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KELP FOREST MONITORING
1993 Annual Report

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ABSTRACT

The 1993 results of the Channel Islands National Park Kelp Forest Monitoring Project are described in this report. Population dynamics of 68 taxa or categories of algae, fish, and invertebrates were measured at 16 permanent sites around the five islands within the park. Survey techniques utilized SCUBA and surface-supplied-air, and included quadrats, band transects, random point contacts, fish transects, video transects, size frequency measurements, artificial recruitment modules, and species list surveys. Temperature data was collected using Sea Data batheothermographs, and HOBOTEMP[tm.] temperature loggers. Temperature loggers were installed at each of the sixteen sites. Size frequency measurements were taken from artificial recruitment modules at nine sites. In 1993, 13 sites had giant kelp, *Macrocystis pyrifera*, forests, one site was dominated by the aggregating red sea cucumber, *Pachythyone rubra*, one site was dominated by red sea urchins, *Strongylocentrotus franciscanus*, and another by purple sea urchins, *S. purpuratus*. The 13 sites with kelp forests consisted of 10 mature and three young kelp forests. Wasting disease was observed in sea stars and wasting syndrome was apparent in sea urchins. Sea urchin wasting syndrome appears to have caused mass mortality of purple sea urchins, *S. purpuratus*, at two Santa Barbara Island sites.

FOREWORD

1993 was a momentous year for the kelp forest monitoring project. First, it was the start of the second decade of the project. Long-term data sets are valuable in understanding ecological trends and documenting change. The data collected during the design phase beginning in 1982, gave us quantitative information about the changes through an El Niño and a La Niña, through the decline and resurgence of kelp beds, and through mass mortalities of sea stars and sea urchins.

1993 also marks a change in the leadership of the project as David Kushner took over responsibility for the cruises. This is the second change in leadership, the first was in 1987 when Dan Richards assumed the roll from Gary Davis when the park resources management division took responsibility from the research branch. The transition of leadership is an important step for the survival of a long-term program. Over 20 National Park Service biologists have been employed on the project in the first 10 years. Many other divers from a variety of agencies and universities have participated adding diversity, experience, and enthusiasm. All of these factors add together to make the program a success.

The project has proven to be a dynamic entity, growing and changing as we learn and as new technology comes on line. Surface-supplied-air, dive computers, video cameras, and countless upgrades of computer software are just some of the changes we've made over the years. In

1993, we finally installed temperature recorders at all of the monitoring sites with new inexpensive and easy to use technology. This will allow us to tie together physical and biological events, adding to our understanding of the kelp forest environment.

Lastly, as we move ahead into the second decade of monitoring, we will be looking critically at the project as a whole. During 1994-1995, we will be conducting a review of the data and how it is used in order to improve our sampling and availability of the results.

Dan Richards

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EXECUTIVE SUMMARY

The Channel Islands kelp forests are an important part of southern California's marine ecosystem and economy. Channel Islands National Park has conducted long-term ecological monitoring of the kelp forests around Santa Barbara, Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands since 1982. Permanent transects were established at 16 stations between 1981 and 1986. In 1993, the stations were monitored during seven five-day, and five one or two day cruises between March and October. Survey techniques utilizing SCUBA or surface-supply air included: quadrat counts, band transect counts, random point contact quadrat counts, fish transect counts, video transects, size frequency measurements, artificial recruitment modules, and species list surveys. Temperature data was collected using batheothermographs and temperature loggers. The 1993 kelp forest monitoring was completed by 35 National Park Service (NPS) and volunteer divers making a total of 919 dives.

In 1993, giant kelp, *Macrocystis pyrifera*, forests were present at 13 of the 16 sites. These included all sites at Santa Barbara, Anacapa, and Santa Rosa Islands, as well as Yellow Banks, Gull Island, and Pelican Bay at Santa Cruz Island, and Wyckoff Ledge at San Miguel Island. Scorpion Anchorage on Santa Cruz Island, remains barren with little algae, high densities of purple urchins, *Strongylocentrotus purpuratus*, and high sedimentation. Hare Rock on San Miguel Island was still dominated by red sea urchins, *S. franciscanus*, but the small kelp forest southeast of the transect remained from last year. Fry's Harbor on Santa Cruz Island had some understory brown algae, but continued to be dominated by small aggregated red sea cucumbers, *Pachythyone rubra*.

Wasting disease was observed in sea stars, and wasting syndrome in sea urchins. Sea urchin wasting syndrome appears to have caused mass mortality of purple sea urchins, *S. purpuratus*, at two sites on Santa Barbara Island. Both of these sites, Arch Point and Cat Canyon are now young kelp forests, having the highest abundance of *M. pyrifera* since monitoring began.

According to NOAA's El Niño advisories (NOAA, 1993), the waters around the Channel Islands were 0.55 - 2.2 ^{o}C above average for most of 1993. Several species associated with warm water were observed: pelagic red crabs, *Pleuroncodes planipes*, were seen throughout the year at all of the

islands, California barracuda, *Sphyraena argentea* were seen on several occasions, and flying fish, *Cypselurus californicus*, were common throughout the summer were seen as far north as San Miguel Island. Although sea surface temperatures were anomalously warm, the temperature data shows that there were frequent upwelling events during the summer. These cold, nutrient rich upwelling events may counteract the effects of the warm, nutrient poor water.

Artificial recruitment modules (ARMs) were placed at Pelican Bay this year. This was a cooperative volunteer effort by the National Park Service, Channel Islands Council of Divers, California Department of Fish and Game, and Southern California Edison. All of the sites on Anacapa, Santa Cruz Islands, and both of the Johnson's Lee sites on Santa Rosa Island now have ARMs.

This year, size frequency measurements in the ARMs were conducted for bat stars, *Patiria miniata*, giant-spined sea stars, *Pisaster giganteus*, sunflower stars, *Pyncopodia helianthoides*, red sea urchins, *Strongylocentrotus franciscanus*, purple sea urchins, *S. purpuratus*, white sea urchins, *Lytechinus anamesus*, Chestnut cowrie, *Cypraea spadicea*, wavy top turban snails, *Astraea undosa*, rock scallops, *Hinnites giganteus*, and abalone, *Haliotis spp.* at nine locations. Overall, the animals measured in the ARMs were smaller than those measured in their natural habitat.

INTRODUCTION

The waters of Channel Islands National Park and Channel Islands National Marine Sanctuary contain one-third of southern California's kelp forests (Davies, 1968). The brown algae, *Macrocystis pyrifera*, is the primary constituent of these kelp forests and over 1,000 species of macro flora and fauna can be found here (Woodhouse 1981, J. M. Engle pers. comm.). Many other species, while not residents of the kelp forest community, are dependent upon the existence and productivity of kelp forests. The kelp forest serves as food, shelter, substrate, and nursery to migratory as well as resident species. Kelp forest detrital flux provides an important source of nutrients to nearby rocky shore, sandy beach, and estuary communities. The kelp forests are essential to our commercial and sport fisheries as well as to

recreation and the associated tourist industry.

Channel Islands National Park consists of five of the eight California Channel Islands (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara) and the submerged lands and waters within one nautical mile of each of the islands. The Channel Islands National Marine Sanctuary overlaps the subtidal portions of the park, and its boundary extends six miles seaward from the park islands. Channel Islands National Park also bears the designation of International Biosphere Reserve and State of California Areas of Special Biological Significance. The State of California maintains jurisdiction over the park's marine resources and manages them through the Department of Fish and Game.

The federal law which established Channel Islands National Park (16-USC-410) mandated the development of inventories and monitoring of natural resources in the park. Kelp forest monitoring is part of the long-term ecological monitoring program at the park which is designed to measure the health of the ecosystems. By determining the limits of normal variation and diagnosing abnormal conditions we hope to prescribe remedial action through management recommendations.

Following a five year design study begun in 1982, the kelp forest monitoring program was implemented in 1987 by the Park's resource management division, using the protocol established during the design phase. Monitoring design rationale is discussed in Davis and Halvorson (1988). Preliminary results and specific design considerations can be found in reports written by Davis (1985, 1986). Richards, Gramlich, and Davis (in prep.), describe monitoring efforts and results for 1982-1989. Richards, Avery, and Kushner (1993), Richards, Kushner, and Avery (1993), and Richards and Kushner (1994) describe the 1990, 1991, and 1992 monitoring efforts and results respectively.

This report summarizes the monitoring efforts and results from 1993, our twelfth year of monitoring. It is hoped that these reports will provide some insight into kelp forest dynamics and stimulate further research into the long-term trends and changes in the nearshore ecosystem. We have highlighted some of the most important observations, and tried to provide a characterization for each site. Organisms are referred to by genus and species, except in the abstract and executive summary where genus, species,

and common names are used. Common names are cross referenced to their scientific names in Table 1. Since the design of the kelp forest monitoring project several genus and species names have been changed. Their original names have been used in this text, and the new names are cross referenced in Table 1.

METHODS

Population dynamics of 68 taxa or categories of algae, fish, and invertebrates (Table 1) were measured at 16 permanent sites (Table 2) around the five park islands (Fig. 1). Site and species selection criteria are provided in the Kelp Forest Monitoring Handbook (Davis, 1988). Sites were monitored between June and October of 1993.

Each site is marked by a 100 m long transect permanently affixed to the seabed. The sampling techniques employed to gather information on population dynamics are summarized in Table 3. At each station, 20 randomly placed 1 m x 2 m quadrats and 12 randomly placed 3 m x 20 m band transects were used to determine densities and distribution of discrete benthic organisms; 1000 random non-adjacent points (random point contacts - RPCs) were used to determine percent cover of encrusting invertebrates, algae, and substrate composition; 2 m x 3 m x 100 m fixed transects were used to determine fish abundance; video taped transects provide a record of the site appearance; and size frequency measurements were collected to determine age structure, population recruitment, and growth rates. A general species list was established for each site, noting presence/absence and relative abundance for all recognizable species. Artificial recruitment modules were used at nine of the sites to measure recruitment and population structure. Documentary still photographs were taken at Cat Canyon, Santa Barbara Island, Fry's Harbor, Santa Cruz Island, and Hare Rock, San Miguel Island.

In previous years, *Macrocystis pyrifera*, *Eisenia arborea*, and *Pterygophora californica* were combined as a category for percent cover on RPCs. In 1993, this category was separated into the three species. We will continue to present the combined category (Appendix A) to assist in caparisons

to previous years

Animals measured for the natural size frequency distributions were located using four different methods; general search, 0.5 m^2 quadrat, 1.5 m pole, and band transects. The method used for each target species is listed at the top of each distribution in appendix A. Most of the animals were located by the general search method. In this method, a diver swims in the area around the transect and measures all the emergent animals of the target species they encounter. The 0.5 m^2 quadrat method was used when there was a relatively high density of target species. For this method the quadrat was placed in an area where the target species was present, and all animals were measured in the quadrat before moving it to the next location. The 1.5 m pole method was conducted by swimming along the transect, holding the pole perpendicular to the divers movement, and measuring the target species that passed beneath. The band transect method was used to measure target animals found while conducting density counts on band transects. All methods of sampling are non-destructive (the substrate is undisturbed), except when sea urchins are removed so that any juvenile sea urchins hiding under their spine canopy can be measured.

In addition to the standard size frequency measurements, we also collected size frequency measurements in the artificial recruitment modules (ARMs). These ARMs are rock cribs, consisting of 20 half-sized concrete blocks (40cm L X 20cm W X 10cm H) stacked five high and enclosed in a wire mesh frame. The wire cage dimensions are 60cm L X 60cm W X 50cm H and the mesh size is 5cm X 10 cm. The ARMs provided a standardized surface area of about 24 m^2. The ARMs are sampled by opening up the cage, and removing each brick while looking for animals. Animals measured included: *Patiria miniata*, *Pisaster giganteus*, *Pycnopodia helianthoides*, *Strongylocentrotus franciscanus*, *S. purpuratus*, *Lytechinus anamesus*, *Cypraea spadicea*, *Astraea undosa*, *Hinnites giganteus*, and *Haliotis spp.*. Due to time constraints underwater, when more than 200 individuals of a particular species were measured, we sometimes discontinued measuring that species in the remaining ARMs at the site. Measurements were taken underwater, or the animals were brought to the surface to be measured then replaced into the ARM they were removed from.

Temperature data was collected at all 16 sites using HOBOTEMP^{tm} temperature loggers, which are attached to stainless steel thread rods that are cemented to bottom at each site. The loggers are programmed to record temperature every 4.8 hours. Temperature and depth data was also collected at Southeast Sea Lion, Santa Barbara Island, and Gull Island South, Santa Cruz Island, using Sea Data^{tm} temperature/depth recorders. This data was not available for this report.

STATION RESULTS AND DISCUSSION

Sampling was completed at all 16 monitoring sites by 36 divers (Table 5) during seven five-day, one two-day trips, and four one day cruises. A total of 919 dives with 689 hours of bottom time were completed.

A brief description of each site is included with the station results below. Means for quadrats, band transects, random point contacts, fish transects, and size frequency tables for each location are in appendix A. Size frequency measurements from the artificial recruitment modules were kept separate from the natural habitat measurements and are identified as such in appendix A. Species lists for all locations are in appendix B. The temperature data collected by the temperature loggers is presented in graphic form for each site where data was available in appendix C. The amount of temperature data varies for each station, dependent on deployment dates, and the operation of the unit. Video transects were completed for all locations. A summary of the 1993 status of each site is presented in Table 4.

Location: Wycoff Ledge, San Miguel Island
Site: #1 SMIWL
1993 sampling dates: 7/15, 7/16, 9/14.
1993 status: dense, mature kelp forest

Macrocystis pyrifera formed a dense canopy covering the entire transect. There were many

large/mature and small/young adult *M. pyrifera* plants. Adult *M. pyrifera* densities have changed little during the last five years. However, juvenile *M. pyrifera* was recorded at its highest density (2.6/m^2) since monitoring began at this site. On RPCs, *M. pyrifera* coverage was 32%, the highest coverage recorded since 1986. Most of the *M. pyrifera* appeared healthy, however epiphytic bryozoans were common on the older blades. Low light conditions occurred on the bottom because of the thick canopy. Understory algae was abundant, with miscellaneous red algae, mostly *Botryoglossum spp.* covering 67% of the bottom, and brown algae, mostly *Desmarestia spp.* covering 14%. *Gigartina spp.*, covered 11%, of the bottom. Juvenile *Pterygophora californica* were observed. Articulated coralline algae was common, covering 17% of the bottom.

Anemones, hydroids, and the worm, *Pista elongata*, were the most common miscellaneous invertebrates observed on RPCs. *Diopatra ornata* were common in the sandy areas, and covered 9.2% of the substrate. Bryozoans covered 11% of the substrate. *Tethya aurantia* were abundant and had a density of 0.13/m^2.

Mysids were abundant in both the canopy, and on the bottom. *Idotea resecata* (kelp isopod) were common on kelp stipes, and in the canopy. *Haliotis rufescens* were relatively common at this site and three were observed on band transects. *Kelletia kelletii* were abundant with a density of 0.367/m^2.

Patiria miniata were abundant with densities of 1.5/m^2. *Pisaster giganteus* were common, but appeared to be aggregated away from the immediate area of the transect. Because of these aggregations, we decided to count them on band transects as well as quadrats; their respective densities were 0.071/m^2 and 0.15/m^2. *Strongylocentrotus purpuratus* and *Pycnopodia helianthoides* were uncommon. Only two *P. helianthoides* were found during size frequencies. *Strongylocentrotus franciscanus* were common, but were patchy, and most were in crevices. *S. franciscanus* size frequencies were not conducted this year.

A small school of *Trachurus symmetricus* (jack mackerel) were observed feeding on swarms of mysids. Adult *Sebastes mystinus*, juvenile, and adult *Oxyjulis californica* were abundant in the area

just below the kelp canopy. These fish were outside the fish transect and were not counted. Rockfish, *Sebastes spp.*, and *Semicossyphus pulcher* were common on the west end of the transect. The east end of the transect had few fish. Several *Aulorhynchus flavidus* (tubesnouts) were seen.

Location: Hare Rock, San Miguel Island

Site: #2 SMIHR

1993 sampling dates: 7/13, 7/15, 9/15.

1993 status: *Strongylocentrotus franciscanus* barren

This site continued to be barren, and was dominated by *S. franciscanus*. The barrens appear to be maintained by overgrazing from the sea urchins. The cobble areas along the transect had patches of macro algae that consisted of the green alga *Ulva sp.*, juvenile *Macrocystis pyrifera*, and *Gigartina spp.*. The cobble appeared to act as a barrier to the sea urchins, as few sea urchins were present on the cobble, but many were at the cobble/rock interface. Only four small adult *M. pyrifera* plants present along the transect. On RPCs, *M. pyrifera* was recorded at its highest coverage, 3.7%, since monitoring began. All of the *M. pyrifera* recorded on RPCs were the juveniles in the cobble areas. There were patches of a filamentous red alga and *Desmarestia spp.* on the tops of rocks along the transect. Encrusting coralline algae was abundant covering 42% of the bottom.

The small kelp forest east of the transect expanded towards the island, but appeared to be less dense than it was in 1992. The forest consisted of few large/mature, and many small adult *M. pyrifera*. *Gigartina spp.* was abundant, and was the most common understory algae. *Patiria miniata* were abundant. *S. franciscanus* were abundant on the edge of the kelp forest, forming a front, but were uncommon within the forest.

Corynactis californica and *Astrangia lajollaensis* were abundant, and covered 9.7% and 3.6% of the bottom, respectively. *Balanophyllia elagans* were common, covering 1.1% of the bottom. Terebellid worms and the worm *Dodecaceria fewkesi* were abundant, and were the most common

miscellaneous invertebrate on RPCs.

Strongylocentrotus franciscanus were abundant, having a density of (6.6/m^2). *Strongylocentrotus purpuratus* were relatively uncommon, having a density of 1.2/m^2. *Pisaster giganteus* and *Patiria miniata* were abundant having densities of 0.4/m^2 and 1.5/m^2 respectively. *Pycnopodia helianthoides* were common with a density of 0.031/m^2.

Large *Chromis punctipinnis*, adult and juvenile *Oxyjulis californica* were common. *Sebastes atrovirens*, *S. mystinus*, and *S. serranoides* were also common. *Embiotoca jacksoni*, *E. lateralis*, *Damalichthys vacca*, male and female *Semicossyphus pulcher*, and a large *Scorpaenichthys marmoratus* (cabezon) were observed.

Location: Wilson's Rock, San Miguel Island
Date: 9/15/93
Loran coordinates: 27862.5, 41668.9

A survey dive on a pinnacle about 0.25 miles west of Wilson's rock was conducted. The pinnacle rose from a depth of 30 m to 6 m. The water was green with a abundance of phytoplankton, and the water temperature was between 13.3-14.4 ^{o}C. There was no *Macrocystis pyrifera* present, but *Eisenia arborea* was abundant on the tops of the rocks around the pinnacle. *Corynactis californica* and *Epiactis prolifera* (proliferating anemone) were abundant covering much of the substrate. *Strongylocentrotus franciscanus* were common, and *S. purpuratus* were uncommon. *Pisaster giganteus* were abundant on the shallower parts of the reef. Large *Hinnites giganteus* were common, and hydroids were abundant. *Allopora californica* was common in a small cave and occasionally on the reef. Sponges were abundant and diverse.

Overall, fish were abundant. Large *Sebastes mystinus*, and both male and female *Semicossyphus pulcher* were abundant. *Chromis punctipinnis* and *Oxyjulis californica* were common. Rockfish,

Sebastes spp., were diverse and common.

Location: Johnson's Lee North, Santa Rosa Island

Site: #3 SRIJLNO

1993 sampling dates: 7/28, 7/29, 9/28.

1993 status: dense mature kelp forest

Macrocystis pyrifera was abundant, covering 46% of the bottom on RPCs. On July 28, *M. pyrifera* canopy cover over the transect was estimated at 10%. The tops of most of the adult *M. pyrifera* plants were just below the surface as if they had been cut as a result of boat traffic. On September 28, *M. pyrifera* canopy cover was estimated at 70%. Adult and juvenile *M. pyrifera* densities were high, $1/m^2$ and $7/m^2$ respectively. *M. pyrifera* plants appeared healthy, and had few epiphytes growing on them. Understory algae was abundant and consisted mostly of miscellaneous red algae, *Cystoseira spp.*, *Gigartina spp.*, and *Pterygophora californica*. These algae covered 52%, 16%, 12%, and 8.7% of the bottom, respectively.

Hydroids, *Pista elongata*, and amphipod tube mats were the most common miscellaneous invertebrates observed on RPCs. This category covered 13% of the bottom. Sponges, tunicates, and bryozoans were abundant and diverse. Their coverages were 7.0%, 8.3% and 23% respectively. *Phragmatopoma californica* covered 11% of the bottom, and were abundant in the *Macrocystis pyrifera* holdfasts.

Strongylocentrotus franciscanus and *S. purpuratus* continued to have low densities at this site, $0.2/m^2$ and $0.03/m^2$ respectively. Most of the sea urchins at this site were found in large crevices or under ledges. *Patiria miniata* and *Pisaster giganteus* densities were $0.075/m^2$ and $0.2/m^2$ respectively. *Pycnopodia helianthoides* were common ($0.033/m^2$), and several large ones were present along the transect.

Haliotis rufescens were common, having a density of 0.032/m^2. All were found under ledges and in crevices. Of the 38 *H. rufescens* measured for size frequencies, only two were larger than 175 mm (sport legal size). Small *H. rufescens* were uncommon, only three 60 mm or less were found in the natural habitat, and two in the ARMs. *Astraea undosa* were uncommon (0.1/m^2), however, two small individuals were seen.

Small *Cephaloscyllium ventriosum* (swell sharks) were more abundant than in previous years. They were often found in crevices and under the ARMs. *Sebastes atrovirens* and juvenile *Embiotoca jacksoni* were abundant. The *Hypsypops rubicundus* nest at 70 m along the transect was still present, as it has been for several years.

Only 13 of the original 15 ARMs were sampled. One of the ARMs was crushed by a large boulder, and we were unable to locate the other. Both of these ARMs were from the middle group of modules. In the 13 remaining ARMs, 13 *Haliotis rufescens* were found. Of these, four were native, six were introduced, and the remaining three were of an undetermined origin. The total number of *H. rufescens* decreased from the 1992 count of 31 from 15 ARMs. From the 13 ARMs, 10 *P. helianthoides* were found, a decrease from the 33 that were found in 1992 from the 15 ARMs. The number of *S. franciscanus* less than or equal to 24 mm increased from 1992, indicating higher recruitment this year.

Location: Johnson's Lee South, Santa Rosa Island

Site: #4 SRIJLSO

1993 sampling dates: 7/28, 7/29, 9/28.

1993 status: mature kelp forest

Macrocystis pyrifera canopy covered about 70% of the transect. Adult and juvenile *M. pyrifera* densities were 0.67/m^2 and 0.38/m^2 respectively, and covered 22% of the bottom. Most of the adult *M. pyrifera* plants were large, and all appeared healthy. Overall, the kelp forest appeared similar to last year. Understory algae consisted mostly of miscellaneous red algae and *Laminaria farlowii*; these

covered 29% and 6.6% of the bottom respectively.

Hydroids and amphipod tube mats were the most common miscellaneous invertebrates observed on RPCs; this category covered 15% of the bottom. Bryozoans, sponges, and tunicates were abundant and diverse, covering 15%, 6.2%, and 3.7% of the bottom respectively. *Diopatra ornata* and *Balanophyllia elagans* were abundant covering 10% and 6% of the bottom, respectively. *Tethya aurantia* and the *Tealia lofotensis* were abundant, and had densities of $0.21/m^2$ and $0.17/m^2$ respectively. *Lophogorgia chilensis* were abundant with a density of $0.2/m^2$.

Haliotis rufescens were common on band transects, but had a lower density ($0.013/m^2$) than Johnson's Lee North. Twenty-nine *H. rufescens* were measured for size frequencies. Two small *H. rufescens* less than 40 mm, and six greater than 175 mm were found. *Kelletia kelletii* were common, having a density of $0.032/m^2$ on band transects. *Hinnites giganteus* were common with a density of $0.082/m^2$.

Strongylocentrotus franciscanus and S. purpuratus continue to occur at low densities ($0.8/m^2$ and $0.68/m^2$, respectively) at this site. *Pycnopodia helianthoides* and *Patiria miniata* were abundant having densities of $0.16/m^2$ and $3.2/m^2$ respectively. Many of the *P. helianthoides* were small. *Pisaster giganteus* were common with a density of $0.13/m^2$.

The seven ARMs that were placed here on July 28, 1992 were sampled for the first time. Five of the ARMs were upside down, but still intact, with few bricks broken. The ARMs were mostly covered with bryozoans, and had few sea urchins in them. *Patiria miniata* were abundant, 82 were found in the seven ARMs. One native *Haliotis rufescens* was found. *Pycnopodia helianthoides* and juvenile *Hinnites giganteus* were common.

Location: Rodes Reef, Santa Rosa Island

Site: #5 SRIRR

1993 sampling dates: 7/12, 7/13, 9/14.

1993 status: open, sparse kelp forest

Macrocystis pyrifera canopy cover over the site was estimated at 30%. Adult and juvenile *M. pyrifera* densities were low, 0.2/m^2 and 0.025/m^2 respectively. Percent cover of *M. pyrifera* on RPCs was also low, 5.6%. Adult *M. pyrifera* plants were large, and only three juveniles were seen along the transect. *Laminaria farlowii* was present but had a low density of 0.05/m^2. Miscellaneous red algae was abundant, covering 73% of the bottom, its highest level recorded at this site. Most of the red algae consisted of *Carpopeltis bushiae* and several other species.

The anemones *Tealia lofotensis*, *T. columbiana*, *T. coriacea*, and *Epiactis prolifera* were all common. *T. lofotensis* had a density of 0.035/m^2. *Tethya aurantia* were abundant, having a density of 0.15/m^2. Sponges were abundant covering 4.1% of the substrate. *Balanophyllia elegans* and *Astrangia lajollaensis* were common, covering 3.9% and 5.2% of the bottom, respectively. *Diopatra ornata* was abundant covering 11% of the bottom. Bryozoans were abundant covering 27% of the bottom, their highest recorded cover since monitoring began at this site. Amphipod tube mats and hydroids were the most common miscellaneous invertebrates observed on RPCs.

Sea stars were abundant and diverse. *Patiria miniata* and *Pisaster giganteus* had densities of 1.8/m^2 and 0.78/m^2 respectively. *Dermasterias imbricata* (leather star), *Mediaster aequalis* (red sea star), *Henricia leviuscula* (blood star), and *Pycnopodia helianthoides* were common. *P. helianthoides* had a density of 0.014/m^2. Several *Orthasterias koehleri* (rainbow stars), and *Pisaster brevispinus* (short-spined sea star) were also seen. *Strongylocentrotus franciscanus* were abundant, and *Strongylocentrotus purpuratus* were common in the crevices. Their densities were 4.6/m^2 and 1.5/m^2, respectively. Sea urchins were more abundant on the western half of the transect where there is more rocky relief.

No live abalone, but two small (about 30 mm) fresh *Haliotis rufescens* shells were found. Mysids were abundant on the bottom, and in the kelp canopy. *Idotea resecata* (kelp isopods), were common in the kelp canopy.

Male and female *Semicossyphus pulcher* were abundant. *Sebastes serranoides*, *S. mystinus*, *Oxyjulis californica*, *Chromis punctipinnis*, *Embiotoca jacksoni* and *Damalichthys vacca* were all common. A *Caulolatilus princeps* (ocean whitefish), and several small *Cephaloscyllium ventriosum* were seen.

Location: Gull Island South, Santa Cruz Island

Site: #6 SCIGISO

1993 sampling dates: 7/26, 7/27, 9/16.

1993 status: mature, sparse kelp forest

Macrocystis pyrifera canopy cover over the transect was estimated at 10%. Adult *M. pyrifera* was less abundant this year than in 1992. Adult *M. pyrifera* were large, spread out, and had a density of $0.05/m^2$, a decrease from the 1992 density of $0.2/m^2$. Most of the plants appeared healthy having few epiphytes. Juvenile *M. pyrifera* were common having a density of $1.6/m^2$, an increase from its 1992 density of $0.03/m^2$. Percent bottom cover of *M. pyrifera* was 10%, about the same as in 1992. Although the percent cover of *M. pyrifera* didn't change much since 1992, the distribution changed such that there was an increase in the number of juvenile plants and a reduction in adults. Miscellaneous red algae was abundant covering 27% of the bottom, the highest coverage recorded since 1982. *Eisenia arborea* was only common on the tops of rocks, and some juveniles were present. Crustose coralline algae was abundant covering 46% of the bottom.

Encrusting bryozoans were abundant and consisted mostly of *Phidolopora pacifica*, *Diaperoecia californica*, and *Lichenopora novae-zelandiae*. Bryozoans combined covered 18% of the bottom. The most common miscellaneous invertebrates on RPCs were amphipod tube mats, hydroids, and gorgonians. This category covered 9.1% of the bottom. *Allopora californica* density was $0.061/m^2$, about the same as in 1992. None of the hydrocoral colonies were observed to be overgrown by crustose coralline algae, a phenomenon that was observed last year.

Strongylocentrotus purpuratus were abundant (19/m^2), especially on the North end of the transect. The *S. purpuratus* along the transect were small, and confined to crevices or small pits. It was often difficult, and sometimes impossible to measure some of the *S. purpuratus* for size frequencies. *Strongylocentrotus franciscanus* were common at a density of 2.6/m^2. Along the transect, two *S. purpuratus* were observed with wasting syndrome. *S. purpuratus* barrens were present inshore of the transect, starting at a depth of about 11 m. In these barrens, several small patches of *S. purpuratus* appeared to be recovering from wasting syndrome. These sea urchins were mostly devoid of spines, but appeared to be regrowing new ones. Whole *S. purpuratus* tests were common.

Patiria miniata, Pisaster giganteus, and *Pycnopodia helianthoides* were all common, having densities of 1.4/m^2, 0.3/m^2, and 0.015/m^2 respectively. *Mediaster aequalis* were also common, and one was observed feeding on the bryozoan, *Lichenopora novae-zelandiae*. One *P. miniata* along the transect was observed with wasting disease. One california sea cucumber, *Parastichopus californicus* was seen.

Aplysia californica and *Kelletia kelletii* were abundant in the *S. purpuratus* barrens inshore of the transect. Two small (<20 mm) fresh abalone (most likely *Haliotis corrugata*) shells were found along the transect.

A small school of *Oxyjulis californica* was observed. *Oxylebius pictus* (painted greenlings) were abundant. *Sebastes atrovirens, Girella nigricans,* and small female *Semicossyphus pulcher* were common.

In the 15 ARMs at this site, six native *Haliotis corrugata* and six native *Haliotis rufescens* were found. Only one *H. rufescens* was found in 1992. *P. miniata* were common in the modules (47 were found in the 15 ARMs), and many were recent recruits with 42.5% of the *P. miniata* being less than or equal to 19 mm. The percent of *S. franciscanus* and *S. purpuratus* less than 15 mm in the ARMs increased from 1992. The percent of *S. franciscanus* was 24% compared to 4% in 1992, and the

percent of *S. purpuratus* was 9.8% compared to 2.9%.

Location: Fry's Harbor, Santa Cruz Island

Site: #7 SCIFH

1993 sampling dates: 8/11, 9/13.

1993 status: open area dominated by *Pachythyone rubra*.

Macrocystis pyrifera continued to be absent at this site and not much other foliose algae was present. Foliose algal densities have changed little over the past several years. Filamentous algae was abundant. Miscellaneous red algae was mostly a filamentous type and covered 22% of the bottom, its highest recorded coverage since 1982. Green algae and brown filamentous alga, thought to be diatom chains covered 5.5% and 5.8% of the bottom respectively. There were several *Eisenia arborea* and *Laminaria farlowii* on the tops of rocks along the transect. The brown alga, *Colpomenia sp*. was common.

The hydroids, *Hydractinia milleri*, and amphipod tube mats were the most common miscellaneous invertebrates recorded on RPCs. This category covered 12% of the bottom. *Astrangia lajollaensis* coverage has decreased over the past several years, from 30% in 1991 to 7.8% in 1993. Bryozoans were abundant. *Diaperoecia californica* was recorded at its highest coverage ever at this site (10%). Other bryozoans covered 7.5% of the bottom, and consisted mostly of the bryozoan, *Thalamoporella californica*.

Pachythyone rubra covered 8.7% of the bottom. *P. rubra* were patchy and more abundant on the northern half of the transect. *Lytechinus anamesus*, *Strongylocentrotus franciscanus*, and *S. purpuratus* densities were similar to last year, 3.2/m^2, 1.2/m^2, and 1.7/m^2 respectively. *L. anamesus* were abundant on the offshore/deep side of the transect. In one of the band transects, 600 were counted, this is equivalent to a density of 20/m^2. *Patiria miniata* and *Pisaster giganteus* were common, having densities of 0.3/m^2 and 0.025/$m/^2$ respectively.

Fish were abundant at this site. Juvenile *Chromis punctipinnis* were common in small schools. Large schools of *Trachurus symmetricus* and *Engraulis mordax* (northern anchovies) were observed near the transect. Adult *Paralabrax clathratus* were abundant and many large individuals were observed. *Lythrypnus dalli* were common. Several *Hypsypops rubicundus* and one small *Sebastes mystinus* were seen.

The seven ARMs placed at this site on July 17, 1992 were sampled for the first time. Divers representing the Channel Islands Council of Divers introduced a total of 350 hatchery raised *Haliotis rufescens* on April 10, 1993. When we surveyed the ARMs on August 11, 1993 only five introduced *H. rufescens* (all less than 25 mm) were found. Juvenile *Hinnites giganteus*, *Patiria miniata*, *Strongylocentrotus franciscanus* and *S. purpuratus* were common. Sea urchins less than 15 mm composed 38% and 29% of the *S. franciscanus* and *S. purpuratus* populations in the ARMs, respectively.

Location: Pelican Bay, Santa Cruz Island
Site: #8 SCIPB
1993 sampling dates: 7/15, 7/16, 8/12, 9/29.
1993 status: developing kelp forest

This site has undergone some remarkable changes since last year. *Macrocystis pyrifera* was recorded at the highest density since monitoring began. Adult and juvenile densities were $0.68/m^2$ and $7.1/m^2$ respectively. The percent bottom cover of *M. pyrifera* was 70%, also its highest coverage recorded at this site. Large mature *M. pyrifera* plants were present along the line, but most of the plants were small, 1-3 m tall. *M. pyrifera* canopy cover over the transect was estimated at 15%. Many of the small adult and juvenile *M. pyrifera* plants were growing epiphytically on *Sargassum muticum*. Miscellaneous brown algae, mostly *S. muticum*, covered 60% of the substrate, about the same as in 1992. Miscellaneous red algae was also recorded at its highest coverage at this site, 36%. Juvenile *Eisenia*

arborea was abundant in the shallower areas above the transect.

The bryozoan *Thalamoporella californica* was abundant covering much of the bottom. Bryozoans covered 36% of the bottom, their highest abundance recorded at this site. Sponges were common, covering 2.3% of the bottom. Parchment tube worms, *Chaetopterus variopedatus*, were abundant, This species was the most common miscellaneous invertebrate recorded on RPCs.

Pisaster giganteus were uncommon. *Patiria miniata* were common, and appeared to be more abundant than last year, but remained at a low density ($0.15/m^2$). Both *Strongylocentrotus franciscanus* and *S. purpuratus* were common, but their densities have gradually decreased during the past three years. Their densities this year were $1.4/m^2$ and $2.7/m^2$ respectively. One Coronado sea urchin, *Centrostephanus coronatus*, was observed on the quadrats.

Aplysia californica, and *A. vaccaria* (california black sea hare), were common. Individuals of both species were often large. *Octopus sp*. were common. Three *octopus sp*. dens were found with many empty *Lima hemphilli* shells (file shells), around their openings. Two large *Navanax inermis* were observed. *Kelletia kelletii* were uncommon, but the individuals found were very large, usually over 130 mm. *Astraea undosa* were common, and several size classes were present. Juveniles *A. undosa* were common, often seen in small crevices, or in/on the clumps of *S. muticum* and *T. californica*.

Heterostichus rostratus (giant kelp fish), and juvenile and small adult *Paralabrax clathratus* were abundant among the small *M. pyrifera*. Adult *P. clathratus* and *Girella nigricans* were abundant. *Chromis punctipinnis*, *Oxyjulis californica*, *Embiotoca jacksoni*, and female and juvenile *Semicossyphus pulcher* were common. *Alloclinus holderi*, *Lythrypnus dalli*, *L. zebra* (zebra gobies), and *Coryphopterus nicholsii* were common. Two *Medialuna californiensis* (halfmoon) were seen.

A new south transect stake was installed. The old stake has not been located for several years, and was possibly torn out by an anchor. A new stake was also installed at the north end of the transect to

attach a temperature logger.

ARMs were placed here on April 30, 1993 and were not sampled this year. There were few animals in the modules and not much algal or encrusting invertebrate growth on the bricks in July. These ARMs will be sampled in 1994. The wire cages of these ARMs were poorly assembled and will need to be replaced.

Location: Scorpion Anchorage, Santa Cruz Island

Site: #9 SCISA

1993 sampling dates: 8/13, 9/29.

1993 status: *Strongylocentrotus purpuratus* barrens

This site has changed little during the past several years, and continues to be dominated by *Strongylocentrotus purpuratus*. The transect was mostly devoid of macroalgae; however, there were some brown algae (mostly *Sargassum muticum*) on the tops of large boulders, and several small patches of small adult *Macrocystis pyrifera* near the transect. These patches were on rocks that were surrounded by sand. The sand appears to act as a barrier to the *S. purpuratus*. Miscellaneous brown algae covered 4.7% of the bottom, this was the highest coverage since 1985. Miscellaneous red algae covered 10% of the bottom, the highest coverage since 1982. Both of these groups of miscellaneous algae consisted mostly of filamentous algae. Encrusting coralline algae was abundant, covering 57% of the bottom.

Miscellaneous invertebrates, mostly *Spirobranchus spinosa* (christmas-tree worm), covered 10% of the bottom. *Serpulorbis squamigerus* were common and covered 2.3% of the bottom. *Lophogorgia chilensis* were present on the north side of the transect, but were uncommon. Several *Panulirus interruptus* and molts were observed near the transect.

S. purpuratus dominated the site, having a density of $42/m^2$. Most of the *S. purpuratus* were out in

the open, on the tops of rocks. *S. franciscanus* had a density of 0.35/m^2 and were mostly found in crevices. *Lytechinus anamesus* were uncommon with a density of 0.11/m^2. *Parastichopus parvimensis* were common (0.63/m^2). *Patiria miniata* were common (0.18/m^2), and *Pisaster giganteus* were uncommon with none being present on quadrats.

Megatura crenulata were common (0.13/m^2). Adult and juvenile *Astraea undosa* were abundant, and had a density of 1.2/m^2. Freshly crushed *A. undosa* shells were common, indicating recent mortality caused by predation. A *Myliobatis californica* (bat ray) was observed feeding on a *A. undosa*. *Heterodontus francisci* (horn sharks) are also potential predators of *A. undosa*, and were present at the site.

Adult and juvenile *Chromis punctipinnis* were common. *Oxyjulis californica* were common but no large schools were seen. Small adult *Paralabrax clathratus* were also common, and several large ones were seen. *Coryphopterus nicholsii* were common, at a density of 0.83/m^2.

On March 15, 1992, seven ARMs were deployed about 200 m from the transect. On March 22, 1993, six of them were located, moved to the west end of the transect, and 350 hatchery raised abalone were placed in them by the Channel Islands Council of Divers. The remaining ARM was located on June 25, 1993, and was moved next to the others. The first complete sampling date for these ARMs was August 13, 1993, and no abalone were found. *Hinnites giganteus* were common, with 24 found in the seven ARMs. About half of the *H. giganteus* were greater than 60 mm, the largest being 96 mm. This seems to be rapid growth rate for a scallop that settled less than 17 months ago. *Cypraea spadicea* were common. *S. purpuratus* were common, and *S. franciscanus* were less common. Juvenile red and *S. purpuratus* were present.

Location: Yellowbanks, Santa Cruz Island

Site: #10 SCIYB

1993 sampling dates: 8/9, 8/10, 9/27.

1993 status: mature kelp forest

Macrocystis pyrifera canopy cover was estimated at 15%. Even though many of the adult *M. pyrifera* were large, most did not reach the surface. Most of the canopy appeared unhealthy, having tattered and discolored fronds. *M. pyrifera* covered 13% of the bottom, and adult and juvenile densities were $0.38/m^2$ and $1.1/m^2$ respectively. Understory algae was abundant and consisted mostly of *Pterygophora californica*, *Cystoseira spp.* and *Laminaria farlowii*. These algae covered 33%, 22%, and 12% of the bottom respectively. *P. californica* and *L. farlowii* densities were $2.6/m^2$ and $0.83/m^2$ respectively. Juvenile *P. californica*, *L. farlowii*, and *M. pyrifera* were common.

The most common miscellaneous invertebrates on RPCs were hydroids, gorgonians, and amphipod tube mats. This category covered 8.5% of the bottom. Bryozoans were common, covering 13% of the bottom. *Lophogorgia chilensis* were common, at a density of $0.06/m^2$. *Muricea fruticosa* and *M. californica* were also present, but were not as abundant as *L. chilensis*. Mysids were common on the bottom; however, none were seen in the kelp canopy. Several *Idotea resecata*, were seen in kelp canopy.

Strongylocentrotus purpuratus densities have declined since 1989, this year they were recorded at their lowest density ($1.4/m^2$) since monitoring began at this site in 1986. *S. franciscanus* and *Lytechinus anamesus* densities were $0.55/m^2$ and $0.84/m^2$ respectively. *Parastichopus parvimensis* were common with a density of $0.7/m^2$. Sea stars were uncommon.

Astraea undosa were common having a density of $0.73/m^2$. Three *Haliotis corrugata* were found on band transects and 30 were measured for size frequencies. *Kelletia kelletii* were common, having a density of $0.058/m^2$. Several large *Aplysia vaccaria* were observed with their egg masses.

Oxyjulis californica and small *Paralabrax clathratus* were abundant in the upper part of the water column, among the *M. pyrifera*. Small *Chromis punctipinnis* were present, but not very abundant. Male and female *Semicossyphus pulcher* were abundant. Small *Sebastes auriculatus* (brown

rockfish), were common in the ARMs. *Embiotoca jacksoni* were present, but did not appear on the fish transects. *Atherinops affinis* (top smelt) were abundant near the surface, and *Trachurus symmetricus* were observed at night. *Coryphopterus nicholsii* were common with a density of $0.38/m^2$. Either a *Epinephalus labriformis* (flag cabrilla) or a *Alphestes afer* (mutton hamelet) was observed in one of the ARMs, these fish are rarely seen this far north.

There are four groups of five ARMs at this site. Only three groups were sampled. In 6 of the 15 ARMs (2 from each group sampled), *Strongylocentrotus franciscanus* and *S. purpuratus*, *Hinnites giganteus*, *Cypraea spadicea*, *Haliotis spp.*, *Patiria miniata*, and *Pisaster giganteus* were measured. In the remaining nine ARMs, only *H. giganteus*, *Haliotis spp.*, *P. miniata*, and *P. giganteus* were measured. Two small *Haliotis corrugata* were found. Small *H. giganteus* were more abundant this year than in 1992. Twenty were found in 15 modules, compared to eight from 18 modules in 1992. Small *P. giganteus* were not as abundant as in 1992. Only 30 were found in 15 modules, compared to the 81 found in 18 modules in 1992. Both *S. franciscanus* and *S. purpuratus* were abundant in the modules, and the percent of juveniles increased from 1992. Of the *S. franciscanus* found in the modules, 36.7% were less than 15 mm, compared to 12.6% in 1992. Of the *S. purpuratus* 23.2% were less than 15 mm, compared to 4.8% in 1992.

In one of the ARMs, many of the *S. purpuratus* were scarred on their ventral surface. We think this scarring may have been caused by prying the urchins off the bricks for measurement during previous sampling. We recommend that sea urchins not be pried off in the future.

Location: Black Point, Santa Cruz Island
Date: 7/30/93

A survey dive was conducted about 50 m east of black point. This site was a small rock reef surrounded by sand. The *Macrocystis pyrifera* canopy was thick and covered about 80% of the reef. The *M. pyrifera* at this reef was characteristic of a mature kelp forest, having few, widely spaced, large

M. pyrifera plants forming a thick canopy. Within the center of the forest there were few juvenile *M. pyrifera*, however along the edges of the reef, juvenile *M. pyrifera* was common. This may be due to increased light levels near the sand/reef interface. *Laminaria farlowii* and *Desmarestia spp.* were present but were not very abundant on the reef. On the rock outcrops in the sandy areas, *L. farlowii*, *Gigartina spp.*, and *M. pyrifera* were common. There was a thin layer of silt over most of the reef.

Lophogorgia chilensis were abundant. Both *Muricea fruticosa* and *M. californica* were present. Bryozoans were abundant, especially *Heteropora/Costazia* (one or the other), *Phidilopora pacifica*, and an unidentified encrusting bryozoan. *Telia lofotensis*, *Astrangia lajollaensis* and *Paracyathus stearnsi* were common.

Small *Pisaster giganteus* were abundant. *Patiria miniata* and *Pycnopodia helianthoides* were present, but not very abundant. *Strongylocentrotus franciscanus* were common, and *Strongylocentrotus purpuratus* were uncommon. Sea cucumbers, *Cucumaria sp*., were present and patches of the *Pachythyone rubra* were seen on the reef, as well as inshore in the shallow areas.

Small *Megathura crenulata* and *Hinnites giganteus* were common. Benthic mysids were common. On the sandy bottom between the reef and the shore, *Astropectin armatus* (sand stars), *Renilla kollikeri* (sea pansy's), and *Stylatula elongata* (sea pens), were common.

Fish were abundant. Small *Chromis punctipinnis*, juvenile and adult *Sebastes serriceps* (tree fish), *Paralabrax clathratus*, *Sebastes serranoides*, and male and female *Semicossyphus pulcher* were abundant. Small *Cephaloscyllium ventriosum* were abundant, and a *Platyrhinoidis triseriata* (thornback ray) was seen. At the reef/sand interface a *Pleuronichthys coenosus* (C-O turbot), and a large (at least 75 cm) *Paralichthys californicus* (California halibut) were seen.

At depths shallower than about 6 m, the sand bottom turned into rock. Here, small adult and juvenile *M. pyrifera*, *Gigartina spp.*, and *Cystoseira spp./Sargassum sp.* were abundant. *Pachythyone rubra* and the bryozoan *Bugula sp*. were also abundant. *Balanophyllia elagans* and *Diopatra ornata*

were common. Five *Haliotis corrugata* were observed. At a depth of about 3 m *Eisenia arborea*, *S. franciscanus* and *S. purpuratus* were abundant. Juvenile sea urchins were common in the sea urchin spine canopy. The *S. purpuratus* had many gamarid amphipods associated with them. The *S. franciscanus* in shallow water were larger than the ones in the deeper areas. The shrimp, *Baeteus macginitieae*, were common underneath the *S. franciscanus*. Male and female *Semicossyphus pulcher* were common, and a large school of juvenile *Oxyjulis californica* were observed.

Location: Christi Beach, Santa Cruz Island
Date: 7/30/93

Due to lack of time we only had about five minutes to snorkel at the north end of Cristy Beach. Snorkeling at depths between 1-5 m, six large pismo clams, *Tivela stultorum* were seen. Spiny mole crabs, *Blepheropoda occidentalis*, were abundant.

Location: Reef midway between Gull Island and Santa Cruz Island.
Date: 9/16/93

Although, no surveys have previously been conducted here, this area appeared to have a dense *Macrocystis pyrifera* bed with a thick canopy last year. This year there was only a thin canopy that formed over part of the reef. At a depth of about 11 m, the bottom was mostly flat with little relief. This area was mostly sea urchin barrens that consisted mainly of *Strongylocentrotus purpuratus*. *S. franciscanus* and *Lytechinus anamesus* were less abundant. Much of this area had thick mats of *Chaetopterus variopedatus*. A piece of one of these mats was brought to the surface and no live worms were found in the tubes. *Kelletia kelletii*, *Astraea undosa*, and *Aplysia californica* were common in this barren area.

In the rocky area at a depth of 4 - 8 m, small adult and juvenile *M. pyrifera* were abundant. *Eisenia*

arborea was common. *S. franciscanus*, *S. purpuratus*, and *Lytechinus anamesus* were common, but not as abundant as in the sea urchin barrens. *L. anamesus* with wasting syndrome were common, as were their fresh whole tests. Juvenile *S. purpuratus* were abundant under rocks. Small *Lophogorgia chilensis* were common. No live *Haliotis spp.* were observed, however, old *Haliotis corrugata* shells were present, and one small fresh shell was found. *Pisaster giganteus* were common, and *Patiria miniata* were uncommon. *Panulirus interruptus* were common. There were few fish here and most were small. Small female *Semicossyphus pulcher* were abundant.

Location: Admiral's Reef, Anacapa Island

Site: #11 ANIAR

1993 sampling dates: 8/23, 8/25, 8/26, 8/27, 9/17.

1993 status: mature kelp forest

Overall, this site changed little from last year. *Macrocystis pyrifera* canopy cover was estimated at 90%. Most of the *M. pyrifera* plants were healthy, but some had discolored/tattered fronds, and epiphytic bryozoans were common on the fronds. *M. pyrifera* covered 12% of the bottom. Understory algae were abundant, consisting mostly of *Eisenia arborea*, *Laminaria farlowii*, *Agarum fimbriatum*, *Cystoseira spp.*, and miscellaneous red algae. On the rocky (west) end of the transect, *E. arborea* was abundant. Its overall density was $0.7/^2$, and covered 22% of the bottom; both adult and juveniles were present. On the eastern end of the transect which is composed mostly of small boulders and sand, adult and juvenile *L. farlowii*, and *A. fimbriatum* were abundant. *Cystoseira spp.* was common covering 17% of the bottom. Miscellaneous red algae was relatively abundant for this site, covering 38% of the bottom. Articulated coralline algae was abundant on the top/shallower parts of the reef; however, coverage was low (3%) along the transect.

Amphipod tube mats, gorgonians, hydroids, christmas-tree worms, anemones, and *Hydractinia milleri* were the most common miscellaneous invertebrates observed on RPCs. This category covered 18% of the bottom. Sponges and tunicates were common, covering 3.6% and 4.4.% of the bottom

respectively. *Lophogorgia chilensis* were abundant, and *Muricea californica* and *M. fruticosa* were common. Their densities were 0.96/m^2, 0.043/m^2, and 0.022/m^2, respectively. *Eugorgia rubens* (purple gorgonian) were also abundant, and small (1-10 cm) individuals were common.

Patiria miniata were common, having a density of 0.23/m^2. *Pisaster giganteus* were uncommon, and none were found during the quadrat counts. *Strongylocentrotus franciscanus* and *S. purpuratus* densities were 7.6/m^2 and 9.0/m^2 respectively. *Lytechinus anamesus* density continued to decline from their 1988 high of 38/m^2 to a density of 0.72/m^2 this year. *L. anamesus* were observed with wasting syndrome and we estimated that 7% were affected on August 27. Whole fresh *L. anamesus* tests were common, indicating recent mortality. *Centrostephanus coronatus* were relatively common. *Parastichopus parvimensis* were abundant with a density of 1.7/m^2.

Hinnites giganteus were abundant, especially on top of the reef. Their density was recorded at 0.43/m^2. *Aplysia californica* were common (0.027/m^2). *Haliotis corrugata* were relatively common having a density of 0.017/m^2. On August 23, the dive boat LIBERTY was anchored almost directly over the transect. They reported observing several *H. corrugata* with withering syndrome at a depth of about 21 m. All abalone found along the transect at a depth between 9 - 15 m appeared to be healthy; however, two fresh adult *H. corrugata* shells were found. On September 17, we dove on the reef just south of the transect to look for *H. corrugata.* This reef looked similar to the transect but was at a depth between 17 - 30 m. Only four live *H. corrugata* were found and all appeared to be healthy. *H. corrugata* shells were common, 56 were counted. Many of the shells appeared relatively fresh, possibly from animals that died within the last year.

Adult *Chromis punctipinnis* and *Girella nigricans* were abundant under the kelp canopy near the surface. *Oxyjulis californica* and *Atherinops affinis* were common. A small school of juvenile *Chromis punctipinnis* and a large school of *Trachurus symmetricus* were observed.

In the seven ARMs, two *H. corrugata* were found. Juvenile *H. giganteus* were abundant, 59 were found in the seven ARMs. This is about the same number that were present in 1992. The modules

contained 17 *P. giganteus*, compared to only five found in 1992. The numbers of both *S. purpuratus* and *S. franciscanus* in the modules increased from 1992. However, the number of red and *S. purpuratus* less than 15 mm remained about the same, indicating similar recruitment during both years.

Location: Cathedral Cove, Anacapa Island

Site: #12 ANICC

1993 sampling dates: 8/26, 10/1.

1993 status: mature kelp forest

This site changed little from last year. *Macrocystis pyrifera* canopy cover over the transect was estimated at 65%. The kelp forest consisted of juvenile, large, and small adult *M. pyrifera* plants, all of which were abundant. Adult and juvenile *M. pyrifera* densities were $0.7/m^2$ and $2.1/m^2$ respectively. *M. pyrifera* covered 27% of the bottom. Understory algae consisted of *Cystoseira spp.*, small adult *Eisenia arborea*, *Laminaria farlowii*, and articulated coralline. *L. farlowii* was common covering 4.0% of the bottom and a density of $0.78/m^2$. *Cystoseira spp.* was common covering 9.4% of the bottom. Articulated and encrusting coralline algae were common covering 17% and 33% of the bottom, respectively. A elongated/teardrop shaped species of *Halicystis* was common on boulders on the inshore side of the transect.

Spirobranchus spinosa and hydroids were the most common miscellaneous invertebrates recorded on RPCs. This category covered 16% of the bottom. Bryozoans were recorded at their highest coverage (9.7%) since monitoring began at this site.
Patiria miniata and *Pisaster giganteus* were uncommon. *Strongylocentrotus franciscanus* and *S.purpuratus* had densities of $3.9/m^2$ and $1.5/m^2$ respectively. Juvenile *S. franciscanus* and *S. purpuratus* were common under the spine canopy of the *S. franciscanus*. *Parastichopus parvimensis* were common at a density of $0.73/m^2$.

Panulirus interruptus were recorded at their highest density recorded at this site ($0.11/m^2$). Most of

these (64 of the 82) *P. interruptus* were from one cavern along the transect. This small cavern typically has many *P. interruptus*, but is rarely encountered on band transects. *P. interruptus* molts were abundant in the cobble bed inshore of the transect. Molts have been abundant in this area for at least the past several years.

Haliotis corrugata were present along the transect, their density was 0.0083/m^2. *Hinnites giganteus* were abundant having a density of 0.22/m^2. Adult and juvenile wavy top turban snails were abundant, and had a density of 1.8/m^2. On the north end of the transect near the ARMs, large *Astraea undosa* were abundant covering most of the bottom.

Small schools of juvenile *Chromis punctipinnis* were common. Adult *C. punctipinnis*, *Embiotoca jacksoni*, *Hypsypops rubicundus*, and *Paralabrax clathratus* were all common. Adult *Halichoeres semicinctus* were abundant. Small female *Semicossyphus pulcher* were abundant, and several males were seen. *Alloclinus holderi* density remained high (0.6/m^2) since last year.

One *H. corrugata* was found in the seven ARMs. *Cypraea spadicea* were more abundant this year than in 1992; 127 were found in the seven ARMs, compared to 27 from four ARMs in 1992. The number of *H. giganteus* found in the ARMs decreased to 7, compared to 23 in 1992. The number of *P. miniata* also decreased in 1993.

Location: Landing Cove, Anacapa Island
Site: #13 ANILC
1993 sampling dates: 8/25, 8/27, 9/30.
1993 status: open kelp forest

Overall, this site has changed little since monitoring began. The site is characterized by an open kelp forest with little canopy, probably due to boat traffic in the cove. Juvenile, and small and large adult *Macrocystis pyrifera* plants were abundant. Adult and juvenile *M. pyrifera* densities were 0.58/m^2

and 1.3/m^2 respectively. Understory algae was abundant and consisted of *Laminaria farlowii*, *Cystoseira spp.*, articulated coralline, *Pterygophora californica*, and *Eisenia arborea*. *M. pyrifera*, *P. californica*, and *E. arborea* combined covered 81% of the bottom, their highest coverage recorded at this site. *L. farlowii* and *Cystoseira spp.* covered 21% and 14% of the bottom respectively. *L. farlowii* densities (2.8/m^2) continued to be high. *Gelidium spp*., was abundant on the shallow/east end of the transect, and covered 26% of the bottom. Miscellaneous red algae covered 24% of the bottom.

Miscellaneous invertebrates covered 7.6% of the bottom. The most common miscellaneous invertebrate was *Hinnites giganteus*. Sponges covered 2.4% of the bottom, a decrease from last several years. Tunicates were uncommon, and bryozoans combined covered 5.7% of the bottom.

Patiria miniata and *Pisaster giganteus* were uncommon along the transect, and none were observed on quadrats this year. *Strongylocentrotus franciscanus* and *S. purpuratus* had densities of 3.1/m^2 and 1.8/m^2 respectively. In early August, three *S. purpuratus* were observed with wasting syndrome; this has been the only sighting at this location. *Parastichopus parvimensis* were common at 0.25/m^2.

Haliotis corrugata and *Panulirus interruptus* were common along the transect, having densities of 0.038/m^2 and 0.014/m^2 respectively. Adult and juvenile *Astraea undosa* were common having a density of 1.1/m^2. *H. giganteus* were abundant with a density of 0.65/m^2. *Megathura crenulata* density continued to decline for the seventh year. This year's density (0.0056/m^2) was the lowest recorded at this location since monitoring began.

During two of our visits to this site within a 35 day period we found nine fresh *H. corrugata* shells. Six of the nine were larger than 110 mm. This appears to be unusually high mortality for adult *H. corrugata.* Although no abalone were removed, and all seemed to be strongly attached to their substrate, one diver observed some abalone that appeared shrunken. A fresh *H. cracherodii* and one old *H. assimilis* shell were found.

Adult and juvenile *Chromis punctipinnis*, *Oxyjulis californica*, and *Hypsypops rubicundus* were

common. Female *Semicossyphus pulcher*, *Girella nigricans*, *Embiotoca jacksoni*, and large adult *Paralabrax clathratus* were common. A *Myliobatis californica* was observed feeding at the rock/sand interface.

Wave action appears to have moved and overturned some of the ARMs at this site. Several of the ARMs were moved to a new location along the transect, which will hopefully be less vulnerable to wave action. Three *H. corrugata* were found in the seven ARMs. Juvenile *H. giganteus* were abundant, with 49 observed in the seven ARMs. In 1992, only five *H. giganteus* were found. Both *S. franciscanus* and *S. purpuratus* were more abundant this year than in 1992. In the ARMs, population size structure of *S. franciscanus* changed little from 1992; however, size structure in *S. purpuratus* did change. *S. purpuratus* size structure showed more bimodality than in 1992.

Location: Cat Rock, Anacapa Island
Date: 8/12/93

Two survey dives were made at this site. The first dive was conducted on the southeast side of Cat Rock. In a relatively small area there were patches of *Strongylocentrotus purpuratus* barrens, patches of dense young kelp forest composed mostly of many small adult *M. pyrifera* plants and patches of mature kelp forest composed of a low density of large canopy forming *M. pyrifera*. In the sea urchin barrens, *S. purpuratus* were seen with wasting syndrome. We estimated that less than 10% of the sea urchins were affected. *Haliotis corrugata* were common.

The second dive was in shallow water (less than 8 m) and circumnavigated Cat Rock. *H. corrugata* were common and one *Haliotis fulgens* was seen. One diver spent about 30 minutes looking for juvenile *Haliotis cracherodii* under rocks on the north west side of the rock at depths less than 3 m. Although this area used to have a large population of *H. cracherodii*, no live black abalone were found and only several old shells were seen.

Location: Southeast Sea Lion, Santa Barbara Island

Site: #14 SBISESL

1993 sampling dates: 6/21, 6/22, 6/23, 8/24.

1993 status: mature and young kelp forest

Macrocystis pyrifera canopy cover was estimated at 25%, and was mostly over the southern half of the transect. *M. pyrifera* was growing along the entire transect, and its abundance increased dramatically from previous years. Adult and juvenile *M. pyrifera* were recorded at their highest densities since monitoring began, 0.63/m^2 and 1.2/m^2 respectively. *M. pyrifera* covered 36% of the substrate, also the highest recorded coverage. Many of the *M. pyrifera* on the southern half of the transect were large and formed a canopy during ebb tides. On the northern half of the transect, small adult and juvenile *M. pyrifera* were abundant; none of these plants were greater than 10 m in height. Most of the *M. pyrifera* appeared to be healthy, but some of the older blades had epiphytes (mostly bryozoans) growing on them. *Cystoseira spp.* coverage was 13%, the highest coverage since 1982. Miscellaneous brown algae covered 4.9%, a decrease from 1992. Bare substrate had a relatively low coverage (18%) for this site.

Balanophyllia elagans were common, and many of them on the north end of the transect were being overgrown with encrusting coralline algae. This is a common phenomena when macro algae grows near cup corals. (Coyer et al, 1993) The high density of young *M. pyrifera* plants may be causing this. *B. elagans* covered 0.7% of the bottom. *Muricea californica*, *M. fruticosa*, and *Lophogorgia chilensis* were all common. *Tethya aurantia* were common having a density of 0.13/m^2. The most abundant miscellaneous invertebrate on RPCs was amphipod tube mats. This category covered 23% of the bottom.

Aplysia californica were abundant and were counted on quadrats and band transects. Their respective densities were 1.1/m^2 and 0.61/m^2. A possible explanation for the lower density on band transects, is that this method covers more, less optimal habitat for sea hares, such as sand. *Conus*

californicus (cone snails) and their egg masses were common. *Simnia vidleri* were common on *L. chilensis*. The opistobranch, *Navanax inermis* and their eggs were common, they were observed eating small sea hares. A 9 mm *Haliotis corrugata* was found on an old *H. corrugata* shell. *Astraea undosa* were common having a density of 0.48/m^2.

Sea urchin wasting syndrome was observed in several *Lytechinus anamesus*; however, *Strongylocentrotus purpuratus* or *S. franciscanus* were observed with the syndrome. *Centrostephanus coronatus* were common. *S. franciscanus* were common, having a density of 2.7/m^2. *S. purpuratus* density declined to 17/m^2, about half of its 1992 density, and the lowest recorded density since 1985. *L. anamesus* densities decreased, and were counted on band transects and quadrats. Their respective densities were 4/m^2 and 3.8/m^2. *Patiria miniata* and *Pisaster giganteus* were common.

Oxyjulis californica adults and juveniles were abundant. Juvenile and small female *Semicossyphus pulcher* were common. Several *Myliobatis californica* and a large school of *Trachurus symmetricus* were seen.

Location: Arch Point, Santa Barbara Island

Site: #15 SBIAP

1993 sampling dates: 6/24, 6/25, 8/24.

1993 status: young kelp forest

In June, *Macrocystis pyrifera* canopy cover was present only on the south end of the transect, and was estimated at 5% cover. The small kelp forest at the offshore edge of the south end of the transect appeared similar to last year, but had expanded closer to the transect. The far north end of the transect had some adult and juvenile *M. pyrifera*, but the rest of the transect had few *M. pyrifera*. Adult *M. pyrifera* was recorded at their highest density since monitoring began. *M. pyrifera* coverage was also recorded at it highest level (15%). Juvenile *M. pyrifera* plants were common at 0.85/m^2. *M. pyrifera*

plants appeared healthy, and had little epiphytic growth. *Eisenia arborea* were common, having a density of 0.6/m^2; most of these were juveniles on the north end of the transect. Green algae (9.4%), miscellaneous brown algae (23%), *Laminaria farlowii* (1.3%), *Cystoseira spp.* (5.4%), and articulated (38%), algae were all at their highest coverage since 1985. *Cystoseira spp.* was common along the transect and two species were present, *C. setchellii* and *C. neglecta.* *C. neglecta* was especially abundant along the south end of the transect. *C. neglecta* is easily confused with *Sargassum spp.* and was counted as miscellaneous brown algae in RPCs. Encrusting coralline algae covered 64% of the substrate. Bare substrate was recorded at its lowest coverage (11%) at this site.

The bryozoan, *Thalamoporella californica*, was abundant and formed several large, dense patches along the transect. Bryozoans covered 8.8% of the bottom. The most abundant miscellaneous invertebrates observed on RPCs were amphipod tube mats, hydroids, and barnacles. This category covered 8.0% of the transect

Astraea undosa were abundant and increased in density (0.73/m^2) from last year. Most were small and aggregated in cobble patches between large rocks. *Aplysia californica* were present in low densities. A small *Haliotis fulgens* approximately 20 mm and a 3 mm abalone (probably green or pink) were found under small rocks.

Patiria miniata were rare; only two small individuals were found underneath rocks. *Pisaster giganteus* were uncommon. No sea stars were found on quadrats this year. *Strongylocentrotus purpuratus* density declined from 59/m^2 in 1992 to 5.7/m^2 this year. Only two *S. purpuratus* were observed with wasting syndrome. Many of the *S. purpuratus* appeared to be growing new spines. Spine loss may have occurred from the wasting syndrome that was observed here in 1992. Unbroken *S. purpuratus* tests were common. *S. franciscanus* were common (2.8/m^2), and densities have changed little since monitoring began in 1982.

Adult *Hypsypops rubicundus*, *Chromis punctipinnis*, *Halichoeres semicinctus*, *Oxyjulis californica*, and juvenile *O. californica* were abundant. *H. rubicundus* nests were common. Two

tagged *H. rubicundus* were seen. *Alloclinus holderi* were common, and had a density on 0.45/m^2.

Location: Cat Canyon, Santa Barbara Island

Site: #16 SBICC

1993 sampling dates: 6/23, 6/24, 8/24.

1993 status: young kelp forest

This site changed dramatically over the last year, from *Strongylocentrotus purpuratus* barrens to a young kelp forest. *Macrocystis pyrifera* plants were abundant along the entire transect. Small patches of mature canopy forming *M. pyrifera* were present on the west end and east of the east end of the transect. The remainder of the transect was covered with juvenile and young/small adult *M. pyrifera* that did not form a canopy. Adult and juvenile *M. pyrifera* densities were 3.9/m^2 and 13/m^2 respectively, their highest densities since monitoring began at this site in 1986. *M. pyrifera* covered 61% of the bottom, also its highest coverage. All of the *M. pyrifera* appeared healthy, and had few epiphytes. Percent cover of green algae (4.1%), miscellaneous red (15%), miscellaneous brown algae (19%), and *Cystoseira spp.* (12%) were also recorded at their highest levels since monitoring began at this site. In March, this site was mostly bare with encrusting coralline algae dominating the bottom. The bottom was covered with red, green, and brown foliose algae as well as articulated and encrusting coralline algae. Articulated coralline algae was abundant and covered 22% of the bottom. Overall, there was a high abundance and diversity of algae.

Astrangia lajollaensis and *Balanophyllia elagans* were recorded at their lowest coverage since 1988, 0% and 0.2% respectively. Bryozoans were common, and covered 7.3% of the substrate. Miscellaneous invertebrate coverage decreased to 7.7%, its lowest coverage since 1986. The most abundant miscellaneous invertebrates on RPCs were amphipod tube mats, hydroids, and barnacles. *Spirobranchus spinosa* were not as abundant as in previous years.

Aplysia californica were common (0.017/m^2), but were not as abundant as in the previous three years.

Four *Haliotis corrugata* were found on band transects. *Astraea undosa* were common, however their densities were low on quadrats, 0.05/m^2. *Panulirus interruptus* were common. On band transects, 18 were found, 16 of these were found on a single transect.

Strongylocentrotus purpuratus density decreased to 5.7/m^2 from their 1992 density of 35/m^2. In March, sea urchin wasting syndrome was observed and many *S. purpuratus* were devoid of spines. During our visits to this site in June and August no wasting syndrome was observed. However, many of the remaining *S. purpuratus* had short spines that appeared to be regrowing from previous loss. Whole *S. purpuratus* tests were common along the transect. *S. franciscanus* density was 3.3/m^2. Only one *Patiria miniata* and several *Pisaster giganteus* were seen.

Adult and juvenile *Oxyjulis californica*, and *Hypsypops rubicundus* were common. One large *Heterodontus francisci* was seen, and *Myliobatis californica* were common. A small school of *Trachurus symmetricus* was seen.

Sutil Island, Santa Barbara Island

Date: 6/24/93

Latitude: 33° 27.27 W

Longitude: 119° 03.00 N

A survey dive was made on the northwest side of Sutil Island. The main objective of this dive was to search for abalone. This area was a typical mature kelp forest. *Macrocystis pyrifera* was growing to a depth of 24 m. The *M. pyrifera* were very large, spread out, and formed a thick canopy. Understory algae was abundant and diverse. Of the eight divers that searched for abalone, two of them were at depths greater than 15 m. The remaining six divers dove a broader range of depths, from 6 - 20 m. All of the abalone found were between 7.5 - 10.5 m. Based on estimated sizes, seven undersize and eight sport legal (6") *Haliotis corrugata*, and four undersize and four sport legal (6") *Haliotis fulgens* were found. No juvenile abalone were found.

Wash Rock, Santa Barbara Island

Date: 6/25/93

Latitude: 33° 28.34 W

Longitude: 119° 03.72 N

Survey dives were made at "Wash Rock", 3/4 of a mile west of Santa Barbara Island. We located the underwater arch at a depth of about 15 m. The area around the arch was typical of a mature kelp forest. The *Macrocystis pyrifera* plants were large, spread out, and formed a thick canopy. About 100 m north of the arch, at depths of 10-14 m, there was a large area of *Strongylocentrotus franciscanus* and *S. purpuratus* barrens. In the kelp forest around the arch, *S. franciscanus* were abundant, and very large. We have heard that the *S. franciscanus* in this area tend to have poor quality gonads, this may be why the large urchins had not been harvested here. *Centrostephanus coronatus* were common. *Allopora californica* was common and appeared to be healthy around the arch. No live abalone and only three old *Haliotis corrugata* shells were found. One large *Sphyraena argentea* was seen.

GENERAL DISCUSSION

In 1993, kelp forests were present at 13 sites, this an increase from the nine sites with kelp in 1992. These included all three Santa Barbara Island sites, all three Anacapa Island sites, Yellow Banks, Gull Island, and Pelican Bay at Santa Cruz Island, all three Santa Rosa Island sites, and Wyckoff Ledge on San Miguel Island. Two of the three remaining sites were sea urchin barrens, and the other was dominated by *Pachythyone rubra*. Scorpion Anchorage on Santa Cruz Island, remains a complete barren with little algae, high densities of *Strongylocentrotus purpuratus* and high sedimentation. Hare Rock on San Miguel Island was still dominated by *Strongylocentrotus franciscanus*, but the small kelp forest southeast of the transect remained from last year. Fry's Harbor on Santa Cruz Island had

some understory brown algae, but continued to be dominated by small *Pachythyone rubra*.

Three of the four sites that developed to kelp forests this year were *S. purpuratus* barrens with small patches of *Macrocystis pyrifera* in 1992. All three of these sites are at Santa Barbara Island. The remaining site, Pelican Bay, at Santa Cruz Island was a barren area with some brown algae in 1992. *S. purpuratus* densities at the Santa Barbara Island sites were high prior to 1993, and declined rapidly since 1992. It appears that kelp returned at these sites because of the decline in *S. purpuratus* densities. Although *S. purpuratus* density declined at Pelican Bay, it is unclear if this was the principle factor for the return of the kelp forest, since *Strongylocentrotus spp.* densities have been low ($< 9/m^2$) since 1991. We expected kelp to return to this site prior to 1992 (Richards and Kushner, 1994).

The sea urchin wasting syndrome described in 1992 (Richards and Kushner, 1994), was still present on the Channel Islands during 1993. The symptoms of this syndrome are partial or complete loss of spines and dark green or black blotches on the test. These blotches were sometimes associated with deformations/lesions on the test. Sea urchin wasting syndrome was observed at seven sites (Table 6) on Santa Cruz, Anacapa, and Santa Barbara Islands in 1993. In 1992, it was observed at six sites on these three islands and Santa Rosa Island. *S. purpuratus* and *Lytechinus anamesus* were observed with the syndrome, while no *S. franciscanus* seemed to be affected. This syndrome appears to have caused high mortality among *S. purpuratus* at two sites on Santa Barbara Island (Cat Canyon, and Arch Point). The other site on Santa Barbara Island (Southeast Sea Lion), also showed a decline in *S. purpuratus* density, however wasting syndrome was only observed in *L. anamesus* at this site. Unbroken *S. purpuratus* tests were common at Gull Island, Santa Cruz Island, Cat Canyon and Arch Point, Santa Barbara Island, and whole *L. anamesus* tests were common at Admirals Reef, Anacapa Island. The presence of whole sea urchin tests indicates that sea urchin mortality was probably caused by reasons other than predation.

The California Department of Fish and Game is beginning to look at sea urchin wasting syndrome, but no results are available. If this syndrome begins to affect *S. franciscanus*, it could negatively impact California's most important fishery.

Sea star wasting disease was observed at three sites during 1993 (Table 6), a decrease from nine sites in 1992. All three of these sites were on Santa Cruz Island. This disease, in which the infected animals appear to be rotting, is possibly caused by a bacterial infection (Schroeter and Dixon, 1988). The prevalence of the disease appeared to be low with only a few individuals being affected at each site. *Patiria miniata* were the only sea stars observed with wasting disease in 1993.

Haliotis rufescens recruitment appeared to be low this year. At the six stations where ARMs were monitored in 1992 and 1993, three *H. rufescens* less than 26 mm were found in 1993, and two in 1992. *Haliotis corrugata* recruitment was higher at these six stations than it was in 1992; 11 *H. corrugata* less than 26 mm were found in 1993, compared with three in 1992. Abalone less than 26 mm were used for this comparison, because they are probably less than 1.5 years old (Hahn, 1989), and only have been detectable in the modules for about one year. We found very few small abalone in their native habitat during 1993.

In 1993 we received three reports of withering syndrome in abalone from sport dive boats. On May 3rd, a diver aboard the dive boat PEACE collected a *H. rufescens* with a withered foot near the ship wreck CHICKASAW on Santa Rosa Island. On July 15, Jim Delong, the captain of the dive boat CONCEPTION, brought us a *H. rufescens* with a shrunken foot that was collected from Castle Rock, San Miguel Island. He said that out of about 100 abalone collected on his boat this year, this was the only one he saw with a shrunken foot. On August 23, the dive boat LIBERTY was anchored almost directly over the Admiral's Reef transect on Anacapa Island. They reported having seen several *H. corrugata* with withering syndrome (see results section under Admiral's Reef). We also observed a unusually large number of fresh *H. corrugata* shells at Landing Cove, Anacapa Island (see results section under Landing Cove). The above evidence suggests the possibility that the withering foot syndrome that devastated the *Haliotis cracherodii* population in Southern California, could possibly affect other *Haliotis spp.*. We will need to carefully check the health of abalone in the future in order to monitor withering syndrome.

We've been concerned about how to standardize and improve size frequency data collections (Richards et al, 1990). In previous years a non-destructive general search method was used to locate animals measured in the natural habitat size frequencies. In this method, divers conduct a general search for emergent animals of one or two target species and measure all individuals encountered. Unfortunately, even the most experienced divers have different search images from one another. We would like to refine this technique so that divers have a defined search area, hopefully decreasing the search image variability among divers. Unfortunately, time is limited and we are unable to utilize new techniques that increase our sampling time underwater.

This year we tried using several different techniques to locate animals for the size frequency measurements. We used a 0.5 m^2 quadrat to chose which *S. franciscanus*, *S. purpuratus*, and *Patiria miniata* to measure. We also measured animals while conducting density counts on band transects. This method worked well for species that were already included on band transects, and had relatively high densities. We also tried using a 1.5 m pole by swimming along the transect, searching for one or two target species and measuring them only if they crossed beneath the pole. This method worked well, but was difficult to conduct in areas of high kelp density. Overall, it appears that unless densities are relatively high, these methods require more time than a general search. We recommend that short band transects perpendicular to the main transect be used to better define and intensify search efforts.

New Artificial Recruitment Modules (ARMs) were placed at Pelican Bay, Santa Cruz Island. There are now ARMs at 10 of the 16 permanent sites. Table 7 contains the date of deployment, and the number of ARMs that are at each location. ARMs at nine sites were sampled this year; the ARMs at Pelican Bay were not sampled this year, because they were recently deployed. We now have two years (1992 and 1993) of size frequency data from the ARMs at six sites. Comparisons at these six sites has indicated an increase in *H. corrugata* recruitment mentioned earlier. *S. franciscanus* recruitment (number of sea urchins less than 15 mm) increased at four, and remained the same at two of the sites. *S. purpuratus* recruitment (number of sea urchins less than 15 mm) increased at three, and remained the same at three of the sites. The data from these six sites also reveals numerous other

changes in recruitment since 1992. We feel that the ARMs are a valuable tool for monitoring recruitment of several species while minimizing the impact on the natural habitat. In 1995, we recommend acquiring the resources needed to place and monitor ARMs at the San Miguel and Santa Barbara Islands sites, and at Rodes Reef, Santa Rosa Island. Maintenance of the already existing ARMs will consist of replacing broken bricks and wire cages as needed.

Water temperatures in the tropical Pacific, continued to be above normal for the fourth consecutive year (Kerr, 1993). According to NOAA's sea surface temperature and El Niño advisories, the waters around the Channel Islands were 0.55 - 2.2 ^{o}C above normal for most of 1993. Several species associated with warm water were observed in 1993. *Pleuroncodes planipes* (pelagic red crabs) were seen throughout the year at all of the Park islands, and *Sphyraena argentea* (California barracuda) were seen on several occasions. *Cypselurus californicus* (flying fish) were common during the summer, and were seen at San Miguel Island which is the northern extent of their range (Eschmeyer et. al., 1983). Although sea surface temperatures were unusually warm, the temperature data from our sites (appendix C.) shows that there were frequent upwelling events during the summer. These cold, nutrient-rich upwelling events possibly reduced the effects of warmer, usually nutrient-poor water. We did not observe any extreme effects of the warm water on algal abundances.

This is the first year that the monitoring program has acquired temperature data from more than 6 stations. Advances in technology has created low cost, user friendly temperature loggers and software that has enabled us to collect these data. Although we only collected 7-23 weeks of data for 14 of the stations during 1993, it appears that we may be able to detect some trends between groups of stations. All sites on the northern sides of Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands had lower temperature variability than on the south sides of these Islands. The higher variability on the southern sides of the islands indicates that there were more cold water (probably localized upwelling) events than on the northern sides of the islands.

Temperature data from Scorpion Anchorage, Santa Cruz Island, and Arch Point, Santa Barbara Island was not collected because of technical problems with battery failure or disconnection. Partial data loss

occurred at Hare Rock, San Miguel Island due to battery failure. Analysis of long term monitoring data is difficult if there are gaps in the data. We recommend that two temperature loggers be placed at each site. This will greatly decrease the chance of not acquiring data if a problem such as battery failure occurs.

Calibration of the HOBOTEMP^{tm} temperature loggers showed that they were all within the Onset Computer Corporation's specified +/- 0.2 ^{o}C accuracy. We placed three temperature loggers in separate housings at Landing Cove, Anacapa Island to check their precision. The results from these loggers show that they collected similar data (appendix C). Of the 380 temperature readings recorded by each temperature logger, 48 were 0.5 ^{o}C apart. This greater than +/- 0.2 ^{o}C is possibly due to the recorders being in different housings, and not a recorder difference.

This year we divided the single RPC category that included *M. pyrifera*, *Eisenia arborea*, and *Pterygophora californica* into three separate categories. We will retain the original category in our databases as a summation so that comparisons to previous years can be made. Female and male categories of *Halichoeres semicinctus* were added to the fish transects in 1993. We recommend that an additional category of juveniles be a added to *Semicossyphus pulcher* on the fish transects in 1994. These changes, and the procedures for the temperature loggers, once refined, need to be added to the Kelp Forest Monitoring Handbook.

This year project divers assisted San Diego State University with sea urchin recruitment and growth studies, and Patty Debenham, a graduate student at the University of California at Santa Barbara, with a *S. franciscanus* genetics study. All *Strongylocentrotus spp.* data from the project was sent to Peter Kalvass at the California Department of Fish and Game. Density and size frequency data for *Kelletia kelletii* were sent to Jill Zamzow, a undergraduate student at the University of California at Santa Cruz. We collected tissue samples from 15 *H. rufescens* at Johnson's Lee, Santa Rosa Island for Robert Carpenter of California State University, at Northridge. He is conducting a genetics study to look at dispersal patterns and capabilities of *H. rufescens*.

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Appendix A. 1993 Station Data - All Sampling Methods

Introduction

Following are the population data gathered in 1993 for the Kelp Forest Monitoring Program sampling methods. Means, standard deviations and total number of samples (cases) are given for QUADRATS, BAND TRANSECTS, RANDOM POINT CONTACTS, and FISH TRANSECTS. SIZE FREQUENCY data are presented as percentiles falling within indicated size classes. (Readers should be aware that the number of significant digits is an artifact of the database program and does not imply this level of precision.)

Notes on methods:

QUADRATS. Means represent average counts obtained from 20 stratified random 1 m X 2 m quadrats, each the sum of two individual divers' counts in 1 m X 1 m quadrats.

BAND TRANSECTS. Means represent average counts obtained from 12 stratified random 3 m X 20 m transects, each the sum of two individual divers' counts on 3 m X 10 m quadrats.

RANDOM POINT CONTACTS. Means represent average percent cover for a given organism, or substrate, at 25 stratified random locations along the transect line. Forty points from each quadrat (1,000 points total) are used to determine percent cover of selected organisms and substrate within one meter of the bottom. Percent cover may total more than 100% because of layering.

FISH TRANSECTS. Means represent the average of counts obtained on each pass by divers swimming the entire 100 m transect line and observing fishes passing within a 2 m X 3 m "window" centered on the line. Cases listed refer to the total number of passes made during fish surveys for the year, or day. Counts of adults and juveniles for each transect pass for each date are available as raw data, as are time and horizontal Secchi measurements. All counts were conducted between 0900 and 1500 hours.

SIZE FREQUENCY MEASUREMENTS. Cases (N) represent the number of organisms measured. Data are presented as percentiles within size classes. Specific dimensions: *Tethya*- diameter in mm; *Hinnites*- maximum shell diameter in mm; *Haliotis*, and *Kelletia*- maximum shell length in mm; *Astraea*- maximum diameter of shell at base in mm; *Megathura*- shell length, not including mantle, in mm; Sea stars- maximum radius in mm; Sea urchins- test diameter in mm; *Macrocystis*- number of stipes (counted 1 m above the substrate) and maximum holdfast-base diameters in cm. Gorgonians and *Allopora*- maximum width and height in cm. Raw data will allow correlation between stipe number and holdfast diameter for individual kelp plants

and between width and height for individual gorgonians. Size frequencies taken from animals found in the artificial recruitment modules (ARMs) are titled appropriately.

LOCATION 1 SAN MIGUEL ISLAND - WYCOFF LEDGE

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.5000	0.4867	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.3750	0.7412	20
Laminaria farlowii	0.1500	0.4617	20
Macrocystis pyrifera juvenile	2.6250	2.4434	20
Macrocystis pyrifera all	3.1250	2.4164	20
Cypraea spadicea	0.0000	0.0000	20
Astraea undosa	0.0000	0.0000	20
Astraea gibberosa	0.3750	0.6664	20
Patiria miniata	1.4750	1.4186	20
Pisaster giganteus	0.1500	0.2856	20
Strongylocentrotus franciscanus	0.5500	1.6694	20
Strongylocentrotus purpuratus	0.0250	0.1118	20
Parastichopus parvamensis	0.1750	0.4064	20
Styela montereyensis	0.1000	0.2616	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0250	0.1118	20
Alloclinus holderi	0.0000	0.0000	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.1250	0.0944	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.1653	0.1228	12
Lophogorgia chilensis	0.0069	0.0111	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0042	0.0075	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.3639	0.1380	12
Megathura crenulata	0.0000	0.0000	12
Hinnites giganteus	0.0139	0.0255	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0125	0.0176	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 1 SAN MIGUEL ISLAND - WYCKOFF LEDGE

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.6000	1.6583	25
Miscellaneous brown algae	0.1000	0.5000	25
Desmarestia spp.	14.4000	17.5932	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	0.3000	0.8292	25
Laminaria farlowii	0.5000	1.4434	25
Cystoseira spp.	3.4000	6.0329	25
Macrocystis,Eisenia,Pterygophora	32.0000	26.9645	25
Macrocystis pyrifera all	31.7000	26.7971	25
Miscellaneous red algae	67.0000	18.2431	25
Articulated coralline algae	16.7000	16.3891	25
Crustose coralline algae	26.5000	11.6145	25
Gelidium spp.	1.5000	2.5000	25
Gigartina spp.	10.6000	9.0220	25
Miscellaneous plants	0.4000	1.1815	25
Sponges	1.6000	2.3805	25
Corynactis californica	0.0000	0.0000	25
Balanophyllia elegans	1.4000	1.9203	25
Astrangia lajollaensis	0.1000	0.5000	25
Diopatra ornata	9.2000	9.8086	25
Phragmatopoma californica	1.1000	2.4023	25
Serpulorbis squamigerus	0.1000	0.5000	25
Bryozoans	10.7000	10.0135	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	1.5000	2.7003	25
Miscellaneous invertebrates	3.6000	3.9581	25
Bare substrate	28.6000	24.1424	25
Rock	67.2000	30.7994	25
Cobble	3.3000	6.3213	25
Sand	29.5000	28.8946	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	2.9904	8.7672	104
Chromis punctipinnis	0.0000	0.0000	8
Oxyjulis californica	15.0000	18.9737	8
Sebastes mystinus	1.8750	2.1671	8
Sebastes serranoides	0.0000	0.0000	8
Sebastes atrovirens	15.6250	17.9200	8
Paralabrax clathratus	0.0000	0.0000	8
Semicossyphus pulcher	1.2500	1.3887	8
Embiotoca jacksoni	3.3750	3.7773	8
Embiotoca lateralis	0.1250	0.3536	8
Damalichthys vacca	1.6250	1.9226	8
Hypsypops rubicundus	0.0000	0.0000	8
Girella nigricans	0.0000	0.0000	8
Halichoeres semicinctus	0.0000	0.0000	8

LOCATION 1 SAN MIGUEL ISLAND - WYCKOFF LEDGE

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		0.0000	0.0000	8
	930714	0.0000	0.0000	4
	930914	0.0000	0.0000	4
Chromis punctipinnis juvenile		0.0000	0.0000	8
	930714	0.0000	0.0000	4
	930914	0.0000	0.0000	4
Oxyjulis californica adult		8.3750	13.5324	8
	930714	0.7500	1.5000	4
	930914	16.0000	16.4317	4
Oxyjulis californica juvenile		6.6250	11.3884	8
	930714	0.7500	1.5000	4
	930914	12.5000	14.4338	4
Sebastes mystinus adult		1.8750	2.1671	8
	930714	1.7500	1.7078	4
	930914	2.0000	2.8284	4
Sebastes mystinus juvenile		0.0000	0.0000	8
	930714	0.0000	0.0000	4
	930914	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	8
	930714	0.0000	0.0000	4
	930914	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	8
	930714	0.0000	0.0000	4
	930914	0.0000	0.0000	

4
Sebastes atrovirens adult 1.8750 2.1002
8
930714 0.2500 0.5000
4
930914 3.5000 1.7321
4
Sebastes atrovirens juvenile 13.7500 17.9821
8
930714 14.0000 27.3374
4
930914 13.5000 2.6458
4
Paralabrax clathratus adult 0.0000 0.0000
8
930714 0.0000 0.0000
4
930914 0.0000 0.0000
4
Paralabrax clathratus juvenile 0.0000 0.0000
8
930714 0.0000 0.0000
4
930914 0.0000 0.0000
4
Semicossyphus pulcher male 0.6250 0.7440
8
930714 0.5000 0.5774
4
930914 0.7500 0.9574
4
Semicossyphus pulcher female 0.6250 0.7440
8
930714 0.2500 0.5000
4
930914 1.0000 0.8165
4
Embiotoca jacksoni adult 1.0000 0.9258
8
930714 0.5000 0.5774
4
930914 1.5000 1.0000
4
Embiotoca jacksoni juvenile 2.3750 3.6621
8
930714 0.0000 0.0000
4
930914 4.7500 4.0311
4

LOCATION 1 SAN MIGUEL ISLAND - WYCKOFF LEDGE

Embiotoca lateralis adult 0.1250 0.3536
8

	930714	0.0000	0.0000
4			
	930914	0.2500	0.5000
4			
Embiotoca lateralis	juvenile	0.0000	0.0000
8			
	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			
Damalichthys vacca	adult	0.2500	0.7071
8			
	930714	0.0000	0.0000
4			
	930914	0.5000	1.0000
4			
Damalichthys vacca	juvenile	1.3750	1.5059
8			
	930714	0.0000	0.0000
4			
	930914	2.7500	0.5000
4			
Hypsypops rubicundus	adult	0.0000	0.0000
8			
	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			
Hypsypops rubicundus	juvenile	0.0000	0.0000
8			
	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			
Girella nigricans	adult	0.0000	0.0000
8			
	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			
Girella nigricans	juvenile	0.0000	0.0000
8			
	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			
Halichoeres semicinctus	male	0.0000	0.0000
8			
	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			
Halichoeres semicinctus	female	0.0000	0.0000
8			

	930714	0.0000	0.0000
4			
	930914	0.0000	0.0000
4			

LOCATION 1 SAN MIGUEL ISLAND - WYCKOFF LEDGE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia
search method: band transect

(cases) N=	32
< 30	0.0
30 - 39	3.1%
40 - 49	12.5%
50 - 59	12.5%
60 - 69	21.9%
70 - 79	12.5%
80 - 89	9.4%
90 - 99	9.4%
> 99	15.6%
min size (mm)	39
max size (mm)	191
mean	77
mode	64

Haliotis rufescens
search method: general search

(cases) N=	58
< 45	0.0
45 - 49	1.7%
50 - 54	1.7%
55 - 59	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	1.7%
75 - 79	5.2%
80 - 84	0.0
85 - 90	0.0
90 - 94	0.0
95 - 99	0.0
100 - 104	3.4%
105 - 109	0.0
110 - 114	1.7%
115 - 119	1.7%
120 - 124	1.7%
125 - 129	0.0
130 - 134	8.6%
135 - 139	3.4%
140 - 144	5.2%
145 - 149	1.7%
150 - 154	3.4%
155 - 159	12.1%
160 - 164	8.6%
165 - 169	0.0
170 - 174	5.2%
175 - 179	3.4%
180 - 184	5.2%
185 - 189	6.9%
190 - 194	6.9%
195 - 199	3.4%
> 199	6.9%
min size (mm)	46
max size (mm)	210
mean	152
mode	156

Kelletia kelletii
search method: general search

(cases) N=	35
< 50	0.0
50 - 59	2.9%
60 - 69	2.9%
70 - 79	8.6%
80 - 89	34.3%
90 - 99	28.6%
100 - 109	22.9%
> 109	0.0
min size (mm)	59
max size (mm)	107
mean	90
mode	87

Astraea gibberosa
search method: general search

(cases) N=	86
< 20	0.0
20 - 29	4.7%
30 - 39	11.6%
40 - 49	17.4%
50 - 59	33.7%
60 - 69	30.2%
70 - 79	2.3%
> 79	0.0
min size (mm)	24
max size (mm)	73
mean	53
mode	45

Hinnites giganteus
search method: general search

(cases) N=	10
< 20	0.0
20 - 29	10.0%
30 - 39	10.0%
40 - 49	0.0
50 - 59	10.0%
60 - 69	0.0
70 - 79	0.0
80 - 89	20.0%
90 - 99	10.0%
100 - 109	20.0%
110 - 119	10.0%
120 - 129	10.0%
> 129	0.0
min size (mm)	29
max size (mm)	127
mean	83
mode	29

LOCATION 1 SAN MIGUEL ISLAND - WYCKOFF LEDGE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Patiria miniata
search method: 1.5 m pole

(cases) N=	120
< 30	0.0
30 - 39	1.7%
40 - 49	4.2%
50 - 59	21.7%
60 - 69	35.0%
70 - 79	30.0%
80 - 89	6.7%
90 - 99	0.8%
> 99	0.0
min size (mm)	36
max size (mm)	92
mean	65
mode	55

Pisaster giganteus
search method: general search

(cases) N=	46
< 20	0.0
20 - 39	4.3%
40 - 59	34.8%
60 - 79	23.9%
80 - 99	21.7%
100 - 119	6.5%
120 - 139	6.5%
140 - 159	2.2%
> 159	0.0
min size (mm)	37
max size (mm)	146
mean	72
mode	64

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	85
< 3	20.0%
3 - 5	11.8%
6 - 8	14.1%
9 - 11	7.1%
12 - 14	3.5%
15 - 17	5.9%
18 - 20	2.4%
21 - 23	10.6%
24 - 26	7.1%
27 - 29	5.9%
30 - 32	4.7%
33 - 35	3.5%
36 - 38	2.4%
39 - 41	0.0
42 - 44	0.0
> 44	1.2%
min number	1
max number	51
mean	14
mode	2

Pycnopodia helianthoides
search method: general search

(cases) N=	2
< 80	0.0
80 - 99	50.0%
100 - 119	0.0
120 - 139	0.0
140 - 159	0.0
160 - 179	0.0
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	50.0%
> 279	0.0
min size (mm)	99
max size (mm)	260
mean	180
mode	99

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	85
< 6	9.4%
6 - 11	24.7%
12 - 17	11.8%
18 - 23	5.9%
24 - 29	9.4%
30 - 35	11.8%
36 - 41	11.8%
42 - 47	4.7%
48 - 53	5.9%
54 - 59	1.2%
60 - 65	1.2%
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	1.2%
> 89	1.2%
min width (cm)	1
max width (cm)	294
mean	27
mode	6

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.0000	0.0000	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	0.4000	1.6749	20
Macrocystis pyrifera all	0.4000	1.6749	20
Cypraea spadicea	0.3000	0.5712	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	1.5250	1.2298	20
Pisaster giganteus	0.4000	0.7363	20
Strongylocentrotus franciscanus	6.5750	4.4700	20
Strongylocentrotus purpuratus	1.2000	1.9153	20
Parastichopus parvamensis	0.0750	0.1832	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.4000	0.6198	20
Alloclinus holderi	0.0250	0.1118	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0333	0.0477	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0111	0.0164	12
Lophogorgia chilensis	0.0000	0.0000	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0014	0.0048	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0056	0.0148	12
Megathura crenulata	0.0000	0.0000	12
Hinnites giganteus	0.0028	0.0065	12
Aplysia californica	0.0139	0.0172	12
Pycnopodia helianthoides	0.0306	0.0347	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	7.0000	12.2474	25
Miscellaneous brown algae	0.6000	1.6583	25
Desmarestia spp.	0.5000	2.5000	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis,Eisenia,Pterygophora	3.7000	11.1365	25
Macrocystis pyrifera all	3.7000	11.1365	25
Miscellaneous red algae	7.2000	8.6096	25
Articulated coralline algae	0.5000	1.2500	25
Crustose coralline algae	42.2000	17.7705	25
Gelidium spp.	0.1000	0.5000	25
Gigartina spp.	0.4000	1.5612	25
Miscellaneous plants	3.2000	3.6458	25
Sponges	0.5000	1.2500	25
Corynactis californica	9.7000	10.188	25
Balanophyllia elegans	1.1000	1.9203	25
Astrangia lajollaensis	3.6000	4.5116	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans	0.8000	1.5679	25
Diaperoecia californica	0.1000	0.5000	25
Tunicates	0.0000	0.0000	25
Miscellaneous invertebrates	10.0000	9.9478	25
Bare substrate	28.8000	16.2038	25
Rock	74.1000	28.5763	25
Cobble	19.2000	24.4174	25
Sand	6.7000	8.2196	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	1.2500	2.9938	156
Chromis punctipinnis	8.5833	5.3676	12
Oxyjulis californica	0.0000	0.0000	12
Sebastes mystinus	4.7500	3.2509	12
Sebastes serranoides	0.1667	0.3892	12
Sebastes atrovirens	0.7500	0.6216	12
Paralabrax clathratus	0.0833	0.2887	12
Semicossyphus pulcher	0.2500	0.6216	12
Embiotoca jacksoni	0.4167	0.5149	12
Embiotoca lateralis	1.0000	0.7385	12
Damalichthys vacca	0.2500	0.4523	12
Hypsypops rubicundus	0.0000	0.0000	12
Girella nigricans	0.0000	0.0000	12
Halichoeres semicinctus	0.0000	0.0000	12

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		8.5833	5.3676	12
	930715	8.0000	5.5976	4
	930915	8.8750	5.6173	8
Chromis punctipinnis juvenile		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8
Oxyjulis californica adult		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8
Oxyjulis californica juvenile		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8
Sebastes mystinus adult		4.7500	3.2509	12
	930715	4.7500	2.6300	4
	930915	4.7500	3.6936	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8
Sebastes serranoides adult		0.0833	0.2887	12
	930715	0.2500	0.5000	4
	930915	0.0000	0.0000	8
Sebastes serranoides juvenile		0.0833	0.2887	12
	930715	0.0000	0.0000	4
	930915	0.1250	0.3536	8
Sebastes atrovirens adult		0.7500	0.6216	12
	930715	1.0000	0.8165	4
	930915	0.6250	0.5175	8
Sebastes atrovirens juvenile		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8
Paralabrax clathratus adult		0.0833	0.2887	12
	930715	0.0000	0.0000	4
	930915	0.1250	0.3536	8
Paralabrax clathratus juvenile		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8
Semicossyphus pulcher male		0.1667	0.3892	12
	930715	0.0000	0.0000	4
	930915	0.2500	0.4629	8
Semicossyphus pulcher female		0.0833	0.2887	12
	930715	0.0000	0.0000	4
	930915	0.1250	0.3536	8
Embiotoca jacksoni adult		0.4167	0.5419	12
	930715	0.0000	0.0000	4
	930915	0.6250	0.5175	8
Embiotoca jacksoni juvenile		0.0000	0.0000	12
	930715	0.0000	0.0000	4
	930915	0.0000	0.0000	8

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

Embiotoca lateralis adult	1.0000	0.7385	12
930715	0.5000	0.5774	4
930915	1.2500	0.7071	8
Embiotoca lateralis juvenile	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Damalichthys vacca adult	0.2500	0.4523	12
930715	0.0000	0.0000	4
930915	0.3750	0.5175	8
Damalichthys vacca juvenile	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Hypsypops rubicundus adult	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Hypsypops rubicundus juvenile	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Girella nigricans adult	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Girella nigricans juvenile	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Halichoeres semicinctus male	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8
Halichoeres semicinctus female	0.0000	0.0000	12
930715	0.0000	0.0000	4
930915	0.0000	0.0000	8

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia
search method: band transect

(cases) N=	32
< 10	0.0
10 - 19	3.1%
20 - 29	6.3%
30 - 39	6.3%
40 - 49	6.3%
50 - 59	15.6%
60 - 69	6.3%
70 - 79	15.6%
80 - 89	18.8%
90 - 99	9.4%
> 99	9.4%
min size (mm)	11
max size (mm)	118
mean	70
mode	72

Haliotis rufescens
search method: general search

(cases) N=	3
< 25	66.7%
25 - 29	33.3%
> 29	0.0
min size (mm)	22
max size (mm)	26
mean	24
mode	22

Kelletia kelletii
search method: general search

(cases) N=	34
< 60	0.0
60 - 69	5.9%
70 - 79	8.8%
80 - 89	17.6%
90 - 99	26.5%
100 - 109	26.5%
110 - 119	11.8%
120 - 129	0.0
130 - 139	2.9%
> 139	0.0
min size (mm)	66
max size (mm)	136
mean	95
mode	91

Patiria miniata
search method: 1.5 m pole

(cases) N=	152
< 10	0.0
10 - 19	3.3%
20 - 29	5.9%
30 - 39	2.6%
40 - 49	9.2%
50 - 59	15.8%
60 - 69	24.3%
70 - 79	25.7%
80 - 89	11.8%
90 - 99	1.3%
> 99	0.0
min size (mm)	17
max size (mm)	92
mean	61
mode	67

Pisaster giganteus
search method: general search

(cases) N=	35
< 40	0.0
40 - 59	37.1%
60 - 79	48.6%
80 - 99	2.9%
100 - 119	11.4%
> 119	0.0
min size (mm)	44
max size (mm)	109
mean	65
mode	53

Pycnopodia helianthoides
search method: general search

(cases) N=	48
< 60	0.0
60 - 79	2.1%
80 - 99	4.2%
100 - 119	8.3%
120 - 139	12.5%
140 - 159	29.2%
160 - 179	12.5%
180 - 199	2.1%
200 - 219	10.4%
220 - 239	4.2%
240 - 259	2.1%
260 - 279	4.2%
280 - 299	8.3%
> 299	0.0
min size (mm)	69
max size (mm)	298
mean	171
mode	143

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	221
< 10	0.0
10 - 14	0.5%
15 - 19	0.5%
20 - 24	1.4%
25 - 29	0.5%
30 - 34	0.9%
35 - 39	0.9%
40 - 44	6.3%
45 - 49	5.9%
50 - 54	5.0%
55 - 59	8.6%
60 - 64	18.6%
65 - 69	14.9%
70 - 74	13.1%
75 - 79	14.9%
80 - 84	6.3%
85 - 90	1.4%
90 - 94	0.5%
> 94	0.0
min size (mm)	14
max size (mm)	90
mean	63
mode	62

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	61
< 5	0.0
5 - 9	1.6%
10 - 14	6.6%
15 - 19	9.8%
20 - 24	18.0%
25 - 29	16.4%
30 - 34	19.7%
35 - 39	11.5%
40 - 44	9.8%
45 - 49	6.6%
> 49	0.0
min size (mm)	8
max size (mm)	48
mean	29
mode	23

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	93
< 3	33.3%
3 - 5	45.2%
6 - 8	7.5%
9 - 11	1.1%
12 - 14	1.1%
15 - 17	1.1%
18 - 20	2.2%
21 - 23	4.3%
24 - 26	0.0
27 - 29	1.1%
30 - 32	0.0
33 - 35	0.0
36 - 38	1.1%
39 - 41	0.0
42 - 44	1.1%
> 44	1.1%
min number	1
max number	54
mean	6
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	93
< 6	15.1%
6 - 11	35.5%
12 - 17	25.8%
18 - 23	11.8%
24 - 29	3.2%
30 - 35	2.2%
36 - 41	3.2%
42 - 47	3.2%
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	2
max width (cm)	47
mean	14
mode	8

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	1.0000	0.9177	20
Eisenia arborea	0.0750	0.1832	20
Pterygophora californica	0.4000	0.5026	20
Laminaria farlowii	0.3750	0.7926	20
Macrocystis pyrifera juvenile	6.9750	7.9563	20
Macrocystis pyrifera all	7.9750	8.0581	20
Cypraea spadicea	0.5000	0.6489	20
Astraea undosa	0.1000	0.2616	20
Patiria miniata	0.0750	0.2447	20
Pisaster giganteus	0.2000	0.4974	20
Strongylocentrotus franciscanus	0.2000	0.4413	20
Strongylocentrotus purpuratus	0.0250	0.1118	20
Parastichopus parvamensis	0.1000	0.2052	20
Styela montereyensis	1.3500	1.1133	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0000	0.0000	20
Alloclinus holderi	0.0250	0.1118	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0500	0.0522	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0125	0.0126	12
Lophogorgia chilensis	0.0000	0.0000	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0319	0.0405	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0208	0.0267	12
Hinnites giganteus	0.0083	0.0133	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0333	0.0201	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.1000	0.5000	25
Miscellaneous brown algae	1.9000	2.9119	25
Desmarestia spp.	1.4000	2.5083	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	8.7000	8.9884	25
Laminaria farlowii	2.7000	6.4113	25
Cystoseira spp.	15.9000	20.4236	25
Macrocystis,Eisenia,Pterygophora	54.8000	22.7752	25
Macrocystis pyrifera all	46.0000	18.5966	25
Miscellaneous red algae	51.9000	14.2207	25
Articulated coralline algae	12.8000	7.3357	25
Crustose coralline algae	6.6000	4.6413	25
Gelidium spp.	0.1000	0.5000	25
Gigartina spp.	11.6000	10.7500	25
Miscellaneous plants	0.1000	0.5000	25
Sponges	7.0000	5.2042	25
Corynactis californica	1.7000	3.5882	25
Balanophyllia elegans	3.3000	2.2500	25
Astrangia lajollaensis	0.5000	1.2500	25
Diopatra ornata	0.8000	3.0380	25
Phragmatopoma californica	11.2000	7.5042	25
Serpulorbis squamigerus	0.2000	0.6922	25
Bryozoans	22.6000	12.8590	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	8.3000	6.2383	25
Miscellaneous invertebrates	12.7000	6.4517	25
Bare substrate	9.5000	8.5696	25
Rock	92.6000	10.2693	25
Cobble	2.1000	3.2819	25
Sand	5.3000	9.2511	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	2.0513	3.2084	156
Chromis punctipinnis	5.0000	7.0711	12
Oxyjulis californica	3.4167	3.3155	12
Sebastes mystinus	0.0833	0.2887	12
Sebastes serranoides	0.4167	0.6686	12
Sebastes atrovirens	2.0000	1.5954	12
Paralabrax clathratus	0.4167	0.6686	12
Semicossyphus pulcher	1.3333	1.4355	12
Embiotoca jacksoni	6.5000	2.5045	12
Embiotoca lateralis	3.5833	2.7784	12
Damalichthys vacca	2.5833	2.8110	12
Hypsypops rubicundus	1.2500	0.6216	12
Girella nigricans	0.0833	0.2887	12
Halichoeres semicinctus	0.0000	0.0000	12

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		2.1667	3.6390	12
	930728	1.6250	4.2067	8
	930928	3.2500	2.2174	4
Chromis punctipinnis juvenile		2.8333	5.1669	12
	930728	0.0000	0.0000	8
	930928	8.5000	5.8023	4
Oxyjulis californica adult		2.5000	3.0600	12
	930728	0.6250	0.7440	8
	930928	6.2500	2.2174	4
Oxyjulis californica juvenile		0.9167	1.9752	12
	930728	1.2500	2.3755	8
	930928	0.2500	0.5000	4
Sebastes mystinus adult		0.0833	0.2887	12
	930728	0.1250	0.3536	8
	930928	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	12
	930728	0.0000	0.0000	8
	930928	0.0000	0.0000	4
Sebastes serranoides adult		0.0833	0.2887	12
	930728	0.0000	0.0000	8
	930928	0.2500	0.5000	4
Sebastes serranoides juvenile		0.3333	0.4924	12
	930728	0.1250	0.3536	8
	930928	0.7500	0.5000	

4
Sebastes atrovirens adult 2.0000 1.5954
12
930728 3.0000 0.7559
8
930928 0.0000 0.0000
4
Sebastes atrovirens juvenile 0.0000 0.0000
12
930728 0.0000 0.0000
8
930928 0.0000 0.0000
4
Paralabrax clathratus adult 0.2500 0.6216
12
930728 0.0000 0.0000
8
930928 0.7500 0.9574
4
Paralabrax clathratus juvenile 0.1667 0.3892
12
930728 0.2500 0.4629
8
930928 0.0000 0.0000
4
Semicossyphus pulcher male 0.3333 0.7785
12
930728 0.5000 0.9258
8
930928 0.0000 0.0000
4
Semicossyphus pulcher female 1.0000 1.0445
12
930728 0.8750 0.9910
8
930928 1.2500 1.2583
4
Embiotoca jacksoni adult 4.7500 2.1373
12
930728 4.0000 2.1381
8
930928 6.2500 1.2583
4
Embiotoca jacksoni juvenile 1.7500 1.7645
12
930728 1.2500 1.6690
8
930928 2.7500 1.7078
4
LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

Embiotoca lateralis adult 3.0833 2.4664
12
930728 1.7500 1.2817

8				
	930928		5.7500	2.0616
4				
Embiotoca	lateralis	juvenile	0.5000	0.6742
12				
	930728		0.5000	0.7559
8				
	930928		0.5000	0.5774
4				
Damalichthys	vacca	adult	2.2500	2.8002
12				
	930728		3.0000	3.1623
8				
	930928		0.7500	0.9574
4				
Damalichthys	vacca	juvenile	0.3333	0.8876
12				
	930728		0.0000	0.0000
8				
	930928		1.0000	1.4142
4				
Hypsypops	rubicundus	adult	1.2500	0.6216
12				
	930728		1.2500	0.4629
8				
	930928		1.2500	0.9574
4				
Hypsypops	rubicundus	juvenile	0.0000	0.0000
12				
	930728		0.0000	0.0000
8				
	930928		0.0000	0.0000
4				
Girella	nigricans	adult	0.0833	0.2887
12				
	930728		0.1250	0.3536
8				
	930928		0.0000	0.0000
4				
Girella	nigricans	juvenile	0.0000	0.0000
12				
	930728		0.0000	0.0000
8				
	930928		0.0000	0.0000
4				
Halichoeres	semicinctus	male	0.0000	0.0000
12				
	930728		0.0000	0.0000
8				
	930928		0.0000	0.0000
4				
Halichoeres	semicinctus	female	0.0000	0.0000
12				
	930728		0.0000	0.0000

8
930928 0.0000 0.0000
4

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia
search method: general search

(cases) N=	23
< 20	0.0
20 - 29	17.4%
30 - 39	4.3%
40 - 49	30.4%
50 - 59	4.3%
60 - 69	17.4%
70 - 79	0.0
80 - 89	8.7%
90 - 99	4.3%
> 99	13.0%
min size (mm)	20
max size (mm)	124
mean	59
mode	20

Megathura crenulata
search method: general search

(cases) N=	16
< 60	0.0
60 - 69	12.5%
70 - 79	0.0
80 - 89	0.0
90 - 99	18.8%
100 - 109	37.5%
110 - 119	18.8%
> 119	6.3%
min size (mm)	62
max size (mm)	151
mean	104
mode	97

Patiria miniata
search method: general search

(cases) N=	50
< 30	0.0
30 - 39	4.0%
40 - 49	4.0%
50 - 59	24.0%
60 - 69	30.0%
70 - 79	28.0%
80 - 89	10.0%
> 89	0.0
min size (mm)	32
max size (mm)	85
mean	65
mode	55

Haliotis rufescens
search method: general search

(cases) N=	38
< 30	0.0
30 - 34	2.6%
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
50 - 54	0.0
55 - 59	2.6%
60 - 64	2.6%
65 - 69	0.0
70 - 74	0.0
75 - 79	0.0
80 - 84	0.0
85 - 90	2.6%
90 - 94	0.0
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
110 - 114	0.0
115 - 119	7.9%
120 - 124	5.3%
125 - 129	2.6%
130 - 134	15.8%
135 - 139	2.6%
140 - 144	7.9%
145 - 149	5.3%
150 - 154	10.5%
155 - 159	5.3%
160 - 164	10.5%
165 - 169	7.9%
170 - 174	2.6%
175 - 179	2.6%
180 - 184	2.6%
> 184	0.0
min size (mm)	33
max size (mm)	184
mean	137
mode	130

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Pisaster giganteus
search method: general search

(cases) N=	89
< 20	0.0
20 - 39	1.1%
40 - 59	14.6%
60 - 79	32.6%
80 - 99	33.7%
100 - 119	13.5%
120 - 139	2.2%
140 - 159	1.1%
160 - 179	1.1%
> 179	0.0
min size (mm)	37
max size (mm)	169
mean	82
mode	81

Pycnopodia helianthoides
search method: general search

(cases) N=	10
< 40	0.0
40 - 59	10.0%
60 - 79	10.0%
80 - 99	20.0%
100 - 119	10.0%
120 - 139	20.0%
140 - 159	0.0
160 - 179	10.0%
180 - 199	10.0%
200 - 219	0.0
220 - 239	10.0%
> 239	0.0
min size (mm)	57
max size (mm)	220
mean	122
mode	57

Strongylocentrotus franciscanus
search method: general search

(cases) N=	23
< 50	0.0
50 - 54	4.3%
55 - 59	0.0
60 - 64	0.0
65 - 69	4.3%
70 - 74	8.7%
75 - 79	0.0
80 - 84	13.0%
85 - 90	8.7%
90 - 94	4.3%
95 - 99	4.3%
100 - 104	21.7%
105 - 109	13.0%
> 109	13.0%
min size (mm)	51
max size (mm)	136
mean	95
mode	101

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	116
< 3	20.7%
3 - 5	11.2%
6 - 8	12.9%
9 - 11	18.1%
12 - 14	16.4%
15 - 17	15.5%
18 - 20	4.3%
21 - 23	0.9%
24 - 26	0.0
27 - 29	0.0
30 - 32	0.0
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0
min number	1
max number	23
mean	9
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	116
< 6	6.0%
6 - 11	12.1%
12 - 17	2.6%
18 - 23	6.9%
24 - 29	7.8%
30 - 35	19.0%
36 - 41	24.1%
42 - 47	12.1%
48 - 53	5.2%
54 - 59	4.3%
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	2
max width (cm)	59
mean	31
mode	39

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis rufescens FROM 13 ARMs

(cases) N=	13
< 25	0.0
25 - 29	7.7%
30 - 34	0.0
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
50 - 54	7.7%
55 - 59	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	0.0
75 - 79	0.0
80 - 84	0.0
85 - 90	0.0
90 - 94	7.7%
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
110 - 114	0.0
115 - 119	0.0
120 - 124	0.0
125 - 129	7.7%
130 - 134	15.4%
135 - 139	7.7%
140 - 144	15.4%
145 - 149	7.7%
150 - 154	7.7%
155 - 159	7.7%
160 - 164	0.0
165 - 169	7.7%
> 169	0.0
min size (mm)	25
max size (mm)	165
mean	123
mode	25

Cypraea spadicea FROM 13 ARMs

(cases) N=	33
< 35	0.0
35 - 39	3.0%
40 - 44	39.4%
45 - 49	39.4%
50 - 54	18.2%
> 54	0.0
min size (mm)	36
max size (mm)	51
mean	46
mode	44

Hinnites giganteus FROM 13 ARMs

(cases) N=	18
< 10	0.0
10 - 19	44.4%
20 - 29	16.7%
30 - 39	11.1%
40 - 49	5.6%
50 - 59	0.0
60 - 69	5.6%
70 - 79	11.1%
80 - 89	5.6%
> 89	0.0
min size (mm)	13
max size (mm)	82
mean	34
mode	14

Patiria miniata FROM 13 ARMs

(cases) N=	19
< 10	0.0
10 - 19	15.8%
20 - 29	26.3%
30 - 39	21.1%
40 - 49	15.8%
50 - 59	10.5%
60 - 69	5.3%
70 - 79	5.3%
> 79	0.0
min size (mm)	13
max size (mm)	76
mean	35
mode	13

Pisaster giganteus FROM 13 ARMs

(cases) N=	26
< 20	3.8%
20 - 39	42.3%
40 - 59	19.2%
60 - 79	19.2%
80 - 99	11.5%
100 - 119	3.8%
> 119	0.0
min size (mm)	18
max size (mm)	101
mean	52
mode	37

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Pycnopodia helianthoides
FROM 13 ARMs

(cases) N=	10
< 20	0.0
20 - 39	10.0%
40 - 59	30.0%
60 - 79	50.0%
80 - 99	0.0
100 - 119	10.0%
> 119	0.0
min size (mm)	31
max size (mm)	101
mean	59
mode	31

Strongylocentrotus purpuratus
FROM 13 ARMs

(cases) N=	11
< 15	0.0
15 - 19	18.2%
20 - 24	27.3%
25 - 29	36.4%
30 - 34	9.1%
35 - 39	9.1%
> 39	0.0
min size (mm)	16
max size (mm)	38
mean	25
mode	25

Strongylocentrotus franciscanus
FROM 13 ARMs

(cases) N=	92
< 15	0.0
15 - 19	5.4%
20 - 24	5.4%
25 - 29	2.2%
30 - 34	7.6%
35 - 39	4.3%
40 - 44	5.4%
45 - 49	3.3%
50 - 54	4.3%
55 - 59	16.3%
60 - 64	7.6%
65 - 69	6.5%
70 - 74	13.0%
75 - 79	8.7%
80 - 84	7.6%
85 - 90	0.0
90 - 94	0.0
95 - 99	2.2%
> 99	0.0
min size (mm)	17
max size (mm)	99
mean	56
mode	56

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.6750	0.6544	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0750	0.1832	20
Laminaria farlowii	0.4750	0.8955	20
Macrocystis pyrifera juvenile	0.3750	0.3582	20
Macrocystis pyrifera all	1.0500	0.6262	20
Cypraea spadicea	0.4000	0.5525	20
Astraea undosa	0.0250	0.1118	20
Patiria miniata	3.1500	1.5736	20
Pisaster giganteus	0.1250	0.2751	20
Strongylocentrotus franciscanus	0.8000	2.7976	20
Strongylocentrotus purpuratus	0.6750	1.7189	20
Parastichopus parvamensis	0.2250	0.3432	20
Styela montereyensis	1.0000	0.8272	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.1750	0.3354	20
Alloclinus holderi	0.1000	0.2052	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.2069	0.0936	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.1653	0.1014	12
Lophogorgia chilensis	0.2000	0.0964	12
Muricea fruticosa	0.0014	0.0048	12
Muricea californica	0.0014	0.0048	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.1250	0.0203	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0319	0.0219	12
Megathura crenulata	0.0181	0.0230	12
Hinnites giganteus	0.0819	0.0676	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.1583	0.0613	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.2000	0.6922	25
Miscellaneous brown algae	0.3000	1.0992	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.2000	1.0000	25
Pterygophora californica	0.5000	2.0412	25
Laminaria farlowii	6.6000	7.9017	25
Cystoseira spp.	1.0000	1.7678	25
Macrocystis,Eisenia,Pterygophora	22.9000	19.7072	25
Macrocystis pyrifera all	22.2000	19.7948	25
Miscellaneous red algae	29.4000	9.7703	25
Articulated coralline algae	10.5000	9.3541	25
Crustose coralline algae	10.3000	4.5254	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	3.2000	6.5558	25
Miscellaneous plants	0.0000	0.0000	25
Sponges	6.2000	5.3092	25
Corynactis californica	1.7000	4.3732	25
Balanophyllia elegans	6.0000	4.3301	25
Astrangia lajollaensis	1.2000	1.7854	25
Diopatra ornata	10.1000	10.5198	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.1000	0.5000	25
Bryozoans	14.6000	12.4516	25
Diaperoecia californica	0.3000	1.5000	25
Tunicates	3.7000	3.9607	25
Miscellaneous invertebrates	14.8000	11.7686	25
Bare substrate	17.2000	13.4498	25
Rock	80.6000	19.2743	25
Cobble	3.3000	5.2401	25
Sand	16.1000	16.8801	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	1.6346	4.2633	104
Chromis punctipinnis	0.7500	2.1213	8
Oxyjulis californica	9.0000	10.7305	8
Sebastes mystinus	0.1250	0.3536	8
Sebastes serranoides	0.0000	0.0000	8
Sebastes atrovirens	1.0000	0.9258	8
Paralabrax clathratus	0.7500	0.8864	8
Semicossyphus pulcher	1.2500	1.0351	8
Embiotoca jacksoni	2.1250	1.7269	8
Embiotoca lateralis	1.5000	1.1952	8
Damalichthys vacca	4.7500	7.0660	8
Hypsypops rubicundus	0.0000	0.0000	8
Girella nigricans	0.0000	0.0000	8
Halichoeres semicinctus	0.0000	0.0000	8

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		0.7500	2.1213	8
	930728	1.5000	3.0000	4
	930928	0.0000	0.0000	4
Chromis punctipinnis juvenile		0.0000	0.0000	8
	930728	0.0000	0.0000	4
	930928	0.0000	0.0000	4
Oxyjulis californica adult		8.7500	10.8989	8
	930728	1.5000	1.2910	4
	930928	16.0000	11.6333	4
Oxyjulis californica juvenile		0.2500	0.4629	8
	930728	0.5000	0.5774	4
	930928	0.0000	0.0000	4
Sebastes mystinus adult		0.1250	0.3536	8
	930728	0.0000	0.0000	4
	930928	0.2500	0.5000	4
Sebastes mystinus juvenile		0.0000	0.0000	8
	930728	0.0000	0.0000	4
	930928	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	8
	930728	0.0000	0.0000	4
	930928	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	8
	930728	0.0000	0.0000	4
	930928	0.0000	0.0000	

4
Sebastes atrovirens adult 0.7500 0.4629
8
930728 0.5000 0.5774
4
930928 1.0000 0.0000
4
Sebastes atrovirens juvenile 0.2500 0.7071
8
930728 0.0000 0.0000
4
930928 0.5000 1.0000
4
Paralabrax clathratus adult 0.6250 0.7440
8
930728 0.0000 0.0000
4
930928 1.2500 0.5000
4
Paralabrax clathratus juvenile 0.1250 0.3536
8
930728 0.0000 0.0000
4
930928 0.2500 0.5000
4
Semicossyphus pulcher male 0.0000 0.0000
8
930728 0.0000 0.0000
4
930928 0.0000 0.0000
4
Semicossyphus pulcher female 1.2500 1.0351
8
930728 1.5000 1.0000
4
930928 1.0000 1.1547
4
Embiotoca jacksoni adult 2.1250 1.7269
8
930728 3.5000 1.2910
4
930928 0.7500 0.5000
4
Embiotoca jacksoni juvenile 0.0000 0.0000
8
930728 0.0000 0.0000
4
930928 0.0000 0.0000
4
LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

Embiotoca lateralis adult 1.5000 1.1952
8
930728 0.7500 0.9574

4			
	930928	2.2500	0.9574
4			
Embiotoca lateralis	juvenile	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Damalichthys vacca	adult	4.7500	7.0660
8			
	930728	7.5000	9.7125
4			
	930928	2.0000	1.4142
4			
Damalichthys vacca	juvenile	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Hypsypops rubicundus	adult	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Hypsypops rubicundus	juvenile	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Girella nigricans	adult	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Girella nigricans	juvenile	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Halichoeres semicinctus	male	0.0000	0.0000
8			
	930728	0.0000	0.0000
4			
	930928	0.0000	0.0000
4			
Halichoeres semicinctus	female	0.0000	0.0000
8			
	930728	0.0000	0.0000

4
930928 0.0000 0.0000
4

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia

search method: band transect

(cases) N=	66
< 10	0.0
10 - 19	1.5%
20 - 29	4.5%
30 - 39	10.6%
40 - 49	19.7%
50 - 59	13.6%
60 - 69	15.2%
70 - 79	9.1%
80 - 89	9.1%
90 - 99	13.6%
> 99	3.0%
min size (mm)	17
max size (mm)	170
mean	63
mode	47

Hinnites giganteus

search method: general search

(cases) N=	20
< 30	0.0
30 - 39	15.0%
40 - 49	20.0%
50 - 59	0.0
60 - 69	30.0%
70 - 79	15.0%
80 - 89	0.0
90 - 99	10.0%
100 - 109	5.0%
> 109	5.0%
min size (mm)	31
max size (mm)	158
mean	66
mode	61

Patiria miniata

search method: 1.5 m pole

(cases) N=	201
< 20	0.0
20 - 29	1.0%
30 - 39	2.0%
40 - 49	7.5%
50 - 59	18.4%
60 - 69	38.8%
70 - 79	27.4%
80 - 89	4.0%
90 - 99	1.0%
> 99	0.0
min size (mm)	27
max size (mm)	94
mean	64
mode	67

Haliotis rufescens

search method: general search

(cases) N=	29
< 30	0.0
30 - 34	3.4%
35 - 39	3.4%
40 - 44	0.0
45 - 49	0.0
50 - 54	0.0
55 - 59	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	3.4%
75 - 79	0.0
80 - 84	0.0
85 - 90	0.0
90 - 94	3.4%
95 - 99	0.0
100 - 104	3.4%
105 - 109	0.0
110 - 114	3.4%
115 - 119	3.4%
120 - 124	0.0
125 - 129	3.4%
130 - 134	3.4%
135 - 139	13.8%
140 - 144	6.9%
145 - 149	6.9%
150 - 154	3.4%
155 - 159	3.4%
160 - 164	3.4%
165 - 169	6.9%
170 - 174	3.4%
175 - 179	6.9%
180 - 184	6.9%
185 - 189	6.9%
> 189	0.0
min size (mm)	30
max size (mm)	187
mean	138
mode	30

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Pisaster giganteus
search method: band transect

(cases) N=	40
< 20	0.0
20 - 39	5.0%
40 - 59	17.5%
60 - 79	30.0%
80 - 99	22.5%
100 - 119	15.0%
120 - 139	2.5%
140 - 159	2.5%
160 - 179	2.5%
180 - 199	0.0
200 - 219	2.5%
> 219	0.0
min size (mm)	32
max size (mm)	205
mean	85
mode	65

Pycnopodia helianthoides
search method: general search

(cases) N=	32
< 40	0.0
40 - 59	6.3%
60 - 79	9.4%
80 - 99	9.4%
100 - 119	37.5%
120 - 139	15.6%
140 - 159	6.3%
160 - 179	9.4%
180 - 199	3.1%
200 - 219	3.1%
> 219	0.0
min size (mm)	50
max size (mm)	212
mean	120
mode	108

Strongylocentrotus franciscanus
search method: general search

(cases) N=	107
< 15	0.0
15 - 19	1.9%
20 - 24	1.9%
25 - 29	0.9%
30 - 34	0.9%
35 - 39	4.7%
40 - 44	3.7%
45 - 49	3.7%
50 - 54	6.5%
55 - 59	6.5%
60 - 64	4.7%
65 - 69	8.4%
70 - 74	3.7%
75 - 79	4.7%
80 - 84	15.0%
85 - 90	4.7%
90 - 94	5.6%
95 - 99	4.7%
100 - 104	5.6%
105 - 109	0.9%
> 109	9.3%
min size (mm)	18
max size (mm)	129
mean	74
mode	83

Strongylocentrotus purpuratus
search method: general search

(cases) N=	130
< 15	0.0
15 - 19	3.8%
20 - 24	6.9%
25 - 29	2.3%
30 - 34	16.2%
35 - 39	17.7%
40 - 44	15.4%
45 - 49	14.6%
50 - 54	8.5%
55 - 59	8.5%
60 - 64	4.6%
65 - 69	1.5%
> 69	0.0
min size (mm)	18
max size (mm)	65
mean	41
mode	36

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	145
< 3	0.7%
3 - 5	3.4%
6 - 8	12.4%
9 - 11	15.9%
12 - 14	21.4%
15 - 17	20.7%
18 - 20	11.7%
21 - 23	6.2%
24 - 26	3.4%
27 - 29	2.1%
30 - 32	2.1%
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0
min number	1
max number	32
mean	14
mode	16

Lophogorgia chilensis widths
search method: general search

(cases) N=	110
< 5	1.8%
5 - 8	1.8%
9 - 12	7.3%
13 - 16	8.2%
17 - 20	13.6%
21 - 24	15.5%
25 - 28	17.3%
29 - 32	10.9%
33 - 36	11.8%
37 - 40	6.4%
41 - 44	3.6%
45 - 48	0.0
49 - 52	0.9%
53 - 56	0.0
57 - 60	0.0
61 - 64	0.9%
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min width (cm)	4
max width (cm)	61
mean	25
mode	28

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	145
< 6	0.7%
6 - 11	0.7%
12 - 17	2.8%
18 - 23	3.4%
24 - 29	14.5%
30 - 35	24.1%
36 - 41	21.4%
42 - 47	22.8%
48 - 53	4.1%
54 - 59	4.8%
60 - 65	0.7%
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	5
max width (cm)	64
mean	37
mode	34

Lophogorgia chilensis heights
search method: general search

(cases) N=	110
< 5	0.0
5 - 8	0.9%
9 - 12	0.9%
13 - 16	1.8%
17 - 20	4.5%
21 - 24	6.4%
25 - 28	16.4%
29 - 32	25.5%
33 - 36	18.2%
37 - 40	15.5%
41 - 44	7.3%
45 - 48	1.8%
49 - 52	0.9%
53 - 56	0.0
57 - 60	0.0
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	8
max height (cm)	50
mean	32
mode	31

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis rufescens FROM 7 ARMs

(cases) N=	1
< 130	0.0
130 - 134	100.0%
> 134	0.0
min size (mm)	133
max size (mm)	133
mean	133
mode	133

Cypraea spadicea FROM 7 ARMs

(cases) N=	3
< 40	0.0
40 - 44	33.3%
45 - 49	66.6%
> 49	0.0
min size (mm)	42
max size (mm)	48
mean	45
mode	42

Hinnites giganteus FROM 7 ARMs

(cases) N=	11
< 10	0.0
10 - 19	63.6%
20 - 29	18.2%
30 - 39	9.1%
40 - 49	0.0
50 - 59	9.1%
> 59	0.0
min size (mm)	11
max size (mm)	59
mean	22
mode	17

Pisaster giganteus FROM 7 ARMs

(cases) N=	3
< 20	0.0
20 - 39	66.7%
40 - 59	33.3%
> 59	0.0
min size (mm)	24
max size (mm)	43
mean	34
mode	24

Patiria miniata FROM 7 ARMs

(cases) N=	82
< 10	1.2%
10 - 19	9.8%
20 - 29	13.4%
30 - 39	18.3%
40 - 49	13.4%
50 - 59	19.5%
60 - 69	19.5%
70 - 79	4.9%
> 79	0.0
min size (mm)	6
max size (mm)	75
mean	43
mode	64

Pycnopodia helianthoides FROM 7 ARMs

(cases) N=	16
< 20	0.0
20 - 39	6.3%
40 - 59	12.5%
60 - 79	37.5%
80 - 99	43.8%
> 99	0.0
min size (mm)	36
max size (mm)	95
mean	73
mode	60

Strongylocentrotus franciscanus FROM 7 ARMs

(cases) N=	7
< 15	0.0
15 - 19	28.6%
20 - 24	0.0
25 - 29	28.6%
30 - 34	0.0
35 - 39	0.0
40 - 44	14.3%
45 - 49	0.0
50 - 54	14.3%
55 - 59	14.3%
> 59	0.0
min size (mm)	17
max size (mm)	55
mean	33
mode	17

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus purpuratus
FROM 7 ARMs

(cases) N=	6
< 20	0.0
20 - 24	33.3%
25 - 29	33.3%
30 - 34	16.7%
35 - 39	0.0
40 - 44	0.0
45 - 49	16.7%
> 49	0.0
min size (mm)	20
max size (mm)	46
mean	29
mode	20

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.2000	0.4104	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0500	0.2236	20
Macrocystis pyrifera juvenile	0.0250	0.1118	20
Macrocystis pyrifera all	0.2250	0.4435	20
Cypraea spadicea	0.1000	0.2052	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	1.7750	1.4186	20
Pisaster giganteus	0.7750	0.8807	20
Strongylocentrotus franciscanus	4.5500	6.8670	20
Strongylocentrotus purpuratus	1.4750	2.5520	20
Parastichopus parvamensis	0.0000	0.0000	20
Styela montereyensis	1.7250	1.2083	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.1500	0.3285	20
Alloclinus holderi	0.2250	0.3024	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.1458	0.0682	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0347	0.0344	12
Lophogorgia chilensis	0.0000	0.0000	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0097	0.0150	12
Megathura crenulata	0.0139	0.0199	12
Hinnites giganteus	0.0014	0.0048	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0139	0.0211	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.0000	0.0000	25
Miscellaneous brown algae	0.0000	0.0000	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.4000	2.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis,Eisenia,Pterygophora	5.6000	10.6135	25
Macrocystis pyrifera all	5.6000	10.6135	25
Miscellaneous red algae	72.7000	20.6019	25
Articulated coralline algae	2.0000	3.6799	25
Crustose coralline algae	24.0000	14.4698	25
Gelidium spp.	0.1000	0.5000	25
Gigartina spp.	1.0000	2.2822	25
Miscellaneous plants	0.0000	0.0000	25
Sponges	4.1000	5.6771	25
Corynactis californica	0.4000	1.1815	25
Balanophyllia elegans	3.9000	4.3349	25
Astrangia lajollaensis	5.2000	6.1203	25
Diopatra ornata	10.5000	15.8935	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans	27.4000	10.0385	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	2.9000	2.9475	25
Miscellaneous invertebrates	9.2000	5.8059	25
Bare substrate	3.1000	3.7694	25
Rock	82.3000	20.9155	25
Cobble	5.0000	6.0810	25
Sand	12.7000	16.8930	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	1.6154	2.8226	104
Chromis punctipinnis	2.3750	3.0208	8
Oxyjulis californica	4.6250	5.8539	8
Sebastes mystinus	3.2500	2.3146	8
Sebastes serranoides	0.3750	0.5175	8
Sebastes atrovirens	0.2500	0.7071	8
Paralabrax clathratus	1.5000	1.0690	8
Semicossyphus pulcher	5.6250	4.0686	8
Embiotoca jacksoni	1.6250	0.7440	8
Embiotoca lateralis	0.8750	1.2464	8
Damalichthys vacca	0.5000	0.7559	8
Hypsypops rubicundus	0.0000	0.0000	8
Girella nigricans	0.0000	0.0000	8
Halichoeres semcinctus	0.0000	0.0000	8

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		2.3750	3.0208	8
	930713	4.7500	2.5000	4
	930914	0.0000	0.0000	4
Chromis punctipinnis juvenile		0.0000	0.0000	8
	930713	0.0000	0.0000	4
	930914	0.0000	0.0000	4
Oxyjulis californica adult		4.6250	5.8539	8
	930713	8.5000	6.2450	4
	930914	0.7500	0.9574	4
Oxyjulis californica juvenile		0.0000	0.0000	8
	930713	0.0000	0.0000	4
	930914	0.0000	0.0000	4
Sebastes mystinus adult		3.0000	2.5635	8
	930713	3.0000	3.8297	4
	930914	3.0000	0.8165	4
Sebastes mystinus juvenile		0.2500	0.7071	8
	930713	0.5000	1.0000	4
	930914	0.0000	0.0000	4
Sebastes serranoides adult		0.3750	0.5175	8
	930713	0.0000	0.0000	4
	930914	0.7500	0.5000	4
Sebastes serranoides juvenile		0.0000	0.0000	8
	930713	0.0000	0.0000	4
	930914	0.0000	0.0000	

4
Sebastes atrovirens adult 0.2500 0.7071
8
930713 0.0000 0.0000
4
930914 0.5000 1.0000
4
Sebastes atrovirens juvenile 0.0000 0.0000
8
930713 0.0000 0.0000
4
930914 0.0000 0.0000
4
Paralabrax clathratus adult 1.3750 1.1877
8
930713 0.5000 0.5774
4
930914 2.2500 0.9574
4
Paralabrax clathratus juvenile 0.1250 0.3536
8
930713 0.2500 0.5000
4
930914 0.0000 0.0000
4
Semicossyphus pulcher male 2.3750 1.0607
8
930713 1.7500 0.9574
4
930914 3.0000 0.8165
4
Semicossyphus pulcher female 3.2500 3.1510
8
930713 1.2500 1.5000
4
930914 5.2500 3.2016
4
Embiotoca jacksoni adult 1.6250 0.7440
8
930713 1.7500 0.5000
4
930914 1.5000 1.0000
4
Embiotoca jacksoni juvenile 0.0000 0.0000
8
930713 0.0000 0.0000
4
930914 0.0000 0.0000
4
LOCATION 5 SANTA ROSA ISLAND - RODES REEF

Embiotoca lateralis adult 0.8750 1.2464
8
930713 1.7500 1.2583

4				
	930914		0.0000	0.0000
4				
Embiotoca lateralis		juvenile	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Damalichthys vacca		adult	0.5000	0.7559
8				
	930713		0.7500	0.9574
4				
	930914		0.2500	0.5000
4				
Damalichthys vacca		juvenile	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Hypsypops rubicundus		adult	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Hypsypops rubicundus		juvenile	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Girella nigricans		adult	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Girella nigricans		juvenile	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Halichoeres semicinctus		male	0.0000	0.0000
8				
	930713		0.0000	0.0000
4				
	930914		0.0000	0.0000
4				
Halichoeres semicinctus		female	0.0000	0.0000
8				
	930713		0.0000	0.0000

4
930914 0.0000 0.0000
4

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia
search method: general search

(cases) N=	102
< 10	0.0
10 - 19	1.0%
20 - 29	2.9%
30 - 39	7.8%
40 - 49	11.8%
50 - 59	18.6%
60 - 69	17.6%
70 - 79	21.6%
80 - 89	9.8%
90 - 99	5.9%
> 99	2.9%
min size (mm)	19
max size (mm)	119
mean	64
mode	70

Patiria miniata
search method: quadrat

(cases) N=	132
< 10	0.0
10 - 19	0.8%
20 - 29	3.0%
30 - 39	18.9%
40 - 49	25.0%
50 - 59	25.0%
60 - 69	18.9%
70 - 79	7.6%
80 - 89	0.8%
> 89	0.0
min size (mm)	17
max size (mm)	86
mean	50
mode	52

Pisaster giganteus
search method: band transect

(cases) N=	105
< 20	0.0
20 - 39	1.0%
40 - 59	34.3%
60 - 79	36.2%
80 - 99	16.2%
100 - 119	8.6%
120 - 139	3.8%
> 139	0.0
min size (mm)	38
max size (mm)	129
mean	71
mode	49

Pycnopodia helianthoides
search method: general search

(cases) N=	13
< 60	0.0
60 - 79	15.4%
80 - 99	0.0
100 - 119	7.7%
120 - 139	7.7%
140 - 159	38.5%
160 - 179	15.4%
180 - 199	7.7%
200 - 219	7.7%
> 219	0.0
min size (mm)	61
max size (mm)	215
mean	143
mode	155

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	226
< 10	0.0
10 - 14	2.2%
15 - 19	9.7%
20 - 24	7.1%
25 - 29	4.4%
30 - 34	2.2%
35 - 39	0.9%
40 - 44	0.9%
45 - 49	0.9%
50 - 54	1.3%
55 - 59	0.4%
60 - 64	2.7%
65 - 69	4.0%
70 - 74	10.2%
75 - 79	8.8%
80 - 84	16.8%
85 - 90	9.7%
90 - 94	9.7%
95 - 99	3.1%
100 - 104	3.1%
105 - 109	0.9%
> 109	0.4%
min size (mm)	12
max size (mm)	115
mean	65
mode	84

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	110
< 10	0.0
10 - 14	1.8%
15 - 19	10.9%
20 - 24	14.5%
25 - 29	9.1%
30 - 34	12.7%
35 - 39	10.0%
40 - 44	14.5%
45 - 49	6.4%
50 - 54	7.3%
55 - 59	5.5%
60 - 64	2.7%
65 - 69	2.7%
70 - 74	1.8%
> 74	0.0
min size (mm)	12
max size (mm)	72
mean	36
mode	34

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	135
< 3	3.0%
3 - 5	6.7%
6 - 8	12.6%
9 - 11	17.0%
12 - 14	10.4%
15 - 17	4.4%
18 - 20	10.4%
21 - 23	4.4%
24 - 26	8.9%
27 - 29	4.4%
30 - 32	4.4%
33 - 35	3.7%
36 - 38	3.0%
39 - 41	1.5%
42 - 44	0.7%
> 44	4.4%
min number	1
max number	65
mean	19
mode	11

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	135
< 6	1.5%
6 - 11	4.4%
12 - 17	13.3%
18 - 23	13.3%
24 - 29	8.9%
30 - 35	6.7%
36 - 41	11.1%
42 - 47	6.7%
48 - 53	7.4%
54 - 59	8.1%
60 - 65	3.0%
66 - 71	2.2%
72 - 77	3.0%
78 - 83	7.4%
84 - 89	2.2%
> 89	0.0
min width (cm)	5
max width (cm)	90
mean	39
mode	17

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.0500	0.1539	20
Eisenia arborea	0.0500	0.1539	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0500	0.2236	20
Macrocystis pyrifera juvenile	1.5750	2.2436	20
Macrocystis pyrifera all	1.6250	2.2176	20
Cypraea spadicea	0.3500	0.4617	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	1.4000	1.0208	20
Pisaster giganteus	0.3000	0.4104	20
Strongylocentrotus franciscanus	2.5500	2.4757	20
Strongylocentrotus purpuratus	18.9250	17.8843	20
Parastichopus parvamensis	0.5250	0.5250	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.3000	0.4413	20
Alloclinus holderi	0.0500	0.1539	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0278	0.0217	12
Allopora californica	0.0611	0.0917	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.1333	0.0651	12
Muricea fruticosa	0.0111	0.0179	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0208	0.0237	12
Megathura crenulata	0.0347	0.0337	12
Hinnites giganteus	0.0431	0.0194	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0153	0.0219	12
Lytechinus anamesus	0.3833	0.9900	12

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.3000	0.8292	25
Miscellaneous brown algae	3.2000	4.7059	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.7000	1.6956	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.4000	0.9354	25
Macrocystis,*Eisenia*,*Pterygophora*	11.1000	9.7382	25
Macrocystis pyrifera all	10.4000	9.5383	25
Miscellaneous red algae	26.6000	14.2134	25
Articulated coralline algae	5.0000	6.9970	25
Crustose coralline algae	46.4000	12.1424	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.3000	0.8292	25
Sponges	2.1000	2.5699	25
Corynactis californica	1.9000	3.0856	25
Balanophyllia elegans	4.2000	4.3133	25
Astrangia lajollaensis	1.5000	2.8868	25
Diopatra ornata	2.9000	7.0961	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.1000	0.5000	25
Bryozoans	18.3000	10.6975	25
Diaperoecia californica	6.0000	4.7324	25
Tunicates	2.5000	3.1458	25
Miscellaneous invertebrates	9.1000	6.9552	25
Bare substrate	3.0000	4.7871	25
Rock	94.7000	9.5830	25
Cobble	2.1000	3.6572	25
Sand	3.2000	7.7567	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	0.8558	1.3683	104
Chromis punctipinnis	1.7500	1.5811	8
Oxyjulis californica	0.3750	0.5175	8
Sebastes mystinus	0.3750	0.5175	8
Sebastes serranoides	0.0000	0.0000	8
Sebastes atrovirens	2.8750	2.0310	8
Paralabrax clathratus	0.5000	0.5345	8
Semicossyphus pulcher	3.1250	1.7269	8
Embiotoca jacksoni	0.2500	0.7071	8
Embiotoca lateralis	0.0000	0.0000	8
Damalichthys vacca	0.5000	0.5345	8
Hypsypops rubicundus	0.5000	0.5345	8
Girella nigricans	0.8750	0.8345	8
Halichoeres semicinctus	0.0000	0.0000	8

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		1.7500	1.5811	8
	930727	2.7500	0.9574	4
	930916	0.7500	1.5000	4
Chromis punctipinnis juvenile		0.0000	0.0000	8
	930727	0.0000	0.0000	4
	930916	0.0000	0.0000	4
Oxyjulis californica adult		0.3750	0.5175	8
	930727	0.5000	0.5774	4
	930916	0.2500	0.5000	4
Oxyjulis californica juvenile		0.0000	0.0000	8
	930727	0.0000	0.0000	4
	930916	0.0000	0.0000	4
Sebastes mystinus adult		0.3750	0.5175	8
	930727	0.7500	0.5000	4
	930916	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	8
	930727	0.0000	0.0000	4
	930916	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	8
	930727	0.0000	0.0000	4
	930916	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	8
	930727	0.0000	0.0000	4
	930916	0.0000	0.0000	

4
Sebastes atrovirens adult 2.7500 1.9821
8
930727 4.2500 1.5000
4
930916 1.2500 0.9574
4
Sebastes atrovirens juvenile 0.1250 0.3536
8
930727 0.2500 0.5000
4
930916 0.0000 0.0000
4
Paralabrax clathratus adult 0.5000 0.5345
8
930727 0.2500 0.5000
4
930916 0.7500 0.5000
4
Paralabrax clathratus juvenile 0.0000 0.0000
8
930727 0.0000 0.0000
4
930916 0.0000 0.0000
4
Semicossyphus pulcher male 0.1250 0.3536
8
930727 0.0000 0.0000
4
930916 0.2500 0.5000
4
Semicossyphus pulcher female 3.0000 1.6903
8
930727 2.7500 1.5000
4
930916 3.2500 2.0616
4
Embiotoca jacksoni adult 0.2500 0.7071
8
930727 0.5000 1.0000
4
930916 0.0000 0.0000
4
Embiotoca jacksoni juvenile 0.0000 0.0000
8
930727 0.0000 0.0000
4
930916 0.0000 0.0000
4
LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

Embiotoca lateralis adult 0.0000 0.0000
8
930727 0.0000 0.0000

4				
	930916		0.0000	0.0000
4				
Embiotoca lateralis		juvenile	0.0000	0.0000
8				
	930727		0.0000	0.0000
4				
	930916		0.0000	0.0000
4				
Damalichthys vacca		adult	0.5000	0.5345
8				
	930727		0.5000	0.5774
4				
	930916		0.5000	0.5774
4				
Damalichthys vacca		juvenile	0.0000	0.0000
8				
	930727		0.0000	0.0000
4				
	930916		0.0000	0.0000
4				
Hypsypops rubicundus		adult	0.5000	0.5345
8				
	930727		0.7500	0.5000
4				
	930916		0.2500	0.5000
4				
Hypsypops rubicundus		juvenile	0.0000	0.0000
8				
	930727		0.0000	0.0000
4				
	930916		0.0000	0.0000
4				
Girella nigricans		adult	0.8750	0.8345
8				
	930727		0.2500	0.5000
4				
	930916		1.5000	0.5774
4				
Girella nigricans		juvenile	0.0000	0.0000
8				
	930727		0.0000	0.0000
4				
	930916		0.0000	0.0000
4				
Halichoeres semicinctus		male	0.0000	0.0000
8				
	930727		0.0000	0.0000
4				
	930916		0.0000	0.0000
4				
Halichoeres semicinctus		female	0.0000	0.0000
8				
	930727		0.0000	0.0000

4
930916 0.0000 0.0000
4

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Kelletia kelletii
search method: general search

(cases) N=	13
< 80	0.0
80 - 89	7.7%
90 - 99	46.2%
100 - 109	38.5%
110 - 119	7.7%
> 119	0.0
min size (mm)	88
max size (mm)	111
mean	99
mode	105

Megathura crenulata
search method: general search

(cases) N=	26
< 60	0.0
60 - 69	11.5%
70 - 79	73.1%
80 - 89	11.5%
90 - 99	3.8%
> 99	0.0
min size (mm)	61
max size (mm)	95
mean	76
mode	72

Hinnites giganteus
search method: general search

(cases) N=	14
< 30	0.0
30 - 39	28.6%
40 - 49	14.3%
50 - 59	14.3%
60 - 69	21.4%
70 - 79	0.0
80 - 89	0.0
90 - 99	14.3%
100 - 109	0.0
110 - 119	7.1%
> 119	0.0
min size (mm)	32
max size (mm)	112
mean	60
mode	39

Patiria miniata
search method: general search

(cases) N=	99
< 20	0.0
20 - 29	7.1%
30 - 39	21.2%
40 - 49	41.4%
50 - 59	17.2%
60 - 69	7.1%
70 - 79	3.0%
80 - 89	2.0%
90 - 99	0.0
> 99	1.0%
min size (mm)	26
max size (mm)	110
mean	46
mode	40

Pisaster giganteus
search method: general search

(cases) N=	41
< 60	0.0
60 - 79	48.8%
80 - 99	36.6%
100 - 119	12.2%
120 - 139	2.4%
> 139	0.0
min size (mm)	65
max size (mm)	127
mean	83
mode	76

Lytechinus anamesus
search method: general search

(cases) N=	80
< 5	0.0
5 - 9	6.3%
10 - 14	47.5%
15 - 19	33.8%
20 - 24	12.5%
> 24	0.0
min size (mm)	8
max size (mm)	22
mean	14
mode	15

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	130
< 5	0.0
5 - 9	0.8%
10 - 14	3.1%
15 - 19	3.8%
20 - 24	6.9%
25 - 29	10.0%
30 - 34	5.4%
35 - 39	8.5%
40 - 44	6.9%
45 - 49	3.1%
50 - 54	2.3%
55 - 59	2.3%
60 - 64	3.8%
65 - 69	0.8%
70 - 74	6.9%
75 - 79	3.1%
80 - 84	1.5%
85 - 90	8.5%
90 - 94	6.9%
95 - 99	4.6%
100 - 104	3.1%
105 - 109	2.3%
> 109	4.6%
min size (mm)	5
max size (mm)	138
mean	59
mode	26

search method: quadrat

(cases) N=	206
< 5	0.5%
5 - 9	3.4%
10 - 14	10.2%
15 - 19	9.7%
20 - 24	13.1%
25 - 29	9.7%
30 - 34	16.0%
35 - 39	18.0%
40 - 44	10.7%
45 - 49	4.9%
50 - 54	1.9%
55 - 59	1.0%
60 - 64	0.0
65 - 69	0.5%
70 - 74	0.0
75 - 79	0.0
80 - 84	0.5%
> 84	0.0
min size (mm)	3
max size (mm)	84
mean	30
mode	37

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	107
< 3	1.9%
3 - 5	4.7%
6 - 8	7.5%
9 - 11	14.0%
12 - 14	11.2%
15 - 17	19.6%
18 - 20	14.0%
21 - 23	10.3%
24 - 26	2.8%
27 - 29	6.5%
30 - 32	1.9%
33 - 35	1.9%
36 - 38	1.9%
39 - 41	0.0
42 - 44	1.9%
> 44	0.0
min number	2
max number	44
mean	17
mode	15

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	107
< 6	0.0
6 - 11	0.0
12 - 17	0.0
18 - 23	3.7%
24 - 29	11.2%
30 - 35	28.0%
36 - 41	24.3%
42 - 47	10.3%
48 - 53	15.0%
54 - 59	3.7%
60 - 65	0.9%
66 - 71	2.8%
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	19
max width (cm)	69
mean	39
mode	30

Strongylocentrotus purpuratus

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Lophogorgia chilensis widths
search method: general search

(cases) N=	73
< 5	0.0
5 - 8	4.1%
9 - 12	6.8%
13 - 16	16.4%
17 - 20	9.6%
21 - 24	11.0%
25 - 28	9.6%
29 - 32	11.0%
33 - 36	6.8%
37 - 40	6.8%
41 - 44	2.7%
45 - 48	0.0
49 - 52	8.2%
53 - 56	1.4%
57 - 60	1.4%
61 - 64	1.4%
65 - 68	1.4%
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	1.4%
97 - 100	0.0
> 100	0.0
min width (cm)	5
max width (cm)	96
mean	28
mode	51

Lophogorgia chilensis heights
search method: general search

(cases) N=	73
< 5	0.0
5 - 8	0.0
9 - 12	4.1%
13 - 16	1.4%
17 - 20	2.7%
21 - 24	15.1%
25 - 28	16.4%
29 - 32	12.3%
33 - 36	12.3%
37 - 40	11.0%
41 - 44	6.8%
45 - 48	5.5%
49 - 52	0.0
53 - 56	2.7%
57 - 60	1.4%
61 - 64	1.4%
65 - 68	1.4%
69 - 72	1.4%
73 - 76	1.4%
77 - 80	0.0
81 - 84	1.4%
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	1.4%
> 100	0.0
min height (cm)	10
max height (cm)	97
mean	35
mode	27

Allopora californica widths
search method: general search

(cases) N=	82
< 3	20.7%
3 - 4	13.4%
5 - 6	9.8%
7 - 8	7.3%
9 - 10	6.1%
11 - 12	2.4%
13 - 14	2.4%
15 - 16	6.1%
17 - 18	0.0
19 - 20	8.5%
21 - 22	3.7%
23 - 24	3.7%
25 - 26	3.7%
27 - 28	3.7%
29 - 30	0.0
> 30	8.5%
width (cm)	1
max width (cm)	38
mean	12
mode	1

Allopora californica heights
search method: general search

(cases) N=	82
< 3	28.0%
3 - 4	26.8%
5 - 6	11.0%
7 - 8	12.2%
9 - 10	3.7%
11 - 12	9.8%
13 - 14	2.4%
15 - 16	2.4%
17 - 18	2.4%
19 - 20	0.0
21 - 22	0.0
23 - 24	1.2%
25 - 26	0.0
27 - 28	0.0
29 - 30	0.0
> 30	0.0
min height (cm)	1
max height (cm)	23
mean	6
mode	3

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis rufescens FROM 15 ARMs

(cases) N=	6
< 25	33.3%
25 - 29	0.0
30 - 34	50.0%
35 - 39	0.0
40 - 44	0.0
45 - 49	16.7%
> 49	0.0
min size (mm)	7
max size (mm)	49
mean	27
mode	7

Haliotis corrugata FROM 15 ARMs

(cases) N=	6
< 25	83.3%
25 - 29	16.7%
> 29	0.0
min size (mm)	6
max size (mm)	25
mean	16
mode	6

Cypraea spadicea FROM 15 ARMs

(cases) N=	102
< 30	1.0%
30 - 34	2.0%
35 - 39	15.7%
40 - 44	45.1%
45 - 49	29.4%
50 - 54	5.9%
55 - 59	1.0%
> 59	0.0
min size (mm)	22
max size (mm)	56
mean	43
mode	42

Megathura crenulata FROM 15 ARMs

(cases) N=	4
< 10	25.0%
10 - 19	25.0%
20 - 29	25.0%
30 - 39	25.0%
> 39	0.0
min size (mm)	9
max size (mm)	33
mean	21
mode	9

Hinnites giganteus FROM 15 ARMs

(cases) N=	17
< 10	23.5%
10 - 19	47.1%
20 - 29	0.0
30 - 39	0.0
40 - 49	5.9%
50 - 59	0.0
60 - 69	5.9%
70 - 79	0.0
80 - 89	11.8%
90 - 99	0.0
100 - 109	5.9%
> 109	0.0
min size (mm)	5
max size (mm)	105
mean	31
mode	9

Patiria miniata FROM 15 ARMs

(cases) N=	47
< 10	6.4%
10 - 19	38.3%
20 - 29	19.1%
30 - 39	8.5%
40 - 49	6.4%
50 - 59	12.8%
60 - 69	6.4%
70 - 79	2.1%
> 79	0.0
min size (mm)	4
max size (mm)	70
mean	29
mode	17

Pisaster giganteus FROM 15 ARMs

(cases) N=	24
< 20	12.5%
20 - 39	54.2%
40 - 59	25.0%
60 - 79	4.2%
80 - 99	4.2%
> 99	0.0
min size (mm)	18
max size (mm)	86
mean	38
mode	33

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus FROM 6 ARMs	
(cases) N=	262
< 5	0.0
5 - 9	15.3%
10 - 14	8.8%
15 - 19	5.7%
20 - 24	9.2%
25 - 29	13.7%
30 - 34	12.6%
35 - 39	8.4%
40 - 44	5.7%
45 - 49	3.4%
50 - 54	2.7%
55 - 59	4.2%
60 - 64	5.0%
65 - 69	1.9%
70 - 74	2.7%
75 - 79	0.8%
> 79	0.0
min size (mm)	5
max size (mm)	78
mean	31
mode	25

Strongylocentrotus purpuratus FROM 6 ARMs	
(cases) N=	522
< 5	1.9%
5 - 9	7.9%
10 - 14	3.4%
15 - 19	4.4%
20 - 24	5.7%
25 - 29	6.5%
30 - 34	7.5%
35 - 39	7.7%
40 - 44	11.7%
45 - 49	15.1%
50 - 54	16.1%
55 - 59	9.8%
60 - 64	1.5%
65 - 69	0.4%
70 - 74	0.0
75 - 79	0.4%
> 79	0.0
min size (mm)	3
max size (mm)	79
mean	37
mode	50

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.0000	0.0000	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	0.0000	0.0000	20
Macrocystis pyrifera all	0.0000	0.0000	20
Cypraea spadicea	0.3250	0.4940	20
Astraea undosa	0.0750	0.3354	20
Patiria miniata	0.3000	0.5938	20
Pisaster giganteus	0.0250	0.1118	20
Strongylocentrotus franciscanus	1.1750	1.1729	20
Strongylocentrotus purpuratus	1.7000	2.8764	20
Parastichopus parvamensis	0.9500	0.9305	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	1.0500	1.1799	20
Coryphopterus nicholsii	0.7500	0.5000	20
Alloclinus holderi	0.0750	0.1832	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0097	0.0132	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.1431	0.1095	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.1875	0.1375	12
Hinnites giganteus	0.0833	0.0823	12
Aplysia californica	0.0181	0.0261	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	3.1736	3.0083	12

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	5.5000	3.3072	25
Miscellaneous brown algae	1.5000	2.2822	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.5000	2.0412	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis,Eisenia,Pterygophora	0.6000	2.0767	25
Macrocystis pyrifera all	0.1000	0.5000	25
Miscellaneous red algae	22.3000	8.8952	25
Articulated coralline algae	1.8000	3.1058	25
Crustose coralline algae	27.4000	10.9326	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	5.8000	4.5484	25
Sponges	0.3000	0.8292	25
Corynactis californica	0.5000	1.0206	25
Balanophyllia elegans	0.0000	0.0000	25
Astrangia lajollaensis	7.8000	5.0166	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.2000	1.0000	25
Bryozoans	7.5000	6.7700	25
Diaperoecia californica	10.4000	8.1866	25
Pachythyone rubra	8.7000	12.6269	25
Tunicates	8.7000	12.6269	25
Miscellaneous invertebrates	11.6000	7.3909	25
Bare substrate	13.7000	13.5808	25
Rock	79.7000	21.4976	25
Cobble	13.5000	14.2339	25
Sand	6.8000	10.5702	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	22.2308	73.9263	104
Chromis punctipinnis	274.1250	42.2254	8
Oxyjulis californica	3.5000	2.4495	8
Sebastes mystinus	0.0000	0.0000	8
Sebastes serranoides	0.2500	0.4629	8
Sebastes atrovirens	0.3750	0.5175	8
Paralabrax clathratus	1.1250	1.1260	8
Semicossyphus pulcher	6.2500	4.2678	8
Embiotoca jacksoni	0.2500	0.4629	8
Embiotoca lateralis	0.0000	0.0000	8
Damalichthys vacca	0.2500	0.4629	8
Hypsypops rubicundus	0.3750	0.5175	8
Girella nigricans	0.3750	0.5175	8
Halichoeres semicinctus	2.1250	1.4577	8

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		219.3750	31.5048	8
	930811	224.2500	46.6503	4
	930913	214.5000	8.7369	4
Chromis punctipinnis juvenile		54.7500	37.5756	8
	930811	76.2500	24.2951	4
	930913	33.2500	38.3612	4
Oxyjulis californica adult		3.5000	2.4495	8
	930811	4.2500	2.9861	4
	930913	2.7500	1.8930	4
Oxyjulis californica juvenile		0.0000	0.0000	8
	930811	0.0000	0.0000	4
	930913	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	8
	930811	0.0000	0.0000	4
	930913	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	8
	930811	0.0000	0.0000	4
	930913	0.0000	0.0000	4
Sebastes serranoides adult		0.2500	0.4629	8
	930811	0.2500	0.5000	4
	930913	0.2500	0.5000	4
Sebastes serranoides juvenile		0.0000	0.0000	8
	930811	0.0000	0.0000	4
	930913	0.0000	0.0000	

4			
Sebastes atrovirens adult		0.3750	0.5175
8			
	930811	0.0000	0.0000
4			
	930913	0.7500	0.5000
4			
Sebastes atrovirens juvenile		0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Paralabrax clathratus adult		0.8750	0.9910
8			
	930811	1.5000	1.0000
4			
	930913	0.2500	0.5000
4			
Paralabrax clathratus juvenile		0.2500	0.4629
8			
	930811	0.5000	0.5774
4			
	930913	0.0000	0.0000
4			
Semicossyphus pulcher male		0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Semicossyphus pulcher female		6.2500	4.2678
8			
	930811	9.5000	3.5119
4			
	930913	3.0000	1.4142
4			
Embiotoca jacksoni adult		0.2500	0.4629
8			
	930811	0.0000	0.0000
4			
	930913	0.5000	0.5774
4			
Embiotoca jacksoni juvenile		0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

Embiotoca lateralis adult		0.0000	0.0000
8			

	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Embiotoca lateralis	juvenile	0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Damalichthys vacca	adult	0.2500	0.4629
8			
	930811	0.0000	0.0000
4			
	930913	0.5000	0.5774
4			
Damalichthys vacca	juvenile	0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Hypsypops rubicundus	adult	0.3750	0.5175
8			
	930811	0.2500	0.5000
4			
	930913	0.5000	0.5774
4			
Hypsypops rubicundus	juvenile	0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Girella nigricans	adult	0.3750	0.5175
8			
	930811	0.2500	0.5000
4			
	930913	0.5000	0.5774
4			
Girella nigricans	juvenile	0.0000	0.0000
8			
	930811	0.0000	0.0000
4			
	930913	0.0000	0.0000
4			
Halichoeres semicinctus	male	1.1250	0.6409
8			
	930811	0.7500	0.5000
4			
	930913	1.5000	0.5774
4			
Halichoeres semicinctus	female	1.0000	1.0690
8			

	930811	0.5000	0.5774
4			
	930913	1.5000	1.2910
4			

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Astraea undosa
search method: general search

(cases) N=	33
< 50	0.0
50 - 59	18.2%
60 - 69	27.3%
70 - 79	33.3%
80 - 89	9.1%
90 - 99	12.1%
> 99	0.0
min size (mm)	50
max size (mm)	96
mean	71
mode	60

Megathura crenulata
search method: general search

(cases) N=	72
< 50	0.0
50 - 59	1.4%
60 - 69	23.6%
70 - 79	63.9%
80 - 89	11.1%
> 89	0.0
min size (mm)	57
max size (mm)	85
mean	73
mode	76

Patiria miniata
search method: general search

(cases) N=	49
< 30	0.0
30 - 39	8.2%
40 - 49	18.4%
50 - 59	38.8%
60 - 69	24.5%
70 - 79	8.2%
80 - 89	2.0%
> 89	0.0
min size (mm)	30
max size (mm)	84
mean	55
mode	57

Pisaster giganteus
search method: general search

(cases) N=	24
< 60	0.0
60 - 79	4.2%
80 - 99	25.0%
100 - 119	37.5%
120 - 139	20.8%
140 - 159	0.0
160 - 179	8.3%
180 - 199	4.2%
> 199	0.0
min size (mm)	74
max size (mm)	180
mean	115
mode	96

Lytechinus anamesus
search method: general search

(cases) N=	397
< 10	0.0
10 - 14	0.3%
15 - 19	37.5%
20 - 24	55.9%
25 - 29	6.3%
> 29	0.0
min size (mm)	14
max size (mm)	28
mean	20
mode	20

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	75
< 5	0.0
5 - 9	1.3%
10 - 14	5.3%
15 - 19	1.3%
20 - 24	5.3%
25 - 29	0.0
30 - 34	1.3%
35 - 39	1.3%
40 - 44	2.7%
45 - 49	10.7%
50 - 54	6.7%
55 - 59	12.0%
60 - 64	21.3%
65 - 69	9.3%
70 - 74	9.3%
75 - 79	4.0%
80 - 84	4.0%
85 - 90	1.3%
90 - 94	2.7%
> 94	0.0
min size (mm)	9
max size (mm)	93
mean	56
mode	62

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	206
< 5	0.0
5 - 9	5.8%
10 - 14	11.2%
15 - 19	17.0%
20 - 24	14.6%
25 - 29	15.0%
30 - 34	20.9%
35 - 39	7.8%
40 - 44	5.3%
45 - 49	1.0%
50 - 54	1.0%
55 - 59	0.5%
> 59	0.0
min size (mm)	5
max size (mm)	57
mean	25
mode	25

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Lophogorgia chilensis widths
search method: general search

(cases) N=	75
< 5	4.0%
5 - 8	1.3%
9 - 12	8.0%
13 - 16	2.7%
17 - 20	8.0%
21 - 24	9.3%
25 - 28	13.3%
29 - 32	17.3%
33 - 36	9.3%
37 - 40	16.0%
41 - 44	5.3%
45 - 48	1.3%
49 - 52	0.0
53 - 56	0.0
57 - 60	1.3%
61 - 64	2.7%
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
> 92	0.0
min width (cm)	4
max width (cm)	64
mean	29
mode	28

Lophogorgia chilensis heights
search method: general search

(cases) N=	75
< 5	0.0
5 - 8	1.3%
9 - 12	2.7%
13 - 16	5.3%
17 - 20	1.3%
21 - 24	1.3%
25 - 28	4.0%
29 - 32	4.0%
33 - 36	6.7%
37 - 40	2.7%
41 - 44	20.0%
45 - 48	21.3%
49 - 52	21.3%
53 - 56	2.7%
57 - 60	4.0%
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	1.3%
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
> 92	0.0
min height (cm)	8
max height (cm)	78
mean	41
mode	43

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis rufescens FROM 7 ARMs

(cases) N=	5
< 25	100.0%
25 - 29	0.0
> 29	0.0

NOTE: these abalone were hatchery raised, and introduced into the ARMs.

min size (mm)	12
max size (mm)	20
mean	17
mode	18

Cypraea spadicea FROM 7 ARMs

(cases) N=	83
< 35	0.0
35 - 39	10.8%
40 - 44	48.2%
45 - 49	31.3%
50 - 54	9.6%
> 54	0.0

min size (mm)	35
max size (mm)	53
mean	44
mode	45

Astraea undosa FROM 7 ARMs

(cases) N=	3
< 20	0.0
20 - 29	66.7%
30 - 39	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	0.0
80 - 89	33.3%
> 89	0.0

min size (mm)	26
max size (mm)	83
mean	45
mode	26

Pisaster giganteus FROM 7 ARMs

(cases) N=	3
< 80	0.0
80 - 99	33.3%
100 - 119	0.0
120 - 139	66.7%
> 139	0.0

min size (mm)	95
max size (mm)	138
mean	119
mode	95

Hinnites giganteus FROM 7 ARMs

(cases) N=	29
< 10	13.8%
10 - 19	55.2%
20 - 29	6.9%
30 - 39	3.4%
40 - 49	13.8%
50 - 59	6.9%
> 59	0.0

min size (mm)	6
max size (mm)	56
mean	20
mode	12

Patiria miniata FROM 7 ARMs

(cases) N=	37
< 10	16.2%
10 - 19	8.1%
20 - 29	24.3%
30 - 39	18.9%
40 - 49	18.9%
50 - 59	10.8%
60 - 69	2.7%
> 69	0.0

min size (mm)	2
max size (mm)	63
mean	30
mode	26

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Megathura crenulata FROM 7 ARMs

(cases) N=	12
< 20	0.0
20 - 29	8.3%
30 - 39	0.0
40 - 49	8.3%
50 - 59	41.7%
60 - 69	16.7%
70 - 79	25.0%
> 79	0.0
min size (mm)	27
max size (mm)	76
mean	58
mode	56

Strongylocentrotus franciscanus FROM 7 ARMs

(cases) N=	129
< 5	0.8%
5 - 9	22.5%
10 - 14	14.7%
15 - 19	13.2%
20 - 24	10.1%
25 - 29	13.2%
30 - 34	10.1%
35 - 39	3.1%
40 - 44	2.3%
45 - 49	2.3%
50 - 54	6.2%
55 - 59	0.8%
60 - 64	0.8%
> 64	0.0
min size (mm)	4
max size (mm)	62
mean	22
mode	9

Strongylocentrotus purpuratus FROM 7 ARMs

(cases) N=	193
< 5	3.1%
5 - 9	19.7%
10 - 14	6.2%
15 - 19	19.2%
20 - 24	19.2%
25 - 29	16.6%
30 - 34	9.8%
35 - 39	4.1%
40 - 44	2.1%
> 44	0.0
min size (mm)	4
max size (mm)	44
mean	20
mode	7

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.6750	0.5911	20
Eisenia arborea	0.0500	0.2236	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	7.0500	4.4630	20
Macrocystis pyrifera all	7.7250	4.4529	20
Cypraea spadicea	0.1000	0.2616	20
Astraea undosa	0.5750	0.7993	20
Patiria miniata	0.1500	0.2856	20
Pisaster giganteus	0.0250	0.1118	20
Strongylocentrotus franciscanus	1.3500	1.7404	20
Strongylocentrotus purpuratus	2.7250	3.1559	20
Parastichopus parvamensis	0.2750	0.4435	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.4500	0.7931	20
Coryphopterus nicholsii	1.7500	1.1528	20
Alloclinus holderi	0.1750	0.4064	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0097	0.0132	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0444	0.0499	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0111	0.0109	12
Megathura crenulata	0.0014	0.0048	12
Hinnites giganteus	0.0514	0.0359	12
Aplysia californica	0.0597	0.0534	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0014	0.0048	12

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	2.6000	3.5707	25
Miscellaneous brown algae	60.4000	14.2097	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.2000	1.0000	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.3000	1.5000	25
Macrocystis,Eisenia,Pterygophora	70.1000	17.5220	25
Macrocystis pyrifera all	69.9000	17.9333	25
Miscellaneous red algae	35.6000	18.4035	25
Articulated coralline algae	4.7000	3.7722	25
Crustose coralline algae	36.6000	10.3803	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.6000	2.5900	25
Sponges	2.3000	2.1554	25
Corynactis californica	0.9000	1.5943	25
Balanophyllia elegans	0.0000	0.0000	25
Astrangia lajollaensis	7.5000	6.4145	25
Diopatra ornata	1.2000	2.2958	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.7000	1.8428	25
Bryozoans	35.7000	17.0862	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	0.9000	1.5943	25
Miscellaneous invertebrates	6.8000	4.6503	25
Bare substrate	30.0000	17.3805	25
Rock	61.4000	18.2728	25
Cobble	10.6000	8.6386	25
Sand	28.0000	17.8973	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	6.7388	12.9940	156
Chromis punctipinnis	31.1667	17.4608	12
Oxyjulis californica	12.0833	8.0843	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.2500	0.4523	12
Sebastes atrovirens	0.1667	0.3892	12
Paralabrax clathratus	16.5833	4.6993	12
Semicossyphus pulcher	3.4167	1.5643	12
Embiotoca jacksoni	3.4167	2.0207	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.1667	0.3892	12
Hypsypops rubicundus	3.4167	1.3114	12
Girella nigricans	13.4167	29.1094	12
Halichoeres semicinctus	3.4167	2.6097	12

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		25.7500	12.9272	12
	930812	29.7500	14.1800	8
	930929	17.7500	3.9476	4
Chromis punctipinnis juvenile		5.4167	11.7663	12
	930812	8.1250	13.8712	8
	930929	0.0000	0.0000	4
Oxyjulis californica adult		9.7500	5.3619	12
	930812	10.2500	5.7508	8
	930929	8.7500	5.1235	4
Oxyjulis californica juvenile		2.3333	4.7546	12
	930812	3.5000	5.5549	8
	930929	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	12
	930812	0.0000	0.0000	8
	930929	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	12
	930812	0.0000	0.0000	8
	930929	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	12
	930812	0.0000	0.0000	8
	930929	0.0000	0.0000	4
Sebastes serranoides juvenile		0.2500	0.4523	12
	930812	0.3750	0.5175	8
	930929	0.0000	0.0000	

4
Sebastes atrovirens adult 0.1667 0.3892
12
930812 0.0000 0.0000
8
930929 0.5000 0.5774
4
Sebastes atrovirens juvenile 0.0000 0.0000
12
930812 0.0000 0.0000
8
930929 0.0000 0.0000
4
Paralabrax clathratus adult 14.4167 4.5218
12
930812 12.7500 3.3274
8
930929 17.7500 5.1881
4
Paralabrax clathratus juvenile 2.1667 1.9924
12
930812 1.5000 1.0690
8
930929 3.5000 2.8868
4
Semicossyphus pulcher male 0.0000 0.0000
12
930812 0.0000 0.0000
8
930929 0.0000 0.0000
4
Semicossyphus pulcher female 3.4167 1.5643
12
930812 2.7500 1.0351
8
930929 4.7500 1.7078
4
Embiotoca jacksoni adult 3.4167 2.0207
12
930812 2.6250 1.3025
8
930929 5.0000 2.4495
4
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930812 0.0000 0.0000
8
930929 0.0000 0.0000
4

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

Embiotoca lateralis adult 0.0000 0.0000
12

	930812		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Embiotoca lateralis		juvenile	0.0000	0.0000
12				
	930812		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Damalichthys vacca		adult	0.1667	0.3892
12				
	930812		0.2500	0.4629
8				
	930929		0.0000	0.0000
4				
Damalichthys vacca		juvenile	0.0000	0.0000
12				
	930812		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Hypsypops rubicundus		adult	3.4167	1.3114
12				
	930812		3.3750	1.4079
8				
	930929		3.5000	1.2910
4				
Hypsypops rubicundus		juvenile	0.0000	0.0000
12				
	930812		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Girella nigricans		adult	13.4167	29.1094
12				
	930812		19.5000	34.7069
8				
	930929		1.2500	0.5000
4				
Girella nigricans		juvenile	0.0000	0.0000
12				
	930812		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Halichoeres semicinctus		male	1.1667	0.9334
12				
	930812		1.3750	1.0607
8				
	930929		0.7500	0.5000
4				
Halichoeres semicinctus		female	2.2500	2.6671
12				

	930812	0.6250	0.7440
8			
	930929	5.5000	1.9149
4			

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Astraea undosa

search method: general search

(cases) N=	92
< 30	0.0
30 - 39	1.1%
40 - 49	2.2%
50 - 59	1.1%
60 - 69	1.1%
70 - 79	4.3%
80 - 89	12.0%
90 - 99	56.5%
100 - 109	19.6%
110 - 119	2.2%
> 119	0.0
min size (mm)	32
max size (mm)	112
mean	92
mode	93

Hinnites giganteus

search method: general search

(cases) N=	30
< 30	0.0
30 - 39	6.7%
40 - 49	16.7%
50 - 59	10.0%
60 - 69	23.3%
70 - 79	26.7%
80 - 89	6.7%
90 - 99	6.7%
100 - 109	3.3%
> 109	0.0
min size (mm)	36
max size (mm)	102
mean	65
mode	60

Patiria miniata

search method: general search

(cases) N=	19
< 40	0.0
40 - 49	5.3%
50 - 59	21.1%
60 - 69	5.3%
70 - 79	47.4%
80 - 89	15.8%
90 - 99	5.3%
> 99	0.0
min size (mm)	49
max size (mm)	94
mean	71
mode	71

Strongylocentrotus franciscanus

search method: quadrat

(cases) N=	98
< 25	0.0
25 - 29	3.1%
30 - 34	2.0%
35 - 39	7.1%
40 - 44	3.1%
45 - 49	5.1%
50 - 54	7.1%
55 - 59	9.2%
60 - 64	13.3%
65 - 69	6.1%
70 - 74	13.3%
75 - 79	9.2%
80 - 84	7.1%
85 - 90	5.1%
90 - 94	6.1%
95 - 99	1.0%
100 - 104	1.0%
105 - 109	1.0%
> 109	0.0
min size (mm)	25
max size (mm)	105
mean	65
mode	78

Strongylocentrotus purpuratus

search method: quadrat

(cases) N=	105
< 15	0.0
15 - 19	1.9%
20 - 24	5.7%
25 - 29	20.0%
30 - 34	21.0%
35 - 39	16.2%
40 - 44	16.2%
45 - 49	6.7%
50 - 54	4.8%
55 - 59	2.9%
60 - 64	3.8%
65 - 69	1.0%
> 69	0.0
min size (mm)	15
max size (mm)	68
mean	37
mode	29

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera numbers of stipes
search method: general search

(cases) N=	106
< 3	39.6%
3 - 5	31.1%
6 - 8	6.6%
9 - 11	5.7%
12 - 14	0.9%
15 - 17	0.9%
18 - 20	1.9%
21 - 23	1.9%
24 - 26	0.0
27 - 29	0.0
30 - 32	4.7%
33 - 35	0.0
36 - 38	0.0
39 - 41	3.8%
42 - 44	0.9%
> 44	0.9%
min number	1
max number	61
mean	8
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	106
< 6	30.2%
6 - 11	42.5%
12 - 17	8.5%
18 - 23	5.7%
24 - 29	5.7%
30 - 35	5.7%
36 - 41	1.9%
42 - 47	0.0
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	2
max width (cm)	40
mean	11
mode	6

Lophogorgia chilensis widths
search method: general search

(cases) N=	100
< 5	0.0
5 - 8	6.0%
9 - 12	5.0%
13 - 16	6.0%
17 - 20	9.0%
21 - 24	9.0%
25 - 28	16.0%
29 - 32	12.0%
33 - 36	15.0%
37 - 40	12.0%
41 - 44	6.0%
45 - 48	1.0%
49 - 52	1.0%
53 - 56	0.0
57 - 60	1.0%
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	1.0%
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min width (cm)	6
max width (cm)	82
mean	28
mode	19

Lophogorgia chilensis heights
search method: general search

(cases) N=	100
< 5	0.0
5 - 8	0.0
9 - 12	1.0%
13 - 16	3.0%
17 - 20	7.0%
21 - 24	10.0%
25 - 28	8.0%
29 - 32	6.0%
33 - 36	16.0%
37 - 40	23.0%
41 - 44	10.0%
45 - 48	8.0%
49 - 52	5.0%
53 - 56	2.0%
57 - 60	1.0%
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	11
max height (cm)	60
mean	35
mode	35

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.0000	0.0000	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	0.0000	0.0000	20
Macrocystis pyrifera all	0.0000	0.0000	20
Cypraea spadicea	0.0000	0.0000	20
Astraea undosa	1.2250	1.3325	20
Patiria miniata	0.1750	0.4375	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	0.3500	0.5643	20
Strongylocentrotus purpuratus	41.5500	17.5603	20
Parastichopus parvamensis	0.6250	0.5350	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.8250	0.6544	20
Alloclinus holderi	0.1250	0.2221	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0069	0.0111	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0000	0.0000	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.1264	0.0889	12
Hinnites giganteus	0.0250	0.0195	12
Aplysia californica	0.0528	0.0577	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.1083	0.1346	12

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.6000	1.3070	25
Miscellaneous brown algae	4.7000	7.5457	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis,Eisenia,Pterygophora	0.6000	2.5290	25
Macrocystis pyrifera all	0.6000	2.5290	25
Miscellaneous red algae	10.4000	8.0584	25
Articulated coralline algae	1.8000	2.2267	25
Crustose coralline algae	57.3000	16.6289	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.1000	1.9203	25
Sponges	0.0000	0.0000	25
Corynactis californica	0.0000	0.0000	25
Balanophyllia elegans	0.0000	0.0000	25
Astrangia lajollaensis	1.0000	1.4434	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	2.3000	3.0551	25
Bryozoans	0.3000	0.8292	25
Diaperoecia californica	0.2000	0.6922	25
Tunicates	0.1000	0.5000	25
Miscellaneous invertebrates	9.7000	6.4275	25
Bare substrate	25.5000	12.1835	25
Rock	89.8000	11.6127	25
Cobble	1.2000	1.9257	25
Sand	9.0000	11.9242	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	4.9803	13.2022	152
Chromis punctipinnis	41.5833	25.5715	12
Oxyjulis californica	11.0000	3.9543	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0833	0.2887	12
Paralabrax clathratus	1.8333	1.0299	12
Semicossyphus pulcher	2.1667	1.4668	12
Embiotoca jacksoni	0.9167	1.0836	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	1.0833	1.3790	12
Girella nigricans	0.5000	0.7977	12
Halichoeres semicinctus	5.8750	2.5319	8

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		38.6667	24.4292	12
	930811	26.8750	10.7363	8
	930929	62.2500	28.4063	4
Chromis punctipinnis juvenile		2.9167	4.4407	12
	930811	0.6250	1.7678	8
	930929	7.5000	4.7958	4
Oxyjulis californica adult		10.9167	3.8720	12
	930811	10.3750	2.5036	8
	930929	12.0000	6.1644	4
Oxyjulis californica juvenile		0.0833	0.2887	12
	930811	0.1250	0.3536	8
	930929	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	12
	930811	0.0000	0.0000	8
	930929	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	12
	930811	0.0000	0.0000	8
	930929	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	12
	930811	0.0000	0.0000	8
	930929	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	12
	930811	0.0000	0.0000	8
	930929	0.0000	0.0000	

4
Sebastes atrovirens adult 0.0833 0.2887
12
930811 0.0000 0.0000
8
930929 0.2500 0.5000
4
Sebastes atrovirens juvenile 0.0000 0.0000
12
930811 0.0000 0.0000
8
930929 0.0000 0.0000
4
Paralabrax clathratus adult 1.7500 1.1382
12
930811 1.2500 0.8864
8
930929 2.7500 0.9574
4
Paralabrax clathratus juvenile 0.0833 0.2887
12
930811 0.1250 0.3536
8
930929 0.0000 0.0000
4
Semicossyphus pulcher male 0.0000 0.0000
12
930811 0.0000 0.0000
8
930929 0.0000 0.0000
4
Semicossyphus pulcher female 2.1667 1.4668
12
930811 2.6250 1.3025
8
930929 1.2500 1.5000
4
Embiotoca jacksoni adult 0.9167 1.0836
12
930811 0.3750 0.7440
8
930929 2.0000 0.8165
4
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930811 0.0000 0.0000
8
930929 0.0000 0.0000
4

LOCATION 9 SANTA CRUZ ISLAND - PELICAN BAY

Embiotoca lateralis adult 0.0000 0.0000
12

	930811		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Embiotoca lateralis	juvenile		0.0000	0.0000
12				
	930811		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Damalichthys vacca	adult		0.0000	0.0000
12				
	930811		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Damalichthys vacca	juvenile		0.0000	0.0000
12				
	930811		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Hypsypops rubicundus	adult		0.7500	0.9653
12				
	930811		0.2500	0.4629
8				
	930929		1.7500	0.9574
4				
Hypsypops rubicundus	juvenile		0.3333	0.6513
12				
	930811		0.2500	0.4629
8				
	930929		0.5000	1.0000
4				
Girella nigricans	adult		0.5000	0.7977
12				
	930811		0.7500	0.8864
8				
	930929		0.0000	0.0000
4				
Girella nigricans	juvenile		0.0000	0.0000
12				
	930811		0.0000	0.0000
8				
	930929		0.0000	0.0000
4				
Halichoeres semicinctus	male		1.5000	1.4142
8				
	930811		0.5000	1.0000
4				
	930929		2.5000	1.0000
4				
Halichoeres semicinctus	female		4.3750	1.9955
8				

	930811	3.2500	1.2583
4			
	930929	5.5000	2.0817
4			

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Astraea undosa
search method: general search

(cases) N=	152
< 20	0.0
20 - 29	9.2%
30 - 39	11.8%
40 - 49	3.3%
50 - 59	7.9%
60 - 69	13.2%
70 - 79	27.0%
80 - 89	26.3%
90 - 99	1.3%
> 99	0.0
min size (mm)	20
max size (mm)	96
mean	64
mode	85

Megathura crenulata
search method: general search

(cases) N=	33
< 60	0.0
60 - 69	24.2%
70 - 79	75.8%
> 79	0.0
min size (mm)	64
max size (mm)	79
mean	72
mode	73

Hinnites giganteus
search method: general search

(cases) N=	30
< 20	0.0
20 - 29	3.3%
30 - 39	20.0%
40 - 49	13.3%
50 - 59	20.0%
60 - 69	13.3%
70 - 79	6.7%
80 - 89	10.0%
90 - 99	3.3%
100 - 109	3.3%
110 - 119	6.7%
> 119	0.0
min size (mm)	27
max size (mm)	117
mean	61
mode	35

Patiria miniata
search method: general search

(cases) N=	29
< 20	0.0
20 - 29	3.4%
30 - 39	10.3%
40 - 49	13.8%
50 - 59	17.2%
60 - 69	24.1%
70 - 79	20.7%
80 - 89	6.9%
90 - 99	3.4%
> 99	0.0
min size (mm)	28
max size (mm)	91
mean	59
mode	31

Strongylocentrotus franciscanus
search method: general search

(cases) N=	32
< 30	0.0
30 - 34	9.4%
35 - 39	31.3%
40 - 44	31.3%
45 - 49	15.6%
50 - 54	3.1%
55 - 59	0.0
60 - 64	3.1%
65 - 69	0.0
70 - 74	3.1%
75 - 79	0.0
80 - 84	3.1%
> 84	0.0
min size (mm)	30
max size (mm)	82
mean	43
mode	45

Strongylocentrotus purpuratus
general search: quadrat

(cases) N=	429
< 20	0.0
20 - 24	3.0%
25 - 29	43.8%
30 - 34	46.2%
35 - 39	6.5%
40 - 44	0.5%
> 44	0.0
min size (mm)	21
max size (mm)	41
mean	30
mode	28

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	11
< 3	45.5%
3 - 5	36.4%
6 - 8	18.2%
9 - 11	0.0
12 - 14	0.0
15 - 17	0.0
18 - 20	0.0
21 - 23	0.0
24 - 26	0.0
27 - 29	0.0
30 - 32	0.0
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0

min number	2
max number	6
mean	3
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	11
< 6	9.1%
6 - 11	18.2%
12 - 17	72.7%
18 - 23	0.0
24 - 29	0.0
30 - 35	0.0
36 - 41	0.0
42 - 47	0.0
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0

min width (cm)	5
max width (cm)	15
mean	12
mode	12

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Cypraea spadicea FROM 7 ARMs

(cases) N=	85
< 30	0.0
30 - 34	12.9%
35 - 39	20.0%
40 - 44	40.0%
45 - 49	17.6%
50 - 54	7.1%
55 - 59	2.4%
> 59	0.0
min size (mm)	30
max size (mm)	56
mean	42
mode	42

Hinnites giganteus FROM 7 ARMs

(cases) N=	24
< 10	29.2%
10 - 19	4.2%
20 - 29	12.5%
30 - 39	4.2%
40 - 49	4.2%
50 - 59	0.0
60 - 69	12.5%
70 - 79	16.7%
80 - 89	12.5%
90 - 99	4.2%
> 99	0.0
min size (mm)	6
max size (mm)	96
mean	44
mode	9

Patiria miniata FROM 7 ARMs

(cases) N=	13
< 10	0.0
10 - 19	7.7%
20 - 29	0.0
30 - 39	15.4%
40 - 49	15.4%
50 - 59	30.8%
60 - 69	23.1%
70 - 79	0.0
80 - 89	7.7%
> 89	0.0
min size (mm)	11
max size (mm)	82
mean	52
mode	57

Pisaster giganteus FROM 7 ARMs

(cases) N=	5
< 20	40.0%
20 - 39	60.0%
> 39	0.0
min size (mm)	17
max size (mm)	29
mean	22
mode	17

Strongylocentrotus franciscanus FROM 7 ARMs

(cases) N=	22
< 5	0.0
5 - 9	18.2%
10 - 14	4.5%
15 - 19	4.5%
20 - 24	4.5%
25 - 29	4.5%
30 - 34	18.2%
35 - 39	18.2%
40 - 44	13.6%
45 - 49	9.1%
50 - 54	4.5%
> 54	0.0
min size (mm)	6
max size (mm)	51
mean	30
mode	9

Strongylocentrotus purpuratus FROM 7 ARMs

(cases) N=	145
< 5	2.8%
5 - 9	4.8%
10 - 14	1.4%
15 - 19	0.0
20 - 24	4.1%
25 - 29	9.0%
30 - 34	54.5%
35 - 39	16.6%
40 - 44	5.5%
45 - 49	1.4%
> 49	0.0
min size (mm)	4
max size (mm)	46
mean	30
mode	32

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Astraea undosa FROM 7 ARMs

(cases) N=	1
< 80	0.0
80 - 89	100.0%
> 89	0.0
min size (mm)	87
max size (mm)	87
mean	87
mode	87

Megathura crenulata FROM 7 ARMs

(cases) N=	1
< 60	0.0
60 - 69	100.0%
> 69	0.0
min size (mm)	61
max size (mm)	61
mean	61
mode	61

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.3750	0.7048	20
Eisenia arborea	0.0250	0.1118	20
Pterygophora californica	2.6250	1.8128	20
Laminaria farlowii	0.8250	0.9497	20
Macrocystis pyrifera juvenile	1.0750	1.1154	20
Macrocystis pyrifera all	1.4500	1.4500	20
Cypraea spadicea	0.0000	0.0000	20
Astraea undosa	0.7250	0.5250	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	0.5500	1.4591	20
Strongylocentrotus purpuratus	1.4250	1.6406	20
Parastichopus parvamensis	0.7000	0.6156	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.3750	0.4833	20
Alloclinus holderi	0.0250	0.1118	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0056	0.0109	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0333	0.0225	12
Lophogorgia chilensis	0.0597	0.0524	12
Muricea fruticosa	0.0028	0.0096	12
Muricea californica	0.0028	0.0065	12
Panulirus interruptus	0.0014	0.0048	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0042	0.0104	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0583	0.0352	12
Megathura crenulata	0.0042	0.0075	12
Hinnites giganteus	0.0056	0.0148	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.8444	0.6196	12

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	1.0000	1.4434	25
Miscellaneous brown algae	7.8000	8.8776	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	1.6000	4.2007	25
Pterygophora californica	32.6000	20.0972	25
Laminaria farlowii	12.4000	13.1395	25
Cystoseira spp.	22.1000	16.6252	25
Macrocystis,*Eisenia*,*Pterygophora*	46.7000	19.1991	25
Macrocystis pyrifera all	12.5000	13.8444	25
Miscellaneous red algae	13.3000	12.1347	25
Articulated coralline algae	33.1000	15.2800	25
Crustose coralline algae	44.2000	10.7461	25
Gelidium spp.	0.1000	0.5000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	2.6000	4.1758	25
Sponges	1.7000	2.0052	25
Corynactis californica	0.3000	0.8292	25
Balanophyllia elegans	0.7000	1.5343	25
Astrangia lajollaensis	1.2000	2.7119	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans	10.4000	8.9174	25
Diaperoecia californica	2.6000	5.1781	25
Tunicates	1.0000	1.6137	25
Miscellaneous invertebrates	8.5000	5.5902	25
Bare substrate	19.0000	17.2301	25
Rock	73.1000	28.5161	25
Cobble	12.8000	17.2651	25
Sand	14.1000	15.7434	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	1.3269	3.0575	104
Chromis punctipinnis	0.7500	0.8864	8
Oxyjulis californica	8.5000	6.6548	8
Sebastes mystinus	0.0000	0.0000	8
Sebastes serranoides	0.0000	0.0000	8
Sebastes atrovirens	0.1250	0.3536	8
Paralabrax clathratus	3.3750	1.8468	8
Semicossyphus pulcher	3.2500	1.5811	8
Embiotoca jacksoni	0.0000	0.0000	8
Embiotoca lateralis	0.0000	0.0000	8
Damalichthys vacca	0.0000	0.0000	8
Hypsypops rubicundus	0.1250	0.3536	8
Girella nigricans	0.0000	0.0000	8
Halichoeres semicinctus	1.1250	1.6421	8

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		0.6250	0.7440	8
	930810	0.5000	0.5774	4
	930927	0.7500	0.9574	4
Chromis punctipinnis juvenile		0.1250	0.3536	8
	930810	0.2500	0.5000	4
	930927	0.0000	0.0000	4
Oxyjulis californica adult		8.3750	6.6748	8
	930810	4.7500	3.3040	4
	930927	12.0000	7.6158	4
Oxyjulis californica juvenile		0.1250	0.3536	8
	930810	0.2500	0.5000	4
	930927	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	8
	930810	0.0000	0.0000	4
	930927	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	8
	930810	0.0000	0.0000	4
	930927	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	8
	930810	0.0000	0.0000	4
	930927	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	8
	930810	0.0000	0.0000	4
	930927	0.0000	0.0000	

4
Sebastes atrovirens adult 0.1250 0.3536
8
930810 0.2500 0.5000
4
930927 0.0000 0.0000
4
Sebastes atrovirens juvenile 0.0000 0.0000
8
930810 0.0000 0.0000
4
930927 0.0000 0.0000
4
Paralabrax clathratus adult 2.7500 2.3146
8
930810 1.0000 0.8165
4
930927 4.5000 1.9149
4
Paralabrax clathratus juvenile 0.6250 0.7440
8
930810 1.2500 0.5000
4
930927 0.0000 0.0000
4
Semicossyphus pulcher male 0.0000 0.0000
8
930810 0.0000 0.0000
4
930927 0.0000 0.0000
4
Semicossyphus pulcher female 3.2500 1.5811
8
930810 3.5000 1.2910
4
930927 3.0000 2.0000
4
Embiotoca jacksoni adult 0.0000 0.0000
8
930810 0.0000 0.0000
4
930927 0.0000 0.0000
4
Embiotoca jacksoni juvenile 0.0000 0.0000
8
930810 0.0000 0.0000
4
930927 0.0000 0.0000
4

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

Embiotoca lateralis adult 0.0000 0.0000
8

	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Embiotoca lateralis juvenile		0.0000	0.0000
8			
	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Damalichthys vacca adult		0.0000	0.0000
8			
	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Damalichthys vacca juvenile		0.0000	0.0000
8			
	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Hypsypops rubicundus adult		0.1250	0.3536
8			
	930810	0.0000	0.0000
4			
	930927	0.2500	0.5000
4			
Hypsypops rubicundus juvenile		0.0000	0.0000
8			
	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Girella nigricans adult		0.0000	0.0000
8			
	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Girella nigricans juvenile		0.0000	0.0000
8			
	930810	0.0000	0.0000
4			
	930927	0.0000	0.0000
4			
Halichoeres semicinctus male		0.6250	0.5175
8			
	930810	0.5000	0.5774
4			
	930927	0.7500	0.5000
4			
Halichoeres semicinctus female		0.5000	1.4142
8			

	930810	0.0000	0.0000
4			
	930927	1.0000	2.0000
4			

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia
search method: general search

(cases) N=	27
< 10	0.0
10 - 19	3.7%
20 - 29	11.1%
30 - 39	22.2%
40 - 49	33.3%
50 - 59	14.8%
60 - 69	7.4%
70 - 79	3.7%
80 - 89	3.7%
> 89	0.0
min size (mm)	19
max size (mm)	87
mean	46
mode	35

Haliotis corrugata
search method: general search

(cases) N=	30
< 90	0.0
90 - 94	3.3%
95 - 99	0.0
100 - 104	6.7%
105 - 109	6.7%
110 - 114	3.3%
115 - 119	3.3%
120 - 124	6.7%
125 - 129	16.7%
130 - 134	10.0%
135 - 139	13.3%
140 - 144	3.3%
145 - 149	10.0%
150 - 154	3.3%
155 - 159	6.7%
160 - 164	0.0
165 - 169	0.0
170 - 174	0.0
175 - 179	3.3%
180 - 184	3.3%
> 184	0.0
min size (mm)	90
max size (mm)	184
mean	132
mode	126

Kelletia kelletii
search method: general search

(cases) N=	16
< 90	0.0
90 - 99	43.8%
100 - 109	37.5%
110 - 119	18.8%
> 119	0.0
min size (mm)	92
max size (mm)	115
mean	102
mode	94

Astraea undosa
search method: general search

(cases) N=	62
< 20	0.0
20 - 29	1.6%
30 - 39	0.0
40 - 49	1.6%
50 - 59	0.0
60 - 69	0.0
70 - 79	0.0
80 - 89	3.2%
90 - 99	16.1%
100 - 109	46.8%
110 - 119	22.6%
> 119	8.1%
min size (mm)	24
max size (mm)	140
mean	104
mode	102

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: general search

(cases) N=	48
< 5	0.0
5 - 9	2.1%
10 - 14	2.1%
15 - 19	4.2%
20 - 24	4.2%
25 - 29	8.3%
30 - 34	4.2%
35 - 39	6.3%
40 - 44	2.1%
45 - 49	4.2%
50 - 54	2.1%
55 - 59	0.0
60 - 64	2.1%
65 - 69	0.0
70 - 74	2.1%
75 - 79	2.1%
80 - 84	6.3%
85 - 90	20.8%
90 - 94	8.3%
95 - 99	0.0
100 - 104	12.5%
105 - 109	2.1%
> 109	4.2%
min size (mm)	7
max size (mm)	122
mean	67
mode	25

Strongylocentrotus purpuratus
search method: general search

(cases) N=	66
< 5	0.0
5 - 9	1.5%
10 - 14	3.0%
15 - 19	4.5%
20 - 24	3.0%
25 - 29	4.5%
30 - 34	6.1%
35 - 39	15.2%
40 - 44	12.1%
45 - 49	10.6%
50 - 54	13.6%
55 - 59	9.1%
60 - 64	9.1%
65 - 69	1.5%
70 - 74	1.5%
75 - 79	3.0%
80 - 84	0.0
85 - 90	1.5%
> 90	0.0
min size (mm)	9
max size (mm)	86
mean	45
mode	38

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	109
< 3	20.2%
3 - 5	16.5%
6 - 8	21.1%
9 - 11	7.3%
12 - 14	4.6%
15 - 17	4.6%
18 - 20	5.5%
21 - 23	5.5%
24 - 26	1.8%
27 - 29	1.8%
30 - 32	3.7%
33 - 35	2.8%
36 - 38	0.9%
39 - 41	0.0
42 - 44	1.8%
> 44	1.8%
min number	1
max number	56
mean	12
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	109
< 6	33.0%
6 - 11	21.1%
12 - 17	22.9%
18 - 23	4.6%
24 - 29	3.7%
30 - 35	3.7%
36 - 41	0.9%
42 - 47	1.8%
48 - 53	0.9%
54 - 59	0.0
60 - 65	2.8%
66 - 71	0.9%
72 - 77	0.0
78 - 83	0.0
84 - 89	1.8%
> 89	1.8%
min width (cm)	2
max width (cm)	93
mean	17
mode	4

Lophogorgia chilensis widths
search method: general search

(cases) N=	76
< 5	0.0
5 - 8	2.6%
9 - 12	11.8%
13 - 16	15.8%
17 - 20	14.5%
21 - 24	25.0%
25 - 28	17.1%
29 - 32	7.9%
33 - 36	1.3%
37 - 40	2.6%
41 - 44	1.3%
45 - 48	0.0
49 - 52	0.0
53 - 56	0.0
57 - 60	0.0
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min width (cm)	5
max width (cm)	41
mean	21
mode	21

Lophogorgia chilensis heights
search method: general search

(cases) N=	76
< 5	0.0
5 - 8	0.0
9 - 12	1.3%
13 - 16	2.6%
17 - 20	14.5%
21 - 24	10.5%
25 - 28	18.4%
29 - 32	18.4%
33 - 36	17.1%
37 - 40	10.5%
41 - 44	1.3%
45 - 48	2.6%
49 - 52	1.3%
53 - 56	0.0
57 - 60	1.3%
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	12
max height (cm)	57
mean	29
mode	26

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata FROM 15 ARMs

(cases) N=	2
< 25	50.0%
25 - 29	0.0
30 - 34	50.0%
> 34	0.0
min size (mm)	23
max size (mm)	34
mean	29
mode	23

Cypraea spadicea FROM 15 ARMs

(cases) N=	103
< 30	1.9%
30 - 34	14.6%
35 - 39	42.7%
40 - 44	31.1%
45 - 49	9.7%
> 49	0.0
min size (mm)	28
max size (mm)	48
mean	39
mode	38

Hinnites giganteus FROM 15 ARMs

(cases) N=	20
< 10	5.0%
10 - 19	35.0%
20 - 29	5.0%
30 - 39	20.0%
40 - 49	5.0%
50 - 59	20.0%
60 - 69	0.0
70 - 79	5.0%
80 - 89	0.0
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
120 - 129	5.0%
> 129	0.0
min size (mm)	9
max size (mm)	122
mean	36
mode	10

Patiria miniata FROM 15 ARMs

(cases) N=	63
< 10	4.8%
10 - 19	31.7%
20 - 29	34.9%
30 - 39	11.1%
40 - 49	9.5%
50 - 59	4.8%
60 - 69	1.6%
70 - 79	0.0
80 - 89	1.6%
> 89	0.0
min size (mm)	4
max size (mm)	84
mean	26
mode	11

Pisaster giganteus FROM 15 ARMs

(cases) N=	30
< 20	23.3%
20 - 39	66.7%
40 - 59	6.7%
60 - 79	3.3%
> 79	0.0
min size (mm)	11
max size (mm)	76
mean	29
mode	35

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus FROM 6 ARMs	
(cases) N=	229
< 5	0.9%
5 - 9	29.7%
10 - 14	6.1%
15 - 19	4.4%
20 - 24	7.0%
25 - 29	7.4%
30 - 34	6.6%
35 - 39	3.1%
40 - 44	3.5%
45 - 49	5.7%
50 - 54	4.4%
55 - 59	5.2%
60 - 64	3.5%
65 - 69	5.2%
70 - 74	5.2%
75 - 79	1.7%
80 - 84	0.4%
> 109	0.0
min size (mm)	4
max size (mm)	83
mean	31
mode	7

Strongylocentrotus purpuratus FROM 6 ARMs	
(cases) N=	683
< 5	2.8%
5 - 9	17.3%
10 - 14	3.1%
15 - 19	4.2%
20 - 24	6.6%
25 - 29	6.1%
30 - 34	4.1%
35 - 39	8.2%
40 - 44	8.8%
45 - 49	11.9%
50 - 54	10.7%
55 - 59	11.6%
60 - 64	3.8%
65 - 69	0.6%
70 - 74	0.0
75 - 79	0.1%
80 - 84	0.1%
> 84	0.0
min size (mm)	3
max size (mm)	80
mean	34
mode	6

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.3500	0.4894	20
Eisenia arborea	0.7000	0.9090	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.9000	1.5944	20
Macrocystis pyrifera juvenile	0.2750	0.4128	20
Macrocystis pyrifera all	0.6250	0.6257	20
Cypraea spadicea	0.0500	0.1539	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	0.2250	0.3432	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	7.5750	3.3728	20
Strongylocentrotus purpuratus	9.0250	5.2578	20
Parastichopus parvamensis	1.6750	1.1729	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.4000	0.4472	20
Alloclinus holderi	0.0250	0.1118	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0028	0.0065	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0958	0.0582	12
Muricea fruticosa	0.0222	0.0217	12
Muricea californica	0.0431	0.0337	12
Panulirus interruptus	0.0014	0.0048	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0167	0.0142	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0125	0.0190	12
Megathura crenulata	0.0028	0.0065	12
Hinnites giganteus	0.4264	0.2395	12
Aplysia californica	0.0264	0.0423	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.7208	0.7237	12

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	2.6000	2.4452	25
Miscellaneous brown algae	18.2000	13.1996	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	21.7000	24.5980	25
Pterygophora californica	1.0000	4.5069	25
Laminaria farlowii	6.2000	11.3679	25
Cystoseira spp.	17.4000	19.1279	25
Macrocystis,Eisenia,Pterygophora	35.1000	30.4949	25
Macrocystis pyrifera all	12.4000	15.2834	25
Miscellaneous red algae	38.3000	17.4063	25
Articulated coralline algae	3.0000	2.7951	25
Crustose coralline algae	34.4000	17.4296	25
Gelidium spp.	0.1000	0.5000	25
Gigartina spp.	0.3000	1.0992	25
Miscellaneous plants	13.1000	10.4153	25
Sponges	3.6000	3.8918	25
Corynactis californica	1.6000	3.3758	25
Balanophyllia elegans	0.8000	1.5679	25
Astrangia lajollaensis	3.7000	3.7583	25
Diopatra ornata	0.4000	1.1815	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.5000	1.4434	25
Bryozoans	6.9000	4.2866	25
Diaperoecia californica	1.5000	2.2822	25
Tunicates	4.4000	4.6368	25
Miscellaneous invertebrates	17.5000	9.7628	25
Bare substrate	7.7000	9.8139	25
Rock	89.2000	13.8203	25
Cobble	3.7000	6.9267	25
Sand	7.1000	9.7809	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	5.6645	16.5965	152
Chromis punctipinnis	52.2500	32.8305	12
Oxyjulis californica	9.9167	3.2039	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.1667	0.5774	12
Paralabrax clathratus	1.3333	1.1547	12
Semicossyphus pulcher	4.4167	4.2310	12
Embiotoca jacksoni	0.4167	0.6686	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.2500	0.6216	12
Hypsypops rubicundus	1.1667	0.9374	12
Girella nigricans	0.5000	1.0000	12
Halichoeres semicinctus	2.0000	0.7559	8

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		42.6667	32.5948	12
	930825	26.1250	23.8533	8
	930917	75.7500	19.4658	4
Chromis punctipinnis juvenile		9.5833	10.9665	12
	930825	14.3750	10.5009	8
	930917	0.0000	0.0000	4
Oxyjulis californica adult		9.9167	3.2039	12
	930825	9.5000	2.5635	8
	930917	10.7500	4.5735	4
Oxyjulis californica juvenile		0.0000	0.0000	12
	930825	0.0000	0.0000	8
	930917	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	12
	930825	0.0000	0.0000	8
	930917	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	12
	930825	0.0000	0.0000	8
	930917	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	12
	930825	0.0000	0.0000	8
	930917	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	12
	930825	0.0000	0.0000	8
	930917	0.0000	0.0000	

4
Sebastes atrovirens adult 0.1667 0.5774
12
930825 0.0000 0.0000
8
930917 0.5000 1.0000
4
Sebastes atrovirens juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
Paralabrax clathratus adult 1.3333 1.1547
12
930825 1.5000 1.0690
8
930917 1.0000 1.4142
4
Paralabrax clathratus juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
Semicossyphus pulcher male 0.0833 0.2887
12
930825 0.0000 0.0000
8
930917 0.2500 0.5000
4
Semicossyphus pulcher female 4.3333 4.0751
12
930825 2.5000 1.5119
8
930917 8.0000 5.3541
4
Embiotoca jacksoni adult 0.4167 0.6686
12
930825 0.5000 0.7559
8
930917 0.2500 0.5000
4
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

Embiotoca lateralis adult 0.0000 0.0000
12
930825 0.0000 0.0000

8
930917 0.0000 0.0000
4
Embiotoca lateralis juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
Damalichthys vacca adult 0.2500 0.6126
12
930825 0.0000 0.0000
8
930917 0.7500 0.9574
4
Damalichthys vacca juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
Hypsypops rubicundus adult 1.1667 0.9374
12
930825 1.1250 0.9910
8
930917 1.2500 0.9574
4
Hypsypops rubicundus juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
Girella nigricans adult 0.5000 1.0000
12
930825 0.6250 1.1877
8
930917 0.2500 0.5000
4
Girella nigricans juvenile 0.0000 0.0000
12
930825 0.0000 0.0000
8
930917 0.0000 0.0000
4
Halichoeres semicinctus male 1.6250 0.7440
8
930825 1.6250 0.7440
8
Halichoeres semicinctus female 0.3750 0.5175
8
930825 0.3750 0.5175
8

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata
search method: general search

(cases) N=	21
< 50	0.0
50 - 54	4.8%
55 - 59	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	0.0
75 - 79	4.8%
80 - 84	0.0
85 - 90	4.8%
90 - 94	0.0
95 - 99	0.0
100 - 104	4.8%
105 - 109	0.0
110 - 114	4.8%
115 - 119	0.0
120 - 124	4.8%
125 - 129	9.5%
130 - 134	14.3%
135 - 139	19.0%
140 - 144	14.3%
145 - 149	9.5%
150 - 154	4.8%
> 154	0.0
min size (mm)	53
max size (mm)	151
mean	125
mode	129

Hinnites giganteus
search method: general search

(cases) N=	56
< 10	0.0
10 - 19	3.6%
20 - 29	8.9%
30 - 39	10.7%
40 - 49	23.2%
50 - 59	12.5%
60 - 69	12.5%
70 - 79	10.7%
80 - 89	8.9%
90 - 99	7.1%
100 - 109	0.0
110 - 119	1.8%
> 119	0.0
min size (mm)	14
max size (mm)	112
mean	56
mode	45

Patiria miniata
search method: general search

(cases) N=	58
< 20	0.0
20 - 29	1.7%
30 - 39	3.4%
40 - 49	5.2%
50 - 59	27.6%
60 - 69	36.2%
70 - 79	20.7%
80 - 89	5.2%
> 89	0.0
min size (mm)	27
max size (mm)	84
mean	62
mode	57

Pisaster giganteus
search method: general search

(cases) N=	13
< 60	0.0
60 - 79	15.4%
80 - 99	15.4%
100 - 119	30.8%
120 - 139	0.0
140 - 159	7.7%
160 - 179	15.4%
180 - 199	7.7%
200 - 219	7.7%
> 219	0.0
min size (mm)	62
max size (mm)	208
mean	127
mode	62

Lytechinus anamesus
search method: general search

(cases) N=	194
< 20	0.0
20 - 24	0.5%
25 - 29	32.0%
30 - 34	56.2%
35 - 39	11.3%
> 39	0.0
min size (mm)	24
max size (mm)	38
mean	31
mode	30

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	153
< 5	0.0
5 - 9	0.7%
10 - 14	1.3%
15 - 19	1.3%
20 - 24	0.7%
25 - 29	0.7%
30 - 34	2.6%
35 - 39	5.2%
40 - 44	2.6%
45 - 49	3.9%
50 - 54	5.2%
55 - 59	7.2%
60 - 64	7.8%
65 - 69	9.8%
70 - 74	8.5%
75 - 79	13.7%
80 - 84	10.5%
85 - 90	9.8%
90 - 94	5.2%
95 - 99	3.3%
> 99	0.0
min size (mm)	9
max size (mm)	99
mean	66
mode	73

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	135
< 10	0.0
10 - 14	2.2%
15 - 19	2.2%
20 - 24	2.2%
25 - 29	5.2%
30 - 34	11.9%
35 - 39	11.9%
40 - 44	25.9%
45 - 49	17.8%
50 - 54	8.9%
55 - 59	8.1%
60 - 64	2.2%
65 - 69	0.7%
70 - 74	0.7%
> 74	0.0
min size (mm)	11
max size (mm)	71
mean	41
mode	42

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	99
< 3	24.2%
3 - 5	9.1%
6 - 8	7.1%
9 - 11	8.1%
12 - 14	10.1%
15 - 17	9.1%
18 - 20	6.1%
21 - 23	9.1%
24 - 26	5.1%
27 - 29	5.1%
30 - 32	3.0%
33 - 35	1.0%
36 - 38	0.0
39 - 41	2.0%
42 - 44	1.0%
> 44	0.0
min number	1
max number	42
mean	13
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	99
< 6	20.2%
6 - 11	7.1%
12 - 17	10.1%
18 - 23	23.2%
24 - 29	24.2%
30 - 35	10.1%
36 - 41	2.0%
42 - 47	3.0%
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	2
max width (cm)	44
mean	20
mode	5

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Lophogorgia chilensis widths
search method: general search

(cases) N=	75
< 5	0.0
5 - 8	0.0
9 - 12	2.7%
13 - 16	2.7%
17 - 20	17.3%
21 - 24	9.3%
25 - 28	14.7%
29 - 32	22.7%
33 - 36	5.3%
37 - 40	2.7%
41 - 44	2.7%
45 - 48	6.7%
49 - 52	2.7%
53 - 56	0.0
57 - 60	0.0
61 - 64	0.0
65 - 68	4.0%
69 - 72	1.3%
73 - 76	1.3%
77 - 80	0.0
81 - 84	1.3%
85 - 88	0.0
89 - 92	2.7%
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min width (cm)	10
max width (cm)	92
mean	34
mode	19

Muricea fruticosa widths
search method: general search

(cases) N=	32
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	9.4%
17 - 20	9.4%
21 - 24	6.3%
25 - 28	18.8%
29 - 32	12.5%
33 - 36	18.8%
37 - 40	12.5%
41 - 44	0.0
45 - 48	3.1%
49 - 52	3.1%
53 - 56	3.1%
57 - 60	0.0
> 60	3.1%
min width (cm)	13
max width (cm)	69
mean	31
mode	25

Lophogorgia chilensis heights
search method: general search

(cases) N=	75
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	2.7%
17 - 20	9.3%
21 - 24	10.7%
25 - 28	13.3%
29 - 32	17.3%
33 - 36	14.7%
37 - 40	6.7%
41 - 44	8.0%
45 - 48	4.0%
49 - 52	1.3%
53 - 56	2.7%
57 - 60	0.0
61 - 64	2.7%
65 - 68	1.3%
69 - 72	2.7%
73 - 76	2.7%
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	13
max height (cm)	74
mean	35
mode	33

Muricea fruticosa heights
search method: general search

(cases) N=	32
< 5	0.0
5 - 8	6.3%
9 - 12	18.8%
13 - 16	9.4%
17 - 20	21.9%
21 - 24	15.6%
25 - 28	21.9%
29 - 32	0.0
33 - 36	3.1%
37 - 40	0.0
41 - 44	0.0
45 - 48	0.0
49 - 52	0.0
53 - 56	3.1%
57 - 60	0.0
> 60	0.0
min height (cm)	7
max height (cm)	55
mean	20
mode	12

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Muricea californica widths
search method: general search

(cases) N=	26
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	0.0
17 - 20	0.0
21 - 24	3.8%
25 - 28	11.5%
29 - 32	0.0
33 - 36	7.7%
37 - 40	7.7%
41 - 44	3.8%
45 - 48	0.0
49 - 52	3.8%
53 - 56	3.8%
57 - 60	0.0
61 - 64	11.5%
65 - 68	15.4%
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	3.8%
85 - 88	7.7%
89 - 92	3.8%
93 - 96	7.7%
97 - 100	3.8%
> 100	3.8%
min width (cm)	23
max width (cm)	104
mean	61
mode	26

Muricea californica heights
search method: general search

(cases) N=	26
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	0.0
17 - 20	11.5%
21 - 24	7.7%
25 - 28	7.7%
29 - 32	3.8%
33 - 36	11.5%
37 - 40	7.7%
41 - 44	7.7%
45 - 48	3.8%
49 - 52	7.7%
53 - 56	0.0
57 - 60	3.8%
61 - 64	11.5%
65 - 68	3.8%
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	7.7%
85 - 88	3.8%
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	19
max height (cm)	88
mean	45
mode	20

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata FROM 7 ARMs

(cases) N=	2
< 25	50.0%
25 - 29	50.0%
> 29	0.0
min size (mm)	11
max size (mm)	27
mean	19
mode	11

Cypraea spadicea FROM 7 ARMs

(cases) N=	12
< 30	0.0
30 - 34	0.0
35 - 39	0.0
40 - 44	33.3%
45 - 49	8.3%
50 - 54	41.7%
55 - 59	16.7%
> 59	0.0
min size (mm)	40
max size (mm)	57
mean	49
mode	51

Megathura crenulata FROM 7 ARMs

(cases) N=	5
< 10	0.0
10 - 19	40.0%
20 - 29	40.0%
30 - 39	0.0
40 - 49	20.0%
> 49	0.0
min size (mm)	15
max size (mm)	40
mean	24
mode	15

Hinnites giganteus FROM 7 ARMs

(cases) N=	59
< 10	47.5%
10 - 19	27.1%
20 - 29	1.7%
30 - 39	3.4%
40 - 49	0.0
50 - 59	6.8%
60 - 69	10.2%
70 - 79	3.4%
> 79	0.0
min size (mm)	3
max size (mm)	72
mean	21
mode	6

Patiria miniata FROM 7 ARMs

(cases) N=	36
< 10	8.3%
10 - 19	16.7%
20 - 29	19.4%
30 - 39	16.7%
40 - 49	11.1%
50 - 59	5.6%
60 - 69	11.1%
70 - 79	11.1%
> 79	0.0
min size (mm)	6
max size (mm)	77
mean	36
mode	17

Pisaster giganteus FROM 7 ARMs

(cases) N=	17
< 20	11.8%
20 - 39	82.4%
40 - 59	0.0
60 - 79	0.0
80 - 99	5.9%
> 99	0.0
min size (mm)	5
max size (mm)	92
mean	27
mode	25

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
FROM 7 ARMs

(cases) N=	169
< 5	0.0
5 - 9	7.1%
10 - 14	2.4%
15 - 19	8.3%
20 - 24	8.9%
25 - 29	8.9%
30 - 34	7.7%
35 - 39	10.7%
40 - 44	5.3%
45 - 49	8.3%
50 - 54	7.1%
55 - 59	5.3%
60 - 64	8.3%
65 - 69	4.1%
70 - 74	2.4%
75 - 79	2.4%
80 - 84	1.2%
85 - 90	1.8%
> 90	0.0
min size (mm)	5
max size (mm)	87
mean	40
mode	62

Strongylocentrotus purpuratus
FROM 7 ARMs

(cases) N=	274
< 5	2.9%
5 - 9	8.0%
10 - 14	4.0%
15 - 19	8.0%
20 - 24	13.9%
25 - 29	16.8%
30 - 34	8.0%
35 - 39	9.5%
40 - 44	9.1%
45 - 49	9.5%
50 - 54	6.6%
55 - 59	2.6%
60 - 64	0.7%
65 - 69	0.0
70 - 74	0.4%
> 74	0.0
min size (mm)	4
max size (mm)	71
mean	30
mode	26

Lytechinus anamesus FROM ARMs
FROM 7 ARMs

(cases) N=	15
< 20	0.0
20 - 24	26.7%
25 - 29	33.3%
30 - 34	20.0%
35 - 39	13.3%
40 - 44	6.7%
> 44	0.0
min size (mm)	21
max size (mm)	42
mean	29
mode	23

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.7000	0.9515	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.7750	0.9101	20
Macrocystis pyrifera juvenile	2.0750	2.9077	20
Macrocystis pyrifera all	2.7750	3.1684	20
Cypraea spadicea	0.0750	0.1832	20
Astraea undosa	1.7750	2.1489	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	3.9250	3.5179	20
Strongylocentrotus purpuratus	1.4500	1.6535	20
Parastichopus parvamensis	0.7250	0.6584	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0750	0.1832	20
Alloclinus holderi	0.6000	0.6806	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0042	0.0075	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0014	0.0048	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.1139	0.3224	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0083	0.0133	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0042	0.0075	12
Hinnites giganteus	0.2208	0.2256	12
Aplysia californica	0.0056	0.0109	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	0.6000	1.3070	25
Miscellaneous brown algae	5.2000	7.0681	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	0.2000	1.0000	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	4.0000	9.0427	25
Cystoseira spp.	9.4000	11.0463	25
Macrocystis,*Eisenia*,*Pterygophora*	27.6000	27.5140	25
Macrocystis pyrifera all	27.4000	27.5896	25
Miscellaneous red algae	5.5000	6.2082	25
Articulated coralline algae	17.0000	15.5791	25
Crustose coralline algae	33.2000	18.1361	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.5000	1.0206	25
Sponges	1.0000	2.1651	25
Corynactis californica	0.0000	0.0000	25
Balanophyllia elegans	0.0000	0.0000	25
Astrangia lajollaensis	1.1000	1.9203	25
Diopatra ornata	0.9000	1.8930	25
Phragmatopoma californica	0.4000	0.9354	25
Serpulorbis squamigerus	0.9000	2.0259	25
Bryozoans	9.7000	6.5080	25
Diaperoecia californica	0.5000	1.2500	25
Tunicates	2.1000	3.5853	25
Miscellaneous invertebrates	15.7000	13.5693	25
Bare substrate	27.6000	15.9178	25
Rock	69.3000	19.8893	25
Cobble	11.7000	15.0471	25
Sand	19.0000	15.3263	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	15.1859	53.4051	156
Chromis punctipinnis	161.4167	120.9316	12
Oxyjulis californica	5.0833	5.5671	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	1.5833	2.9064	12
Sebastes atrovirens	0.3330	0.6513	12
Paralabrax clathratus	5.4167	3.3155	12
Semicossyphus pulcher	4.3333	4.3345	12
Embiotoca jacksoni	3.0000	1.6514	12
Embiotoca lateralis	0.0833	0.2887	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	6.3333	3.7254	12
Girella nigricans	0.9167	1.5050	12
Halichoeres semicinctus	8.9167	9.8669	12

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		104.9167	72.1494	12
	930826	82.8750	14.2772	8
	930931	149.0000	121.3452	4
Chromis punctipinnis juvenile		56.5000	62.8237	12
	930826	20.1250	10.9079	8
	930931	129.2500	60.0743	4
Oxyjulis californica adult		5.0833	5.5671	12
	930826	2.1250	1.8077	8
	930931	11.0000	6.0000	4
Oxyjulis californica juvenile		0.0000	0.0000	12
	930826	0.0000	0.0000	8
	930931	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	12
	930826	0.0000	0.0000	8
	930931	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	12
	930826	0.0000	0.0000	8
	930931	0.0000	0.0000	4
Sebastes serranoides adult		1.5833	2.9064	12
	930826	0.0000	0.0000	8
	930931	4.7500	3.3040	4
Sebastes serranoides juvenile		0.0000	0.0000	12
	930826	0.0000	0.0000	8
	930931	0.0000	0.0000	

4
Sebastes atrovirens adult 0.3333 0.6513
12
930826 0.1250 0.3536
8
930931 0.7500 0.9574
4
Sebastes atrovirens juvenile 0.0000 0.0000
12
930826 0.0000 0.0000
8
930931 0.0000 0.0000
4
Paralabrax clathratus adult 5.1667 3.2146
12
930826 3.5000 1.6036
8
930931 8.5000 3.1091
4
Paralabrax clathratus juvenile 0.2500 0.4523
12
930826 0.2500 0.4629
8
930931 0.2500 0.5000
4
Semicossyphus pulcher male 0.2500 0.6216
12
930826 0.0000 0.0000
8
930931 0.7500 0.9574
4
Semicossyphus pulcher female 4.0833 4.1222
12
930826 1.8750 1.6421
8
930931 8.5000 4.1231
4
Embiotoca jacksoni adult 3.0000 1.6514
12
930826 2.6250 1.4079
8
930931 3.7500 2.0616
4
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930826 0.0000 0.0000
8
930931 0.0000 0.0000
4

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

Embiotoca lateralis adult 0.0833 0.2887
12

	930826		0.1250	0.3536
8				
	930931		0.0000	0.0000
4				
Embiotoca	lateralis	juvenile	0.0000	0.0000
12				
	930826		0.0000	0.0000
8				
	930931		0.0000	0.0000
4				
Damalichthys	vacca	adult	0.0000	0.0000
12				
	930826		0.0000	0.0000
8				
	930931		0.0000	0.0000
4				
Damalichthys	vacca	juvenile	0.0000	0.0000
12				
	930826		0.0000	0.0000
8				
	930931		0.0000	0.0000
4				
Hypsypops	rubicundus	adult	5.0000	3.7417
12				
	930826		3.0000	2.5635
8				
	930931		9.0000	2.0000
4				
Hypsypops	rubicundus	juvenile	1.3333	1.3707
12				
	930826		1.3750	1.4079
8				
	930931		1.2500	1.5000
4				
Girella	nigricans	adult	0.9167	1.5050
12				
	930826		0.0000	0.0000
8				
	930931		2.7500	1.2583
4				
Girella	nigricans	juvenile	0.0000	0.0000
12				
	930826		0.0000	0.0000
8				
	930931		0.0000	0.0000
4				
Halichoeres	semicinctus	male	3.1667	4.1084
12				
	930826		1.2500	1.3887
8				
	930931		7.0000	5.2915
4				
Halichoeres	semicinctus	female	5.7500	5.9103
12				

	930826	2.3750	0.7440
8			
	930931	12.5000	5.9722
4			

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata
search method: general search

(cases) N=	6
< 140	0.0
140 - 144	50.0%
145 - 149	16.7%
150 - 154	16.7%
155 - 159	0.0
160 - 164	0.0
165 - 169	16.7%
> 169	0.0
min size (mm)	141
max size (mm)	167
mean	148
mode	141

Astraea undosa
search method: general search

(cases) N=	175
< 10	0.6%
10 - 19	0.0
20 - 29	0.0
30 - 39	1.7%
40 - 49	8.6%
50 - 59	4.6%
60 - 69	8.6%
70 - 79	16.6%
80 - 89	28.0%
90 - 99	19.4%
100 - 109	9.1%
110 - 119	2.3%
> 119	0.6%
min size (mm)	8
max size (mm)	131
mean	79
mode	92

Strongylocentrotus purpuratus
search method: general search

(cases) N=	63
< 5	0.0
5 - 9	15.9%
10 - 14	20.6%
15 - 19	4.8%
20 - 24	0.0
25 - 29	11.1%
30 - 34	7.9%
35 - 39	22.2%
40 - 44	6.3%
45 - 49	4.8%
50 - 54	6.3%
> 54	0.0
min size (mm)	7
max size (mm)	53
mean	27
mode	37

Hinnites giganteus
search method: general search

(cases) N=	64
< 20	0.0
20 - 29	1.6%
30 - 39	4.7%
40 - 49	9.4%
50 - 59	9.4%
60 - 69	21.9%
70 - 79	15.6%
80 - 89	12.5%
90 - 99	12.5%
100 - 109	6.3%
110 - 119	4.7%
120 - 129	0.0
130 - 139	0.0
140 - 149	1.6%
> 149	0.0
min size (mm)	23
max size (mm)	148
mean	73
mode	68

Strongylocentrotus franciscanus
search method: general search

(cases) N=	86
< 5	0.0
5 - 9	1.2%
10 - 14	4.7%
15 - 19	2.3%
20 - 24	0.0
25 - 29	0.0
30 - 34	1.2%
35 - 39	5.8%
40 - 44	0.0
45 - 49	1.2%
50 - 54	2.3%
55 - 59	1.2%
60 - 64	3.5%
65 - 69	0.0
70 - 74	12.8%
75 - 79	7.0%
80 - 84	16.3%
85 - 90	16.3%
90 - 94	14.0%
95 - 99	2.3%
100 - 104	4.7%
105 - 109	0.0
> 109	1.2%
min size (mm)	8
max size (mm)	117
mean	74
mode	85

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	164
< 3	45.1%
3 - 5	15.9%
6 - 8	6.1%
9 - 11	9.1%
12 - 14	3.7%
15 - 17	3.0%
18 - 20	4.3%
21 - 23	4.3%
24 - 26	1.8%
27 - 29	1.2%
30 - 32	1.8%
33 - 35	0.6%
36 - 38	0.6%
39 - 41	0.0
42 - 44	0.0
> 44	2.4%
min number	1
max number	79
mean	9
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	164
< 6	27.4%
6 - 11	31.1%
12 - 17	4.9%
18 - 23	11.0%
24 - 29	14.0%
30 - 35	7.3%
36 - 41	1.8%
42 - 47	1.2%
8 - 53	1.2%
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	3
max width (cm)	52
mean	14
mode	5

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata FROM 7 ARMs

(cases) N=	1
< 25	0.0
25 - 29	100.0%
> 29	0.0
min size (mm)	29
max size (mm)	29
mean	29
mode	29

Cypraea spadicea FROM 7 ARMs

(cases) N=	127
< 30	6.3%
30 - 34	15.0%
35 - 39	31.5%
40 - 44	37.0%
45 - 49	8.7%
50 - 54	1.6%
> 54	0.0
min size (mm)	8
max size (mm)	54
mean	38
mode	43

Astraea undosa FROM 7 ARMs

(cases) N=	6
< 50	0.0
50 - 59	16.7%
60 - 69	0.0
70 - 79	16.7%
80 - 89	66.7%
> 89	0.0
min size (mm)	55
max size (mm)	89
mean	80
mode	89

Pisaster giganteus FROM 7 ARMs

(cases) N=	11
< 20	27.3%
20 - 39	63.6%
40 - 59	9.1%
> 59	0.0
min size (mm)	18
max size (mm)	46
mean	26
mode	19

Hinnites giganteus FROM 7 ARMs

(cases) N=	7
< 10	42.9%
10 - 19	28.6%
20 - 29	0.0
30 - 39	14.3%
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	14.3%
> 79	0.0
min size (mm)	4
max size (mm)	72
mean	22
mode	4

Patiria miniata FROM 7 ARMs

(cases) N=	10
< 10	20.0%
10 - 19	40.0%
20 - 29	0.0
30 - 39	30.0%
40 - 49	10.0%
> 49	0.0
min size (mm)	8
max size (mm)	41
mean	21
mode	8

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
FROM 7 ARMs

(cases) N=	274
< 5	0.4%
5 - 9	15.7%
10 - 14	20.1%
15 - 19	4.7%
20 - 24	5.8%
25 - 29	7.3%
30 - 34	5.8%
35 - 39	4.4%
40 - 44	5.1%
45 - 49	6.9%
50 - 54	4.4%
55 - 59	6.6%
60 - 64	4.7%
65 - 69	4.0%
70 - 74	3.3%
75 - 79	0.4%
80 - 84	0.0
85 - 90	0.4%
> 90	0.0
min size (mm)	4
max size (mm)	86
mean	31
mode	10

Strongylocentrotus purpuratus
FROM 7 ARMs

(cases) N=	352
< 5	0.3%
5 - 9	13.6%
10 - 14	9.1%
15 - 19	6.5%
20 - 24	7.7%
25 - 29	11.9%
30 - 34	13.1%
35 - 39	14.5%
40 - 44	8.8%
45 - 49	6.5%
50 - 54	5.1%
55 - 59	2.6%
60 - 64	0.3%
> 64	0.0
min size (mm)	4
max size (mm)	60
mean	29
mode	36

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.5750	1.1729	20
Eisenia arborea	1.1750	1.3006	20
Pterygophora californica	0.4750	1.4462	20
Laminaria farlowii	2.7500	4.6637	20
Macrocystis pyrifera juvenile	1.3250	2.1961	20
Macrocystis pyrifera all	1.9000	3.2387	20
Cypraea spadicea	0.1250	0.3193	20
Astraea undosa	1.1250	1.9048	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	3.1250	3.3002	20
Strongylocentrotus purpuratus	1.7500	2.2390	20
Parastichopus parvamensis	0.2500	0.3804	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.1750	0.3726	20
Alloclinus holderi	0.2000	0.2991	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0028	0.0065	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0083	0.0195	12
Muricea fruticosa	0.0014	0.0048	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0139	0.0186	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0375	0.0450	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0028	0.0065	12
Megathura crenulata	0.0056	0.0109	12
Hinnites giganteus	0.6500	0.3459	12
Aplysia californica	0.0028	0.0065	12
Pycnopodia helianthoides	0.0014	0.0048	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	2.1000	3.7969	25
Miscellaneous brown algae	7.9000	10.3501	25
Desmarestia spp.	0.4000	2.0000	25
Eisenia arborea	29.1000	33.3610	25
Pterygophora californica	5.9000	11.3853	25
Laminaria farlowii	21.1000	25.7601	25
Cystoseira spp.	13.8000	15.4973	25
Macrocystis,*Eisenia*,*Pterygophora*	80.7000	39.5911	25
Macrocystis pyrifera all	45.7000	35.5794	25
Miscellaneous red algae	23.8000	23.3644	25
Articulated coralline algae	26.9000	18.8094	25
Crustose coralline algae	36.8000	18.7711	25
Gelidium spp.	25.5000	36.7990	25
Gigartina spp.	0.9000	2.2684	25
Miscellaneous plants	1.7000	2.5739	25
Sponges	2.4000	3.7832	25
Corynactis californica	1.4000	3.3135	25
Balanophyllia elegans	0.1000	0.5000	25
Astrangia lajollaensis	2.5000	4.0182	25
Diopatra ornata	0.3000	1.0992	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.4000	0.9354	25
Bryozoans	2.9000	3.8649	25
Diaperoecia californica	2.8000	4.5254	25
Tunicates	0.8000	1.3919	25
Miscellaneous invertebrates	7.6000	7.8555	25
Bare substrate	15.2000	18.5674	25
Rock	70.8000	29.3570	25
Cobble	18.8000	19.3800	25
Sand	10.4000	16.8121	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	6.1603	19.9850	156
Chromis punctipinnis	60.3333	45.7112	12
Oxyjulis californica	4.0000	2.5937	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.2500	0.4523	12
Paralabrax clathratus	3.8333	2.1672	12
Semicossyphus pulcher	3.4167	4.1878	12
Embiotoca jacksoni	1.0000	1.2792	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	3.1667	1.1934	12
Girella nigricans	1.1667	0.5774	12
Halichoeres semicinctus	2.9167	1.9752	12

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		32.0833	18.7445	12
	930827	33.8750	21.2027	8
	930930	28.5000	14.6173	4
Chromis punctipinnis juvenile		28.2500	42.0262	12
	930827	3.5000	4.8697	8
	930930	77.7500	38.9904	4
Oxyjulis californica adult		3.6667	2.2293	12
	930827	3.0000	1.7728	8
	930930	5.0000	2.7080	4
Oxyjulis californica juvenile		0.3333	0.4924	12
	930827	0.1250	0.3536	8
	930930	0.7500	0.5000	4
Sebastes mystinus adult		0.0000	0.0000	12
	930827	0.0000	0.0000	8
	930930	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	12
	930827	0.0000	0.0000	8
	930930	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	12
	930827	0.0000	0.0000	8
	930930	0.0000	0.0000	4
Sebastes serranoides juvenile		0.0000	0.0000	12
	930827	0.0000	0.0000	8
	930930	0.0000	0.0000	

4
Sebastes atrovirens adult 0.2500 0.4523
12
930827 0.3750 0.5175
8
930930 0.0000 0.0000
4
Sebastes atrovirens juvenile 0.0000 0.0000
12
930827 0.0000 0.0000
8
930930 0.0000 0.0000
4
Paralabrax clathratus adult 3.8333 2.1672
12
930827 2.6250 1.3025
8
930930 6.2500 1.2583
4
Paralabrax clathratus juvenile 0.0000 0.0000
12
930827 0.0000 0.0000
8
930930 0.0000 0.0000
4
Semicossyphus pulcher male 0.0000 0.0000
12
930827 0.0000 0.0000
8
930930 0.0000 0.0000
4
Semicossyphus pulcher female 3.4167 4.1878
12
930827 0.8750 1.1260
8
930930 8.5000 3.1091
4
Embiotoca jacksoni adult 1.0000 1.2792
12
930827 1.2500 1.3887
8
930930 0.5000 1.0000
4
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930827 0.0000 0.0000
8
930930 0.0000 0.0000
4

LOCATION 13 ANACAPA ISLAND - LANDING COVE

Embiotoca lateralis adult 0.0000 0.0000
12

	930827		0.0000	0.0000
8				
	930930		0.0000	0.0000
4				
Embiotoca	lateralis	juvenile	0.0000	0.0000
12				
	930827		0.0000	0.0000
8				
	930930		0.0000	0.0000
4				
Damalichthys	vacca	adult	0.0000	0.0000
12				
	930827		0.0000	0.0000
8				
	930930		0.0000	0.0000
4				
Damalichthys	vacca	juvenile	0.0000	0.0000
12				
	930827		0.0000	0.0000
8				
	930930		0.0000	0.0000
4				
Hypsypops	rubicundus	adult	2.8333	1.4035
12				
	930827		3.2500	1.3887
8				
	930930		2.0000	1.1547
4				
Hypsypops	rubicundus	juvenile	0.3333	0.6513
12				
	930827		0.0000	0.0000
8				
	930930		1.0000	0.8165
4				
Girella	nigricans	adult	1.1667	0.5774
12				
	930827		1.2500	0.7071
8				
	930930		1.0000	0.0000
4				
Girella	nigricans	juvenile	0.0000	0.0000
12				
	930827		0.0000	0.0000
8				
	930930		0.0000	0.0000
4				
Halichoeres	semicinctus	male	0.5000	0.6742
12				
	930827		0.7500	0.7071
8				
	930930		0.0000	0.0000
4				
Halichoeres	semicinctus	female	2.4167	2.1933
12				

	930827	1.5000	1.6036
8			
	930930	4.2500	2.2174
4			

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata
search method: general search

(cases) N=	59
< 120	0.0
120 - 124	1.7%
125 - 129	0.0
130 - 134	6.8%
135 - 139	10.2%
140 - 144	10.2%
145 - 149	11.9%
150 - 154	8.5%
155 - 159	8.5%
160 - 164	15.3%
165 - 169	5.1%
170 - 174	8.5%
175 - 179	3.4%
180 - 184	5.1%
185 - 189	3.4%
190 - 194	0.0
195 - 199	1.7%
> 199	0.0
min size (mm)	123
max size (mm)	197
mean	156
mode	163

Astraea undosa
search method: 1.5 m pole

(cases) N=	111
< 10	0.0
10 - 19	1.8%
20 - 29	0.9%
30 - 39	6.3%
40 - 49	36.0%
50 - 59	19.8%
60 - 69	14.4%
70 - 79	14.4%
80 - 89	5.4%
90 - 99	0.9%
> 99	0.0
min size (mm)	11
max size (mm)	92
mean	54
mode	45

Hinnites giganteus
search method: general search

(cases) N=	216
< 10	0.0
10 - 19	1.4%
20 - 29	4.2%
30 - 39	9.7%
40 - 49	15.7%
50 - 59	16.7%
60 - 69	14.4%
70 - 79	16.7%
80 - 89	7.4%
90 - 99	6.5%
100 - 109	3.7%
110 - 119	2.8%
120 - 129	0.0
130 - 139	0.5%
> 139	0.5%
min size (mm)	14
max size (mm)	188
mean	63
mode	50

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: general search

(cases) N=	110
< 5	0.9%
5 - 9	2.7%
10 - 14	2.7%
15 - 19	1.8%
20 - 24	0.0
25 - 29	0.0
30 - 34	0.0
35 - 39	4.5%
40 - 44	3.6%
45 - 49	1.8%
50 - 54	3.6%
55 - 59	0.9%
60 - 64	4.5%
65 - 69	4.5%
70 - 74	1.8%
75 - 79	3.6%
80 - 84	9.1%
85 - 90	9.1%
90 - 94	10.0%
95 - 99	7.3%
100 - 104	14.5%
105 - 109	8.2%
> 109	2.7%
min size (mm)	4
max size (mm)	120
mean	78
mode	88

Strongylocentrotus purpuratus
search method: general search

(cases) N=	35
< 20	0.0
20 - 24	2.9%
25 - 29	2.9%
30 - 34	0.0
35 - 39	8.6%
40 - 44	17.1%
45 - 49	11.4%
50 - 54	25.7%
55 - 59	17.1%
60 - 64	5.7%
65 - 69	8.6%
> 69	0.0
min size (mm)	20
max size (mm)	69
mean	50
mode	54

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	149
< 3	79.9%
3 - 5	14.8%
6 - 8	3.4%
9 - 11	0.7%
12 - 14	0.0
15 - 17	0.0
18 - 20	0.0
21 - 23	0.0
24 - 26	0.7%
27 - 29	0.7%
30 - 32	0.0
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0
min number	1
max number	28
mean	3
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	149
< 6	30.9%
6 - 11	55.0%
12 - 17	13.4%
18 - 23	0.0
24 - 29	0.0
30 - 35	0.7%
36 - 41	0.0
42 - 47	0.0
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	2
max width (cm)	34
mean	8
mode	5

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata FROM 7 ARMs

(cases) N=	3
< 25	100.0%
26 - 29	0.0
> 29	0.0
min size (mm)	21
max size (mm)	23
mean	22
mode	22

Cypraea spadicea FROM 7 ARMs

(cases) N=	29
< 30	0.0
30 - 34	10.3%
35 - 39	20.7%
40 - 44	31.0%
45 - 49	31.0%
50 - 54	6.9%
> 54	0.0
min size (mm)	32
max size (mm)	52
mean	42
mode	41

Astraea undosa FROM 7 ARMs

(cases) N=	10
< 40	0.0
40 - 49	10.0%
50 - 59	30.0%
60 - 69	40.0%
70 - 79	20.0%
> 79	0.0
min size (mm)	40
max size (mm)	79
mean	61
mode	64

Megathura crenulata FROM 7 ARMs

(cases) N=	1
< 10	0.0
10 - 19	100.0%
> 19	0.0
min size (mm)	18
max size (mm)	18
mean	18
mode	18

Hinnites giganteus FROM 7 ARMs

(cases) N=	49
< 10	61.2%
10 - 19	24.5%
20 - 29	2.0%
30 - 39	2.0%
40 - 49	2.0%
50 - 59	2.0%
60 - 69	4.1%
70 - 79	0.0
80 - 89	2.0%
> 89	0.0
min size (mm)	4
max size (mm)	83
mean	14
mode	6

Patiria miniata FROM 7 ARMs

(cases) N=	14
< 10	35.7%
10 - 19	42.9%
20 - 29	14.3%
30 - 39	7.1%
> 39	0.0
min size (mm)	5
max size (mm)	32
mean	14
mode	8

Pisaster giganteus FROM 7 ARMs

(cases) N=	17
< 20	47.1%
20 - 39	35.3%
40 - 59	5.9%
60 - 79	0.0
80 - 99	0.0
100 - 119	0.0
120 - 139	5.9%
140 - 159	5.9%
> 159	0.0
min size (mm)	12
max size (mm)	150
mean	35
mode	18

LOCATION 13 ANACAPA ISLAND - LANDING COVE

1993 ARTIFICIAL RECRUITMENT MODULE SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
FROM 7 ARMs

(cases) N=	83
< 5	1.2%
5 - 9	20.5%
10 - 14	9.6%
15 - 19	8.4%
20 - 24	15.7%
25 - 29	12.0%
30 - 34	8.4%
35 - 39	4.8%
40 - 44	6.0%
45 - 49	6.0%
50 - 54	2.4%
55 - 59	2.4%
60 - 64	0.0
65 - 69	1.2%
70 - 74	1.2%
> 74	0.0
min size (mm)	4
max size (mm)	70
mean	25
mode	7

Strongylocentrotus purpuratus
FROM 7 ARMs

(cases) N=	216
< 5	3.2%
5 - 9	14.4%
10 - 14	11.6%
15 - 19	7.9%
20 - 24	8.8%
25 - 29	9.3%
30 - 34	7.4%
35 - 39	13.4%
40 - 44	10.2%
45 - 49	11.1%
50 - 54	1.4%
55 - 59	1.4%
> 59	0.0
min size (mm)	3
max size (mm)	57
mean	27
mode	7

Lytechinus anamesus FROM 7 ARMs

(cases) N=	5
< 5	0.0
5 - 9	100.0%
> 9	0.0
min size (mm)	7
max size (mm)	9
mean	8
mode	9

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.6250	0.8565	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0250	0.1118	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	1.2000	1.3707	20
Macrocystis pyrifera all	1.8250	1.7417	20
Cypraea spadicea	0.0500	0.1539	20
Astraea undosa	0.4750	0.4993	20
Patiria miniata	0.0750	0.1832	20
Pisaster giganteus	0.1750	0.2936	20
Strongylocentrotus franciscanus	2.6750	3.1800	20
Strongylocentrotus purpuratus	16.7750	16.2703	20
Parastichopus parvamensis	0.7500	0.7695	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.4500	0.4560	20
Alloclinus holderi	0.2750	0.3796	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.1306	0.1176	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.1736	0.0683	12
Muricea fruticosa	0.0083	0.0112	12
Muricea californica	0.0208	0.0267	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0014	0.0048	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0028	0.0096	12
Hinnites giganteus	0.0028	0.0065	12
Aplysia californica	0.6111	0.3198	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	3.9458	1.5292	12

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	2.5000	2.7951	25
Miscellaneous brown algae	4.9000	4.5917	25
Desmarestia spp.	0.3000	1.5000	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	0.5000	2.5000	25
Cystoseira spp.	12.9000	17.5843	25
Macrocystis,Eisenia,Pterygophora	36.2000	27.1485	25
Macrocystis pyrifera all	36.2000	27.1485	25
Miscellaneous red algae	7.4000	10.0902	25
Articulated coralline algae	2.1000	2.7651	25
Crustose coralline algae	44.8000	14.0483	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.5000	1.7678	25
Sponges	0.9000	1.4216	25
Corynactis californica	0.5000	1.2500	25
Balanophyllia elegans	0.7000	1.5343	25
Astrangia lajollaensis	4.0000	3.1458	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans	5.7000	5.4734	25
Diaperoecia californica	0.4000	0.9354	25
Tunicates	5.4000	4.9308	25
Miscellaneous invertebrates	23.2000	10.5948	25
Bare substrate	17.5000	17.5594	25
Rock	86.8000	18.5056	25
Cobble	2.9000	3.5119	25
Sand	10.3000	16.3191	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	8.2961	24.2751	152
Chromis punctipinnis	57.1667	36.7741	12
Oxyjulis californica	40.2500	48.2515	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0833	0.2887	12
Paralabrax clathratus	0.9167	0.7930	12
Semicossyphus pulcher	4.0000	1.4142	12
Embiotoca jacksoni	0.0000	0.0000	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.1667	0.3892	12
Hypsypops rubicundus	1.0000	0.8528	12
Girella nigricans	0.6667	1.3707	12
Halichoeres semicinctus	1.2500	1.0351	8

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		33.6667	20.1600	12
	930623	26.0000	14.0712	4
	930824	37.5000	22.4372	8
Chromis punctipinnis juvenile		23.5000	38.5168	12
	930623	70.5000	31.9635	4
	930824	0.0000	0.0000	8
Oxyjulis californica adult		23.9167	24.1264	12
	930623	51.2500	21.4223	4
	930824	10.2500	8.8115	8
Oxyjulis californica juvenile		16.3333	24.9885	12
	930623	46.0000	22.3756	4
	930824	1.5000	3.5051	8
Sebastes mystinus adult		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes serranoides juvenile		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	

8
Sebastes atrovirens adult 0.0833 0.2887
12
930623 0.2500 0.5000
4
930824 0.0000 0.0000
8
Sebastes atrovirens juvenile 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8
Paralabrax clathratus adult 0.6667 0.4924
12
930623 0.7500 0.5000
4
930824 0.6250 0.5175
8
Paralabrax clathratus juvenile 0.2500 0.6216
12
930623 0.7500 0.9574
4
930824 0.0000 0.0000
8
Semicossyphus pulcher male 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8
Semicossyphus pulcher female 4.0000 1.4142
12
930623 3.2500 1.5000
4
930824 4.3750 1.3025
8
Embiotoca jacksoni adult 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

Embiotoca lateralis adult 0.0000 0.0000
12

	930623		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Embiotoca lateralis	juvenile		0.0000	0.0000
12				
	930623		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Damalichthys vacca	adult		0.1667	0.3892
12				
	930623		0.0000	0.0000
4				
	930824		0.2500	0.4629
8				
Damalichthys vacca	juvenile		0.0000	0.0000
12				
	930623		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Hypsypops rubicundus	adult		0.6667	0.6513
12				
	930623		0.2500	0.5000
4				
	930824		0.8750	0.6409
8				
Hypsypops rubicundus	juvenile		0.3333	0.4924
12				
	930623		0.0000	0.0000
4				
	930824		0.5000	0.5345
8				
Girella nigricans	adult		0.6667	1.3707
12				
	930623		1.7500	2.0616
4				
	930824		0.1250	0.3536
8				
Girella nigricans	juvenile		0.0000	0.0000
12				
	930623		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Halichoeres semicinctus	male	0.2500	0.4629	8
	930623	0.0000	0.0000	4
	930824	0.5000	0.5774	4
Halichoeres semicinctus	female	1.0000	1.1952	8
	930623	1.5000	1.2910	4
	930824	0.5000	1.0000	4

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Tethya aurantia
search method: general search

(cases) N=	105
< 10	0.0
10 - 19	1.9%
20 - 29	9.5%
30 - 39	21.0%
40 - 49	21.9%
50 - 59	17.1%
60 - 69	13.3%
70 - 79	10.5%
80 - 89	3.8%
90 - 99	0.0
> 99	1.0%
min size (mm)	15
max size (mm)	119
mean	49
mode	42

Astraea undosa
search method: general search

(cases) N=	118
< 20	0.0
20 - 29	0.8%
30 - 39	5.1%
40 - 49	30.5%
50 - 59	36.4%
60 - 69	15.3%
70 - 79	4.2%
80 - 89	3.4%
90 - 99	2.5%
100 - 109	1.7%
> 109	0.0
min size (mm)	21
max size (mm)	108
mean	55
mode	50

Patiria miniata
search method: general search

(cases) N=	68
< 30	0.0
30 - 39	1.5%
40 - 49	7.4%
50 - 59	19.1%
60 - 69	33.8%
70 - 79	26.5%
80 - 89	10.3%
90 - 99	1.5%
> 99	0.0
min size (mm)	33
max size (mm)	93
mean	67
mode	59

Pisaster giganteus
search method: general search

(cases) N=	58
< 40	0.0
40 - 59	1.7%
60 - 79	50.0%
80 - 99	41.4%
100 - 119	1.7%
120 - 139	3.4%
140 - 159	0.0
160 - 179	0.0
180 - 199	1.7%
> 199	0.0
min size (mm)	43
max size (mm)	187
mean	81
mode	81

Lytechinus anamesus
search method: 1.5 m pole

(cases) N=	455
< 5	0.4%
5 - 9	1.8%
10 - 14	8.1%
15 - 19	17.4%
20 - 24	39.1%
25 - 29	26.8%
30 - 34	6.4%
> 34	0.0
min size (mm)	2
max size (mm)	33
mean	22
mode	23

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	85
< 5	0.0
5 - 9	22.4%
10 - 14	21.2%
15 - 19	3.5%
20 - 24	3.5%
25 - 29	3.5%
30 - 34	14.1%
35 - 39	16.5%
40 - 44	10.6%
45 - 49	4.7%
> 49	0.0
min size (mm)	6
max size (mm)	46
mean	24
mode	9

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	170
< 5	0.6%
5 - 9	21.8%
10 - 14	7.6%
15 - 19	4.7%
20 - 24	17.6%
25 - 29	32.9%
30 - 34	12.9%
35 - 39	1.8%
> 39	0.0
min size (mm)	4
max size (mm)	36
mean	21
mode	26

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	150
< 3	34.7%
3 - 5	40.0%
6 - 8	19.3%
9 - 11	3.3%
12 - 14	1.3%
15 - 17	1.3%
18 - 20	0.0
21 - 23	0.0
24 - 26	0.0
27 - 29	0.0
30 - 32	0.0
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0
min number	1
max number	16
mean	4
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	150
< 6	18.0%
6 - 11	52.7%
12 - 17	22.0%
18 - 23	7.3%
24 - 29	0.0
30 - 35	0.0
36 - 41	0.0
42 - 47	0.0
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	2
max width (cm)	23
mean	10
mode	9

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Lophogorgia chilensis widths
search method: general search

(cases) N=	125
< 5	0.8%
5 - 8	4.8%
9 - 12	7.2%
13 - 16	15.2%
17 - 20	16.0%
21 - 24	16.0%
25 - 28	15.2%
29 - 32	13.6%
33 - 36	4.0%
37 - 40	4.0%
41 - 44	0.8%
45 - 48	0.8%
49 - 52	0.0
53 - 56	0.8%
57 - 60	0.0
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.8%
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min width (cm)	3
max width (cm)	77
mean	23
mode	25

Lophogorgia chilensis heights
search method: general search

(cases) N=	125
< 5	0.0
5 - 8	0.8%
9 - 12	4.8%
13 - 16	8.8%
17 - 20	8.8%
21 - 24	17.6%
25 - 28	22.4%
29 - 32	10.4%
33 - 36	9.6%
37 - 40	8.8%
41 - 44	2.4%
45 - 48	4.0%
49 - 52	0.8%
53 - 56	0.8%
57 - 60	0.0
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	5
max height (cm)	54
mean	27
mode	26

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Muricea californcia widths
search method: general search

(cases) N=	46
< 5	0.0
5 - 8	0.0
9 - 12	2.2%
13 - 16	2.2%
17 - 20	4.3%
21 - 24	8.7%
25 - 28	13.0%
29 - 32	4.3%
33 - 36	4.3%
37 - 40	2.2%
41 - 44	4.3%
45 - 48	0.0
49 - 52	8.7%
53 - 56	10.9%
57 - 60	2.2%
61 - 64	8.7%
65 - 68	0.0
69 - 72	4.3%
73 - 76	2.2%
77 - 80	2.2%
81 - 84	4.3%
85 - 88	0.0
89 - 92	2.2%
93 - 96	2.2%
97 - 100	2.2%
> 100	4.3%
min width (cm)	12
max width (cm)	115
mean	50
mode	27

Muricea californcia heights
search method: general search

(cases) N=	46
< 5	0.0
5 - 8	0.0
9 - 12	2.2%
13 - 16	8.7%
17 - 20	2.2%
21 - 24	2.2%
25 - 28	15.2%
29 - 32	8.7%
33 - 36	13.0%
37 - 40	6.5%
41 - 44	2.2%
45 - 48	19.6%
49 - 52	13.0%
53 - 56	2.2%
57 - 60	2.2%
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	2.2%
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	0.0
min height (cm)	12
max height (cm)	88
mean	37
mode	28

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	0.4000	0.7712	20
Eisenia arborea	0.6000	1.0336	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	0.8500	1.3679	20
Macrocystis pyrifera all	1.2500	1.8028	20
Cypraea spadicea	0.0000	0.0000	20
Astraea undosa	0.7250	0.8503	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	2.8250	2.3802	20
Strongylocentrotus purpuratus	5.7000	6.9099	20
Parastichopus parvamensis	0.1500	0.2856	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0500	0.1539	20
Alloclinus holderi	0.4500	0.5356	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0014	0.0048	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0014	0.0048	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0014	0.0048	12
Panulirus interruptus	0.0042	0.0104	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0000	0.0000	12
Hinnites giganteus	0.0056	0.0148	12
Aplysia californica	0.0208	0.0176	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0028	0.0096	12

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	9.4000	7.4400	25
Miscellaneous brown algae	22.5000	20.0650	25
Desmarestia spp.	0.0000	0.0000	25
Eisenia arborea	2.3000	8.6277	25
Pterygophora californica	0.0000	0.0000	25
Laminaria farlowii	1.3000	3.8270	25
Cystoseira spp.	5.4000	13.5339	25
Macrocystis,*Eisenia*,*Pterygophora*	17.5000	24.0767	25
Macrocystis pyrifera all	15.2000	22.5915	25
Miscellaneous red algae	12.3000	8.9245	25
Articulated coralline algae	37.5000	17.9699	25
Crustose coralline algae	64.0000	21.3722	25
Gelidium spp.	1.1000	2.9826	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.3000	3.4701	25
Sponges	0.9000	1.5943	25
Corynactis californica	1.0000	1.6137	25
Balanophyllia elegans	0.0000	0.0000	25
Astrangia lajollaensis	0.6000	1.3070	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.1000	0.5000	25
Bryozoans	8.8000	13.1719	25
Diaperoecia californica	0.1000	0.5000	25
Tunicates	2.5000	3.1458	25
Miscellaneous invertebrates	8.0000	5.4962	25
Bare substrate	11.0000	9.5743	25
Rock	79.5000	15.0866	25
Cobble	16.1000	16.0416	25
Sand	4.4000	5.8310	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	24.7628	73.7996	156
Chromis punctipinnis	175.6667	62.8452	12
Oxyjulis californica	116.5833	180.7391	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0000	0.0000	12
Paralabrax clathratus	7.3333	3.9619	12
Semicossyphus pulcher	4.0000	2.6629	12
Embiotoca jacksoni	0.2500	0.4523	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	11.8333	4.3240	12
Girella nigricans	4.5833	5.8692	12
Halichoeres semicinctus	3.6250	1.5980	8

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		164.9167	57.3006	12
	930624	177.5000	29.0115	4
	930824	158.6250	68.2871	8
Chromis punctipinnis juvenile		10.7500	9.6023	12
	930624	12.5000	12.5831	4
	930824	9.8750	8.6262	8
Oxyjulis californica adult		22.3333	12.6299	12
	930624	32.7500	16.3376	4
	930824	17.1250	6.5778	8
Oxyjulis californica juvenile		94.2500	170.3751	12
	930624	282.5000	188.5692	4
	930824	0.1250	0.3536	8
Sebastes mystinus adult		0.0000	0.0000	12
	930624	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	930624	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	930624	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes serranoides juvenile		0.0000	0.0000	12
	930624	0.0000	0.0000	4
	930824	0.0000	0.0000	

8
Sebastes atrovirens adult 0.0000 0.0000
12
930624 0.0000 0.0000
4
930824 0.0000 0.0000
8
Sebastes atrovirens juvenile 0.0000 0.0000
12
930624 0.0000 0.0000
4
930824 0.0000 0.0000
8
Paralabrax clathratus adult 6.8333 4.2391
12
930624 1.7500 1.7078
4
930824 9.3750 2.1998
8
Paralabrax clathratus juvenile 0.5000 1.0000
12
930624 1.0000 1.4142
4
930824 0.2500 0.7071
8
Semicossyphus pulcher male 0.2500 0.4523
12
930624 0.7500 0.5000
4
930824 0.0000 0.0000
8
Semicossyphus pulcher female 3.7500 2.3789
12
930624 5.2500 2.6300
4
930824 3.0000 2.0000
8
Embiotoca jacksoni adult 0.2500 0.4523
12
930624 0.5000 0.5774
4
930824 0.1250 0.3536
8
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930624 0.0000 0.0000
4
930824 0.0000 0.0000
8
LOCATION 15 ANACAPA ISLAND - ARCH POINT

Embiotoca lateralis adult 0.0000 0.0000
12
930624 0.0000 0.0000

4				
	930824		0.0000	0.0000
8				
Embiotoca lateralis		juvenile	0.0000	0.0000
12				
	930624		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Damalichthys vacca		adult	0.0000	0.0000
12				
	930624		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Damalichthys vacca		juvenile	0.0000	0.0000
12				
	930624		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Hypsypops rubicundus		adult	9.9167	3.3967
12				
	930624		6.7500	1.5000
4				
	930824		11.5000	2.9277
8				
Hypsypops rubicundus		juvenile	1.9167	1.1645
12				
	930624		1.2500	1.2583
4				
	930824		2.2500	1.0351
8				
Girella nigricans		adult	4.5833	5.8692
12				
	930624		3.7500	3.3040
4				
	930824		5.0000	6.9898
8				
Girella nigricans		juvenile	0.0000	0.0000
12				
	930624		0.0000	0.0000
4				
	930824		0.0000	0.0000
8				
Halichoeres semicinctus		male	1.6250	0.9151
8				
	930824		1.6250	0.9151
8				
Halichoeres semicinctus		female	2.0000	1.0690
8				
	930824		2.0000	1.0690
8				

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Astraea undosa
search method: general search

(cases) N=	182
< 10	0.0
10 - 19	3.8%
20 - 29	13.2%
30 - 39	37.9%
40 - 49	28.6%
50 - 59	5.5%
60 - 69	3.3%
70 - 79	5.5%
80 - 89	1.6%
90 - 99	0.0
100 - 109	0.5%
> 109	0.0
min size (mm)	13
max size (mm)	108
mean	41
mode	35

Pisaster giganteus
search method: general search

(cases) N=	17
< 60	0.0
60 - 79	11.8%
80 - 99	17.6%
100 - 119	29.4%
120 - 139	23.5%
140 - 159	5.9%
160 - 179	11.8%
> 179	0.0
min size (mm)	68
max size (mm)	173
mean	113
mode	104

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	140
< 5	2.1%
5 - 9	17.1%
10 - 14	3.6%
15 - 19	3.6%
20 - 24	7.1%
25 - 29	6.4%
30 - 34	2.9%
35 - 39	0.7%
40 - 44	3.6%
45 - 49	7.9%
50 - 54	6.4%
55 - 59	2.1%
60 - 64	8.6%
65 - 69	5.7%
70 - 74	9.3%
75 - 79	5.0%
80 - 84	4.3%
85 - 90	0.7%
90 - 94	0.7%
95 - 99	0.7%
100 - 104	0.7%
> 104	0.0
min size (mm)	3
max size (mm)	110
mean	43
mode	7

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	203
< 5	3.9%
5 - 9	18.2%
10 - 14	26.1%
15 - 19	11.8%
20 - 24	13.3%
25 - 29	9.4%
30 - 34	7.4%
35 - 39	5.4%
40 - 44	2.5%
45 - 49	1.5%
50 - 54	0.0
55 - 59	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	0.0
75 - 79	0.0
80 - 84	0.0
85 - 90	0.5%
> 90	0.0
min size (mm)	2
max size (mm)	85
mean	18
mode	12

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	99
< 3	58.6%
3 - 5	34.3%
6 - 8	6.1%
9 - 11	0.0
12 - 14	1.0%
15 - 17	0.0
18 - 20	0.0
21 - 23	0.0
24 - 26	0.0
27 - 29	0.0
30 - 32	0.0
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0
min number	1
max number	13
mean	3
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	99
< 6	3.0%
6 - 11	55.6%
12 - 17	36.4%
18 - 23	4.0%
24 - 29	0.0
30 - 35	1.0%
36 - 41	0.0
42 - 47	0.0
48 - 53	0.0
54 - 59	0.0
60 - 65	0.0
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
> 89	0.0
min width (cm)	4
max width (cm)	31
mean	11
mode	11

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

1993 QUADRAT DATA: MEAN NUMBER PER M^2

Species	Mean	Std Dev	Cases
Macrocystis pyrifera adult	3.8750	4.9468	20
Eisenia arborea	0.0250	0.1118	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	13.2750	14.2279	20
Macrocystis pyrifera all	17.1500	16.8274	20
Cypraea spadicea	0.0000	0.0000	20
Astraea undosa	0.0500	0.1539	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0500	0.1539	20
Strongylocentrotus franciscanus	3.2500	3.5596	20
Strongylocentrotus purpuratus	5.7250	5.1157	20
Parastichopus parvamensis	0.2250	0.3796	20
Styela montereyensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0000	0.0000	20
Alloclinus holderi	0.0500	0.1539	20

1993 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0000	0.0000	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0000	0.0000	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0014	0.0048	12
Panulirus interruptus	0.0250	0.0764	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0042	0.0104	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0056	0.0109	12
Megathura crenulata	0.0083	0.0112	12
Hinnites giganteus	0.0014	0.0048	12
Aplysia californica	0.0167	0.0201	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

1993 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	Mean	Std Dev	Cases
Green algae	4.1000	5.0970	25
Miscellaneous brown algae	19.2000	15.3725	25
Desmarestia spp.	0.1000	0.5000	25
Eisenia arborea	0.0000	0.0000	25
Pterygophora californica	0.3000	1.5000	25
Laminaria farlowii	0.4000	1.5612	25
Cystoseira spp.	11.8000	12.1518	25
Macrocystis,Eisenia,Pterygophora	61.7000	21.3322	25
Macrocystis pyrifera all	61.4000	21.2999	25
Miscellaneous red algae	15.1000	5.4715	25
Articulated coralline algae	21.9000	14.9353	25
Crustose coralline algae	36.8000	18.9643	25
Gelidium spp.	0.2000	0.6922	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.1000	0.5000	25
Sponges	1.4000	1.7795	25
Corynactis californica	0.0000	0.0000	25
Balanophyllia elegans	0.2000	0.6922	25
Astrangia lajollaensis	0.0000	0.0000	25
Diopatra ornata	0.1000	0.5000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.3000	0.8292	25
Bryozoans	7.3000	8.6277	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	2.5000	2.7951	25
Miscellaneous invertebrates	7.7000	5.4448	25
Bare substrate	27.6000	19.8625	25
Rock	80.5000	20.2073	25
Cobble	1.4000	2.6101	25
Sand	18.1000	20.7826	25

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Total Fish Abundance	2.5658	5.5106	152
Chromis punctipinnis	17.0000	9.3127	12
Oxyjulis californica	6.1667	5.7656	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0000	0.0000	12
Paralabrax clathratus	2.0833	1.1645	12
Semicossyphus pulcher	1.0000	0.8528	12
Embiotoca jacksoni	0.0833	0.2887	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	2.6667	1.3027	12
Girella nigricans	1.0833	1.0836	12
Halichoeres semicinctus	1.6667	1.4355	12

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

1993 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		17.0000	9.3127	12
	930623	18.0000	5.5976	4
	930824	16.5000	11.0454	8
Chromis punctipinnis juvenile		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Oxyjulis californica adult		6.1667	5.7656	12
	930623	13.0000	4.8990	4
	930824	2.7500	1.3887	8
Oxyjulis californica juvenile		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes mystinus adult		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	8
Sebastes serranoides juvenile		0.0000	0.0000	12
	930623	0.0000	0.0000	4
	930824	0.0000	0.0000	

8
Sebastes atrovirens adult 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8
Sebastes atrovirens juvenile 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8
Paralabrax clathratus adult 1.8333 1.1146
12
930623 1.5000 0.5774
4
930824 2.0000 1.3093
8
Paralabrax clathratus juvenile 0.2500 0.6216
12
930623 0.7500 0.9574
4
930824 0.0000 0.0000
8
Semicossyphus pulcher male 0.0833 0.2887
12
930623 0.2500 0.5000
4
930824 0.0000 0.0000
8
Semicossyphus pulcher female 0.9167 0.9003
12
930623 0.7500 1.5000
4
930824 1.0000 0.5345
8
Embiotoca jacksoni adult 0.0833 0.2887
12
930623 0.0000 0.0000
4
930824 0.1250 0.3536
8
Embiotoca jacksoni juvenile 0.0000 0.0000
12
930623 0.0000 0.0000
4
930824 0.0000 0.0000
8
LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

Embiotoca lateralis adult 0.0000 0.0000
12
930623 0.0000 0.0000

4			
	930824	0.0000	0.0000
8			
Embiotoca lateralis	juvenile	0.0000	0.0000
12			
	930623	0.0000	0.0000
4			
	930824	0.0000	0.0000
8			
Damalichthys vacca	adult	0.0000	0.0000
12			
	930623	0.0000	0.0000
4			
	930824	0.0000	0.0000
8			
Damalichthys vacca	juvenile	0.0000	0.0000
12			
	930623	0.0000	0.0000
4			
	930824	0.0000	0.0000
8			
Hypsypops rubicundus	adult	1.8333	0.9374
12			
	930623	1.7500	0.9574
4			
	930824	1.8750	0.9910
8			
Hypsypops rubicundus	juvenile	0.8333	0.9374
12			
	930623	1.2500	0.9574
4			
	930824	0.6250	0.9161
8			
Girella nigricans	adult	1.0833	1.0836
12			
	930623	0.5000	0.5774
4			
	930824	1.3750	1.1877
8			
Girella nigricans	juvenile	0.0000	0.0000
12			
	930623	0.0000	0.0000
4			
	930824	0.0000	0.0000
8			
Halichoeres semicinctus	male	0.2500	0.6216
12			
	930623	0.0000	0.0000
4			
	930824	0.3750	0.7440
8			
Halichoeres semicinctus	female	1.4167	1.3114
12			
	930623	2.2500	1.8930

4
930824 1.0000 0.7559
8

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Haliotis corrugata
search method: general search

(cases) N=	5
< 25	0.0
25 - 29	0.0
30 - 34	0.0
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
50 - 54	0.0
55 - 59	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	0.0
75 - 79	0.0
80 - 84	0.0
85 - 90	0.0
90 - 94	0.0
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
110 - 114	20.0%
115 - 119	0.0
120 - 124	0.0
125 - 129	0.0
130 - 134	20.0%
135 - 139	0.0
140 - 144	0.0
145 - 149	20.0%
150 - 154	20.0%
155 - 159	0.0
160 - 164	20.0%
> 164	0.0
min size (mm)	113
max size (mm)	162
mean	141
mode	113

Astraea undosa
search method: general search

(cases) N=	54
< 10	0.0
10 - 19	7.4%
20 - 29	11.1%
30 - 39	9.3%
40 - 49	16.7%
50 - 59	37.0%
60 - 69	5.6%
70 - 79	9.3%
80 - 89	3.7%
> 89	0.0
min size (mm)	10
max size (mm)	80
mean	48
mode	57

Strongylocentrotus franciscanus
search method: quadrat

(cases) N=	139
< 5	0.0
5 - 9	0.0
10 - 14	1.4%
15 - 19	5.0%
20 - 24	9.4%
25 - 29	10.8%
30 - 34	9.4%
35 - 39	7.2%
40 - 44	7.2%
45 - 49	7.2%
50 - 54	3.6%
55 - 59	1.4%
60 - 64	2.2%
65 - 69	0.0
70 - 74	4.3%
75 - 79	5.8%
80 - 84	12.2%
85 - 90	6.5%
90 - 94	5.0%
95 - 99	0.7%
100 - 104	0.0
105 - 109	0.7%
> 109	0.0
min size (mm)	10
max size (mm)	105
mean	51
mode	27

Strongylocentrotus purpuratus
search method: quadrat

(cases) N=	230
< 5	0.0
5 - 9	1.7%
10 - 14	7.8%
15 - 19	8.7%
20 - 24	7.4%
25 - 29	4.8%
30 - 34	5.7%
35 - 39	11.7%
40 - 44	22.6%
45 - 49	17.4%
50 - 54	9.1%
55 - 59	3.0%
> 59	0.0
min size (mm)	6
max size (mm)	59
mean	36
mode	42

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

1993 NATURAL HABITAT SIZE FREQUENCY DISTRIBUTIONS:

Macrocystis pyrifera number of stipes
search method: general search

(cases) N=	100
< 3	36.0%
3 - 5	26.0%
6 - 8	16.0%
9 - 11	5.0%
12 - 14	8.0%
15 - 17	3.0%
18 - 20	2.0%
21 - 23	0.0
24 - 26	0.0
27 - 29	2.0%
30 - 32	1.0%
33 - 35	1.0%
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
> 44	0.0
min number	1
max number	33
mean	6
mode	2

Macrocystis pyrifera holdfast diameters
search method: general search

(cases) N=	100
< 6	8.0%
6 - 11	46.0%
12 - 17	20.0%
18 - 23	13.0%
24 - 29	6.0%
30 - 35	2.0%
36 - 41	0.0
42 - 47	2.0%
48 - 53	1.0%
54 - 59	0.0
60 - 65	1.0%
66 - 71	0.0
72 - 77	0.0
78 - 83	1.0%
84 - 89	0.0
> 89	0.0
min width (cm)	3
max width (cm)	80
mean	15
mode	10

Table 1. Regularly monitored species by taxonomic grouping, common name, scientific name and associated monitoring technique.

TAXA/COMMON NAME	SCIENTIFIC NAME	TECHNIQUE
ALGAE		
Miscellaneous Green Algae		
Miscellaneous Red Algae		
Articulated Coralline Algae		R
Crustose Coralline Algae		R
Agar weed	*Gelidium spp.*	R
Sea tongue	*Gigartina spp.*	R
Miscellaneous Brown Algae		R
Acid weed	*Desmarestia spp.*	R
Oar weed	*Laminaria farlowii*	R,Q
Bladder chain kelp	*Cystoseira spp.*	R
Giant kelp	*Macrocystis pyrifera*	R,Q
California sea palm	*Pterygophora californica*	R,Q
Southern sea palm	*Eisenia arborea*	R,Q
Miscellaneous plants		R
INVERTEBRATES		
Miscellaneous Sponges		R
Orange puffball sponge	*Tethya aurantia*	B,S
Southern staghorn bryozoan	*Diaperoecia californica*	R
Miscellaneous Bryozoans		R
California hydrocoral	*Allopora californica*	B,S
White-spotted rose anemone	*Tealia lofotensis*	B
Red gorgonian	*Lophogorgia chilensis*	B,S
Brown gorgonian	*Muricea fruticosa*	B,S
California golden gorgonian	*Muricea californica*	B,S
Strawberry anemone	*Corynactis californica*	R
Orange cup coral	*Balanophyllia elegans*	R
La Jolla cup coral	*Astrangia lajollaensis*	R
Hydroids		R
Ornate tube worm	*Diopatra ornata*	R
Colonial sand-tube worm	*Phragmatopoma californica*	R
Scaled-tube snail	*Serpulorbis squamigerus*	R
Chestnut cowrie	*Cypraea spadicea*	Q
Wavy turban snail	*Astraea undosa*	Q,S
Red turban snail	*Astraea gibberosa*	Q,S
Bat star	*Patiria miniata*	Q,S
Giant-spined sea star	*Pisaster giganteus*	Q,S
Sunflower star	*Pycnopodia helianthoides*	B,S
White sea urchin	*Lytechinus anamesus*	B,S
Red sea urchin	*Strongylocentrotus franciscanus*	Q,S
Purple sea urchin	*Strongylocentrotus purpuratus*	Q,S
Warty sea cucumber	*Parastichopus parvimensis*	Q
Aggregated red sea cucumber	*Pachythyone rubra*	R
Red abalone	*Haliotis rufescens*	B,S
Pink abalone	*Haliotis corrugata*	B,S
Green abalone	*Haliotis fulgens*	B,S

Table 1. continued.

TAXA/COMMON NAME	SCIENTIFIC NAME	TECHNIQUE
Kellet's whelk	*Kelletia kelletii*	B,S
Giant keyhole limpet	*Megathura crenulata*	B,S
California brown sea hare	*Aplysia californica*	B
Scaled tube snail	*Serpulorbis squamigerus*	R
Rock scallop	*Hinnites giganteus*	B,S
California spiny lobster	*Panulirus interruptus*	B
Tunicates		R
Stalked tunicate	*Styela montereyensis*	Q
Miscellaneous Invertebrates		R
SUBSTRATE		
Bare Substrate		R
Substrates: Rock		R
Cobble		R
Sand		R
FISH		
Bluebanded goby	*Lythrypnus dalli*	Q
Blackeye goby	*Coryphopterus nicholsii*	Q
Island kelpfish	*Alloclinus holderi*	Q
Blacksmith	*Chromis punctipinnis*	V
Señorita	*Oxyjulis californica*	V
Blue rockfish	*Sebastes mystinus*	V
Olive rockfish	*Sebastes serranoides*	V
Kelp rockfish	*Sebastes atrovirens*	V
Kelp bass	*Paralabrax clathratus*	V
Sheephead	*Semicossyphus pulcher*	V
Black surfperch	*Embiotoca jacksoni*	V
Striped surfperch	*Embiotoca lateralis*	V
Pile perch	*Damalichthys vacca*	V
Garibaldi	*Hypsypops rubicundus*	V
Opaleye	*Girella nigricans*	V
Rock Wrasse	*Halichoeres semicinctus*	V

B= Band Transect
Q= Quadrat Count
R= Random Point Contact
S= Size Frequency Measurement
V= Visual Transect

CHANGES IN SCIENTIFIC NOMANCLATURE:

Patiria miniata = *Asterina miniata*
Astraea undosa = *Lithopoma undosum*
Astraea gibberosa = *Lithopoma gibberosum*
Hinnites giganteus = *Crassedoma giganteum*

Table 2. Station information.

SITE NUMBER	ISLAND	LOCATION	ABBREVIATION	DEPTH (METERS)	YEAR EST.
1	San Miguel	Wyckoff Ledge	SMIWL	13-15	1981
2	San Miguel	Hare Rock	SMIHR	6-9	1981
3	Santa Rosa	Johnson's Lee North	SRIJLNO	9-11	1981
4	Santa Rosa	Johnson's Lee South	SRIJLSO	14-16	1981
5	Santa Rosa	Rodes Reef	SRIRR	13-15	1983
6	Santa Cruz	Gull Island South	SCIGISO	14-16	1981
7	Santa Cruz	Fry's Harbor	SCIFH	12-13	1981
8	Santa Cruz	Pelican Bay	SCIPB	6-8	1981
9	Santa Cruz	Scorpion Anchorage	SCISA	5-6	1981
10	Santa Cruz	Yellowbanks	SCIYB	14-15	1986
11	Anacapa	Admiral's Reef	ANIAR	13-15	1981
12	Anacapa	Cathedral Cove	ANICC	6-11	1981
13	Anacapa	Landing Cove	ANILC	5-12	1981
14	Santa Barbara	SE Sea Lion Rookery	SBISESL	12-14	1981
15	Santa Barbara	Arch Point	SBIAP	7-8	1981
16	Santa Barbara	Cat Canyon	SBICC	7-9	1986

Table 3. Summary of sampling techniques used to monitor population dynamics of selected kelp forest organisms.

TECHNIQUE
Quadrat count
Band Transect count
Random Point count (RPC)
Visual Fish transect
Video transects
Size frequency
Photogrametric plots
Species checklist
Artificial Recruitment Modules modules

Table 4. Kelp forest monitoring site status 1993.

<u>San Miguel Island</u>	
Wyckoff Ledge	Mature kelp forest with dense canopy and abundant understory red algae.
Hare Rock	Sea urchin barren, high density of *Strongylocentrotus franciscanus*, *Corynactis californica*. Small kelp forest near the transect.
<u>Santa Rosa Island</u>	
Johnson's Lee North	Mature kelp forest with a high density of *Macrocystis pyrifera*.
Johnson's Lee South	Mature kelp forest with a dense canopy.
Rodes Reef	Open mature sparse kelp forest with a low density of *Macrocystis pyrifera* and abundant understory of red algae.
<u>Santa Cruz Island</u>	
Gull Island South	Open mature sparse kelp forest.
Fry's Harbor	Open area with an abundance of *Pachythyone rubra* and *Astrangia lajollaensis*.
Pelican Bay	Developing kelp forest.
Scorpion Anchorage	Sea urchin barren with high density of *Strongylocentrotus purpuratus*, and low diversity.
Yellowbanks	Mature kelp forest with a moderate understory of brown algae.
<u>Anacapa Island</u>	
Admiral's Reef	Mature kelp forest with a rich understory of brown algae and a diverse assemblage of fish and invertebrates.
Cathedral Cove	Mature kelp forest with a dense canopy and a high density of *Macrocystis pyrifera*
Landing Cove	Open kelp forest with a diverse assemblage of fish and invertebrates.
<u>Santa Barbara Island</u>	
SE Sea Lion Rookery	Mature and young kelp forest.
Arch Point	Young kelp forest.
Cat Canyon	Young dense kelp forest.

Table 5. 1993 kelp forest monitoring program participant and cruise list.

PARTICIPANTS	AFFILIATION	CRUISES PARTICIPATED
Kristine Barsky	Calif. Dept. of Fish and Game	12
Steve Barsky	Marine Marketing & Consulting	12
Dennis Bedford	Calif. Dept. of Fish and Game	7
John Brooks	National Park Service (SCRU)	11
Kent Bullard	Channel Islands National Park	10
John Conti	Truth Aquatics	5
Gary Davis	Channel Islands National Park	12
Keith Duran	Channel Islands National Park	10
Dave Forcucci	Florida Inst. of Oceanography	11
Tim Glass	Channel Islands National Park	9
Laura Gorodezky	Channel Islands National Park	5,6,7,8,9,10
Peter Haaker	Calif. Dept. of Fish and Game	6,12
Scott Harris	Calif. Dept. of Fish and Game	6,9
Ross Hein	Univ. Calif. Santa Cruz	7
Jerry Kashiwada	Calif. Dept. of Fish and Game	
David Kushner	Channel Islands National Park	Attended all cruises
Derek Lerma	Channel Islands National Park	5,6,7,8,9,10,11,12
Carolyn Meyer	Redwood National Park	12
John Miller	NOAA/Channel Islands NMS	8
Tom Nieson	San Francisco State Univ.	8
David Orsorio	Univ. Calif. Berkely	9
Jack Regan	Univ. Calif. Santa Cruz	10
Paul Reilly	Calif. Dept. of Fish and Game	10
Mason Posner	Univ. Southern California	9
John Provo	Channel Islands National Park	5,6,7,8,9,10,11,12
Karen Press	Moss Landing Marine Lab	9
Dan Richards	Channel Islands National Park	2,5,6,11,12
Diane Richardson	Channel Islands National Park	5,6,7,8,10,11,12
Mack Shaver	Channel Islands National Park	5
Heidi Togstad	Calif. Dept. of Fish and Game	7
Ian Taniguchi	Calif. Dept. of Fish and Game	5,6
John Trone	Moss Landing Marine Lab	9
Ronald Walder	Channel Islands National Park	3,5,6,7,8,9,10,11,12
Dwight Willey	Channel Islands National Park	1,9
Jill Zamzow	Univ. Calif. Santa Cruz	8

	Cruise Dates 1993
Cruise #1	March 9, 1993
Cruise #2	March 22, 1993
Cruise #3	March 31, 1993
Cruise #4	April 30, 1993
Cruise #5	June 21-25, 1993
Cruise #6	July 6-7, 1993
Cruise #7	July 12-16, 1993
Cruise #8	July 26-30, 1993

Cruise #9	August 9-13, 1993
Cruise #10	August 23-27, 1993
Cruise #11	September 13-17, 1993
Cruise #12	Sept. 27 - Oct. 1, 1993

Table 6. 1993 echinoderm wasting disease/syndrome observations.

	Sea Star wasting syndrome observed		Sea Urchin wasting disease observed	
	species	dates	species	dates
San Miguel Island				
Wyckoff Ledge	none		none	
Hare Rock	none		none	
Santa Rosa Island				
Johnson's Lee North	none		none	
Johnson's Lee South	none		none	
Rodes Reef	none		none	
Santa Cruz Island				
Gull Island South	1	7/27	2,3	7/27,9/16
Fry's Harbor	none		3	9/13
Pelican Bay	1	9/29	none	
Scorpion Anchorage	1	9/29	none	
Yellowbanks	none		none	
Anacapa Island				
Admiral's Reef	none		3	8/23,9/17
Cathedral Cove	none		none	
Landing Cove	none		2	8/27
Santa Barbara Island				
SE Sea Lion Rookery	none		3	6/22,8/24
Arch Point	none		2	6/24
Cat Canyon	none		2	6/23

Species legend:

1 = *Patiria miniata*
2 = *Strongylocentrotus purpuratus*
3 = *Lytechinus anamesus*

none = not observed at the site during our visits.
date = dates disease/syndrome was observed.

Table 7. Deployment dates of artificial recruitment modules (ARMs).

Location	Date of deployment	# of modules
SMIWL		0
SMIHR		0
SRIJLNO	9/12/89	15 *
SRIJLSO	7/28/92	7
SRIRR		0
SCIGI	10/2/89	15
SCIFH	7/17/92	7
SCIPB	4/30/93	7
SCISA	3/15/92	7
SCIYB	10/11/89	20
ANILC	7/28/91	4
"	9/30/91	3
ANICC	6/6/91	7
ANIAR	4/21/91	7
SBISESL		0
SBIAP		0
SBICC		0

* only 13 of the 15 ARMs deployed were intact in 1993.

Appendix B. 1993 Species List for all Channel Islands National Park Kelp Forest Monitoring Stations.

Introduction

The species list contains presence/absence and relative abundance data for all species that could be found during the site visits between June and October. Generally at least one dive is made by an experienced biologist strictly for species list observations. The overall effort varies from station to station with the water conditions and available time. Relative abundance values are subjective, and generally based on opinions of several divers viewing the overall site. Some species assemblages are more difficult to identify than others and may be lumped into general categories. Organism were generally not collected for additional taxonomic work. When identification is tentative we either do not mark it or place a question mark on the list. Some categories, (eg. sponges or tunicates) may be much more diverse than it would appear from the list.

Abundance Ratings:

X - present, no relative abundance rating given
4 - abundant, organism present in higher than normal densities
3 - common, organism found over most of site or in high density patches
2 - present, organism found in moderate numbers
1 - rare, few organisms found
0 - noticeably absent, an effort was made to look for an organism that was not found

Notes:

e - eggs
j or jvs - juvenile
s - shell only
int - intertidal
d - drift
PM or night - seen only on night dive
JX - juveniles present and adults present
J#/# - (e.g. J3/2 - juvenile abundance 3, adult abundance 2)
nests - hypsypop nest turf
dis - diseased

Station names are listed in Table 2 of the text.

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
BRYOPSIS CORTICULANS			X											1		1
BRYOPSIS HYPNOIDES		1														
CHAETOMORPHA SPIRALIS															1	2
CLADOPHORA GRAMINEA		2	2				2			2						2
CLADOPHORA MICROCLADIOIDES													1			
CLADOPHORA SP.														2	2	2
CODIUM CUNEATUM				X			3				2	2	2	2	3	3
CODIUM FRAGILE		2						X	X		X			1	1	1
CODIUM HUBBSII/SETCHELLII														3	2	2
CODIUM JOHNSTONEI				X												
CODIUM SETCHELLII			2	2							2		2			
DERBESIA MARINA	X		X	X			X		X	X	2	2	2		1	1
ENTEROMORPHA SP.									X			X				
GREEN MAT ON SAND												X				
HALICYSTIS OVALIS							X	3	2	1	2	3	2	2	2	3
HALICYSTIS N. SP.							3					3				
ULVA SP.	X	X	X					X				X	1			
AGARUM FIMBRIATUM											3					
COILODESME CORRUGATA												2		2		
COILODESME SP.						2										
COLPOMENIA PEREGRINA		X					X				2	2	2	3	2	2
COLPOMENIA/HYDROCLATHRUS									X							
COLPOMENIA SP.								X			X					
CYSTOSEIRA NEGLECTA															4	4
CYSTOSEIRA OSMUNDACEA	2	1	4	2	X					2	2	2	3	3		
CYSTOSEIRA SETCHELLII										2					1	
CYSTOSEIRA SP.											X					
DESMARESTIA LIGULATA	2	2	2											2		
DESMARESTIA MUNDA															X	
DESMARESTIA SP.	X															
DICTYONEUROPSIS RETICULATA	X			X												
DICTYOPTERIS NEW SP.													2			
DICTYOPTERIS UNDULATA											2	2	2	2	3	2
DICTYOTA BINGHAMIAE															2	2
DICTYOTA FLABELLATA			2				2					4	2	2	2	2
DICTYOTA/PACHYDICTYON	X		2					3				X	2			
DICTYOTA SP.							3									
ECTOCARPOID FUZZ														X		1
EGREGIA MENZIESII												2			X	
EISENIA ARBOREA	D	2		X			2	J4/1	2	3	3	2	2	X	3	1
HALIDRYS DIOICA		X													2	
HYDROCLATHRUS CLATHRATUS							3									
LAMINARIA FARLOWII			3	2	X		2			3	3	2	3	2	2	X
MACROCYSTIS PYRIFERA	J3/4	2	J4/4	J1/4	J1/2	J2/3	1	J4/3	1	J3/4	4	J3/4	J4/4	4	2	4
PACHYDICTYON CORIACEUM										2				3	2	3
PTERYGOPHORA CALIFORNICA	2	X	4	3						3			3			X
SARGASSUM MUTICUM									1			2	1	2	2	2
SARGASSUM SP.								J3/3								
TAONIA LENNEBACKERIAE																1
ZONARIA FARLOWII												2	2	3	2	2
ACROSORIUM UNCINATUM		X	2	2	4					3	3	2				2
AMPHIROA ZONATA												2		2	4	2
ASPARAGOPSIS TAXIFORMIS														D	1	4
BONNEMAISONIA HAMIFERA														1	1	3
BOSSIELLA ORBIGNIANA			2	2									2			

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
BOSSIELLA SP.						X		X		2						
BOTRYOCLADIA HANCOCKII		X														
BOTRYOCLADIA PSEUDODICHOTOMA	2		2	2	2		X									
BOTRYOCLADIA SP.																1
BOTRYOGLOSSUM FARLOWIANUM	4															
BRANCHIOGLOSSUM WOODII	3	2														
CALLIARTHRON CHEILOSPORIOIDES			2	2			X			3	2	2	4	2	2	3
CALLIARTHRON SP.										3				1		
CALLIARTHRON TUBERCULOSUM			2													2
CALLOPHYLLIS FIRMA	X		2	2												
CALLOPHYLLIS FLABELLULATA			2	2												
CALLOPHYLLIS SP.	3					1									1	1
CALLOPHYLLIS VIOLACEA	X		3	3	3											
CARPOPELTIS BUSHIAE		X	2	2							2	2	3			
CARPOPELTIS SP.					3											
CHONDRIA CALIFORNICA												2			2	
COELOSEIRA COMPRESSA		2									2					
CORALLINA OFFICINALIS			2	2			2			2	2	2	2		2	2
CORALLINES - ENCRUSTING	2	4	2	3	2		3		3		4	4	4	4	4	4
CORALLINES - ERECT	2	2	2	2	X		2		2		2	3	4	2	4	4
CRYPTOPLEURA SP.				X	X					2			X			
FAUCHEA LACINIATA			2	2												
FAUCHEA SP.	3	X			3		X			1	2					
FILAMENTOUS REDS		X	X	X			4	X	X	2	2	X	X	2	2	1
FRYEELLA GARDNERI	2		2	2												
GELIDIUM NUDIFRONS							1								2	2
GELIDIUM PURPURASCENS	X						X								2	2
GELIDIUM ROBUSTUM			1				3				2	2	3			
GIGARTINA CORYMBIFERA	2	2	4	3	2							2	2	2		
GIGARTINA SP.	2		X		X											
HALIPTYLON GRACILE															4	2
HALYMENIA/SCHIZYMENIA	X	X	2	2												
JANIA SP.																2
LAURENCIA PACIFICA															1	2
LAURENCIA SP.		X	2	2					2			X				
LAURENCIA SPECTABILIS		X														
LITHOTHAMNIUM SP.														X	X	X
LITHOTHRIX ASPERGILLUM												2				3
MICROCLADIA COULTERI	X				X								1			
NIENBURGIA ANDERSONIANA			2	2												
OPUNTIELLA CALIFORNICA			2		X											
PHYCODRYS SETCHELLII				2	X											
PIKEA ROBUSTA	2															
PLOCAMIUM CARTILAGINEUM							2								1	
PLOCAMIUM SP.	X										X					
PLOCAMIUM VIOLACEUM				2							3	2	2			
POLYNEURA LATISSIMA	3	X			X											
POLYSIPHONIA SP.		X														
PRIONITIS SP.							X					2	2			
RHODOPTILUM PLUMOSUM				2	X											
RHODYMENIA ARBORESCENS												2	2			
RHODYMENIA CALIFORNICA	2		3	3						2	X	2	2		2	2
RHODYMENIA CALLOPHYLLIDOIDES	X		2	2						X		2	2			
RHODYMENIA PACIFICA	3			2												
RHODYMENIA SP.					X		X									

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
SCIADOPHYCUS STELLATUS							X			2		2	3			
SCINAIA SP.		X									X	1	X		2	2
PHYLLOSPADIX SPP.			D	D				X		D						
ZOSTERA MARINA									D							
DIATOM FILM								X							X	
SCHIZYNEMA/COLONIAL DIATOMS												X			X	
HYPSYPOPS NEST TURF			X					X					X		X	X
HOMOTREMA RUBRUM						X	X				X	2	3	2	2	
CLATHRINA BLANCA													0		1	
LEUCETTA LOSANGELENSIS							1									
LEUCILLA NUTTINGI	2	X		2						2					2	
LEUCOSOLENIA ELEANOR		X					1									
ACARNUS ERITHACUS	2		2	2												
AXOCIELITA ORIGINALIS			2													
CLIONA CELATA	X	X	2	2	X					X	2			2		
HALICLONA SP.		X		1								X				
HYMENAMPHIASTRA CYANOCRYPTA	2	2	2	2	X	X		X		2	2	2	2	2		X
LISSODENDORYX TOPSENTI			2								X	2	X	2		
OPHALITASPONGIA PENNATA V.CALIF.			2	2										2		
PENARES CORTIUS				X						1	2	1	2			
POLYMASTIA PACHYMASTIA	2			1	X											
RED SPONGES - ENCRUSTING	X	X	2	2				X		2	2	2	2	2	X	
SPHECIOSPONGIA CONFOEDERATA			2	X	X	X					1					
TETHYA AURANTIA	3	2	2	2	4		2	X	1	2		1	2	3	1	
TETILLA ARB					X											
TETILLA FLAMINGO				X												
TETILLA SP.					X											
VERONGIA AUREA				2	X						2	1				
XESTOSPONGIA TRINDINAEA	X	X	2	2						1		1				
ABIETINARIA SP.	2		3	3			2								X	
AGLAOPHENIA SP.	2	X	3	3	X		X	X		2		2		1		
ALLOPORA CALIFORNICA						3										
ANTENELLA AVALONIA											3			1		
GARVEIA ANNULATA	3															
HYDRACTINIA SP.	X	2	2	2			2	X	X		2	2	0		X	
OBELIA SP.	3	X		2			3	2			2	2		4		X
PLUMULARIA SP.	X	2	2	2	X	X				2	2	2		3	2	2
SERTULARELLA SP.		X		2							2					
SERTULARIA SP.				2												
TUBULARIA SP.	X	X							X							
STAUROMEDUSAE	X															
PACHYCERIANTHUS FIMBRIATUS	2	1	2	2			2	3	2	3	X	2	2	2		
UNID. CERIANTHID.												2				
CLAVULARIA SP.							3			2	2	3	2		X	
EUGORGIA RUBENS											4					
LOPHOGORGIA CHILENSIS	1		2	2	X		4	2		3	4	2	2	3	1	1
MURICEA CALIFORNICA				X						2	3	2	X	3	1	
MURICEA FRUTICOSA				X						2	3		1	2	1	
STYLATULA ELONGATA							X					2				
PARAZOANTHUS LUCIFICUM							1				X					
CORYNACTIS CALIFORNICA	3	4	2	2	4	X	2	X	1	2	3	2	2	1	1	1
ANTHOPLEURA ARTEMISIA														3		
ANTHOPLEURA ELEGANTISSIMA	2	4	2				2		X		X			2	2	1
ANTHOPLEURA XANTHOGRAMMICA		3														
EPIACTIS PROLIFERA	3	3	2		2					X	X		X			

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
HALCAMPA DECEMTENTACULATA	2			2												X
METRIDIUM SENILE		3														
PHYLLACTIS BRADLEYI												2		1		
TEALIA COLUMBIANA					3											
TEALIA CORIACEA			2	2	2								1			
TEALIA LOFOTENSIS	3	3	2	2	2											
TEALIA SP.				X	X		X			X	X			2		X
ZAOLUTUS ACTIUS	2		2	2			1			2				2		
ASTRANGIA LAJOLLENSIS	3	4	2	2	3		3	4	X	3	2	3	2	2	2	2
BALANOPHYLLIA ELEGANS	3	3	2	4	3		2	2	2	2	X		2	2	2	2
COENOCYATHUS BOWERSI													2			
PARACYATHUS STEARNSI	2	2	2	2	X		2	X	X	2	2	2	2	2	2	
PHYLUM PLATYHELMINTHES															X	
"LEPTOPLANA/NOTOPLANA													X			
PSEUDOCEROS SP.				X												
PHYLUM NEMERTEA												X				
TUBULANUS SEXLINEATUS				X												
PHYLUM SIPUNCULA	X			X						X			X			
APHRODITE scale worm								X								
ARCTONOE PULCHRA							X						X			
CHAETOPTERUS VARIOPEDATUS							3	4		X	X	3	2	3	2	
DIOPATRA ORNATA	2	3	2	3	3	X		2		2		2	1	1		
DODECACERIA FEWKESI	3	4	1						X	X	2	1		3	2	1
EUDISTYLIA POLYMORPHA	2	3	2	2			1		X			1				
FLABELLIGERA ESSENBERGE					X											X
MESOCHAETOPTERUS SP.	X															
MYXICOLA INFUNDIBULUM	X	2	2	2	X		2	2		2	2			2		
OPHIODROMUS PUGETTENSIS	X	1	2	2	4		2	2	X	2	2			2	X	
PHRAGMATOPOMA CALIFORNICA	1	1	3		X	X				X		2				1
PHYLLOCHAETOPTERUS PROLIFICA		2														
PISTA ELONGATA	3	2	2	2	X	X	2	2		2		2	1	3		X
POLYNOID		X		X												
SALMACINA TRIBRANCHIATA		2	2	2			2	X		1	2	2	2			2
SERPULA VERMICULARIS	X	X		2					X	X						
SERPULID														2	X	X
SPIROBRANCHUS SPINOSUS	X	1	1	1			2	2	3	1	3	3	3	2	3	3
SPIRORBID		X			X								X		X	
TEREBELLID	X	4		1	X		2	2	2		X	2	1		2	
BALANUS AQUILA/NUBILUS				S												
BALANUS SP.			2	2	X	X						3	3		3	
CONOPEA GALEATA				2							2					
MEGABALANUS CALIFORNICUS		3	2	2			3				X	2	X			2
TETRACLITA ELEGANS		X												2		
MYSIDS										1						
MYSIDS IN CANOPY (AMBER)		2			X			X						2		1
MYSIDS OVER BOTTOM (TRANSPARENT)	X	3			X											
COLIDOTIA												X				
IDOTEA RESECATA	2	2		1	3											
AMPHIPOD TUBE MASSES		X		X	2		2	2		X	X			4		2
PERAMPITHOE SP.	X	2														
CAPRELLID	X	X			X							X			X	
GAMMARID	X	X			X					X	X	X			X	
COPEPODS ON MEGATHURA				X	X	4	X		X	2						
COPEPOD PARASITES ON FISH		X			3											X
ALPHEUS SP.								X								

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
BETAEUS MACGINITIEAE		X				X										X
BETAEUS SP.	X	X			X	X										
HEPTACARPUS SP.	X	X						X								
LYSMATA CALIFORNICA															2	
PANDALUS DANAE	X	3		2	X	X		X		2				1		
SPIRONTOCARIS PRIONATA		2														
PANULIRUS INTERRUPTUS							2	S	2	2		4	4	1	2	2
BLEPHARIPODA OCCIDENTALIS												S				
HAPALOGASTER CAVICAUDA	X															
PACHYCHELES SP.	X	X														
PAGURISTES SP.	X			X	X		X	X				X	X			X
PAGURUS HIRSUTIUSCULUS		4														
PAGURUS SP.							X	X								
PETROLISTHES SP.		X			X			X							X	
PLEURONCODES PLANIPES					3											
PYLOPAGURUS SP.							S			X	X	2	2			
CANCER ANTENNARIUS	3	JV		S												
CANCER PRODUCTUS		JV													X	
CANCER SP.								X		JX			JX			
HERBSTIA PARVIFRONS	X		2		X		X	X		X		2	2		X	
LOPHOPANOPEUS SP.															X	
LOXORHYNCHUS CRISPATUS	X	3										X		S		
LOXORHYNCHUS GRANDIS								X								
PARAXANTHIAS TAYLORI		X	S		X		2		S		X	2	2	1	2	
PELIA TUMIDA	X														2	
PUGETTIA PRODUCTA	S	S		S				S						2		
PUGETTIA RICHII		3		S	X								2			
PUGETTIA SP.																X
SCYRA ACUTIFRONS														1		
TALIEPUS NUTTALLI														S		
PARASITIC COPEPODS on fish					X	X				X						
ACMAEA MITRA	3	4	X													
AMPHISSA VERSICOLOR	X	X	X							X			2			
ASTRAEA GIBBEROSA	3	2		2	S										X	
ASTRAEA UNDOSA	0	0	2	S	1		2	J4/4	J4/4	3		J3/4	4	3	3	2
BITTIUM SP.					X							X	X		X	
CAECUM SP.	2															
CALLIOSTOMA ANNULATUM	X	X		1									1			
CALLIOSTOMA LIGATUM							1									
CALLIOSTOMA SUPRAGRANOSUM	X										X	X	2			
CALLIOSTOMA GLORIOSUM		X														
CALLIOSTOMA SP.					X											
CERATOSTOMA FOLIATUM	2	2	X	1												
CERATOSTOMA NUTTALLI	X			1				4	4	2	2	2	2	1	2	2
COLLISELLA SP.		X														
CONUS CALIFORNICUS	2	X	2	2				3	X	2	X	2	2	E3	E3	E2
CRASSISPIRA SEMIINFLATA										2						
CREPIPATELLA LINGULATA	2	2	2	2		X	E3		4	2	X	2	2			2
CREPIDULA ACULEATA											X					
CREPIDULA ADUNCA	4			2						2			X			
CREPIDULA NORRISARUM			X							2				1		
CREPIDULA SP.			X			X		X							2	
CYPRAEA SPADICEA		3	2	2	2		2	2	X	2	2	2	JX/2	2	1	1
DIODORA ARNOLDI				S								X	X			
DIODORA ASPERA	X	S														

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
EPITONIUM SP.			S													
FISSURELLA VOLCANO		S														
FUSINUS KOBELTI			3	3												
FUSINUS LUTEOPICTUS		X			X	X	X					2	1			
HALIOTIS CORRUGATA	0	0	0	0	0	JX/0	O	0	0	JV/2	3	2	3	J1	0	2
HALIOTIS CRACHERODII	0	S	0	0	0	0	0	0	0	0	0	0	0	S	0	0
HALIOTIS FULGENS	0	0	0	0	0	0	0	0	0	0	0	0	0	S	1	0
HALIOTIS RUFESCENS	3	1	2	3	0	JX/0	0	0	0	0	0	0	0	0	0	0
HALIOTIS SORENSENI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIPPONIX SP.									X				X			
HIPPONIX TUMENS										S						
HOMALOPOMA LURIDUM	X	X	X	2							X	X	X			
HOMALOPOMA SP.	X	X			X	X		X								
KELLETIA KELLETII	4	1		2	X	2	2	2	X	3	2		1	1	S	X
LATIAXIS OLDROYDI													X			
MAXWELLIA GEMMA	2	X							X		2	2	2	1		S
MAXWELLIA SANTAROSANA					X	X				2						
MAXWELLIA SP.			1		X			X								
MEGATHURA CRENULATA	2	2	2	2	X		3	1	3	2	1	2	JX/X	1		1
MITRA IDAE	3	2	2	2	3		X	2		2			1	1		1
MITRELLA SP.													X			
NORRISIA NORRISI	2		2	2	X	X		S		2	2	2	3	2	2	2
NUCELLA EMARGINATA		S										S	S			
PETALOCONCHUS MONTEREYENSIS		X														
PSEUDOMELATOMA SP.	X		2	2	X											
PTEROPURPURA TRIALATA		2														
SERPULORBIS SQUAMIGERUS	2	2	2	2	X		3	4	X	2	2	2	2	1	2	3
SIMNIA VIDLERI							2			X	3		X/E	3		
TEGULA AUREOTINCTA									X							S
TEGULA EISENI												2	2	2	3	3
TEGULA REGINA			1	1		X	2					1	1	4	X	2
TEGULA SP.								X								
TRIVIA CALIFORNIANA										2				2		
TRIVIA SOLANDRI		1	S								X		X			
VOLVARINA TAENIOLATA		2									X	X	X		X	1
APLYSIA CALIFORNICA		2			X		2	3	X		X	X	1	4	2	2
APLYSIA VACCARIA			X					3		2		2				
NAVANAX INERMIS		3	X	X	X		X	X				X		4	2	
HAMINOEA SP.		3											X		E2	2
TYLODINA FUNGINA													X			
ALDISA SANGUINEA													X			
ANISODORIS NOBILIS	X		X	X					X							
CADLINA FLAVOMACULATA					X											
CADLINA LIMBAUGHI										1						
CADLINA LUTEOMARGINATA	X												X			
CHROMODORIS MACFARLANDI													X			
CORYPHELLA TRILINEATA		X														
DIAULULA SANDIEGENSIS	X		X	X	X			X		1	X					
DORIOPSILLA ALBOPUNCTATA	X	X		X	X						X	X	X		X	
CORYPHELLA IODINEA	X	1					3	X	2		X	2	2		2	
HERMISSENDA CRASSICORNIS	3	2	X	X	X	X		X			X					
JORUNNA PARDUS						X	X				X					
LAILA COCKERELLI	X	X	X				X				X	X	X			
MELIBE LEONINA								X								
MEXICHROMIS PORTERAE			X			X								2		X

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
PHIDIANA HILTONI	X	X		X	X							X		2		
POLYCERA ATRA		X	X									X				
ROSTANGA PULCHRA														1		
TRIOPHA CATALINAE	X	X	X	X	X	X		X								
TRIOPHA MACULATA		X														
TRITONIA FESTIVA											X		X			
CLASS POLYPLACOPHORA	3	3	X		X											
LEPIDOZONA SP.		X														
AMERICARDIA BIANGULATA								S4					S	S		
CHAMA ARCANA						X	3	3				2	4			
GARI SP.		S	S						S/X							
HINNITES GIGANTEUS	2	2	2	2	X	X	3	2	3	X	4	3	4	2	2	X
IRUSELLA LAMELLIFERA	S	S														
LEPTOPECTEN LATIAURATUS		X														
LIMA HEMPHILLI	S	X		S	S	S	S	S4	SX			S	S	S	S	
MYTILUS CALIFORNIANUS		S					S4					S3	S4			
PARAPHOLUS CALIFORNICUS			2	2	2											
PECTEN DIEGENSIS								S		S						
PENITELLA CONRADI		X	3	2					S							
PHOLAD	X					X				X						
PODODESMUS CEPIO	2	4	2	2	X	X	X	X	X	2						
SEMELE DECISA												S			S	
SEMELE RUPICOLA		S														
SEMELE SP.	S				S	S	S									
TRACHYCARDIUM QUADRAGENARIUM	S							S		S						
TRESUS NUTTALLII		S										S				
VENTRICOLARIA FORDII	S	S		S	S	S	S	S3	S	S	S	S	S	S	S	S
OCTOPUS BIMACULATUS/BIMACULOIDES	X	X		X	X	X						2	3	2	2	
OCTOPUS RUBESCENS				X												
OCTOPUS SP.					X			3								
AETEA SP.			X							X		X	X			
ANTROPORA TINCTA		X		2		X	3					2				
BUGULA NERITINA	X	X	1	2	X	X	2	2	X	1	2	X	1	3	2	2
BUGULA SP.	X															
COSTAZIA ROBERTSONIAE	X	X	2	2	X		X			2						
CRISIA SP.	X													1	X	1
DIAPEROECIA CALIFORNICA	2	X	2	2	X	3	4	2	2	2	3		2	2	2	2
EURYSTOMELLA SP.		X	2	3						X		2				
HETEROPORA MAGNA					X											
HIPPODIPLOSIA INSCULPTA	2		2	2						2			1			
LICHENOPORA NOVAE-ZELANDIAE		1	2								2	1	1	3	2	1
MEMBRANIPORA MEMBRANACEA	X	X	3	3				2			X	2	2	4	2	2
MEMBRANIPORA TUBERCULATA			X					3			X	2	2			
PHIDOLOPORA LABIATA	1	1	2	2	X	X	1	X	X	1	1	1	1		1	
THALAMOPORELLA CALIFORNICA			2	2			3	4					1		4	4
BARENTSIA SP.	X															
PHORONIS VANCOUVERENSIS		1														
ASTROMETIS SERTULIFERA				X								X	2			
ASTROPECTEN ARMATUS								X						1	1	
DERMASTERIAS IMBRICATA			2	2	2											
HENRICIA LEVIUSCULA					X	X	2				2			2		
HENRICIA N.SP.	2	1	2	2							1					
LINCKIA COLUMBIAE								3			2		2			
LUIDIA FOLIOLATA				2												
MEDIASTER AEQUALIS				2	X					2						

LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
ORTHASTERIAS KOEHLERI	2			1	X		2									
PATIRIA/ASTERINA MINIATA	3	4	2	3	3	X	2	2	1	2	2	J2/1	2	3	X	1
PISASTER BREVISPINUS			X													
PISASTER GIGANTEUS	3	4	2	2	X	X	2	1		2	1	1	2	3	2	2
PISASTER OCHRACEUS		2													X	
PYCNOPODIA HELIANTHOIDES	X	4	2	3	X	X				1						
CENTROSTEPHANUS CORONATUS						X	3	1			2	2	X	4	1	
DENDRASTER EXCENTRICUS	S													S		
LYTECHINUS ANAMESUS						2	3	1	1	2	3			4	1	1
L. ANAMESUS JUVENILES						3		X	0	2				2		
STRONGYLOCENTROTUS FRANCISCANUS	3	4	2	2	2	2	2	2	2	2	2	3	3	2	2	3
S. FRANCISCANUS JUVENILES		3				4	1	X		2	X	X	2	3	2	2
STRONGYLOCENTROTUS PURPURATUS	2	2	1	2	2	2	2	2	4	2	2	2	2	3	2	3
S. PURPURATUS JUVENILES						4	2	X		1	X	2	2	4	3	2
OPHIACTIS SIMPLEX						X	3				X	3	X			
OPHIODERMA PANAMENSE					3		2					2	2	2	2	2
OPHIOPLOCUS ESMARKI	3	2	2	2	X					2		2	3			
OPHIOPTERIS PAPILLOSA	2	2	2	2			3			3	2	2	3	2	2	2
OPHIOTHRIX SPICULATA		2			1		2			2	2	2		4	2	
CUCUMARIA MINIATA													X			
CUCUMARIA PIPERATA	2	2	2	2	3											
CUCUMARIA SP.		2		2	2	X		3		X						
CUCUMARIA SALMA			2				3		X	1	2	2	2			
EUPENTACTA QUINQUESEMITA											2		1			
LEPTOSYNAPTA ALBICANS												X				
PACHYTHYONE RUBRA							4	X								
PARASTICHOPUS PARVIMENSIS	2	2	2	2			2	2	2	2	2	2	2	3	2	2
UNIDENTIFIED TUNICATE	X	X	X	X	X					X			X			
APLIDIUM SP.				2											3	X
ARCHIDISTOMA MOLLE		X														
ARCHIDISTOMA SP.		X											X			
BOLTENIA VILLOSA	X	X	1	1	3											
BOTRYLLUS/BOTRYLLOIDES					X			X		1	X		X	4	2	2
CIONA INTESTINALIS		X						X								
CLAVELINA HUNTSMANI		2	X	1	X			X		2				2	2	2
CNEMIDOCARPA FINMARKIENSIS		2		2	X											
CYSTODYTES LOBATUS				2	X											
DIDEMNID	X		2	2								2	2	2	2	2
EUHERDMANIA CLAVIFORMIS			2									2	2			
METANDROCARPA TAYLORI		X						X				2	2		2	
MOLGULA SP.		X		X												
POLYCLINUM PLANUM	X		2													
PYCNOCLAVELLA STANLEYI	2		X		X									3	2	2
PYURA HAUSTOR			X	X	X						X	X				
STYELA MONTEREYENSIS	2		3	2	X											
STYELA PLICATA												X	X			
CEPHALOSCYLLIUM VENTRIOSUM	E		2	X												
HETERODONTUS FRANCISCI								E/X	1	X		2	X		3	1
MYLIOBATIS CALIFORNICA							2		2			X	X	2	2	3
GYMNOTHORAX MORDAX												X		2	3	
ATHERINOPS AFFINIS	X		2	2				X		2	X					X
CYPSELURUS CALIFORNICUS								X								
AULORHYNCHUS FLAVIDUS	1															
RATHBUNELLA HYPOPLECTA		2					3									
TRACHURUS SYMMETRICUS	3		X		X			X						2		2

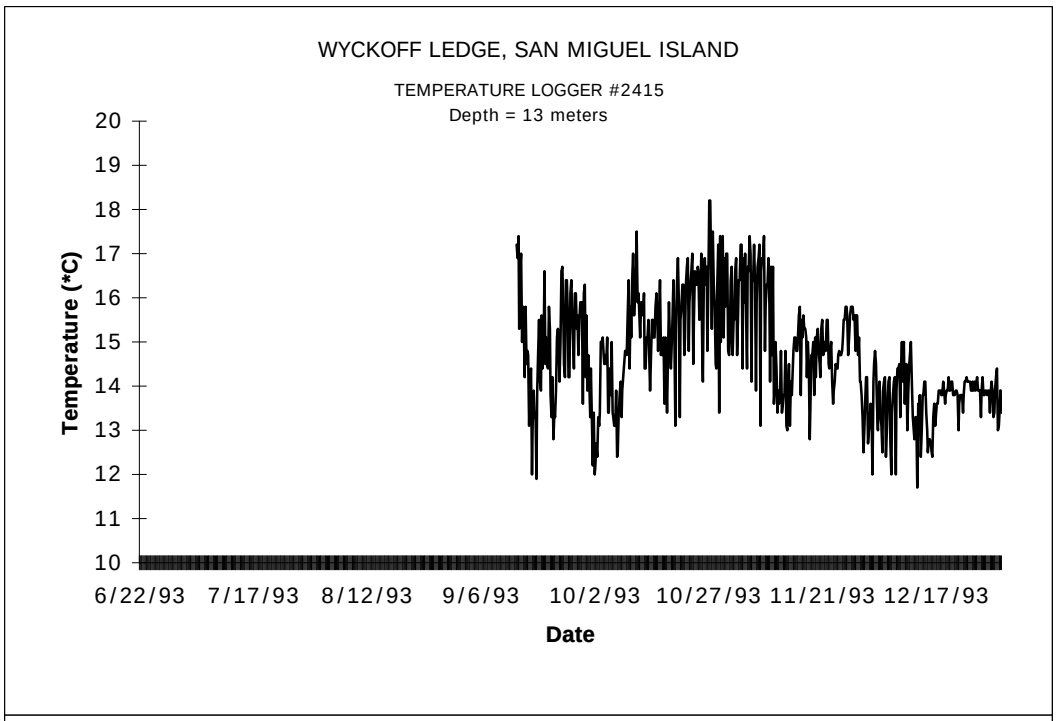
LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
ALLOCLINUS HOLDERI							2	3	X		2	2	3	3	3	3
GIBBONSIA SP.	3	2					2				X	2	2		3	
HETEROSTICHUS ROSTRATUS	J2		3	J2	J2	X		J3/X		J/2		2	2		2	2
NEOCLINUS SP.					X											
NEOCLINUS STEPHANSAE				X				2	3							2
ARTEDIUS CORALLINUS		2	2	2										2	2	
ARTEDIUS CREASERI		2											3			2
LEIOCOTTUS HIRUNDO													X			
ORTHONOPIAS TRIACIS	2	2			X					2					2	
SCORPAENICHTHYS MARMORATUS	2	2											X			
BRACHYISTIUS FRENATUS	2		2	2						3			2	2		2
CYMATOGASTER AGGREGATA			3									2				
RHACOCHILUS VACCA	2	2	3	2	X		2	J3/2	X							
EMBIOTOCA JACKSONI	2	2	3	2	X	X	2	J3/3	J2/2	X		2	2		2	J1
EMBIOTOCA LATERALIS	3	3	3	2	X			1								
HYPERPROSOPON SP.	X															
HYPSURUS CARYI	2		3	2						2						
RHACOCHILUS TOXOTES			2	1	X		2									
CORYPHOPTERUS NICHOLSI	2	2	2	2	X	X	2	3	3	3	2	2	2	2	2	2
LYTHRYPNUS DALLI	0	0	0	0			3	3			0	1	1	1	0	
LYTHRYPNUS ZEBRA	0	0					2		2		1		1	1	0	
HEXAGRAMMOS STELLARI						X										
OPHIODON ELONGATUS	X															
OXYLEBIUS PICTUS	2	2	3	2	X		2	2	2	2	2	2	2	2	2	2
OXYLEBIUS (Juveniles)	X										X					
GIRELLA NIGRICANS	X	X	0	2	X	X	2	2	X	1	3	2	2	2	2	
MEDIALUNA CALIFORNIENSIS			2	2	X	X	2	X			2	2	2	2		1
HALICHOERES SEMICINCTUS					X		3			2	2	2	3	2	3	3
H. SEMICINCTUS females					X		3	3	2	2	2	2	3	X	X	X
H. SEMICINCTUS males			1				2	3	2	2	2	2	2		X	X
H. SEMICINCTUS juveniles											X			X		X
OXYJULIS CALIFORNICA	3	3	2	2	2	X	2	2	2	2	2	2	2	4	3	3
O. CALIFORNICA juveniles	X			2		X						X	2	4	2	3
SEMICOSSYPHUS PULCHER	3	2	X	X	4	X	2	X		2	2	3	3	3	2	3
S. PULCHER females	3	2	2	2	X	X	2	2		3	3	3	4	3	X	X
S. PULCHER males	3	2	0	1	X	X	2	1		1	1	2	2			
S. PULCHER juveniles	0	1	2	0	0	2		1		1	1		2	3	X	X
CAULOLATILUS PRINCEPS					2		2	1						1	1	
CHROMIS PUNCTIPINNIS		2	2	2	2		4	3	2	2	4	4	3	2	4	2
C. PUNCTIPINNIS juvenile			2	2			X		2	2	2	4	4	2	2	
HYPSYPOPS RUBICUNDUS	0	0	2	0			2	2	3	1	3	3	3	2	4	2
H. RUBICUNDUS juveniles									3			3	3		4	3
SCORPAENA GUTTATA							2	3				2	3	J3	J2	2
SEBASTES ATROVIRENS	3	3	2	2	2		2	2		1	2	X	2	1		2
S. ATROVIRENS juveniles	X	2		X												
SEBASTES AURICULATUS			X													
SEBASTES CARNATUS	2	2	2	2			1							1		
SEBASTES CAURINUS	2	2		X												
S. CARNATUS/CAURINUS juveniles	2	2			X											
SEBASTES CHRYSOMELAS	2	2	2	2	X		1		X		2		1			
SEBASTES MINIATUS	X				X											
SEBASTES MYSTINUS	3	3	2	2	4		1	0								
S. MYSTINUS juveniles		2														
SEBASTES PAUCISPINIS			1													
SEBASTES RASTRELLIGER		2			X								X			

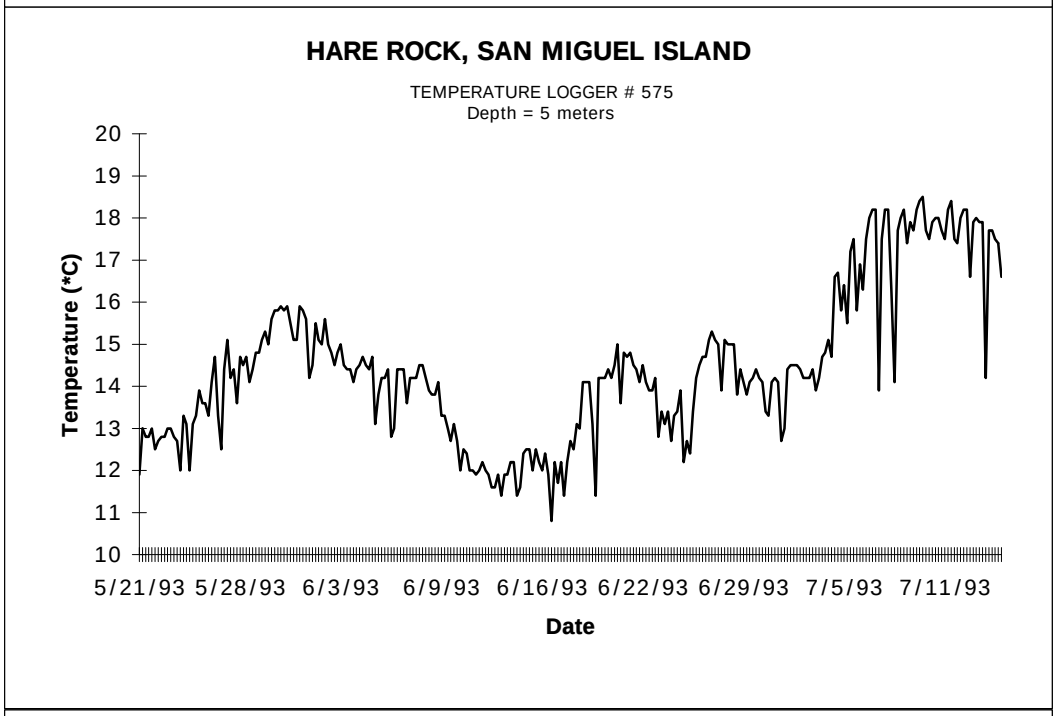
LOCATION:	SMIWL	SMIHR	SRIJLN	SRIJLS	SRIRR	SCIGI	SCIFH	SCIPB	SCISA	SCIYB	ANIAR	ANICC	ANILC	SBISESL	SBIAP	SBICC
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SPECIES																
SEBASTES SERRANOIDES	2	2	2	2	3		2					X	2			
S. SER./S. FLAVIDUS juveniles	X	2		2												
SEBASTES SERRICEPS	X	1	2				2	2			X		2			
S. SERRICEPS juveniles							X	X					2			
PARALABRAX CLATHRATUS			2	2	X		2	2	3	3	X	3	2	2	2	3
P. CLATHRATUS juveniles								3	2	1		3		1	X	
SPHYRAENA ARGENTEA										X						
CITHARICHTHYS SORDIDUS		X														
CITHARICHTHYS SP.														2		
PLEURONICHTHYS SP.								X								
PLEURONICHTHYS COENOSUS	X		X	X								2		2		
PHALACROCORAX SP.														2	3	3
PHOCA VITULINA	X	X	X				X						X			
ZALOPHUS CALIFORNIANUS					X											X

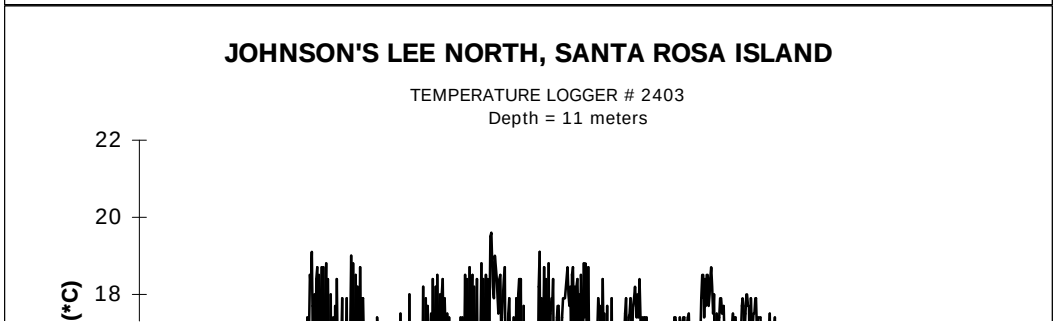
Appendix C. 1993 Temperature data collected at Channel Islands National Park Kelp Forest Monitoring Stations by temperature loggers.

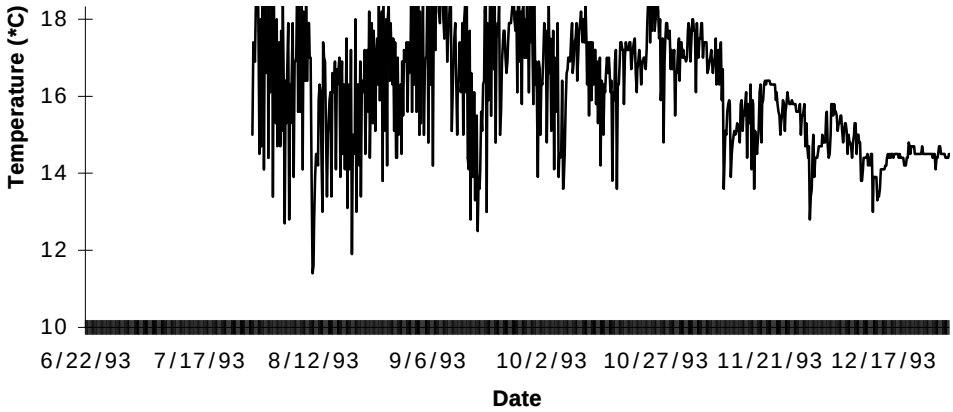
Introduction

This appendix contains the temperature data collected by HOBOTEMP™ temperature loggers that were deployed at all 16 Kelp Forest Monitoring sites. There is no data available for Scorpion's Anchorage, Santa Cruz Island and Arch Point, Santa Barbara Island because of technical problems. The temperature loggers were deployed at all sites between June 22 and October 1, 1993, except for one at Hare Rock, San Miguel Island, which was deployed on May 21, 1993. The data is presented graphically, and all graphs are presented on the same date scale, except for Hare Rock. Hare Rock is presented with a different date scale because of the earlier deployment date and the lack of data past July 15, due to technical problems.


WYCKOFF LEDGE, SAN MIGUEL ISLAND
TEMPERATURE LOGGER #2415
Depth = 13 meters
Temperature (*C)
20
19
18
17
16
15
14
13
12
11
10
6/22/93
7/17/93
8/12/93
9/6/93
10/2/93
10/27/93
11/21/93
12/17/93
Date

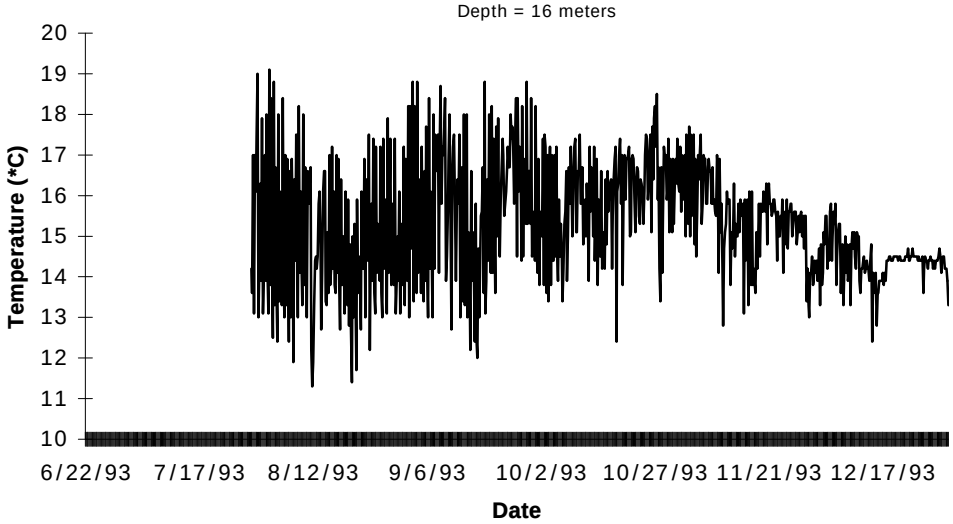

HARE ROCK, SAN MIGUEL ISLAND
TEMPERATURE LOGGER # 575
Depth = 5 meters
Temperature (*C)
20
19
18
17
16
15
14
13
12
11
10
5/21/93
5/28/93
6/3/93
6/9/93
6/16/93
6/22/93
6/29/93
7/5/93
7/11/93
Date


JOHNSON'S LEE NORTH, SANTA ROSA ISLAND
TEMPERATURE LOGGER # 2403
Depth = 11 meters
22
20
18
(*C)



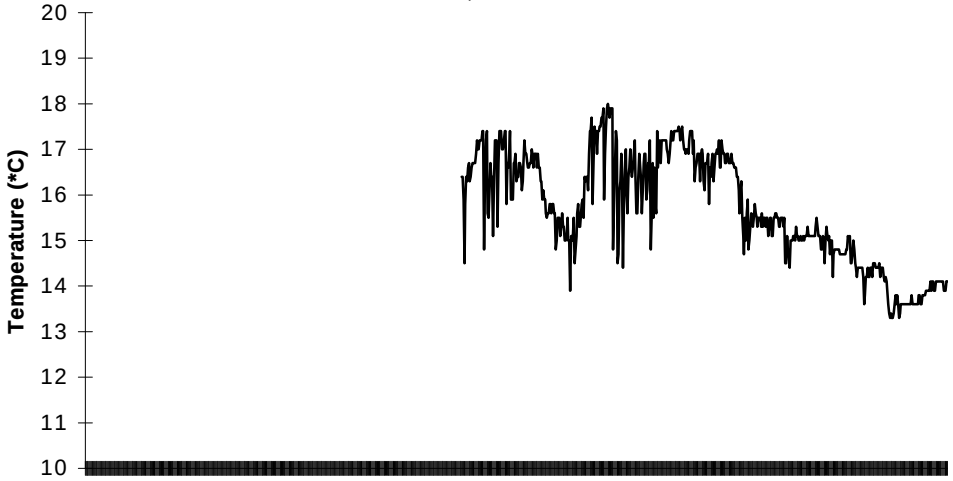
JOHNSON'S LEE SOUTH, SANTA ROSA ISLAND

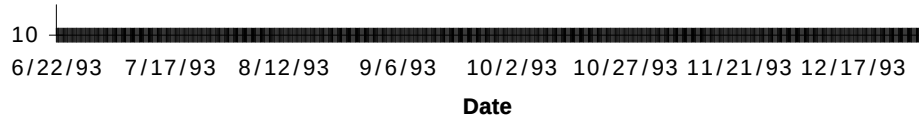
TEMPERATURE LOGGER # 2408
Depth = 16 meters



RODES REEF, SANTA ROSA ISLAND

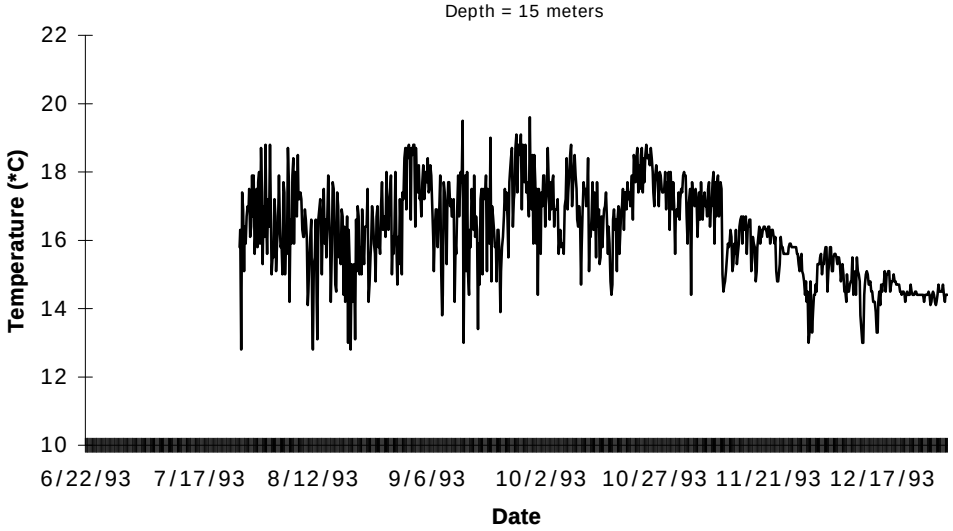
TEMPERATURE LOGGER # 2414
Depth = 13 meters





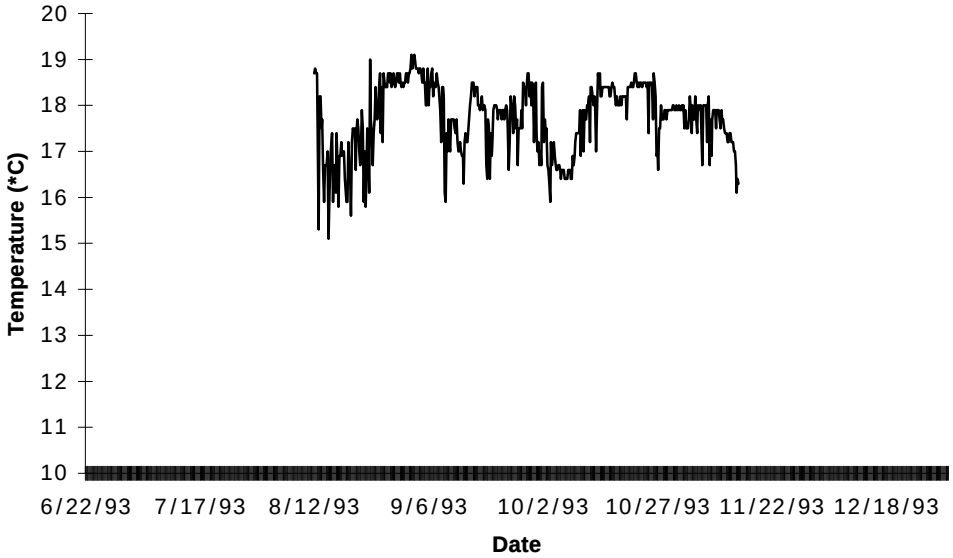
GULL ISLAND SOUTH, SANTA CRUZ ISLAND

TEMPERATURE LOGGER # 2407
Depth = 15 meters



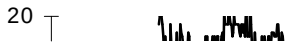
FRY'S HARBOR, SANTA CRUZ ISLAND

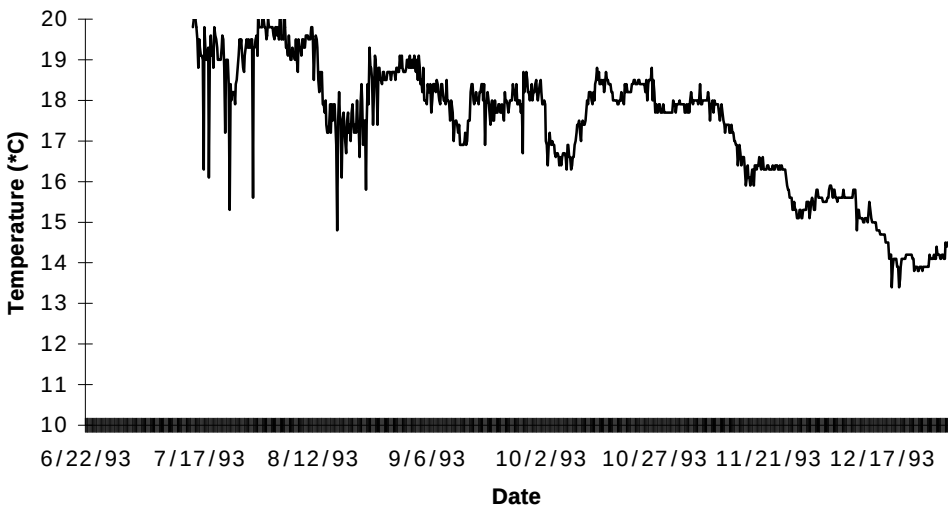
TEMPERATURE LOGGER # 2410
Depth = 13 meters



PELICAN BAY, SANTA CRUZ ISLAND

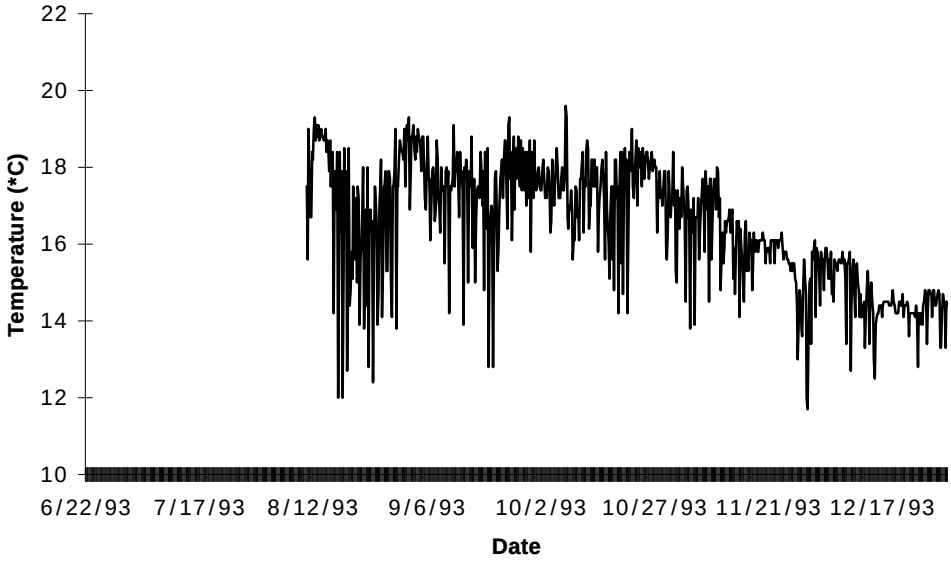
TEMPERATURE LOGGER # 2406
Depth = 8 meters





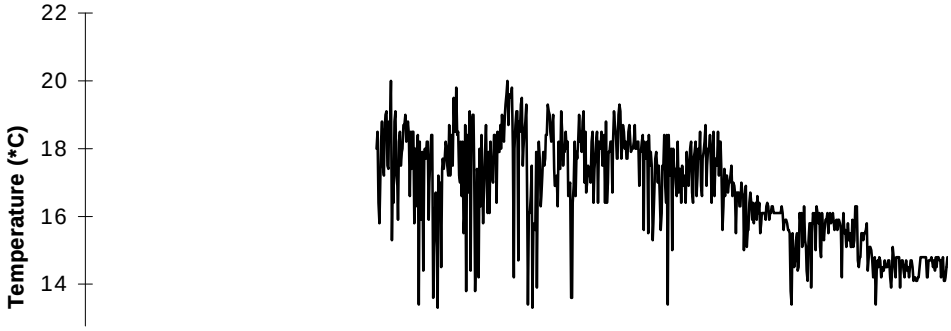
YELLOW BANKS, SANTA CRUZ ISLAND

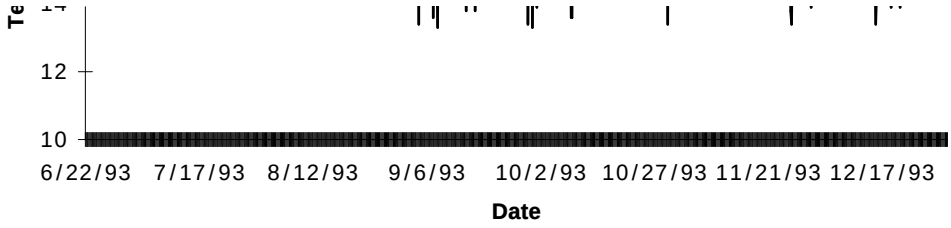
TEMPERATURE LOGGER # 2409
Depth = 15 meters



ADMIRAL'S REEF, ANACAPA ISLAND

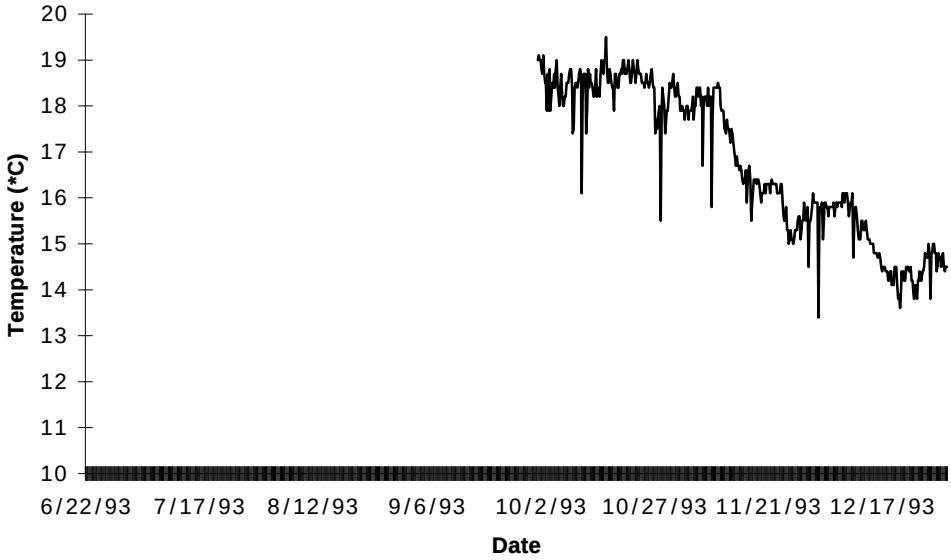
TEMPERATURE LOGGER # 2412
Depth = 16 meters





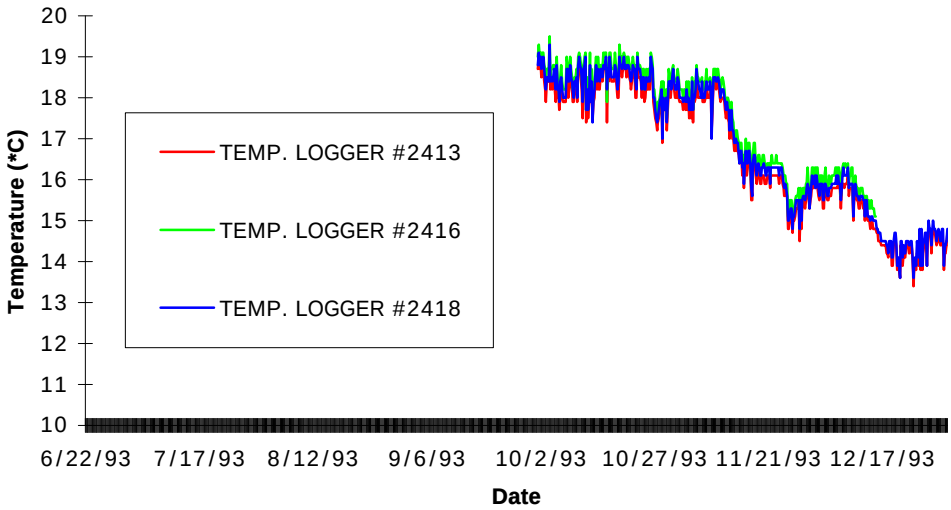
CATHEDRAL COVE, ANACAPA ISLAND

TEMPERATURE LOGGER # 2417
Depth = 6 meters

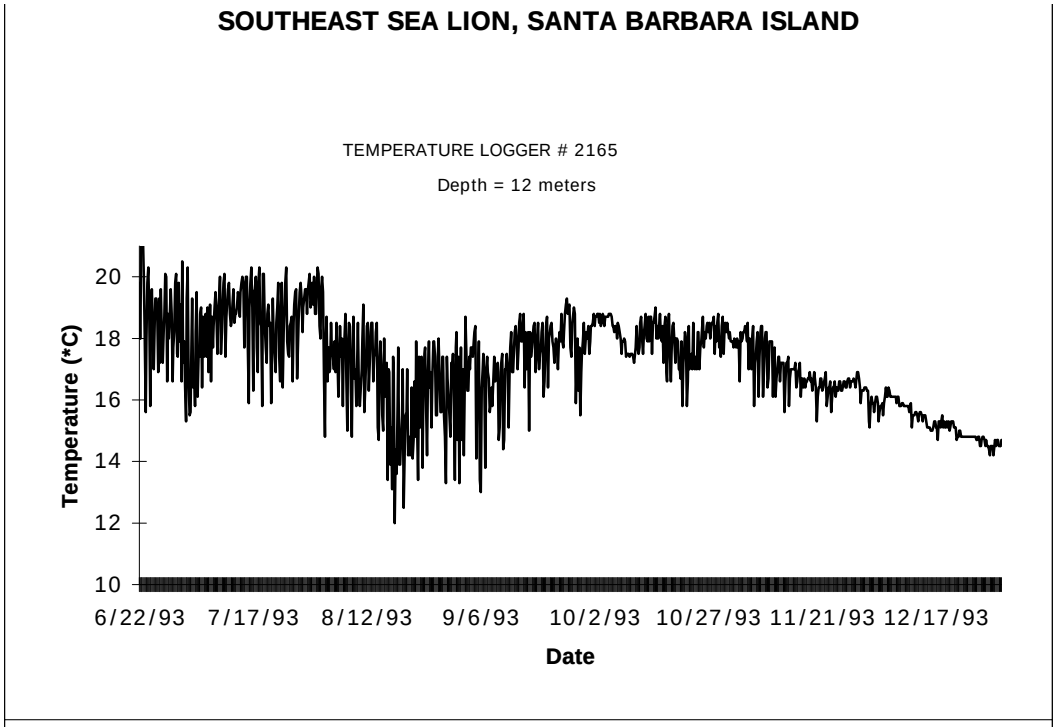


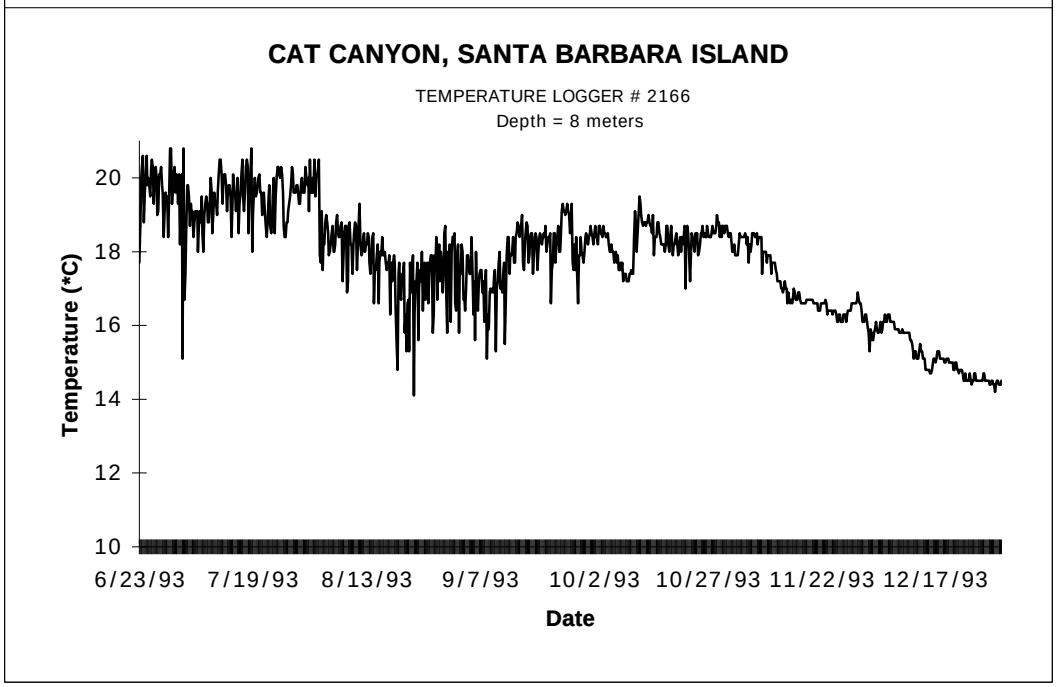
LANDING COVE, ANACAPA ISLAND

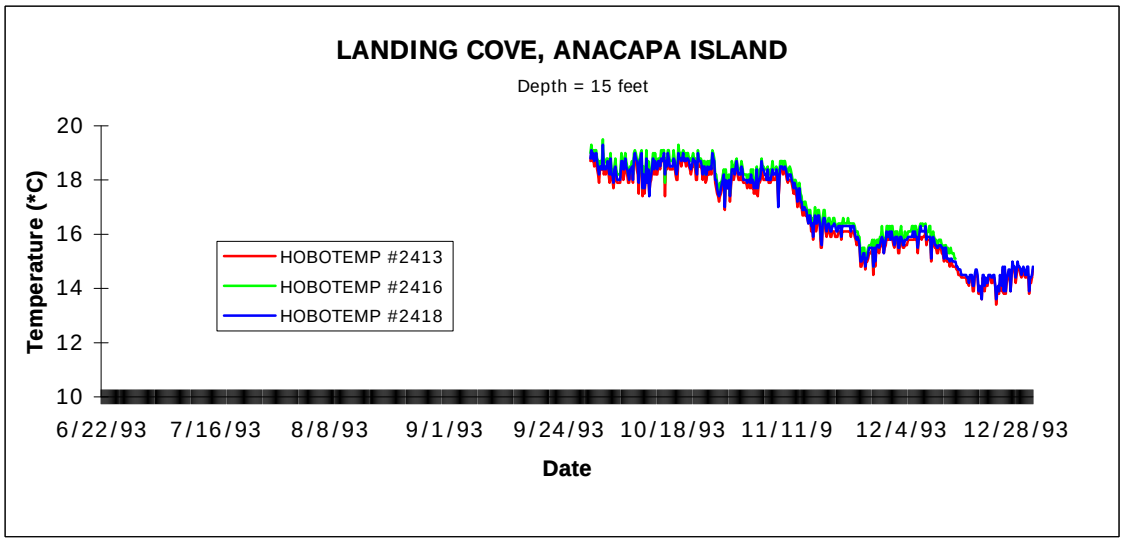
Depth = 5 meters



SOUTHEAST SEA LION, SANTA BARBARA ISLAND


SOUTHEAST SEA LION, SANTA BARBARA ISLAND
TEMPERATURE LOGGER # 2165
Depth = 12 meters
Temperature (*C)
20
18
16
14
12
10
6/22/93
7/17/93
8/12/93
9/6/93
10/2/93
10/27/93
11/21/93
12/17/93
Date


CAT CANYON, SANTA BARBARA ISLAND
TEMPERATURE LOGGER # 2166
Depth = 8 meters
Temperature (*C)
20
18
16
14
12
10
6/23/93
7/19/93
8/13/93
9/7/93
10/2/93
10/27/93
11/22/93
12/17/93
Date


LANDING COVE, ANACAPA ISLAND
Depth = 15 feet
Temperature (*C)
20
18
16
14
12
10
HOBOTEMP #2413
HOBOTEMP #2416
HOBOTEMP #2418
6/22/93
7/16/93
8/8/93
9/1/93
9/24/93
10/18/93
11/11/9
12/4/93
12/28/93
Date