp.		
Fartulum sp.		
Micranellium sp.		
Calypteridae		
Calyptraeidae, unid.		
Crepidula onyx		
Crepidula dorsata (= *Crepepatella lingulata*)		
Crepidula preforans		
Crepidula sp., juv.		
Lamellariidae		
Marseniopsis sharonae (= *Lamellaria sharonae*)		
Naticidae		
Neverita recluziana		
Sinum sp.		
Vitrinellidae		
Vitrinella oldroydi		

Station MDR 2

GASTROPODA, cont'd.	26 Apr	25 Oct
NEOGASTROPODA		
Columbellidae		
Alia carinata		
(= *Mitrella carinata*)		
Mitrella sp., juv.		
Muricidae		
Pteropurpura festiva		
Nassariidae		
Nassarius mendicus		
Nassarius perpinguis		
Nassarius sp.		
Olividae		
Olivella baetica		
Turridae		
Kurtziella plumbea		
PELECYPODA		
Pelecypoda, unid. juv.		
Cardiidae		
Laevicardium substriatum		
Cooperellidae		
Cooperella subdiaphana		
Cultellidae		
Ensis myrae		
Siliqua lucida		
Donacidae		
Donax gouldii		
Erycinidae		
Lasaea subviridis		
Hiatellidae		
Hiatella arctica		
Kelliidae		
Kellia laperousi		
Leptonidae		
Platomysia meroeum		
(= *Lepton meroeum*)		
Lucinidae		
Parvilucina approximata		10
Parvilucina tenuisculpta		
(= *Parvilucina* sp.)		
Lucina nuttalli		
Lyonsiidae		
Lyonsia californica		
Mactridae		
Mactridae, juv.		
Mactra californica		
Mactra sp.		
Spisula catilliformis		
Spisula sp.		
Tresus nuttalli		
Montacutidae		
Mysella grippi		
Mysella pedroana		
Mysella sp.		

PELECYPODA, cont'd. Station MDR 2	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)		
Myidae		
Cryptomya californica		20
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		10
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		30
Macoma sp., juv.		
Tellina carpenteri		1,570
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

Station MDR 2	26 Apr	25 Oct
SCAPHOPODA		
Cadulus fusiformis		
NEMERTEA		
Nemertea, unid.		40
Cerebratulus californiensis		20
Euplectonema burgeri		
Micrura alaskensis		
Paranemertes sp. *A*		100
Tubulanua nothus		10
Tubulanus pellucidus		
Tubulanus polymorphus	240	420
PHORONIDA		
Phoronis pallida		
Phoronis sp.		10
Phoronopsis sp.		
PLATHYHELMINTHES		
Polycladida, unid.		20
SIPUNCULIDA		
Sipunculida, unid.		20
ADDENDUM		
Ilypnus gilberti		1

BENTHIC DATA STATION MDR 3

DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	160	160
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops	10	
Amphicteis scaphobranchiata	30	
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata	10	30
Mediomastus acutus		10
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	2.350	4,060
Notomastus magnus		
Notomastus tenuis	40	20
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona	210	500
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.		120
Cossuridae		
Cossura candida	560	650
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 3	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis		
Eunicidae		
Marphysa disjuncta		10
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.		
Glyceridae		
Glycera americana	50	20
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		70
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra		10
(= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta		10
Lumbrineris lagunae	930	630
Lumbrineris limicola		
Lumbrineris ? tetraura		
Lumbrineris spp.		
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides	60	30

POLYCHAETA, Nephtyidae cont'd. Station MDR 3	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana		
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera	10	20
Nereis sp., juv.		
? Perinereis monterea		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata	10	60
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus	270	410
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 3	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? Genetyllis castanea		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta	10	
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		10
Lepidonotus ? squamatus		
Tenonia priops (= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	1,090	1,930
Megalomma pigmentum		
Myxicola ? infundibulum		
? Potamilla sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans (= *Hydroides pacifica*)		
Hydroides gracilis (= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		10
Spionidae		

POLYCHAETA, Spionidae cont'd. Station MDR 3	26 Apr	25 Oct
Spionidae, unid.		
Apoprionospio pygmaea		
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*;		
= *Nerinides maculata*)		
Minuspio cirrifera	510	1,400
(= *Prionospio cirrifera*)		
Paraprionospio pinnata	30	40
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni		
Polydora socialis		
Polydora sp.		10
Prionospio heterobranchia	150	610
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*";		
= *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	170	
Rynchospio arenicola		
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	60	230
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis	10	10
Streblospio benedicti		
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		10
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*	60	90
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd. Station MDR 3	26 Apr	25 Oct
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? Syllis sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis	20	10
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		70
Clausidium vancouverense		
HARPACTICOIDA		
Harpacticoida, unid.	30	10
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra		20
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum		
Ericthonis brasiliensis	40	
Listriella goleta		
Monoculoides sp.		
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus		
Rudilemboides stenopropodus		90
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica		10
DECAPODA		
Decapoda--larval	10	10
Anomura		

CRUSTACEA, cont'd. Station MDR 3	26 Apr	25 Oct
Callianassidae		
Callianassa californiesis	10	80
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		10
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis	40	280
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana	10	
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis	10	30
Alpheopsis equidactylus (= *Alpheus equidactylus*)	10	
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.		20
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.	10	
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTROAODA cont'd. Station MDR 3	26 Apr	25 Oct
Philomedes sp.		
Rudiderma rostrata		
Scleroconcha sp.		
CIRRIPEDIA		
Balanus (Balanus) pacificus		
Balanus trigonus		
Balanus sp.		
Megabalanus tintinnabulum californicus (= *Balanus*)		
INSECTA		
Chironomidae, larvae		
Paraclunio alaskensis, larvae		
PYCNOGONIDA		
Anoplodactylus erectus		
Callipallene californiensis		
Pallenidae, unid.		
Tantystylum intermedium		
ASCHELMINTHES		
Nematoda, unid.	10	
BRACHIOPODA		
Glottidia albida		
BRYOZOA (= ECTOPROCTA)		
Bowerkankia gracilis		
Bugula neritina		
Celleporaria brunnea		
Cryptosula pallasiana		
Schizoporella unicornis		
Watersipora arcuata		
Zoobotryon verticillatum		
CHORDATA		
CEPHALOCHORDATA		
Branchiostoma californiense		
UROCHORDATA		
ASCIDACEA		
Ascidacea, unid.		
Botryllus sp.		
Ciona intestinalis		
Mogula pugetiensis		
Styela clava		
Styela plicata		
VERTEBRATA		
OSTEICHTHYS		
Gobiesocidae		
Gobiesox rhessodon		
Gobiidae		
Gobiidae, unid.		

Gobiidae, larvae
Clevelandia ios
Ilypnus gilberti
Lepidogobius lepidus

CNIDARIA (= COELENTERATA)
ANTHOZOA
Anthozoa, unid.
ACTINARIA
Actinaria, unid.
Diadumenidae
Diadumene sp.
Edwardsiidae
Edwardsiidae, unid.
Edwardsia californica
Edwardsia sp.
Edwardsia sp., juv.
Halocliviidae
Mesacmaea sp. *A*
PENNATULACEA
Stylatula elongata
Acanthoptilum gracile
CERIANTHARIA
Ceriantharia, unid.
HYDROZOA
HYDROIDA
Aglaophenia diversidentata
Aglaophenia nr.*pluma*
Aglaophenia sp.
Corymorpha aurata
(= *Euphysa* sp. *A*)
Obelia sp.

ECHINODERMATA
ECHINOIDEA
Echinoidea, unid. juv.
Strongylocentrotus purpuratus
HOLOTHUROIDEA
Holothuroidea, unid.
OPHIUROIDEA
Ophiuroidea, unid. juv.

ECHIURA
Listriolobus pelodes
Urechis caupo

HEMICHORDATA
Enteropneusta, unid.

MOLLUSCA
GASTROPODA
Gastropoda, unid. juv.
OPHISTHOBRANCHIA

GASTROPODA, cont'd. Station MDR 3	26 Apr	25 Oct
CEPHALASPIDEA		
Cephalaspidea, unid.		
Acteonidae		
Rictaxis punctocaelatus		
Aglajidae		
Aglaja sp.		
Atyidae		
Haminoea vesicula		
Bullidae		
Bulla gouldiana		
Philinidae		
Woodbridgea sp.		
Retusidae		
Sulcoretusa sp.		
Volvulella panamica		
Scaphandridae		
Cylincha diegensis		
Cylichnella culcitella		
(= *Acteocina culcitella*)		
Cylichnella harpa		
(= *Acteocina harpa*)		
Cylichnella inculta		20
(= *Acteocina inculta*)		
NUDIBRANCHIA		
Nudibranchia, unid.		
Acanthodoris sp.		
Cuthona sp.		
(= *Trinchesia* sp.)		
PYRAMIDELLIDA		
Pyramidellidae		
Odostomia sp.		
Turbonilla sp.		
PROSOBRANCHIA		
MESOGASTROPODA		
Caecidae		
Caecum sp.		
Fartulum sp.		
Micranellium sp.		
Calypteridae		
Calyptraeidae, unid.		
Crepidula onyx		
Crepidula dorsata		
(= *Crepepatella lingulata*)		
Crepidula preforans		
Crepidula sp., juv.		
Lamellariidae		
Marseniopsis sharonae		
(= *Lamellaria sharonae*)		
Naticidae		
Neverita recluziana		
Sinum sp.		
Vitrinellidae		
Vitrinella oldroydi		

GASTROPODA, cont'd. Station MDR 3	26 Apr	25 Oct
NEOGASTROPODA		
Columbellidae		
Alia carinata		
(= *Mitrella carinata*)		
Mitrella sp., juv.		
Muricidae		
Pteropurpura festiva		
Nassariidae		
Nassarius mendicus		
Nassarius perpinguis		
Nassarius sp.		
Olividae		
Olivella baetica		
Turridae		
Kurtziella plumbea		
PELECYPODA		
Pelecypoda, unid. juv.		
Cardiidae		
Laevicardium substriatum		150
Cooperellidae		
Cooperella subdiaphana		
Cultellidae		
Ensis myrae		
Siliqua lucida		
Donacidae		
Donax gouldii		
Erycinidae		
Lasaea subviridis		
Hiatellidae		
Hiatella arctica		
Kelliidae		
Kellia laperousi		
Leptonidae		
Platomgsia meroeum		
(= *Lepton meroeum*)		
Lucinidae		
Parvilucina approximata		20
Parvilucina tenuisculpta		
(= *Parvilucina* sp.)		
Lucina nuttalli		
Lyonsiidae		
Lyonsia californica		20
Mactridae		
Mactridae, juv.		
Mactra californica		
Mactra sp.		
Spisula catilliformis		
Spisula sp.		
Tresus nuttalli		
Montacutidae		
Mysella grippi		
Mysella pedroana		
Mysella sp.		

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PELECYPODA, cont'd.	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		80
Macoma sp., juv.		
Tellina carpenteri		
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		10
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

	Station MDR 3	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis			20
Euplectonema burgeri			
Micrura alaskensis		20	
Paranemertes sp. *A*			10
Tubulanua nothus		10	20
Tubulanus pellucidus			10
Tubulanus polymorphus		360	100
PHORONIDA			
Phoronis pallida			
Phoronis sp.			
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			
SIPUNCULIDA			
Sipunculida, unid.			

BENTHIC DATA STATION MDR 4

DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	40	50
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops	20	
Amphicteis scaphobranchiata	20	10
Melinna oculata	10	
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata		
Mediomastus acutus	30	20
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	1,640	3,600
Notomastus magnus	10	
Notomastus tenuis		10
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona	150	190
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.	40	60
Cossuridae		
Cossura candida	70	120
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd.	Station MDR 4	26 Apr	25 Oct
Dorvilleidae			
Dorvilleidae, unid.			
Ophryotrocha puerilis			
Protodorvillea gracilis			
Schistomeringos longicornis			
Eunicidae			
Marphysa disjuncta			
Marphysa belli oculata			
Flabelligeridae			
Flabelligeridae, unid.			
Pherusa capulata			
Pherusa sp., juv.			
Glyceridae			
Glycera americana		10	10
Glycera capitata			
Glycera convoluta			
Gylcera rouxii			
Glycera sp., juv.			
Goniadidae			
Goniadidae, unid. juv.			
Glycinde armigera			
Goniada brunnea			
Goniada littorea		10	
Goniada sp., juv.			
Hesionidae			
Hesionidae, unid.			
Gyptis brunnea			
Micropodarke dubia			
Ophiodromus pugettensis			
Podarkeopsis glabra (= *Gyptis brevipalpa*)			
Lumbrineridae			
Lumbrineridae, unid.			
Lumbrineris ? crassidentata			
Lumbrineris erecta			
Lumbrineris lagunae		680	780
Lumbrineris limocola			10
Lumbrineris ? tetraura			
Lumbrineris spp.			
Magelonidae			
Magelona pacifica			
Magelona pitelkai			
Magelona sacculata			
Maldanidae			
Maldanidae, unid.			
Asychis disparidentata			
Asychis sp.			
Axiothella sp.			
Praxillella affinis pacifica		10	
Praxillella sp.			
Nephtyidae			
Nephtyidae, unid. juv.			
Nephtys caecoides		60	10

POLYCHAETA, Nephtyidae cont'd. Station MDR 4	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	100	10
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? Perinereis monterea		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		20
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus	680	660
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		10
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*; = *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 4	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		10
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		200
Lepidonotus ? squamatus		
Tenonia priops (= *Harmothoe priops*)	10	
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius	10	
Euchone incolor		
Euchone limnicola	1,560	1,820
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans (= *Hydroides pacifica*)		
Hydroides gracilis (= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd.		
Spionidae, unid.		
Apoprionospio pygmaea	30	10
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*;		
= *Nerinides maculata*)		
Minuspio cirrifera	10	150
(= *Prionospio cirrifera*)		
Paraprionospio pinnata		10
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni	20	
Polydora socialis		
Polydora sp.		
Prionospio heterobranchia	70	720
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*";		
= *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	8,040	110
Rynchospio arenicola	10	
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	30	250
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis	40	20
Streblospio benedicti		10
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*	100	
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd.		
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? Syllis sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis	20	40
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		
Clausidium vancouverense		
HARPACTICOIDA		
Harpacticocoida, unid.		10
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra	1,120	140
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum		
Ericthonis brasiliensis		
Listriella goleta		
Monoculoides sp.		50
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus		
Rudilemboides stenopropodus		40
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica	20	20
DECAPODA		
Decapoda--larval		
Anomura		

CRUSTACEA, cont'd. Station MDR 4	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		20
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis	40	180
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		10
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.		
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.	250	
Cylindroleberis sp.		
Euphilomedes carcharodonta		

Station MDR 4

CRUSTACEA, OSTRACODA cont'd.	26 Apr	25 Oct
Philomedes sp.		
Rudiderma rostrata		
Scleroconcha sp.		
CIRRIPEDIA		
Balanus (Balanus) pacificus		
Balanus trigonus		
Balanus sp.		
Megabalanus tintinnabulum californicus (= *Balanus*)		
INSECTA		
Chironomidae, larvae		
Paraclunio alaskensis, larvae		
PYCNOGONIDA		
Anoplodactylus erectus		
Callipallene californiensis		10
Pallenidae, unid.		
Tantystylum intermedium		
ASCHELMINTHES		
Nematoda, unid.		
BRACHIOPODA		
Glottidia albida		
BRYOZOA (= ECTOPROCTA)		
Bowerkankia gracilis		
Bugula neritina		
Celleporaria brunnea		
Cryptosula pallasiana		
Schizoporella unicornis		
Watersipora arcuata		
Zoobotryon verticillatum		
CHORDATA		
CEPHALOCHORDATA		
Branchiostoma californiense		
UROCHORDATA		
ASCIDACEA		
Ascidacea, unid.		
Botryllus sp.		
Ciona intestinalis		
Mogula pugetiensis		
Styela clava		
Styela plicata		
VERTEBRATA		
OSTEICHTHYS		
Gobiesocidae		
Gobiesox rhessodon		
Gobiidae		
Gobiidae, unid.		

VERTEBRATA, Gobiidae cont'd.	Station MDR 4	26 Apr	25 Oct
Gobiidae, larvae			
Clevelandia ios			
Ilypnus gilberti			
Lepidogobius lepidus			
CNIDARIA (= COELENTERATA)			
ANTHOZOA			
Anthozoa, unid.		10	
ACTINARIA			
Actinaria, unid.			
Diadumenidae			
Diadumene sp.			
Edwardsiidae			
Edwardsiidae, unid.			
Edwardsia californica			
Edwardsia sp.			
Edwardsia sp., juv.			
Halocliviidae			
Mesacmaea sp. *A*			
PENNATULACEA			
Stylatula elongata			
Acanthoptilum gracile			
CERIANTHARIA			
Ceriantharia, unid.			
HYDROZOA			
HYDROIDA			
Aglaophenia diversidentata			
Aglaophenia nr.*pluma*			
Aglaophenia sp.			
Corymorpha aurata (= *Euphysa* sp. *A*)		250	
Obelia sp.			present
ECHINODERMATA			
ECHINOIDEA			
Echinoidea, unid. juv.			
Strongylocentrotus purpuratus			
HOLOTHUROIDEA			
Holothuroidea, unid.			
OPHIUROIDEA			
Ophiuroidea, unid. juv.			
ECHIURA			
Listriolobus pelodes			
Urechis caupo			
HEMICHORDATA			
Enteropneusta, unid.			
MOLLUSCA			
GASTROPODA			
Gastropoda, unid. juv.			
OPHISTHOBRANCHIA			

GASTROPODA, cont'd.	Station MDR 4	26 Apr	25 Oct
CEPHALASPIDEA			
Cephalaspidea, unid.			
Acteonidae			
Rictaxis punctocaelatus			
Aglajidae			
Aglaja sp.			
Atyidae			
Haminoea vesicula			
Bullidae			
Bulla gouldiana			
Philinidae			
Woodbridgea sp.			
Retusidae			
Sulcoretusa sp.			
Volvulella panamica			
Scaphandridae			
Cylincha diegensis			
Cylichnella culcitella (= *Acteocina culcitella*)			
Cylichnella harpa (= *Acteocina harpa*)			
Cylichnella inculta (= *Acteocina inculta*)			
NUDIBRANCHIA			
Nudibranchia, unid.			
Acanthodoris sp.			
Cuthona sp. (= *Trinchesia* sp.)			
PYRAMIDELLIDA			
Pyramidellidae			
Odostomia sp.			
Turbonilla sp.			
PROSOBRANCHIA			
MESOGASTROPODA			
Caecidae			
Caecum sp.			
Fartulum sp.			
Micranellium sp.			
Calypteridae			
Calyptraeidae, unid.			
Crepidula onyx			
Crepidula dorsata (= *Crepepatella lingulata*)			
Crepidula preforans			
Crepidula sp., juv.			
Lamellariidae			
Marseniopsis sharonae (= *Lamellaria sharonae*)			
Naticidae			
Neverita recluziana			
Sinum sp.			
Vitrinellidae			
Vitrinella oldroydi			

NEOGASTROPODA
Columbellidae
Alia carinata
(= *Mitrella carinata*)
Mitrella sp., juv.
Muricidae
Pteropurpura festiva
Nassariidae
Nassarius mendicus
Nassarius perpinguis
Nassarius sp.
Olividae
Olivella baetica
Turridae
Kurtziella plumbea
PELECYPODA
Pelecypoda, unid. juv.
Cardiidae
Laevicardium substriatum
Cooperellidae
Cooperella subdiaphana
Cultellidae
Ensis myrae
Siliqua lucida
Donacidae
Donax gouldii
Erycinidae
Lasaea subviridis
Hiatellidae
Hiatella arctica
Kelliidae
Kellia laperousi
Leptonidae
Platomgsia meroeum
(= *Lepton meroeum*)
Lucinidae
Parvilucina approximata
Parvilucina tenuisculpta
(= *Parvilucina* sp.)
Lucina nuttalli
Lyonsiidae
Lyonsia californica
Mactridae
Mactridae, juv.
Mactra californica
Mactra sp.
Spisula catilliformis
Spisula sp.
Tresus nuttalli
Montacutidae
Mysella grippi
Mysella pedroana
Mysella sp.

PELECYPODA, cont'd.	Station MDR 4	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)			
Myidae			
Cryptomya californica			
Mytilidae			
Mytilidae, juv.			
Amygdalum sp.			
Modiolus sp.			
Musculus senhousei			
Mytilus edulis			
Nuculanidae			
Nuculana sp.			
Ostreidae			
Ostrea lurida			
Pectinidae			
Leptopecten latiauratus			
Petricolidae			
Petricola tellimyalis			
Petricola sp.			
Semelidae			
Cumingia californica			
Theora lubrica			
Solecurtidae			
Tagelus subteres			10
Solenidae			
Solen rosaceus			
Solen sicarius			
Solen sp. juv.			
Tellinidae			
Leporimetis obesa			
Macoma acolasta			
Macoma carlottensis			
Macoma nasuta			
Macoma yoldiformis			120
Macoma sp., juv.			
Tellina carpenteri			
Tellina modesta			
Tellina sp., juv.			
Thraciidae			
Thracia curta			
Thyasiridae			
Axinopsida serricata			
Thyasira flexuosa			
Veneridae			
Chione ? undatella			
Chione sp., juv.			
Compsomyax subdiaphana			
Protothaca staminea			
Protothaca sp., juv.			
Saxidomus nuttalli			
Saxidomus sp., juv.			
POLYPLACOPHORA			
Polyplacophora, unid.			

	Station MDR 4	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis		20	
Euplectonema burgeri		10	
Micrura alaskensis			
Paranemertes sp. *A*			
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus		180	
PHORONIDA			
Phoronis pallida			
Phoronis sp.			
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.		10	
SIPUNCULIDA			
Sipunculida, unid.			

BENTHIC DATA STATION MDR 5

DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	10	10
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata		
Mediomastus acutus		
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	1,930	2,200
Notomastus magnus		
Notomastus tenuis		
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona	520	350
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		120
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.	80	180
Cossuridae		
Cossura candida	60	20
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 5	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis		
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.	10	
Glyceridae		
Glycera americana		
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.	10	
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)	30	10
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta		20
Lumbrineris lagunae	180	80
Lumbrineris limicola		
Lumbrineris ? tetraura		
Lumbrineris spp.	10	
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		10
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides	30	

POLYCHAETA, Nephtyidae cont'd. Station MDR 5	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	170	
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? *Perinereis monterea*		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus	10	
Orbiniidae		
Leitoscoloplos elongatus	1,340	380
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracilis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? *myriacyclum*		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 5	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? Genetyllis castanea		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops		
(= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	3,370	1,350
Megalomma pigmentum		
Myxicola ? infundibulum		
? Potamilla sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans		10
(= *Hydroides pacifica*)		
Hydroides gracilis		
(= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd. Station MDR 5	26 Apr	25 Oct
Spionidae, unid.		
Apoprionospio pygmaea		
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		30
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*;		
= *Nerinides maculata*)		
Minuspio cirrifera	50	20
(= *Prionospio cirrifera*)		
Paraprionospio pinnata	20	10
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni	370	80
Polydora socialis		
Polydora sp.		
Prionospio heterobranchia	110	240
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*";		
= *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	18,010	1,740
Rynchospio arenicola		10
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	90	110
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis	30	40
Streblospio benedicti	10	
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*	690	110
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd.	Station MDR 5	26 Apr	25 Oct
Sphaerosyllis californiensis			
Sphaerosyllis sp.			
? Syllis sp.			
Typosyllis ? hyalina			
Typosyllis sp.			
Terebellidae			
Terebellidae, unid.			
Amaeana occidentalis		20	
Pista fasciata			
Pista ? disjuncta			
Pista sp., juv.			
Streblosoma crassibranchia			
ARTHROPODA			
CRUSTACEA			
COPEPODA			
CALANOIDA			
Calanoida, unid.			
CYCLOPOIDEA			
Cyclopoidea, unid.			
Clausidium vancouverense			
HARPACTICOIDA			
Harpacticoida, unid.			
MALACOSTRACA			
AMPHIPODA			
CAPRELLIDEA			
Caprellidea, unid.			
Caprella californica			
Caprella equilibra		170	430
GAMMARIDEA			
Gammaridea, unid.			
Amphideutopus oculatus			
Ampelisca cristata			
Argissa hamatipes			
Corophium acherusicum			
Ericthonis brasiliensis			
Listriella goleta			
Monoculoides sp.			10
Parapleustes pugettensis			
Photis sp.			
Podocerus cristatus			10
Rudilemboides stenopropodus			
Westwoodilla caecula			
CUMACEA			
Cumacea, unid.			
Campylaspis sp.			
Cyclaspis sp.			
Diastylis sp.			
Diastylopsis tenuis			
Oxyurostylus pacifica			
DECAPODA			
Decapoda--larval			
Anomura			

CRUSTACEA, cont'd. Station MDR 5	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis	20	30
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	30	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.	130	
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd.	Station 5	26 Apr	25 Oct
Philomedes sp.			
Rudiderma rostrata			
Scleroconcha sp.			
CIRRIPEDIA			
Balanus (Balanus) pacificus			
Balanus trigonus			
Balanus sp.			
Megabalanus tintinnabulum californicus (= *Balanus*)			
INSECTA			
Chironomidae, larvae			
Paraclunio alaskensis, larvae			
PYCNOGONIDA			
Anoplodactylus erectus			
Callipallene californiensis			
Pallenidae, unid.			
Tantystylum intermedium			
ASCHELMINTHES			
Nematoda, unid.			
BRACHIOPODA			
Glottidia albida			
BRYOZOA (= ECTOPROCTA)			
Bowerkankia gracilis			
Bugula neritina			
Celleporaria brunnea			
Cryptosula pallasiana			
Schizoporella unicornis			
Watersipora arcuata			
Zoobotryon verticillatum			
CHORDATA			
CEPHALOCHORDATA			
Branchiostoma californiense			
UROCHORDATA			
ASCIDACEA			
Ascidacea, unid.			
Botryllus sp.			
Ciona intestinalis			
Mogula pugetiensis			
Styela clava			
Styela plicata			
VERTEBRATA			
OSTEICHTHYS			
Gobiesocidae			
Gobiesox rhessodon			
Gobiidae			
Gobiidae, unid.			

VERTEBRATA, Gobiidae cont'd. Station MDR 5	26 Apr	25 Oct
Gobiidae, larvae		
Clevelandia ios		
Ilypnus gilberti		
Lepidogobius lepidus		
CNIDARIA (= COELENTERATA)		
ANTHOZOA		
Anthozoa, unid.		
ACTINARIA		
Actinaria, unid.		
Diadumenidae		
Diadumene sp.		
Edwardsiidae		
Edwardsiidae, unid.		
Edwardsia californica		
Edwardsia sp.		
Edwardsia sp., juv.		
Haloclividae		
Mesacmaea sp. *A*		
PENNATULACEA		
Stylatula elongata		
Acanthoptilum gracile		
CERIANTHARIA		
Ceriantharia, unid.		
HYDROZOA		
HYDROIDA		
Aglaophenia diversidentata		
Aglaophenia nr. *pluma*		
Aglaophenia sp.		
Corymorpha aurata (= *Euphysa* sp. *A*)	10	
Obelia sp.		present
ECHINODERMATA		
ECHINOIDEA		
Echinoidea, unid. juv.		
Strongylocentrotus purpuratus		
HOLOTHUROIDEA		
Holothuroidea, unid.		20
OPHIUROIDEA		
Ophiuroidea, unid. juv.		
ECHIURA		
Listriolobus pelodes		
Urechis caupo		
HEMICHORDATA		
Enteropneusta, unid.		
MOLLUSCA		
GASTROPODA		
Gastropoda, unid. juv.		
OPHISTHOBRANCHIA		

GASTROPODA, cont'd. Station MDR 5	26 Apr	25 Oct
CEPHALASPIDEA		
Cephalaspidea, unid.		
Acteonidae		
Rictaxis punctocaelatus		
Aglajidae		
Aglaja sp.		
Atyidae		
Haminoea vesicula		
Bullidae		
Bulla gouldiana		
Philinidae		
Woodbridgea sp.		
Retusidae		
Sulcoretusa sp.		
Volvulella panamica		
Scaphandridae		
Cylincha diegensis		
Cylichnella culcitella (= *Acteocina culcitella*)		
Cylichnella harpa (= *Acteocina harpa*)		
Cylichnella inculta (= *Acteocina inculta*)		40
NUDIBRANCHIA		
Nudibranchia, unid.		
Acanthodoris sp.		
Cuthona sp. (= *Trinchesia* sp.)		
PYRAMIDELLIDA		
Pyramidellidae		
Odostomia sp.		
Turbonilla sp.		
PROSOBRANCHIA		
MESOGASTROPODA		
Caecidae		
Caecum sp.		
Fartulum sp.		
Micranellium sp.		
Calypteridae		
Calyptraeidae, unid.		
Crepidula onyx		
Crepidula dorsata (= *Crepepatella lingulata*)		
Crepidula preforans		
Crepidula sp., juv.		
Lamellariidae		
Marseniopsis sharonae (= *Lamellaria sharonae*)		
Naticidae		
Neverita recluziana		
Sinum sp.		
Vitrinellidae		
Vitrinella oldroydi		

GASTROPODA, cont'd. Station MDR 5	26 Apr	25 Oct
NEOGASTROPODA		
Columbellidae		
Alia carinata		
(= *Mitrella carinata*)		
Mitrella sp., juv.		
Muricidae		
Pteropurpura festiva		
Nassariidae		
Nassarius mendicus		
Nassarius perpinguis		
Nassarius sp.		
Olividae		
Olivella baetica		
Turridae		
Kurtziella plumbea		
PELECYPODA		
Pelecypoda, unid. juv.		
Cardiidae		
Laevicardium substriatum		
Cooperellidae		
Cooperella subdiaphana		
Cultellidae		
Ensis myrae		
Siliqua lucida		
Donacidae		
Donax gouldii		
Erycinidae		
Lasaea subviridis		
Hiatellidae		
Hiatella arctica		
Kelliidae		
Kellia laperousi		
Leptonidae		
Platomgsia meroeum		
(= *Lepton meroeum*)		
Lucinidae		
Parvilucina approximata		20
Parvilucina tenuisculpta		
(= *Parvilucina* sp.)		
Lucina nuttalli		
Lyonsiidae		
Lyonsia californica		
Mactridae		
Mactridae, juv.		
Mactra californica		
Mactra sp.		
Spisula catilliformis		
Spisula sp.		
Tresus nuttalli		
Montacutidae		
Mysella grippi		
Mysella pedroana		
Mysella sp.		

PELECYPODA, Montacutidae cont'd. Station MDR 5	26 Apr	25 Oct
Neaeromga sp.		
(= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		10
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		10
Solenidae		
Solen rosaceus		10
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		50
Macoma sp., juv.		
Tellina carpenteri		
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		10
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

SCAPHOPODA	Station MDR 5	26 Apr	25 Oct
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.		10	
Cerebratulus californiensis		20	
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*		20	
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus			10
PHORONIDA			
Phoronis pallida			
Phoronis sp.			
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			10
SIPUNCULIDA			
Sipunculida, unid.			

BENTHIC DATA	STATION MDR 6	
DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.		
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata		100
Mediomastus acutus		
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	340	530
Notomastus magnus		
Notomastus tenuis		
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona	90	300
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		430
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.	10	80
Cossuridae		
Cossura candida		
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 6	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis	10	40
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.		
Glyceridae		
Glycera americana	10	
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta	30	
Lumbrineris lagunae	150	110
Lumbrineris limicola		
Lumbrineris ? tetraura		20
Lumbrineris spp.		
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides		

POLYCHAETA, Nephtyidae cont'd. Station MDR 6	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	20	
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata (= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? *Perinereis monterea*		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans (= *Nothria elegans*)		
Onuphis iridescens (= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus (= *Haploscoloplos elongatus*)	280	680
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae (= *Acesta catherinae*)		
Acmira horikoshii (= *Acesta horikoshii*)		
Levinsenia oculata (= *Tauberia oculata*; = *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia (= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis (= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata (= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 6	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops		
(= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	430	4,090
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans		10
(= *Hydroides pacifica*)		
Hydroides gracilis		
(= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd. Station MDR 6	26 Apr	25 Oct
Spionidae, unid.		
Apoprionospio pygmaea		
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		20
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*;		
= *Nerinides maculata*)		
Minuspio cirrifera	20	10
(= *Prionospio cirrifera*)		
Paraprionospio pinnata	10	
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni	120	170
Polydora socialis		
Polydora sp.		
Prionospio heterobranchia	40	40
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*";		
= *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	760	1,660
Rynchospio arenicola	30	
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	140	20
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis		
Streblospio benedicti		30
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*		
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd.	Station MDR 6	26 Apr	25 Oct
Sphaerosyllis californiensis			
Sphaerosyllis sp.			
? Syllis sp.			
Typosyllis ? hyalina			
Typosyllis sp.			
Terebellidae			
Terebellidae, unid.			
Amaeana occidentalis			
Pista fasciata			
Pista ? disjuncta			
Pista sp., juv.			
Streblosoma crassibranchia			
ARTHROPODA			
CRUSTACEA			
COPEPODA			
CALANOIDA			
Calanoida, unid.			
CYCLOPOIDEA			
Cyclopoidea, unid.			
Clausidium vancouverense			
HARPACTICOIDA			
Harpactiocoida, unid.		10	
MALACOSTRACA			
AMPHIPODA			
CAPRELLIDEA			
Caprellidea, unid.		10	300
Caprella californica			
Caprella equilibra			
GAMMARIDEA			
Gammaridea, unid.			
Amphideutopus oculatus			
Ampelisca cristata			
Argissa hamatipes			
Corophium acherusicum			
Ericthonis brasiliensis			
Listriella goleta			
Monoculoides sp.			
Parapleustes pugettensis			
Photis sp.			
Podocerus cristatus			
Rudilemboides stenopropodus			
Westwoodilla caecula			
CUMACEA			
Cumacea, unid.			
Campylaspis sp.			
Cyclaspis sp.			
Diastylis sp.			
Diastylopsis tenuis			
Oxyurostylus pacifica		20	
DECAPODA			
Decapoda--larval			
Anomura			

Station MDR 6

CRUSTACEA, cont'd.	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		10
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.		
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

Philomedes sp.
Rudiderma rostrata
Scleroconcha sp.

CIRRIPEDIA
Balanus (Balanus) pacificus
Balanus trigonus
Balanus sp.
Megabalanus tintinnabulum californicus (= *Balanus*)

INSECTA
Chironomidae, larvae
Paraclunio alaskensis, larvae

PYCNOGONIDA
Anoplodactylus erectus
Callipallene californiensis
Pallenidae, unid.
Tantystylum intermedium

ASCHELMINTHES
Nematoda, unid.

BRACHIOPODA
Glottidia albida

BRYOZOA (= ECTOPROCTA)
Bowerkankia gracilis
Bugula neritina
Celleporaria brunnea
Cryptosula pallasiana
Schizoporella unicornis
Watersipora arcuata
Zoobotryon verticillatum

CHORDATA
CEPHALOCHORDATA
Branchiostoma californiense

UROCHORDATA
ASCIDACEA
Ascidacea, unid.
Botryllus sp.
Ciona intestinalis
Mogula pugetiensis
Styela clava
Styela plicata

VERTEBRATA
OSTEICHTHYS
Gobiesocidae
Gobiesox rhessodon
Gobiidae
Gobiidae, unid.

GASTROPODA, cont'd. Station MDR 6	26 Apr	25 Oct
CEPHALASPIDEA		
Cephalaspidea, unid.		
Acteonidae		
Rictaxis punctocaelatus		
Aglajidae		
Aglaja sp.		
Atyidae		
Haminoea vesicula		
Bullidae		
Bulla gouldiana		
Philinidae		
Woodbridgea sp.		
Retusidae		
Sulcoretusa sp.		
Volvulella panamica		
Scaphandridae		
Cylincha diegensis		
Cylichnella culcitella (= *Acteocina culcitella*)		
Cylichnella harpa (= *Acteocina harpa*)		
Cylichnella inculta (= *Acteocina inculta*)		60
NUDIBRANCHIA		
Nudibranchia, unid.		
Acanthodoris sp.		
Cuthona sp. (= *Trinchesia* sp.)		
PYRAMIDELLIDA		
Pyramidellidae		
Odostomia sp.		
Turbonilla sp.		
PROSOBRANCHIA		
MESOGASTROPODA		
Caecidae		
Caecum sp.		
Fartulum sp.		
Micranellium sp.		
Calypteridae		
Calyptraeidae, unid.		
Crepidula onyx		
Crepidula dorsata (= *Crepepatella lingulata*)		
Crepidula preforans		
Crepidula sp., juv.		
Lamellariidae		
Marseniopsis sharonae (= *Lamellaria sharonae*)		
Naticidae		
Neverita recluziana		
Sinum sp.		
Vitrinellidae		
Vitrinella oldroydi		

VERTEBRATA, Gobiidae cont'd.	Station MDR 6	26 Apr	25 Oct

Gobiidae, larvae
Clevelandia ios
Ilypnus gilberti
Lepidogobius lepidus

CNIDARIA (= COELENTERATA)
ANTHOZOA
Anthozoa, unid.
ACTINARIA
Actinaria, unid.
Diadumenidae
Diadumene sp.
Edwardsiidae
Edwardsiidae, unid.
Edwardsia californica
Edwardsia sp.
Edwardsia sp., juv.
Halocliviidae
Mesacmaea sp. *A*
PENNATULACEA
Stylatula elongata
Acanthoptilum gracile
CERIANTHARIA
Ceriantharia, unid.
HYDROZOA
HYDROIDA
Aglaophenia diversidentata
Aglaophenia nr.*pluma*
Aglaophenia sp.
Corymorpha aurata
(= *Euphysa* sp. *A*)
Obelia sp.

ECHINODERMATA
ECHINOIDEA
Echinoidea, unid. juv.
Strongylocentrotus purpuratus
HOLOTHUROIDEA
Holothuroidea, unid.
OPHIUROIDEA
Ophiuroidea, unid. juv.

ECHIURA
Listriolobus pelodes
Urechis caupo

HEMICHORDATA
Enteropneusta, unid.

MOLLUSCA
GASTROPODA
Gastropoda, unid. juv.
OPHISTHOBRANCHIA

GASTROPODA, cont'd. Station MDR 6 26 Apr 25 Oct

NEOGASTROPODA
Columbellidae
Alia carinata
(= *Mitrella carinata*)
Mitrella sp., juv.
Muricidae
Pteropurpura festiva
Nassariidae
Nassarius mendicus
Nassarius perpinguis
Nassarius sp.
Olividae
Olivella baetica
Turridae
Kurtziella plumbea

PELECYPODA
Pelecypoda, unid. juv.
Cardiidae
Laevicardium substriatum
Cooperellidae
Cooperella subdiaphana
Cultellidae
Ensis myrae
Siliqua lucida
Donacidae
Donax gouldii
Erycinidae
Lasaea subviridis
Hiatellidae
Hiatella arctica
Kelliidae
Kellia laperousi
Leptonidae
Platomgsia meroeum
(= *Lepton meroeum*)
Lucinidae
Parvilucina approximata
Parvilucina tenuisculpta
(= *Parvilucina* sp.)
Lucina nuttalli
Lyonsiidae
Lyonsia californica
Mactridae
Mactridae, juv.
Mactra californica
Mactra sp.
Spisula catilliformis
Spisula sp.
Tresus nuttalli
Montacutidae
Mysella grippi
Mysella pedroana
Mysella sp.

PELECYPODA, Montacutidae cont'd. Station MDR 6	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		560
Macoma sp., juv.		
Tellina carpenteri		
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		20
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

	Station MDR 6	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis			
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*			
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus			
PHORONIDA			
Phoronis pallida			
Phoronis sp.			
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			
SIPUNCULIDA			
Sipunculida, unid.			

BENTHIC DATA STATION MDR 7

DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	20	20
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata		
Mediomastus acutus		10
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	670	460
Notomastus magnus		
Notomastus tenuis		30
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona	20	60
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		10
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.	4,110	3,770
Cossuridae		
Cossura candida	20	10
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 7	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis	10	
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.		
Glyceridae		
Glycera americana	10	
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		20
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta		
Lumbrineris lagunae	470	170
Lumbrineris limicola		
Lumbrineris ? tetraura		
Lumbrineris spp.		
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides	20	20

POLYCHAETA, Nephtyidae cont'd. Station MDR 7	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	20	
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata (= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? *Perinereis monterea*		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans (= *Nothria elegans*)		
Onuphis iridescens (= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus (= *Haploscoloplos elongatus*)	460	560
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae (= *Acesta catherinae*)		
Acmira horikoshii (= *Acesta horikoshii*)		
Levinsenia oculata (= *Tauberia oculata*; = *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia (= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis (= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata (= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 7	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		10
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops	10	
(= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	1,750	1,890
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans		140
(= *Hydroides pacifica*)		
Hydroides gracilis		
(= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd.	Station MDR 7	26 Apr	25 Oct
Spionidae, unid.			
Apoprionospio pygmaea			
(= *Prionospio pygmaeus*)			
Boccardia sp.			
Boccardia basilaria			
Boccardiella hamata			10
(= *Boccardia hamata*)			
Caraziella calafia			
(= "*Pseudopolydora* sp.")			
Laonice cirrata			
Microspio pigmentata			
Microspio maculata			
(= *Spio maculata*;			
= *Nerinides maculata*)			
Minuspio cirrifera		10	20
(= *Prionospio cirrifera*)			
Paraprionospio pinnata		10	20
Polydora bioccipitalis			
Polydora caulleryi			
(= *P. brachycephala*)			
Polydora ligni		400	190
Polydora socialis			
Polydora sp.			
Prionospio heterobranchia		140	110
(= *P. h. newportensis*)			
Prionospio sp. *A*			
(= *Prionospio* "*steenstrupi*";			
= *P.* nr. *malmgreni*)			
Prionospio sp.			
Pseudopolydora paucibranchiata		10,960	4,270
Rynchospio arenicola		120	30
Rhynchospio sp.			
Scolelepis acuta			
(= *Nerinides acuta*)			
Scolelepis sp. *A*		130	110
Spio ? filicornis			
Spiophanes berkeleyorum			
Spiophanes bombyx			
Spiophanes missionensis		10	10
Streblospio benedicti			
Spirorbidae			
Janua brasiliensis			
Pileolaria pseudomilitaris			
Syllidae			
Syllidae, unid.			
Autolytus sp.			10
Brania sp.			
Exogone gemmifera			
Exogone lourei			
Exogone verugera			
Exogone sp. *A*		350	240
Exogone sp.			
Odontosyllis phosphorea			

POLYCHAETA, Syllidae cont'd. Station MDR 7	26 Apr	25 Oct
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? Syllis sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis		
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		
Clausidium vancouverense		
HARPACTICOIDA		
Harpacticoida, unid.		
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra	70	10
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum	300	
Ericthonis brasiliensis		
Listriella goleta		
Monoculoides sp.		
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus		
Rudilemboides stenopropodus		
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica	10	
DECAPODA		
Decapoda--larval		
Anomura		

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CRUSTACEA, cont'd.	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	270	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd. Station MDR 7	26 Apr	25 Oct
Philomedes sp.		
Rudiderma rostrata		
Scleroconcha sp.		
CIRRIPEDIA		
Balanus (*Balanus*) *pacificus*		
Balanus trigonus		
Balanus sp.		
Megabalanus tintinnabulum californicus (= *Balanus*)		
INSECTA		
Chironomidae, larvae		
Paraclunio alaskensis, larvae		
PYCNOGONIDA		
Anoplodactylus erectus		
Callipallene californiensis		
Pallenidae, unid.		
Tantystylum intermedium		
ASCHELMINTHES		
Nematoda, unid.		
BRACHIOPODA		
Glottidia albida		
BRYOZOA (No. of colonies)		
Bowerkankia gracilis		
Bugula neritina		
Celleporaria brunnea		
Cryptosula pallasiana		
Schizoporella unicornis		
Watersipora arcuata		1
Zoobotryon verticillatum		
CHORDATA		
CEPHALOCHORDATA		
Branchiostoma californiense		
UROCHORDATA		
ASCIDACEA		
Ascidacea, unid.		
Botryllus sp.		
Ciona intestinalis		
Mogula pugetiensis		
Styela clava		
Styela plicata		
VERTEBRATA		
OSTEICHTHYS		
Gobiesocidae		
Gobiesox rhessodon		
Gobiidae		
Gobiidae, unid.		

Gobiidae, larvae
Clevelandia ios
Ilypnus gilberti
Lepidogobius lepidus

CNIDARIA (= COELENTERATA)
ANTHOZOA
Anthozoa, unid.
ACTINARIA
Actinaria, unid.
Diadumenidae
Diadumene sp.
Edwardsiidae
Edwardsiidae, unid.
Edwardsia californica
Edwardsia sp.
Edwardsia sp., juv.
Haloclividae
Mesacmaea sp. *A*
PENNATULACEA
Stylatula elongata
Acanthoptilum gracile
CERIANTHARIA
Ceriantharia, unid.
HYDROZOA
HYDROIDA
Aglaophenia diversidentata
Aglaophenia nr.*pluma*
Aglaophenia sp.
Corymorpha aurata
(= *Euphysa* sp. *A*)
Obelia sp.

ECHINODERMATA
ECHINOIDEA
Echinoidea, unid. juv.
Strongylocentrotus purpuratus
HOLOTHUROIDEA
Holothuroidea, unid.
OPHIUROIDEA
Ophiuroidea, unid. juv.

ECHIURA
Listriolobus pelodes
Urechis caupo

HEMICHORDATA
Enteropneusta, unid.

MOLLUSCA
GASTROPODA
Gastropoda, unid. juv.
OPHISTHOBRANCHIA

GASTROPODA, cont'd.	Station MDR 7	26 Apr	25 Oct
CEPHALASPIDEA			
Cephalaspidea, unid.			
Acteonidae			
Rictaxis punctocaelatus			
Aglajidae			
Aglaja sp.			
Atyidae			
Haminoea vesicula			
Bullidae			
Bulla gouldiana			
Philinidae			
Woodbridgea sp.			
Retusidae			
Sulcoretusa sp.			
Volvulella panamica			
Scaphandridae			
Cylincha diegensis			
Cylichnella culcitella (= *Acteocina culcitella*)			
Cylichnella harpa (= *Acteocina harpa*)			
Cylichnella inculta (= *Acteocina inculta*)			440
NUDIBRANCHIA			
Nudibranchia, unid.			
Acanthodoris sp.			
Cuthona sp. (= *Trinchesia* sp.)			
PYRAMIDELLIDA			
Pyramidellidae			
Odostomia sp.			
Turbonilla sp.			
PROSOBRANCHIA			
MESOGASTROPODA			
Caecidae			
Caecum sp.			
Fartulum sp.			
Micranellium sp.			
Calypteridae			
Calyptraeidae, unid.			
Crepidula onyx			
Crepidula dorsata (= *Crepepatella lingulata*)			
Crepidula preforans			
Crepidula sp., juv.			
Lamellariidae			
Marseniopsis sharonae (= *Lamellaria sharonae*)			
Naticidae			
Neverita recluziana			
Sinum sp.			
Vitrinellidae			
Vitrinella oldroydi			

GASTROPODA, cont'd. Station MDR 7	26 Apr	25 Oct
NEOGASTROPODA		
Columbellidae		
Alia carinata		
(= *Mitrella carinata*)		
Mitrella sp., juv.		
Muricidae		
Pteropurpura festiva		
Nassariidae		
Nassarius mendicus		
Nassarius perpinguis		
Nassarius sp.		
Olividae		
Olivella baetica		
Turridae		
Kurtziella plumbea		
PELECYPODA		
Pelecypoda, unid. juv.		
Cardiidae		
Laevicardium substriatum		
Cooperellidae		
Cooperella subdiaphana		
Cultellidae		
Ensis myrae		
Siliqua lucida		
Donacidae		
Donax gouldii		
Erycinidae		
Lasaea subviridis		
Hiatellidae		
Hiatella arctica		
Kelliidae		
Kellia laperousi		
Leptonidae		
Platomgsia meroeum		
(= *Lepton meroeum*)		
Lucinidae		
Parvilucina approximata		
Parvilucina tenuisculpta		
(= *Parvilucina* sp.)		
Lucina nuttalli		
Lyonsiidae		
Lyonsia californica		
Mactridae		
Mactridae, juv.		
Mactra californica		
Mactra sp.		
Spisula catilliformis		
Spisula sp.		
Tresus nuttalli		
Montacutidae		
Mysella grippi		
Mysella pedroana		
Mysella sp.		

PELECYPODA, Montacutidae cont'd. Station MDR 7	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		
Macoma sp., juv.		
Tellina carpenteri		
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

SCAPHOPODA	Station MDR 7	26 Apr	25 Oct
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis			10
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*			20
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus			10
PHORONIDA			
Phoronis pallida			
Phoronis sp.			
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			
SIPUNCULIDA			
Sipunculida, unid.			
ADDENDUM:			
UROCHORDATA			
ASCIDACEA			
Styela truncata			10

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DATE	26 Apr 1984	25 Oct 1984
ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	40	10
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata		970
Mediomastus acutus		
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	110	10
Notomastus magnus		
Notomastus tenuis		
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona		40
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha	380	10
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.		30
Cossuridae		
Cossura candida		
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd.	Station MDR 8	26 Apr	25 Oct
Dorvilleidae			
Dorvilleidae, unid.			
Ophryotrocha puerilis			
Protodorvillea gracilis			
Schistomeringos longicornis		20	10
Eunicidae			
Marphysa disjuncta			
Marphysa belli oculata			
Flabelligeridae			
Flabelligeridae, unid.			
Pherusa capulata			
Pherusa sp., juv.			
Glyceridae			
Glycera americana			
Glycera capitata			
Glycera convoluta			
Gylcera rouxii			
Glycera sp., juv.			
Goniadidae			
Goniadidae, unid. juv.			
Glycinde armigera			
Goniada brunnea			
Goniada littorea			
Goniada sp., juv.			
Hesionidae			
Hesionidae, unid.			
Gyptis brunnea			
Micropodarke dubia			
Ophiodromus pugettensis			
Podarkeopsis glabra (= *Gyptis brevipalpa*)			
Lumbrineridae			
Lumbrineridae, unid.			
Lumbrineris ? crassidentata			
Lumbrineris erecta		10	
Lumbrineris lagunae		30	10
Lumbrineris limicola			
Lumbrineris ? tetraura			
Lumbrineris spp.			
Magelonidae			
Magelona pacifica			
Magelona pitelkai			
Magelona sacculata			
Maldanidae			
Maldanidae, unid.			
Asychis disparidentata			
Asychis sp.			
Axiothella sp.			
Praxillella affinis pacifica			
Praxillella sp.			
Nephtyidae			
Nephtyidae, unid. juv.			
Nephtys caecoides			

POLYCHAETA, Nephtyidae cont'd. Station MDR 8	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana		
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? *Perinereis monterea*		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus	110	
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 8	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (*Anaitides*) *papillosa*		
Phyllodoce sp.		
Phyllodoce (*Anaitides*) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? *crassicirrata*		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? *squamatus*		
Tenonia priops (= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	360	40
Megalomma pigmentum		
Myxicola ? *infundibulum*		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans (= *Hydroides pacifica*)		
Hydroides gracilis (= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd. Station MDR 8	26 Apr	25 Oct
Spionidae, unid.		
Apoprionospio pygmaea		
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*;		
= *Nerinides maculata*)		
Minuspio cirrifera	60	
(= *Prionospio cirrifera*)		
Paraprionospio pinnata		
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni	110	860
Polydora socialis		
Polydora sp.		
Prionospio heterobranchia	20	
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*";		
= *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	720	1,020
Rynchospio arenicola		
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	60	10
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis		
Streblospio benedicti	40	10
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*		30
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd. Station MDR 8	26 Apr	25 Oct
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? *Syllis* sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis		
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		
Clausidium vancouverense		
HARPACTICOIDA		
Harpactiocoida, unid.		
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra	30	800
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum	10	
Ericthonis brasiliensis		
Listriella goleta		
Monoculoides sp.		
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus	10	
Rudilemboides stenopropodus		
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica		
DECAPODA		
Decapoda--larval		
Anomura		

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CRUSTACEA, cont'd.	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	80	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd. Station MDR 8 26 Apr 25 Oct

Philomedes sp.
Rudiderma rostrata
Scleroconcha sp.

CIRRIPEDIA

Balanus (Balanus) pacificus
Balanus trigonus
Balanus sp.
Megabalanus tintinnabulum californicus (= *Balanus*)

INSECTA

Chironomidae, larvae
Paraclunio alaskensis, larvae

PYCNOGONIDA

Anoplodactylus erectus
Callipallene californiensis
Pallenidae, unid.
Tantystylum intermedium

ASCHELMINTHES

Nematoda, unid.

BRACHIOPODA

Glottidia albida

BRYOZOA (= ECTOPROCTA)

Bowerkankia gracilis
Bugula neritina
Celleporaria brunnea
Cryptosula pallasiana
Schizoporella unicornis
Watersipora arcuata
Zoobotryon verticillatum

CHORDATA

CEPHALOCHORDATA

Branchiostoma californiense

UROCHORDATA

ASCIDACEA

Ascidacea, unid.
Botryllus sp.
Ciona intestinalis
Mogula pugetiensis
Styela clava
Styela plicata

VERTEBRATA

OSTEICHTHYS

Gobiesocidae

Gobiesox rhessodon

Gobiidae

Gobiidae, unid.

VERTEBRATA, Gobiidae cont'd.	Station MDR 8	26 Apr	25 Oct
Gobiidae, larvae			
Clevelandia ios			
Ilypnus gilberti			
Lepidogobius lepidus			
CNIDARIA (= COELENTERATA)			
ANTHOZOA			
Anthozoa, unid.			
ACTINARIA			
Actinaria, unid.			
Diadumenidae			
Diadumene sp.			
Edwardsiidae			
Edwardsiidae, unid.			
Edwardsia californica			
Edwardsia sp.			
Edwardsia sp., juv.			
Haloclividae			
Mesacmaea sp. *A*			
PENNATULACEA			
Stylatula elongata			
Acanthoptilum gracile			
CERIANTHARIA			
Ceriantharia, unid.			
HYDROZOA			
HYDROIDA			
Aglaophenia diversidentata			
Aglaophenia nr.*pluma*			
Aglaophenia sp.			
Corymorpha aurata (= *Euphysa* sp. *A*)			
Obelia sp.			
ECHINODERMATA			
ECHINOIDEA			
Echinoidea, unid. juv.			
Strongylocentrotus purpuratus			
HOLOTHUROIDEA			
Holothuroidea, unid.			170
OPHIUROIDEA			
Ophiuroidea, unid. juv.			
ECHIURA			
Listriolobus pelodes			
Urechis caupo			
HEMICHORDATA			
Enteropneusta, unid.			
MOLLUSCA			
GASTROPODA			
Gastropoda, unid. juv.			
OPHISTHOBRANCHIA			

GASTROPODA, cont'd.	Station MDR 8	26 Apr	25 Oct
CEPHALASPIDEA			
Cephalaspidea, unid.			
Acteonidae			
Rictaxis punctocaelatus			
Aglajidae			
Aglaja sp.			
Atyidae			
Haminoea vesicula			
Bullidae			
Bulla gouldiana			
Philinidae			
Woodbridgea sp.			
Retusidae			
Sulcoretusa sp.			
Volvulella panamica			
Scaphandridae			
Cylincha diegensis			
Cylichnella culcitella (= *Acteocina culcitella*)			
Cylichnella harpa (= *Acteocina harpa*)			
Cylichnella inculta (= *Acteocina inculta*)			
NUDIBRANCHIA			
Nudibranchia, unid.			
Acanthodoris sp.			
Cuthona sp. (= *Trinchesia* sp.)			
PYRAMIDELLIDA			
Pyramidellidae			
Odostomia sp.			
Turbonilla sp.			
PROSOBRANCHIA			
MESOGASTROPODA			
Caecidae			
Caecum sp.			
Fartulum sp.			
Micranellium sp.			
Calypteridae			
Calyptraeidae, unid.			
Crepidula onyx			
Crepidula dorsata (= *Crepepatella lingulata*)			
Crepidula preforans			
Crepidula sp., juv.			
Lamellariidae			
Marseniopsis sharonae (= *Lamellaria sharonae*)			
Naticidae			
Neverita recluziana			
Sinum sp.			
Vitrinellidae			
Vitrinella oldroydi			

GASTROPODA, cont'd. Station MDR 8	26 Apr	25 Oct
NEOGASTROPODA		
Columbellidae		
Alia carinata		
(= *Mitrella carinata*)		
Mitrella sp., juv.		
Muricidae		
Pteropurpura festiva		
Nassariidae		
Nassarius mendicus		
Nassarius perpinguis		
Nassarius sp.		
Olividae		
Olivella baetica		
Turridae		
Kurtziella plumbea		
PELECYPODA		
Pelecypoda, unid. juv.		
Cardiidae		
Laevicardium substriatum		
Cooperellidae		
Cooperella subdiaphana		
Cultellidae		
Ensis myrae		
Siliqua lucida		
Donacidae		
Donax gouldii		
Erycinidae		
Lasaea subviridis		
Hiatellidae		
Hiatella arctica		
Kelliidae		
Kellia laperousi		
Leptonidae		
Platomgsia meroeum		
(= *Lepton meroeum*)		
Lucinidae		
Parvilucina approximata		
Parvilucina tenuisculpta		
(= *Parvilucina* sp.)		
Lucina nuttalli		
Lyonsiidae		
Lyonsia californica		
Mactridae		
Mactridae, juv.		
Mactra californica		
Mactra sp.		
Spisula catilliformis		
Spisula sp.		
Tresus nuttalli		
Montacutidae		
Mysella grippi		
Mysella pedroana		
Mysella sp.		

PELECYPODA, Montacutidae cont'd. Station MDR 8	26 Apr	25 Oct
Neaeromga sp.		
(= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		10
Macoma sp., juv.		
Tellina carpenteri		
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

	Station MDR 8	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis			
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*			
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus			
PHORONIDA			
Phoronida, unid.			30
Phoronis pallida			
Phoronis sp.			20
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			
SIPUNCULIDA			
Sipunculida, unid.			

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ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	10	
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata		
Mediomastus acutus		
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	60	90
Notomastus magnus		
Notomastus tenuis		
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona		50
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		310
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.	10	
Cossuridae		
Cossura candida		
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 9	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis		
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		10
Pherusa sp., juv.		
Glyceridae		
Glycera americana		
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta	10	10
Lumbrineris lagunae	40	
Lumbrineris limicola		
Lumbrineris ? tetraura		
Lumbrineris spp.		
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides		

POLYCHAETA, Nephtyidae cont'd. Station MDR 9	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	10	
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? *Perinereis monterea*		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus	170	50
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 9	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops (= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		30
Euchone incolor		
Euchone limnicola	390	1,320
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans (= *Hydroides pacifica*)		60
Hydroides gracilis (= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd.	Station MDR 9	26 Apr	25 Oct
Spionidae, unid.			
Apoprionospio pygmaea			
(= *Prionospio pygmaeus*)			
Boccardia sp.			
Boccardia basilaria			
Boccardiella hamata			
(= *Boccardia hamata*)			
Caraziella calafia			
(= "*Pseudopolydora* sp.")			
Laonice cirrata			
Microspio pigmentata			
Microspio maculata			
(= *Spio maculata*;			
= *Nerinides maculata*)			
Minuspio cirrifera		20	20
(= *Prionospio cirrifera*)			
Paraprionospio pinnata			
Polydora bioccipitalis			
Polydora caulleryi			
(= *P. brachycephala*)			
Polydora ligni		20	110
Polydora socialis			
Polydora sp.			
Prionospio heterobranchia			10
(= *P. h. newportensis*)			
Prionospio sp. *A*			
(= *Prionospio* "*steenstrupi*";			
= *P.* nr. *malmgreni*)			
Prionospio sp.			
Pseudopolydora paucibranchiata		1,700	160
Rynchospio arenicola			
Rhynchospio sp.			
Scolelepis acuta			
(= *Nerinides acuta*)			
Scolelepis sp. *A*		10	20
Spio ? filicornis			
Spiophanes berkeleyorum			
Spiophanes bombyx			
Spiophanes missionensis			
Streblospio benedicti		10	10
Spirorbidae			
Janua brasiliensis			
Pileolaria pseudomilitaris			
Syllidae			
Syllidae, unid.			
Autolytus sp.			
Brania sp.			
Exogone gemmifera			
Exogone lourei			
Exogone verugera			
Exogone sp. *A*		30	
Exogone sp.			
Odontosyllis phosphorea			

POLYCHAETA, Syllidae cont'd. Station MDR 9	26 Apr	25 Oct
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? Syllis sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis		
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		
Clausidium vancouverense		
HARPACTICOIDA		
Harpactiocoida, unid.		
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra		20
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum		20
Ericthonis brasiliensis		
Listriella goleta		
Monoculoides sp.		
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus		
Rudilemboides stenopropodus		
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica		
DECAPODA		
Decapoda--larval		
Anomura		

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CRUSTACEA, cont'd.	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		10
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	70	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd.	Station MDR 9	26 Apr	25 Oct
Philomedes sp.			
Rudiderma rostrata			
Scleroconcha sp.			
CIRRIPEDIA			
Balanus (Balanus) pacificus			
Balanus trigonus			
Balanus sp.			
Megabalanus tintinnabulum californicus (= *Balanus*)			
INSECTA			
Chironomidae, larvae			
Paraclunio alaskensis, larvae			
PYCNOGONIDA			
Anoplodactylus erectus			
Callipallene californiensis			
Pallenidae, unid.			
Tantystylum intermedium			
ASCHELMINTHES			
Nematoda, unid.			
BRACHIOPODA			
Glottidia albida			
BRYOZOA (= ECTOPROCTA)			
Bowerkankia gracilis			
Bugula neritina			
Celleporaria brunnea			
Cryptosula pallasiana			
Schizoporella unicornis			
Watersipora arcuata			
Zoobotryon verticillatum			
CHORDATA			
CEPHALOCHORDATA			
Branchiostoma californiense			
UROCHORDATA			
ASCIDACEA			
Ascidacea, unid.			10
Botryllus sp.			
Ciona intestinalis			
Mogula pugetiensis			
Styela clava			
Styela plicata			
VERTEBRATA			
OSTEICHTHYS			
Gobiesocidae			
Gobiesox rhessodon			
Gobiidae			
Gobiidae, unid.			

VERTEBRATA, Gobiidae cont'd. Station MDR 9	26 Apr	25 Oct
Gobiidae, larvae		
Clevelandia ios		
Ilypnus gilberti		
Lepidogobius lepidus		
CNIDARIA (= COELENTERATA)		
ANTHOZOA		
Anthozoa, unid.		
ACTINARIA		
Actinaria, unid.		
Diadumenidae		
Diadumene sp.		
Edwardsiidae		
Edwardsiidae, unid.		
Edwardsia californica		
Edwardsia sp.		
Edwardsia sp., juv.		
Halocliviidae		
Mesacmaea sp. *A*		
PENNATULACEA		
Stylatula elongata		
Acanthoptilum gracile		
CERIANTHARIA		
Ceriantharia, unid.		
HYDROZOA		
HYDROIDA		
Aglaophenia diversidentata		
Aglaophenia nr.*pluma*		
Aglaophenia sp.		
Corymorpha aurata (= *Euphysa* sp. *A*)	10	
Obelia sp.		
ECHINODERMATA		
ECHINOIDEA		
Echinoidea, unid. juv.		
Strongylocentrotus purpuratus		
HOLOTHUROIDEA		
Holothuroidea, unid.		30
OPHIUROIDEA		
Ophiuroidea, unid. juv.		
ECHIURA		
Listriolobus pelodes		
Urechis caupo		
HEMICHORDATA		
Enteropneusta, unid.		
MOLLUSCA		
GASTROPODA		
Gastropoda, unid. juv.		
OPHISTHOBRANCHIA		

GASTROPODA, cont'd. Station MDR 9	26 Apr	25 Oct
CEPHALASPIDEA		
Cephalaspidea, unid.		
Acteonidae		
Rictaxis punctocaelatus		
Aglajidae		
Aglaja sp.		
Atyidae		
Haminoea vesicula		
Bullidae		
Bulla gouldiana		
Philinidae		
Woodbridgea sp.		
Retusidae		
Sulcoretusa sp.		
Volvulella panamica		
Scaphandridae		
Cylincha diegensis		
Cylichnella culcitella (= *Acteocina culcitella*)		
Cylichnella harpa (= *Acteocina harpa*)		
Cylichnella inculta (= *Acteocina inculta*)	60	60
NUDIBRANCHIA		
Nudibranchia, unid.		
Acanthodoris sp.		
Cuthona sp. (= *Trinchesia* sp.)		
PYRAMIDELLIDA		
Pyramidellidae		
Odostomia sp.		
Turbonilla sp.		
PROSOBRANCHIA		
MESOGASTROPODA		
Caecidae		
Caecum sp.		
Fartulum sp.		
Micranellium sp.		
Calypteridae		
Calyptraeidae, unid.		
Crepidula onyx		
Crepidula dorsata (= *Crepepatella lingulata*)		
Crepidula preforans		
Crepidula sp., juv.		
Lamellariidae		
Marseniopsis sharonae (= *Lamellaria sharonae*)		
Naticidae		
Neverita recluziana		
Sinum sp.		
Vitrinellidae		
Vitrinella oldroydi		

GASTROPODA, cont'd.	Station MDR 9	26 Apr	25 Oct
NEOGASTROPODA			
Columbellidae			
Alia carinata			
(= *Mitrella carinata*)			
Mitrella sp., juv.			
Muricidae			
Pteropurpura festiva			
Nassariidae			
Nassarius mendicus			
Nassarius perpinguis			
Nassarius sp.			
Olividae			
Olivella baetica			
Turridae			
Kurtziella plumbea			
PELECYPODA			
Pelecypoda, unid. juv.			
Cardiidae			
Laevicardium substriatum			
Cooperellidae			
Cooperella subdiaphana			
Cultellidae			
Ensis myrae			
Siliqua lucida			
Donacidae			
Donax gouldii			
Erycinidae			
Lasaea subviridis			
Hiatellidae			
Hiatella arctica			
Kelliidae			
Kellia laperousi			
Leptonidae			
Platomgsia meroeum			
(= *Lepton meroeum*)			
Lucinidae			
Parvilucina approximata			
Parvilucina tenuisculpta			
(= *Parvilucina* sp.)			
Lucina nuttalli			
Lyonsiidae			
Lyonsia californica			
Mactridae			
Mactridae, juv.			
Mactra californica			
Mactra sp.			
Spisula catilliformis			
Spisula sp.			
Tresus nuttalli			
Montacutidae			
Mysella grippi			
Mysella pedroana			
Mysella sp.			

PELECYPODA, Montacutidae cont'd. Station MDR 9	26 Apr	25 Oct
Neaeromga sp.		
(= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		
Macoma sp., juv.		
Tellina carpenteri		
Tellina modesta		
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus		

	Station MDR 9	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis			
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*			
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus			
PHORONIDA			
Phoronis pallida			
Phoronis sp.			10
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			
SIPUNCULIDA			
Sipunculida, unid.			
ADDENDUM:			
Ilypnus gilberti			1
UROCHORDATA			
ASCIDACEA			
Styela truncata			30

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ANNELIDA		
OLIGOCHAETA		
Oligochaeta, unid.	430	180
Tubificidae		
Peloscolex gabriellae		
POLYCHAETA		
Ampharetidae		
Ampharete labrops		
Amphicteis scaphobranchiata		
Melinna oculata		
Arabellidae		
Arabellidae, unid. juv.		
Drilonereis falcata		
Arabella sp.		
Capitellidae		
Capitella capitata	270	1,730
Mediomastus acutus		
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)	110	20
Notomastus magnus		
Notomastus tenuis		
Chaetopteridae		
Spiochaetopterus costarum		
Chrysopetalidae		
Chrysopetalum occidentale		
Paleanotus bellis		
Cirratulidae		
Cirratulidae, unid.		
Caulleriella alata		
Caulleriella bioculata		
Caulleriella hamata		
Caulleriella sp., juv.		
Chaetozone corona	110	
Chaetozone setosa		
Chaetozone sp.		
Cirratulus cirratus		
Cirriformia luxuriosa		
Cirriformia spirabrancha		2,240
Cirriformia sp., juv.		
Tharyx nr. *tesselata*		
Tharyx spp.	150	
Cossuridae		
Cossura candida	40	
Cossura pygodactylata		
Ctenodrilidae		
Ctenodrilus serratus		

POLYCHAETA, cont'd. Station MDR 10	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis	160	10
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.		
Glyceridae		
Glycera americana		
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.	10	
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta		
Lumbrineris lagunae	80	20
Lumbrineris limicola		
Lumbrineris ? tetraura		
Lumbrineris spp.	10	
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides		

POLYCHAETA, Nephtyidae cont'd. Station MDR 10	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	20	
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		10
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? Perinereis monterea		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus	410	
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*; = *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 10	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetiidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops		
(= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		
Euchone incolor		
Euchone limnicola	1,100	160
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans		
(= *Hydroides pacifica*)		
Hydroides gracilis		
(= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd. Station MDR 10	26 Apr	25 Oct
Spionidae, unid.		
Apoprionospio pygmaea		
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		40
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*; = *Nerinides maculata*)		
Minuspio cirrifera	60	
(= *Prionospio cirrifera*)		
Paraprionospio pinnata		10
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni	870	370
Polydora socialis		
Polydora sp.		
Prionospio heterobranchia	50	
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*"; = *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	5,580	1,570
Rynchospio arenicola	50	110
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	170	210
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis		
Streblospio benedicti	520	60
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		10
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*	20	30
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd. Station MDR 10	26 Apr	25 Oct
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? Syllis sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis		
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		
Clausidium vancouverense		
HARPACTICOIDA		
Harpactiocoida, unid.		
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra	90	50
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum	30	
Ericthonis brasiliensis		
Listriella goleta		
Monoculoides sp.		
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus		
Rudilemboides stenopropodus		
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica		
DECAPODA		
Decapoda--larval		
Anomura		

CRUSTACEA, cont'd. — Station MDR 10	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis		
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	30	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd.	Station MDR 10	26 Apr	25 Oct
Philomedes sp.			
Rudiderma rostrata			
Scleroconcha sp.			
CIRRIPEDIA			
Balanus (Balanus) pacificus			
Balanus trigonus			
Balanus sp.			
Megabalanus tintinnabulum californicus (= *Balanus*)			
INSECTA			
Chironomidae, larvae			
Paraclunio alaskensis, larvae			
PYCNOGONIDA			
Anoplodactylus erectus			
Callipallene californiensis			
Pallenidae, unid.			
Tantystylum intermedium			
ASCHELMINTHES			
Nematoda, unid.			
BRACHIOPODA			
Glottidia albida			
BRYOZOA (= ECTOPROCTA)			
Bowerkankia gracilis			
Bugula neritina			
Celleporaria brunnea			
Cryptosula pallasiana			
Schizoporella unicornis			
Watersipora arcuata			
Zoobotryon verticillatum			
CHORDATA			
CEPHALOCHORDATA			
Branchiostoma californiense			
UROCHORDATA			
ASCIDACEA			
Ascidacea, unid.			
Botryllus sp.			
Ciona intestinalis			
Mogula pugetiensis			
Styela clava			
Styela plicata			
VERTEBRATA			
OSTEICHTHYS			
Gobiesocidae			
Gobiesox rhessodon			
Gobiidae			
Gobiidae, unid.			

VERTEBRATA, Gobiidae cont'd. Station MDR 10 26 Apr 25 Oct

Gobiidae, larvae
Clevelandia ios
Ilypnus gilberti
Lepidogobius lepidus

CNIDARIA (= COELENTERATA)
ANTHOZOA
Anthozoa, unid.
ACTINARIA
Actinaria, unid.
Diadumenidae
Diadumene sp.
Edwardsiidae
Edwardsiidae, unid.
Edwardsia californica
Edwardsia sp.
Edwardsia sp., juv.
Halocliviidae
Mesacmaea sp. *A*
PENNATULACEA
Stylatula elongata
Acanthoptilum gracile
CERIANTHARIA
Ceriantharia, unid.
HYDROZOA
HYDROIDA
Aglaophenia diversidentata
Aglaophenia nr.*pluma*
Aglaophenia sp.
Corymorpha aurata
(= *Euphysa* sp. *A*)
Obelia sp.

ECHINODERMATA
ECHINOIDEA
Echinoidea, unid. juv.
Strongylocentrotus purpuratus
HOLOTHUROIDEA
Holothuroidea, unid.
OPHIUROIDEA
Ophiuroidea, unid. juv.

ECHIURA
Listriolobus pelodes
Urechis caupo

HEMICHORDATA
Enteropneusta, unid.

MOLLUSCA
GASTROPODA
Gastropoda, unid. juv.
OPHISTHOBRANCHIA

GASTROPODA, cont'd.	Station MDR 10	26 Apr	25 Oct
CEPHALASPIDEA			
Cephalaspidea, unid.			
Acteonidae			
Rictaxis punctocaelatus			
Aglajidae			
Aglaja sp.			
Atyidae			
Haminoea vesicula			
Bullidae			
Bulla gouldiana			
Philinidae			
Woodbridgea sp.			
Retusidae			
Sulcoretusa sp.			
Volvulella panamica			
Scaphandridae			
Cylincha diegensis			
Cylichnella culcitella			
(= *Acteocina culcitella*)			
Cylichnella harpa			
(= *Acteocina harpa*)			
Cylichnella inculta		240	
(= *Acteocina inculta*)			
NUDIBRANCHIA			
Nudibranchia, unid.			
Acanthodoris sp.			
Cuthona sp.			
(= *Trinchesia* sp.)			
PYRAMIDELLIDA			
Pyramidellidae			
Odostomia sp.			
Turbonilla sp.			
PROSOBRANCHIA			
MESOGASTROPODA			
Caecidae			
Caecum sp.			
Fartulum sp.			
Micranellium sp.			
Calypteridae			
Calyptraeidae, unid.			
Crepidula onyx			
Crepidula dorsata			
(= *Crepepatella lingulata*)			
Crepidula preforans			
Crepidula sp., juv.			
Lamellariidae			
Marseniopsis sharonae			
(= *Lamellaria sharonae*)			
Naticidae			
Neverita recluziana			
Sinum sp.			
Vitrinellidae			
Vitrinella oldroydi			

GASTROPODA, cont'd.	Station MDR 10	26 Apr	25 Oct
NEOGASTROPODA			
Columbellidae			
Alia carinata			
(= *Mitrella carinata*)			
Mitrella sp., juv.			
Muricidae			
Pteropurpura festiva			
Nassariidae			
Nassarius mendicus			
Nassarius perpinguis			
Nassarius sp.			
Olividae			
Olivella baetica			
Turridae			
Kurtziella plumbea			
PELECYPODA			
Pelecypoda, unid. juv.			
Cardiidae			
Laevicardium substriatum			
Cooperellidae			
Cooperella subdiaphana			
Cultellidae			
Ensis myrae			
Siliqua lucida			
Donacidae			
Donax gouldii			
Erycinidae			
Lasaea subviridis			
Hiatellidae			
Hiatella arctica			
Kelliidae			
Kellia laperousi			
Leptonidae			
Platomgsia meroeum			
(= *Lepton meroeum*)			
Lucinidae			
Parvilucina approximata			
Parvilucina tenuisculpta			
(= *Parvilucina* sp.)			
Lucina nuttalli			
Lyonsiidae			
Lyonsia californica			
Mactridae			
Mactridae, juv.			
Mactra californica			
Mactra sp.			
Spisula catilliformis			
Spisula sp.			
Tresus nuttalli			
Montacutidae			
Mysella grippi			
Mysella pedroana			
Mysella sp.			

PELECYPODA, Montacutidae cont'd. Station MDR 10	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		
Macoma sp., juv.		10
Tellina carpenteri		
Tellina modesta	140	
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

Station MDR 10	26 Apr	25 Oct
SCAPHOPODA		
Cadulus fusiformis		
NEMERTEA		
Nemertea, unid.		10
Cerebratulus californiensis	10	
Euplectonema burgeri		
Micrura alaskensis		
Paranemertes sp. *A*		
Tubulanua nothus		
Tubulanus pellucidus		
Tubulanus polymorphus		
PHORONIDA		
Phoronis pallida		
Phoronis sp.		20
Phoronopsis sp.		
PLATHYHELMINTHES		
Polycladida, unid.		
SIPUNCULIDA		
Sipunculida, unid.		

BENTHIC DATA	STATION MDR 11		
	DATE	26 Apr 1984	25 Oct 1984
ANNELIDA			
OLIGOCHAETA			
Oligochaeta, unid.		10	
Tubificidae			
Peloscolex gabriellae			
POLYCHAETA			
Ampharetidae			
Ampharete labrops			
Amphicteis scaphobranchiata			
Melinna oculata			
Arabellidae			
Arabellidae, unid. juv.			
Drilonereis falcata			
Arabella sp.			
Capitellidae			
Capitella capitata			
Mediomastus acutus			
Mediomastus ambiseta (= *M. californiensis*, = *Capitita ambiseta*)		80	50
Notomastus magnus			
Notomastus tenuis			
Chaetopteridae			
Spiochaetopterus costarum			
Chrysopetalidae			
Chrysopetalum occidentale			
Paleanotus bellis			
Cirratulidae			
Cirratulidae, unid.			
Caulleriella alata			
Caulleriella bioculata			
Caulleriella hamata			
Caulleriella sp., juv.			
Chaetozone corona		20	80
Chaetozone setosa			
Chaetozone sp.			
Cirratulus cirratus			
Cirriformia luxuriosa		10	
Cirriformia spirabrancha			530
Cirriformia sp., juv.			
Tharyx nr. *tesselata*			
Tharyx spp.		20	
Cossuridae			
Cossura candida			
Cossura pygodactylata			
Ctenodrilidae			
Ctenodrilus serratus			

POLYCHAETA, cont'd. Station MDR 11	26 Apr	25 Oct
Dorvilleidae		
Dorvilleidae, unid.		
Ophryotrocha puerilis		
Protodorvillea gracilis		
Schistomeringos longicornis	10	10
Eunicidae		
Marphysa disjuncta		
Marphysa belli oculata		
Flabelligeridae		
Flabelligeridae, unid.		
Pherusa capulata		
Pherusa sp., juv.		
Glyceridae		
Glycera americana		
Glycera capitata		
Glycera convoluta		
Gylcera rouxii		
Glycera sp., juv.		
Goniadidae		
Goniadidae, unid. juv.		
Glycinde armigera		
Goniada brunnea		
Goniada littorea		
Goniada sp., juv.		
Hesionidae		
Hesionidae, unid.		
Gyptis brunnea		
Micropodarke dubia		
Ophiodromus pugettensis		
Podarkeopsis glabra (= *Gyptis brevipalpa*)		
Lumbrineridae		
Lumbrineridae, unid.		
Lumbrineris ? crassidentata		
Lumbrineris erecta		
Lumbrineris lagunae		
Lumbrineris limicola		
Lumbrineris ? tetraura		
Lumbrineris spp.	10	
Magelonidae		
Magelona pacifica		
Magelona pitelkai		
Magelona sacculata		
Maldanidae		
Maldanidae, unid.		
Asychis disparidentata		
Asychis sp.		
Axiothella sp.		
Praxillella affinis pacifica		
Praxillella sp.		
Nephtyidae		
Nephtyidae, unid. juv.		
Nephtys caecoides		

POLYCHAETA, Nephtyidae cont'd. Station MDR 11	26 Apr	25 Oct
Nephtys californiensis		
Nephtys cornuta franciscana	50	
Nephtys ferruginea		
Nereididae (= Nereidae)		
Nereididae, unid. juv.		
Neanthes acuminata		
(= *Neanthes arenaceodentata*)		
Nereis latescens		
Nereis procera		
Nereis sp., juv.		
? *Perinereis monterea*		
Platynereis bicanaliculata		
Onuphidae		
Onuphidae, unid. juv.		
Diopatra ornata		
Diopatra splendidissima		
Diopatra sp., juv.		
Onuphis elegans		
(= *Nothria elegans*)		
Onuphis iridescens		
(= *Nothria iridescens*)		
Opheliidae		
Armandia bioculata		
Polyophthalmus pictus		
Orbiniidae		
Leitoscoloplos elongatus	110	90
(= *Haploscoloplos elongatus*)		
Naineris dentritica		
Scoloplos acmeceps		
Oweniidae		
Owenia collaris		
Paraonidae		
Acmira catherinae		
(= *Acesta catherinae*)		
Acmira horikoshii		
(= *Acesta horikoshii*)		
Levinsenia oculata		
(= *Tauberia oculata*;		
= *Paraonis gracillis oculata*)		
Aricidea wassi		
Paraonella platybranchia		
(= *Paraonides platybranchia*)		
Pectinariidae		
Pectinaria californiensis		
(= *P. c. newportensis*)		
Phyllodocidae		
Phyllodocidae, unid.		
Eteone californica		
Eteone dilatae		
Eteone sp.		
Eulalia ? myriacyclum		
Eulalia quadrioculata		
(= *Eulalia aviculiseta*)		

POLYCHAETA, Phyllodocidae cont'd. Station MDR 11	26 Apr	25 Oct
Eulalia sp., juv.		
Eumida bifoliata		
Eumida sanquinea		
? *Genetyllis castanea*		
Hesionura coineaui difficilis		
Phyllodoce hartmanae		
Phyllodoce (Anaitides) papillosa		
Phyllodoce sp.		
Phyllodoce (Anaitides) sp., juv.		
Pterocirrus sp.		
Pilargiidae		
Ancistrosyllis hamata		
Pilargis berkeleyi		
Sigambra tentaculata		
Poecilochaetidae		
Poecilochaetus johnsoni		
Poecilochaetus sp.		
Polynoidae		
Polynoidae, unid.		
Halosydna johnsoni		
Halosydna sp.		
Harmothoe ? crassicirrata		
Harmothoe hirsuta		
Harmothoe imbricata		
Harmothoe scriptoria		
Harmothoe sp.		
Lepidonotus ? squamatus		
Tenonia priops		
(= *Harmothoe priops*)		
Sabellariidae		
Sabellaria cementarium		
Sabellidae		
Sabellidae, unid.		
Chone ecaudata		
Chone mollis		
Chone sp.		
Demonax medius		10
Euchone incolor		
Euchone limnicola	640	1,360
Megalomma pigmentum		
Myxicola ? infundibulum		
? *Potamilla* sp.		
Serpulidae		
Serpulidae, unid.		
Hydroides elegans		
(= *Hydroides pacifica*)		
Hydroides gracilis		
(= *Eupomatus gracilis*)		
Sigalionidae		
Pholoe glabra		
Sthenelais verruculosa		
Sthenelanella uniformis		
Spionidae		

POLYCHAETA, Spionidae cont'd. Station MDR 11	26 Apr	25 Oct
Spionidae, unid.		
Apoprionospio pygmaea		
(= *Prionospio pygmaeus*)		
Boccardia sp.		
Boccardia basilaria		
Boccardiella hamata		
(= *Boccardia hamata*)		
Caraziella calafia		
(= "*Pseudopolydora* sp.")		
Laonice cirrata		
Microspio pigmentata		
Microspio maculata		
(= *Spio maculata*;		
= *Nerinides maculata*)		
Minuspio cirrifera	30	60
(= *Prionospio cirrifera*)		
Paraprionospio pinnata		
Polydora bioccipitalis		
Polydora caulleryi		
(= *P. brachycephala*)		
Polydora ligni	40	80
Polydora socialis		
Polydora sp.		
Prionospio heterobranchia	20	40
(= *P. h. newportensis*)		
Prionospio sp. *A*		
(= *Prionospio* "*steenstrupi*";		
= *P.* nr. *malmgreni*)		
Prionospio sp.		
Pseudopolydora paucibranchiata	1,830	280
Rynchospio arenicola		
Rhynchospio sp.		
Scolelepis acuta		
(= *Nerinides acuta*)		
Scolelepis sp. *A*	110	40
Spio ? filicornis		
Spiophanes berkeleyorum		
Spiophanes bombyx		
Spiophanes missionensis		
Streblospio benedicti	20	520
Spirorbidae		
Janua brasiliensis		
Pileolaria pseudomilitaris		
Syllidae		
Syllidae, unid.		
Autolytus sp.		
Brania sp.		
Exogone gemmifera		
Exogone lourei		
Exogone verugera		
Exogone sp. *A*	90	10
Exogone sp.		
Odontosyllis phosphorea		

POLYCHAETA, Syllidae cont'd. Station MDR 11	26 Apr	25 Oct
Sphaerosyllis californiensis		
Sphaerosyllis sp.		
? Syllis sp.		
Typosyllis ? hyalina		
Typosyllis sp.		
Terebellidae		
Terebellidae, unid.		
Amaeana occidentalis		
Pista fasciata		
Pista ? disjuncta		
Pista sp., juv.		
Streblosoma crassibranchia		
ARTHROPODA		
CRUSTACEA		
COPEPODA		
CALANOIDA		
Calanoida, unid.		
CYCLOPOIDEA		
Cyclopoidea, unid.		
Clausidium vancouverense		
HARPACTICOIDA		
Harpactiocoida, unid.		
MALACOSTRACA		
AMPHIPODA		
CAPRELLIDEA		
Caprellidea, unid.		
Caprella californica		
Caprella equilibra		40
GAMMARIDEA		
Gammaridea, unid.		
Amphideutopus oculatus		
Ampelisca cristata		
Argissa hamatipes		
Corophium acherusicum		
Ericthonis brasiliensis		
Listriella goleta		
Monoculoides sp.		
Parapleustes pugettensis		
Photis sp.		
Podocerus cristatus		
Rudilemboides stenopropodus		
Westwoodilla caecula		
CUMACEA		
Cumacea, unid.		
Campylaspis sp.		
Cyclaspis sp.		
Diastylis sp.		
Diastylopsis tenuis		
Oxyurostylus pacifica		
DECAPODA		
Decapoda--larval		
Anomura		

CRUSTACEA, cont'd. Station MDR 11	26 Apr	25 Oct
Callianassidae		
Callianassa californiensis		
Callianassa sp.		
Upogebia sp.		
Paguridae		
Pagurus sp.		
Brachyura		
Canceridae		
Cancer anthonyi		
Cancer gracilis		
Cancer sp., juv.		
Grapsidae		
Hemigrapsus oregonensis		
Hemigrapsus sp., juv.		
Majidae		
Loxorhyncus crispatus		
Pyromaia tuberculata		
Pinnotheridae		
Pinnotheridae, unid.		
Opisthopus transversus		
Pinnixa franciscana		
Pinnixa sp.		
Scleroplax granulata		
Caridea		
Alpheidae, unid.		
Alpheus californiensis	10	
Alpheopsis equidactylus (= *Alpheus equidactylus*)		
Betaeus ensenadensis		
Betaeus sp. unid.		
Palaemonidae		
Palaemonella holmesi		
ISOPODA		
Isopoda, unid.		
Cyathura sp.		
Edotea sublittoralis		
Edotea sp.		
Gnathia crenulatifrons		
Limnoria sp.		
Munna sp.		
LEPTOSTRACA		
Epinebalia sp.		
MYSIDACEA		
Mysidacea, unid.	110	
TANAIDACEA		
Tanaidacea, unid.		
Anatanais normani		
Leptochelia sp.		
OSTRACODA		
Ostracoda, unid.		
Cylindroleberis sp.		
Euphilomedes carcharodonta		

CRUSTACEA, OSTRACODA cont'd. Station MDR 11 26 Apr 25 Oct

Philomedes sp.
Rudiderma rostrata
Scleroconcha sp.

CIRRIPEDIA
Balanus (Balanus) pacificus
Balanus trigonus
Balanus sp.
Megabalanus tintinnabulum californicus (= *Balanus*)

INSECTA
Chironomidae, larvae
Paraclunio alaskensis, larvae

PYCNOGONIDA
Anoplodactylus erectus
Callipallene californiensis
Pallenidae, unid.
Tantystylum intermedium

ASCHELMINTHES
Nematoda, unid.

BRACHIOPODA
Glottidia albida

BRYOZOA (= ECTOPROCTA)
Bowerkankia gracilis
Bugula neritina
Celleporaria brunnea
Cryptosula pallasiana
Schizoporella unicornis
Watersipora arcuata
Zoobotryon verticillatum

CHORDATA
CEPHALOCHORDATA
Branchiostoma californiense

UROCHORDATA
ASCIDACEA
Ascidacea, unid.
Botryllus sp.
Ciona intestinalis
Mogula pugetiensis
Styela clava
Styela plicata

VERTEBRATA
OSTEICHTHYS
Gobiesocidae
Gobiesox rhessodon
Gobiidae
Gobiidae, unid.

VERTEBRATA, Gobiidae cont'd. Station MDR 11 26 Apr 25 Oct

Gobiidae, larvae
Clevelandia ios
Ilypnus gilberti
Lepidogobius lepidus

CNIDARIA (= COELENTERATA)
ANTHOZOA
Anthozoa, unid.
ACTINARIA
Actinaria, unid.
Diadumenidae
Diadumene sp.
Edwardsiidae
Edwardsiidae, unid.
Edwardsia californica
Edwardsia sp.
Edwardsia sp., juv.
Halociividae
Mesacmaea sp. *A*
PENNATULACEA
Stylatula elongata
Acanthoptilum gracile
CERIANTHARIA
Ceriantharia, unid.
HYDROZOA
HYDROIDA
Aglaophenia diversidentata
Aglaophenia nr.*pluma*
Aglaophenia sp.
Corymorpha aurata
(= *Euphysa* sp. *A*)
Obelia sp.

ECHINODERMATA
ECHINOIDEA
Echinoidea, unid. juv.
Strongylocentrotus purpuratus
HOLOTHUROIDEA
Holothuroidea, unid.
OPHIUROIDEA
Ophiuroidea, unid. juv.

ECHIURA
Listriolobus pelodes
Urechis caupo

HEMICHORDATA
Enteropneusta, unid.

MOLLUSCA
GASTROPODA
Gastropoda, unid. juv.
OPHISTHOBRANCHIA

GASTROPODA, cont'd. Station MDR 11	26 Apr	25 Oct
CEPHALASPIDEA		
Cephalaspidea, unid.		
Acteonidae		
Rictaxis punctocaelatus		
Aglajidae		
Aglaja sp.		
Atyidae		
Haminoea vesicula		10
Bullidae		
Bulla gouldiana		
Philinidae		
Woodbridgea sp.		
Retusidae		
Sulcoretusa sp.		
Volvulella panamica		
Scaphandridae		
Cylincha diegensis		
Cylichnella culcitella		
(= *Acteocina culcitella*)		
Cylichnella harpa		
(= *Acteocina harpa*)		
Cylichnella inculta	70	160
(= *Acteocina inculta*)		
NUDIBRANCHIA		
Nudibranchia, unid.		
Acanthodoris sp.		
Cuthona sp.		
(= *Trinchesia* sp.)		
PYRAMIDELLIDA		
Pyramidellidae		
Odostomia sp.		
Turbonilla sp.		
PROSOBRANCHIA		
MESOGASTROPODA		
Caecidae		
Caecum sp.		
Fartulum sp.		
Micranellium sp.		
Calypteridae		
Calyptraeidae, unid.		
Crepidula onyx		
Crepidula dorsata		
(= *Crepepatella lingulata*)		
Crepidula preforans		
Crepidula sp., juv.		
Lamellariidae		
Marseniopsis sharonae		
(= *Lamellaria sharonae*)		
Naticidae		
Neverita recluziana		
Sinum sp.		
Vitrinellidae		
Vitrinella oldroydi		

GASTROPODA, cont'd.	Station MDR 11	26 Apr	25 Oct
NEOGASTROPODA			
Columbellidae			
Alia carinata			
(= *Mitrella carinata*)			
Mitrella sp., juv.			
Muricidae			
Pteropurpura festiva			
Nassariidae			
Nassarius mendicus			
Nassarius perpinguis			
Nassarius sp.			
Olividae			
Olivella baetica			
Turridae			
Kurtziella plumbea			
PELECYPODA			
Pelecypoda, unid. juv.			
Cardiidae			
Laevicardium substriatum			
Cooperellidae			
Cooperella subdiaphana			
Cultellidae			
Ensis myrae			
Siliqua lucida			
Donacidae			
Donax gouldii			
Erycinidae			
Lasaea subviridis			
Hiatellidae			
Hiatella arctica			
Kelliidae			
Kellia laperousi			
Leptonidae			
Platomgsia meroeum			
(= *Lepton meroeum*)			
Lucinidae			
Parvilucina approximata			
Parvilucina tenuisculpta			
(= *Parvilucina* sp.)			
Lucina nuttalli			
Lyonsiidae			
Lyonsia californica			
Mactridae			
Mactridae, juv.			
Mactra californica			
Mactra sp.			
Spisula catilliformis			
Spisula sp.			
Tresus nuttalli			
Montacutidae			
Mysella grippi			
Mysella pedroana			
Mysella sp.			

PELECYPODA, Montacutidae cont'd. Station MDR 11	26 Apr	25 Oct
Neaeromga sp. (= *Orobitella* sp.)		
Myidae		
Cryptomya californica		
Mytilidae		
Mytilidae, juv.		
Amygdalum sp.		
Modiolus sp.		
Musculus senhousei		10
Mytilus edulis		
Nuculanidae		
Nuculana sp.		
Ostreidae		
Ostrea lurida		
Pectinidae		
Leptopecten latiauratus		
Petricolidae		
Petricola tellimyalis		
Petricola sp.		
Semelidae		
Cumingia californica		
Theora lubrica		
Solecurtidae		
Tagelus subteres		
Solenidae		
Solen rosaceus		10
Solen sicarius		
Solen sp. juv.		
Tellinidae		
Leporimetis obesa		
Macoma acolasta		
Macoma carlottensis		
Macoma nasuta		
Macoma yoldiformis		10
Macoma sp., juv.		10
Tellina carpenteri		
Tellina modesta	10	
Tellina sp., juv.		
Thraciidae		
Thracia curta		
Thyasiridae		
Axinopsida serricata		
Thyasira flexuosa		
Veneridae		
Chione ? undatella		
Chione sp., juv.		
Compsomyax subdiaphana		
Protothaca staminea		
Protothaca sp., juv.		
Saxidomus nuttalli		
Saxidomus sp., juv.		
POLYPLACOPHORA		
Polyplacophora, unid.		

	Station MDR 11	26 Apr	25 Oct
SCAPHOPODA			
Cadulus fusiformis			
NEMERTEA			
Nemertea, unid.			
Cerebratulus californiensis			
Euplectonema burgeri			
Micrura alaskensis			
Paranemertes sp. *A*			
Tubulinidae, unid.		10	
Tubulanua nothus			
Tubulanus pellucidus			
Tubulanus polymorphus			
PHORONIDA			
Phoronis pallida			
Phoronis sp.			20
Phoronopsis sp.			
PLATHYHELMINTHES			
Polycladida, unid.			
SIPUNCULIDA			
Sipunculida, unid.			
ADDENDUM:			
Ilypnus gilberti			2