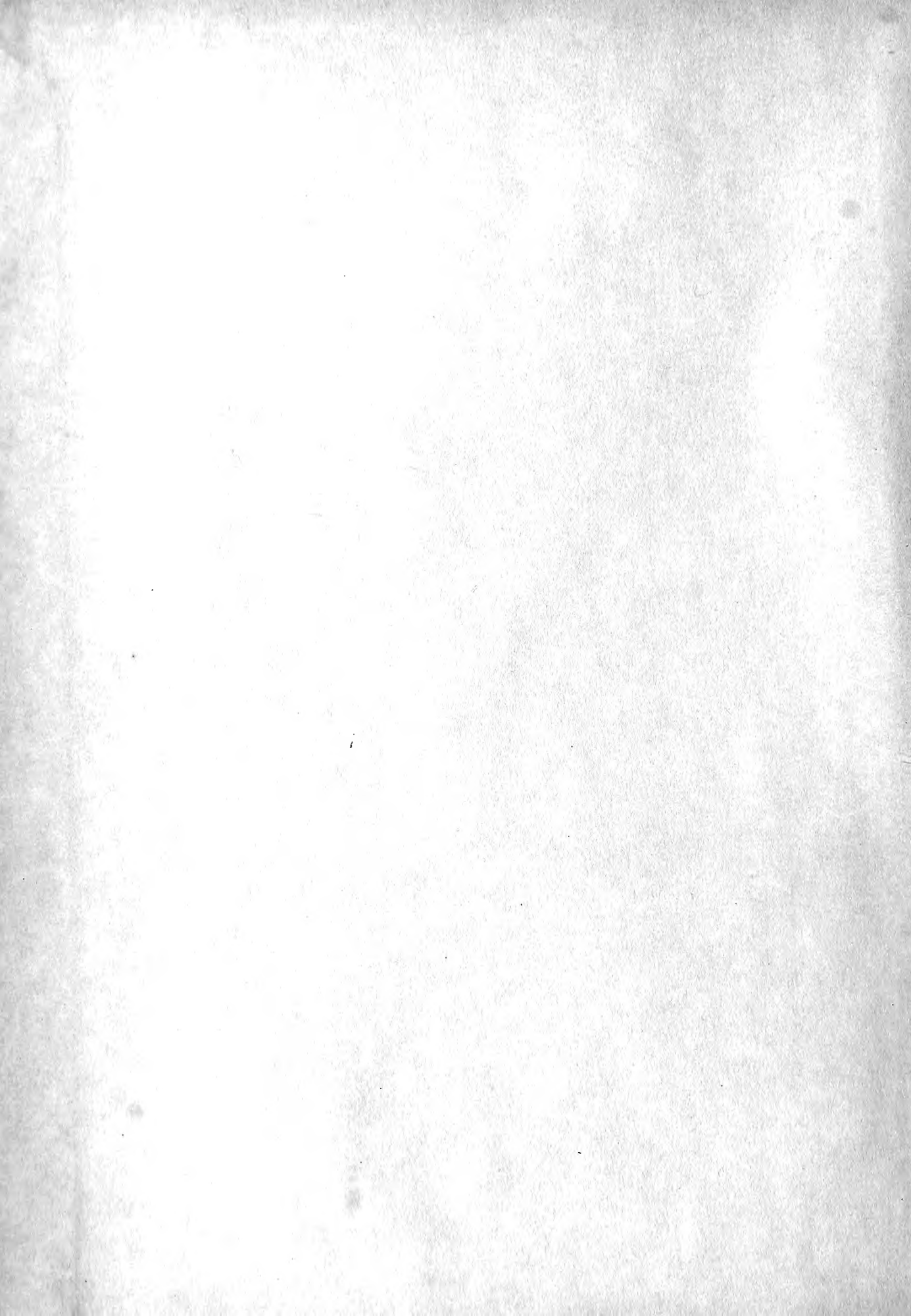
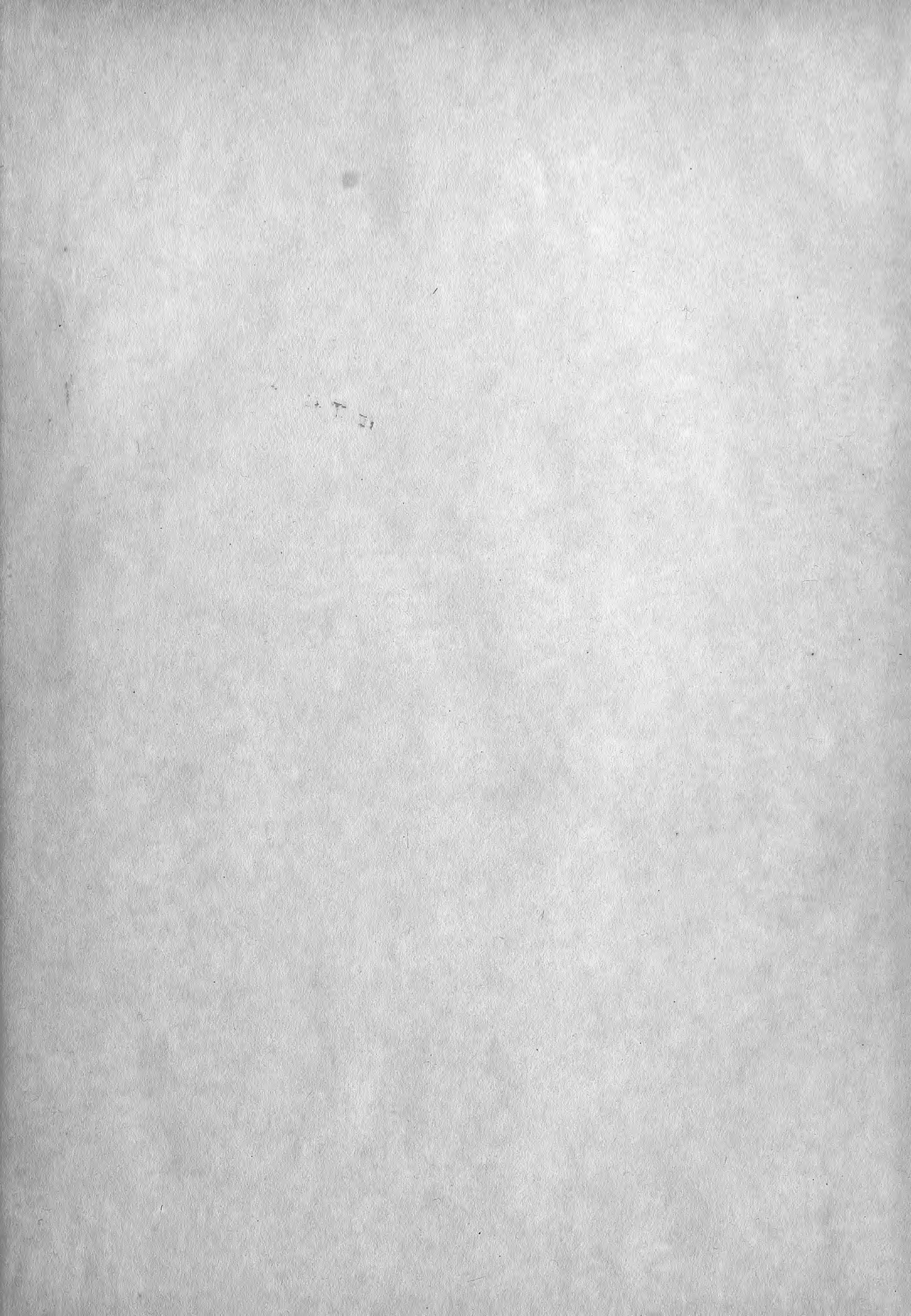


MBL/WHOI



0 0301 0031868 9





GIC
856
A 24



CONTRIBUTIONS TO A
BIOLOGICAL SURVEY OF
SANTA MONICA BAY, CALIFORNIA

by

Olga Hartman

A Final Report

submitted to

Hyperion Engineers, Inc.

by

The Geology Department

University of Southern California

September 17, 1956

TABLE OF CONTENTS

	Page
Introduction-----	1
Description of Area-----	2
Methods and Equipment-----	8
Faunal Affinities-----	11
Ecological-----	11
Geographical-----	15
Patchiness-----	20
Systematic Classification of Faunal Units-----	23
Ecological Classification-----	26
Indicator Species-----	37
Results of Some Other Biological Observations-----	40
Comparative Food Values-----	43
Size of Largest Species-----	44
Acknowledgements-----	45
Literature Cited-----	46
Appendix I-----	47
Appendix II-----	57
Appendix III-----	60
Appendix IV-----	67
Appendix V-----	136
Appendix VI-----	138
Appendix VII-----	140



CONTRIBUTIONS TO A BIOLOGICAL SURVEY
OF SANTA MONICA BAY, CALIFORNIA

Introduction

The purpose of this report is to record the results of bottom sampling in Santa Monica Bay between 1952 and 1956, and to evaluate the analyses of these samples in terms of organic productivity by systematic faunal units. The analyses are believed to approximate the ecological associations of animal populations as they exist in nature. Values of comparative biomasses are expressed in terms of varying horizontal and vertical distances from the effluent outlets. The major faunal units are identified and their affinities noted with those of adjacent and more distant areas. In Santa Monica Bay, six biological zones are recognized. Each supports a characteristic fauna differing primarily for depth of sea-floor, nature of sediments, and varying with distance from the ends of effluent pipes. The more abundant or conspicuous faunal categories are named for each zone, resulting in about 500 specific entities.

About 150 measured bottom samples were taken from selected parts of the bay. They are in the range of stations numbered 2148-52 to 4451-56, made by the VELERO IV. Most samples were quantitative and taken with a 2 1/2 cubic foot orange peel grab. Others were taken with a larger (5-6 cubic foot) Campbell grab, a biological

dredge, a beam trawl, and baited lobster traps. A few animals were snagged on hydrographic lines. The quantitative samples differed in volume from a fraction to five cubic feet, or 1.67 cubic meters. These variations were mainly because of differences in depths and kinds of sediments, with the greatest variations being from shallow hard-packed bottoms.

The concentration of samples from shallow areas in the vicinity of the Hyperion outfall, and along the shelf bordering the upper end of Santa Monica Canyon, was to more intensively study patchiness and present conditions along paths that a series of new outfall lines may occupy.

Description of the Area

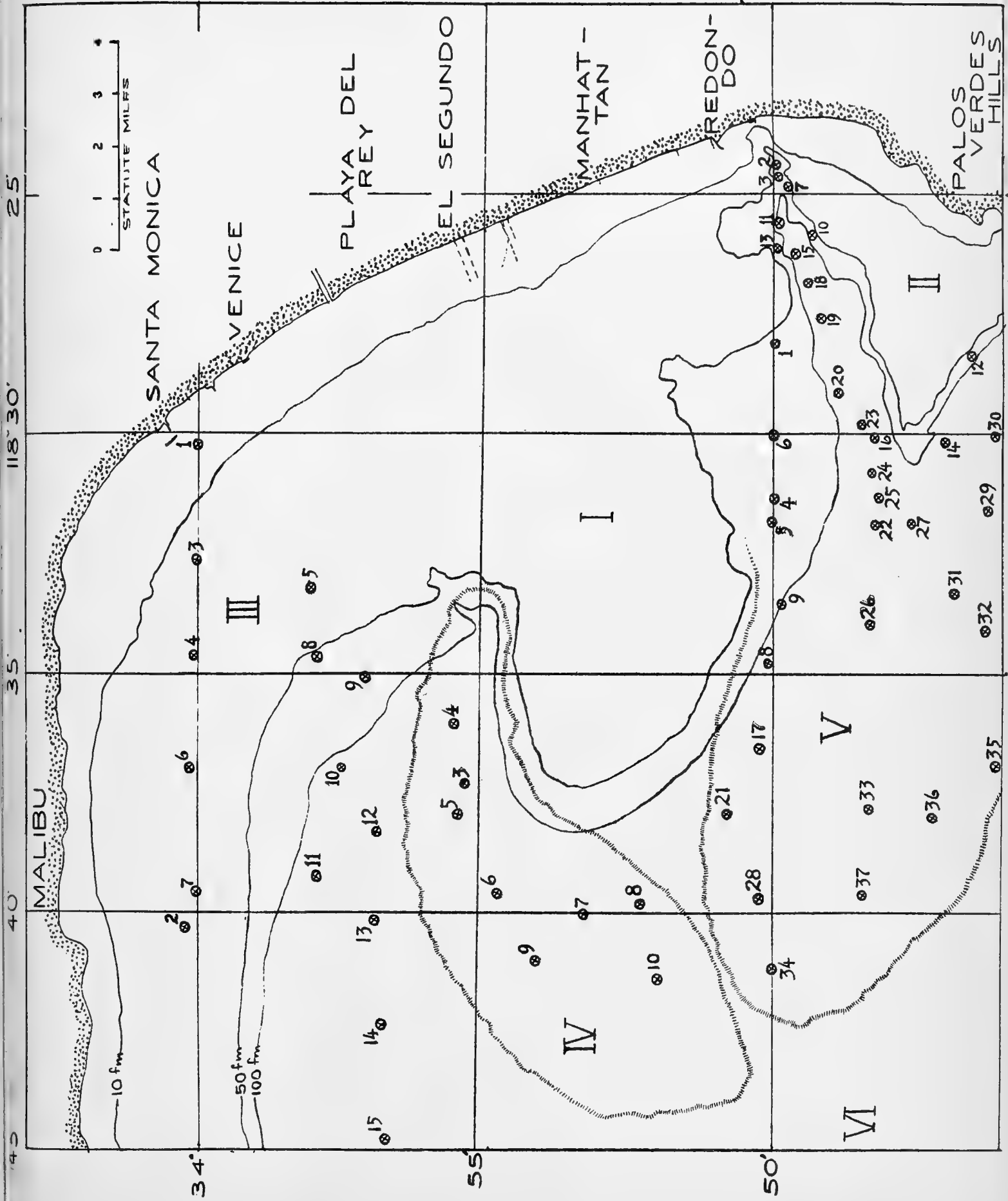
The benthos of Santa Monica Bay is a northward continuation of the San Pedro area and shares many of its biological characteristics. Both embayments have a similar shallower (to 300 feet) and deeper (to 1500 feet) shelf, a slope (to 2250 feet or more), and a deep or subsill basin (to 2940 feet). The faunal groups consist of similar categories, and differ mainly in the numbers of their occurrence because of physical differences. The San Pedro area is traversed by a channel through which a strong current flows and its bottoms, therefore, support some associations which are sparse or not represented in Santa Monica Bay. The presence of submerged mountains (the Lasuen Seamount and Six-Mile Bank at either

side of its southern sill, and two similar mounts at either end of the northern sill) account for some gross differences. Its sediments are more diversified and have many rubbly slopes. In their deeper parts these slopes have associations of glass sponge which are sparse or lacking in Santa Monica Bay except in scattered patches along the outer slopes of Santa Monica Canyon. The shallower submerged slopes, continuous with the Palos Verdes Hills, have an unusually diversified and abundant benthonic fauna which in amount is unparalleled in any other area of southern California. Although the specific categories occur in other regions where currents prevail, their quantities are much diminished.

The sea floor of Santa Monica Bay is divisible into six faunal zones, numbered I to VI (May 7, 1956 report, p. 13). Zone I refers to the broad, shallow shelf extending west from Hyperion; II refers to the shallow triangular area between Redondo and Palos Verdes Hills, and west to the outer end of Redondo Canyon; III refers to the northern shelf of Santa Monica Bay to depths of 330 fathoms; IV refers to Santa Monica Canyon, and V refers to Redondo Canyon. In Figure 1 is shown their locations and the serial arabic numbers for zones III, IV, and V. Those for zone I are more completely detailed in Figure 2.

The shallower bottoms of Santa Monica Bay are populated mainly by animals existing within the sediments which

Figure 1. Santa Monica Bay showing Zones I to VI, and sample numbers from Zones III, IV and V.



25

118° 30'

35

40

45

SANTA MONICA

VENICE

PLAYA DEL REY

EL SEGUNDO

MANHATTAN

REDONDO

PALOS VERDES HILLS

III

I

II

V

IV

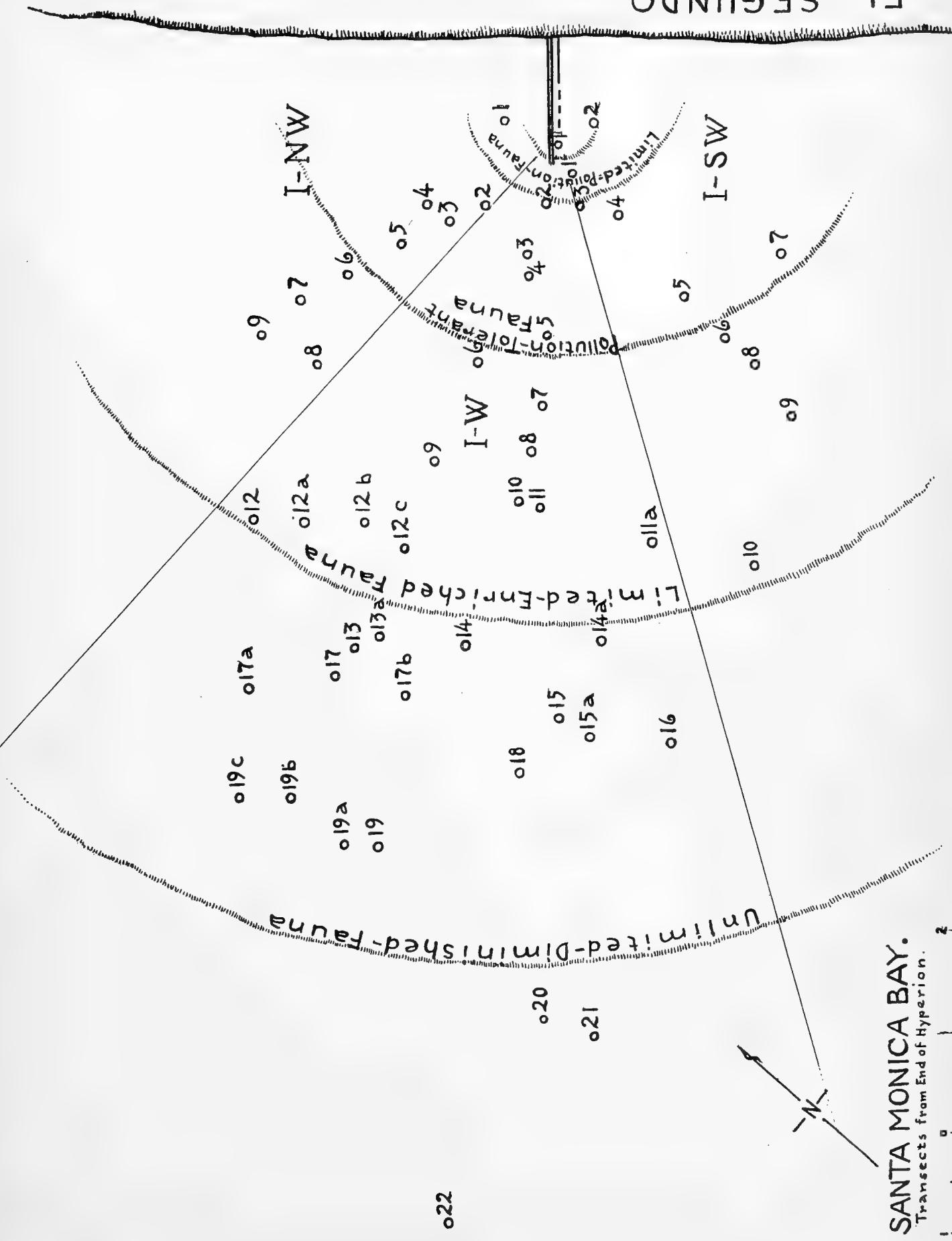
VI

10 fm

50 fm
100 fm

0 1 2 3
STATUTE MILES

Figure 2. Chart of Zone I showing sectors W (west), SW (southwest), and NW (northwest) with sample numbers for each.



SANTA MONICA BAY.
 Transects from End of Hyperion.

022

are muddy, sandy, or mixed. The sea floor appears smooth and nearly barren (Figure 3), but the presence of innumerable small hillocks, holes, and other irregularities verify the existence of an abundant fauna which consists mainly of different kinds of smaller metazoan animals. An occasional five-rayed shallow depression is made by an Astropecten, and the slender erect sticklike projections are tubes of phoronids, onuphids, or the stiff stipe of a sea whip.

Animal associations of rocky or gravelly areas are limited mainly to the upper slopes of Santa Monica Canyon, as in the outer regions of Zone I. Macrokelps, which require shallow rocky surfaces for attachment of the stipe, are mainly restricted to the northern areas of Santa Monica Bay. A small triangular area (Zone II) between the upper end of Redondo Canyon and the Palos Verdes Hills, supports a diversity of kinds of animals in unusual concentrations. The broad sandy shelf and slopes of the western and northwestern end of Zone I have concentrations of brittle stars requiring quiet water. The bottom of Redondo Canyon below 300 feet (Zone V) is overlain by muddy sediments which support unique associations of animals having their greatest known concentrations in this place. The fauna of Santa Monica Canyon, below 300 feet (Zone IV) resembles that of Zone V, but is more limited and dispersed. Analyses of samples from these bottoms are given in the Appendix.

Figure 3. Photograph of a silty sand sea floor about 4 1/2 miles from the end of Hyperion outfall in 160 to 200 feet of water. Typical animals in the sediments are Astropecten californicus, Onuphis nebulosa, a slender sea whip, Glycera, Nephtys, maldanids and smaller pelecypods. The base line represents about two feet. Photo taken by Dr. R. B. Tibby, July 1955.



The broad flat shelf extending west from Hyperion to the upper end of Santa Monica Canyon (Zone I) comprises 85 to 90 square miles. It can be divided into faunal areas expressed in terms of distance from the outfall. Six faunal groups are named, each with west (I W), southwest (I SW), and northwest (I NW) sectors. The boundaries as noted in the report of May 7, 1956 are retained except that the outer fringe of the Limited-Enriched-Fauna in I W has been moved west about a fifth of a mile to encompass all of the stations in the I W-12 sector (Figure 2). This fauna, as well as the adjacent Unlimited-Diminished-Fauna, have been more completely sampled since the last report was issued.

Methods and Equipment

The samples taken with the Hayward orange peel grab were screened on board ship through sieves of which the finest measured 24 meshes to the inch, bottled in suitable containers, and fixed with formalin added to seawater. As soon as possible thereafter the samples were transported to the laboratory where cleaning and analyses were done (Hartman, 1955). Because of these collecting methods, many smaller metazoan animals (especially smaller crustaceans, worms, mollusks and others) were undoubtedly lost. However, the counts of animals were high in spite of such unmeasurable losses and the species are believed to be characteristic of the areas investigated.

The grab was usually filled when soft fine-grained bottoms were sampled. In rocky bottoms it was less successful, so either a biological dredge or a trawl was used to obtain qualitative measures. Volumes of individual grabs varied most in shallow water where sediments were hard packed. Thus, differences from nearby stations varied as much as 300%. For example, in sector I W-12c at station 4325 with a medium to coarse green glauconite sand bottom, 1.88 cubic foot was recovered, and in I W-19a at station 4329 in silt and sand, 0.06 cubic foot was recovered.

Baited lobster traps were used in the vicinity of the outfall to lure foraging animals not easily taken by other means. At first, traps with copper and brass fittings were lowered and found unsuccessful, perhaps because of repellant metallic ions leached into the seawater. Another time the entrance of the trap had been clogged by a crab too large to enter or escape, so that the entrance of other kinds of animals was impeded. Other traps recovered various foraging animals such as crabs, flounders, and snails, and smaller associated animals.

Beam-trawl fishing (Zone II-5) was incidental except for the catch of certain kinds of fishes from water over a shallow sandy bottom.

Some human factors are probably reflected in the sorting and analyses of the samples, which were done

by the writer. As the work progressed, it was obvious that an increasing number of kinds of animals were being recognized, partly because many animal species lie in tubes or burrows made by other kinds, or are covered with debris, or occupy various sheltered nooks not easily seen. (Analyses were usually made with the aid of a dissecting microscope.) Such was the case with many small tubicolous animals, Monobrachium, a commensal hydroid on small bivalves, an unknown flabelligeriid found in considerable numbers in dead shells of Cadulus (tooth shell), commensal and parasitic animals associated with host species, and other kinds. In time, therefore, it may be necessary to review all of the earlier samples. This can still be done since most have been preserved. Fortunately, experiences gained from similar studies in the San Pedro area, where many animals are the same, made the recognition of most species simpler.

Emphasis on the importance of annelids from the start might have been due to interests on the part of the investigator. However, it is believed that this group will loom the largest in mass productivity and diversity to anyone who will examine the samples, and that they, together with the ophiuroids and the smaller though poorly known entomostracans, are the most important constituents in the bottoms investigated.

1

vi

2

Faunal Affinities

Ecological

The benthonic fauna in Santa Monica Bay has its closest affinities with that in the adjacent San Pedro area. The kinds and numbers of species are somewhat higher in the San Pedro embayment because of its greater diversity of physical features. It also supports many species requiring currents, such as the large associations of Chaetopterus (polychaete), Ophiothrix (brittle star), and gorgonian corals which flourish in abundance near Whites Point; the large beds of Tagelus (jack-knife clam) just outside the Los Angeles breakwater, and the siliceous sponge associations along the steep slopes of submerged mountains. These, and other kinds, are sparse to absent in the Santa Monica area. Undersea gardens of macrokelps with their rich associations of animals both in the protecting canopy above and in the sediments below, which abound in great numbers along the leeward shores of Santa Catalina Island, are present near Malibu in Santa Monica Bay, but much less extensive.

The outer basins (Catalina, Santa Cruz, San Clemente, and others) off southern California have been found (Hartman, unpublished) to have many different kinds of animals not present in the near shore basins (San Pedro and Santa Monica). The densities in the outer basins (mass productivities) are, however, much lower except in places where nutrients are supplied from outside sources

(as at Catalina Harbor on the outer side of Santa Catalina Island). The absence from, or sparsity in, the inner basins suggest that the species have different temperature requirements, either as larvae or adults, or that there are competitive factors which may be selective.

The most abundant animals in the shallower bottoms of Santa Monica Bay are various kinds of polychaetes, smaller crustaceans (entomostracans) and ophiuroids. Others which may be present in abundance at scattered places are various types of mollusks, sipunculids, echiuroids, a stalked brachiopod, nemerteans, and other animals, most of which lie partly or wholly buried in the sediments.

Those in shallower depths are small in size, exceedingly numerous, and perhaps have short life spans. Those in moderate depths tend to be larger in size, fewer in numbers, and are more diversified. The deepest bottoms (in the basin) are impoverished or dead.

The dominance of one or two species over extensive areas, such as has been described from shallow bottoms of western Europe (Danish authors), from Puget Sound (Shelford and associates), from Long Island Sound (Sanders), and other places, has not been observed in either the Santa Monica or San Pedro areas. Instead, populations exist in patterns much like a patch-work design, with irregular or unpredictable recurrences and in various kinds of associations. A few species have been more or

less constantly associated with certain kinds of sediments. Such are the epifaunal Chloeia pinnata (an amphinomid annelid) and the tubicolous Pectinaria californiensis (the cone worm) on sandy or silty bottoms and in shallow to fairly deep water. Ampharetids (Amphicteis, Amage), Maldane, Nothria pallida and some terebellids are associated with soft muddy bottoms in shallow to greater depths. Species of Glycera, Ampharete, Onuphis nebulosa, Phyllochaetopterus prolifica with attached Scalpellum (stalked barnacle), Pherusa capulata, Isocirrus planiceps, and some other kinds are most frequent in mixed bottoms, especially where coarse sand or gravel prevails. Rocky bottoms support such attached forms as solitary coral, Corynactis (an anemone), various attached serpulid worms, and crevice or nestling kinds as chitons, various other mollusks, and scale worms. Some of the rocky areas of the upper end of Santa Monica Canyon show evidence of former colonies of pholad mollusks, for which occupants have not been recovered. These rocks are now inhabited by borers of smaller dimensions such as sipunculid, a small clam, Saxicava arctica, a sabellid worm, Hypsicomus, and others. In deep water, wood may be penetrated by another boring mollusk, Xylophaga.

Near effluent outlets, the kinds of bottoms have largely determined the kinds of animal associations. In coarse, mixed bottoms with little or no current, as at Hyperion, the conspicuous animal is Diopatra ornata.

Where currents occur, as at Whites Point, it is Chaetopterus variopedatus with Ophiothrix spiculata. In sandy or muddy bottoms it is Nothria elegans, and where bottoms are mixed with gravel it may be Glycera or Nephtys species.

The most flourishing population of Diopatra ornata has been found close inshore near Malibu Point. It is adjacent to macrokelps on which it may depend for its food and tube-building materials. The densest colony of Chaetopterus is at Whites Point. This species feeds by secreting a mucus mesh in which it captures various microorganisms as they are swept along with the currents.

The preponderance of a few families of animals is noteworthy. The onuphids are well represented with Diopatra ornata, usually in coarse sediments near shore or near outfalls, and Nothria elegans occurs in finer bottoms at similar levels. In deeper waters, these are replaced by Onuphis nebulosa, O. vexillaria, Diopatra tridentata, or others. The maldanids, represented in shallow waters by Praxillella and Axiiothella are replaced in other areas by Maldane in soft bottoms, and by Isocirrus in gravelly bottoms. Among the chaetopterids, Chaetopterus is tolerant to effluent and requires currents; Phyllochaetopterus prolifica requires mixed bottoms and thrives in a wide range of vertical depths; Telepsavus occurs in shallow fine sandy sediments; Mesochaetopterus is in soft deeper bottoms, and another kind of Phyllochaetopterus occurs in subsill depths of the basins.

Among the glycerids, Glycera americana is predominantly present in mixed bottoms in shallow water. It gives way to G. capitata in finer sediments and deeper water; to G. tessellata at moderate depths, and to G. branchiopoda at deepest levels. Other kinds of systematically-related animals have shown similar patterns of replacement with differences in depth and kinds of sediments. In Santa Monica Bay, such species are in the spionid, magelonid, cirratulid, paraonid, nephtyid, goniadid, and other family groups.

The enteropneusts (acorn worms) are noteworthy for their occurrence in shallow to deep areas. Members of the Spengelidae are represented by no less than three species, and the Ptychoderidae by one or more. Saccoglossus of the spengelids occurs in shallow soft bottoms, and Schizocardium (with perhaps more than one species) has been found in depths of a few feet (in Zone II) to about 2300 feet on the Palos Verdes slope. Stereobalanus has a similar wide vertical range, and the ptychoderids have been found in shallow area (Woodwick, in Hartman, 1955).

Faunal Affinities

Geographical

Santa Monica Bay belongs to the temperate east Pacific faunal subdivision, or the Californian Province (Ekman, 1953, pp. 151-156), which reaches north to about 42° north latitude (near Cape Mendocino, California). At

its southern range it extends to Lower California or western Mexico. It is said to be characterized by a southern submergence, which means that species existing in shallow waters to the north, occur at greater depths farther to the south (southern and Lower California), because of gradually rising surface temperatures.

Furthermore, the endemic (native) element in the temperate fauna of the North American Pacific Ocean is believed to be developed to the extent that endemic species constitute at least half of all species in the various animal groups. These conclusions were reached from studies based largely on hard-shelled mollusks, echinoderms, and fishes coming mainly from parts of central California and northward. Applications to southern California is therefore limited except to deeper waters, because the surface temperatures are much higher. In the basin systems of southern California there are perhaps barriers of unknown quantities and kinds, and in Santa Monica Bay there are additional variables resulting from possible effects of pollution. It is difficult, therefore, to find parallel studies. In the best studied groups of metazoan invertebrates (mollusks and echinoderms) there are many specific names, referring to geographic locations of southern California, which suggests that these species are endemic to these places.

Some comparisons were made with quantitative samples taken from shallow bottoms near Acapulco, Mexico (collected

February 1955 by Jens Knudsen). These showed the presence of some species identical with those in southern California. Many more were lacking from one or the other area, and still others, including the annelid genera, Aglaurides, Chaetacanthus and Hesione, were well represented in the south, but absent in southern California. Cerianthid anemones were abundant and large at Acapulco, but small or of another kind in Santa Monica Bay.

Quantitative studies made in the Puget Sound area of Washington by Shelford and associates (1935) named many species occurring in shallow (to 105 feet) unpolluted level bottoms. The study was based largely on hard-shelled mollusks, many of which do not occur in Santa Monica Bay. A complex system of classification was described. Some species were called biome prevalents or predominants, others were slow moving influents. There were characteristic species and faciations, and interactions of coaction and reaction kinds. The Puget Sound area was described with broad expanses characterized by the dominance of one or a few kinds of species, with clear boundaries existing from one expanse to the next. One restricted area in East Sound, with bottoms in 60 to 105 feet, was investigated with a small Petersen bottom sampler which took samples from a tenth of a square meter. The sediments were then screened through a 0.20 mm mesh. From 14 such samples, 68 metazoan invertebrate animals were identified (Weese, In Shelford

pp. 316-318). Of these, 45 were various kinds of polychaetes, 20 were mollusks, and 3 were echinoderms. Allowing for changes in systematic nomenclature, about half of the polychaete species are the same as those in Santa Monica Bay, and the other half may be kinds limited to more northern or colder waters. The ratio of polychaete numbers to total individuals counted, in various depths was given as follows: 5016:5276; 36:266(a clam bottom); 6:104 (a clam bottom); 2058:2683; 84:205 (a snail bottom); 1659:1993; 1294:1368; 45:1454 (a holothurian bottom); 35:562 (a holothurian bottom); and 39:132 (an echinoderm bottom). From this analysis it will be seen that mollusks are limited to shallower, echinoderms to deeper bottoms, and polychaetes are prominent in all depths. Smaller crustaceans, which might have been present, were not noted. Ophiuroids were said to be most abundant in 90 feet.

Benthonic studies in Japan in the northwestern Pacific (Miyadi and associates, 1940) in shallow (less than 60 feet) nonpolluted areas, emphasized the preponderance of certain groups of animals. Polychaetes and mollusks constituted the major parts, with echinoderms and smaller crustaceans next in numbers and all other kinds less than 3%. Two kinds of communities were recognized, a Maldane (bambooworm) in the deeper muddy or sandy bottoms, and a Cerithium (snail) in shallower shelly bottoms. The Maldane was commonly associated

with an amphipod, Ampelisca, and both the worm and the snail communities were characterized by the presence of mollusk genera such as Tellina, Cylichna, Philine, Dentalium, Nucula, Macoma, and polychaete genera such as Prionospio, Magelona, Glycera, Terebellides, Sternaspis, Chaetozone, and Praxillella, all of which occur in nonpolluted areas of southern California.

Most of the species in the benthos of Santa Monica Bay are believed to be endemic; that is, they have restricted, not cosmopolitan, distributions. There are perhaps many which are nearly related to some from similar habitats in other temperate areas, and among the annelids these are Capitella capitata, Maldane sarsi, Chaetopterus variopedatus, Terebellides stroemi, Sternaspis scutata, Scalibregma inflatum, and others. It is noteworthy that although these are not easily distinguished morphologically from their relatives in North Atlantic areas, they may, by detailed study, show physiological or other differences which may have more than varietal significance. For example, Chaetopterus variopedatus is best known for constructing a U-shaped tube, largely or fully embedded in the substratum except for its distal ends, and it usually harbors commensals of several kinds (a small fish and polynoid). In southern California, however, it forms dense clusters or irregularly tangled tubes clumped together on the surface, and not embedded. It has never been found to harbor a commensal. In most

cases the specific names of these genera have been avoided, since a much more detailed study of the species is required.

Among the ophiuriids only one, Amphipholis squamata, is regarded cosmopolitan. Among the amphipods there are perhaps 2 or 3 species, and among the mollusks there are believed to be very few.

Patchiness

The patterns of patchiness known in the San Pedro area (Hartman, 1955) occur also in Santa Monica Bay, but are less marked. A species may be abundant and conspicuous in one sample, and rare to absent in an adjacent one, but its recurrence can be expected in other more distant samples. These variations might be explained for slight changes in the character of sediments such as size of grain, varying amounts of organic content, differences in nutrient values of the overlying water columns, proximity to kinds of foods, incidental dispersal of larvae, or other indirect causes. Differences in rates and/or times of larvae and other settling stocks which are necessary to replenish the beds, might effectively alter the entire facies of a population. Many smaller species, abounding in shallow water, are known to grow rapidly and may reach maturity within a period of a few weeks or months. This is especially the case for many polychaetes which are numerically and productively high in Santa Monica Bay.

Aside from occasional samples which have been recovered from the bottom with pitch globules, there have been no indications of repellent bottoms such as have been described in British Seas (Wilson, 1953). Sediments of nonpolluted areas have been classed as attractive, neutral, or repellent in their reactions to settling of larvae. According to this theory, attractive factors derived from organic activity, such as a coat of living microorganisms as bacteria, can be too abundant or too few for settling of some species. Bottoms with dead organisms and non-living organic matter can be actually repellent.

Where compositions of sediments appear about the same (such as fine mud), the kinds, proportions, and densities of animal species may vary considerably in adjacent areas. Exception can be made to the more immediate areas of the outfalls, where differences in kinds of associations are more accurately expressed in terms of distance (within 1 to 3 miles) from the end of the pipe and with kinds of sediments.

Because of patchiness in shallower bottoms, it is difficult to repeat samples with like results, even though they presumably come from identical bottoms. It should be noted, however, that the associations of species, rather than individual kinds and amounts, share the common characteristics and can provide an index of productivity. Beyond these shallower depths the assemblages

of organisms vary with greater horizontal distance and reflect differences in kinds of sediments, amounts of light intensities, decreasing temperature ranges and perhaps other physical factors.

Diversity resulting from cyclic (seasonal or diurnal) or from meteorological changes are believed to be insignificant in Santa Monica Bay, except in the shallowest parts where bottom temperature or salinities might differ from one season to another, or after prolonged rainfalls.

One of the most striking phenomena of patchiness in areas of southern California has been observed in the accumulating evidence for unusual abundance of certain gregarious species occurring in one, or a few, restricted patches, perhaps not exceeding several square yards in extent. In Santa Monica Bay there are such beds as Schizocardium (enteropneust) with commensal pinnixid crabs at Zone II-6, Dentalium rectius (scaphopod) at V-2, Thalassema sp. (echiuroid worm) at V-6 and V-7, Pisione nr. remota (polychaete) at II-1. Glottidia albida (brachiopod) occurs in many shallow areas in Santa Monica Bay, but the individuals are usually small, presumably immature, and few in number in any one sample. Mature individuals have been found in unusual abundance at only one place (Station 3410-55) off Palisades on the outer side of Santa Catalina Island in 20 fathoms. Myxicola sp. (polychaete) is sparse in most parts of southern California, although it is to be found in shallower

areas where currents prevail, sometimes in Chaetopterus beds, or in rocky shaley pockets. However, off Santa Rosa Island (Station 3505-55) it occurs in a flourishing aggregate of large individuals that has not been found at any other locality. A conspicuous bed of Lacqueus californicus (brachiopod) is believed to be present along a rocky shelf off Empire Landing, on the leeward side of Santa Catalina Island, in less than 40 fathoms. Its occurrence in other areas is noted only as scattered small clusters or individuals, usually with one or a few valves of another brachiopod, Terebratalia transversa, in rocky outcrops of similar depths. It seems possible that these and other unique aggregations survive through periods of years, and that they have biological properties which encourage the settling of new stocks to insure existence through successive generations. At any rate, it must be assumed that there is no sparsity of larval or settling stocks in other more distant areas.

Systematic Classification of Faunal Units in Santa Monica Bay

Any scheme of classification must ultimately be by systematic categories so that each species will have a binomial name which can be recognized by other scientists. Its place in the phylogenetic scale will then be established. In Santa Monica Bay, as well as most of southern California, this is a problem of the greatest magnitude because many of the animals (including some economically important ones)

are still unknown.

Among the smaller crustaceans, which include about 150 species and abound in most of the shallower bottoms, especially in the environs of outfalls or other polluted areas, 90% of the amphipods, 80 to 90% of the cumaceans, and 80 to 90% of the ostracods are considered to be unknown (Personal communication, Dr. J. Laurens Barnard). These three crustacean groups are not only highly differentiated, but may have indicator value.

The worm-like animals, including the polychaetes, echiuroids, sipunculids, nemerteans, enteropneusts, phoronids and solenogasters, are all well represented in Santa Monica Bay, but are among the least known of all invertebrates. The polychaetes (segmented worms) are represented by no less than 350 species, most of which are poorly or not known. They occur at all depths and in moderate to great abundance, and are associated with sediments and other animals in predictable numbers and kinds. The echiuroids (spoon worms) are represented by 5 to 10 species, all either unknown or recorded through only original descriptions. Sipunculids (peanut worms) and nemerteans (ribbon worms) are conspicuous and easily recognized when present, but their systematic categories remain to be determined. Enteropneusts (acorn worms) of large size have been found to occur in significant parts of Santa Monica Bay and at varying depths. According to the authority of specialists, they have not been studied

or named. Solenogasters (worm-like mollusks) have been found in a wide variety of bottoms and at different depths. They are currently being studied by specialists in Europe who have tentatively identified 10 to 20 different kinds of Chaetoderma, a Limifossor and a neomeniid, all of which represent either new records or unknown kinds.

Echinoderms (especially brittle stars, sea urchins, seastars and cucumbers) are rather well known (Personal communication, F. C. Ziesenhenné) and were found to be represented by 58 species. The brittle stars were found to be particularly characteristic in some parts of the bay (see Analyses below).

Small mollusks (pelecypods and gastropods) are present in considerable numbers where the effects of pollution are low. Because of hard shelled parts they are easily collected, but their specific determinations are made with difficulty. Their systematic study is in progress and when completed these groups may show significant patterns of distribution and abundance. In the adjacent San Pedro area, the shelled kinds comprise about 132 categories (Personal communication, Donald Wilson). In a recent study of mollusks from the offshore islands of southern California (Berry, 1956), 91 species were reported from 11 to 58 fathoms, dredged from muddy and algal bottoms. The number of individuals in single dredge hauls ran as high as 198 for Amphissa undata (small snail),

105 for Acila castrensis (small clam) and 98 for Mitrella carinata (snail). Another haul north of Anacapa Island had no less than 59 species. The other kinds of animals in these hauls were not named.

Illustrated faunal handbooks and keys for ready identification of the invertebrate animals of southern California are greatly needed in attempting a study of many of these groups of animals. Many are still unknown or unrecorded. Until these needs are supplied, studies of other kinds will not only be discouraging, but impossible.

Ecological Classification of Faunal Units

A systematic classification is an expression of genetic differences between the various faunal units and therefore expresses progressive degrees of developmental similarity or relationship. An ecological classification, on the other hand, is an expression of degrees of social integration, of adaptational modifications and adjustments to environmental factors. This results in grouping organisms according to unrelated phenomena, such as the kinds of sediments they inhabit, the character of the food they eat, the levels of temperature or light tolerances, and other factors of external origin.

Although ecological classification has no phylogenetic significance, it is valuable to recognize groups or associations of animals, which may have indicator value,

but vary with time and place, with depth, and with geography. Once known, however, they predict not only their living environment, but the physical and nonbiological factors or changes with a higher degree of accuracy than can be done with mechanical instruments. In Santa Monica Bay these assemblages or associations of organisms have been found not only to differ appreciably with varying distances from the ends of the outfall, but to vary in kind, in organic productivity, and according to the sediments they occupy. These results are expressed more fully in the Analyses of samples from these faunal zones.

A single association from shallow bottoms of Santa Monica Bay may be represented by a quantitative sample taken from a bottom area measuring two to four square feet, in a volume of sediments measuring from one to three cubic feet. Actually the samples have varied considerably from these dimensions, usually in the lesser directions. A sample may contain between 50 to 90 different kinds of metazoan invertebrate animals, numbering from 500 to 1000 individuals, in various stages of growth to maturity. These assemblages exist in integrated though constantly changing patterns, and maintain inter- and intraspecific stabilities over periods of time that may exceed a year. Because they are believed to include largely species with short life histories (less than a year), there must be the constant replacement of populations by young individuals, many of which pass through

swimming or planktonic stages in the upper columns of water.

Any factor that might affect one of the units of such an association, such as diminished food supplies or other unfavorable physical or chemical conditions or disease, might effectively upset a balance which could bring about a change in the facies of the entire association. Such changes have doubtless occurred in the past, and continue to occur in Santa Monica Bay. As evidence, there are not only the dead remains of former inhabitants, such as shell or tube fragments and bored rocks, but there exist unusual abundances of some kinds of animals which would not be normally expected unless there was an unbalance of feeding types. These abundance peaks are most prominent in Zone I (Limited Enriched Sector). It is noteworthy that areas of displaced populations are perhaps constantly being restocked by animals of other kinds. Settling stocks as swimming or creeping larvae may be constantly available from outside sources, but only few kinds might be expected which can establish themselves. The replacement of worn out, starved, or overpolluted areas in Santa Monica Bay may be ecologically complex. It may differ with time of year and with depth and kind of bottom. The temperature, salinity, and pollution tolerances of the invading animals, are other factors of importance.

Animals can be further classified according to the

depth of horizon at which they exist, from shallow (a few feet), to slope and deep (2940 feet) areas (see Zones I to VI for the major areas in Santa Monica Bay). They can also be classified according to biological requirements, such as varying amounts of dissolved oxygen, or lack of it (the near absence of life in subsill parts of Santa Monica Basin may be the result of such a lack). These animals can be classified according to their feeding habits as predators or scavengers (living on dead animal food), carnivores (flesh-eaters), herbivores (plant feeders), detritus feeders (such as most animals near Hyperion), limnivores (ingesting mud with contained microorganisms), filter feeders (straining water containing nutrients), or as commensals or parasites (depending on other animals for their food). All of these are represented in Santa Monica Bay. In normal habitats, all feeding groups can be expected to be represented in an association. In the environs of the outfall, however, most species are detritus feeders (polychaetes and Astropecten). Predators are occasional, entering the area as foragers (such as larger Cancer crabs, frog snail, and flounder fishes).

Species vary according to tolerances to salinity so that near the outfall where large volumes of nonmarine water are introduced, most echinoderms, mollusks, many entomostracans and polychaetes are unable to exist. As the effects of these dilutions decrease, the number of

kinds invading the areas is gradually enlarged and approaches peak productivity.

Ecologically these species vary according to the sediments they occupy; whether mud, silt, sand, gravel, rock, algae, or mixed bottoms. In the sediments they maintain over (pelagic), on (epifaunal), or in (infaunal) positions. The positions may differ according to stages of life history, for some have pelagic eggs and larvae, and at a certain age they sink to the bottom and creep about, seeking suitable sediments for settling. Once a suitable habitat is found, they metamorphose and grow to maturity in the sediments. Other animals may be errant or foraging as adults (crabs, Chloeia, many snails), or they may be attached to a substratum, as hydroids, barnacles, bryozoans. Many are tubicolous and construct characteristic tubes which require building materials of exact kind and size, according to kind or species. Others are nestling and occupy the burrows or tubes made by other kinds, or they may be somewhat buried (seawhip, Glottidia), or burrowing (many mollusks, worms, some urchins). Each kind has specific requirements which differ from those of others, and each species is uniquely modified to occupy its niche at maximum efficiency.

In Santa Monica Bay only a few boring species have been identified. Such are some sipunculids, in dead tests of Dendraster, Zone II, and others in shaley rocks in outer parts of Zone I. A small clam (Saxicava) occurs

in calcareous rock and a boring sabellid in the outer areas of Zone I. A deep-water boring mollusk, Xylophaga, occurs in water-logged wood. Commensal species may be more frequent than current records indicate. Astropecten (the large sand seastar) harbors two polychaetes, and a small clam is frequently overrun with a creeping hydroid. Parasitic forms have been infrequent or perhaps overlooked. Such are parasitic crustaceans (copepod on Terebellides; rhizocephalan in Gnathia) and others. The presence of commensals or parasites with host species can be regarded as a normal or healthy condition, and when one of the association species is absent, it is usually the most dependent one (in such cases, the parasite).

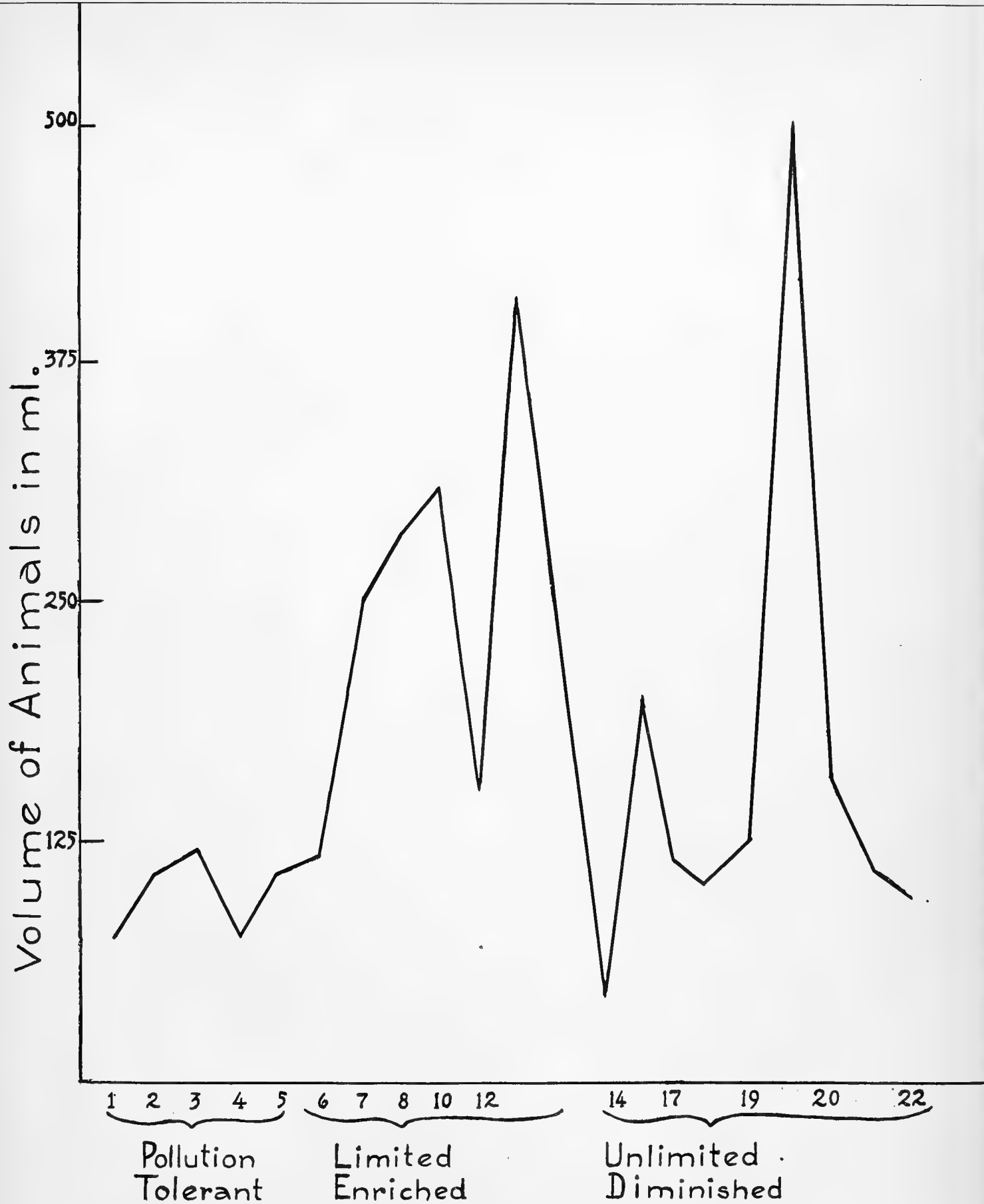
In Santa Monica Bay it has been found convenient to classify animal associations according to increasing distance from the ends of effluent pipes. Six such areas have been identified, varying with successive distance from an inner zone, at intervals of a half, to several miles. The inner, or most shoreward zone, the Beach-Sand Fauna, is characteristic of much of the strand of Santa Monica Bay, and may be little influenced by the effects of pollution. Only one sample, I W-1, was examined. It contained mainly sand worms, Nephtys californiensis, several snails, a sand crab, a prochordate, and numerous smaller sand-dwelling species. All of these species may be dug up along the sandy beach at low tide.

Sample I W-2, from the bottom under the end of the

pipe, is regarded as a Limited-Pollution-Fauna. Most characteristic were two onuphids, Nothria elegans and Diopatra ornata, also Nephtys caecoides and Glycera americana. These are also intertidal forms and can withstand considerable exposure or dilution. Other samples in this zone (I SW-1), where sediments were coarse, had considerably more Diopatra and some other kinds. Their kinds and numbers increase gradually with greater distance from the pipe (Zone IW-3 to 6), and they come to attain excessive numbers and sizes farther away (Zone I W-6 to 12) where the greatest numbers and largest sizes are found. Thus we may speak of peaks of productivity or maximum biomass in this zone.

Biomass is an expression of the quantity of organic matters expressed in terms of unit areas. It varies with kinds of bottoms, and with depth so that the greatest volumes are usually in shallow depths. In Santa Monica Bay such peaks are related to amounts of nutrients supplied by the effluent. They have been observed in a variety of species (Figure 4), some of which are listed, and others are named in the Analyses. Such peaks of productivity have been observed persisting through different months of the year. Thus they are probably not seasonal or fluctuating or the results of large numbers of larval or juvenile individuals, but perhaps are directly proportional to increased nutrients and indirectly to variations in salinity from normal sea water. The estimated biomass

Figure 4. Graph showing estimated biomass values in Zone I, with peak productivity at I-19 to 20.



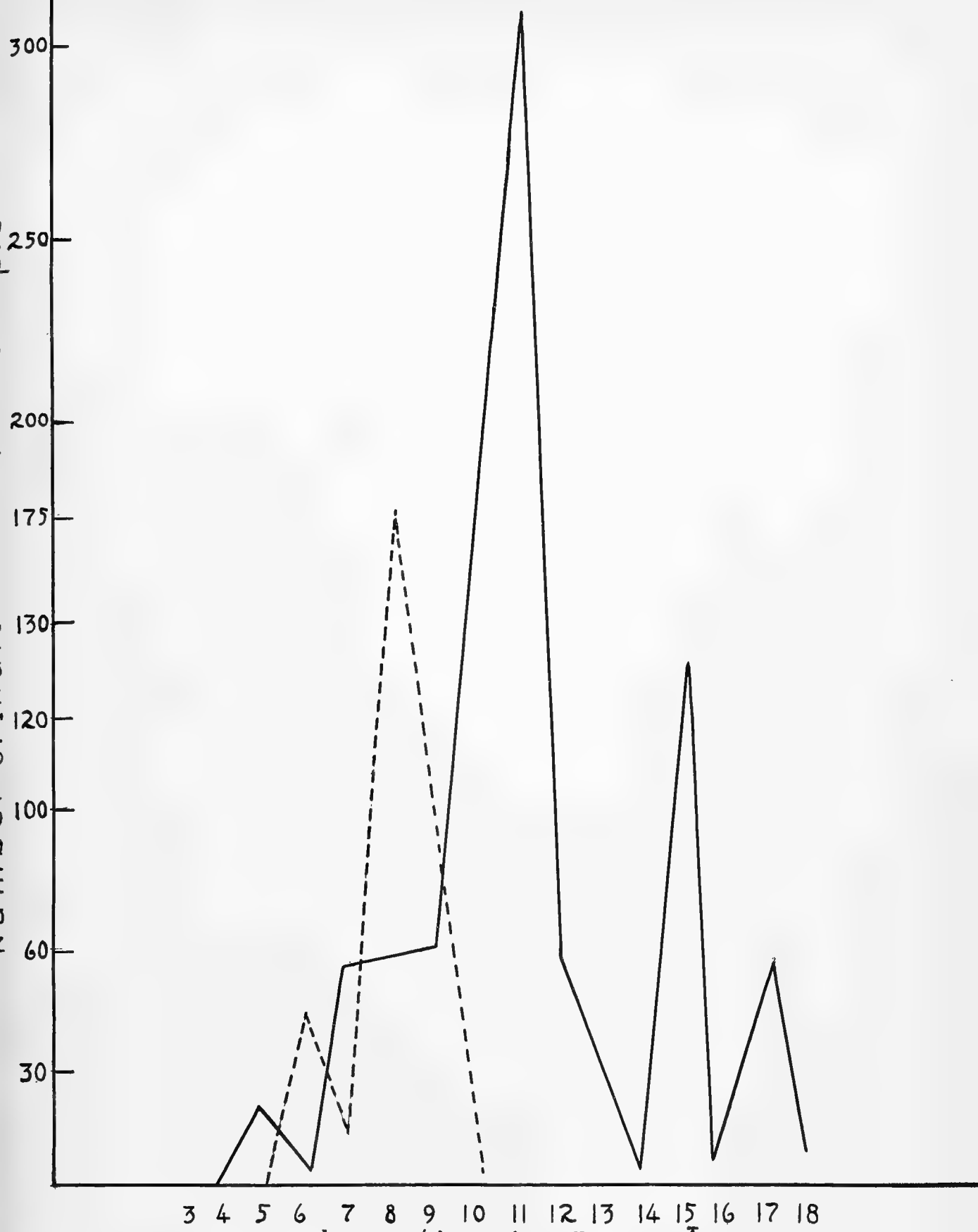
Estimated Biomass Values, in milliliters for samples taken in Zone I, from 1 to 22.

values, taken from samples in Zone I-1 to 22, are indicated in Figure 5.

Polychaetes with peaks of productivity, the numbers of individuals, and the location of zone or area are:

- Ampharete ?arctica 200+ individuals (San Pedro)
- Aricidea suecica 90+ at 224 (San Pedro)
- Brada ?pilosa 25 at V-25
- Capitella capitata nearly 1000 at 42 (San Pedro)
- Chloeia pinnata 150+ at II-7
- Chaetopterus variopedatus hundreds off Whites Point
- Chone ecaudata 200+ at 69 (San Pedro)
- Dorvillea articulata 200+ at 42 (San Pedro)
- Eumida ?sanguinea 41+ at 42 (San Pedro)
- Exogone sp. 26 at I NW-4
- Glycera capitata 16+ at I SW-8
- Goniada littorea 12 at III-1
- Haploscoloplos elongatus 13+ at I NW-3
- Harmothoë lunulata var. 10 or more at III-4
- Lumbrineris spp. 100+ at II-7
- Magelona (pouched) 20+ at I SW-3
- Maldane sp. 50+ at V-23
- Nephtys californiensis 15 at I W-1
- Nereis procera 70+ at I SW-1
- Nothria elegans 35+ at I SW-3
- Nothria pallida many at V-17
- Pectinaria californiensis 90+ at I W-10
- Phyllochaetopterus ?prolifera 50+ at II-3

Figure 5. Graph showing peak productivity of two associated ophiuroids in the Limited-Enriched-Fauna of Zone I.



Location in Zone I.

Chart comparing Maximal numbers of *Amphipholis squamata* in Zone I W, (solid line) and Zone I SW, (broken with peak numbers between 8 and 11).

Pisione nr remota many at II-1

Prionospio nr malmgreni 120+ at II-2

Prionospio pinnata 40 at I SW-6

Ophiuroid echinoderms with peaks of productivity
and location:

Amphiodia (Amphispina) urtica 654 individuals at
I W-11; 441 at I W-9; 328 at I SW-9; 141 at I SW-8;
123 at I W-7; 118 at I NW-8; and 46 at I W-16

Amphiodia (Amphispina) digitata 531 at I W-10
47 at III-11; and 37 at I W-13.

Amphipholis squamata 305 at I W-11; 176 at I SW-8;
157 at I W-10; 126 at I SW-9; and 78 at III-11.

Amphiacantha amphacantha 24 at V-4

Ophoithrix spiculata a thick mat with hundreds of
individuals in a sample off Whites Point.

Bio-index is an expression of the ratio of number of
species to that of individuals. It varies with kind of
bottom and with depth. In shallow areas it is lowest
in mixed bottoms where currents prevail (as at Whites
Point), or in Santa Monica Bay in Zone II. It rises
sharply with depth to Zone VI where the ratio approaches
one.

In Santa Monica Bay there is a marked decrease in
numbers of species with increasing depth. They may drop
from 60 or 90 species in a shallow sample from 60 feet,

to 3 or none in 2820 feet. Variations from a straight descending line graph may result partly from imperfect sample sizes, or they may reflect the presence of a few larger predaceous individuals or other patterns of patchiness.

Indicator Species

An indicator species is one which can provide precise information in geography, ecology and distribution, or one which can indicate characteristics of physical and chemical significance. Such species, to be of value, have certain requirements. They should be specifically identified, they should be endemic to an area, not cosmopolitan in range, and their horizontal and ecological limits should be known. They should be easily recognized so that their identity cannot be confused with nearly related ones. In some recognizable form of their life history they should occur in all seasons, or at least not fluctuate. For those undergoing changes in development, their stages should be known and recognizable. They should also occur in sufficient numbers to represent stable, not stray, populations (Sverdrup, Johnson, and Fleming, 1942). Their tolerances to varying amounts of salinities, to changes in temperature, to varying concentrations of silt, to possible toxic substances, or degrees of acclimitization of these factors should be known. Thus, sedentary or attached species have greater

indicator value than foraging or roaming kinds.

In Santa Monica Bay the use of indicator species seems especially practical because many occur as aggregates or in association, and have limited ecological distributions. Some of these by location in zones and alphabetic by group are:

Ampharete ?arctica near outfall, nr 42 (San Pedro)

Aricidea spp. at I SW-1, 3, 6; II-1, 3, and 8.

Capitella capitata at SW-3 and nr 42 (San Pedro)

Chaetopterus variopedatus rare in SMB; common at 27, 43, 110, and 186 in San Pedro area.

Chloeia pinnata at I SW-8; II-7; and III-5

Chone ecaudata at 69 in San Pedro area

various cirratulids, especially Tharyx, Chaetozone, at I W-1 and 2; I SW-1, 3, and 6; I NW-1 and 9.

Diopatra ornata I SW-1; I NW-2

Eumida ?sanguinea rare in SMB; nr 42 in San Pedro area

Glycera americana and G. capitata in varying distances from the outfall.

Hypoeulalia sp. at I W-1

Lumbrineris cruzensis, L. bicirrata and other kinds, at varying distances from the outfall.

Magelona spp. differing in depth at varying distances

Nephtys ferruginea at I SW-3 and 6

Nereis procera at I SW-1, 2, 3; I NW-3 and 4

Nothria elegans at I W-2 and 4; I SW-2 and 3; I NW-1

Onuphis nebulosa at I W-13, gravelly or sandy bottoms remote from the outfall

Pectinaria californiensis varying distances from the outfall, associated with fine sand.

Pherusa capulata gravelly bottoms remote from outfall

Pherusa inflata penetrating soft shaley rocks

Pholoë at I W-8; II-7; and III-5

Pisione nr remota at II-1; 36b in San Pedro area

Prionospio pinnata at I W-7; I SW-6

Rhynchospio arenicola 63a (San Pedro)

Tharyx parvus at I W-2; I NW-7; I SW-6

Echinoderms with:

Amphiodia (Amphispina) digitata at I W-10

Amphiodia (Amphispina) urtica at I W-9 and 11; I SW-9

Amphipholis squamata at I W-10, 11, and 12; I SW-8 and 9; I NW-8; III-11

Ophiothrix spiculata 42a (San Pedro) requiring current

Astropecten californicus in Limited-Enriched-Fauna near the outfall

A checklist with keys to systematic entities of the commoner species from a given geographic region would be most valuable to permit the analyses and evaluation of different populations. In southern California this lack is one of the greatest obstacles in ecological surveys, for many large and important animals are either unknown

or unreported.

Results of Some Other Biological Observations

A fish-kill in June 1956, resulting in the death of several hundred tons of fishes, along the shallow beaches of Santa Monica Bay was found to have been caused by the discharge of large volumes of scalding water by the Edison power plant. The fishes examined were surf-perches and measured 3 to 5 inches long.

The use of current meter lines along outer parts of Zone I resulted in occasional catches of the large sand sea-star, Astropecten californicus, with commensal polychaetes, Arctonoe and Podarke, both of which do not occur with their host in the more immediate environs of the effluent outfall. The fire-body, Pyrosoma atlanticum (a colonial tunicate), was occasionally snagged on lines during the summer months.

Lobster traps baited with dead fish were set at varying distances from the outfall, with the following results. On one line extending 1.2 to 3 miles from the Hyperion stack, in depths of 10 to 25 1/2 fathoms, traps were dropped in the evening and pulled up in the morning. The stations were those of the VELERO IV numbered 4448-56 to 4451-56.

Station 4448-56, in 60 feet.

Bursa californica, the frog snail; two larger sand dab fishes; 9 Astropecten californicus;

17 medium large Cancer crabs:

Cancer jordani -3: one female 50 by 75 mm,
with spent egg capsules, and two smaller
immature males.

Cancer antennarius-14: none with attached
eggs or larvae;

male, 149X95 mm, 429 grams (wet weight)

male, 130X80 mm, 273.5 grams

female, 140X95 mm, 458 grams

female, 120X80 mm, 247 grams

female, 148X95 mm, 404.5 grams

female, 130X85 mm, 288 grams

other juvenile males and females, about
two-thirds grown, some spotted or immature
stages.

The following were attached to the shell of Bursa:

Balanus tintinabulum californicus numerous
living juveniles and some large dead shells.

Crepidula the common slipper shell- one

Sabellaria gracilis a sand builder- 2,
one ovigerous

The debris from the animals in the trap contained:

immature gastropods, perhaps Eulima- 11

a brown papillated nudibranch

a slender dark-purple immature leech

several kinds of amphipods

a cumacean bearing ova

a parasitic cyclopoid copepod, with a pair
of long egg cases

Podarke pugettensis, hesionid polychaete
several small specimens of a chrysopetalid
polychaete

2 nematodes

Substation 4448-56

Same as above but using a plastic mesh lining
in the trap. When recovered, the openings of the
trap had a very large Cancer antennarius wedged
across the aperture. The trap contained only 3
moderate-sized Astropecten californicus, a juvenile
Cancer jordani in the process of moulting.

Station 4449-56 1.7 miles from Hyperion stack in
84 feet of water. The trap contained:

Astropecten californicus 6 moderately large
Cancer antennarius 3 large with attached Balanus
male, 145X100 mm, 575 grams
female, 135X90 mm 368 grams (no eggs)
female, 135X90 mm, lacking chelae, 256 grams
no eggs.

Balanus tintinabulum californicus on carapaces
of Cancer

Station 4450-56 1.95 miles from Hyperion stack in 102
feet of water. The trap contained:

Cancer antennarius 8 large: 4 males and 4
females, all with attached barnacles on the

exposed surfaces of the carapaces. The largest male, 175X115 mm, lacked two walking legs and weighed 827 grams.

Station 4451-56 3 miles from Hyperion stack in 153 feet of water. The trap contained:

Cancer antennarius 6; the largest a male, 168X110 mm, weighed 857 grams.

Astropecten californicus 7

Balanus tintinabulum californicus, on carapaces of Cancer crabs.

From these results it appears that not only crabs and snails forage in search of food, but that Astropecten has similar habits.

Comparative Food Values of the Benthonic Animals

The wide-spread use of bait-worms in various parts of the world indicates the preference of many fishes for this kind of food. Commonly used are several kinds of Glycera, Marphysa, nereids, nephtyids, opheliids, Arenicola, and others. (The frequently used terms blood, sand or proboscis worms, refer to color, habitat or some part of the animal. The names differ with locality and have no specific meaning.) Soft-shelled clams and sand shrimps are also used for bait. These animals are the most natural foods of animals in the sea. Some animals which occur in great numbers, such as sea-stars and brittle-stars, have little if any food value, whereas urchins may be

sought for by some foraging animals. Pelagic larvae of many benthonic animals are a chief source of food.

It is generally agreed (Blegvad, 1951) that many animals select their food and that they seldom change diets. Benthonic animals can be regarded as the chief source of food for predators and carnivores. Fluctuations in their kinds and numbers can thus provide an index of productivity of animals in higher categories. In a series of studies on the food of bottom-feeding fishes of Danish waters, Blegvad regarded most pelecypods and smaller crustaceans and nearly all polychaetes as first class plaice food. The amounts by weight and frequency in stomach contents of fishes, gave worms the highest ratings, varying from 50 to 90%. Pelecypods and crustaceans comprised most of the rest. Later Blegvad summarized the results of studies of nearly 25 years and showed that only slight variations in kinds of foods occurred with time and place. It was found that the amounts of commercial fishes caught were directly related to the amounts of bottom animals present. These experiments may be directly applicable to the animals existing in Santa Monica Bay.

Size of the Largest Animal Species Taken

Most invertebrate metazoan animals in Santa Monica Bay are small to minute, often measuring less than one to two inches long. A few individuals, from scattered places,

have been conspicuous for their size or weight. They include:

Cancer antennarius Station 4450-56 827 grams

Astropecten californicus at I SW-4, 3 1/2 inches across

Pisaster giganteus at I NW-6, weighed 187 1/2 grams

Stichopus californicus at I W-20, measured 5 inches

Compsomyax subdiaphana a clam, at III-7, measured 2 1/2 by 1 3/4 inches and weighed 24 grams.

Macoma a clam, at II-6, weighed 31.7 grams

?Drupa a snail, at I NW-6, weighed 75 1/3 grams

Glycera robusta at I W-10b, the only one of this kind taken.

Acknowledgements

The author is indebted to the various teams which cooperated on board the VELERO IV, in taking and processing the biological samples used for this report. David Scholl, assisted by Donn Gorsline, Emil Zalesny, and others, did much of the field work. To Drs. Robert E. Stevenson and K. O. Emery she is indebted for organizing the various aspects of the project, and for much information on physical data. The maps and figures were prepared by Anker Petersen. The author is especially thankful to Captain G. Allan Hancock for his interest and support of these studies, and to the Hyperion Engineers, Inc. for their financial aid.

Literature Cited

- Berry, S., 1956, Mollusca dredge by the ORCA off the Santa Barbara Islands, California in 1951, Jour. Wash. Acad. Sci., Vol 46, pp. 150-157
- Belgvad, H., 1930, Quantitative investigations of bottom invertebrates in the Kattegat with special reference to the Plaice food, Rep. Danish Biol. Sta., Vol. XXXVI, pp. 1-55
- _____, 1951, Fluctuations in the amounts of food animals of the bottom at the Limfjord in 1928-1950, Rep. Danish Biol. Sta., No. 53
- Ekman, S., 1953, Zoogeography of the Sea, Sedgwick and Jackson, Ltd.
- Hartman, O., 1955, Quantitative survey of the benthos of San Pedro Basin, southern California, Allan Hancock Pacific Expeditions, Vol. 19, No. 1, University of Southern California Press, Los Angeles
- Hartman, O., 1956, Results on investigations of pollution and its effects on benthonic populations in Santa Monica Bay, California, Allan Hancock Foundation
- Miyadi, D., 1940, Marine benthic communities of the Tanabe-Wan, Annotationes Zoologicae Japonenses, Vol. 19, pp. 136-148
- Shelford, V. E., A. O. Weese, and others, 1935, Some marine biotic communities of the Pacific coast of North America, Ecol. Mon., Vol. 5, pp. 249-356
- Sverdrup, H. U., M. W. Johnson, and R. H. Fleming, 1942, The Oceans, Prentice-Hall, Inc., New York
- Wilson, D. P., 1953, The settlement of Ophelia Bicornis Savigny larvae, Jour. Mar. Biol. Assoc., Vol. xxxi, pp. 413-438
- _____, 1955, The role of micro-organisms in the settlement of Ophelia bicornis Savigny, Jour. Mar. Biol. Assoc., Vol. 34, pp. 531-543

List of stations in Santa Monica Bay, made by the VELERO IV,
from which biological samples originate,
with cross reference to Zone number

STATION LIST IN SANTA MONICA BAY FROM WHICH
BIOLOGICAL SAMPLES ORIGINATE

- Sta. 2148-52. Sep. 26. $33^{\circ} 49' 32''$, $118^{\circ} 25' 53''$. In 161 fms. OPG took 2.8 cuft. Bottom is mud. See V-15.
- Sta. 2149-52. Sep. 26. $33^{\circ} 49' 54''$, $118^{\circ} 25' 27''$. In 129 fms. OPG took 2.7 cuft. Bottom is mud. See V-13.
- Sta. 2150-52. Sep. 26. $33^{\circ} 47' 56''$, $118^{\circ} 31' 16''$. In 310 fms. OPG took 1.38 cuft. Bottom is mud. See V-25
- Sta. 2151-52. Sep. 27. $33^{\circ} 48' 06''$, $118^{\circ} 30' 39''$. In 291 fms. OPG took 0.5 cuft. Bottom is mud. See V-24.
- Sta. 2189-52. Dec. 5. $33^{\circ} 48' 33''$, $118^{\circ} 28' 30''$. In 228 fms. OPG took 1.07 cuft. Bottom is fine sand and mud. See V-20.
- Sta. 2190-52. Dec. 5. $33^{\circ} 49' 19''$, $118^{\circ} 26' 33''$. In 186 fms. OPG took 3.02 cuft. Bottom is fine sand and mud. See V-18.
- Sta. 2191-52. Dec. 5. $33^{\circ} 49' 42''$, $118^{\circ} 25' 18''$. In 125 fms. OPG took 2.70 cuft. Bottom is green mud and fine sand. See V-11.
- Sta. 2192-52. Dec. 5. $33^{\circ} 49' 58''$, $118^{\circ} 24' 40''$. In 61 fms. OPG took 1.51 cuft. Bottom is fine mud and sand. See V-3.
- Sta. 2193-52. Dec. 5. $33^{\circ} 49' 49''$, $118^{\circ} 24' 12''$. In 40 fms. OPG took 3.0 cuft. Bottom is fine sandy mud. See II-8.
- Sta. 2194-52. Dec. 5. $33^{\circ} 51' 36''$, $118^{\circ} 25' 55''$. In 16 fms. 6-foot beam trawl. Bottom is grey sand. See II-5.
- Sta. 2358-53. July 8. $33^{\circ} 46' 12''$, $118^{\circ} 28' 04''$. In 125 fms. OPG took 2.89 cuft. Bottom is grey clay. See V-12.
- Sta. 2359-53. July 8. $33^{\circ} 48' 00''$, $118^{\circ} 26' 03''$. In 31 fms. OPG took 0.63 cuft. Bottom is gray sand and clay. See II-7.
- Sta. 2360-53. July 8. $33^{\circ} 47' 59''$, $118^{\circ} 27' 58''$. In 49 fms. OPG took 1.63 cuft. Bottom is gray sand, rock, and clay. See II-9.
- Sta. 2361-53. July 8. $33^{\circ} 47' 03''$, $118^{\circ} 30' 07''$. In 157 fms. OPG took 1.44 cuft. Bottom is gray sand and mud. See V-14.
- Sta. 2362-53. July 8. $33^{\circ} 46' 02''$, $118^{\circ} 31' 52''$. In 352 fms. OPG took 2.83 cuft. Bottom is fine gray green mud. See V-29.
- Sta. 2474-53. Oct. 28. $33^{\circ} 46' 03''$, $118^{\circ} 34' 08''$. In 405 fms. OPG took 3.9 cuft. Bottom is green black mud. See V-32.

- Sta. 2620-54. Apr. 7. $33^{\circ} 44' 02''$, $118^{\circ} 33' 59''$. In 418 fms. OPG took 2.20 cuft. Bottom is gray green mud. See VI-2.
- Sta. 2722-54. May 8. $33^{\circ} 46' 00''$, $118^{\circ} 26' 00''$. In 14 fms. OPG took 0.25 cuft. Bottom is green sand and shale. See II-4.
- Sta. 2723-54. May 8. $33^{\circ} 46' 00''$, $118^{\circ} 30' 00''$. In 325 fms. OPG took 3.4 cuft. Bottom is fine green mud. See V-30.
- Sta. 2724-54. May 8. $33^{\circ} 48' 00''$, $118^{\circ} 30' 00''$. In 157 fms. OPG took 2.52 cuft. Bottom is fine green mud. See V-16.
- Sta. 2725-54. May 8. $33^{\circ} 50' 00''$, $118^{\circ} 28' 00''$. In 58 fms. OPG took 1.13 cuft. Bottom is coarse green mud. See V-1.
- Sta. 2726-54. May 8. $33^{\circ} 50' 00''$, $118^{\circ} 30' 00''$. In 70 fms. OPG took 2.77 cuft. Bottom is green mud. See V-6.
- Sta. 2727-54. May 8. $33^{\circ} 50' 00''$, $118^{\circ} 32' 00''$. In 66 fms. OPG took 1.76 cuft. Bottom is green mud. See V-4.
- Sta. 2728-54. May 8. $33^{\circ} 46' 00''$, $118^{\circ} 36' 00''$. In 445 fms. OPG sample not measured. Bottom is green mud. See V-35.
- Sta. 2729-54. May 8. $33^{\circ} 45' 49''$, $118^{\circ} 35' 50''$. In 445 fms. OPG took 3.4 cuft. Bottom is fine green mud. See VI-5.
- Sta. 2788-54. May 22. $33^{\circ} 48' 03''$, $118^{\circ} 24' 47''$. In 9.5 fms. OPG took 1.32 cuft. Bottom is grey sand and shale. See II-1.
- Sta. 2789-54. May 22. $33^{\circ} 49' 59''$, $118^{\circ} 34' 05''$. In 90 fms. OPG took 1.7 cuft. Bottom is blue grey mud. See V-9.
- Sta. 2790-54. May 22. $33^{\circ} 49' 58''$, $118^{\circ} 36' 00''$. In 180 fms. OPG took 2.32 cuft. Bottom is blue grey mud. See V-17.
- Sta. 2791-54. May 22. $33^{\circ} 48' 00''$, $118^{\circ} 36' 03''$. In 415 fms. OPG took 5.08 cuft. Bottom is blue grey mud. See VI-1.
- Sta. 2792-54. May 22. $33^{\circ} 47' 59''$, $118^{\circ} 33' 59''$. In 300 fms. OPG took 2.77 cuft. Bottom is blue grey mud. See V-26.
- Sta. 2793-54. May 22. $33^{\circ} 48' 00''$, $118^{\circ} 32' 00''$. In 251 fms. OPG took 0.95 cuft. Bottom is blue grey mud. See V-22.
- Sta. 2794-54. May 22. $33^{\circ} 44' 02''$, $118^{\circ} 36' 00''$. In 430 fms. OPG took 3.4 cuft. Bottom is blue grey mud. See VI-4.
- Sta. 2963-54. Oct. 30. $33^{\circ} 44' 22''$, $118^{\circ} 44' 16''$. In 490 fms. Campbell grab took 5.74 cuft. Bottom is grey green mud. See VI-13.
- Sta. 2964-54. Oct. 30. $33^{\circ} 49' 26''$, $118^{\circ} 49' 16''$. In 490 fms. Campbell grab took 5.74 cuft. Bottom is grey green mud. See VI-14.

Sta. 2965-54. Oct. 30. $33^{\circ} 54' 23''$, $118^{\circ} 54' 11''$. In 470 fms. Campbell grab took 3.3 cuft. Bottom is grey green mud. See VI-7.

Sta. 2970-54. Oct. 31. $33^{\circ} 45' 30''$, $119^{\circ} 05' 00''$. In 476 fms. Campbell grab took 3.59 cuft. Bottom is grey green mud. See VI-8.

Sta. 2971-54. Oct. 31. $33^{\circ} 40' 37''$, $119^{\circ} 00' 09''$. In 485 fms. Campbell grab. No bottom, grab took water only. See VI-9.

Sta. 2990-55. Feb. 5. $33^{\circ} 49' 08''$, $118^{\circ} 25' 10''$. In 110 fms. OPG took 3.08 cuft. Bottom is fine black mud. See V-10.

Sta. 2991-55. Feb. 5. $33^{\circ} 52' 43''$, $118^{\circ} 26' 53''$. In 22 fms. OPG took 0.5 cuft. Bottom is black mud. See I SW-7.

Sta. 2992-55. Feb. 5. $33^{\circ} 55' 02''$, $118^{\circ} 26' 57''$. In 9 fms. OPG took 0.5 cuft. Bottom is sand. See I SW-1.

Sta. 2993-55. Feb. 5. $33^{\circ} 54' 59''$, $118^{\circ} 28' 47''$. In 21 fms. OPG took 1.38 cuft. Bottom is green mud. See I W-6.

Sta. 2994-55. Feb. 5. $33^{\circ} 55' 00''$, $118^{\circ} 30' 38''$. In 29 fms. OPG took 0.69 cuft. Bottom is green mud. See I W-9.

Sta. 2995-55. Feb. 5. $33^{\circ} 55' 00''$, $118^{\circ} 52' 37''$. In 33 fms. OPG took 0.95 cuft. Bottom is grey sand. See I W-13.

Sta. 2996-55. Feb. 5. $33^{\circ} 55' 03''$, $118^{\circ} 33' 04''$. In 50 fms. OPG took 0.61 cuft. Bottom is rock. See I W-17.

Sta. 2997-55. Feb. 5. $33^{\circ} 54' 57''$, $118^{\circ} 33' 39''$. In 100 fms. OPG took 1.89 cuft. Bottom is fine green mud. See IV-1.

Sta. 2998-55. Feb. 6. $33^{\circ} 51' 22''$, $118^{\circ} 34' 40''$. In 40 fms. OPG took 0.37 cuft. Bottom is black mud. See I W-21.

Sta. 2999-55. Feb. 6. $33^{\circ} 53' 11''$, $118^{\circ} 40' 00''$. In 250 fms. OPG took 2.83 cuft. Bottom is green grey mud. See IV-7.

Sta. 3000-55. Feb. 6. $33^{\circ} 55' 12''$, $118^{\circ} 37' 30''$. In 150 fms. OPG took 2.2 cuft. Bottom is dark grey clay. See IV-3.

Sta. 3001-55. Feb. 6. $33^{\circ} 57' 02''$, $118^{\circ} 35' 09''$. In 70 fms. OPG took 1.89 cuft. Bottom is dull grey clay. See III-9.

Sta. 3002-55. Feb. 6. $33^{\circ} 57' 04''$, $118^{\circ} 37' 31''$. In 125 fms. OPG took 2.77 cuft. Bottom is dull grey clay. See III-12.

Sta. 3003-55. Feb. 6. $33^{\circ} 57' 02''$, $118^{\circ} 40' 00''$. In 160 fms. OPG took 2.45 cuft. Bottom is dark hard clay. See III-13.

Sta. 3004-55. Feb. 6. $33^{\circ} 57' 00''$, $118^{\circ} 42' 27''$. In 230 fms. OPG took 2.2 cuft. Bottom is green grey clay. See III-14.

- Sta. 3005-55. Feb. 6. $33^{\circ} 57' 00''$, $118^{\circ} 44' 45''$. In 280 fms. OPG took 2.83 cuft. Bottom is green grey clay and mud. See III-15.
- Sta. 3006-55. Feb. 6. $33^{\circ} 57' 00''$, $118^{\circ} 47' 05''$. In 330 fms. OPG took 2.77 cuft. Bottom is green grey clay and mud. See III-16.
- Sta. 3019-55. Apr. 1. $33^{\circ} 39' 14''$, $118^{\circ} 39' 29''$. In 425 fms. Campbell grab took 5.31 cuft. Bottom is green mud. See VI-3.
- Sta. 3020-55. Apr. 1. $33^{\circ} 54' 09''$, $119^{\circ} 10' 15''$. In 445 fms. Campbell grab took 4.45 cuft. Bottom is green mud. See VI-6.
- Sta. 3161-55. June 25. $33^{\circ} 47' 56''$, $118^{\circ} 25' 12''$. In 12.5 fms. OPG took .06 cuft. Bottom is fine grey sand. See II-2.
- Sta. 3162-55. June 25. $33^{\circ} 47' 59''$, $118^{\circ} 25' 09''$. In 12.5 fms. OPG took .10 cuft. Bottom is fine grey sand. See II-3.
- Sta. 3163-55. June 25. $33^{\circ} 49' 53''$, $118^{\circ} 24' 39''$. In 60 fms. OPG. Bottom is grey mud-stone. See V-2.
- Sta. 3164-55. June 25. $33^{\circ} 49' 52''$, $118^{\circ} 24' 37''$. In 80 fms. OPG took 2.83 cuft. Bottom is black mud. See V-7.
- Sta. 3165-55. June 25. $33^{\circ} 50' 18''$, $118^{\circ} 23' 36''$. In 22 fms. OPG took 2.83 cuft. Bottom is black mud. See II-6.
- Sta. 3166-55. June 25. $33^{\circ} 49' 15''$, $118^{\circ} 27' 14''$. In 196 fms. OPG took 2.52 cuft. Bottom is green mud. See V-19.
- Sta. 3167-55. June 25. $33^{\circ} 48' 16''$, $118^{\circ} 29' 38''$. In 280 fms. OPG took 1.95 cuft. Bottom is green mud. See V-23.
- Sta. 3168-55. June 25. $33^{\circ} 47' 40''$, $118^{\circ} 32' 10''$. In 315 fms. OPG took 2.08 cuft. Bottom is green mud. See V-27.
- Sta. 3169-55. June 25. $33^{\circ} 46' 33''$, $118^{\circ} 33' 42''$. In 380 fms. OPG took 1.95 cuft. Bottom is green mud. See V-31.
- Sta. 3170-55. June 25. $33^{\circ} 46' 38''$, $118^{\circ} 37' 02''$. In 460 fms. OPG took 2.58 cuft. Bottom is green mud. See V-36.
- Sta. 3171-55. June 25. $33^{\circ} 48' 10''$, $118^{\circ} 37' 04''$. In 425 fms. OPG took 2.45 cuft. Bottom is green mud. See V-33.
- Sta. 3173-55. July 5. $33^{\circ} 48' 04''$, $118^{\circ} 39' 21''$. In 462 fms. OPG took 3.08 cuft. Bottom is green mud. See V-37.
- Sta. 3174-55. July 5. $33^{\circ} 50' 22''$, $118^{\circ} 39' 20''$. In 325 fms. OPG took 2.64 cuft. Bottom is green mud and silt. See V-28.
- Sta. 3175-55. July 5. $33^{\circ} 50' 00''$, $118^{\circ} 41' 45''$. In 410 fms. OPG took 3.15 cuft. Bottom is green mud. See V-34.

- Sta. 3176-55. July 5. $33^{\circ} 51' 58''$, $118^{\circ} 41' 57''$. In 330 fms. OPG took 1.95 cuft. Bottom is green mud and sand. See IV-10.
- Sta. 3177-55. July 5. $33^{\circ} 53' 26''$, $118^{\circ} 41' 36''$. In 294 fms. OPG took 2.14 cuft. Bottom is green mud. See IV-9.
- Sta. 3178-55. July 5. $33^{\circ} 54' 38''$, $118^{\circ} 39' 48''$. In 230 fms. OPG took 2.33 cuft. Bottom is green mud. See IV-6.
- Sta. 3179-55. July 5. $33^{\circ} 55' 39''$, $118^{\circ} 38' 00''$. In 190 fms. OPG took 2.01 cuft. Bottom is green mud and silt. See IV-5.
- Sta. 3180-55. July 5. $33^{\circ} 55' 30''$, $118^{\circ} 35' 55''$. In 160 fms. OPG took 1.70 cuft. Bottom is green mud and silt. See IV-4.
- Sta. 3181-55. July 5. $33^{\circ} 55' 12''$, $118^{\circ} 34' 00''$. In 104 fms. OPG took 2.20 cuft. Bottom is green mud and silt. See IV-2.
- Sta. 3194-55. July 6. $33^{\circ} 53' 05''$, $118^{\circ} 33' 07''$. In 36 fms. OPG not measured. Bottom is rocky shale. See I W-18.
- Sta. 3195-55. July 6. $33^{\circ} 53' 03''$, $118^{\circ} 32' 24''$. In 33 fms. OPG not measured. Bottom is rocky shale. See I W-15.
- Sta. 3200-55. July 7. $34^{\circ} 01' 38''$, $118^{\circ} 40' 02''$. In 10 fms. OPG took 1.0 cuft. Bottom is medium green sand. See III-2.
- Sta. 3203-55. July 7. $34^{\circ} 00' 00''$, $118^{\circ} 39' 13''$. In 34 fms. OPG took 1.57 cuft. Bottom is fine green sand. See III-7.
- Sta. 3204-55. July 7. $33^{\circ} 58' 10''$, $118^{\circ} 39' 10''$. In 115 fms. OPG took 2.08 cuft. Bottom is green silty mud. See III-11.
- Sta. 3205-55. July 7. $33^{\circ} 58' 00''$, $118^{\circ} 37' 00''$. In 88 fms. OPG took 2.08 cuft. Bottom is green silty mud. See III-10.
- Sta. 3206-55. July 7. $34^{\circ} 00' 02''$, $118^{\circ} 37' 02''$. In 31 fms. OPG took 1.05 cuft. Bottom is green silty sand. See III-6.
- Sta. 3208-55. July 7. $34^{\circ} 00' 03''$, $118^{\circ} 34' 40''$. In 25 fms. OPG took 1.15 cuft. Bottom is green silty sand. See III-4.
- Sta. 3209-55. July 7. $33^{\circ} 57' 54''$, $118^{\circ} 34' 45''$. In 57 fms. OPG took 1.05 cuft. Bottom is green shell sand. See III-8.
- Sta. 3210-55. July 7. $33^{\circ} 57' 58''$, $118^{\circ} 32' 36''$. In 29 fms. OPG took 0.97 cuft. Bottom is green silty sand. See III-5.
- Sta. 3213-55. July 7. $34^{\circ} 00' 00''$, $118^{\circ} 32' 28''$. In 15 fms. OPG took 0.84 cuft. Bottom is green silty sand. See III-3.
- Sta. 3218-55. July 7. $34^{\circ} 00' 03''$, $118^{\circ} 30' 20''$. In 6.5 fms. OPG took 0.51 cuft. Bottom is green silty sand. See III-1.
- Sta. 3219-55. July 7. $33^{\circ} 56' 00''$, $118^{\circ} 27' 45''$. In 11 fms. OPG took 1.19 cuft. Bottom is coarse sand and gravel. See I NW-4.

- Sta. 3220-55. July 7. $33^{\circ} 54' 51''$, $118^{\circ} 27' 00''$. In 10.5 fms. OPG took 0.9 cuft. Bottom is coarse black sand. See I SW-3.
- Sta. 3385-55. Aug. 23. $33^{\circ} 50' 00''$, $118^{\circ} 32' 23''$. In 65 fms. OPG took 1.78 cuft. Bottom is fine sandy mud. See V-5.
- Sta. 3386-55. Aug. 23. $33^{\circ} 50' 00''$, $118^{\circ} 34' 48''$. In 100 fms. OPG took 0.44 cuft. Bottom is fine sandy mud. See V-8.
- Sta. 3387-55. Aug. 23. $33^{\circ} 51' 59''$, $118^{\circ} 37' 10''$. In 50 fms. OPG took 0.31 cuft. Bottom is coarse sand and shell. See I W-22.
- Sta. 3388-55. Aug. 23. $33^{\circ} 52' 01''$, $118^{\circ} 34' 48''$. In 40 fms. OPG took 0.63 cuft. Bottom is coarse sandstone. See I W-20.
- Sta. 3389-55. Aug. 23. $33^{\circ} 52' 03''$, $118^{\circ} 32' 33''$. In 38 fms. OPG took 0.63 cuft. Bottom is coarse sandy mud. See I W-16.
- Sta. 3390-55. Aug. 23. $33^{\circ} 52' 05''$, $118^{\circ} 30' 00''$. In 33 fms. OPG took 0.88 cuft. Bottom is green sandy mud. See I SW-10.
- Sta. 3391-55. Aug. 23. $33^{\circ} 54' 06''$, $118^{\circ} 30' 00''$. In 30 fms. OPG took 1.57 cuft. Bottom is coarse sandstone and gravel. See I W-11.
- Sta. 3392-55. Aug. 23. $33^{\circ} 54' 06''$, $118^{\circ} 32' 33''$. In 35 fms. OPG took 1.57 cuft. Bottom is coarse sandstone and gravel. See I W-14.
- Sta. 3393-55. Aug. 23. $33^{\circ} 54' 02''$, $118^{\circ} 34' 12''$. In 41 fms. OPG took 1.57 cuft. Bottom is coarse gravel and green mud. See I W-19.
- Sta. 3394-55. Aug. 23. $33^{\circ} 56' 14''$, $118^{\circ} 32' 27''$. In 32 fms. OPG took 0.68 cuft. Bottom is gravel and green mud. See I W-12.
- Sta. 3395-55. Aug. 23. $33^{\circ} 56' 15''$, $118^{\circ} 30' 00''$. In 24 fms. OPG took 2.00 cuft. Bottom is sticky black mud. See I NW-8.
- Sta. 3399-55. Aug. 25. $33^{\circ} 52' 08''$, $118^{\circ} 39' 15''$. In 250 fms. OPG took 2.58 cuft. Bottom is fine green mud. See IV-8.
- Sta. 3400-55. Aug. 25. $33^{\circ} 50' 30''$, $118^{\circ} 37' 06''$. In 220 fms. OPG took 2.83 cuft. Bottom is green mud. See V-21.
- Sta. 3410-55. Aug. 30. $33^{\circ} 40' 20''$, $118^{\circ} 48' 28''$. In 488 fms. OPG. Bottom is fine mud. See VI-11.
- Sta. 3411-55. Aug. 30. $33^{\circ} 43' 30''$, $118^{\circ} 52' 01''$. In 487 fms. OPG. Bottom is fine See VI-10.
- Sta. 3412-55. Aug. 30. $33^{\circ} 44' 53''$, $118^{\circ} 46' 04''$. In 488 fms. OPG. Bottom is fine mud. See VI-12.

- Sta. 3478-55. Sep. 15. $33^{\circ} 54' 33''$, $118^{\circ} 27' 07''$. In 12 fms. OPG took 0.25 cuft. Bottom is black sandy mud. See I SW-4.
- Sta. 3479-55. Sep. 15. $33^{\circ} 55' 05''$, $118^{\circ} 26' 25''$. In 6 fms. OPG took 1.19 cuft. Bottom is black mud. See I SW-2.
- Sta. 3480-55. Sep. 15. $33^{\circ} 55' 10''$, $118^{\circ} 26' 56''$. In 7 fms. OPG took 1.19 cuft. Bottom is light beach sand. See I W-1.
- Sta. 3481-55. Sep. 15. $33^{\circ} 55' 37''$, $118^{\circ} 26' 49''$. In 7.5 fms. OPG took 2.52 cuft. Bottom is mud. See I NW-1.
- Sta. 3482-55. Sep. 15. $33^{\circ} 55' 33''$, $118^{\circ} 27' 30''$. In 13 fms. OPG took 1.51 cuft. Bottom is coarse gravel and black mud. See I NW-2.
- Sta. 3483-55. Sep. 15. $33^{\circ} 55' 01''$, $118^{\circ} 27' 29''$. In 14 fms. OPG took 1.80 cuft. Bottom is black mud and sticks. See I W-3.
- Sta. 3484-55. Sep. 15. $33^{\circ} 55' 05''$, $118^{\circ} 27' 17''$. In 15 fms. OPG took 0.44 cuft. Bottom is fine black mud. See I W-2.
- Sta. 3485-55. Sep. 15. $33^{\circ} 53' 36''$, $118^{\circ} 27' 35''$. In 20 fms. OPG took 0.31 cuft. Bottom is fine mud. See I SW-5.
- Sta. 3486-55. Sep. 15. $33^{\circ} 54' 50''$, $118^{\circ} 28' 03''$. In 17 fms. OPG took 1.44 cuft. Bottom is fine black mud. See I W-4.
- Sta. 3487-55. Sep. 15. $33^{\circ} 55' 49''$, $118^{\circ} 28' 00''$. In 14 fms. OPG took 0.75 cuft. Bottom is fine black mud. See I NW-3.
- Sta. 3488-55. Sep. 15. $33^{\circ} 56' 07''$, $118^{\circ} 28' 30''$. In 16 fms. OPG took 1.57 cuft. Bottom is green mud. See I NW-5.
- Sta. 3489-55. Sep. 15. $33^{\circ} 54' 40''$, $118^{\circ} 28' 37''$. In 23 fms. OPG took 1.57 cuft. Bottom is green mud. See I W-5.
- Sta. 3490-55. Sep. 15. $33^{\circ} 53' 09''$, $118^{\circ} 27' 49''$. In 25 fms. OPG took 0.63 cuft. Bottom is green mud. See I SW-6.
- Sta. 3491-55. Sep. 15. $33^{\circ} 52' 41''$, $118^{\circ} 28' 04''$. In 31 fms. OPG took 1.63 cuft. Bottom is green mud. See I SW-8.
- Sta. 3492-55. Sep. 15. $33^{\circ} 54' 30''$, $118^{\circ} 29' 11''$. In 26 fms. OPG took 1.19 cuft. Bottom is black mud. See I W-7.
- Sta. 3493-55. Sep. 15. $33^{\circ} 56' 24''$, $118^{\circ} 29' 01''$. In 17 fms. OPG took 1.19 cuft. Bottom is green mud. See I NW-6.
- Sta. 3494-55. Sep. 15. $33^{\circ} 56' 42''$, $118^{\circ} 29' 30''$. In 19 fms. OPG took 2.68 cuft. Bottom is green mud. See I NW-7.
- Sta. 3495-55. Sep. 15. $33^{\circ} 56' 58''$, $118^{\circ} 30' 00''$. In 21 fms. OPG took 0.63 cuft. Bottom is green mud. See I NW-9.

Sta. 3496-55. Sep. 15. $33^{\circ} 54' 21''$, $118^{\circ} 29' 46''$. In 28 fms. OPG took 1.19 cuft. Bottom is green. See I W-8.

Sta. 3497-55. Sep. 15. $33^{\circ} 54' 11''$, $118^{\circ} 30' 18''$. In 31 fms. OPG took 1.50 cuft. Bottom is green mud. See I W-10.

Sta. 3498-55. Sep. 15. $33^{\circ} 52' 14''$, $118^{\circ} 28' 16''$. In 42 fms. OPG took 1.0 cuft. Bottom is green mud. See I SW-9.

Sta. 4047-46. Apr. 7. $33^{\circ} 47' 12''$, $118^{\circ} 24' 58''$. In 37 fms. OPG not measured. Bottom is gravelly rubble. See II-sub 2.

Sta. 4316-56. June 19. $34^{\circ} 00' 00''$, $118^{\circ} 39' 20''$. In 37 fms. OPG took 0.81 cuft. Bottom is sticky green mud. See III-7a.

Sta. 4318-56. June 20. $33^{\circ} 56' 37''$, $118^{\circ} 33' 02''$. In 32.5 fms. OPG took 0.63 cuft. Bottom is green silty foily mud. See I W-17a.

Sta. 4319-56. June 20. $33^{\circ} 55' 38''$, $118^{\circ} 34' 11''$. In 91 fms. OPG took 1.63 cuft. Bottom is sticky green mud. See I W-19c.

Sta. 4320-56. June 20. $33^{\circ} 54' 37''$, $118^{\circ} 34' 15''$. In 82 fms. OPG took 1.26 cuft. Bottom is sticky green silty mud. See I W-19b.

Sta. 4321-56. June 20. $33^{\circ} 53' 39''$, $118^{\circ} 34' 15''$. In 41 fms. OPG took 0.75 cuft. Bottom is bedded mud stone. See I W-19a.

Sta. 4322-56. June 20. $33^{\circ} 53' 40''$, $118^{\circ} 33' 07''$. In 35 fms. OPG took 1.19 cuft. Bottom is glauconite coarse and fine gravel. See I W-17b.

Sta. 4323-56. June 20. $33^{\circ} 52' 45''$, $118^{\circ} 33' 10''$. In 38 fms. OPG took 4 liters. Bottom is shale covered coarse rock and sand. See I W-15a.

Sta. 4324-56. June 20. $33^{\circ} 53' 38''$, $118^{\circ} 32' 01''$. In 32 fms. OPG took 1.19 cuft. Bottom is coarse glauconite sand, (coarse to fine). See I W-12d.

Sta. 4325-56. June 20. $33^{\circ} 54' 57''$, $118^{\circ} 32' 02''$. In 33.5 fms. OPG took 1.88 cuft. Bottom is medium and coarse green glauconite sand. See I W-12c.

Sta. 4326-56. June 20. $33^{\circ} 54' 38''$, $118^{\circ} 33' 07''$. In 38 fms. OPG took 0.63 cuft. Bottom is coarse green sand. See I W-13a.

Sta. 4327-56. June 20. $33^{\circ} 55' 38''$, $118^{\circ} 33' 02''$. In 39 fms. OPG took 0.81 cuft. Bottom is coarse green sand. See I W-13b.

Sta. 4328-56. June 20. $33^{\circ} 55' 39''$, $118^{\circ} 31' 58''$. In 32.5 fms. OPG took 0.37 cuft. Bottom is coarse green sand. See I W-12b.

Sta. 4329-56. June 20. $33^{\circ} 55' 37''$, $118^{\circ} 30' 50''$. In 28 fms. OPG took 0.06 cuft. Bottom is green and black silt. See I W-9a.

Sta. 4330-56. June 20. $33^{\circ} 54' 35''$, $118^{\circ} 30' 54''$. In 31 fms. OPG took 0.63 cuft. Bottom is dark to black muddy silt. See I W-10a.

Sta. 4331-56. June 20. $33^{\circ} 53' 54''$, $118^{\circ} 30' 34''$. In 30.5 fms. OPG took 0.56 cuft. Bottom is black muddy silt. See I W-9b.

Sta. 4332-56. June 20. $33^{\circ} 52' 42''$, $118^{\circ} 30' 50''$. In 31 fms. OPG took 1.51 cuft. Bottom is dark green to black glauconite sand. See I W-11a.

Sta. 4333-56. June 20. $33^{\circ} 52' 42''$, $118^{\circ} 31' 58''$. In 34 fms. OPG took 1.19 cuft. Bottom is dark green to black glauconite sand. See I W-14a.

Sta. 4334-56. June 20. $33^{\circ} 56' 35''$, $118^{\circ} 32' 00''$. In 28.5 fms. OPG took 0.06 cuft. Bottom is dark green to black glauconite sand. See I W-12a.

Sta. 4335-56. June 20. $33^{\circ} 55' 56''$, $118^{\circ} 30' 53''$. In 26 fms. OPG took 0.63 cuft. Bottom is green muddy sand. See I W-10b.

Sta. 4448-56. June 28. $33^{\circ} 54' 00''$, $118^{\circ} 28' 00''$. In 10 fms. Baited lobster trap. Bottom is packed mud.

Sta. 4449-56. June 28. $33^{\circ} 54' 42''$, $118^{\circ} 27' 32''$. In 14 fms. Baited lobster trap. Bottom is packed mud.

Sta. 4450-56. June 28. $33^{\circ} 54' 40''$, $118^{\circ} 27' 49''$. In 17 fms. Baited lobster trap. Bottom is packed mud.

Sta. 4451-56. June 28. $33^{\circ} 54' 18''$, $118^{\circ} 29' 04''$. In 25.5 fms. Baited lobster trap. Bottom is packed mud.

List of samples by Zones (I to VI) with cross
reference to Station number of the VELERO IV

List of Samples by Zones I to VI, and Serial Numbers,
with station numbers of the VELERO IV:

Zone I. I W-1 to 22, with 40 samples, is a transect extending west from Hyperion, arranged according to increasing distance from the outfall.

1 at 3480	11 at 3391	15a at 4323
2 at 3484	11a at 4332	16 at 3389
3 at 3483	12 at 3394	17 at 2996
4 at 3486	12a at 4334	17a at 4318
5 at 3489	12b at 4328	17b at 4322
6 at 2993	12c at 4325	18 at 3194
7 at 3492	12d at 4324	19 at 3393
8 at 3496	13 at 2995	19a at 4321
9 at 2994	13a at 4326	19b at 4320
9a at 4329	13b at 4327	19c at 4319
9b at 4331	14 at 3392	20 at 3388
10 at 3497	14a at 4333	21 at 2998
10a at 4330	15 at 3195	22 at 3387
10b at 4335		

Zone I. I SW-1 to 10, is a transect extending southwest from Hyperion.

1 at 2992	4 at 3478	8 at 3491
2 at 3479	5 at 3485	9 at 3498
3 at 3220	6 at 3490	10 at 3390
	7 at 2991	

Zone I. I NW-1 to 9, is a transect extending northwest from Hyperion.

1 at 3481	4 at 3219	7 at 3494
2 at 3482	5 at 3488	8 at 3395
3 at 3487	6 at 3493	9 at 3495

Zone II-1 to 9, represents the shallow shelf, to 50 fms., in the vicinity of Redondo Beach.

1 at 2788	3 at 3162	7 at 2359
2 at 3161	4 at 2722	8 at 2193
sub 2 at 4047	5 at 2194	9 at 2360
	6 at 3165	

Zone III-1 to 16, represents the northern part of Santa Monica Bay.

1 at 3218	7 at 3203	12 at 3002
2 at 3200	7a at 4316	13 at 3003
3 at 3213	8 at 3209	14 at 3004
4 at 3208	9 at 3001	15 at 3005
5 at 3210	10 at 3205	16 at 3006
6 at 3206	11 at 3204	

Zone IV-1 to 9, represents Santa Monica Canyon, in 51 to 400 fathoms.

1 at 2997	5 at 3179	8 at 3399
2 at 3181	6 at 3178	9 at 3177
3 at 3000	7 at 2999	10 at 3176
4 at 3180		

Zone V-1 to 37 represents Redondo Canyon, in 51 to 410 fathoms.

1 at 2725	13 at 2149	25 at 2150
2 at 3163	14 at 2361	26 at 2792
3 at 2192	15 at 2148	27 at 3168
4 at 2727	16 at 2724	28 at 3174
5 at 3385	17 at 2361	29 at 2362
6 at 2726	18 at 2190	30 at 2723
7 at 3164	19 at 2362	31 at 3169
8 at 3386	20 at 2189	32 at 2474
9 at 2789	21 at 2727	33 at 3171
10 at 2990	22 at 2793	34 at 3175
11 at 2191	23 at 3167	35 at 2728
12 at 2358	24 at 2151	36 at 3170
		37 at 3173

Zone VI-1 to 14, represents the deeper areas of Santa Monica Basin.

1 at 2791	6 at 3020	11 at 3410
2 at 2620	7 at 2965	12 at 3412
3 at 2794	8 at 2970	13 at 2963
4 at 3019	9 at 2971	14 at 2964
5 at 2729	10 at 3411	

List of samples by depth, in ascending
order, from 6 to 490 fathoms

The following 18 samples came from 6 to 15 fathoms:

I SW-2 at 3479, in 6 fms.
III-1 at 3218, in 6 1/2 fms.
I W-1 at 3480, in 7 fms.
I NW-1 at 3481, in 7 1/2 fms.
I SW-1 at 2992, in 9 fms.
II-1 at 2788, in 9 1/2 fms.
III-2 at 3200, in 10 fms.
I SW-3 at 3220, in 10 1/2 fms.
I NW-4 at 3219, in 11 fms.
I SW-4 at 3478, in 12 fms.
II-2 at 3161, in 12 1/2 fms.
II-3 at 3162, in 12 1/2 fms.
I NW-2 at 3482, in 13 fms.
II-4 at 2722, in 14 fms.
I W-3 at 3483, in 14 fms.
I NW-3 at 3487, in 14 fms.
III-3 at 3213, in 15 fms.
I W-2 at 3484, in 15 fms.

The following 14 samples came from 16 to 25 fathoms:

I NW-5 at 3488, in 16 fms.
I W-4 at 3486, in 17 fms.
I NW-6 at 3493, in 17 fms.
II-5 at 2194, in 16-18 fms.
I NW-7 at 3494, in 19 fms.
I SW-5 at 3485, in 20 fms.

I W-6 at 2993, in 21 fms.
I NW-9 at 3495, in 21 fms.
I SW-7 at 2991, in 22 fms.
II-6 at 3165, in 22 fms.
I W-5 at 3489, in 23 fms.
I NW-8 at 3395, in 24 fms.
III-4 at 3208, in 25 fms.
I SW-6 at 3490, in 25 fms.

The following 42 samples came from 26 to 50 fathoms:

I W-7 at 3492, in 26 fms.
I W-10b at 4335 in 26 fms.
I W-8 at 3496, in 28 fms.
I W-9a at 4329, in 28 fms.
I W-12a at 4334 in 28.5 fms.
I W-9 at 2994, in 29 fms.
III-5 at 3210, in 29 fms.
I W-11 at 3391 in 30 fms.
I W-9b at 4331 in 30.5 fms.
II-7 at 2359, in 31 fms.
III-6 at 3206, in 31 fms.
I SW-8 at 3491, in 31 fms.
I W-10 at 3497, in 31 fms.
I W-10a at 4330, in 31 fms.
I W-11a at 4332, in 31 fms.
I W-12 at 3394, in 32 fms.
I W-12d in 4324, in 32 fms.

I W-17a at 4318, in 32.5 fms.
I W-12b at 4328, in 32.5 fms.
I W-13 at 2995, in 33 fms.
I W-15 at 3195, in 33 fms.
I SW-10 at 3390, in 33 fms.
I W-12c at 4325, in 33.5 fms.
III-7 at 3203, in 34 fms.
I W-14a at 4333, in 34 fms.
I W-14 at 3392, in 35 fms.
I W-17b at 4322, in 35 fms.
I W-18 at 3194, in 36 fms.
II-sub 2 at 4047, in 37 fms.
III-7a at 4316, in 37 fms.
I W-16 at 3389, in 38 fms.
I W-15a at 4323, in 38 fms.
I W-13a at 4326, in 38 fms.
II-8 at 2193, in 40 fms.
I W-21 at 2998, in 40 fms.
I W-20 at 3388, in 40 fms.
I W-19 at 3393, in 41 fms.
I W-19a at 4321, in 41 fms.
I SW-9 at 3498, in 42 fms.
II-9 at 2360, in 49 fms.
I W-17 at 2996, in 50 fms.
I W-22 at 3387, in 50 fms.

The following 15 samples came from 51 to 100 fathoms:

III-8 at 3209, in 57 fms.
V-1 at 2725, in 58 fms.
V-2 at 3163, in 60 fms.
V-3 at 2192, in 61 fms.
V-5 at 3385, in 65 fms.
V-4 at 2727, in 66 fms.
V-6 at 2726, in 70 fms.
III-9 at 3001, in 70 fms.
V-7 at 3164, in 80 fms.
I W-19b at 4320, in 82 fms.
III-10 at 3205, in 88 fms.
V-9 at 2789, in 90 fms.
I W-19c at 4319, in 91 fms.
IV-1 at 2997, in 100 fms.
V-8 at 3386, in 100 fms.

The following 18 samples came from 101 to 225 fathoms:

IV-2 at 3181 in 104 fms.
V-10 at 2990, in 110 fms.
III-11 at 3204, in 115 fms.
V-11 at 2191, in 125 fms.
V-12 at 2358, in 125 fms.
III-12 at 3002, in 125 fms.
V-13 at 2149, in 129 fms.
IV-3 at 3000, in 150 fms.
V-14 at 2361, in 157 fms.
V-16 at 2724, in 157 fms.

III-13 at 3003, in 160 fms.

IV-4 at 3180, in 160 fms.

V-15 at 2148, in 161 fms.

V-17 at 2790, in 180 fms.

V-18 at 2190, in 186 fms.

IV-5 at 3179, in 190 fms.

V-19 at 3166, in 196 fms.

V-21 at 3400, in 220 fms.

The following 11 samples came from 226 to 300 fathoms:

V-20 at 2189, in 228 fms.

III-14 at 3004, in 230 fms.

IV-6 at 3178, in 230 fms.

IV-7 at 2999, in 250 fms.

IV-8 at 3399, in 250 fms.

V-22 at 2793, in 251 fms.

III-15 at 3005, in 280 fms.

V-23 at 3167, in 280 fms.

V-24 at 2151, in 291 fms.

IV-9 at 3177, in 294 fms.

V-26 at 2792, in 300 fms.

The following 15 samples came from 301 to 440 fathoms:

V-25 at 2150, in 310 fms.

V-27 at 3168, in 315 fms.

V-28 at 3174, in 325 fms.

V-30 at 2723, in 325 fms.

III-16 at 3006, in 330 fms.

IV-10 at 3176, in 330 fms.
V-29 at 2362, in 352 fms.
V-31 at 3169, in 380 fms.
V-32 at 2474, in 405 fms.
V-34 at 3175, in 410 fms.
VI-1 at 2791, in 415 fms.
VI-2 at 2620, in 418 fms.
VI-3 at 3019, in 425 fms.
V-33 at 3171, in 425 fms.
VI-4 at 2794, in 430 fms.

The following 13 samples came from 441 to 490 fathoms:

V-35 at 2728, in 445 fms.
VI-5 at 2729, in 445 fms.
VI-6 at 3020, in 445 fms.
V-36 at 3170, in 460 fms.
V-37 at 3173, in 462 fms.
VI-7 at 2965, in 470 fms.
VI-8 at 2970, in 476 fms.
VI-9 at 2971, in 485 fms.
VI-10 at 3411, in 487 fms.
VI-11 at 3410, in 488 fms.
VI-12 at 3412, in 488 fms.
VI-13 at 2963, in 490 fms.
VI-14 at 2964, in 490 fms.

Analyses of Samples from Zones I to VI

The following stations in Zone I-W are analyzed: 68

1 at 3480, 2 at 3484, 3 at 3483, 4 at 3486, 5 at 3489,
6 at 2993, 7 at 3492, 8 at 3496, 9 at 2994, 9a at 4329,
9b at 4331, 10 at 3497, 10a at 4330, 10b at 4335, 11 at 3391,
11a at 4332, between 11 and 15 at 3257, 12 at 3394, 12a at 4334,
12b at 4328, 12c at 4325, 12d at 4324, 13 at 2995, 13a at 4326,
13b at 4327, 14 at 3392, 14a at 4333, nr 14 at 3542, between 14
and 15 at 3539, 15 at 3195, 15a at 4323, 16 at 3389, 17 at 2996,
17a at 4318, 17b at 4322, 18 at 3194, 19 at 3393, 19a at 4321,
19b at 4320, 19c at 4319, 20 at 3388, 21 at 2998, 22 at 3387.

I W-1. Sta. 3480-55. In 58 feet. OPG took 1.19 cuft of greenish beach sand, most of which failed to pass through the screens. The animals were floated out of the debris in the laboratory. Prochordate, Branchiostoma californiense- 2 individuals
Echinoderms include: Amphipholis squamata-1, Ophiouroconis bispinosa-1
Crustaceans include: Lepidopa myops (sand crab)-3 and amphipods- 14
Mollusks include: Olivella-7, Nassarius-1, ?Aglaja -1
Nemertean- 2 smaller
Nematodes- several
Polychaetes include:

Nephtys californiensis - 15 moderately large

Telepsavus sp. - 1 in tube

Hypoeulalia sp.- many

Dorvillea gracilis- many

Spirophanes sp.- 3

Glycera sp.- 1 small

Armandia sp.- 1 small

SUMMARY.- The fauna is that of a shifting sandy beach extending into intertidal areas. The volume of organic materials is about 70 ml.

I W-2. Sta. 3484-55. In 100 feet. OPG took 0.44 cuft of fine black mud with H₂S odor, Most of the sediments passed through the screens. The animals are diversified with polychaetes the most abundant. Echinoderms include:

Astropecten californicus- 1 medium sized

Amphiodia (Amphisphaera) urtica- 6

a small holothuroid

Crustaceans include: a few amphipods, isopods, a pinnixid crab (perhaps commensal of a maldanid), and some cumaceans

Mollusks include: a small living Conus californicus and a dead shell of moon snail

Nemertean- a few small only

Nematodes- some

Polychaetes include larger individuals of:

Diopatra ornata- 1 larger

Nephtys caecoides- 2 or more

Nothria elegans- 10 or more in thin, sand-covered tubes

Glycera americana- 1 ; and smaller individuals of:

Ancistrosyllis sp., Aricidea spp., capitellid, cirratulids,

Drilonereis, Eumida, Exogoninae, Goniada, Haploscoloplos elongatus,

Harmothoe lunulata var., Laonice, Leocrates, Lumbrineris,

Magelona, maldanid, Nereis proceras, Pherusa, Phyllodoce, Podarke,

Prionospio pinnata and other kinds, Sthenelais, Syllis, Tharyx and others.

SUMMARY.- The animals are largely polychaetes of smaller⁶⁹ kinds. The volume of organic materials is about 100 ml.

I W-3. Sta. 3483-55. In 58 feet. OPG took 1.8 cuft of black mud with sticks.

Echinoderms include 9 smaller ophiuroids, a very small asteroid and 2 moderately large Astropecten californicus

Coelenterates- a few small, resembling Harenactis (anemone)

Brachiopod- Glottidia albida- 1 smaller only

Crustaceans include 2 caprellids and 13 or more amphipods

Polychaetes include larger individuals of:

Nephtys caecoides-1

Nothria elegans- 3

Phyllochaetopterus prolifica- 1 in tube

and smaller individuals of: Chaetozone, Eumida, Goniada, Haploscoloplos, Laonice, Lumbrineris, maldanids, Nephtys, Nereis, paraonids, Pherusa, Phyllodoce, Prionospio, Syllis, Tharyx, and others.

SUMMARY.- The representatives of these species are smaller in size than those more remote from the outfall, and represented by fewer individuals. Their volume is about 115 ml. The largest individual is Nephtys caecoides, the most conspicuous is Nothria elegans.

I W-4. Sta. 3486-55. In 111 feet. OPG took 1.44 cuft of fine black mud with H₂S odor. The screenings consisted of much biological debris, especially algal bits, broken tubes and a few shelly fragments, in all about half a liter.

Echinoderms include:

Astropecten californicus- 1

Amphiodia (Amphisgina) digitata- 2

Amphipholis squamata - 1

Crustaceans include: 3 ghost shrimps, about 24 amphipods, 2 pinnixids

Nemertean- a few smaller

Mollusks include: several Tellina, an Aglaja, and other smaller kinds

Polychaetes include:

Brada

Caulleriella

Chaetozone

Cossura candida

Eumida

Glycera americana (large)

Goniada

Haploscoloplos

Laonice

Lumbrineris

Magelona

maldanids

Nephtys

Nereis procera

Nothria elegans

Pectinaria californiensis

Pherusa (6, some ovigerous)

Phyllodoce

Prionospio pinnata

Telepsavus

Spiophanes (in silt-covered tube)

Tharyx

and others

SUMMARY.- This sample is characterized by its preponderance of polychaetes. The largest individual is Glycera americana, the most abundant is Nothria elegans. Its volume is estimated at 70 ml.

I W-5. Sta. 3489-55. In 138 feet. OPG took 1.57 cuft of green sticky mud with slight H₂S odor. The screenings consist of many arenaceous foraminiferans and much diversified life.

Echinoderms include:

70

Amphiodia (Amphisgina) digitata- 7
Amphiodia "rugosa"- 4 (specific name is unpublished)
Amphioplus hexacanthus- 2
Amphipholis squamata- 19
Astropecten californicus- 2

Crustaceans include some amphipods, ostracods, and nebalians

Nemertean- several, ovigerous in tubes of Sthenelanelia

Mollusks include: Cadulus, smaller pelecypods, small Aglaja and other gastropods

Brachiopod, Glottidia albida- a few smaller

Enteropneust- 1

Polychaetes include:

Aglaophamus
Amphicteis scaphobranchiata
Ancistrosyllis
Cossura candida
Drilonereis
Glycera americana- 1 large
Haploscoloplos elongatus
Magelona
maldanids with species in at least 3 genera
Marphysa, resembling conferta- 3 larger
Nephtys, smaller kinds
Nereis procerata- some mature, undergoing metamorphosis in tubes of maldanids

Nothria elegans

Pectinaria californiensis- 12 or more

Pherusa

Sternaspis- 1 larger

Pholoe

Sthenelais

Pilargis

Sthenelanelia- 5 in tubes

Prionospio pinnata

Terebellides- 1 larger

Scalibregma

Tharyx

Sphaerodorum- 1 ovigerous

and others

SUMMARY.- Species best represented are polychaetes. The largest one is Glycera americana; the most conspicuous is Pectinaria. The volume of organic matter is estimated at 98 ml.

I W-6. Sta. 2993-55. In 109 feet. OPG took 1.38 cuft of dark green mud. Most of the silt and detritus passed through the screens.

Echinoderms include:

Astropecten californicus-1
Amphipholis squamata - 5
Amphiodia occidentalis - 3
Amphiodia urtica - 10
Amphioplus hexacanthus- 3

Crustaceans include a ghost shrimp and an amphipod, Pontharpinia sp.G.

Nemertean- 1

Mollusks include a chaetoderm and a few other kinds

Polychaetes include:

Aricidea
Euclymene- many
Glycera americana- 1 larger
Lumbrineris
Marphysa, resembling conferta-1
Nephtys ?ferruginea
Pectinaria californiensis-many
Prionospio spp.
Sternaspis- 1 small
and others

SUMMARY.- The largest is Glycera americana; the most conspicuous are Pectinaria and Euclymene. Volume of organic content is estimated at 110 ml.

I W-7. Sta. 3492-55. In 155 feet. OPG took 1.19 cuft of black sticky mud. The screenings are largely small bits of broken shells and sandy tube fragments and arenaceous foraminiferans.

Echinoderms include:

Amphiodia urtica- 123
Amphioplus strongyloplax-4
Amphipholis squamata - 61

Crustaceans include:

ghost shrimp- 6 small
ostracods, largely brown- 83
cumaceans- 12
nebalians- 2
isopods: Gnathia-4 and Anthurid- 2 large
amphipods include:

Ampelisca- 1 or more
oedocerotid- 9
Lysianassidae with: Aruga sp.-2, Podoprionella-1, Lepidepecreum
phoxocephalids with:
Heterophoxus sp. A-4 Pontharpinia sp. E-29
Metaphoxus sp. A- 4 Pontharpinia sp. J-4

pinnixid crabs- 9

pycnogonid- 1

smaller nemerteans- some

Mollusks include:

Chaetoderm- 2

Scaphopods: Cadulus fusiformis- 46, Dentalium neohexagonum-shells

Gastropods: Aglaja- 2 smaller, Eulima- 3, Nassarius- 1,
turban shells- about 29

Pelecypods (identified by Dr. Myra Keen):

Acila castrensis- 1
Compsomyax subdiaphana- 12 or more
Cooperella subdiaphana- 1
Crenella sp.- fragment
Hiatella arctica- 2
Leptopecten monotimeris- 1
Lyonsia californica- 2
Macoma yoldiformis - 4
Macoma sp. - 2
?Myrella sp.- 2 juv.
Parvilucina sp.- 3 juv., length 3 mm.
Periploma discus- 4
Saxicavella pacifica - 1
Tellina buttoni - 2
Tellina idae - 1
Thyasira barbarentis - 3

Sea pen- 1 small only

Brachiopoda- Glottidia albida- 2 small

phoronid- 1 or more

Enteropneust- 3, of which 1 is small and 2 are larger

Polychaetes include:

Amaea occidentalis
Ammotrypane
Ampharete
Ancistrosyllis
Aricidea spp.

Brada- 3
 larger capitellid
 slender capitellid
Chaetozone- several
Chloeia pinnata
Cossura candida
Diopatra tridentata- 1 large
Drilonereis
 flabelligerid, unknown
Glycera americana- 1 large
 small Glycera
Goniada
Haploscoloplos elongatus
Harmothoe lunulata var.
Laonice- 3 larger
Leocrates
Lumbrineris spp.
Magelona
 maldanids
Marphysa, resembling conferta-4
Megalomma, in tube

Nephtys ferruginea
 another nephtyid
Nereis procera
Ninoë
Onuphis nebulosa- 6 or more
Pectinaria californiensis - 22+
Pherusa
Pholoë
 phyllodocid juv.
Pilargis
Poecilochaetus- 2 juv.
Polycirrus
Polydora- in irregular tube
Prionospio pinnata- 12
Prionospio, nr. malmgreni-some
Rhodine- in tubes
Spiophanes
Sternaspis
Sthenelanelia
Terebellides

SUMMARY.- This sample is highly diversified. The largest individual is Glycera americana; the most conspicuous are Pectinaria and Amphiodia urtica. The organic volume is estimated at 250 ml.

I W-8. Sta. 3496-55. In 172 feet. OPG took 1.19 cuft of fine green sticky mud with arenaceous foraminiferans including Alveolophragmium, Goëssella and other kinds. The screenings were almost entirely animals.

Echinoderms include many small smooth red ophiuroids and a tiny asteroid.

Crustaceans include:

stalked barnacle- cluster attached to onuphid tube
 pycnogonid- 2; pinnixid crabs- 6; ghost shrimp-1
 cumaceans- 32; nebalian- 2; ostracods - 85 or more
 gnathid isopod- 3 males and 2 females; flabelligerid isopod-1
 amphipods- more than 100
 parasitic copepod on thorax of Terebellides (polychaete)

Mollusks include:

chaetoderm-3; Cadulus - many; numerous smaller gastropods
 and pelecypods

Polychaetes include:

Aglaophamus
Anaitides
Aricidea
Asychis ?lacera
Ceratocephala c. americana-2
Chloeia pinnata - 9
 cirratulids- many
Cossura candida, in tubes
Eumida
Glycera americana -2
Glycera capitata - 7
Goniada - 3
Haploscoloplos elongatus -2
Harmothoe lunulata var.
Leocrates
Lumbrineris bicirrata
Magelona pacifica - larger

maldanids
Marphysa, cf. conferta
Nephtys spp.
Nereis procera
Ninoë- 4 ovigerous
Onuphis nebulosa
Paraonis spp.
Pectinaria californiensis -40
Pholoë
Pista, in tube
Prionospio pinnata - larger
Prionospio spp. several
Rhodine
Scalibregma- ovigerous
Spiophanes
Streblosoma
Terebellides- 8 or more

Others include:

Echiuroids - 2; Sipunculids - 4; Enteropneusts - 3;
a small burrowing anemone; Monobrachium colonies on
Axionopsis (a white clam); a large red ribbon nemertean

SUMMARY.- This is an enriched diversified sample containing many species not found nearer Hyperion. The largest one is the nemertean, the most conspicuous is Pectinaria. The volume of organic matter is estimated at 285 ml.

I W-9. Sta. 2994-55. In 179 feet. OPG took 0.69 cuft of dark sticky, hard packed mud.

Echinoderms, with small disks measuring 5 mm or less across, include:

Amphiodia (Amphisgina) urtica - 441

Amphipholis squamata - 64

Astropecten californicus- 1 juvenile

several holothurians

Crustaceans include:

a pinnixid crab; stalked barnacle; many brown and white ostra-
cods; some isopods; cumaceans; a pycnogonid; many
amphipods with phoxocephalid species identified:

Heterophoxus sp. A.- 5

Metaphoxus sp. A - 19

Pontharpinia sp. E- 21

Pontharpinia sp. J- 18

Mollusks include a chaetoderm and numerous small diversified kinds

Polychaetes include:

many smaller spioniform and cirratulid kinds

Pectinaria, Pholoë, Lumbrineris, Magelona, and others

SUMMARY.- The sample, though small, is representative of a diversified mud bottom fauna.

I W-9a. Sta. 4329-56. In 200 feet. OPG took 0.06 cuft of green and black silt. The screenings consisted of about a liter of black sand with numerous smaller animals, especially smooth red ophiuroids, smaller mollusks and many smaller polychaetes.

I W-9b. Sta. 4331-56. In 193 feet. OPG took 0.56 cuft of dark green to black muddy silt. The screenings consist of about two liters of solids, with many smooth ophiuroids, shelled mollusks of different kinds, tubes of animals and many diversified species. Echinoderms include many ophiuroids

Mollusks include many smaller bivalves, a medium sized Polynices and other kinds

Polychaetes include:

Chloeia pinnata

Lepidasthenia virens

Lumbrineris bicirrata

other lumbrinerids

Magelona

?Notomastus

Pectinaria californiensis

and other kinds

Sipunculid- 1 larger; Nemertean- 1 yellow-striped

SUMMARY.- This bottom is characterized by the presence of Onuphis nebulosa, many smooth ophiuroids, the large sipunculid, and the diversity of its kinds of species.

I W-10. Sta. 3497-55. In 188 feet. OPG took 1.5 cuft of green sticky mud. The screenings retained many stellate foraminiferans, Rhabdammina abyssorum and other arenaceous kinds.

Foraminiferans, partly identified by Dr. Orville Bandy, include:

Cibicides lobatus (d'Orbigny)
Planulina ornata (d'Orbigny)
Rhabdammina abyssorum Carpenter
Robertina californica Cushman and Parker
Textularia abbreviata d'Orbigny
Textularia schencki Cushman and Valentine

Echinoderms include:

Amphiodia (Amphisgina) digitata - 531
Amphipholis squamata - 157
Amphiura arcystata - 2
Ophiura lütkeni - 1
Ophiothrix spiculata - an arm only
 several small holothurians

Mollusks include:

Cadulus - some living and dead shells
Chaetoderma - 5 small
 bubble and turbon shells
Aglaja ; Nassarius ; Pandora; and others

Crustaceans include:

stalked barnacle - 1 larger
 cumaceans - about 40, with 2 or more species
 pinnixid crab - 1 juvenile
 sand crab - 1 juvenile
 amphipods - 114 or more, including a larger Ampelisca,
 a caprellid, and phoxocephalids:
Heterophoxus sp. A - 9 Pontharpinia sp. E - 29
Metaphoxus sp. A - 20 Pontharpinia sp. Y - 1
 pycnogonid - 1 ; isopods with at least 4 species - 12 or more
 ostracods, mostly brown, a few pale and sculptured kinds - 90

small sipunculids, in rays of stellate foraminiferans - many

nemertean - in tube of Eunice

hydroid, Monobrachium, on small white clams - many colonies

Polychaetes include:

Nephtys caecoides - 1 larger and posterior end of another
Chloeia pinnata
Magelona
Onuphis nebulosa - 3 long stiff tubes
Prionospio pinnata
Prionospio nr. malmgreni
Pectinaria californiensis - 90 or more
 and many other smaller kinds

SUMMARY.- The largest individual is Nephtys caecoides; the most conspicuous are Amphiodia digitata and Pectinaria californiensis. The volume of organic matter is estimated at 300 ml.

I W-10a. Sta. 4330-56. In 198 feet. OPG took 0.63 cuft of dark to black muddy silt. The screenings consisted of about a liter of dark sand and animals of many diversified kinds. The most numerous are smooth ophiuroids.

Mollusks are represented by a larger Modiolus, Cylichna, and others.

Polychaetes include:

<u>Anaitides</u>	<u>Pectinaria californiensis</u>
<u>Glycera</u>	papillated <u>Pherusa</u>
<u>Marphysa</u> resembling <u>conferta</u>	<u>Prionospio pinnata</u>
<u>Nephtys</u>	and other kinds
<u>Lumbrineris</u> spp.	

I W-10b. Sta. 4335-56. In 166 feet. OPG took 0.63 cuft of green muddy sand. The screenings consisted of less than half a liter of solids, mostly animals, of which not quite half was ophiuroids of smooth red kinds. A small Pyrosoma colony was taken. Crustaceans include many amphipods, ostracods, cumaceans and some isopods (one Gnathia carries many juveniles in a brood pouch) Mollusks include: many smaller gastropods, clams of various kinds Polychaetes include:

<u>Ammotrypane</u>	<u>Haploscoloplos elongatus</u>
<u>Aricidea</u> , ovigerous	<u>Lumbrineris cruzensis</u> , ovigerous
<u>Chloeia</u> , many juveniles	<u>Pectinaria californiensis</u> - few
<u>Glycera robusta</u> - 1 large	<u>Pholoe</u> , ovigerous
(the only record in the samples)	<u>Tharyx</u> , ovigerous
	and many others

SUMMARY.- The sample is dominantly ophiuroids; the largest individual is Glycera robusta.

I W-11. Sta. 3391-55. In 180 feet. OPG took 1.57 cuft of green coarse sandstone and gravel and some arenaceous foraminiferans. Echinoderms include:

Amphiodia (Amphisgina) urtica - 654
Amphipholis squamata - 305
Astropecten californicus - 1
holothurians - 3

Mollusks include scaphopods, pelecypods, gastropods, with none large or conspicuous.

Crustaceans include many cumaceans, a few isopods, many brown ostracods and many amphipods, with phoxocephalids:

<u>Heterophoxus</u> sp. A - 7	<u>Pontharpinia</u> sp. E - 44
<u>Metaphoxus</u> sp. A - 36	<u>Pontharpinia</u> sp. J - 26

Polychaetes include:

Pectinaria, with many tubes
a large empty tube of Panthalis
many smaller kinds in the genera Glycera, Pholoe, Sphaerodorum, various kinds of spionids, paraonids, cirratulids, and others.

SUMMARY.- The sample is characterized by its numerous smooth ophiuroids and the diversity of its other animal kinds.

I W-11a. Sta. 4332-56. In 168 feet. OPG took 1.51 cuft of dark green to black glauconite sand. The screenings consisted of about 9 liters of coarse shelly rubble with bleached and broken shells of larger animals not present in the sample, such as pecten shells, large Bursa, Conus, murex and turret shells, tubes of Protula, valves of Lacqueus.

Living animals include:

Ophiura lütkeni and other echinoderms
Epitonium and other mollusks
polychaetes of many kinds of which the largest are:

Mesochaetopterus, sigalionids, Glycera, Pherusa, Pista

SUMMARY.- The present fauna appears to be a replaced one, with no single kind outstanding in number or size.

Between I W-11 and I W-15. Sta. 3257-55. Dredged. In 150 to 174 feet from a rocky bottom. The screenings consisted of about 2 liters of rubble with many kinds of larger animals. Most of the soft-bodied and smaller kinds were lost. The sample retains encrusting gorgonian coral, bryozoans, attached solitary coral, small colonies of white sponge, many clumps of vermetid mollusk, possibly Vermicularia, smaller sea urchins, shelled mollusks including the genera Nemocardium, Nuculana, Pecten, Leda, and others. Polychaetes are represented by tubes of Onuphis nebulosa, Phyllochaetopterus prolifica, Pista elongata, Owenia, Pherusa, Vermilliopsis, and others, also a small Aphrodita.

Broken shelly fragments of larger animal species suggest that these kinds have been replaced or their shells carried in.

I W-12. Sta. 3394-55. In 192 feet. OPG took 0.68 cuft. Bottom is gravel with green mud. The screenings retained fragmented dead moon snails, pectens, brachiopod and other shells, a living and a dead shell of Terebratalia (brachiopod).

Echinoderms include:

<u>Astropecten californicus</u> - 1 juv.	<u>Amphiura arcystata</u> - 1
<u>Amphiacantha amphacantha</u> - 1	<u>Ophiopsila californica</u> - 1
<u>Amphiodia urtica</u> - 118	<u>Ophiothrix spiculata</u> - 1
<u>Amphiodia digitata</u> - 29	<u>Ophiura lutkeni</u> - 1
<u>Amphioplus squamata</u> - 63	holothurians - 2 small

Crustaceans include many amphipods, many cumaceans, many brown ostracods and some white linear kinds; some slender white isopods, and a pycnogonid. Phoxocephalid amphipods are:

<u>Metaphoxus</u> sp. A - 23	<u>Pontharpinia</u> sp. E - 23
<u>Pontharpinia</u> sp. B - 4	<u>Pontharpinia</u> sp. J - 23

Mollusks include a chaetoderm and some smaller shelled kinds

Coelenterates: some small hydroids on a Conus shell; 2 small anemones

Brachiopod- Terebratalia - 1

A sipunculid and a phoronid

Polychaetes include:

<u>Ammotrypane</u> - 3	<u>Onuphis nebulosa</u> - some
ampharetids	<u>Panthalis pacifica</u> - 1 ovigerous
<u>Aricidea</u>	<u>Paraonis</u>
small capitellid - some	<u>Pectinaria californiensis</u>
<u>Chaetozone ?corona</u>	<u>Pista</u>
<u>Chloeia pinnata</u> - 18 juv.	<u>Prionospio</u> nr. <u>malmgreni</u> - 46
<u>Chone ?mollis</u> - 7	<u>Prionospio pinnata</u> - 5
<u>Drilonereis</u> - 3	<u>Rhodine</u>
<u>Euchone</u>	<u>Sabella</u> nr. <u>crassicornis</u>
<u>Glycera americana</u> - 2 juv.	<u>Sphaerodorum minutum</u> - 2
<u>Lumbrineris</u> spp. - 6	<u>Sphaerodorum</u> , another sp.
maldanid - 3, in sandy tubes	<u>Sternaspis</u> sp.
<u>Myriochele gracilis</u> - several	<u>Sthenelanelia uniformis</u> - 14
<u>Nephtys</u> sp. - 2	<u>Terebellides</u>

and many other smaller kinds, of various genera and species

SUMMARY.- The animals are largely smaller kinds and individually very numerous. The volume of organic matter is estimated at 150 ml.

I W-12a. Sta. 4334-56. In 179 feet. OPG took 0.06 cuft of dark green to black glauconite sand and silt. The screenings consisted of about a half liter of animals and little debris.

Echinoderms include a few ophiuroids and a smaller holothurian

Crustaceans include colonies of Scalpellum (barnacle), amphipods, cumaceans, isopods, in considerable numbers

Mollusks include smaller gastropods, especially Cylichna, Bittium,

Aglaja, smaller pelecypods, and others

Glottidia albida- 2, the largest measures 12 mm long

Polychaetes include:

Ancistrosyllis, ovigerous

Artacamella

Lanice, in long tubes

Lumbrineris bicirrata

Magelona

Nephtys spp.

and many other kinds of smaller polychaetes

Nothria elegans

Chloeia pinnata, many juveniles

Pectinaria californiensis

Pholoe

Terebellides- 2 with copepods

Thalenessa

SUMMARY.- The largest animal is Nephtys, the most abundant is Chloeia; the bulk of organic matter is composed mainly of smaller polychaetes.

I W-12b. Sta. 4328-56. In 227 feet. OPG took 0.37 cuft of coarse green sand, some black gravel and broken shells. The screenings consisted of nearly 2 liters of animals and sand, together with broken shells of mollusks such as Polynices, Crepidula, pectens, also Lacqueus, Protula and other shelled animals.

Echinoderms include many smooth ophiuroids and about 8 smaller holothuroids.

Coelenterates : Monobrachium on small bivalve shells

Scalpellum (barnacle) on tubes of Phyllochaetopterus prolifica

Mollusks include many smaller shells of diversified kinds

Polychaetes include:

Artacamella

Chloeia pinnata

Lumbrineris spp.

and many other kinds of smaller species.

Phyllochaetopterus

Sphaeodorium minutum

Sthenelabella

SUMMARY.- The bulk of animal materials is less than half a liter; it consists largely of ophiuroids and annelids of various kinds.

I W-12c. Sta. 4325-56. In 200 feet. OPG took 1.88 cuft of medium and coarse green glauconite sand. The screenings consisted of about 2 liters of coarse to fine sand and animals.

Echinoderms include about 50 smaller ophiuroids and a holothuroid

Crustaceans include:

Scalpellum in clusters, attached to ends of onuphid and Phyllochaetopterus tubes

many amphipods, isopods, cumaceans, a large ostracod measuring 1.3 mm long, and a dark brown tortoise-shelled ostracod

Nemerteans include 1 or more pale with light brown longitudinal streaks and several smaller ones

Monobrachium, 2 colonies on a small clam

Mollusks include:

scaphopod- 1, measures 22 mm long ; Polynices, Tellina, Bittium,

Thyasira, and Axionopsis

Polychaetes include:

Chloeia pinnata- many juveniles

Ceratocephala americana

Chone ?mollis- 1 larger measuring 52 mm without crown, and a smaller

Drilonereis - 3

78

Glycera americana - large, parasitized by many nematodes, projecting from posterior segments at parapodial bases

Glycera capitata - 3 small

Hyalinoecia juvenalis - 1 not mature

Isocirrus longiceps - 1 in coarse gravelly tube

Lepidonotus - 1 juvenile

Lumbrineris cruzensis - 12 small

Lumbrineris bicirrata - 1 larger

Lumbrineris latreilli - 1 nearly as large

Onuphis nebulosa - many in coarse tubes, in all about half a liter

Pectinaria californiensis - about 12

Pholoe - more than 2

Pherusa capulata - 1

Pista, resembling small P. cristata - 1

Phyllochaetopterus tubes, with attached barnacles

Rhodine

Sabellaria cementarium - 1 in coarsely cemented tube

Schistocomus - 1 large

sigalionids, of more than one genus - about 6

Spiophanes missionensis - 2

Terebellides - 1 or more

and others

SUMMARY.- This sample has many species characterized by an unpolluted shelf or shallow slope fauna. The largest one is Isocirrus and the most abundant is Onuphis nebulosa. The volume of organic matter is estimated at 400 ml.

I W-12d. Sta. 4324-56. In 195 feet. OPG took 1.19 cuft of coarse glauconite sand and fine black sand. The screenings consisted of about 8 liters, half of which was coarser red to dark sand, the other fine black sand.

Echinoderms include holothurians of 2 kinds, - a white with rows of papillae and a pale lavender, each with 2 individuals

Mollusks include 2 living shells of Pterynotus, some Amphissa, Thyasira and others

Corynactis (red and white anemone) - at least 13, in rocky crevices of larger gravelly rocks

A small Pyrosoma colony

Polychaetes include:

Brada - 1

Megalomma - 1

Peisidice aspera - 1

Pherusa capulata - many

Pherusa inflata - in U-shaped burrow

Vermiliopsis sp., on pecten shell

SUMMARY.- This fauna is characteristic of outer, sloping areas in rocky habitats. The volume of organic matter is estimated at 250 ml.

I W-13. Sta. 2995-55. In 220 feet. OPG took 0.95 cuft of coarse gray clay and sandy mud. The screenings are largely animals of diversified kinds.

Echinoderms include:

Amphiacantha amphacantha - 2

Amphiodia (Amphispina) digitata - 37

Amphiodia psara - 1

Ophiocnida californica - 1

Ophiopholis bakeri - 1

holothurians of two kinds, a dark purple, and a pale papillated kind

Crustaceans- many amphipods, cumaceans and other kinds

Phoxocephalid amphipods:

Heterophoxus sp. A-1

Pontharpinia sp. Y-2

Pontharpinia sp. J-2

Nemerteans - several smaller

Polychaetes include many tubes of Onuphis nebulosa, a larger Chone

?mollis, and other kinds

SUMMARY.- The sample may be characterized for the presence of Onuphis.

I W-13a. Sta. 4326-56. In 254 feet. OPG took 0.63 cuft of coarse green sand and some silt. The screenings consisted of nearly 8 liters of coarse to fine sand, gravel and some animals, in addition to broken mollusk shells, Protula tubes, slender sticklike pieces of ?Rhabdamina (foraminiferan) and other biological remains.

Echinoderms include a few smaller smooth ophiuroids and at least one individual of Ophiura lütkeni.

Crustaceans include a cluster of Scalpellum (barnacle) attached to a tube of Phyllochaetopterus, many small brown ostracods, amphipods, cumaceans and some isopods (with at least one Exosphaeroma).

Mollusks are entirely small and include caecid gastropods, smaller pelecypods of various kinds and perhaps others.

Coelenterates include a long whiplike gorgonian coral

Sipunculid- 1 larger

Polychaetes include:

Aphrodita- 1 measures 15 by 11 mm

Glycera americana - 1

Hyalinoecia juvenalis - 1 not mature

Onuphis nebulosa - many in stiff, slender gravelly tubes

Pectinaria californiensis - some

Phyllochaetopterus prolifica- some, with attached barnacles

Pista

Sabellaria cementarium

Sthenelanelia uniformis

Travisia

and others

SUMMARY.- The largest individuals are Glycera, sipunculid and Aphrodita; the most conspicuous are Onuphis nebulosa and Phyllochaetopterus prolifica.

I W-13b. Sta. 4327-56. In 249 feet. OPG took 0.81 cuft of coarse green sand. The screenings consisted of about 8 liters of coarse to fine sand, shell fragments and animals.

Echinoderms include:

Astropecten californicus - 1 large, measures 140 mm across the tips of the arms and 28 mm across the disk

ophiuroids, smooth red kinds- not more than 50 individuals

Ophiothrix spiculata - 2 or more

Ophiura lütkeni - 1

holothurians- many, at least 2 kinds, a deep dark purple and a paler, smaller kind

Crustaceans include stalked barnacles and many smaller amphipods, ostracods and other kinds

Mollusks include diversified smaller kinds including Volvulella, Cuspidaria, Nuculana and others

Phoronid- several stiff, slender tubes

Polychaetes include:

Eteone- long slender, yellow in life

goniadid- lemon yellow in life

Isocirrus - in coarse gravelly tube

Magelona

Myriochele gracilis

Onuphis nebulosa - many in stiff slender tubes

Pectinaria californiensis

Pherusa capulata

Pherusa papillata

Phyllochaetopterus prolifica

Rhodine

Sabellaria cementarium, in coarsely cemented tubes

Terebellides- ovigerous, with bright pink ova

Tharyx, with tessellated tubes

SUMMARY.- The largest individual is Isocirrus, and the most conspicuous is Onuphis nebulosa. The organic materials comprise about a liter of which Onuphis is about half.

I W-14. Sta. 3392-55. In 213 feet. OPG took 1.57 cuft of coarse green sandstone and gravel, shelly rubble, broken bits of protulid tubes, Lacqueus shells, dead solitary coral, mollusks shells and other biological debris. The screenings retain very few living echinoderms or mollusks; other animals are also much limited.

Echinoderms include a small lot of ophiuroids only, represented by single individuals of Amphioplus hexacanthus, Amphipholis squamata and Ophiopsila californica

Crustaceans include 3 amphipods, a few brown ostracods, a cluster of stalked barnacle attached to a tube of Phyllochaetopterus

Polychaetes include:

Chloeia pinnata

Cossura candida

Harmothoe

Lumbrineris spp.

Magelona

Onuphis nebulosa- 2 or more

Phyllochaetopterus prolifica

Prionospio spp.

Sphaerodorum minutum

Spiophanes

small terebellid, in gravelly tube

Terebellides- 1 mature

Tharyx

SUMMARY.- All animals are quite small and reduced in number and kind. Organic material is estimated at 50 ml.

I W-14a. Sta. 4333-56. In 212 feet. OPG took 1.19 cuft of dark green to black glauconite sand. The screenings consisted of about 8 liters of coarser dark rubble, shelly remains and biological materials. There are bleached or broken shells of animals not found living, including Lacqueus, pecten mollusks, Protula and others.

Echinoderms include:

Astropecten - 1 small

Ophiura lütkeni- 22

holothurians- pale, with longitudinal rows of papillae

Crustaceans include 10 caprellids, 5 amphipods, a juvenile crab

Mollusks include:

Amphissa

Amygdalum

a small chiton

Epitonium

and others

Eulima

Leda- 4 living

Saxicava- in dead rock oyster shell

Tellina- 2

echiuroid, perhaps Listriolobus- a larger and a smaller branching hydroid on snail shell, and stalk of a branching hydroid
 Polychaetes include:

<u>ampharetid</u>	<u>Pherusa capulata</u> - 18 or more
<u>arabellid</u>	<u>Phyllochaetopterus</u> tubes with
<u>Chaetozone</u>	stalked barnacle
<u>Glycera capitata</u>	<u>Prionospio</u> nr. <u>malmgreni</u>
<u>goniadid</u>	<u>Prionospio pinnata</u>
<u>Hyalinoecia juvenalis</u> - 3 tubes	<u>Sabellaria cementarium</u>
<u>?Isocirrus</u> , in tube	<u>Scalibregma</u>
<u>Laonice</u>	<u>Spiophanes</u>
<u>Nephtys</u>	<u>Sthenelabella</u> - about 14
<u>Notomastus</u> - 1 large, ovigerous	<u>Terebellides</u>
<u>Onuphis nebulosa</u> - about 12	<u>Tharyx</u>
<u>Pectinaria californiensis</u> - 7	<u>Vermiliopsis</u> , on black stone

SUMMARY.- The largest are Ophiura lütkeni; the most conspicuous are Ophiura, Onuphis, Pherusa. The volume of organic matter is estimated as 20 ml or more.

near I W-14. Sta. 3542-55. Biological dredge, in 42 fms, on rocky bottoms. Animals retained in the dredge on recovery included: stalks of hydroids and encrusting bryozoans sponges- white with long spicules, and brown, Halichondria-like solitary coral- several living individuals a living Terebratalia; a cluster of stalked barnacle Philine, a snail, and Saxicava arctica, in dead shell fragments ascidians attached to stones

Polychaetes include:

Anaitides - 1
Autolytinae- a female sexual stolon
Nereis ?procera - 1
Pseudopotamilla, perhaps occelata - 1 or more in long, horny tubes
 tubes of Phyllochaetopterus prolifica
 syllid in brown sponge - 1
Vermiliopsis multiannulata - 1, in white ridged tube fully attached to a stone

SUMMARY.- This sample is that characteristic of a rocky bottom, and has been found similar to that on the leeward side of Santa Catalina Island in rocky habitats, but has fewer specific categories.

between I W-14 and I W-14. Sta. 3539-55. Biological dredge, in 44 to 37 fms, on rocky bottoms. Animals retained in the dredge on recovery included:

Pyrosoma, measuring 6 inches long
 Echinoderms include many epifaunal seurchins, a few arms of ophiuroids and 2 purple holothurians
 Stalked barnacles; ostracods; cumaceans; isopods; caprellid amphipods
Listriolobus pelodes, an echiuroid

Nemertean

Enteropneust

Mollusks include:

<u>Philine</u> - 2 larger	<u>Nassarius</u>
<u>Amygdalum</u> - 5 or more	<u>Polynices</u>
<u>Bittium</u>	<u>Pseudochama</u> (rock oyster)
<u>?Macoma</u>	<u>Tellina</u>
and others	



a small leech
Polychaetes include:

82

ampharetid
Anaitides
Aphrodita armifera
Chone
Drilonereis
Exogoninae
Lumbrineris spp.
maldanid
Megalomma, in tube
Nothria conchylega
Onuphis nebulosa - many
Pectinaria californiensis
Odontosyllis

Peisidice aspera
Phyllochaetopterus prolifica
polydoriid
Prionospio ?pinnata - small
Protula superba - 2 long tubes
Schistocomus
Spiophanes
spirorbids, on dead mollusk shells
Sthenelanellella uniformis
Streblosoma
Terebellides
terebellid, resembling Lanice-3
Vermiliopsis spp.
Tharyx in tessellated tube

SUMMARY.- This sample has a mixed fauna, taken from rocky areas and soft bottoms; Pyrosoma is usually pelagic.

I W-15. Sta. 3195-55. In 200 feet. OPG took only a small sample of sandstone, shale, boulders and shelly rubble. The screenings consisted of some ophiuroids, annelids and other smaller animals. The fauna is that of a rocky association.

I W-15a. Sta. 4323-56. In 240 feet. OPG took about 4 liters of shaley coarse rock and sand. The screenings consisted of about 3 1/2 liters of rocks penetrated by borers, with attached or encrusting serpulids, bryozoans and other animals, a sea whip, perhaps Stylatula and others.

The shaley rocks were penetrated by burrows harboring Saxicava arctica. In holes or on dark sides of the rocks are attached serpulids of Vermiliopsis with 2 kinds of species, spirorbids of more than two kinds. The rocks have projecting tubes of polychaetes, including Phyllochaetopterus and Hypsicomus.

The rocky crevices or niches harbor small chitons, Lacqueus juveniles, bryozoans and a very flat tunicate. A small scale-worm, Peisidice aspera, occurs in narrow runways.

I W-16. Sta. 3389-55. In 230 feet. OPG took 0.63 cuft of coarse sandy yellow-green mud. The screenings consisted of coarse sand which weighed 1440 grams, including many smaller diversified animals.

Echinoderms include:

<u>Amphiacantha amphacantha</u> - 6	<u>Ophiura lütkeni</u> - 4
<u>Amphiodia (Amphisphaera) urtica</u> - 46	<u>Lytechinus anamesus</u> - 1
<u>Amphioplus hexacanthus</u> - 2	? <u>Leptosynapta inhaerens</u> - 1
<u>Amphipholis squamata</u> - 7	deep purple holothuroid - 3
<u>Amphiura arcystata</u> - 2	

Crustaceans are diversified with many amphipods, ostracods and other kinds.

Mollusks include diversified smaller kinds.

Polychaetes include:

<u>Aglaophamus dicirris</u>	<u>Fabricia</u>
<u>Ammotrypane</u>	<u>Glycera capitata</u>
<u>Anaitides</u>	<u>Goniada</u>
<u>Aricidea</u>	<u>Haploscoloplos elongatus</u>
<u>Ceratocephala c. americana</u>	<u>Harmothoe lunulata</u> var.
<u>Drilonereis</u>	maldanid

Nephtys
Nothria, perhaps elegans
Onuphis nebulosa, tubes
Paraonis
Pectinaria californiensis
Pholoe
Phyllochaetopterus prolifica
 and others

Prionospio, nr. malmgreni - many
Prionospio pinnata
Scalibregma
Sternaspis
Sthenelabella uniformis
 syllid
Travisia

SUMMARY.- This is a diversified bottom, characterized for the presence of many kinds of smaller animals.

I W-17. Sta. 2996-55. In 300 feet. OPG took 0.61 cuft of sand, gravel, stones, and coarse materials. The screenings consisted of nearly the entire lot and contained many animals.

Echinoderms include:

<u>Amphiodia occidentalis</u> - 1	<u>Ophiacantha quadrispina</u> - 1
<u>Amphipholis squamata</u> - 44	<u>Ophiopholis bakeri</u> - 3
<u>Amphipholis pugetana</u> - 9	<u>Ophionereis eurybrachioplax</u> - 9 large
<u>Odontaster crassus</u> - 1 juv.	<u>Ophiura lütkeni</u> - 1
<u>Ophiacantha diplasia</u> - 3	<u>Sclerasterias heteropaes</u> - 5

Crustaceans include:

caprellid amphipods - 2	
phoxocephalid amphipods:	
<u>Heterophoxus</u> sp. A-3	<u>Paraphoxus</u> sp. A-1

Sipunculids - 1 larger and several smaller

Leech- 1 small

Polychaetes include:

ampharetid - 1	<u>Magelona</u> - 2
<u>Anaitides</u> - 2	<u>Nereis</u> - 2
<u>Aricidea</u> - 1	<u>Notoproctus</u> - 3
<u>Armandia</u> - 4	<u>Paraonis</u> - 1
capitellid - 5	<u>Peisidice</u> - 6
<u>Chone</u> - 1	phyllodocid - 2
<u>Cirratulus</u> - 2	<u>Pherusa</u> - 2
<u>Drilonereis</u> - 3	<u>Pholoe</u> - 3
<u>Eunice</u> - 2	<u>Phyllochaetopterus prolifica</u> - some
<u>Euphrosine</u> - 2	<u>Prionospio pinnata</u> - 1
<u>Glycera</u> - 2	<u>Prionospio</u> , other species
<u>Goniada</u> - 5	sabellariid, fragment
<u>Laonice</u> - 3	<u>Sphaerodorum</u> - 2
<u>Leocrates</u> - 6	syllid, 2 or more species
<u>Lepidasthenia</u> - 2	terebellid juveniles
<u>Lepidonotus</u> - 3	<u>Tharyx</u> - about 8
<u>Lumbrineris</u> - 4 or more	and others

SUMMARY.- The largest individual is a sipunculid; the most conspicuous is Ophionereis eurybrachioplax. The estimated amount of organic matter is 110 ml.

I W-17a. Sta. 4318-56. In 206 feet. OPG took 0.63 cuft of green silt, ?oily. The screenings consisted of a little less than a liter of animals and little debris.

Echinoderms, weighing about 9.4 grams include:

Ophiura lütkeni - 2
 smaller red kinds - more than 100
 holothurians - a deep purple and a pale lavender

Crustaceans include clusters of stalked barnacle and smaller amphipods, isopods and other kinds

Mollusks include few individuals of Cardiomya, Tellina, Leda, Thyasira, Axionopsis (without Monobrachium), Nemocardium, and others
 Nemerteans - several smaller
 Polychaetes include:

<u>Artacamella</u>	<u>Owenia</u>
<u>Chloeia</u> - many juveniles	<u>Pectinaria californiensis</u>
<u>Drilonereis</u>	<u>Pherusa</u> (papillate)
<u>Isocirrus</u>	<u>Pholoe</u>
<u>Laonice</u>	<u>Pilargis berkeleyi</u>
<u>Lanice</u>	<u>Scalibregma</u>
<u>Lumbrineris cruzensis</u>	<u>Sternaspis</u>
<u>Magelona</u>	<u>Sthenelanelia</u>
<u>Myriochele gracilis</u>	<u>Terebellides</u> , with pink ova
<u>Onuphis nebulosa</u>	<u>Thalenessa</u>

SUMMARY.- All of the animals are smaller in size but diversified in kind. The estimated amount of organic matter is 100 ml.

I W-17b. Sta. 4322-56. In 241 feet. OPG took 1.19 cuft of glauconite coarse and fine gravel and sand. The screenings consisted of nearly 8 liters of gravelly and sandy materials, including animals.
 Echinoderms include:

Ophiothrix spiculata - 1
 holothurians - several purple

a very long sea whip, Stylatula
 burrowing anemone, perhaps Cerianthid

Crustaceans include amphipods, many brown ostracods, and others

Mollusks include:

<u>Chaetoderma</u>	a small <u>Polynices</u>
<u>Chama</u>	<u>Thyasira</u>
shells of <u>Amphissa</u>	and others

Nemerteans - a larger pale, with longitudinal yellow stripes

Sipunculid

Polychaetes include:

? <u>Anaitides</u> spp.	<u>Prionospio</u> spp.
? <u>Ampharete</u>	<u>Streblosoma</u>
<u>Chloeia pinnata</u> - few	<u>Tharyx</u>
<u>Lumbrineris</u> spp.	serpulid tubes
<u>Onuphis nebulosa</u> - many	and others

SUMMARY.- The largest animal is the sea whip; the most conspicuous is Onuphis nebulosa.

I W-18. Sta. 3194-55. In 217 feet. OPG took only a very small sample from a stone, shaley and sandy bottom. Some animals attached to rocks include sedentary tunicates, rock oysters and smaller annelids. The bottom is presumed to be similar to adjacent rocky areas.

near I W-18. Animals snagged on lines of current meters, included large individuals of Astropecten californicus with commensal annelid species, Podarke pugettensis and Arctonoe sp.

I W-19. Sta. 3393-55. In 244 feet. OPG took 1.57 cuft of coarse gravel with green mud. The screenings contained many calcareous

foraminiferans, especially Buliminidae. The silt was unusually colored reddish brown or coffee colored when washed.

Echinoderms include:

Amphiacantha amphacantha - 1

Amphiodia urtica - 7

Ophiura lütkeni - 2

Lytechinus anamesus - 1

Spatangus californicus - 1

holothurian - 1 juvenile

Crustaceans include numerous amphipods, isopods and possibly others

Phoxocephalid amphipod, Pontharpinia sp. J-2

Mollusks include diversified smaller pelecypods and gastropods, with Tellina and Acila.

Echiuroid: Thalassema - 1 larger

Polychaetes include:

Aricidea

smaller capitellids

Chloeia pinnata - juveniles

cirratulids

Glycera - juvenile

Goniada

Isocirrus

Laonice

Paraonis

Pherusa capulata

Pholoe

spionids, smaller kinds

Tharyx

and others

SUMMARY.- The largest animal is Thalassema, the most conspicuous are various kinds of polychaetes. The estimated amount of organic matter is 125 ml.

I W-19a. Sta. 4321-56. In 257 feet. OPG took 0.75 cuft of bedded mud-stone. The screenings consisted of about a liter of materials, with considerable fine coffee-colored silt, tiny mud balls, a larger ghost shrimp, and other animals weighing not over 10 grams.

Echinoderm: a larger Ophiothrix spiculata

Crustaceans include a ghost shrimp, some amphipods, brown ostracods and cumaceans.

Polychaetes include juvenile Chloeia, Glycera, small Lumbrineris, Nephtys and others.

SUMMARY.- The animal contents were few in quantity and diversity.

I W-19b. Sta. 4320-56. In 492 feet. OPG took 1.26 cuft of sticky green silty mud. The screenings consisted of a little over a liter with much shelly coral and other calcareous debris, especially old or bleached fragments of Allopora (hydrocoral), tube fragments and other biological rubble. The animal population is diversified.

Echinoderms include some smooth red ophiuroids

Mollusks include smaller shells of Axonopsis, a tiny Dacridium, caecids, and others

Monobrachium, a coelenterate, is fairly abundant

Polychaetes include:

Pectinaria californiensis - 50 to 75; the largest measure 43 mm long a giant capitellid

SUMMARY.- The largest animal is a capitellid, the most conspicuous is Pectinaria. The bottom appears to have been earlier populated by a hydrocoral association and more recently replaced by a mixed fauna.

I W-19c. Sta. 4319-56. In 573 feet. OPG took 1.63 cuft of sticky green mud. The screenings consisted of about a liter which was almost entirely animals of various kinds. When silt and sand were removed, the contents weighed 157 grams.

Echinoderms include:

Brisaster townsendi - 2, the larger measures 31 x 25 mm, the smaller 10 x 8 1/2 mm

Amphiacantha amphacantha - 7

Amphiodia digitata - 59

Amphioplus strongyloplax - 2

Amphipholis squamata - 2

Crustaceans include numerous amphipods, ostracods, and cumaceans

Hydroid, on living shells of Acila (pelecypod)

Monobrachium - 2 colonies on pelecypod shells

Mollusks include:

Axionopsis

Acila

Bittium

Chaetoderma

and others

Nemocardium

Nucula

Tellina

Thyasira

Polychaetes include:

Aricidea

ampharetid

capitellid

Chloeia - 3 larger and 30 or more smaller

Cossura candida

Drilonereis

flabelligerid, in old gastropod shell - 3 or more

Glycera ?capitata - 4

Goniada

Harmothoe lunulata var. - 5

Lumbrineris bicirrata - 1 larger

Lumbrineris cruzensis - 3 or more

Maldane - 1 or more, in mud tubes

Melinna - in tube resembling that of Maldane but slenderer

Nephtys ?ferruginea - 2 or more

Pectinaria californiensis - about 50, weighing 18.7 grams; the longest measure 43 mm and average length is 30-35 mm

Pholoe - several

Poecilochaetus - juvenile

Prionospio nr. malmgreni - 2

Prionospio pinnata - 1

Rhodine - in tubes

Spiophanes ?missionensis - several in silty tubes

Tharyx, with tessellated tubes - many, some ovigerous

SUMMARY.- The largest animals are Lumbrineris bicirrata and Brisaster townsendi; the most conspicuous are Pectinaria californiensis and ophiuroids. The estimated amount of organic matter is 500 ml.

I W-20. Sta. 3388-55. In 250 feet. OPG took 0.63 cuft of coarse sandstone, yellow-green nodules and biological debris. The screenings consisted of considerably shelly debris, especially entire and broken shells of scallop and augur shells, broken brachiopods and Protula tubes.



Echinoderms include:

Amphiodia (Amphisgina) urtica - 3

Leptosynapta - 2 juv.

Stichopus californicus - 1 very large

Crustaceans include many amphipods, brown ostracods, cumaceans and others
phoxocephalid amphipods:

Heterophoxus sp. A-2

Pontharpinia sp. J-14

Phoxocephalus sp. A-2

Pontharpinia sp. Y-1

Mollusks include many smaller gastropods and pelecypods

Echiuroid - 1 moderately large

Sipunculid - 1 brown, moderately large

Polychaetes include:

Chloeia pinnata - many juv.

Rhodine fragments

Harmothoe lunulata var.

Scalibregma

Pectinaria californiensis

various spioniform annelids

Pherusa capulata

Sthenelanelia uniformis

Pholoe

and others

SUMMARY.- The largest is Stichopus californicus, followed by the echiuroid and sipunculid; there is no single species conspicuous for abundance. The estimated volume of organic material is 150 ml.

I W-21. Sta. 2998-55. In 265 feet. OPG took 0.37 cuft of black, clayey mud, with large friable clumps. The screenings consisted of little besides the animals, which are richly diversified.

Echinoderms include:

Amphiacantha amphiacantha - 2

Amphiura seminuda - 2

Amphiodia digitata - 8

Ophiura lütkeni - 3

Amphiodia urtica - 23

Astropecten californicus - 1

Amphioplus strongyloplax - 1

Lytechinus anamesus - 1

Amphipholis pugetana - 7

Crustaceans include many amphipods, cumaceans, ostracods and others
phoxocephalid amphipods:

Heterophoxus sp. A-4

Pontharpinia sp. J-8

Metaphoxus sp. A-6

Pontharpinia sp. Y-1

Polychaetes are very numerous, diversified and characterized by

Pherusa capulata and Pectinaria californiensis.

SUMMARY.- The estimated volume of organic matter is 110 ml.

I W-22. Sta. 3387-55. In 310 feet. OPG took 0.31 cuft of coarse sand, shell and sandstone. The screenings consisted of stones and gravel somewhat covered with white deposit, some stones lightly sprinkled with dead shells of spirorbids and biological materials.

Echinoderms include:

Amphiodia digitata - 1

Ophiopholis bakeri - 1

Lytechinus anamesus - 3

holothurian, brown papillated - 1

Crustaceans include a few amphipods and ostracods

Mollusks include caecids, smaller gastropods and pelecypods

Encrusting bryozoans on stones

Polychaetes are entirely small and include:

cirratulids

Paraonis

Glycera

Placostegus, tubes attached to stone

goniadiid

spionids of several kinds

Lanice in tube

spirorbid tubes on stones

Magelona

Sthenelanelia uniformis

neriid

syllid

onuphid

Vermiliopsis on black stone

SUMMARY.- None of the animals is conspicuously large or abundant. The fauna has the appearance of a replaced one, with individual numbers sparse and perhaps at the fringe of their distributions. The estimated volume of organic matter is 90 ml.

Summary of Zone I, western sector, numbers W-1 to 22.

The sample from W-1 is from a shifting beach sand characterized by sand worms, Nephtys californiensis, a sand crab, Lepidopa myops, and diversified smaller kinds. The Limited-Pollution-Fauna is represented by W-2, characterized by Nephtys caecoides, Nothria elegans and other kinds of smaller polychaetes. Species are limited in number and size. Echinoderms, mollusks and smaller crustaceans are either sparse or absent. A Pollution-Tolerant-Fauna is represented by samples from W-3 to 5, and characterized by increasing numbers and kinds of species and larger sizes of individuals; present are Glycera americana, Marphysa nr. conferta, Nereis procera, and other kinds of polychaetes, in addition to some smaller mollusks, and increasing number of smaller crustaceans and some ophiuroids, or also smaller individuals of Astropecten.

The Limited-Enriched-Fauna, represented by samples from W-6 to 12, is considered limited for lacking some species known to occur in similar areas that are not polluted. It is enriched for having unusually high numbers of individuals (peaks of biomass). Thus, in one sample (W-7) ophiuroids are represented by 3 species with 188 individuals, mollusks by 23 species and 125 individuals, crustaceans by 19 species and about 150 individuals, polychaetes by 46 species and more than 200 individuals, or in all 7 major groups with 95 species and 760 individuals.

The Unlimited-Diminished Fauna, represented by samples from W-13 to 19, has increasing numbers of kinds, but diminishing peaks (or none) of biomass. This area is further characterized by having bottoms that are largely gravelly, rocky or rubbly. The current fauna has the appearance of a replaced one, with vestiges of a former one, represented by bleached fragments of hydrocorals, brachiopods, larger mollusks and other larger epifaunal kinds of animals. The species now present are largely those in the sediments or capable of moving about.

I SW-1 Sta. 2992-55. In 60 feet. OPG took 0.5 cuft of hard packed sandy mud. The screenings consisted almost entirely of polychaetes. Polychaetes include:

Ampharete arctica - 1

parasitic arabellid - 1

Aricidea spp. - more than 50

cirratulids, including Chaetozone, Tharyx and perhaps others - hundreds

Diopatra ornata - about 12 larger, in coarsely constructed tubes

Glycera americana - 1 larger and 1 smaller

Haploscoloplos elongatus - 2 larger and several smaller

Lumbrineris cruzensis - several

Lumbrineris, other species

Nephtys caecoides - 2 larger

Nereis procera - more than 70, some undergoing epitoky in tubes of onuphid

Nothria elegans - 6 or more, in thin sand-covered tubes

Paraonis - many

Platynereis bicanaliculata - 6

Prionospio pinnata - 1

SUMMARY.- The fauna is almost entirely polychaetes of limited kinds; echinoderms, mollusks, smaller crustaceans and foraminiferan tests are few or absent.

I SW-2. Sta. 3479-55. In 38 feet. OPG took 1.19 cuft of black, well-packed mud with moderate odor of H₂S. The screenings were almost entirely animals and little flocculent debris.

Crustaceans include 1 amphipod, 2 brown ostracods, a few cumaceans and 2 pycnogonids.

Mollusks include 3 small living Polynices, a Nassarius, several small Tellina and a mollusk egg-string.

Polychaetes (all small except Nothria and Nephtys) include:

Aricidea

Armandia

capitellid, perhaps Notomastus

Eumida ?sanguinea

Glycera

Goniada

Haploscoloplos

Lumbrineris

Magelona

Nephtys ?caecoides - 1 larger

Nereis procera

Nothria elegans - many, in tubes

Phyllodoce, small spotted

Prionospio spp.

?Telepsavus sp.

Tharyx

SUMMARY.- The largest and most abundant is Nothria elegans; all other animals are small. The volume of organic matter is estimated at less than 60 ml.

I SW-3 Sta. 3220-55. In 50 feet. OPG took 0.9 cuft of coarse black sand. The screenings consisted largely of polychaetes, a few crustaceans and mollusks.

Crustaceans include:

amphipods - about 26

cumacean, very attenuate - 9

brown ostracod - 1

isopod - 1

canceroid crab - 2 juveniles

Mollusks include several smaller gastropods and pelecypods

Glottidia albida - 3 minute

Anemone, ?Harenactis - 3 smaller

Nemertean - 1 larger and 6 smaller, perhaps more than 1 species

Polyclad - 1 small

Polychaetes include:

ampharetid - 3

Anaitides s-- 15 minute though mature

Ancistrosyllis - 1

Arabella - 6

Aricidea suecica - 40

Aricidea, another species 4

Capitella capitata - 60 or more

larger capitellid - 1

minute capitellid - 7

Chaetzone corona - 3

cirratulids of various kinds - many

Diopatra ornata- 3 larger and 6 smaller, weight with tubes about
43 grams
Dorvillea articulata - 1
Eumida - 1
Goniada - 5
Halosydna - 2
Haploscoloplos elongatus - 7
Leocrates - 3
Lumbrineris cruzensis - 26, some ovigerous
Lumbrineris, larger species - 1
Magelona, pouched - 20 or more
Nephtys ferruginea - 6 larger
smaller Nephtys - 9
Nereis procera - 36 or more
Nothria elegans - 35 or more; the longest tube measures about 30
30 cm; total weight with tubes is 34.2 grams
Platynereis bicanaliculata - 6
Tharyx ?parvus - 5

SUMMARY.- The largest animal is Diopatra ornata, the most conspicuous is Nothria elegans. The sample is estimated to have about 45 species and 350 individuals.

I SW-4. Sta. 3478-55. In 78 feet. OPG took 0.25 cuft of black sandy mud with a slight odor of H₂S. The screenings consisted of less than half a pint of materials, including a larger seastar and other animals which were largely polychaetes.

Echinoderms include:

Astropecten californicus -1, measuring 85 mm to tips of arms and 18 mm across the disk, and 2 arms of another individual ophiuroids- 2 arms only, no disks

Crustaceans include:

amphipods- 5 (one carries 2 embryos, another is an oedocerotid)
cumaceans - 3
ostracods- 2 brown and 2 with sculptured

Mollusks are few and include:

Cadulus - 1 small
Nassarius - 1 small
Tellina - 3
shell fragments of others

Glottidia albida- 2 small

Nemertean - one moderately large and several minute ones

Sipunculid - 1 small

Polychaetes include:

ampharetid - 1 tiny
Aricidea - 3
Chaetozone - many small
Glycera - 7 small
Haploscoloplos elongatus - 12
hesionid - 1 small
Laonice - 1
Lumbrineris ?cruzensis - 3
Magelona, pouched - 18
maldanid - 1, in sandy tube
Nephtys - 1 large and 1 small
Nereis procera - 2
Nothria elegans- 6 or more
Pherusa - 1 juvenile
phyllodocid - 1 juvenile
polynoid - 1 juvenile
Prionospio, nr. malmgreni - 19
Tharyx ?parvus - many

SUMMARY.- The sample is characterized by the presence of many smaller polychaetes and Astropecten. Total volume of organic matter, excluding the seastar, is 6 drams.

I SW-5. Sta. 3485-55. In 135 feet. OPG took 0.31 cuft of fine green, well packed mud. The screenings were almost entirely animals of various kinds.

Echinoderms include:

Astropecten californicus - 3
Amphiodia (Amphispina) digitata - 2
Amphipholis squamata - 20

Crustaceans include:

larger amphipods, perhaps Ampelisca- several
 smaller amphipods- many
 cancrioid crab- 1 small

Mollusks include:

Yoldia - 1
 smaller pelecypods and gastropods - few

Nemertean- few smaller kinds

Nematodes - some

Polychaetes include:

<u>Anaitides</u>	<u>Exogone</u> , with attached embryos
<u>Chaetozone</u>	<u>Nephtys</u>
<u>Chloeia</u>	<u>Pectinaria</u> , smaller individuals
other cirratulids	<u>Prionospio</u> spp.
? <u>Euclymene</u>	<u>Sphaerodorum</u>
<u>Eumida</u>	and others

SUMMARY.- The numbers and kinds of animals are limited, perhaps because of the small size of the sample.

I SW-6. Sta. 3490-55. In 156 feet. OPG took 0.63 cuft of green sticky mud with many arenaceous and calcareous foraminiferans.

Echinoderms include:

<u>Amphiodia digitata</u> - 8	<u>Astropecten californicus</u> - 2
<u>Amphioplus hexacanthus</u> - 1	<u>Ophiura lutkeni</u> - 2
<u>Amphipholus squamata</u> - 47	

Crustaceans include:

amphipods - at least 30, with Pontharpinia sp. G-1
 brown ostracods - about 80
 cumaceans - some
 fragment of a ghost shrimp
 nebalian - at least 1
 pinnixid - 1

Mollusks include 2 living Polynices, a chaetoderm, a small Aglaja, many Cadulus, other small pelecypods and gastropods

Anemone, ?Harenactis - 1

Nemerteans - about 10 smaller

Phoronids- 3, in stiff slender tubes

Polychaetes with 40 or more species, include:

<u>Anaitides</u>	<u>Eumida</u>
<u>Ancistrosyllis</u> - 2	<u>Glycera americana</u> - 1 large
<u>Aricidea</u> - many, some ovigerous	<u>Glycera</u> , other spp.- about 20
<u>Brada</u> - 1 juvenile	<u>Haploscoloplos elongatus</u> - 7
capitellids with 2 or more species	<u>Harmothoe</u> - 2 juveniles
-many	<u>Leocrates</u> - 2
<u>Chaetozone</u> - several	<u>Lumbrineris cruzensis</u> - many
<u>Chloeia pinnata</u> - 38 juveniles	<u>Lumbrineris</u> , other species
other cirratulids - many	<u>Magelona</u> - 2
<u>Cossura candida</u> - 4	maldanids, several species- many
<u>Drilonereis</u> - 2	<u>Nephtys ferruginea</u> - several

other nephtyids- some

Nereis procera - 15

?Nerine - 2 or more

Ninoë - several

Onuphis nebulosa - 3 or more

Panthalis - 1 larger

Pectinaria - about 30, largely juveniles

Pherusa - 20 small, some ovigerous

Pholoe - 5 small

phyllodocids- various

Polydora - 1

Prionospio nr. malmgreni - about 100

Prionospio pinnata - about 40

Scalibregma - 1 ovigerous

Sphaerodorum - 3 ovigerous

Spiophanes - 6 or more

Sthenelabella uniformis - 5

terebellid in sand-covered tube -1

Thalenessa and other sigalionids

- several

Tharyx ?parvus - many

SUMMARY.- This is a diversified shelf fauna characterized by many kinds of species in different groups.

I SW-7. Sta. 2991-55. In 130 feet. OPG took 0.5 cuft of hard packed black mud. The screenings consisted largely of different kinds of smaller polychaetes.

Echinoderms include:

Amphipholis squamata - 15 juveniles

Ophiothrix spiculata - an arm segment only

Crustaceans include a pinnixid crab, a ghost shrimp, and a few amphipods

Mollusks include a Cadulus, smaller gastropods and pelecypods.

Polychaetes include:

Amaea occidentalis

Chaetozone

Drilonereis, dark green fragments

Euclymene- 12 or more in tubes

Glycera

Goniada

Haploscoloplos elongatus - 10 or more

Lumbrineris spp.

Magelona pacifica - 1 or more

Magelona, pouched - 1 or more

Melinna

Nephtys

Nereis procera

Pherusa

Pholoë

Podarke pugettensis

Poecilochaetus johnsoni

Sthenelabella uniformis

Syllis

SUMMARY.- This fauna is characterized largely by a diversity of smaller polychaetes.

I SW-8. Sta. 3491-55. In 198 feet. OPG took 1.63 cuft of dark green sticky mud with odor of H₂S. The screenings contained many arenaceous foraminiferans, especially Alveolophragmium planisimum (Cushman), and many different kinds of metazoan animals.

Echinoderms include:

Amphiodia (Amphisina) urtica - 141

Amphioplus hexacanthus - 1

Amphipholis squamata - 176

holothurians- a purple, and a white papillated one

Crustaceans include:

pinnixid crab - 18, presumably commensal of maldanid

ghost shrimp - 3

amphipods- more than 64, include:

dexaminid - 19 ovigerous

phoxocephalids with:

Heterophoxus sp. A-2

Metaphoxus sp. A-20

Pontharpinia sp. G-1

Pontharpinia sp. J-3

isopods - 9

cumaceans - 20 or more

ostracods - at least 13

Mollusks include many small pelecypods and gastropods, and a larger chaetoderm

Echiuroid - 1

Enteropneust - 1

Nemertean - a very large red-ribbon kind and a smaller one

Nematodes - some ; Polyclad - 1

Phoronid - 3

Polychaetes include:

ampharetid - 1

Ancistrosyllis - 8 small though mature

Brada - 1 larger, coarsely papillated and 4 much smaller, finely papillated

capitellid, smaller kind- about 10

capitellid, larger - 1

Ceratocephala c. americana - 1

Chaetozone - some

Chloeia pinnata - 44 or more

Chone - 1

cirratulids, various kinds- many

Cossura candida - about 20

Drilonereis - 2 or more

Eumida - 1

Eunice - 1 larger, in mucoid tube

Glycera americana - 1 large

Glycera capitata - 16 or more

Goniada - 5 or more

Haploscoloplos elongatus - about 10

Harmothoe lunulata var.

?Laonice - 1

Leocrates - 2

Lumbrineris, large species - 1

Lumbrineris spp., smaller kinds- many

Magelona - 2

Maldane

other maldanids

Marphysa, resembling conferta- 2 larger and 2 small

Nephtys ferruginea and other species - 10 or more

Nereis procera

Ninoe - 1

Paranaitis polynoides - 1 larger

Paraonis spp. several

Pectinaria californiensis - 17

Pherusa - 8

Pholoe - 1 or more

Phyllodoce - 1

Pista, resembling cristata - in large, thick muddy tube

Prionospio pinnata - 10

Prionospio, other kinds - many

Rhodine - 1

Scalibregma - 1

other sigalionids - some

Spiophanes - 1

Sthenelanelia uniformis - 1 or more

Terebellides - 1

Tharyx sp.- many

Travisia - 2



SUMMARY.- The largest animal is a red nemertean followed by Glycera americana; the most numerous are various kinds of annelids, ophiurids and crustaceans.

I SW-9. Sta. 3498-55. In 261 feet. OPG took 1.0 cuft of green sticky mud. The screenings consisted almost entirely of animals or their remains, large numbers of arenaceous foraminiferans, especially Alveolophragmium and Goesella.

Echinoderms include:

Amphiodia (Amphisgina) urtica - 328

Amphipholis squamata - 126

Amphioplus strongyloplax - 1

holothurians - 5 juveniles

Crustaceans include many entomostracans of various kinds

Mollusks include:

Aglaja - 1

Cadulus

chaetoderm - 2 or more

Cuspidaria

Dentalium rectius - 1 large

Solemya

Tellina

smaller gastropods - many

smaller pelecypods - many

Glottidia albida - a few small or juvenile

branching hydroid on turbon shell

hydroid, Monobrachium, on Axionopsis shells - many

Nemerteans - some

Polyclad - 3 or more

Nematodes - some

Phoronid - slender tubes

Polychaetes include:

Ancistrosyllis

smaller capitellids

Chloeia pinnata

various cirratulids

Cossura candida

Drilonereis

small Glycera

Goniada

Haploscoloplos elongatus

Harmothoe lunulata var.

Laonice

Lumbrineris ?cruzensis

Magelona

smaller maldanids

Nephtys ferruginea and another kind

paraonids

Pectinaria californiensis

Pholoe

smaller phyllodocids

Prionospio spp.

Sthenelanelia

Tharyx

SUMMARY.- The most conspicuous animals are ophiuroids and Pectinaria.

I SW-10. Sta. 3390-55. In 200 feet. OPG took 0.88 cuft of fine green sandy mud.

Echinoderms include:

Amphiodia (Amphisgina) urtica - 44

Amphipholis squamata - 3

Ophiura lutkeni - 5

Crustaceans include:

stalked barnacles (Scalpellum) attached to onuphid tubes

a pinnixid crab

phoxocephalid amphipods:

Heterophoxus sp. A-1

Pontharpinia sp. J- 2

Pontharpinia sp. E-3

other amphipods, ostracods, cumaceans

Mollusks include a living Polynices, other gastropods and pelecypods

Glottidia albida - 1 larger and 1 smaller

Polychaetes include:

Aphrodita - 1
Onuphid tubes
Pectinaria californiensis - 13
Travisia - 1
 and others

SUMMARY of I SW-1 to 10: The biomass values resemble those in Zone I-W, and the numbers and kinds of animal species are similar.

I NW-1. Sta. 3481-55. In 48 feet. OPG took 2.52 cuft of dark, well packed mud with strong odor of H₂S. The screenings consisted of much black algal detritus, shell fragments and fine black gravelly material. The contained animals are polychaetes of a few species.

Aricidea spp.- many, including large individuals

Haploscoloplos elongatus - many

Lumbrineris spp.

Nothria elegans - many

and some other smaller kinds

SUMMARY.- The largest and most conspicuous are Nothria elegans.

I NW-2. Sta. 3482-55. In 80 feet. OPG took 1.51 cuft of coarse gravel with black mud. The screenings consisted of 2 1/2 liters of coarse black gravel, sand, detritus and animal remains. Living species were largely annelids, associated with a few small Glottidia, some amphipods and other small crustaceans; mollusks were few and small.

SUMMARY.- The most conspicuous and largest animal was Diopatra ornata with many individuals in coarsely constructed tubes

I NW-3. Sta. 3487-55. In 75 feet. OPG took 0.75 cuft of fine black mud with odor of H₂S. The screenings consisted of shell fragments of Conus, Polynices, Nassarius and other kinds, in addition to many kinds of animals.

Echinoderms include:

Amphiodia (Amphisipina) digitata - 11

Amphipholis squamata - 9

holothurian - 1 juvenile

Crustaceans include:

amphipods - 21

ostracods - 10

pinnixid, commensal probably of maldanid - 4

cumaceans - some

Glottidia - 1 small

Nemertean, sipunculids and small anemones, represented

Polychaetes include:

Ampharete ?arctica

Ancistrosyllis

Aricidea suecica

Aricidea uschakovi

Brada- 1 larger and 5 small

small capitellid

Chaetozone

Chone

other cirratulids, many

Cossura candida

Drilonereis - 2

Euclymene

Goniada - 17 or more

Haploscoloplos elongatus - 13 or more

Leocrates

Lumbrineris limicola - 1 large

Magelona spp.- 10 or more

Nereis procera - 28 or more

Nothria elegans- some, in tubes

Paraonis

<u>Pherusa</u> - 3	<u>Telepsavus</u> sp. . . . 1
<u>Phyllodoce</u>	<u>Spiophanes</u> - 1, in tube
<u>Pilargis</u>	<u>Sthenelais</u>
<u>Prionospio</u> , nr. <u>malmgreni</u> - 50 or more	syllids
<u>Prionospio pinnata</u> - 2	<u>Tharyx</u> - many
<u>Sphaerodorum</u> - 1	and others

SUMMARY.- The sample contained 60 or more species with more than 200 individuals; a few show peaks of abundance. The largest one is Lumbrineris limicola, the most conspicuous are Nereis procera, and spioniform kinds.

I NW-4. Sta. 3219-55. In 57 feet. OPG took 1.19 cuft of coarse gravel. The screenings consisted of about 9 liters of rubble, with many animals.

Echinoderms include 2 ophiuroids and a holothuroid

Crustaceans include:

cancroid crabs- 11 juveniles
pinnixid crab, commensal of Schizocardium- 7
amphipods - 92 or more
isopods - 9

also a cumacean, a pycnogonid, and perhaps others

Mollusks include a smaller Conus, a Crepidula, various smaller gastropods and pelecypods, none conspicuous

Hydroid colonies on tubes of Phyllochaetopterus
tubicolous anemone (cerianthid)- 1 in tube

a larger sea pen, Stylatula
white branching bryozoans- few

Nemertean - 2

Sipunculids- 16 smaller

Nematodes- 15 or more

Leech- 1 tiny

Enteropneust, possibly Schizocardium- 1 large

Polychaetes include:

ampharetids - 9

Amphiteteis scaphobranchiata - 1

Anaitides - 1 larger and 13 smaller

Ancistrosyllis

Arabella - 2

Aricidea - 7

larger capitellid - 1

small capitellid - 12

Chaetozone ?corona - 22 or more

Chone - 7

Cistenides - 1

Diopatra ornata - 28 or more, to
25 cm long, weigh 437 grams

Dorvillea gracilis - 13, some mature

Drilonereis - 1

Euclymene - 4

Eulalia - 2

Eumida - 7

Exogone - 26

Glycera americana - 1

Glycera, another sp.- some

Haploscoloplos - 9

Harmothoe lunulata var.- 4

Laonice

Leocrates - 1

Lumbrineris ?californiensis-
4 large

Lumbrineris, small form- 22

Melinna - 1

Nephtys - 1 juvenile

Nereis procera - 37

Pherusa - 1 larger, 9 small

Phyllochaetopterus prolifica-
about 30

Prionospio pinnata - 4

Prionospio, other spp.- 10

Sabellaria - 2, on dead shells
sabellid colony, in old Conus
shell

Scalibregma - 1

Spiophanes - 1

Sthenelais - 1

syllid - 4

Tharyx - 33, some ovigerous
and many others

SUMMARY.- The largest and most conspicuous are Diopatra ornata. Total number of species is estimated at 70 of which 50 are annelids; total number of individuals in excess of 600. Echinoderms and mollusks are few.

I NW-5. Sta. 3493-55. In 100 feet. OPG took 1.57 cuft of green sticky mud with slight odor of H₂S. Most of the sediment passed through the screens.

Echinoderms include: Astropecten armatus - 5

Crustaceans include a few amphipods

Mollusks include a living Polynices, a few Tellina, Cadulus, and some other smaller gastropods and pelecypods

Glottidia - a few small

Cerianthid anemone- in tube

Some sipunculids and smaller nemertean

Polychaetes include:

Ancistrosyllis

Asychis- 1 in limp, silt-covered tube

Chaetozone

Glyceria

Laonice and other small spionids

Lepidasthenia

and others

Lumbrineris spp.

maldanids, in stiff sandy tubes, with more than 1 species

Nereis procera- 1 ovigerous

Prionospio pinnata

Spiophanes

Sthenelanelle uniformis

Tharyx parvus- many

I NW-6. Sta. 3493-55. In 95 feet. OPG took 1.19 cuft of green sticky mud. The screenings were almost entirely animals of various kinds.

Echinoderms include:

Pisaster giganteus- 1 large, weighs 187.5 grams (wet weight)

Astropecten - 1

Crustaceans include:

phoxocephalid amphipods, Pontharpinia sp. G-1 , and

Pontharpinia sp. J-1

other amphipods, ostracods, cumaceans

Mollusks include:

a large ?Drupa sp.- 1, weighs 75.3 grams (wet weight)

Conus

Eulima

and other smaller gastropods and pelecypods

Nemertean, perhaps Cerebratulus- 1 large

Polychaetes with many species and individuals, include:

Nephtys

other spionids

Nereis procera

Sternaspis

Prionospio spp.

Terebellides

various cirratulids

a large terebellid, in tube

and many other kinds

SUMMARY.-The fauna from this area is enriched, represented by larger and smaller individuals of many groups of animals. The largest individual is Pisaster giganteus. The number of species is estimated at 75, that of individuals at 125.

I NW-7. Sta. 3494-55. In 114 feet. OPG took 2.68 cuft of green sticky mud. The screenings consisted of many kinds of animals.

Echinoderms include:

Astropecten californicus - 1 large

Amphiodia (Amphispina) digitata - 7

Crustaceans include some amphipods, 2 pinnixid crabs, a nebalian.

Mollusks include a moon snail, a few Tellina, living shells of Cadulus, Leda, Thyasira, and others.

Glottidia albida - several juveniles

Nemerteans include a large Cerebratulus and several other small kinds.

Phoronid - 1 or more in tubes.

Polychaetes include:

Ancistrosyllis - several

Aricidea - several

Cossura candida - more than 1

Diopatra tridentata - 1 larger

Glycera

Goniada

Lumbrineris spp.

maldanids in slender sandy tubes

Marphysa, resembling conferta - 1

Melinna, in tube

Nephtys caecoides - 2 larger

Nereis procera - 3

Pectinaria californiensis - smaller individuals and a few tubes

Pherusa - several smaller

Pholoe

Prionospio, nr. malmgreni - some

Spiophanes missionensis, in tubes - many

Sternaspis - 1 small

Sthenelabella uniformis, in tubes

Tharyx parvus - many

Tharyx, with tattered tubes - many

SUMMARY.- The largest individuals are Astropecten and Cerebratulus; the most conspicuous are various kinds of polychaetes. The number of species is estimated at 50, that of individuals at 400.

I NW-8. Sta. 3395-55. In 146 feet. OPG took 2.00 cuft of sticky black mud with slight odor of H S. The screenings consisted of about half a pint of dark gray sandy debris and a similar volume of small white shell fragments.

Echinoderms include:

Amphiodia (Amphispina) urtica - 118

Amphipholis squamata - 60

Amphiopus hexacanthus - 4

Amphiura arcystata - 1

Ophiura lütkeni - 1

holothuroids - 2 small

Crustaceans include:

ghost shrimp - 3

pinnixid crabs - 6

amphipods, many, with phoxocephalids:

Heterophoxus sp. A-1

Metaphoxus sp. A - 4

Pontharpinia sp. G-1

Pontharpinia sp. J-6

Mollusks include a few Cadulus, 2 Aglaja, a chaetoderm, and several other small pelecypods and gastropods.

Cerianthid anemone - 3 in tubes

Nemerteans - some smaller

Enteropneust

Phoronid

Polychaetes include:

Anaitides
Aricidea
Asychis
Ceratocephala c. americana
Chloeia pinnata
Cossura candida
Drilonereis
Glycera - 20 or more
Goniada - 4
Haploscoloplos elongatus - 6
Harmothoe lunulata var.
Hyalinoecia juvenalis - 2
Lumbrineris, larger species 10
Lumbrineris, smaller kind - 55 /
Maldane - 2

Marphysa, resembling conferta
Nephtys
Nereis procera - 6
Ninco - several
 onuphids in tubes
Panthalis pacifica
Pectinaria californiensis - 25
Pholoe
Prionospio pinnata - 17
Prionospio, others - 50
 sabellid in tube
Spiophanes
Sthenelanelia uniformis
 and other kinds

SUMMARY.- The largest individual is Panthalis pacifica, and the most conspicuous various annelids and ophiuroids. The number of species is estimated at 75, that of individuals at 500 or more.

I NW-9. Sta. 3495-55. In 122 feet. OPG took 0.63 cuft of green sticky mud. The screenings consisted of various kinds of animals, tubes and many arenaceous foraminiferans.

Echinoderms include a few smaller ophiuroids and a moderately large

Astropecten californicus.

Crustaceans include several clusters of Scalpellum (barnacle), some amphipods, many brown ostracods, cumaceans and other small kinds.

Mollusks include:

Acila
Aglaja
Cadulus
Polynices

Thyasira
 various kinds of bubble shells
 other small gastropods and
 pelecypods

Glottidia albida - 2 small

Phoronids - several tubes

Polychaetes, very numerous, diversified and largely smaller, include:

various cirratulids

Cossura candida

Drilonereis

Euclymene

Glycera capitata

Goniada

Harmothoe lunulata var.

and others

Lumbrineris spp.

Pectinaria, small and few

Phyllodoce, juveniles

Prionospio, nr. malmgreni

Prionospio pinnata

Rhodine

Telepsavus sp.

Terebellides

SUMMARY.- The largest individual is Astropecten, the most conspicuous various kinds of annelids. The number of species is estimated at 42, that of individuals at 150.

SUMMARY OF I NW-1 to 9. The biomass values are comparable to those in zone I W and I SW, ranging from a Limited-Pollution-Fauna to a Limited-Enriched Fauna.

II-1. Sta. 2788-54. In 54 feet. OPG took 1.32 cuft of coarse gray sand and shell. The screenings consisted of nearly 32 liters of shelly and sandy rubble and biological debris; many dead tests of Dendraster, filled with black mud, contained a long, slender sipunculid and their outer side had occasional sand-covered solitary tunicates. The living animals are largely sipunculids and polychaetes of a few kinds.

Amphipods, few, with phoxocephalids:

Pontharpinia sp. B-32

Pontharpinia sp. M-2

Polychaetes include:

Aricidea suecica - many

Lumbrineris, with long head - 1

Marphysa mortenseni - 1 large

Pisone, near remota - many

and some others

SUMMARY.- The largest individual is Marphysa, the most conspicuous the sipunculid inhabiting dead tests of Dendraster. The number of species is estimated at 7 to 10, and that of individuals at about 150.

II-2. Sta. 3161-55. In 75 feet. OPG took 0.06 cuft of fine gray sandy mud. The screenings consisted of biological rubble weighing 196 grams, some tube fragments, broken shells, many smaller dead mollusk shells, a few foraminiferans, and many animals.

Echinoderms include:

Amphiodia (Amphisgina) digitata - 1

Amphioplus hexacanthus - 2

Amphipholis squamata - 1

Ophiura lütkeni - 6

Ophiuroconis bispinosa - 5

Crustaceans include:

amphipods with 14 species and about 106 individuals with:

caprellids - 30

phoxocephalids with:

Metaphoxus sp. A-1

Pontharpinia sp. K - 1

Pontharpinia sp. B-23

Pontharpinia sp. Q - 8

ampeliscid, Ampelisca cristata - 1

stenothoid - 3

oedicerotid - 4

pleustid - 1

photid - 25

corophiids with:

Corophium sp. - 1

Erichthonius brasiliensis - 3

aorid - 4

Mollusks include few living small gastropods and pelecypods

Glottidia albida - 6 small

Slender hydroid stalks

Nemertean - 1 larger red, in a tube, and 4 smaller ones

Ascidian - 1

Polychaetes include:

ampharetid - 1 juvenile

capitellid - 1 juvenile

Anaitides - 1 juvenile

Chone - 1 large and 3 small

Aphrodita

Diopatra ornata - 1 juvenile

Aricidea spp. - 23

Diopatra tridentata

Armandia - 2

Drilonereis



?Euclymene - 8
Eumida
Goniada - 4
Haploscoloplos elongatus
Hemipodus - 1
Hesperalia - 1
Laonice - 2
Lumbrineris cruzensis - 17
Magelona (pouched) - 15
Nephtys caecoides - 5
Nereis procera - 5
Onuphis eremita - 5, in tubes
Onuphis nebulosa - 100 or more
 and others

Paraonis - 5
Pherusa - 2 small
Phyllochaetopterus prolifica-10
Platynereis bicanaliculata
Podarke pugettensis-2 juveniles
Prionospio nr. malmgreni-120 or
 more
Prionospio pinnata - 3 large
 and 2 small
Spiophanes missionensis - 4
Sthenelais - 1
Syllis - 3
 terebellid - 2 juveniles
Thalenessa - 4
Tharyx - many

SUMMARY.- The largest individual is Nephtys caecoides and the most conspicuous is Onuphis nebulosa. The sample is estimated to have about 60 species and more than 650 individuals. The sample was very imperfect, - about 0.06 cuft.

II- sub 2. Sta. 4047-56. In 222 feet. Volume not measured. Screenings consisted of about 6 liters of gravelly materials; most conspicuous animals were pink cone-like colonies of a bryozoan, Conopeum commensale (identified by Dr. John Soule), white sponge with long, compact needles, various dead mollusk shells, and polychaetes especially Nephtys, maldanids, and many others.

II-3. Sta. 3162-55. In 75 feet. OPG took 0.1 cuft of fine gray sand. Screenings consisted of about 250 grams of rubble mixed with many different kinds of animals, mostly small in size. Echinoderms include:

<u>Amphioplus hexacanthus</u> - 2	<u>Ophiuroconis bispinosa</u> - 5
<u>Amphipholis squamata</u> - 2	<u>Ophiura lütkeni</u> - 5
<u>Astropecten californicus</u> - 1	holothurian - 1
<u>Lovenia cordiformis</u> - 1	

Crustaceans include many amphipods with:
 phoxocephalids:

<u>Pontharpinia</u> sp. B- 38	<u>Pontharpinia</u> sp. K - 5
<u>Pontharpinia</u> sp. G- 3	<u>Pontharpinia</u> sp. W - 9

many isopods, some cumaceans, a pinnixid

Scalpellum (barnacle) attached to tube of Phyllochaetopterus

Mollusks include various smaller gastropods and pelecypods, none conspicuous

Glottidia albida - 23 small

Nemertean - 4 or more, all small

Platyhelminth - 2

Nematodes - 2 or more

about 10 slender stalks of hydroids

Polychaetes include:

?Ampharete arctica, in tubes - 2
Anaitides - 3
Aphrodita armifera - 1
Aricidea spp. - 19
Armandia - 2
 capitellid - 1

Chone, slender form - 1
Chone, robust form - 1
 ?Chaetozone - 6
Drilonereis
Eumida ?sanguinea - 2
Exogoninae - 2

<u>?Genetyllis</u> - 2	<u>Onuphis nebulosa</u> - more than 200
<u>Glycera</u> - 3	onuphid
<u>Goniada</u> - 6	<u>Phyllochaetopterus prolifica</u> -50
<u>Haploscoloplos elongatus</u> - 3	<u>Pista</u>
<u>Hesperalia</u> - 4	<u>Platynereis bicanaliculata</u> - 4
<u>?Heteromastus filobranchus</u>	<u>Podarke pugettensis</u>
<u>Laonice</u>	<u>Prionospio nr. malmgreni</u> - 40
<u>Leocrates</u>	<u>Prionospio ?cirrifera</u> - some
<u>Lumbrineris cruzensis</u> - 12	<u>Prionospio pinnata</u> - 3
<u>Lumbrineris</u> , large kind - 1	<u>Pseudopotamilla</u> , in tube
<u>Magelona</u> , pouched - 18	<u>Spiophanes</u> - 2
maldanid - 7 or more	<u>Syllid</u> - 8
<u>Nereis procera</u> - 6	<u>?Talehsapia</u>
<u>Nephtys ferruginea</u> - 10	<u>Thalenessa</u> - 3
<u>Nothria ?elegans</u> - 1	<u>Tharyx</u> - 10 or more
and others	

SUMMARY.- The sample represents a diversified fauna; the large individual is Glycera, the most conspicuous Onuphis nebulosa. The number of species are estimated at 90, that of individuals at 500.

II-4. Sta. 2722-54. In 92 feet. OPG took -.25 cuft of greenish sand with shell fragments. The screenings consisted of less than a liter, with many kinds of smaller animals and little debris. Echinoderms include:

Amphioplus hexacanthus - 1
Lytechinus anamesus - 2
Ophiura lutkeni - 11

Smaller crustaceans numerous and diversified

Mollusks include Chaetoderm and other kinds

Sipunculids

Nemerteans

Polychaetes numerous and diversified

SUMMARY.- The sample is estimated to contain about 50 species and more than 350 individuals.

II-5. Stations 2194-52 and 2195-52, in the vicinity of Hermosa and Seal Beach piers, in 96 to 128 feet, over gray sand, using a 6-foot beam trawl, took the following kinds of fishes (identified by Howard Winter and Vernon Gregory).

1.6 miles from the end of Hermosa Beach pier:

Sand dab, Citharichthys stigmaeus
Dover sole, Microstomus pacificus
English sole, Parophrys vetulus

4 miles from the end of Seal Beach pier:

Tongue sole, Symphurus atricaudus - 2
Sand dab, Citharichthys stigmaeus - 4
Kingfish, Genyonemus lineatus
Mottled turbot, Pleuronichthys coenosus - 6
Queenfish, Seriphus politus - 2
Midshipman, Porichthys miriaster - 2
Bay pipefish, Syngnathus leptorhynchus

II-6. Sta. 3165-55. In 132 feet. OPG took 2.83 cuft of black mud with strong odor of H₂S. The screenings consisted of fine black sand, a stick and small bits of plant debris weighing 1050 grams. Echinoderms include only 3 very small ophiuroids

Crustaceans include:

- pinnixid crab, commensal with Schizocardium, an enteropneust - 59
- amphipods, presumably of one kind - 18
- ostracod - 1

Mollusks include:

- Macoma sp. - 1 large, weighing 31.7 grams (wet weight)
- many smaller gastropods and pelecypods of various kinds

Nemertean - 4 or more

Nematode - 1 or more

Schizocardium, an enteropneust - at least 20

Polychaetes include:

- | | |
|------------------------------------|---------------------------------------|
| <u>Ancistrosyllis</u> - 26 | <u>Leocrates</u> - 1 |
| <u>Brada</u> - 6 | <u>Nephtys ferruginea</u> - 2 |
| <u>Capitella capitata</u> - 56 | other <u>Nephtys</u> |
| other capitellids | <u>Nereis procera</u> - 3 |
| <u>Chloeia</u> | <u>Pectinaria californiensis</u> - 2 |
| <u>Cossura candida</u> - 4 | <u>Pholoe</u> - 2 |
| <u>Glycera</u> - 7 | <u>Prionospio ?cirrifera</u> - 7 |
| <u>Haploscoloplos elongatus</u> | <u>Prionospio pinnata</u> - 8 |
| <u>Harmothoe lunulata</u> var. - 8 | <u>Prionospio</u> , other spp. - many |
| <u>Laonice</u> - 2 | <u>Telepsavus</u> sp. - 3 in tubes |
| | <u>Spiophanes</u> |

SUMMARY.- The largest individual is Macoma, the most conspicuous is Schizocardium. Conspicuously lacking are echinoderms, diversified smaller crustaceans, Glottidia, and others. The sample is estimated to contain 33 species with 275 individuals.

II-7. Sta. 2359-53. In 185 feet. OPG took 0.63 cuft of gray sand and clay. The screenings consisted of many polychaetes, ophiuroids, echiuroids, arenaceous foraminiferans, and many diversified kinds of animals.

Echinoderms, totalling about a pint, include:

- Amphiodia (Amphisgina) digitata - 388
- Amphipholis squamata - 43
- Astropecten californicus - 2 juveniles
- holothuroids - a long purple and a smaller white papillated kind

Crustaceans include:

- amphipods - more than 100
- ostracods - about 12 with 2 or 3 species
- isopods - 9 or more
- cumaceans - 5 or more

Mollusks include many smaller pelecypods and gastropods with:

- Cadulus
- Cylinchna diegensis
- chaetoderm
- Volvulella
- and others

Glottidia albida - 1 larger and 6 small

Nemertean - several

Echiuroidea - 5 moderately large

Enteropneust - an anterior end

Polychaetes include:

Amaea occidentalis - 2

Ammotrypane

ampharetid

Armandia

Brada - 4

capitellid

Ceratocephala c. americana - 2

Chloeia pinnata - 150 or more

Cossura candida - 4

Diopatra in tube - 1

Eumida ? sanguinea - 1 or more

Eumida sp. in sandy tube

Eunice

Glycera ? capitata - 14

Goniada - 7

Haploscoloplos elongatus - 11

Harmothoe lunulata var. - 10, in maldanid tube

Leocrates - 3

Laonice

Lumbrineris bicirrata - 3 large

Lumbrineris spp. - more than 100

Marphysa, resembling conferta - 8

Myriochele gracilis - with everted proboscis

Nephtys ? californiensis - 1 larger

Nephtys spp. - 3 or more

Nereis procera

Ninoe - 2

Onuphis, in tubes - 2

Paraonis - 5 or more

Pectinaria californiensis - 21

Pherusa - 18

Pholoe - 149 or more

phyllodocids - several

Pilargis maculata

small Pista

Polydora, in tubes fully attached to Diopatra tube

Praxillella affinis pacifica - at least 6, in sandy tubes

Prionospio, nr. malmgreni - 60

Prionospio pinnata - 24

Scalibregma, small species - 5 ovigerous

Sigalionid

Telepsavus [sp.] in tubes

Spiophanes missionensis, in tubes

Sthenelanellella uniformis, in tubes

Terebellides - 5

terebellid fragments

Travisia - 3

SUMMARY.- The sample is characterized by diversity of kinds and large numbers of individuals. Number of species is estimated at 65, and that of individuals at more than 1000.



II-8. Sta. 2193-52. In 240 feet. OPG took 3.0 cuft of fine sandy mud. The sample has been partly analyzed (Hartman, 1955, p. 45). The bottom resembled II-7 in its diversity and large biomass.

II-9. Sta. 2360-53. In 291 feet. OPG took 1.63 cuft of gray sand, rock and clay. The sample has not yet been analyzed.

SUMMARY of Zone II-1 to 9. The small triangular shallow area in the vicinity of Redondo Beach supports an unusually diversified fauna with concentrations of species unmatched in other parts of Santa Monica Bay.

III-1. Sta. 3218-55. In 39 feet. OPG took 0.51 cuft of fine green silty sand. The screenings consisted of less than half a pint of animals, mostly annelids, and little debris.

Echinoderms include 3 small ophiuroids and 2 tiny holothuroids.

Crustaceans include:

pinnixid crab - 3
amphipods - 34, and caprellids - 3
cumacean - 3
nebalian - 2
tanaids - 7
munnid isopod - 1 or more
ostracod - 2
pyncogonid - 1

Mollusks include smaller pelecypods and gastropods, both dead and living shells, of Tellina, Eulima Volvulella, Nassarius, Polynices, Yoldia and others.

Glottidia albida - 1 minute

Coelenterates include a few stems of Aglaophenia (hydroid)

Monobrachium, on small clam, perhaps Axionopsis

Nemertean - 1 larger and 6 small

Nematodes - 3 or more

Polychaetes include:

Arabella - 1 large
Aricidea - 7
Caulleriella - 10 or more
Exogoninae - some
Glycera
Goniada littorea - 12, ovigerous
Haploscoloplos elongatus - 3
Harmothoe lunulata var.
Laonice
Lumbrineris spp. - 25 or more
Magelona - 8
Nephtys caecoides - 1 large, 6 small
Nereis - 2 juvenile

Nothria elegans, in tubes - 6
Onuphis
paraonids
Phyllodoce - 2 ovigerous
Pilargis maculata
Platynereis, juvenile
Poecilochaetus johnsoni
Prionospio nr. malmgreni - 30
or more
Prionospio pinnata - 4
Syllis - 10
Tharyx parvus - 2

SUMMARY.- The largest individual is Arabella, the most conspicuous Nothria elegans.

III-2. Sta. 3200-55. In 60 feet. OPG took 1.0 cuft of medium green sand. The screenings consisted of much flocculent dark debris and many animals.

Echinoderms include:

Astropecten californicus - 5

Amphipholis squamata - 1

Amphioplus hexacanthus - 2

Crustaceans include a pycnogonid and a few isopods

Mollusks include:

Solen - 2

Tagelus - 3

Tellina - several

and some others

Glottidia albida - 1 small

Polychaetes include:

Amphicteis scaphobranchiata

arabellid, partly engulfed by Nephtys

cirratulids

Drilonereis

?Euclymene

Lepidasthenia

Lumbrineris cruzensis

Lumbrineris, large species

Magelona

Megalomma

Melinna

Nephtys

Nereid

Nothria

Paraonis, ovigerous

Platynereis

Prionospio pinnata

?Psammolyce

Sternaspis

Streblosoma

Terebellides

terebellid, in old shell

and others

SUMMARY.- The most conspicuous is Astropecten. The sample is limited in diversity and abundance.

III-3. Sta. 3312-55. In 91 feet. OPG took 0.84 cuft of fine green silty sand. The screenings consisted largely of biological debris and animals.

Echinoderms include a larger and 2 smaller holothuroid, and ophiuroids numbering more than 20.

Crustaceans include:

a small pagurid in dead moon snail shell

Scalpellum clusters - 1 larger and several smaller

amphipods include :

phoxocephalids with

Metaphoxus sp. A - 3

Pontharpinia sp. B-12

Pontharpinia sp. E- 5

Pontharpinia sp. G- 14

Pontharpinia sp. Q- 5

and other kinds

Mollusks include Chaetoderma, smaller shells of Tellina, Nucula, Cadulus and others.

Glottidia albida - 13 small, perhaps juvenile

Anemone - 2 small

Phoronid, in slender stiff tubes - 3 small

Polychaetes (very numerous and diversified) include:

Amaea occidentalis - 5

Amphicteis scaphobranchiata - 1

Anaitides - 7

Aphrodita - 1 juv.

Aricidea - 7

capitellid, small kind - about 10



Chloeia pinnata - 3
Cossura candida - 3
Drilonereis
 ?Euclymene - about 20
Exogone, ovigerous - 1
Glycera ? americana - 2
Glycera ? capitata - 9
 goniadid - 2
Haploscoloplos elongatus - 2
Harmothoe lunulata var. - 1
Lepidasthenia - 1
Lumbrineris ? cruzensis - 24
Magelona - 1
Maldane - 1 large and 5 small
 maldanids - several
Megalomma - 1 juv. in tube
Melinna - 5 or more, in tubes
Nephtys - 5
Nereis ? procera - 8

Nerine - 3
Nothria elegans - 6
Notomastus magnus - 1
Onuphis nebulosa - 1
 onuphids - several, in tubes
Pectinaria californiensis - 2
Pherusa - 10 small
Pholoe - 2
Phyllochaetopterus prolifica - 1
Platynereis bicanaliculata - 1
Polydora - 1
Prionospio pinnata - 5
Prionospio, other species - 7 or more
Spiophanes - 1
Sternaspis - 3
Sthenelanellella uniformis - 10
Terebellides - 3
Thanelessa - 2
Tharyx - 3 or more
 and others

SUMMARY.- The largest is Notomastus magnus, and the most conspicuous is Euclymene sp. The polychaetes are the most numerous and diversified.

III-4. Sta. 3208-55. In 150 feet. OPG took 1.15 cuft of fine green silty sand. The sample resembles that of III-3, except for the presence of an echiuroid, Listriolobus, and the increasing number of species living in the bottoms.

Echinoderms include more than 100 ophiuroids and 2 purple holothuroids.

Crustaceans include:

ghost shrimp - 2
 amphipods - many, including 4 larger Ampelisca and others
 cumaceans - many
 ostracods - many
 isopods - some, with Gnathia and others

Mollusks include:

<u>Chaetoderma</u>	<u>Leda</u>
<u>Bittium</u>	<u>Pandora</u>
<u>Cadulus</u>	<u>Tellina</u>
<u>Cuspidaria</u>	<u>Volvulella</u>
<u>Cylichna</u>	and others
<u>Hiatella arctica</u>	

Glottidia albida - 1 larger and 11 smaller

Echiuroid with Listriolobus - 8 or more

Nemerteans

Sipunculid

Monobrachium - 2 colonies on a small clam

Phoronid - 2

Enteropneust - 1

Polychaetes include:

<u>Ammotrypane</u>	<u>Diopatra tridentata</u>
ampharetids	<u>Drilonereis</u>
<u>Ancistrosyllis</u>	<u>Glycera americana</u> - 1 larger
<u>Artacamella</u>	<u>Glycera capitata</u> - 10 smaller
<u>Chloeia pinnata</u> - 40 or more	<u>Haploscoloplos elongatus</u> - 4 small
cirratulids - few	<u>Harmothoe lunulata</u> var. - 10 or more
<u>Cossura candida</u> - 3	<u>Leocrates</u>



Lumbrineris cruzensis - many
Lumbrineris californiensis - 1
Magelona - 2
Maldane - 2 small
 maldanids, other kinds
Nephtys - about 8
Nerine - 3
Pectinaria californiensis - 8
Pherusa capulata - 1 larger
Pherusa, another kind - 1 small

Prionospio pinnata - several
Prionospio, nr. malmgreni - 10
Rhodine - fragments
Scalibregma - 3 small
Sternaspis - 2
Sthenelais
Sthenelanellella uniformis
Terebellides - 9 smaller
 and others

SUMMARY.- The sample has characteristics of an undiminished fauna for having representatives not present near effluent areas.

III-5. Sta. 3210-55. In 170 feet. OPG took 0.97 cuft of fine medium green silty sand. The screenings consisted of about a pint, largely animals, of which about half was various kinds of ophiuroids, not quite as much as other kinds of invertebrates, and the inert debris had many arenaceous foraminiferan remains, especially Rhabdamina and others. Echinoderms include many smaller ophiuroids and a tiny asteroid. Crustaceans include:

larger amphipods, perhaps Ampelisca - 17
 many smaller amphipods
 ostracods, largely brown, some rectangular white - many
 cumaceans - 9 or more
 tanaids - 4
 isopods - gnathid - 6; presumably with rhizocephalan parasite
 anthurid - 6
 a small crab, Heterocrypta
 parasitic copepod attached to thorax of Terebellides.

Mollusks include some smaller pelecypods and gastropods, none conspicuous
 Hydroid, Monobrachium, on small clam

Polyclad, 1 smaller

Polychaetes include conspicuous numbers of Chloeia, Pectinaria, Pholoe, a larger Travisia, and many other kinds.

SUMMARY.- The sample is characterized by many different kinds of animals.

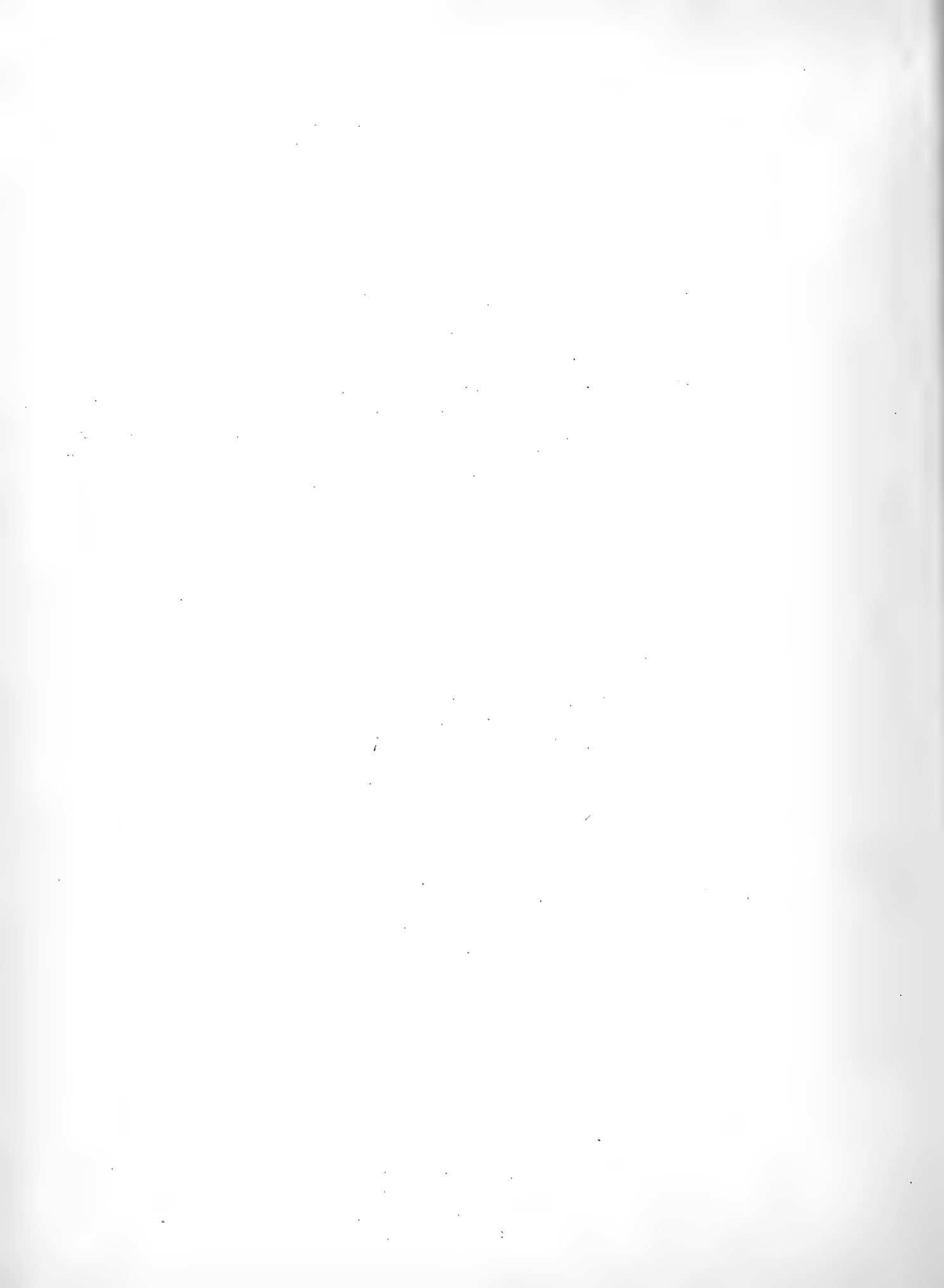
III-6. Sta. 3206-55. In 201 feet. OPG took 0.05 cuft of fine green silty sand. The screenings consisted of many kinds of smaller animals totalling about 1 1/2 pints of which ophiuroids and other echinoderms measured about half of the total. There were a few red waxy lumbs, so light in weight as to float in water.

Echinoderms include:

many smooth disked, smaller ophiuroids, totalling about 2/3 pint
 small purple holothuroids - 6
 sea urchin - 1 small, measuring about 21 mm across the disk
 a small sea star

Crustaceans include:

pinnixid - 2 small
 amphipods - about 124, with 23 larger red, and 101 smaller pale kinds
 cumaceans, including at least 4 species and totalling about 36
 ostracods, including at least 3 species and numbering more than 70
 isopods, including 2 anthurid, 8 Gnathia (some of which may be parasitized by a rhizocephalan), and 6 tanaids of which one is an adult male and one female carries ova.



Mollusks include:

chaetoderm - 2

many smaller gastropods and pelecypods of diversified kinds

Coelenterate, Monobrachium - about 50 colonies, on small clam?Harenactis - 4

Nemertean - a few smaller

Polychaetes include:

Ammotrypane

ampharetid

Aricidea - 5Asychis - a posterior endcapitellid, ?Leiochrides - 1Chloeia pinnata - 1 large, 21 smallChone ? mollis - 3

cirratulids - 10 or more

Glycera capitata - 5Goniada - 2Haploscoloplos elongatus - 4Harmothoe lunulata var. - 5LeaniraLumbrineris californiensisLumbrineris cruzensis - 35Lumbrineris latreilliMagelona ?pacificaMaldane - 3Megalomma, in tubeMyriochele gracilisMyxicolaNephtys - 3Nothria elegans - fragmentPanthalis pacifica, with tubeParaonis - 7Pectinaria californiensis - 2Pholoe - 42PhyllodocePoecilochaetus ?johnsoni - 2 juv.PolydoraPraxillella affinis pacifica - 2Prionospio nr. malmgreni - about

10

Prionospio pinnata - about 10Scalibregma - 4, some ovigerousSternaspisSthenelais tertiaglabraSthenelanelia uniformisStreblosomaSyllisTerebellides - 3

terebellid, in tubes - 4

Thalenessa spinosaTravisia ?pupa - 3

and others

SUMMARY.- This sample contains no less than 90 species of metazoan invertebrates of which about 48% are estimated to be polychaetes. None is conspicuous for its abundance. The sample was very small.

III-7. Sta. 3203-55. In 200 feet. OPG took 1.57 cuft of sandy and finer green silty mud. The screenings consisted of about 2 pints of various kinds of animals, a large clam, various kinds of arenaceous foraminiferans and some silt.

Echinoderms include:

ophiuroids, perhaps hundreds of smaller, smooth kinds

asteroids - a small juvenile, and arms of a larger one

holothuroids - several smaller, including 2 tailed (?Molpadia) and others

Crustaceans include:

amphipods - 50 or more

ostracods - many

cumaceans - many

isopods, including Gnathia, with a pair in a tube and 4 others, some of which may be parasitized by rhizocephalan

tanaids - some

Mollusks include:

Compsomyax subdiaphana - 1 larger, measures 60 by 45 mm, weighs 24 grams (wet weight)Chaetoderm - 1various smaller gastropods and pelecypods, with 50 or more small clams partly covered by Monobrachium, a hydroid



Glottidia albida - several small

Coelenterate, Monobrachium - about 50 colonies on small white clam, some have attached medusae

Nemertean - several very small

Nematode - 1 or more

Sipunculids - many, in arms of Rhabdamina (a foraminiferan)

Polychaetes include:

Aglaophamus dicirris - 2

Ancistrostylis

Ceratocephala c. americana - 5

Chloeia pinnata - 32 small

chaetopterid, ?Spiochaetopterus

Cossura candida

Glycera - 3

Goniada - 3

Harmothoe lunulata var. - 4

Lumbrineris spp. - about 40

Magelona - 1 large

Maldane - 3

maldanids - many in sandy tubes

nerinid - several

Ninõe

Panthalis - 2

Paraonis - 2

Pectinaria californiensis - 5

Pholoe - about 20

?Pista, in tube

Poecilochaetus johnsoni

Prionospio nr. malmgreni - 6 or more

Prionospio pinnata - 6 or more

Sphaerodorum minutum - 4

Spiophanes - several

Sternaspis

Sthenelanelia uniformis

Streblosoma

Terebellides - about 6

Tharyx or also other cirratulids

Travisia - 1 large and 2 small

and others

SUMMARY.- This is a diversified, unlimited shelf fauna. The largest individual was Compsomyax subdiaphana; Monobrachium showed unusual abundance.

III-7a. Sta. 4316-56. In 221 feet. OPG took 0.81 cuft of sticky green mud, all of which passed through the screens but about a pint, weighing about 56 grams, of which most was smooth red ophiuroids, weighing 37 grams. The screenings contained considerable Rhabdamina. This was nearly a repeat of III-7, for the purpose of taking Monobrachium (see above), which proved sparse in this sample.

Echinoderms include many smooth red ophiuroids, and holothuroids of two kinds, - a white with longitudinal rows of papillae (3), and a pale lavender kind without papillar rows (2 or 3).

Crustaceans include:

amphipods - many

ostracods - many brown and fewer white with black spot

cumaceans - some

isopods, including tanaids, anthurid and Gnathia

Mollusks include:

chaetoderm - 1 very long and several smaller ones

numerous smaller pelecypods, some with Monobrachium

gastropods of smaller and various kinds

Coelenterate, Monobrachium - some colonies on small clam, of which a few have attached medusae.

Polychaetes include:

Chloeia pinnata, juveniles

Chone

Cossura candida

Flabelligera - 2 juveniles

Maldane

other maldanid

nerinid

Panthalis, tube

paraonids - many

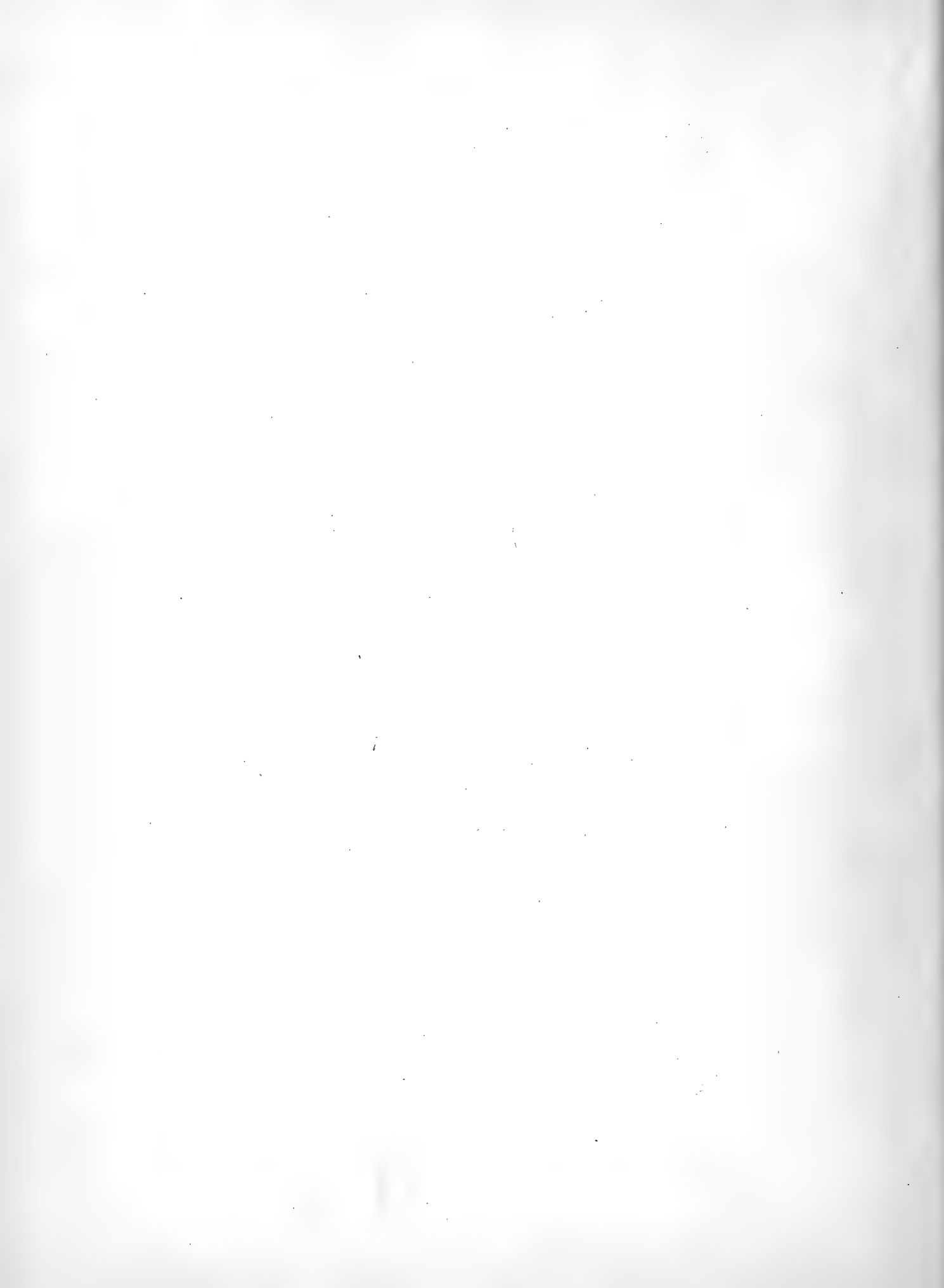
Pectinaria californiensis - 12

Pholoe - many

Pilargis berkeleyi

Pista, in thick mud tube

Prionospio, various species



Sthenelanelia, in tubes
Terebellides

Travisia
and others

SUMMARY.- The sample resembles that in III-7, but is represented with fewer kinds of animals.

III-8. Sta. 3209-55. In 360 feet. OPG took 1.05 cuft of medium green shelly sand. The screenings consisted of considerable rubble, weighing 620 grams (wet weight); there was considerable black debris in the form of algal bits, shell fragments and other biologically formed material.

Echinoderms include:

Amphiodia (Amphisgina) urtica - 191

Amphipholis squamata - 1

caudate holothurian - 2 large

Crustaceans include:

amphipods, about 40, with phoxocephalids:

Heterophoxus sp. A-4

Pontharpinia sp. E-10

brown ostracods - 2

cumaceans - 3

isopod - 1, ovigerous in tube

Mollusks include many smaller pelecypods and gastropods, a tiny chaetoderm, and many dead shells

Echiuroid - 1 small

Sipunculid - 1

Polychaetes include:

Aricidea

Artacamella hancocki

Chloeia pinnata - 11

cirratulids - many

Drilonereis

Glycera - 5

Glycinde - 2

Harmothoe lunulata var.

Lumbrineris cruzensis - 4

maldanid - 1 or more

Megalomma

Nephtys - several

?Nothria - 12

Owenia

Pectinaria californiensis - 34

Pherusa

Pista, in tubes - about 24

Prionospio pinnata - 4

Scalibregma

Spiophanes - several

various spionids

Sternaspis - 4 juveniles

Sthenelanelia uniformis - 4

Terebellides

and others

SUMMARY.- Echinoderms and smaller polychaetes are the most conspicuous and abundant animals.

III-9. Sta. 3001-55. In 489 feet. OPG took 1.89 cuft of sticky gray clay. The screenings consisted of only numerous kinds of smaller animals.

Echinoderms include:

Amphiacantha amphacantha - 5

Amphiodia (Amphisgina) urtica - 4

Amphipholis squamata - 5

Amphiura seminuda - 1

Crustaceans include various kinds of smaller entomostracans, with phoxocephalid amphipods:

Harpinia sp. A-3

Heterophoxus sp. A-7

Mollusks include smaller gastropods, pelecypods, a few Dentalium, and some chaetoderms.

Nemertean - 1 or more, none conspicuous

Polychaetes (most abundant and diversified) include:

<u>Aglaophamus</u>	<u>Lumbrineris</u> spp.
<u>Anaitides</u>	<u>Pectinaria</u> - many
capitellids	<u>Prionospio</u> spp.
<u>Euchone</u>	<u>Rhodine</u>
<u>Glycera</u>	other spionids
goniadiid	Terebellids
<u>Laonice</u>	and many other kinds

SUMMARY.- The sample is characteristic of the shelf fauna; there are many kinds of smaller animals.

III-10. Sta. 3205-55. In 555 feet. OPG took 2.08 cuft of silty green mud. The screenings consisted largely of various kinds of animals and tubes, and very little inert debris.

Echinoderms include:

Amphiacantha amphacantha - 4
Amphiodia (Amphispira) urtica - 3
Amphioplus strongyloplax - 2

Crustaceans include many amphipods, ostracods, and other kinds.

phoxocephalid amphipods include:

Harpinia sp. A-3
Heterophoxus sp. A-2
Phoxocephalus sp. A-2

Mollusks include:

scaphopods: Dentalium rectius - 2, and another kind
 chaetoderm - 4
 pelecypods, with Nucula, Acila, Tellina, and others
 gastropods, smaller shells

Hydroid colonies, some on mollusk shells, Acila and Nucula

Nemertean - 1 larger and 1 smaller

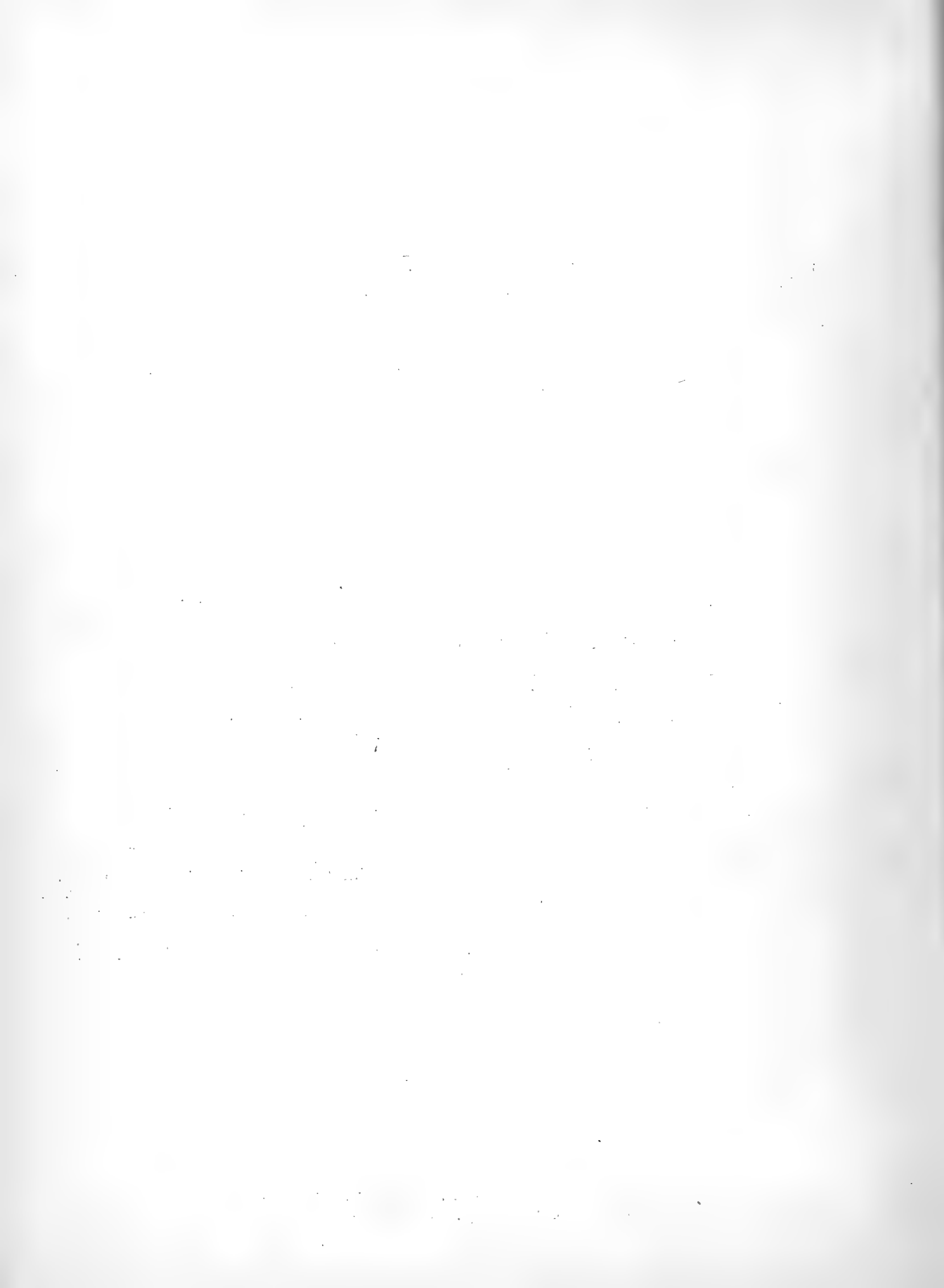
Leech, resembling a flatworm, with suckers at either end - 1

Polychaetes include:

? <u>Amage</u> - 1 larger and 1 smaller	large maldanid, in tube
<u>Anaitides</u>	small maldanid
<u>Ancistrosyllis</u>	<u>Mesochaetopterus</u> , with tube
<u>Aricidea</u> - 5	<u>Nothria pallida</u> - 3 in mud tubes
capitellid	<u>Onuphis parva</u> - 30 in mud tubes
<u>Chloeia pinnata</u> - 8 larger	<u>Panthalis pacifica</u> - 2 in tubes
cirratulid	<u>Pectinaria californiensis</u> - 11
<u>Cossura candida</u>	<u>Prionospio pinnata</u> - 4 smaller
flabelligerid - 2 in scaphopod shell	<u>Sphaerodorum</u>
<u>Glycera</u>	<u>Spiophanes</u> - 5 smaller
<u>Goniada</u> - 5	spionid, perhaps <u>Nerine</u>
<u>Harmothoe</u> - 3 juveniles	<u>Terebellides</u> - 5
? <u>Laonice</u>	and others
<u>Lumbrineris ?cruzensis</u> - 3	

SUMMARY.- The largest and most conspicuous were tubes of Panthalis, maldanid and a large nemertean. The species are diversified with none unusually abundant.

III-11. Sta. 3204-55. In 729 feet. OPG took 2.08 cuft of fine silty green mud. Screenings were largely various kinds of animals.



Echinoderms include:

<u>Amphiacantha amphacantha</u> - 1	<u>Amphipholis squamata</u> - 78
<u>Amphiodia (Amphisgina) digitata</u> - 47	a juvenile asteroid
<u>Amphioplus strongyloplax</u> - 2	holothurians - 4 juveniles

Crustaceans include:

many amphipods with phoxocephalids:

<u>Harpinia</u> sp. A-3	<u>Pontharpinia</u> sp. B-2
<u>Heterophoxus</u> sp. A-9	<u>Pontharpinia</u> sp. B-22
<u>Metaphoxus</u> sp. A-9	<u>Pontharpinia</u> sp. J-17
<u>Phoxocephalus</u> sp. A-1	<u>Pontharpinia</u> sp. Y- 1

isopods with at least 4 species and 32 individuals
ostracods, with 44 brown oval, and 9 white rectilinear
cumaceans - about 31
copepods - one calanoid and one parasitic

Mollusks include:

chaetoderm - 6
scaphopods - 2 living and some dead shells
pelecypods with:
Acila - about 36 living
and many others, especially smaller, living and dead shells
gastropods - various smaller shells

Echiuroid, Thalassema - 1 large

Nemertean - some

Sipunculid - 1 larger

Leech, resembling a flatworm, but with suckers - 2

Polychaetes include:

<u>Amaea occidentalis</u>	<u>Mesochaetopterus</u> , long tube
<u>Ammotrypane</u>	<u>Myriochele gracilis</u>
ampharetid - 2	<u>Nephtys</u> - 6 smaller
<u>Anaitides</u> - larger	neriid fragment
<u>Aricidea</u> - 10 or more	<u>Nothria</u> - several larger
<u>Brada</u>	paraonids - some
capitellid - 2 or more	<u>Pectinaria californiensis</u>
<u>Chloeia pinnata</u> - 37	<u>Pholoe</u> - 9
cirratulids - many	<u>Pista</u> - 2
<u>Cossura candida</u> - 2 or more	<u>Prionospio pinnata</u> - many
<u>Drilonereis</u> - 1 or more	<u>Prionospio</u> spp. - some
<u>Glycera</u> - 12	<u>Rhodine</u>
<u>Goniada</u> - 4	sabellid, in tube - 1 or more
<u>Haploscoloplos elongatus</u> - 5	<u>Scalibregma</u> - 3 small
<u>Harmothoe</u>	<u>Sphaerodorium minutum</u> - 4
<u>Laonice</u>	<u>Spiophanes</u> - many
<u>Lepidasthenia</u>	<u>Sternaspis</u> - 1 tiny
<u>Lumbrineris</u> spp. - 10 or more	<u>Terebellides</u> - 4
<u>Maldane</u> - 5	terebellid fragment
Maldanids, of several kinds	<u>Tharyx</u> - several
<u>Melinna</u>	and others

SUMMARY.- The large animal was a large echiuroid, followed by a sipunculid; the most numerous were 2 kinds of ophiuroids and several kinds of polychaetes.

III-12. Sta. 3002-55. In 715 feet. OPG took 2.77 cuft of sticky gray clay. The screenings consisted of about a pint of many different kinds of animals.



Echinoderms include:

Amphioplus strongyloplax - 4

Amphipholis squamata - 1

Brisaster townsendi - 1

holothurians - 4 juveniles

Crustaceans include diversified entomostracans, with phoxocephalid amphipods:

Harpinia sp. A-2

Heterophoxus sp. A-2

Mollusks include:

Amygdalum pallidulum - 5

Acila castrensis

Macoma sp. - dead shells

Volvulella cylindrica - 2

Nemertean

Enteropneust

Polychaetes include:

Glycera

Maldane

Melinna

Mesochaetopterus, in long, coarse tubes

Nothria

Onuphis

spionids, various - numerous

and others

SUMMARY.- This fauna is characteristic of moderate depths in mud bottoms.

III-13. Sta. 3003-55. In 974 feet. OPG took 2.45 cuft of dark gray clayey mud. The screenings consisted of about 2 pints of material, with many different kinds of animals, including larger kinds such as echiuroid, brissopsid echinoderms, and various polychaetes.

Echinoderms include:

Brisaster townsendi - 2

Amphipolus strongyloplax - 3

Amphipods, with phoxocephalids - Harpinia sp. A-3, and Heterophoxus sp. A-2

Echiuroid - 1 large

Many polychaetes of diversified kinds and other animals.

III-14. Sta. 3004-55. In 1344 feet. OPG took 2.2 cuft of clayey mud. The screenings consisted of about 1 1/2 pints of animals of various kinds, including 3 echinoids, a few smaller crustaceans, diversified annelids, and others. The echinoderms are:

Brisaster townsendi - 2

Brissopsis pacifica - 1

III-15. Sta. 3005-55. In 1630 feet. OPG took 2.83 cuft of clayey mud. The screenings consisted of little except foraminiferan tests, a small sea pen and some polychaetes. They include:

Ancistrosyllis

onuphid

Brada

Paraonis

capitellid

Pectinaria

Myriochele

polynoid

SUMMARY.- In spite of its large size, this sample was unique for having few kinds and numbers of animals. There were no echinoderms, mollusks or smaller crustaceans, and polychaetes were few.

III-16. Sta. 3006-55. In 1920 feet. OPG took 2.77 cuft of clayey mud. The screenings consisted of many foraminiferan tests and various kinds of animals.

Echinoderms include:

- Amphipholis squamata - 1
Astropecten californicus - 1 juv.
Ophiocynodus corynetes - 1

Mollusks include:

- chaetoderm - 4
 gastropod, perhaps Mitrella permodesta - 6

Echiuroid - a large proboscis only

Polychaetes include:

- | | |
|-----------------------------------|-----------------------------|
| ampharetids - many | cirratulids - several |
| <u>Ancistrosyllis</u> - 1 or more | flabelligerid - 1 |
| <u>Aricidea</u> - 1 | maldanids - several |
| unknown orbinid - 1 | unknown <u>Polydora</u> - 1 |
| capitellid - 1 | <u>Terebellides</u> |
| ? <u>Chone</u> - 1 | and others |

SUMMARY.- This is representative of deeper water and resembles that of about the same depth and sediment of San Pedro Basin, above the sill depth.

SUMMARY OF ZONE III-1 to 16.- The fauna of the northern end of Santa Monica Bay is characterized by animal species existing in sandy or muddy bottoms. In shallower parts (to 150 fathoms) there are many smaller, smooth ophiuroids, diversified shallow-water polychaetes, and smaller crustaceans. Deeper parts, represented by samples 14 to 16, are characterized by the presence of burrowing echinoids, echiuroids, and different kinds of polychaetes.

IV-1. Sta. 2997-55. In 600 feet. OPG took 1.89 cuft of fine dark green clayey mud. The screenings consisted of many animals of smaller sizes.

Echinoderms include:

- | | |
|-------------------------------------|-------------------------------------|
| <u>Amphiacantha amphacantha</u> - 4 | <u>Amphipholis pugetana</u> - 1 |
| <u>Amphiodia digitata</u> - 25 | <u>Amphipholis squamata</u> - 5 |
| <u>Amphiodia urtica</u> - 1 | <u>Amphioplus strongyloplax</u> - 4 |
| <u>Amphiodia psara</u> - 5 large | <u>Ophiura lutkeni</u> - 2 |
| <u>Amphiodia rugosa</u> - 12 | <u>Brisaster townsendi</u> - 2 |

Crustaceans include various entomostracans, with phoxocephalid amphipods:

- | | |
|-----------------------------|------------------------------|
| <u>Harpinia</u> sp. A-7 | <u>Phoxocephalus</u> sp. A-5 |
| <u>Heterophoxus</u> sp. A-4 | <u>Pontharpinia</u> sp. E-1 |
| <u>Metaphoxus</u> sp. A-9 | |

Polychaetes include many diversified kinds, especially species in Chloeia, Pectinaria, maldanids, and others. See also the next sample.

IV-2. Sta. 3181-55. In 648 feet. OPG took 2.2 cuft of gray green silty mud. The screenings contained many animals of different kinds but rather few foraminiferan tests.

Echinoderms include:

- | | |
|-------------------------------------|---------------------------------|
| <u>Amphiacantha amphacantha</u> - 6 | <u>Amphiodia urtica</u> - 16 |
| <u>Amphioplus strongyloplax</u> - 4 | <u>Amphipholis squamata</u> - 1 |



Crustaceans include various kinds of amphipods, cumaceans, ostracods
phoxocephalid amphipods:

Harpinia sp. A-6

Heterophoxus sp. A-4

Metaphoxus sp. A-5

Phoxocephalus sp. A-3

Pontharpinia sp. E-1

Mollusks include:

Chaetoderm - 2

shells of Dentalium, Acila, Amphissa, Tellina, and many others

Echiuroid - 1 large Thalassema

Nemerteans - 2, one in onuphid tube

Sipunculid - 1 in gastropod shell

Polyclad - 1

Polychaetes include:

ampharetids - 5

Anaitides - 1

capitellid

Caulleriella

Ceratocephala c. americana

Chloeia pinnata - 10

Drilonereis - 5

Euclymene

flabelligerid, in tooth-shell- 2

Glycera ?americana - 1 large

Glycera capitata - 2

Goniada - 2

Harmothoe lunulata var. - 2

Laonice - 2

Lumbrineris cruzensis - 2

Magelona

Maldane - 3

large maldanid, in annular tube

Myriochele gracilis - 2

Nephtys ferruginea

Onuphis, in tubes - about 20

Pectinaria californiensis - 56

Pista, in tube

Prionospio, nr. malmgreni - 2

Prionospio pinnata - 2

Rhodine

Sphaerodorum - 2

spionids of several kinds - many

Terebellides

Travisia ? olens - 1 large

and others

SUMMARY.- The largest animal is an echiuroid, the most conspicuous
Pectinaria and onuphid polychaetes. The fauna is diversified and
abundant.

IV-3. Sta. 3000-55. In 885 feet. OPG took 2.2 cuft of gray clay.
Screenings consisted of about 2 pints of materials containing foraminiferan
tests and many different kinds of animals.

Crustaceans include some amphipods, isopods, a commensal copepod and
perhaps other kinds

Mollusks include:

scaphopods with Dentalium

shells of pelagic pteropods

many smaller gastropods, especially caecids

Thalassema - 2 large

Sipunculid - 1 large

Polychaetes include:

ampharetids - many

Brada

Chloeia

maldanids

Marphysa, resembling conferta

Melinna

Nothria

onuphid

Pectinaria

polynoid

Rhodine - several

Terebellides

and others

SUMMARY.- The largest animals are Thalassema, followed by a sipunculid.
The most diversified are various kinds of polychaetes.

IV-4. Sta. 3180-55. In 1091 feet. OPG took 1.7 cuft of shale, pebbles, sticky green mud and rubble; the screenings consist of about 8 liters of various kinds of debris and some larger animals, of which the largest were dark red Thalassema, various kinds of other wormlike animals, and smaller crustaceans.

IV-5. Sta. 3179-55. In 1201 feet. OPG took 2.01 cuft of green gray mud with odor of H₂S. The screenings retained many polychaetes, especially Chloeia, malidanids, and others, also mollusk shells and other animals.

IV-6. Sta. 3178-55. In 1428 feet. OPG took 2.33 cuft of green gray, very sticky mud. The screenings included a large echiuroid, 4 brissopsids, a few ophiuroids, some onuphid and maldanid polychaetes, and many other kinds of annelids.

Echinoderms include: Brissopsis pacifica - 2
Brisaster townsendi - 2

IV-7. Sta. 2999-55. In 1486 feet. OPG took 2.83 cuft of fine dark sticky mud. The screenings contained many foraminiferans, muddy tubes of annelids, and other animals.

Mollusks include shells of Dentalium, gastropod, and a larger chaetoderm.

Polyclad - 1 smaller

Polychaetes include:

ampharetid in thick mud tube

Ancistrosyllis

Drilonereis

Euclymenid

Glycinde

Goniada

Lumbrineris spp.

Onuphis ?vexillaria - many paraonids

Pilargis, fragment

Prionospio pinnata

sigalionids

and others

IV-8. Sta. 3399-55. In 1565 feet. OPG took 2.58 cuft of fine green sticky mud. The screenings retained many foraminiferans and numerous larger animals of various kinds.

Echinoderms include:

Brissopsis pacifica - 2 larger

Amphiodia (Amphispina) urtica - 3

Amphipholis squamata - 1

Crustacean - a parasitic cyclopoid copepod

Mollusks include largely dead shells, especially of Amphissa

Glottidia albida - 2 tiny

Echiuroid - 1

Nemertean - a large red-ribbon species

Polychaetes include:

Ancistrosyllis

Aricidea uschakovi - 2

Chone mollis - 1 larger

Lumbrineris - 1 small

Maldane - about 15

Onuphis vexillaria - 1 large

Paraonis - 2

and few other smaller kinds

IV-9. Sta. 3177-55. In 1800 feet. OPG took 2.14 cuft of green mud. The screenings consisted of 2 translucent pale echiuroids, 2 or more nemerteans and polychaetes including:

ampharetids	<u>Prionospio</u>
cirratulid	a large terebellid
<u>Goniada</u>	

IV-10. Sta. 3176-55. In 2385 feet. OPG took 1.95 cuft of green mud, sand and shale. The screenings consisted of about 13 liters of black rubbly soft muddy to shaley debris, and about a liter of foraminiferans with fine dark rubble. The shaley lumps are more or less penetrated by larger (perhaps pholad) to smaller (perhaps sipunculid) burrows. There are 2 larger clumps of siliceous sponge, and a dead valve of pecten with fenestrated valves. The living animals are few. Mollusks include:

Lucinoma annulata - 1 living and 1 dead shell

Mitrella

Macoma

a very small ophiuroid
orbiniid polychaete

SUMMARY OF IV-1 to 10. The fauna in Santa Monica Canyon, in 600 to 2385 feet, resembles that in Redondo Canyon (zone V) but is less diversified and sparser.

V-1. Sta. 2725-54. In 345 feet. OPG took 1.13 cuft of coarse green shelly mud with some rounded stones. The screenings consisted of about 8 liters of fine to coarse gravel, shell fragments and various animals and matted masses of white spicules, like those of sponge, but no living sponges.

Echinoderms include:

Amphiacantha amphacantha - 8

Amphichondrius granulatus - 1

Amphiodia (Amphispina) digitata - 39

Amphiodia (Amphispina) urtica - 5

Amphioplus hexacanthus - 3

Amphioplus strongyloplax - 3

Crustaceans include many diversified entomostracans

Mollusks few, include:

scaphopods, pelecypods and gastropods

some chaetoderm

One sea whip

Echiuroidea - 1 large deep green

Polyclad - 1

Polychaetes include:

Aglaophamus

Brada

Haploscoloplos elongatus

Laonice

Lumbrineris, 1 larger

maldanids

Nephtys, perhaps ferruginea

onuphids, in tubes

Pectinaria californiensis

polyodontid tube - 1 larger

sigalionids

Sternaspis

Terebellides

and others

SUMMARY.- The largest animal is an echiuroid; the most abundant or conspicuous are an ophiuroid and various kinds of polychaetes. The number of species is estimated at 45, that of individuals about 200.

V-2. Sta. 3163-55. In 360 feet. OPG took only a very small sample of gray mudstone from the wall of the canyon.
Echinoderm - fragment of an ophiuroid only
Crustaceans include an isopod, an ostracod, and 4 amphipods (2 caprellids)
Mollusks include a small gastropod and a juvenile Yoldia
A few hydroid stems
Nemertean - 1

Polychaetes, largely single individuals, include:

<u>Anaitides</u> , juvenile	<u>Magelona</u> , pouched
<u>Armandia</u>	<u>Nereis procera</u>
<u>Capitella</u> ? <u>capitata</u>	<u>Nothria</u> , perhaps <u>elegans</u>
another slender capitellid	<u>Onuphis</u>
<u>Chone</u> , perhaps <u>mollis</u>	<u>Prionospio</u> , nr. <u>malmgreni</u>
<u>Lumbrineris</u>	<u>Tharyx</u> , perhaps <u>parvus</u>

SUMMARY.- This small sample contains animal species resembling those in shallow bottoms of Zone I (see above).

V-3. Sta. 2192-52. In 366 feet. OPG took 1.51 cuft of fine mud and sand. The screenings consisted largely of many kinds of animals, especially annelids, smaller crustaceans, smaller mollusks, and others.

Mollusks (identified by Dr. Norman T. Mattox) include:

<u>Cadulus fusiformis</u> - 1	<u>Solemya panamensis</u> - 1
<u>Dentalium rectius</u> - 142	<u>Tellina bodegensis</u> - 1
<u>Acteon punctocoelata</u> - 1	<u>Thyasira barborensis</u> - 3
<u>Bittium catalinensis</u> - 1	<u>Yoldia scissurata</u> - 13
<u>Fusinus arnoldi</u> - 2	
<u>Turbonilla</u> sp. - 1	
<u>Volvulella tenussima</u> - 6	

Polychaetes are very numerous and diversified, comprising no less than 40 species and many hundreds of individuals; Pectinaria, larger terebellids and other tubicolous kinds are particularly conspicuous.

SUMMARY.- It is estimated that the sample has about 60 species and 950 or more individuals.

V-4. Sta. 2727-54. In 398 feet. OPG took 1.76 cuft of green sticky mud. The screenings consisted of many ophiuroids, annelids and dead and living mollusk shells.

Echinoderms include:

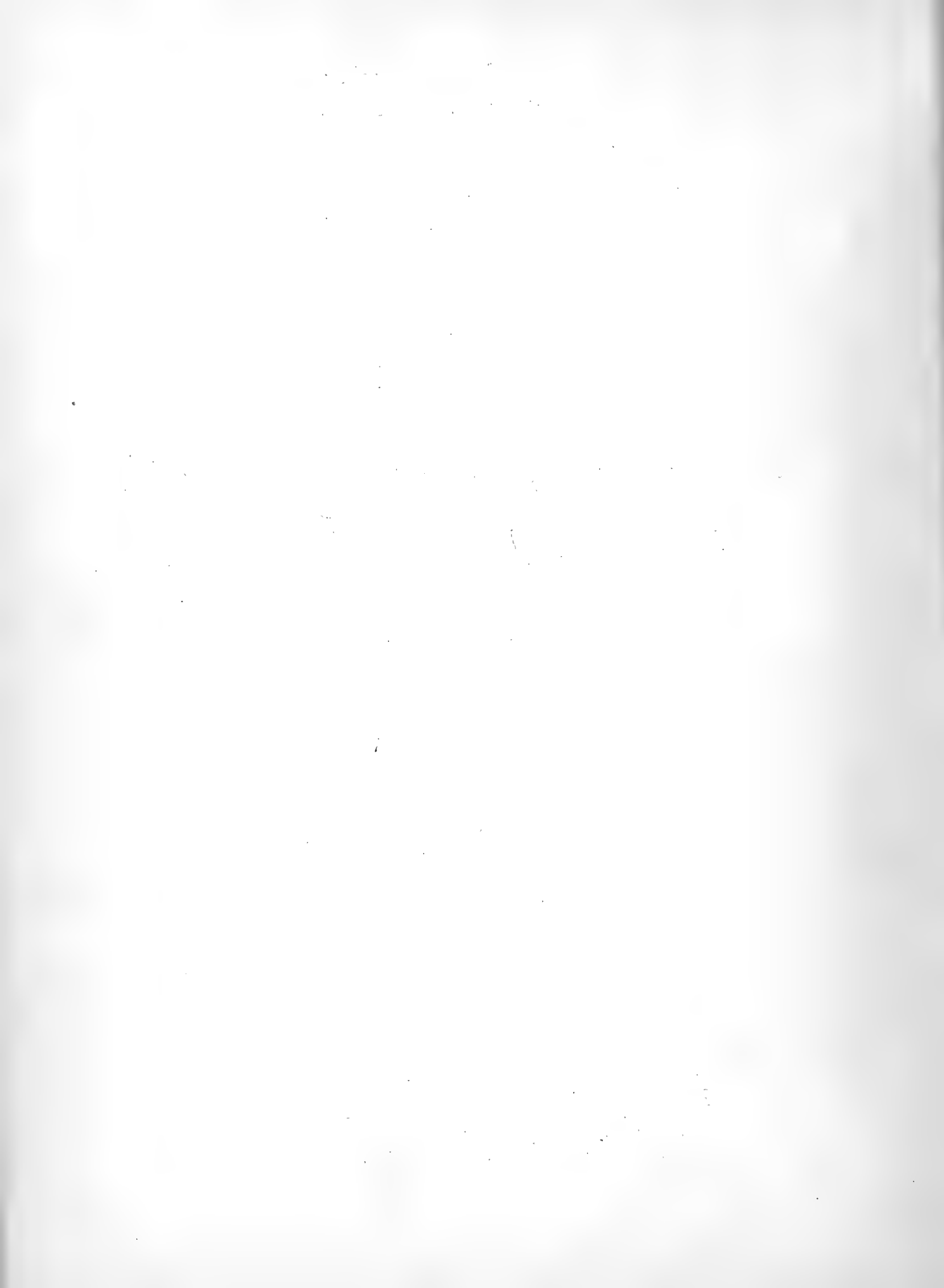
Amphiacantha amphacantha - 25
Amphiodia (Amphispina) digitata - 107
Amphioplus hexacanthus - 5
Amphioplus strongyloplax - 5

holothuroids - a larger (90 mm long) and a smaller (35 mm long) tailed kind, perhaps Molpadia

Crustaceans include various entomostracans, with:

phoxocephalid amphipods:

<u>Metaphoxus</u> sp. A-19	<u>Pontharpinia</u> sp. E-13
<u>Heterophoxus</u> sp. A-12	<u>Pontharpinia</u> sp. J-1
<u>Phoxocephalus</u> sp. A-3	<u>Pontharpinia</u> sp. Y-2



Mollusks include:

Amygdalum pallidulum - 21
Dentalium rectius - 2
Cadulus - 6
Cuspidaria - 2 or more
Leda

Tellina
 white bubble-shells
Acila castrensis
 various other gastropods
 and pelecypods

Sipunculid

Polychaetes include:

Aglaophamus
Ammotrypane
Brada
Ceratocephala
Chloeia
Glycera capitata
Goniada ?brunnea - 1 larger
Laonice
Lumbrineris bicirrata
Lumbrineris cruzensis
 maldanid
Megalomma

Nephtys ferruginea - 7
Panthalis, in large tube
Pectinaria - 6
Pholoe
Prionospio pinnata - 4
Prionospio, nr. malmgreni
Telepsavus sp.
Sternaspis
Sthenelais
Tharyx
Travisia
 and others

SUMMARY.- The sample is characteristic of the shelf fauna; it is estimated to have 70 different kinds, with 800 or more individuals.

V-5. Sta. 3385-55. In 401 feet. OPG took 1.78 cuft of very fine sandy green mud. The screenings consisted of much biological debris, fragments of shells, tubes of animals and fragments of ophiuroids, also many tests of arenaceous foraminiferans.

Echinoderms include:

Amphiacantha amphacantha - 24
Amphiodia (Amphispira) urtica - 85
Amphioplus strongyloplax - 7
Amphipholis squamata - 20
Amphipholis sp. - 1 juvenile
Ophiocnida sp. - disk
Brissopsis acifica - 1 larger
 holothurian, white - 2 juveniles

Crustaceans include many amphipods, cumaceans and other entomostracans.

Phoxocephalid amphipods include:

Heterophoxus sp. A-7
Metaphoxus sp. A-18
Phoxocephalus sp. A-4
Pontharpinia sp. E-21
Pontharpinia sp. J- 4

Mollusks include many smaller living gastropods and pelecypods, also some Dentalium and 3 small Aglaia

Nemertean - 1 larger in tube of polyodontid (worm), and other smaller ones

Polyclad - 1

Polychaetes include:

ampharetids of several kinds, some in tubes
Brada
 capitellids - several small
Chloeia pinnata
 cirratulids of several kinds - many
Glycera, perhaps capitata
Goniada - 2
Harmothoe lunulata var.
Laonice - larger
Leanira - 2

Lumbrineris ?bifilaris
Lumbrineris, other species - several
Nephtys ferruginea - 3
Owenia
Panthalis pacifica, in tube
 paraonids, including Aricidea - several
Pectinaria californiensis - many
Pherusa
Phyllochaetopterus prolifica, tubes
Pista, in tube
Praxillella, perhaps gracilis, in sandy tube
Prionospio, perhaps cirrifera
Prionospio pinnata
 sabellid
 sigalionids
Sphaerodorum minutum - 3
Spiophanes missionensis
 other spionids - many
Sternaspis
Terebellides
Tharyx ?multifilis - 3
Travisia- 1 juvenile
 and others

SUMMARY.- This sample is characteristic of the shelf fauna; the number of species is estimated at about 70, that of individuals at 950.

V-6. Sta. 2726-54. In 420 feet. OPG took 2.77 cuft of green sticky mud. The screenings contained many ophiuroids, resembling those in V-5, a larger brissopsid urchin, many different kinds of polychaetes and some mollusks, including Dentalium rectius. The most conspicuous animals in the sample were Chloeia pinnata and Pectinaria californiensis. The sample was partly spoiled during processing.

V-7. Sta. 3164-55. In 480 feet. OPG took 2.83 cuft of black mud with odor of H₂S. The screenings consisted of much detritus, broken tubes of Pectinaria, mollusks shells especially those of olive and other smaller kinds.

Echinoderms, with 4 small ophiuroids only, include:

Amphiodia (Amphispina) digitata - 3

Amphipholis squamata - 1

Crustaceans include:

caprellid amphipods - 5

phoxocephalid amphipod, Pontharpinia sp. B-1

ostracods - 2

pinnixid crab - 2

Mollusks include:

Dentalium rectius - 30

Yoldia scissurata - 27 larger

Solemya - 2

various other gastropods and pelecypods of smaller sizes



a small hydroid stalk

Nemerteans include a larger Cerebratulus and 10 smaller ones

Polychaetes include:

Amaea occidentalis

Anaitides

Ancistrosyllis rigida - 47

Aricidea, various kinds - 42 or more

Brada - 1 larger and 1 smaller

Capitella capitata - 14

Chloeia pinnata - 5 larger and 18 smaller

Dorvillea articulata - 1

Glycera (more than one species) - 8 larger and 4 smaller
goniadiid - 3 larger

Haploscoloplos elongatus - 2

Harmothoe lunulata var. - 2

Heteromastus filobranchus - 24 larger

Laonice - 1 very large

Lepidasthenia, commensal perhaps with onuphid - 2 larger

Lumbrineris bifilaris - 1

Lumbrineris cruzensis - 19, some ovigerous

Lumbrineris index - 1

Magelona, pouched - 1

maldanid - 2

Nephtys ferruginea - 4

Ninoë - 1

Nothria pallida, in thick mud tubes - 8

Onuphis ?parvus, in mud tube - 1, ovigerous

Pectinaria californiensis - 95

Pilargis maculata - 1

Prionospio ?cirrifera - 35, ovigerous, though small in size

Prionospio spp. - 29 or more

syllid - 1 or more

Tharyx - 4 or more

SUMMARY.- This sample is estimated to have about 70 species and more than 1000 individuals.

V-8. Sta. 3386-55. In 603 feet. OPG took 0.44 cuft of fine dark green sandy mud. The screenings consisted in part of many small black cemented nodules with attached arenaceous foraminiferans, many echinoderms, a large nemertean, echiuroid, and many other animals.

Echinoderms include:

Brissopsis pacifica - 3

Spatangus californicus - 1

Amphiacantha amphacantha - 1

Amphiodia (Amphisphaera) urtica - 48

Amphioplus strongyloplax - 3

Amphipholis squamata - 13

Crustaceans include:

cumaceans, with at least 2 species - many

ostracods, with at least 3 species, most brown - many

amphipods, many with phoxocephalids:

Heterophoxus sp. A-5

Pontharpinia sp. E- 8

Metaphoxus sp. A- 7

Pontharpinia sp. J-2

Phoxocephalus sp. A-2

isopods - some

Echiuroids include a large green, and a smaller green one.

Nemerteans include:

Cerebratulus - 1 large, ribbonlike

smaller kind



Polychaetes include:

Ancistrosyllis

capitellids

Chloeia - 21 or more

Cossura candida

Glycera

Goniada

Haploscoloplos

Magelona

Maldane

Nephtys

Onuphis

paraonids of several kinds

Pectinaria

Pholoe

Prionospio pinnata

sabellid

Spiophanes

Terebellides

large terebellid in silty tube

Tharyx, perhaps multifilis

and others

SUMMARY.- The largest animals are a nemertean, an echiuroid and echinoid echinoderms; the most numerous are various kinds of annelids.

V-9. Sta. 2789-54. In 564 feet. OPG took 1.7 cuft of sandy blue-gray mud, several larger stones and much shelly rubble in which many kinds of animals were buried.

Echinoderms include a brissopsid urchin and some ophiuroids.

Mollusks include 7 living Tellina, other kinds of pelecypods and some gastropods.

Polychaetes are numerous and diversified, with Chloeia, polyodontid, and Travisia the most conspicuous.

V-10. Sta. 2990-55. In 657 feet. OPG took 3.08 cuft of fine black mud. The screenings consisted almost entirely of various kinds of animals.

Echinoderms include:

Amphiopholis squamata - 2 juveniles

Ophiothrix spiculata - an arm segment only

Ophiura lütkeni - 1 juvenile

Crustaceans include phoxocephalid amphipods:

Heterophoxus sp. A-2

Phoxocephalus sp. A-2

Pontharpinia sp. J-1

Mollusks include many smaller shelled gastropods and pelecypods, also some scaphopods, Dentalium rectius.

Nemerteans - some

Polychaetes include:

Aglaophamus

Anaitides

Ancistrosyllis

Glycera

Laonice

Mesochaetopterus, large tube

Nothria pallida, in thick mud tubes

Pectinaria californiensis

Pholoe

Prionospio spp.

Telepsavus sp.

and others

SUMMARY.- The largest animal is Mesochaetopterus, the most conspicuous is Nothria pallida. The number of species is estimated at 50, that of individuals at 350.

V-11. Sta. 2191-52. In 750 feet. OPG took 2.7 cuft of fine sandy green mud. The screenings consisted of various kinds of animals, especially polychaetes, Chloeia, Mesochaetopterus, various spionids, cirratulids, maldanids and others. Mollusks were represented by pelecypods, scaphopods and others.



V-12. Sta. 2358-53. In 750 feet. OPG took 2.89 cuft of light colored clayey mud. The screenings contained many annelids, some ophiuroids, a larger holothurian, and other kinds.

V-13. Sta. 2149-52. In 775 feet. OPG took 2.7 cuft of mud. The screenings consisted of much diversified life.

Echinoderm - 1 large echinoid
Crustaceans include amphipods, ostracods, a copepod.
phoxocephalid amphipods with
Heterophoxus sp. A-1
Paraphoxus sp. A-1
Phoxocephalus sp. A-1

Mollusks include:

Dentalium rectius - 2

Yoldia scissurata - 3

and few others

Nemertean - 1 or more

Echiuroid: Thalassema - 3 large

Polychaetes include:

Anaitides

Ancistrosyllis

Chloeia pinnata - more than 60

cirratulid

Cossura candida - several

Dorvillea - 2

Glycera - 2

Goniada - 2

Haploscoloplos elongatus - 6

Lumbrineris index - 6 large

Lumbrineris, other spp. - several

maldanid, in thick mud tubes

Mesochaetopterus - 1

Nothria ?pallida - 2

Notomastus - many

Pectinaria californiensis -
several

Pherusa spp. - several

polynoid

Terebellides

other kinds

SUMMARY.- The species are typical of moderate depths of Redondo Canyon.

V-14. Sta. 2361-53. In 942 feet. OPG took 1.44 cuft of fine green silty mud. The screenings contained many animals, with echiuroids, annelids and ophiuroids, having resemblance to those in adjacent samples.

V-15. Sta. 2148-52. In 996 feet. OPG took 2.8 cuft of mud. The screenings consisted of various kinds of animals.

Echinoderm - an echinoid

Echiuroid: Thalassema - 4 large, deep red in life, length to 140 mm,
harboring a pinnotherid crab

Nemertean - 1 large

Polychaetes numerous and diversified, include:

Ancistrosyllis - several

capitellids - many

Chloeia pinnata - about 50

Lepidasthenia

Lumbrineris spp. - several

Nephtys - several

neriid

Pherusa spp. - several

Prionospio spp. - several

Travisia - 1

many other kinds

SUMMARY.- The fauna resembles that in adjacent parts of Redondo Canyon.



V-16. Sta. 2724-54. In 1027 feet. OPG took 2.52 cuft of fine green sticky mud with a few very hard rocks. The screenings consisted of about 16 liters of rubble, fine to coarse gravel and shelly fragments. The contained animals were numerous and diversified.

Some siliceous sponge

Echinoderms: a few ophiuroids

Crustaceans with many amphipods.

phoxocephalid amphipod: Heterophoxus sp. A-7

Echiuroid: deep green kind - 3

Polychaetes include:

Anaitides - several

Ceratocephala c. americana - 1

Drilonereis - 1 or more

Glycera - 1

Lumbrineris - several

Maldane - many

onuphids - several

polynoid - 1 or more

polyodontid

spionids - several

other kinds

SUMMARY.- The sample is characterized by the presence of glass sponge, a green echiuroid, and Maldane.

V-17. Sta. 2790-54. In 1115 feet. OPG took 2.33 cuft of blue gray mud. The screenings consisted of many different kinds of animals. Echinoderms include a brissopsid and a surface urchin.

Crustaceans include some amphipods, cumaceans, an isopod, an ostracod, and phoxocephalid amphipod, Harpinia sp. A-2

Echiuroid

Anemone

Polychaetes include:

Aglaophamus - 2

Anaitides - 3

Chone - 1

cirratulid - 1

Drilonereis - 1

Goniada - 1

Harmothoe lunulata var. - 1

another harmothoid - 1

Laonice - 1

Lumbrineris cruzensis - 1

Lumbrineris, other sp. - 1

Maldane - many

other maldanid - 1

Nothria pallida, in thick mud
tubes - many

Onuphis - 1 or more

Pectinaria californiensis - many

Prionospio pinnata - several

Prionospio, other sp. - 2

terebellid - 1

and others

SUMMARY.- The bottom is characterized by Nothria pallida and Pectinaria.

V-18. Sta. 2190-52. In 1140 feet. OPG took 3.02 cuft of fine silty mud. The screenings consisted of many kinds of animals.

Echinoderms - an echinoid, and several holothuroids

Echiuroid, Thalassema - 1

Nemertean - several

Mollusk with Chaetoderm - several

Polychaetes include:

Aglaophamus - 1 or more

Anaitides - 1

Brada - 1

?Capitella - 1

other capitellids

Chloeia pinnata - many

Glycera - 1 large

Goniada - 1

Harmothoe lunulata var. - 2, with

internal parasites

Lumbrineris - several

Nephtys - several

Nothria - 1

Pectinaria californiensis - 12

Pherusa - several

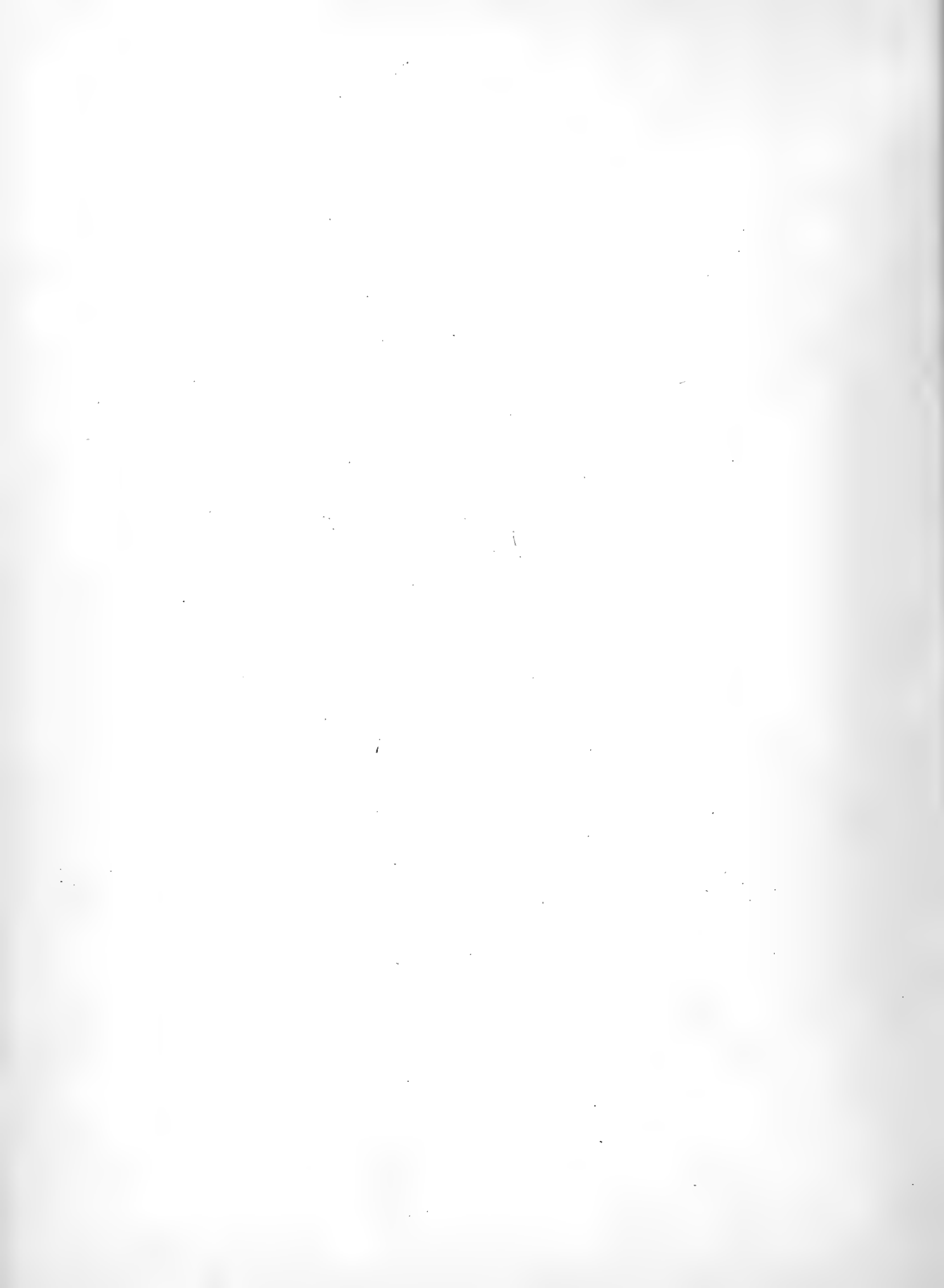
Prionospio spp. - several

sabellid - 1

Scalibregma - 1

other annelids

SUMMARY.- The bottom is characterized by Chloeia, Pectinaria, and Thalassema.



V-19. Sta. 3166-55. In 1176 feet. OPG took 2.52 cuft of fine green mud. The screenings included many tests of foraminiferans, especially Goesella, many smaller mollusks, dead fragments of Dentalium, and various kinds of animals.

Crustaceans include phoxocephalid amphipods:

Paraphoxus sp. A-1

Pontharpinia sp. Q-1

Echiuroid, Thalassema - 2 larger

Nemerteans include:

red-ribbon nemertean, Cerebratulus - 2 larger

another kind - 2 smaller

Sipunculid - 1

Enteropneust - 2 anterior ends

Polychaetes include:

Anaitides

Ancistrosyllis - 3

Brada

capitellid

Cossura

Euclymene

Glycinde - 2 larger

Goniada

Haploscoloplos elongatus - 3

Harmothoe lunulata var

Leocrates - 2

Lumbrineris ?cruzensis

Maldane - 4

maldanid in sandy tube

Marphysa

Melinna - 1 or more

Nephtys - 3 small

Nereis ?procera

very long nereid

Pectinaria - more than 500

Pherusa

Scalibregma

Spiophanes - 3

and others

SUMMARY.- The largest animals are Thalassema, the most conspicuous Pectinaria. The sample is estimated to have 40 species with more than 200 individuals.

V-20. Sta. 2189-52. In 1768 feet. OPG took 1.87 cuft of silty mud. The screenings consisted of many diversified animals.

Echinoderms include ophiuroids and an urchin.

Crustaceans include:

ostracods with at least 3 species - more than 50

cumaceans - 5

phoxocephalid amphipod, Heterophoxus sp. A-11

Mollusks, identified by Dr. Mattox, include:

solenogasters Chaetoderma - 13, and Limifossor - 9

scaphopods, Cadulus tolmiei - 33, and Dentalium rectius - 3

gastropods, Balcis rutila - 6, and Bittium attenuatum - 1

pelecypods with:

Axionopsis sericatus - 12

Cardiomya pectinata - 1

Crenella columbiana - 1

Macoma incongrua - 323

Nuculana conceptionis - 42

Nucalana spargana - 8

Sphenia globula - 5

Tellina carpenteri - 61

Thyasira barbarensis - 1

Nemerteans - several

Polychaetes include:

ampharetid in mud tube - 2 or more

other ampharetid in sandy tube - several

Anaitides - 4

Brada - 5



capitellid - 1
Chloeia pinnata - about 90
 other cirratulids - several
Cossura candida - 2
Glycera americana - 1 large
 another Glycera sp. - 1
Glycinde - 1
Goniada - 1
Haploscoloplos elongatus - 1
 maldanids - 10 or more
Marphysa - 1
Myriochele gracilis - about 8

nephtyids - several
 onuphid
Pectinaria californiensis - 50
 or more
Pherusa spp. - several
Polydora - 1
 polynoid - several
Prionospio ?cirrifera - 8
Prionospio pinnata - 8
 sabellids - 2
Scalibregma - 3
Streblosoma - fragment
 and others

SUMMARY.- The sample is characterized by its numerous mollusks, Chloeia and Pectinaria.

V-21. Sta. 3400-55. In 1393 feet. OPG took 2.33 cuft of oily green sticky mud. The screenings consisted of many arenaceous foraminiferans, a trace of siliceous sponge, and many kinds of other animals. Present, though perhaps not typical, was a long tapeworm, presumably dropped from a pelagic fish, 3 otoliths, and a serrated shark's tooth.

Echinoderms include:

Brissopsis pacifica - 5
Amphioplus strongyloplax - 4

Crustaceans include:

an isopod
 phoxocephalid amphipods: Harpinia sp. A-2

Mollusks include:

Chaetoderma - 2 smaller
Amphissa shells
 other gastropods and pelecypods

A small sea whip

Echiuroid - 1

Nemertean - a larger ribbonlike species

Tubicolous anemone - 2

Polychaetes include:

Aglaophamus
Ancistrosyllis
Aricidea uschakovi
 flabelligerid, in snail shell
Leocrates - 2
Lumbrineris bicirrata - 1 very large
Maldane
Melinna

Nephtys - small
Nothria - many larger
Paraonis - 2 or more
Pectinaria californiensis -
 5 large

Pilargis
Prionospio pinnata - 10 larger
Tharyx - several

SUMMARY.- The sample is estimated to have about 30 species and 100 individuals.

V-22. Sta. 2793-54. In 1543 feet. OPG took 0.95 cuft of blue gray mud with much coarse to fine rubble, and many kinds of animals.

Siliceous sponge with long spicules

Echinoderm - 1 ophiuroid only

Crustaceans include some amphipods and isopods.

Phoxocephalid amphipods with:

Harpinia sp. B-1
Leptophoxus sp. A-2



Mollusks include:

chaetoderm - several

Cadulus - 14 or more

gastropods and pelecypods of several kinds

Burrowing anemone - 3

Echiuroid, Thalassema - 2

Polyclad - 1

Polychaetes include:

Ammotrypane

ampharetid - 2

Lanice, in large tubeLumbrineris cruzensis - 3Maldane - more than 50Melinna - 2Myriochele gracilisNothriaOnuphis vexillaria - 1 or moreParaonisPectinaria californiensis - 1Petaloproctus - 2 or morePherusa - 2

polynoids of 2 kinds

Prionospio - 2Syllis

?Thelepus in tube

other kinds

SUMMARY.- The sample is characterized by Maldane and Thalassema.

V-23. Sta. 3167-55. In 1680 feet. OPG took 1.95 cuft of green mud. The screenings consisted of many arenaceous and calcareous foraminiferans, also flocculent bits of algae and debris, and many different kinds of animals.

Echinoderm - 1 brissopsid only

Crustaceans - 1 phoxocephalid amphipod only, Pontharpinia sp. ♀

Mollusks include:

Amphissa bicolor - 38 shells, many livingChaetoderma - 2

scaphopods, 8 shells, most dead

various pelecypods and gastropods

Nemertean, red ribbonlike Cerebratulus - 2 large

Sipunculid - 1

Polychaetes include:

Ancistrosyllis - 3AricideaBrada - 16, some ovigerous? Dasybranchus - 5

onuphid, with tube, lacks head

Pectinaria californiensis - 1Prionospio pinnata - 1 larger and 1 smallScalibregma - 1 giant ovigerous, weighs 900 mg (wet weight)Spiophanes

SUMMARY.- The largest individuals are Scalibregma and Cerebratulus, the most conspicuous are Brada and Amphissa. The number of species is estimated at 30, that of individuals at 75.

V-24. Sta. 2151-52. In 1746 feet. OPG took 0.5 cuft of mud.

The screenings consisted of many kinds of animals.

Siliceous sponge - some

Echinoderms include 2 echinoids and many ophiuroids

Crustaceans include 2 small spider crabs, a shrimp, a Scalpellum (barnacle) and a phoxocephalid amphipod, Heterophoxus sp. A.

Mollusks include:

gastropod, ?Nitidella sp. - about 30boring pelecypod, Xylophaga sp. - many in water-logged wood



Polychaetes include:

Acrocirrus ?crassifilis - about 15
Amphicteis
Anaitides
 ?Asclerocheilus - about 4
 capitellid - 2
 chaetopterid - 3 long tubes and fragments of animals
Cirratulus, resembling cirratus
Cirratulis, another kind - 4
 ?Eumida
Euphrosine
Evarnella fragilis
Glycera tessellata - 3
 ?Hauchiella
 ?Hypoeulalia bilineata
Lagisca
Laonice
Lepidonotus - 2
Lumbrineris, more than 1 kind - 9
Nereis
Onuphis
Pherusa - 3
 phyllodocid
Polydora, with 3 species - about 10
Protula, tubes fully attached to surfaces
 syllid - 3
Terebellides

SUMMARY.- This bottom has a uniquely diversified fauna, characteristic of moderate to deep parts of Redondo Canyon.

V-25. Sta. 2150-52. In 1810 feet. OPG took 1.38 cuft of mud. The screenings consisted of many reddish brown arenaceous foraminiferans, especially Valvulinidae, Goesella, and others, and small pieces of wood riddled by a boring mollusk.

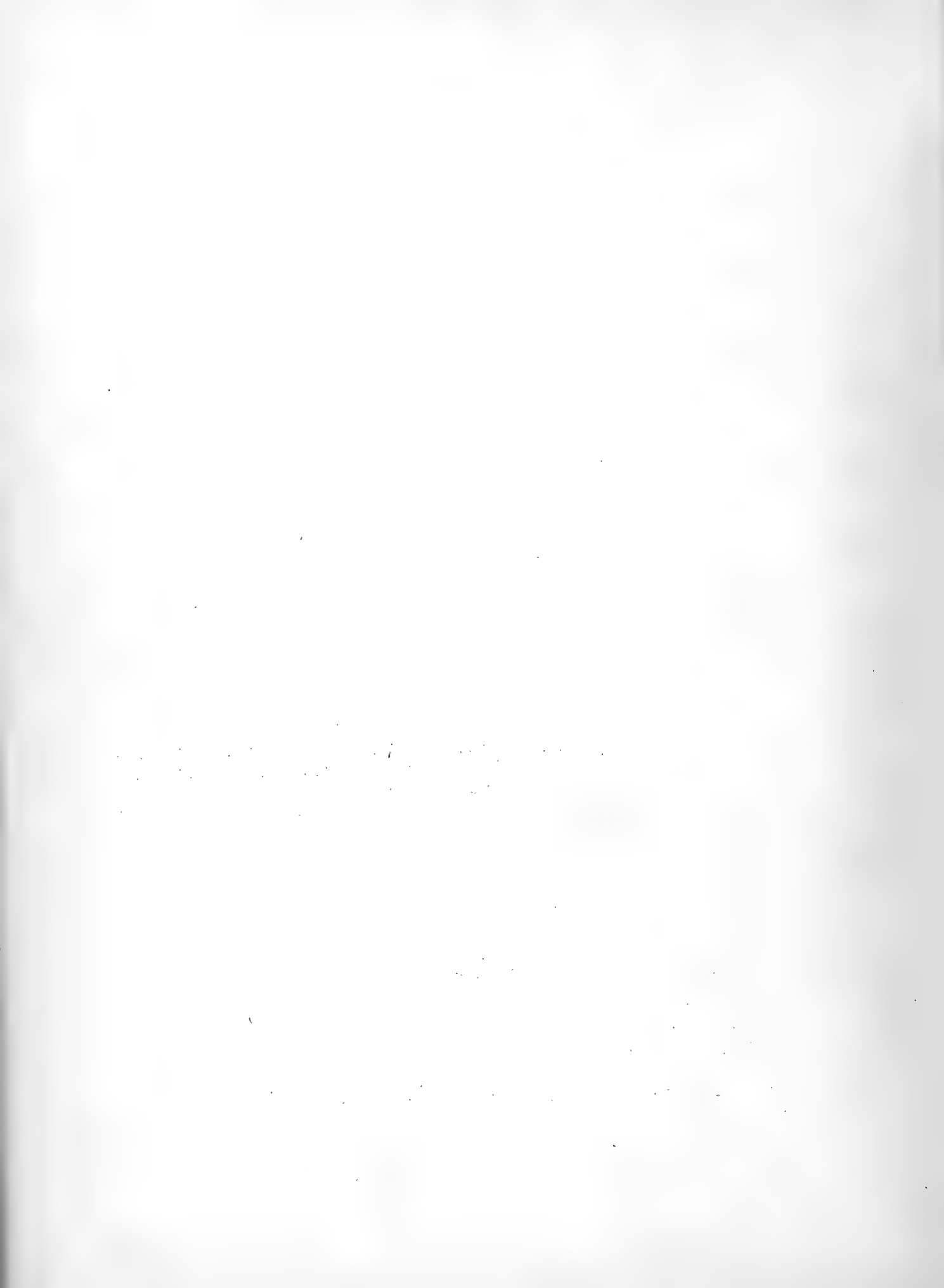
Echinoderm - Brissopsis pacifica - 1

Mollusks include:

Amphissa - 3
Acila - 1
 scaphopods - 2
 ?Macoma - 1
 solenogasters - 6
Xylophaga, boring pelecypod, in wood
 Fragments of a sea pen with pendanted stipe
 Nemerteans - 3 or 4 larger

Polychaetes include:

Amage, in silt covered tube
Aricidea
Brada, perhaps pilosa - 25 (largest measure 22 mm long)
Capitella - 1 female only
Chloeia pinnata
Dorvillea articulata
Glycera, perhaps capitata - 1 minute
Heteromastus filobranchus
Leocrates - 2



Nephtys - 8 ovigerous, length only 7 to 10 mm

Ninoe

Pilargis, fragment

polynoid - 1 minute

Prionospio pinnata - 2

sabellid, in silt covered tube

Scalibregma - 5 smaller, to 10 mm long

Terebellides

SUMMARY.- The largest animals are nemerteans; none is conspicuous.
The fauna resembles that in adjacent samples.

V-26. Sta. 2792-54. In 1850 feet. OPG took 2.77 cuft of blue gray mud. The screenings retained many foraminiferans and metazoan animals.
Echinoderms - Brissopsis pacifica - 2
Crustacean - a phoxocephalis amphipods: Harpinia sp. B-1
Mollusks include white gastropods and perhaps a few others
Polychaetes of diversified kinds, resembling those in adjacent samples.

V-27. Sta. 3168-55. In 1890 feet. OPG took 2.08 cuft of gray green mud. The screenings consisted almost entirely of foraminiferans and shell fragments weighing 56 grams, and a large living gastropod, Turricula, which weighed 14.25 grams. In addition, the animals listed below.

A small sea whip

Mollusks include:

Amphissa - 8 shells

solenogaster - 1

shells of caecids, gastropods and pelecypods, few in numbers

Turricula bairdii - 1 large living

Polychaetes include:

ampharetids - 14, and about 50 uniformly small tubes

Amphicteis scaphobranchiata - 1 larger

Brada

capitellid

Chloeia pinnata - 3 larger

?Chone, in sand-covered, cartilaginous tube - 3

Cossura candida

Lumbrineris - 1 small

Melinna - 4 larger

unknown orbinid

Paraonid

Pista, in tubes attached to large shell

Polydora

Prionospio

Terebellides

Tharyx

serpulid, attached to shell

SUMMARY.- This is a deep water fauna, characterized by the large snail, ampharetids, and some other polychaete genera.



V-28. Sta. 3174-55. In 2008 feet. OPG took 2.64 cuft of dark green silty mud. The screenings consisted of many foraminiferans and a few animals.

Echinoderms include Ophiomusium jolliensis-1, and an Ophiomyxid - 1
dead shells of scaphopods

Sipunculids

Nemerteans - 2

Polychaetes include:

ampharetids - parts of 2 species

unknown orbinid

deep-water Phyllochaetopterus, with tubes

SUMMARY.- This approaches the Impoverished Fauna characteristic in the subsill parts of San Pedro Basin.

V-29. Sta. 2362-53. In 2112 feet. OPG took 2.83 cuft of fine gray green mud. The screenings consisted of foraminiferan tests, an echiuroid and numerous smaller polychaetes.

V-30. Sta. 2723-54. In 2163 feet. OPG took 3.4 cuft of fine green sticky mud. Only a small sample failed to pass through the screens; this contained many foraminiferan tests and some metazoan animals.

A small ophiuroid

Mollusks include:

solenogasters - 1 large and several small

?Nitidella - several

another gastropod - several

Echiuroid - 2

Sipunculid - several

Enteropneust - 33, with 2 or more species

Polychaetes include:

Amphicteis scaphobranchiata, in thick muddy tubes

Aricidea - 2

capitellid

several cirratulids

maldanids of 2 kinds

?Leocrates

Lumbrineris

unknown orbinid - several

Paraonis - 3

unknown sabellid - 2

sigalionids - 4 or more

SUMMARY.- This bottom is characterized by the presence of an enteropneust and ampharetid annelids.

V-31. Sta. 3169-55. In 2280 feet. OPG took 1.95 cuft of green mud. The screenings consisted of foraminiferan tests and metazoan animals.

Echinoderm - Ophiomusium jolliensis - 1 larger

A small sea whip

A tiny nemertean

Mollusks with dead shells of Cyclopecten and a white gastropod

Polychetes include:

ampharetid, in muddy tubes - about 20
 unknown capitellid
 cirratulid
 ?Melinnexis, in tube - 1, measured 50 cm long and weighs 30 grams
 unknown orbinid
 protulid tubes, attached to that of ?Melinnexis
 sabellid, in tubes - 2

SUMMARY.- This sample is characterized by the large ophiuroid, and the ampharetid polychaetes.

V-32. Sta. 2474-53. In 2430 feet. OPG took 3.9 cuft of fine dark green mud. The screenings, a little less than a pint, included many calcareous and some arenaceous foraminiferan tests, large tubes of chaetopterids, and numerous smaller animals.

Echinoderm - a small urchin only, perhaps Allocentrotus fragilis

Mollusks include a tiny, clay-covered bivalve, and 3 small solenogasters

Sipunculids - 2 long, linear

Polychaetes include:

?Amage - 59, with tubes

Ancistrostylis

unknown capitellid

Drilonereis

Lumbrineris

small maldanid fragment

unknown orbinid

Paraonis - 2 long, slender

Potamethus elongatus - 1, in cylindrical tube 95 mm long

protulid, with tube fragments

Spiophanes, with tube

V-33. Sta. 3171-55. In 2550 feet. OPG took 2.45 cuft of green mud. The screenings measured less than a pint, consisted of many foraminiferan tests, some black, glassy stones, a small piece of wood, 2 fish otoliths, tubes of animals, and a few broken valves of Cyclopecten.

Polychaetes include:

a large Pista, in thick mud tube

deep-water Phyllochaetopterus - with tubes and a few specimens

small bits of Protis pacifica

a very slender, perhaps juvenile cirratulid

V-34. Sta. 3175-55. In 2590 feet. OPG took 3.15 cuft of green mud. The screenings consisted of only foraminiferans and a few smaller animals.

Echinoderm - a larger ophiuroid, Ophiomyxidae

A galatheid crab

A sipunculid

Polychaetes include:

ampharetids

deep-water Phyllochaetopterus

Spiophanes

V-35. Sta. 2728-54. In 2670 feet. An unscreened and unfixed sample was examined after it was brought into the laboratory. Only Phyllochaetopterus could be identified. It is possible that lack of preservation on shipboard caused destruction of other animal contents.

V-34. Sta. 3170-55. In 2760 feet. OPG took 2.58 cuft of green mud. The screenings consisted of foraminiferan tests, a few dead valves of Cyclopecten and a few polychaetes.
Amage ?anops - 8 large, in thick mud tubes
Phyllochaetopterus, deep water species - many tubes and 1 individual
Protis tubes - none living.

V-37. Sta. 3173-55. In 2850 feet. OPG took 3.08 cuft of green sticky mud. The screenings consisted of only foraminiferan tests, dead valves of Cyclopecten, and polychaetes:
Amage ?anops - 2, in thick mud tubes
Protis tubes
 unknown orbinid

SUMMARY of V-1 to 37. Redondo Canyon supports a unique fauna, characterized by many species which are sparse or absent in other parts of Santa Monica Bay. Most of its bottoms are soft or muddy. In its moderate depths it supports a Thalassema association, which is replaced in its deeper parts by an ampharetid, and finally by a Phyllochaetopterus association.

VI-1. Sta. 2791-54. In 2567 feet. OPG took 3.08 cuft of fine blue gray mud. All materials passed through the screens but about a pint of foraminiferan tests and empty tubes of Phyllochaetopterus (deep-water species).

VI-2. Sta. 2620-54. In 2562 feet. OPG took 2.2 cuft of fine gray green mud. The screenings consisted of less than a pint of foraminiferan tests and empty tubes of Phyllochaetopterus (deep-water species).

VI-3. Sta. 3019-55. In 2570 feet. The Campbell grab took 5.31 cuft of black rock fragments, some of which had dead tubes of fully attached serpulid; there were many siliceous sponge spicules and foraminiferan tests, in addition to animals listed. Echinoderm with a tiny, juvenile seastar only
 Crustaceans with 1 amphipod and 5 calanoid copepods
 Mollusks include:

solenogasters - 5
 Cadulus - 3
 a small white Macoma-like clam - 3
Mitrella - 1
 fragments of Delectopecten shells

Polychaetes include:

Ancistrosyllis - 2
Aricidea
Lumbrineris fragment
Paraonis

SUMMARY.- This sample came from the sill between San Pedro and Santa Monica basins. Its diversified fauna may be the result of greater water exchange than in other parts of this zone.

VI-4. Sta. 2794-54. In 2672 feet. OPG took 3.4 cuft of blue gray mud. The screenings consisted of foraminiferan tests, some siliceous sponge and fragments of tubes (Phyllochaetopterus and protulid).

VI-5. Sta. 2729-54. In 2721 feet. OPG took 3.4 cuft of fine green sticky mud. The screenings consisted of about a pint of foraminiferan shells, some siliceous sponge spicules and a few metazoan animals.

A calanoid copepod

A small gastropod, perhaps Mitrella

A small sipunculid

Polychaetes include:

Amage, nr. anops - 1 larger and 6 smaller, in thick mud tubes
Glycera branchiopoda
Phyllochaetopterus, deep-water species - at least 9 and many tubes
Spiophanes

VI-6. Sta. 3020-55. In 2670 feet. The Campbell grab took 4.45 cuft of green mud. The screenings consisted of many foraminiferan tests, empty tubes of Phyllochaetopterus, protulid tubes, broken valves of Cyclopecten, and a single large ampharetid, Amage, nr. anops, in a thick mud tube.

VI-7. Sta. 2965-54. In 2820 feet. The Campbell grab took 3.3 cuft of fine mud. The sediments had no living metazoan animals.

VI-8. Sta. 2970-54. In 2856 feet. The Campbell grab took 3.59 cuft of gray green mud. There were no living metazoan animals.

VI-9. Sta. 2971-54. In 2910 feet. The Campbell grab took only plankton with ctenophores; it failed to take a bottom sample.

VI-10. Sta. 3411-55. In 2922 feet. OPG came up with a full (not measured) sample of fine mud. The screenings consisted of many dead (though not black) sticks of wood, foraminiferan and radiolarian

tests, broken shells of Cyclopecten and empty tubes of Phyllochaetopterus and Protis. There were no living metazoan animals.

VI-11. Sta. 3410-55. In 2928 feet. OPG was filled with fine dark mud and smaller nodules of reddish brown waxy masses which floated in water. The screenings consisted of dead and blackened tubes of Phyllochaetopterus, Protis, and broken, dead shells of Cyclopecten. There were no living metazoan animals.

VI-12. Sta. 3412-55. In 2928 feet. OPG was filled with fine mud. There were no living metazoan animals.

VI-13. Sta. 2963-54. In 2993 feet. The Campbell grab took 5.74 cuft of fine mud. The screenings consisted of many small dead sticks of wood, dead tubes of Phyllochaetopterus, serpulid, and Cyclopecten shells. There were no living metazoan animals.

VI-14. Sta. 2964-54. In 2993 feet. The Campbell grab took 5.74 cuft of fine mud. There were no living metazoan animals.

SUMMARY OF VI-1 to 14.- The stations in Zone VI represent a large, subsill area in soft, muddy bottoms of Santa Monica Bay. There are only two or three species (Phyllochaetopterus, Protis, and Cyclopecten), in sparse numbers, in scattered areas. Two samples (VI-5 and VI-4) near the lower end of Redondo Canyon, have metazoan animals of more diversified kinds. Faunistically considered, the subsill area of Santa Monica Bay is a continuation of the impoverished or dead area present in San Pedro Basin.

Chart showing decrease in numbers of species
with increasing depth

CHART SHOWING DECREASE IN NUMBERS OF SPECIES WITH INCREASING
DEPTH [in zones II and V (which are continuous) and VI]

Zone and location	Number of Species	Volume of sample in cuft.	Depth in fathoms	No. of species estimated per cuft of sample
II-2	60	0.06	12.5	1000
II-3	90	0.10	12.5	900
II-4	50	0.25	14	200
II-7	65	0.63	31	104
V-1	45	1.13	58	39
V-3	60	1.51	61	40
V-5	70	1.78	65	38
V-4	70	1.78	66	38
V-7	70	2.83	80	25
V-8	45	0.44	100	100
V-10	50	3.08	110	61
V-19	40	2.52	196	16
V-21	30	2.33	220	13
V-23	30	1.95	280	15
V-25	26	0.50	310	52
V-27	26	2.77	315	9
V-28	9	2.64	325	3.4
V-31	12	1.95	380	6
V-32	15	3.90	405	3.9
VI-7 to 14	3-0	3.3 to 5.74	470 to 490	3-0

Chart showing
Bio-index Values in Zones I to VI

The bio-index (the ratio of the number of metazoan species to the number of individuals) is estimated from detailed analyses of some stations in zones I to VI.

Zone and No.	Volume in cuft.	Depth in ft.	Bio-Index	Percentage Value
I NW-2	1.51	80	40/150	26.0
I NW-3	0.75	75	60/200	30.0
I NW-4	1.19	57	70/600	9.9
I NW-5	1.57	100	30/150	20.0
I NW-7	2.68	114	50/400	12.5
I NW-8	2.00	146	75/500	15.0
I NW-9	0.63	122	42/150	28.0
II-1	1.32	54	7/150	4.7
II-3	0.10	75	90/500	18.0
II-4	0.25	92	50/350	14.0
II-6	2.83	132	33/275	12.0
II-7	0.63	185	65/1000	6.5
V-1	1.13	345	45/200	24.0
V-3	1.51	366	60/950	6.3
V-4	1.76	398	50/600	6.3
V-5	1.78	401	70/950	7.3
V-7	2.83	480	70/1000	7.0
V-8	0.44	603	45/300	15.0
V-10	3.08	657	50/350	14.0
V-19	2.52	1176	40/200	20.0
V-21	2.33	1393	30/100	33.0
V-23	1.95	1680	30/75	40.0
V-25	0.50	1810	26/150	18.0
V-27	2.77	1850	26/75	33.3
V-28	2.64	2008	9/20	45.0
V-31	1.95	2280	12/31	40.0
V-32	3.90	2430	15/57	22.5
VI-1	3.08	2567	1/trace	95/
VI-3	3.40	2672	1/several	95/
VI-4	5.31	2670	12/24	50.0
VI-5	3.40	2721	7/21	33.3
VI-6	4.45	2670	4/4	100/
VI-7	3.30	2820	0/0	100/
VI-8 to 14	3.59 to	2856 to	0/0	100/
	5.74	2993		

List of some species in Santa Monica Bay
and more distant areas
with locations by zones

LIST OF ECHINODERMS, WITH OCCURRENCE IN SANTA MONICA BAY
AND MORE DISTANT AREAS

(All determinations and individual counts were made by Fred Ziesenhenné)

OPHIUROIDEA (brittle stars)

Amphiacantha amphacantha McClendon. I W-12 (1); I W-13 (2); I W-16 (6);
I W-19 (1); I W-19c (7); I W-21 (3); III-9 (5); III-10 (4);
III-11 (1); IV-1 (4); IV-2 (6); V-1 (8); V-4 (25); V-5 (24);
V-9 (1); San Pedro and outer areas.

Amphichondrius granulatus Nielsen. V-1 (1).

Amphiodia (Amphispina) digitata (Nielsen). I W-4 (2); I W-10 (531);
I W-12 (24); I W-13 (37); I W-19c (59); I W-21 (8); I W-22 (1);
I NW-3 (11); I NW-7 (7); I SW-5 (2); I SW-6 (8); II-2 (1);
III-11 (47); IV-1 (25); V-1 (39); V-4 (107); San Pedro and outer
areas.

Amphiodia (Amphispina) urtica (Lyman). I W-2 (6); I W-6 (10);
I W-7 (123); I W-9 (441); I W-11 (654); I W-12 (110); I W-16 (46);
I W-19 (7); I W-20 (3); I W-21 (23); I NW-8 (118); I SW-8 (141);
I SW-9 (328); I SW-10 (44); III-8 (191); III-9 (4); III-10 (3);
IV-1 (1); IV-2 (16); IV-8 (3); V-1 (5); V-4 (85); V-5 (85);
V-9 (48); San Pedro and outer areas.

Amphiodia occidentalis Lyman. I W-6 (3); I W-17 (1); off Santa Barbara
Island.

Amphiodia psara H.L.Clark. I W-13 (1); IV-1 (5 large).

Amphiodia "rugosa" A.H.Clark (MS name). I W-5 (4); IV-1 (12).

Amphioplus hexacanthus H.L.Clark. I W-6 (3); I W-12 (4); I W-14 (1);
I W-16 (3); I NW-8 (4); I SW-6 (1); I SW-8 (1); II-2 (2);
II-3 (2); II-4 (1); III-2 (2); V-1 (3); V-4 (5); San Pedro
and outer areas.

Amphioplus stronglyloplax (H.L.Clark). I W-7 (4); I W-19c (2); I W-21 (1);
I SW-9 (1); III-10 (2); III-11 (2); III-12 (4); III-13 (3);
IV-1 (4); IV-2 (4); V-1 (3); V-4 (5); V-5 (7); V-9 (3); V-19 (4);
San Pedro areas.

Amphipholis pugetana Lyman. IW-17 (9); I W-21 (7); IV-1 (1); San Pedro
and outer areas.

Amphipholis squamata (Delle Chiaje). I W-4 (1); I W-6 (5); I W-7 (61);
I W-9 (64); I W-10 (157); I W-11 (305); I W-12 (63); I W-14 (1);
I W-16 (7); I W-17 (44); I W-19c (2); I NW-3 (9); I NW-8 (60);
I SW-5 (20); I SW-6 (47); I SW-7 (15 juv.); I SW-8 (176);
I SW-9 (126); I SW-10 (3); II-2 (1); II-3 (2); III-8 (1);
III-9 (5); III-10 (3); III-11 (78); III-12 (1); III-16 (1);
IV-1 (5); IV-2 (1); IV-5 (20); V-5 (6); V-9 (13); V-10 (2 juv.);
off Santa Cruz Island.

- Amphipholis sp. V-5 (1 juv.).
- Amphiura arcystata H.L.Clark. I W-10 (2); I W-12 (1); I W-16 (2);
I NW-8 (1); San Pedro areas.
- Amphiura seminuda Lütken and Mortensen. I W-21(2); III-9 (1); off
Santa Barbara Island.
- Amphiuridae sp.? I W-17 (1 juv.).
- Astrophiuura marionae Ziesenhenné. San Pedro areas.
- Ophiacantha diplasia H.L.Clark. I W-17 (3); San Pedro and outer areas.
- Ophiacantha phragma Ziesenhenné. San Pedro and outer areas.
- Ophiacantha quadrispina H.L.Clark. I W-17 (1).
- Ophiacantha sp.? III-14 (6); Santa Cruz Basin.
- Ophiactis simplex (Le Conte). Shore at Newport.
- Ophiocnida californica Ziesenhenné. I W-13 (1).
- Ophiocnida sp. V-5 (1-).
- Ophiocynodus corynetes H.L.Clark. III-16 (1); San Pedro and outer areas.
- Ophiomyxid. V-29 (1); V-34 (1).
- Ophiomusium jolliensis McClendon. V-29 (1); San Pedro area.
- Ophionereis eurybrachiplax H.L.Clark. I W-17 (9 large); San Pedro and
outer areas.
- Ophiopholis bakeri McClendon. I W-13 (1); I W-17 (3); I W-22 (1);
San Pedro and outer areas.
- Ophiopholis longispina H.L.Clark. Catalina area.
- Ophiopsila californica A.H.Clark. I W-12 (1); I W-13 (1); I W-14 (1).
- Ophiopteris papillosa (Lyman). San Pedro areas.
- Ophiothrix spiculata Le Conte. I W-10 (fragment); I W-12 (1); I SW-7
(fragment); V-10 (1); I W-13b (2^f); I W-17b (1); I W-19a (1);
San Pedro and outer areas.
- Ophiura leptoctenia H.L.Clark. Catalina Basin.
- Ophiura lütkeni Lyman. I W-10 (1); I W-12 (1); I W-13a (1); I W-13b (2^f);
I W-14a (22); I W-17a (2); I W-16 (4); I W-17 (1); I W-19 (2);
I W-21 (2); I NW-8 (1); I SW-6 (2); I SW-10 (5); II-2 (6);
II-3 (5); II-4 (11); IV-1 (2); V-5 (1 juv.); San Pedro and outer
areas.



Ophiuroconis bispinosa Ziesenhenné. II-2 (5); II-3 (5).

ASTEROIDEA (Sea Stars)

Asterina miniata (Brandt). San Pedro areas.

Astropecten armatus Gray. I NW-5 (5).

Astropecten californicus Fisher. I W-2 (1 medium large); I W-3 (2 moderately large); I W-4 (1); I W-6 (1); I W-9 (1 juv.); I W-11 (1); I W-12 (1 juv.); I W-13b (1 large); I W-14a (1 juv.); near I W-18 (1 large); I W-21 (1); I NW-7 (1 large); I NW-9 (1 large); I SW-4 (1 large); I SW-5 (3); I SW-6 (2 juv.); San Pedro areas.

Luidia asthenosoma Fisher. II-3 (1); III-2 (5); III-16 (1 juv.); San Pedro area.

Luidia foliolata Grube. San Pedro and Catalina areas.

Luidia ludwigi Fisher. San Pedro area.

Henricia sp. San Pedro areas.

Mediaster aequalis (Stimpson). San Pedro areas.

Odontaster crassus Fisher. I W-17 (1 juv.).

Pisaster giganteus (Stimpson). I NW-4 (1 large).

Pisaster capitatus Stimpson. San Pedro area.

Sclerasterias heteropaes Fisher. IW-17 (5); San Pedro areas.

ECHINOIDEA (Surface or Epifaunal Sea Urchins)

Allocentrotus fragilis (Jackson). Deep water in San Pedro and outer areas.

Dendraster excentricus (Eschscholtz). Off Santa Barbara Island.

Dendraster laevis H.L.Clark. San Pedro area.

Lytechinus anamesus H.L.Clark. I W-16 (1); I W-19 (1); I W-21 (1); I W-22 (3); II-4 (2); San Pedro and outer areas.

Strongylocentrotus franciscanus (A. Agassiz). Intertidal rocky areas.

Strongylocentrotus purpuratus Stimpson. Intertidal rocky areas.

ECHINOIDEA (Burrowing or Infaunal Sea Urchins)

Brisaster townsendi (A. Agassiz). I W-19c (2); III-12 (1); III-13 (2); III-14 (2); IV-2 (2); IV-5 (2); San Pedro and outer areas.



Brissopsis pacifica (A. Agassiz). III-14 (1); IV-5 (2); IV-8 (2 large); V-5 (1 large); V-9 (3); V-19 (5); V-26 (2); San Pedro and outer areas.

Lovenia cordiformis A. Agassiz. II-3 (1).

Spatangus californicus H.L.Clark. I W-19 (1); V-9 (1).

HOLOTHUROIDEA (Sea Cucumbers)

(most are not specifically identified)

Leptosynapta ?inhaerens (Müller). I W-16 (1); I W-20 (1).

Stichopus californicus (Stimpson). I W-20 (1 very large).

brown papillated holothurian. I W-22 (1 juv.).

Other kinds. I W-13b; I W-14; I W-17a; I W-17b.

CRINOIDEA (Sea Lilies)

Florometra perplexa A.H.Clark. San Pedro area.

LIST OF AMPHIPODS, WITH OCCURRENCE IN SANTA MONICA BAY

AND MORE DISTANT AREAS

(All determinations and individual counts were made by Dr. J. Laurens Barnard)

AMPHIPODA

Ampeliscidae- Ampelisca sp. I W-7 (1 or more); I SW-5 (several).
Ampelisca cristata II-2 (1).

Aorid. II-2 (4).

Caprellids. II-2 (30).

Corophiidae. Corophium sp. II-2 (1).
Erichthonius brasiliensis. II-2 (3).

Dexaminid. I SW-8 (19 ovigerous)

Lysianissidae- Aruga sp. I W-7 (2).
Lepidepcreum sp. I W-7 (1).
Podoprionella sp. I W-7 (1).

Oedocerotid. I W-1; I W-2; I W-3; I W-4; I W-5; I W-7 (9); I W-8;
I SW-3; I SW-4; I SW-5; I NW-4; II-2.

Photid. II-2 (25).

PHOXOCEPHALIDAE

- Harpinia sp. A. III-9 (7); III-10 (3); III-12 (2); III-11 (3);
III-14 (3); IV-1 (7); IV-2 (6); V-17 (2); V-20 (2); San Pedro areas.
- Harpinia sp. B. V-22 (1); V-31 (1); San Pedro areas.
- Harpinia sp. C. San Pedro areas.
- Harpinia sp. D. San Pedro areas.
- Harpinia sp. F. San Pedro areas.
- Harpinia sp. G. San Pedro areas.
- Heterophoxus sp. A. I W-7 (4); I W-9 (5); I W-10 (9); I W-11 (7);
I W-13 (1); I W-17 (3); I W-20 (2); I W-21 (4); I NW-8 (1);
I SW-8 (2); I SW-10 (1); III-8 (4); III-10 (2); III-11 (9);
III-12 (2); III-13 (5); III-14 (2); IV-1 (4); IV-2 (4);
V-2 (1); V-4 (7); V-9 (5); V-10 (2); V-13 (1); V-14 (7);
V-16 (7); V-20 (11); V-24 (1); San Pedro areas.
- Leptophoxus sp. A. V-22 (2); San Pedro areas.
- Metaphoxus sp. A. I W-7 (4); I W-9 (19); I W-10 (20); I W-11 (36);
I W-12 (23); I W-21 (6); I SW-8 (20); I NW-8 (4); II-2 (1);
III-3 (3); III-11 (9); IV-1 (9); IV-2 (5); V-4 (18); V-5 (6);
V-9 (7); San Pedro areas.
- Paraphoxus sp. A. I W-18 (1); V-13 (1); V-19 (1).
- Phoxocephalus sp. A. I W-20 (2); III-10 (2); III-11 (1); IV-1 (5);
IV-2 (3); V-4 (4); V-5 (1); V-9 (2); V-10 (2); V-13 (1);
San Pedro areas.
- Pontharpinia sp. B. I W-12 (4); II-1 (32); II-2 (23); III-3 (12);
III-11 (2); V-7 (1); San Pedro areas.
- Pontharpinia sp. E. I W-5 (1); I W-9 (21); I W-10 (29); I W-11 (44);
I W-12 (23); I SW-10 (3); III-3 (5); III-8 (10); III-11 (22);
IV-1 (1); IV -2 (1); V-4 (21); V-9 (8); San Pedro areas.
- Pontharpinia sp. F. San Pedro area.
- Pontharpinia sp. G. I W-6 (1); I SW-6 (1); I SW-8 (1); I NW-4 (1);
I NW-8 (1); II-3 (3); III-3 (14); San Pedro areas.
- Pontharpinia sp. J. I W-7 (4); I W-9 (18); I W-11 (26); I W-12 (23);
I W-13 (2); I W-19 (2); I W-20 (14); I W-21 (8); I SW-8 (3);
I SW-10 (2); I NW-4 (1); I NW-8 (6); III-11 (17); V-4 (4);
V-5 (1); V-9 (2); V-10 (1); San Pedro area.

Pontharpinia sp. K. II-2 (1); II-3 (5); San Pedro area.

Pontharpinia sp. L. San Pedro area.

Pontharpinia sp. M. II-1 (2); San Pedro areas.

Pontharpinia sp. N. San Pedro area.

Pontharpinia sp. P. San Pedro area.

Pontharpinia sp. Q. II-2 (8); II-3 (9); III-3 (5); V-19 (1); V-23 (1);
San Pedro area.

Pontharpinia sp. R. San Pedro areas.

Pontharpinia sp. S. San Pedro areas.

Pontharpinia sp. T. San Pedro areas.

Pontharpinia sp. U. San Pedro areas.

Pontharpinia sp. V. San Pedro areas.

Pontharpinia sp. Y. I W-10 (1); I W-13 (1); I W-20 (1); I W-21 (1);
III-11 (1).

Pleustid. II-2 (1).

Stenothoid. II-2 (3).

LIST OF POLYCHAETA, WITH OCCURRENCE IN SANTA MONICA BAY
AND MORE DISTANT AREAS

(Individual counts are only partly given. San Pedro area numbers are published in Hartman, 1955. Outer areas refer to locations in Catalina, Santa Cruz, or other basin systems of southern California.)

Acrocirrus ?crassifilis Moore. V-25 (about 15).

Aglaophamus dicirris Hartman. I W-16; III-7.

Aglaophamus spp. I W-5; I W-8; III-9; V-1; V-4; V-8; V-10; V-17;
V-18; V-21; V-30; San Pedro and outer areas.

Amaea occidentalis Hartman. I W-7; I SW-7; II-7; III-3 (5); III-11;
San Pedro areas.

Amage ?anops var. Johnson. III-10 (2); V-25 (1); VI-5 (7); VI-6 (1);
San Pedro areas in deeper water and outside areas.

Ammotrypane sp. I W-7; I W-10b (1); I W-12 (3); II-7 (1); III-4 (1);
III-11 (1); V-4 (1); V-5 (1); V-23 (1).

Ampharete ?arctica Malmgren. I SW-1; I NW-3; II-3; San Pedro area
near 42 (200'), and other places.

Ampharete sp. I W-7; San Pedro area.

ampharetids. I W-12; I W-17; I W-19c; I SW-3 (3); I SW-4; I SW-8;
I NW-4 (9); II-2; II-7; III-4; III-6; III-11; III-16 (many);
IV-2 (5); IV-3 (many); IV-7; IV-9; V-5 (some); V-11 (2 or more);
V-23; San Pedro and outer areas, in moderate to deep soft bottoms.

Amphicteis scaphobranchiata Moore. I W-5; I NW-4; III-2; V-16; San
Pedro and outer areas.

Amphicteis spp. III-3 (1); V-18(); San Pedro area.

amphinomid. San Pedro area.

Amphisamytha bioculata (Moore). San Pedro area at 164.

Anaitides spp. I W-8; I W-16; I W-17; I SW-3 (15); I SW-5; I SW-6;
I NW-4 (14); I NW-8; II-2; II-3 (3); III-3 (7); III-9; III-10;
III-11; IV-2; V-2; V-4; V-10; V-11; V-14; V-17 (3); V-19;
V-18; V-30; San Pedro and outer areas.

Ancistrosyllis bassi Hartman. San Pedro in shallow areas.

Ancistrosyllis rigida Fauvel. I W-2 (1); I W-12a (1); San Pedro area.

- Ancistrosyllis spp. I W-2; I W-5; I W-7; I W-12a (1); I SW-3 (1); I SW-6 (2); I SW-8 (8); I SW-9; I NW-3; I NW-4; I NW-5; I NW-7 (some); II-6 (26); II-8 (1); III-4 (1); III-7 (1); III-10 (1); III-15; III-16 (1); IV-7; IV-8 (1); V-4; V-10; V-15 (1); V-19 (3); V-21; V-23 (3); VI-4 (2); San Pedro and outer areas.
- Anotomastus gordiodes (Moore). San Pedro areas.
- Aphrodita armifera Moore. II-3 (1); between I W-14 and I W-15 (1); San Pedro area.
- Aphrodita parva Moore. San Pedro area.
- Aphrodita spp. I W-13a (1); between I W-11 and I W-15 (1); II-2 (1); III-3 (1); San Pedro and outer areas.
- Arabella sp. I SW-3 (6); I NW-4 (2); III-1 (1); San Pedro area.
- arabellid, parasitic. I W-14a; I SW-1; San Pedro area.
- arabellid, unknown. III-2; San Pedro areas.
- Arctonoe ?vittata (Grube). near I W-18 (commensal with Astropecten)
- Aricidea ramosa (Annenkova). Catalina Basin.
- Aricidea nr. suecica Wesenberg-Lund. I SW-3 (40 $\frac{1}{2}$); I NW-3; II-1 (many); III-1 (7); San Pedro and outer areas.
- Aricidea uschakovi Annenkova. I NW-3; IV-8 (2); V-21 (1); San Pedro and outer areas.
- Aricidea spp. I W-2 (several); I W-6; I W-7; I W-8 (2); I W-16; I W-17; I W-19; I W-19c; I SW-1 (50 $\frac{1}{2}$); I SW-2; I SW-3 (4); I SW-4 (3); I SW-6 (many); I SW-8 (several); I NW-1 (many); I NW-4 (7); I NW-7 (several); I NW-8; II-1 (23); II-3 (19); II-8 (many); III-3 (7); III-6 (5); III-7; III-8; III-10 (6); III-11 (10 $\frac{1}{2}$); III-16; V-25; V-23; VI-4; common in San Pedro and outer areas.
- Armandia spp. I W-1; I W-17 (4); I SW-2; II-2 (2); II-3 (2); II-7 (1); V-2; San Pedro and outer areas.
- Artacamella hancocki Hartman. I W-12a (1); I W-12b (1); I W-17a; III-4; San Pedro area.
- Ascleirocheilus sp. V-24 (4).
- Asychis spp. I W-8 (1); I NW-5 (1); I NW-8 (1); III-6 (1); San Pedro and outer areas.
- Autolytus spp. nr. I W-14 (1); San Pedro and outer areas.
- Axiothella sp. San Pedro area.
- Boccardia spp. San Pedro and outer areas.



Brada pilosa Moore. V-25 (25).

Brada spp. I W-4; I W-7; I W-12d; I SW-6; I SW-8 (5); I NW-3 (6); II-6 (6); II-7 (4); III-11; III-15; IV-3; V-1; V-4; V-10; V-11 (5); V-18; V-19; V-23 (16); San Pedro and outer areas.

Capitella capitata. I SW-3 (60~~/~~); II-6 (56); San Pedro area nr 42.

Capitella ovincola Hartman. San Pedro area in Loligo egg cases.

Capitella spp. V-2; V-4; V-18; V-25; San Pedro area.

unknown capitellids. I W-2; I W-7; I W-12; I W-17 (5); I W-19; I W-19c; I W-19b; I SW-2; I SW-3 (8); I SW-6 (many); I SW-8 (11); I SW-9; I NW-2; I NW-4 (13); I NW-5; II-2; II-3; II-6; II-7; II-8 (many); III-3 (10); III-9; III-10; III-11; III-16; IV-2; V-2; V-5; V-7 (many); V-11; V-15 (many); V-16; V-18; V-19; San Pedro and outer areas.

Carazzia sp. San Pedro area.

Caulleriella sp. I W-4; III-1 (10~~/~~); IV-2; San Pedro area.

Ceratocephala crosslandi americana Hartman. I W-8 (2); I W-12c; I W-16; I SW-8; I NW-8; II-7; III-4; III-7; IV-2; V-4; V-14; San Pedro and outer areas.

Ceratonereis sp. San Pedro and outer areas.

Chaetopterus variopedatus Renier. very abundant at Whites Point in parts of San Pedro area; sparse in Santa Monica area.

Chaetozone corona Berkeley and Berkeley. I W-12; I SW-3; I NW-4; San Pedro and outer areas.

Chaetozone spp. I W-3; I W-4; I W-7; I W-14a; I SW-4 (many); I SW-5; I SW-6; I SW-8; I NW-3; I NW-5; ?II-3 (6); San Pedro and outer areas.

Chloeia pinnata Moore. I W-7; I W-8 (9); I W-10; I W-10b (many juv.); I W-12 (18 juv.); I W-12c (many juv.); I W-14; I W-17a (many juv.); I W-17b (few); I W-19 (juv.); I W-19c (3 adult and 30 juv.); I W-20 (many juv.); I SW-5; I SW-6 (38 juv.); I SW-8 (44~~/~~); I SW-9; I NW-8 (7 juv.); II-6 (1); II-7 (150~~/~~); III-3 (3); III-4 (40~~/~~ juv.); III-5 (many juv.); III-6 (1 adult and 21 juv.); III-7 (32 juv.); III-8 (11); III-11 (8 adult); III-11 (37); IV-2 (10); IV-3; IV-5; V-4; V-5; V-6 (60~~/~~ adult); V-9 (several); V-11 (90~~/~~); V-15 (50~~/~~); V-18 (many); V-25 (1); V-27 (several); San Pedro and outer areas.

Chone ecaudata Moore. San Pedro area at 69 (200~~/~~).

Chone ?mollis (Bush). I W-12 (7); I W-12c (1 very large); I W-13 (1 large); II-3 (1); III-6 (3); IV-8 (1 large); ?V-2; San Pedro and outer areas.

- Chone spp. I W-17 (1); I SW-8 (1); I NW-3; I NW-4 (7); II-1 (4);
II-3 (1); III-16 (1); V-17 (1); V-30; San Pedro and outer areas.
- Cirratulus ?cirratulus (Müller). V-18 (1); San Pedro areas.
- Cirratulus sp. I W-17 (2); San Pedro areas.
- cirratulids. I W-2 (many); I W-8 (many); I W-22; I SW-1 (hundreds);
I SW-3 (many); I SW-6 (many); I SW-8; I SW-9; I NW-3; I NW-9;
II-8; III-2; III-4; III-6 (about 10); III-8 (many); III-10;
III-11 (many); III-16; IV-9; V-5 (many); V-6; V-11; V-16;
V-30; San Pedro and outer areas.
- Cirriformia spp. San Pedro areas; scrapings from hull of Velero IV.
- Cistenides sp. I NW-4.
- Cossura candida Hartman. I W-4; I W-5; I W-7; I W-8 (some ovigerous);
I W-14; I W-19c; I SW-6; I SW-8 (about 20); I SW-9; I NW-3;
I NW-7; I NW-9; II-6 (4); II-7 (4); II-8 (several); III-3 (3);
III-4 (3); III-7; III-8; III-11; V-6; V-11; V-19; San Pedro
and outer areas.
- Dasybranchus sp. V-23(5); San Pedro areas.
- Dexiospira sp. rocky areas of Santa Monica and San Pedro shallow areas.
- Diopatra ornata Moore. I W-2 (1 large); I SW-1 (12 large); I SW-3
(3 large and 6 small); I NW-2 (many large); I NW-4 (28/ large);
II-2 (1 juvenile); San Pedro areas.
- Diopatra tridentata Hartman. IW-7; I NW-7 (1 larger); II-2 (1);
III-4 (1); San Pedro and outer areas.
- Diopatra sp. II-7; San Pedro areas.
- disomid. San Pedro area.
- Dodecaceria sp. San Pedro area at 236.
- Dorvillea articulata Hartman. I SW-3; V-25; San Pedro area nr 42
(700/) and other places.
- Dorvillea gracilis Hartman. I W-1 (many); I NW-4 (13/, some mature);
San Pedro areas.
- Dorvillea sp. V-6 (2); San Pedro and outer areas.
- Drilonereis spp. (includes both D. falcata Moore and D. nuda Moore,
or also other species). I W-2 (1); I W-5; I W-7; I W-12; I W-12c
(3); I W-16; I W-17 (3); I W-17a; I W-19c; I SW-6 (2); I SW-7;
I SW-8; I SW-9; I NW-3 (2); I NW-4; I NW-8 (2); I NW-9; II-2;
II-3; III-2; III-3 (9); III-4; III-8; III-11; IV-2 (5); IV-7;
V-14; V-17; V-30; San Pedro and outer areas.
- Ehlersia heterochaeta Moore. San Pedro area.



Eteone californica Hartman. San Pedro area.

Eteone spp. I W-13b (1); San Pedro areas.

Euchone sp. I W-12; II-9; San Pedro areas.

?Euclymene sp. I W-6 (many); I SW-5; I SW-7 (12 or more); I NW-3;
I NW-4 (4); I NW-9 (some); II-2 (8); III-2; III-3 (20~~7~~); IV-2;
IV-7; V-19; San Pedro and outer areas.

Euclymenini. V-16; San Pedro areas.

Eulalia spp. I NW-4; I W-12a; San Pedro areas.

Eumida ?sanguinea Oersted. I SW-2; II-3 (2); II-7; San Pedro nr.
42 (41~~7~~) and other areas.

Eumida spp. I W-2; I W-3; I W-4; I W-8; I SW-3; I SW-5; I SW-6;
I SW-8; I NW-4 (7); II-2; II-7; V-18; San Pedro and outer areas.

Eunice americana Hartman. San Pedro area at 159.

Eunice aphroditois (Pallas). San Pedro area at 161.

Eunice spp. I W-10; I W-17 (2); I SW-8; II-7; San Pedro areas.

Euphrosine sp. I W-18; V-18 (1); San Pedro areas.

Evarnella fragilis (Moore). V-18.

Exogone spp. I SW-5; I NW-4 (26); III-3; San Pedro and outer areas.

Exogoninae. I W-2; II-3 (2); III-1; San Pedro and outer areas.

Fabricia sp. I W-16; San Pedro areas.

Flabelligera commensalis Moore. Commensal with Strongylocentrotus purpuratus in shallow areas of Santa Monica and San Pedro areas.

flabelligerids (nestling in dead shells of Cadulus). I W-7; I W-19c;
III-10; III-16; IV-2; San Pedro area.

flabelligerid. San Pedro area at 173 (20).

?Genetyllis sp. II-3 (2).

Glycera americana Leidy. I W-2; I W-4 (1 large); I W-5 (1 large);
I W-6 (1 large); I W-7 (1 large); I W-8 (2 smaller); I W-12
(2 smaller); I W-12c (large parasitized by nematodes);
I SW-1 (1 large and 1 small); I SW-6 (1 large); I SW-8 (1 giant);
I W-13a (1 large); I NW-4 (1); III-4 (1 large); IV-2 (1);
IV-2 (1); V-11 (1 large); San Pedro and outer areas.

Glycera branchiopoda Moore. VI-5; VI-6; San Pedro and outer areas.

- Glycera capitata Oersted. I W-8 (7); I 12c (3); I W-16 (several);
I SW-8 (16/); I W-14a; I W-19c (4); I NW-4; I NW-9; ?II-7 (14);
?III-3 (9); III-4 (10); III-6 (5); IV-2 (2); V-4 (2); ?V-5;
?V-25 (1 tiny).
- Glycera robusta Ehlers. I W-10b (1 large).
- Glycera tessellata Grube. V-18 (3); San Pedro and outer areas.
- Glycera spp. I W-1; I W-7; I W-17; I W-19; I W-22; I SW-2; I SW-4 (7);
I SW-6 (20/); I SW-7; I SW-9; I NW-5; I NW-7; II-3 (3);
II-6 (7); III-1; III-7(3); III-8 (5); III-9; III-10; III-11 (12);
V-6 (2); V-10; V-11; V-14; V-18; San Pedro and outer areas.
- Glycinder spp. III-8 (2); IV-7; V-11; V-19 (2); San Pedro and outer
areas.
- Goniada littorea Hartman. III-1 (12 mature).
- Goniada brunnea Treadwell. V-4.
- Goniada spp. I W-2; I W-3; I W-7; I W-8 (3); I W-16; I W-17 (5);
I W-19; I SW-2; I SW-3 (5); I SW-7; I SW-8 (5); I SW-9;
I NW-3 (17); I NW-7; I NW-8 (4); I NW-9; II-2 (4); II-3 (6);
II-7 (7); III-6 (2); III-7 (3); III-10 (5 large); III-11 (4);
IV-2 (2); IV-7; IV-9; V-5 (2); V-6 (2); V-8; V-11; V-17; V-18;
San Pedro and outer areas.
- goniadid, I W-13b; I W-14a; San Pedro areas.
- Halosydna latior Chamberlin. San Pedro area at 45.
- Halosydna spp. I SW-3; San Pedro and outer areas.
- Haploscoloplos elongatus (Johnson). I W-2; I W-8 (2); I W-10b; I W-16;
I SW-1 (3); I SW-2; I SW-3 (7); I SW-4 (12); I SW-8 (10/); I NW-2
(many); I NW-3 (13/); I NW-8 (6); II-1 (1 juv.); II-3 (3);
II-6; II-7 (11); III-1 (3); III-3 (2); III-4 (4); III-6 (4);
III-11 (5); V-1; V-6 (6); V-11; V-19 (3); San Pedro and outer areas.
- Haploscoloplos sp. I W-3; I W-4; I W-5; I W-7; I SW-9; I NW-4 (9);
V-10; San Pedro areas.
- Harmothoe hirsuta Johnson. San Pedro areas, rocky areas.
- Harmothoe lunulata var. I W-2; I W-7; I W-16; I W-19c (5); I W-20;
I SW-9; I NW-4 (4); I NW-9; II-6 (8); II-7 (10); II-1; III-3;
III-4 (10); III-6 (5); III-7 (4); III-8; IV-2 (2); V-5; V-8
(2 with internal parasites); V-17; V-30; San Pedro and outer areas.
- Harmothoe triannulata Moore. San Pedro area at 69.
- Harmothoe spp. I W-8; I W-14; I SW-6; I SW-8; I NW-8; III-10 (3 juv.);
III-11; San Pedro and outer areas.
- harmothoid. V-30; San Pedro area at 126.

?Hauchiella sp. V-18.

Hemipodus sp. II-2.

hesionids. I SW-4; San Pedro areas.

Hesperalia. II-2; II-3 (4); San Pedro areas.

Heteromastus filobranchus Berkeley and Berkeley. II-3; V-25.

Hyalinoecia juvenalis Moore. I NW-8 (2); I W-12c; I W-1ea; I W-14a (3);
San Pedro and outer areas.

Hydroides norvegica (Gunnerus). scrapings of hull of Velero IV.

Hydroides sp. San Pedro area at 212 and 249.

Hypoeulalia ?bilineata (Johnston). V-18; San Pedro area at 164.

Hypoeulalia sp. I W-1 (many).

Hypsicomus sp. I W-15a (many burrowing in shaley rocks).

Isocirrus longiceps (Moore). I W-12c; I W-13b; I W-14a; I W-17a.

?Isolda sp. San Pedro area at 46 and 89.

Labidognathus sp. San Pedro area at 82. (internal parasite).

Lagisca sp. V-18; San Pedro areas.

Lanice sp. I-12a (several); I W-17a; I W-22; V-23; San Pedro and
outer areas.

Laonice cirrata (Sars). San Pedro and perhaps Santa Monica areas.

Laonice spp. I W-2; I W-3; I W-4; I W-7 (3 large); I W-14a; I W-17 (3);
I W-19; I SW-9; I NW-4; I NW-5; II-2 (2); II-3; II-6 (2); II-7;
III-1; III-9; III-10; III-11; IV-2 (2); V-1; V-4; V-5; V-19 (3);
V-23; V-30; San Pedro and outer areas.

Leanira spp. III-6; V-5 (2); San Pedro and outer areas.

?Leiochrides sp. III-6.

Leocrates sp. I W-2; I W-7; I W-8; I W-18 (6); I SW-3 (3); I SW-6 (2);
I SW-8 (2); I NW-3; I NW-4; II-3; II-6; II-7 (2); III-4; V-16;
V-19 (2); V-21 (2); V-25 (2); San Pedro areas.

Lepidasthenia virens Johnson. San Pedro areas.

Lepidasthenia spp. I W-17 (2); I NW-5; II-8; III-2; III-3; III-11;
V-4; V-15; San Pedro areas.

Lepidonotus sp. I W-12c; I W-17 (3); V-18 (2); San Pedro areas.

Loandalia fauveli Berkeley and Berkeley. San Pedro area at 108.

Longosoma catalinensis Hartman. Vicinity of Santa Catalina and San Clemente islands.

Lumbrineris bicirrata (Treadwell). I W-8 (1); I W-12a; I W-12c; I W-19c; II-7 (3); V-4; V-21 (1 very large, ?giant); San Pedro and outer areas.

Lumbrineris bifilaris Moore. III-4 (2); ?V-5; San Pedro areas.

Lumbrineris californiensis Hartman. III-4; III-6; San Pedro and outer areas.

Lumbrineris cruzensis Hartman. I W-10b (many); I W-12c (12); I W-17a; I W-19c; I SW-3 (26); I SW-6 (many); I SW-9; II-2 (17); II-3 (12); III-2; III-3 (24); III-6 (35); III-8; III-10; IV-2; V-4; V-17; V-23; V-30; San Pedro and outer areas.

Lumbrineris erecta Moore. San Pedro area; scrapings from hull of the VELERO IV.

Lumbrineris index Moore. V-6 (6 large); San Pedro and outer areas.

Lumbrineris japonica (Marenzeller). San Pedro and outer areas.

Lumbrineris latreilli Audouin and Edwards. I W-12c (1).

Lumbrineris limicola Hartman. I NW-3 (1).

Lumbrineris minima Hartman. San Pedro and outer areas.

Lumbrineris spp. I W-2; I W-3; I W-4; I W-6; I W-7; I W-9; I W-12; I W-14; I W-17; I SW-1; I SW-2; I SW-3; I SW-6; I SW-7; I SW-8; I NW-1; I NW-4; I NW-5; I NW-7; I NW-8 (67 or more); II-1; II-3 II-7 (more than 100); III-1 (25); III-2; III-4; III-7; III-11; IV-7; IV-8; V-1; V-2; V-5; V-7; V-15; V-16; V-17; V-30; VI-4; San Pedro and outer areas.

Magelona pacifica Monro. I W-8; I SW-7; III-6; outer areas.

Magelona, pouched. I SW-3 (20 or more); I SW-4 (18); II-2 (15); II-3 (18); V-2.

Magelona spp. I W-2; I W-4; I W-5; I W-7; I W-9; I W-10; I W-12a; I W-13b; I W-14; I W-17; I W-17a; I W-22; I SW-2; I SW-6; I SW-8; I SW-9; I NW-3 (10); III-1 (8); III-2; III-3; III-4; III-7; IV-2; San Pedro and outer areas.

Maldane spp. I W-19c; I SW-8; I NW-8; III-3; III-4; III-6; III-7; III-11; III-12; IV-2; IV-8 (about 15); V-14 (many); V-16; V-17; V-20; V-23 (more than 50); V-30 (many); San Pedro and outer areas.

Maldanella robusta Moore. San Pedro areas.



maldanids of different kinds. I W-2; I W-3; I W-4; I W-5; I W-7;
I W-8; I W-12; I W-14; I W-19; I SW-6 (many); I SW-8; I SW-9;
I NW-5; I NW-7 (many); II-3 (7 or more); II-8; III-4; III-7;
III-8; III-10; III-11; IV-3; IV-5; IV-6; V-1; V-4; V-6; V-10;
V-11 (10 or more); V-19; V-23; V-30; San Pedro and outer areas.

Marphysa mortenseni Monro. II-1; outer areas.

Marphysa, resembles conferta Moore. I W-5 (3); I W-6; I W-7 (4);
I W-8; I SW-8 (4); I NW-7; I NW-8, II-7 (8); IV-3; V-11;
San Pedro and outer areas.

Marphysa sp. V-19; San Pedro area.

Megalomma spp. I W-7; I W-12d; III-2; III-3; III-6; III-8; V-4;
San Pedro and outer areas.

Melinna sp. I W-19c I SW-7; I NW-4; I NW-7; III-2; III-3; III-11;
III-12; IV-3; V-19; V-20; V-23; San Pedro and outer areas.

Mesochaetopterus sp. III-10; III-11; III-12; V-6; V-10; V-11; San
Pedro and outer areas.

Myriochele gracilis Hartman. I W-12; I W-13b; I W-17a; II-7; III-6;
III-11; III-15; IV-2; V-11; V-23; San Pedro and outer areas.

Myxicola sp. III-6; San Pedro and outer areas.

Nephtys caecoides Hartman. I W-2; I W-3; I SW-1; I SW-2; I NW-8;
II-2; III-1; III-2; San Pedro and outer areas.

Nephtys californiensis Hartman. I W-1 (15); II-7; San Pedro and outer
areas.

Nephtys ferruginea Hartman. I W-6; I W-7; I W-19c; I SW-3; I SW-6;
I SW-8; I SW-9; II-3; II-6; IV-2; V-1; V-4; V-5; San Pedro and
outer areas.

Nephtys spp. I W-3; I W-4; I W-5; I W-7; I W-8; I W-12; I W-12a;
I W-14; I W-16; I SW-3; I SW-5; I SW-8; I SW-9; I NW-4; I NW-8;
II-6; II-7; II-8; III-3; III-4; III-6; III-8; III-11; V-8;
V-15; V-19; V-20; V-25; San Pedro and outer areas.

Nereis procera Ehlers. I W-2; I W-4; I W-5; I W-7; I W-8; I SW-1
(70 or more); I SW-2; I SW-3 (36 or more); I SW-6 (15);
I SW-7; I SW-8; I NW-3 (28 or more); I NW-4 (37); I NW-5;
I NW-7; I NW-8; II-2; II-3; II-6; II-7; III-8; V-2; V-19;
San Pedro areas

Nereis spp. I W-3; I W-17; III-1; III-2; V-18; San Pedro and outer
areas.

nereids. I W-22; III-11; V-7; V-15; V-19; San Pedro and outer areas.

?Nerine sp. I SW-6; III-3; III-4; III-7; San Pedro and outer areas.



Ninob sp. I W-7; I W-8; I SW-6; I SW-8; II-7; II-8; III-7; V-25;
San Pedro and outer areas.

Nothria conchylega (Sars). I W-19; San Pedro and outer areas.

Nothria elegans (Johnson). I W-2 (10 or more); I W-3; I W-4; I W-12a;
I W-14; I SW-1 (6 or more); I SW-2 (many); I SW-3 (35 or more);
I NW-1 (many); I NW-3; II-3; III-1 (5); III-3 (6); III-6; V-2;
San Pedro and outer areas.

Nothria geophiliformis Moore. San Pedro and outer areas.

Nothria iridescens (Johnson). San Pedro and outer areas.

Nothria pallida Moore. III-10; V-10; V-17; San Pedro and outer areas.

Nothria spp. I W-5; II-8; III-2; III-11; IV-3; V-6; V-8; V-20; V-21;
San Pedro and outer areas.

Notomastus hemipedus Hartman. San Pedro areas.

Notomastus lobatus Hartman. I W-14a; San Pedro areas.

Notomastus magnus Hartman. III-3; San Pedro areas.

Notomastus tenuis Chamberlin. San Pedro and outer areas.

Notomastus spp. V-6; San Pedro and outer areas.

Notoproctus sp. I W-17 (3); San Pedro areas.

Odontosyllis spp. San Pedro and areas.

Oncoscolex sp. San Pedro and outer areas.

Onuphis eremita Audouin and Edwards. II-2; San Pedro and outer areas.

Onuphis nebulosa Moore. I W-7; I W-8; I W-10; I W-12; I W-12a (many);
between I W-11 and I W-15; I W-13; I W-13b (many); I W-14;
I W-14a; I W-16; I W-17a; I SW-6; II-2 (many); II-3 (many);
III-3; San Pedro and outer areas.

Onuphis parva Moore. III-10 (30); San Pedro and outer areas.

Onuphis vexillaria Moore. IV-7; IV-8; V-23; San Pedro and outer areas.

Onuphis spp. III-6; IV-2 (about 20); V-2; V-17; V-18; V-19; San Pedro
and outer areas.

onuphids. I W-22; I SW-10; I NW-8; II-3; III-3; IV-3; IV-6; V-1;
V-10; V-11; V-14; V-23; San Pedro and outer areas.

Ophelia sp. San Pedro and outer areas.

orbiniid, new genus and species. III-16; IV-10; V-16; San Pedro areas.

Owenia fusiformis collaris Hartman. I W-17a; III-8; San Pedro and outer areas.

Owenia spp. V-5; San Pedro and outer areas.

Panthalis pacifica Treadwell. I W-12; I NW-8; III-6; III-10; V-5; San Pedro and outer areas.

Panthalis spp. I SW-6; III-7; V-4; San Pedro areas.

Paranaitis polynoides (Moore). I SW-8 (1); outer areas.

Paraonis spp. I W-3; I W-8; I W-12; I W-17; I W-19; I W-22; I SW-1; I SW-8; I SW-9; I NW-3; II-2; II-7; III-1; III-6; III-7; III-11; IV-7; IV-8; V-5; V-21; VI-4; San Pedro and outer areas.

Pareurythoe sp. II-8; San Pedro areas.

Pectinaria californiensis Hartman. I W-4; I W-5 (12); I W-6 (many); I W-7 (22); I W-8 (40); I W-9; I W-10 (90); I W-10b; I W-12 (9); I W-12a; I W-12c (about 12); I W-13b; I W-14a; I W-16; I W-17a; I W-19b (50 or more); I W-19c (about 50); I W-20; I W-21 (many); I SW-5; I SW-8 (17); I SW-10 (13); I NW-7; I NW-8 (25); I NW-9; II-6 (2); II-7 (21); II-8 (many); III-3 (2); III-4 (about 8); III-5; III-6; III-7 (about 5); III-8 (34); III-9 (many); III-10 (some); III-11 (1); IV-2 (56); IV-3; V-1; V-3 (many); V-4 (6); V-5 (many); V-6 (many tubes); V-8 (12); V-10; V-11 (50 or more); V-17 (many); V-19 (many); V-21 (5 large); V-23; San Pedro and outer areas.

Peisidice aspera Johnson. I W-12d; I W-17 (6); San Pedro and outer areas.

Perinereis monterea Chamberlin. San Pedro and outer areas.

Petaloproctus sp. V-23 (2 or more); San Pedro areas.

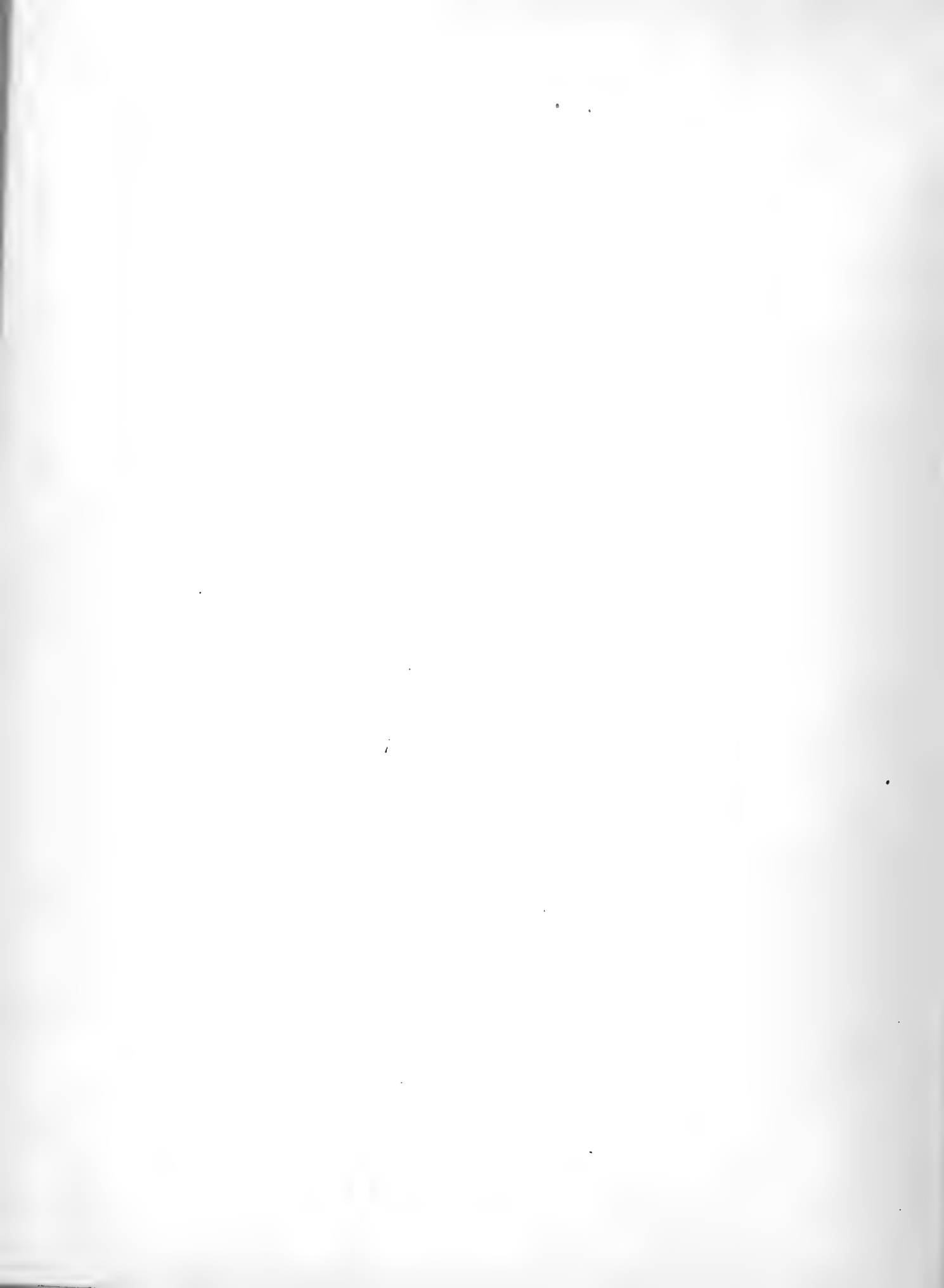
Pherusa capulata (Moore). I W-12d (many); I W-12c; I W-13b; I W-14a (18 or more); I W-19; I W-20; III-4; San Pedro and outer areas.

Pherusa inflata (Treadwell). I W-12d; San Pedro and outer areas.

Pherusa papillata (Johnson). I W-13b; I W-17a; San Pedro and outer areas.

Pherusa spp. I W-2; I W-3; I W-4; I W-5; I W-7; I W-17; I W-21 (many); I SW-6 (20); I SW-7; I SW-8 (8); I NW-3; I NW-4 (10); I NW-7; I NW-8; II-2; II-7 (18); III-3 (10); III-4; III-8; V-5; V-6; V-7; V-11; V-15; V-18; V-19; V-23; San Pedro and outer areas.

Pholoë sp. I W-5; I W-7; I W-8 (many); I W-9; I W-10b; I W-12a; I W-12c; I W-16; I W-17; I W-17a; I W-19; I W-19c; I W-20; I SW-6; I SW-7; I SW-8; I SW-9; I NW-7; II-6; II-7 (about 150); III-3; III-5 (many); III-6 (42); III-7 (about 20); III-11(9); San Pedro and outer areas.



- Phyllochaetopterus prolifica Potts. I W-3; I W-12c; between I W-11 and I W-15; I W-13b; I W-14; I W-14a; I W-16; I W-17; I NW-4 (about 30); II-2 (10); II-3 (50 or more); III-3; V-5; San Pedro and outer areas.
- Phyllochaetopterus sp. (in impoverished deep area). VI-1; VI-2; VI-3; VI-5; VI-6; VI-10; VI-11; VI-12; VI-13; San Pedro Impoverished Area.
- Phyllodoce ferruginea Moore. San Pedro and outer areas.
- Phyllodoce spp. I W-2; I W-3; I W-4; I SW-2; I SW-8; I NW-3; I NW-9; III-1; III-6; V-14; San Pedro areas.
- phyllodocids, various. I W-7; I W-17; I SW-6; II-7; San Pedro areas.
- Pilargis berkeleyi Monro. I W-17a; III-7b; San Pedro areas.
- Pilargis maculata Hartman. II-7; III-1; San Pedro areas.
- Pilargis spp. I W-5; I W-7; I NW-3; IV-7; V-21; V-25; San Pedro and outer areas.
- Pisione, near remota Southern. II-1 (many); San Pedro area at 63b (many).
- Pista, resembles crustata (Müller). I W-8; I SW-8; I NW-8; San Pedro areas.
- Pista disjuncta Moore. San Pedro and outer areas.
- Pista elongata Moore. Between I W-11 and I W-15; San Pedro and outer areas.
- Pista spp. I W-12; I W-12c; I W-13a; II-3; II-7; III-7; III-8 (about 24); IV-2; V-5; San Pedro and outer areas.
- Placostegus sp. I W-15a; I W-22; outer areas.
- Platynereis bicanaliculata (Baird). I SW-1 (6); I SW-3 (6); II-2 (1); II-3 (4); III-3 (1); San Pedro and outer areas.
- Platynereis sp. III-1; III-2.
- Podarke pugettensis Johnson. I W-2; nr. I W-18; I SW-7; II-2; II-3; San Pedro and outer areas.
- Poecilochaetus johnsoni Hartman. I W-7; I W-19c; I SW-7; III-1; III-6; III-7; San Pedro and outer areas.
- Polycirrus sp. I W-7; San Pedro and outer areas.
- Polydora, near armata Langerhans. San Pedro areas.
- Polydora citrona Hartman. San Pedro areas.
- Polydora ligni Webster. San Pedro areas; fouling on hull of VELERO IV.

Polydora spp. I W-7; I SW-6; II-7; III-3; III-6; III-16; V-11; V-18;
San Pedro and outer areas.

polynoids. III-15; IV-3; V-6; V-11; V-14; V-23; V-25; San Pedro and
outer areas.

Polyodontes, near panamensis Monro. San Pedro and outer areas.

polyodontids. V-1; V-9; V-10; V-14; V-27.

Praxillella affinis pacifica Berkeley. II-7 (6); III-6 (2); San Pedro
and outer areas.

Praxillella ?gracilis (Sars). V-5; San Pedro areas.

Prionospio ?cirrifera Wiren. II-3; II-6; V-5; V-11; San Pedro areas.

Prionospio, near malmgreni Claparede. I W-10; I W-12 (46 or more);
I W-14a; I W-16 (many); I W-19c; I SW-6 (about 100); I NW-3 (more
than 50); I NW-7; I NW-9; II-2 (120 or more); III-3 (40); II-7
(60); III-1 (about 30); III-4 (about 10); III-6; III-7; IV-2;
V-2; V-4; V-10; San Pedro and outer areas.

Prionospio pinnata Ehlers. I W-2; I W-4; I W-5; I W-7 (12); I W-8;
I W-10; I W-12 (5); I W-14a; I W-16; I W-19c; I SW-1; I SW-6
(about 40); I SW-8 (about 10); I NW-3; I NW-4; I NW-8 (17);
I NW-9; II-2; II-3; II-6 (more than 8); II-7 (24); II-8 (many);
III-2; III-3 (5); III-4; III-6 (about 10); III-7 (6 or more);
III-8 (4); III-10; III-11 (many); IV-2; IV-7; V-4; V-5; V-11 (8);
V-17; V-19; V-21 (10 large); V-23; V-25; San Pedro and outer
areas.

Prionospio spp. I W-2 (many); I W-3; I W-6; I W-8; I W-10; I W-14;
I W-17; I SW-2; I SW-5; I SW-8 (many); I SW-9; I NW-4 (10);
I NW-8 (50 or more); II-8; III-3; III-9; III-11 IV-9; V-4;
V-15; V-23; V-30; San Pedro and outer areas.

Protis pacifica Moore. VI-3; VI-6; VI-10; VI-11; impoverished area
in San Pedro Basin.

Protula superba Moore. Deep basins, associated with siliceous sponge.

Psammolyce sp. III-2; San Pedro and outer areas.

Pseudopotamilla ocellata Moore. nr. I W-14; San Pedro and outer areas.

Pseudopotamilla sp. II-3; San Pedro areas.

Rhamphobrachium sp. San Pedro and outer areas.

Rhodine bitorquata Moore. I W-7; I W-8; I W-12; I W-12c; I W-13b;
I W-19c; I W-20; I SW-8; I NW-9; III-4; III-9; III-11; IV-2
IV-3; San Pedro and outer areas.

Rhynchospio arenicola Hartman. San Pedro areas.



Sabella, resembles crassicornis Sars. I W-12; San Pedro and outer areas.

sabellids. I NW-4 (about 10); I NW-8; III-11; V-5; V-8; V-11; V-16;
V-25; San Pedro and outer areas.

Sabellaria cementarium Moore. I W-12c; I W-13a; I W-13b; I W-14a;
San Pedro and outer areas.

Sabellaria sp. I NW-4; I W-17; San Pedro and outer areas.

Saccocirrus papillocercus Bobretzky. San Pedro area at 50.

Salmacina sp. San Pedro areas.

Scalibregma sp. I W-5; I W-8; I W-14a; I W-16; I W-17a; I W-20;
I SW-6; I SW-8; I NW-4 II-4; II-7; III-4; III-6; III-8; III-11;
V-8; V-11; V-19; V-23 (a giant); V-25; San Pedro and outer
areas.

Schistocomus sp. I W-12c; San Pedro and outer areas.

sigalionids. I W-12c; I SW-8; II-7; IV-7; V-1; V-5; V-16; San Pedro
and outer areas.

Sphaerodorum minutum Webster and Benedict. I W-12; I W-12b; I W-14;
I SW-6; III-7; III-11; V-5; San Pedro and outer areas.

Sphaerodorum spp. I W-5; I W-12; I W-17; I SW-5; I NW-3; III-10;
IV-2; San Pedro and outer areas.

Telepsavus sp. . . . I W-1; I SW-2; I NW-3; I NW-9; II-6; II-7; III-7;
V-4; V-10; San Pedro and outer areas.

spionids. I W-9; I W-19; I W-20; I W-22; III-8; III-9; III-10;
IV-2; V-4; V-14; San Pedro and outer areas.

Spiophanes missionensis Hartman. I W-12c; I W-19c; I NW-7; II-2;
II-7; San Pedro and outer areas.

Spiophanes (or also Laonice) spp. I W-1; I W-4; I W-7; I W-8; I W-14;
I SW-6; I SW-8; I NW-3; I NW-5; I NW-8; II-3; II-6; II-8; III-3;
III-7; III-8; III-10; III-11; San Pedro and outer areas.

Spiophanes, deep water species. VI-5; outer basins

spirorbids. I W-15; I W-22; San Pedro and outer areas.

Sternaspis sp. I W-5; I W-6; I W-7; I W-12; I W-16; I NW-7; I W-17a;
III-2; III-3; III-4; III-6; III-7; III-8; III-11; V-1; V-4;
V-10; San Pedro and outer areas.

Sthenelais tertiaglabra Moore. III-6; San Pedro and outer areas.

Sthenelais spp. I W-2; I W-5; I NW-3; II-2; III-4; V-4; San Pedro
and outer areas.

Sthenelanelia uniformis Moore. I W-5; I W-7; I W-13a; I W-14a (about 14); I W-16; I W-17a; I W-20; I W-22; I SW-6; I SW-7; I SW-8; I SW-9; I NW-5; I NW-7; I NW-8; II-3; II-7; III-4; III-6; III-7; III-8; San Pedro and outer areas.

Streblosoma crassibranchis Treadwell. I W-8; III-2; III-6; III-7; San Pedro and outer areas.

syllids. I W-16; I W-17; I W-22; I NW-3; I NW-4; II-3; San Pedro and outer areas.

Syllis spp. I W-2; I W-3; I SW-7; II-2; III-1 (10); III-6; San Pedro and outer areas.

Talehsapia sp. II-3; San Pedro area.

Telepsavus, see preceding page

Terebellides sp. I W-5; I W-7; I W-8 (8); I W-12a; I W-12c; I W-13b; I W-14; I W-17a; I SW-8; I NW-9; II-7; III-2; III-3; III-4; III-6; III-7; III-8; III-9; III-10; III-11; III-16; IV-2; IV-3; V-1; V-25; San Pedro and outer areas.

terebellids. I W-14; I W-17; I SW-6; II-2; II-7; III-2; III-6; III-11; IV-9; V-3; V-19; San Pedro and outer areas.

Thalenessa spinosa (Hartman). III-6; San Pedro and outer areas.

Thalenessa spp. I W-12a; I W-17a; I SW-6; II-2; II-3; San Pedro and outer areas.

Tharyx multifilis Moore. I W-19; San Pedro and outer areas.

Tharyx parvus Berkeley. I W-2 (many); I SW-3; I SW-4 (many); I SW-6 (many); I NW-7 (many); III-1; V-2; San Pedro and outer areas.

Tharyx, with tattered tube. I W-13b; I W-19c; I NW-7; outer areas.

Tharyx spp. I W-3; I W-10b; I W-14; I W-17; I SW-2; I SW-8; I SW-9; I NW-3 (many); I NW-4 (33); II-2 (many); II-3 (10 or more); III-3; III-7; III-11; V-4; V-21; San Pedro and outer areas.

Thelepus crispus Johnson. San Pedro and outer areas.

Travisia ?olens Ehlers. IV-2; outer areas.

Travisia ?pupa Moore. I W-13b; III-6; San Pedro and outer areas.

Travisia spp. I W-16; I SW-8; I SW-10; II-7; III-5; III-7; V-4; V-9; V-15; San Pedro and outer areas.

Vermiliopsis multiannulata (Moore). I W-15a; San Pedro and outer areas.

Vermiliopsis spp. I W-12d; I W-14a; I W-15a; I W-22; San Pedro and outer areas.







