KELP FOREST MONITORING
CHANNEL ISLANDS NATIONAL PARK

1990 Annual Report

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ABSTRACT

The 1990 results of the Channel Islands National Park Kelp Forest Monitoring Project are described in this report. Sixty-eight species of algae, fish, and invertebrates were monitored annually 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, size frequencies, fish and video transects, photogrammetric plots, size frequency measurements, and species list surveys. In 1990, eight sites had healthy kelp forests, while three others had remnants or signs of a developing forest, though dominated by purple sea urchins. Four sites were dominated by purple sea urchins and one was dominated by red sea urchins. Four sites had high to moderate densities of white sea urchins, but two of those had dense kelp forests over most of the transect.

EXECUTIVE SUMMARY

As part of the long-term ecological monitoring program, Channel Islands National Park has been conducting monitoring of the kelp forests around Santa Barbara, Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands since 1982. In 1990, 44 National Park Service and volunteer divers made 759 dives during a series of seven five-day and three shorter cruises to conduct the monitoring.

Though originally all sites were kelp forests ten years ago when the monitoring program began, only eight of the 16 permanent sites had healthy kelp forests in 1990. Another site, Cathedral Cove, Anacapa Island had some kelp along the transect and showed signs of recovery though it does not really fit a description of either a kelp forest or urchin barren at present. Four other sites, including all three Santa Barbara Island sites and Scorpion Anchorage on Santa Cruz Island were considered purple sea urchin barrens, with little algae and more than 40 sea urchins per square meter. There were signs of kelp forest development nearby to Arch Point and Cat Canyon. Hare Rock on San Miguel Island had an abundance of ephemeral algae and red sea urchins. Fry's Harbor on Santa Cruz Island had an extremely high density of

small red sea cucumbers covering the site. Also on Santa Cruz Island, Pelican Bay was barren of most macro algae and was covered with silt. The purple sea urchin density has declined there in the last few years.

White sea urchin densities were high at four sites; Fry's Harbor and Yellowbanks on Santa Cruz Island, Admiral's Reef on Anacapa Island, and Southeast Sea Lion Rookery on Santa Barbara Island. Densities at Fry's Harbor were patchy and generally just below the transect area.

The water around the islands was warmer than usual in 1990. This resulted in an early deterioration of the kelp forest canopy by the end of the monitoring season. An increase in the incidence of echinoderms (sea stars, sea cucumbers, and sea urchins) with wasting disease was observed and may also be attributable to the warmer waters. At least three species of sea stars were observed with the wasting disease at seven different sites from Anacapa to Santa Rosa Island.

Fish were generally abundant with young-of-year observed for most species monitored. For many fish, 1990 appeared to be a very good recruitment year. Sheephead, kelp bass, rock wrasse, giant kelpfish, and topsmelt were some of the juvenile

fish that were noted as being especially abundant.

Red abalone abundance continued to decline slightly at most sites. Young abalone were most abundant at Hare Rock and Johnson's Lee North. The abalone at Johnson's Lee North were mostly older than one year.

In a cooperative experiment with California Department of Fish and Game, abalone recruitment modules were placed out at Yellow Banks, Gull Island, and Johnson's Lee North to test the efficacy of monitoring abalone recruitment. Juvenile hatchery raised red abalone were placed in modules to test the suitability of the modules as habitat. Juvenile native abalone were found using the modules along with various other species of fish, sea stars, octopus, and many encrusting invertebrates. After ten months, survival of transplanted abalone in the modules was best at Johnson's Lee North.

Recommendations evolving from the monitoring program in 1990 include research into improving sampling design, quantifying drift algae and siltation, and conducting regular aerial surveys of the kelp forests for quantification of kelp canopy coverage.

INTRODUCTION

The waters of Channel Islands National Park and Channel Islands National Marine Sanctuary harbor one-third of southern California's kelp forests (Davies, 1968). The giant kelp, *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 the kelp forest. 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 estuarine 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) requires monitoring of the natural resources in the park. Kelp forest monitoring is part of the long-term ecological monitoring at the park 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 was implemented in 1987 by the park 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 (1993), describe monitoring efforts and results for 1982-1989.

This report summarizes the monitoring efforts and results from 1990. Comparisons with previous years are discussed in general reference. The purpose of this report is to archive the data and make them available. Detailed analysis of annual variations will be provided in future reports. 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 at each of the stations, and tried to provide a characterization for each site. When possible, organisms are referred to by common name and cross referenced to their scientific names in Table 2.

METHODS

Population dynamics of 68 taxa or "target species" (Table 2) were measured at 16 fixed sites 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 1990.

Each site is marked by a 100 m-long transect permanently affixed to the seabed. The nine sampling techniques employed

to gather population dynamics information are summarized in Table 3. At each station, randomly placed 1 m x 2 m quadrats and 3 m x 20 m band transects were used to determine densities and distribution of discrete benthic organisms; 1,000 randomly selected points (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 and video taped 20 m^2 photogrammetric plots 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 made for each station, noting presence/absence and relative abundance for all recognizable species.

White sea urchins were counted in quadrat counts at Admiral's Reef and Yellow banks in 1990 because of the high numbers of sea urchins and the difficulties of counting those densities on band transects.

In 1990 a new video system was acquired for use on video transects to document the visual changes along the length of the transect. The system is much smaller and results were favorable except for some problems with focusing. Problems

with cameras and strobes continued to plague us, so we tried videotaping the photogrids at several sites with favorable results.

Abalone recruitment modules designed by Earl Ebert of California Department of Fish and Game were placed at three sites to test the efficacy of using artificial habitat to monitor juvenile abalone recruitment. The module frames were made from plastic coated, galvanized two-inch fencing. Each frame holds twenty concrete half-blocks (cut lengthwise) and arranged in five tiers of four, forming a central open area. The cage holding the blocks protects the young abalone from fish predators, but allows young abalone and all but very large seastars to move freely in and out through the wire. Three sets of five modules were placed at each of three stations; Johnson's Lee North at Santa Rosa Island, Gull Island at Santa Cruz Island, and Yellowbanks at Santa Cruz Island. At each station, 2,000 hatchery raised abalone (from island stock) were distributed among 12 of the modules to test the suitability of the modules as habitat in October 1989. The three empty modules at each site served as controls to test the effects of pre-conditioning the modules with abalone. Further details and final results of this experiment will be presented in a later paper.

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		R
Miscellaneous Red Algae		R
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	
Chestnut cowrie		Cypraea spadicea
	Q,S	
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 shell	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	*Semicossiphus 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

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

Table 2. Station information.

STATION NUMBER	ISLAND	LOCATION	ABBREVIATION	DEPTH (FEET)	YEAR EST.
1	San Miguel	Wyckoff Ledge	SMIWL	43-49	1981
2	San Miguel	Hare Rock	SMIHR	20-30	1981
3	Santa Rosa	Johnson's Lee North	SRIJLNO	31-36	1981
4	Santa Rosa	Johnson's Lee South	SRIJLSO	46-52	1981
5	Santa Rosa	Rodes Reef	SRIRR	43-49	1983
6	Santa Cruz	Gull Island South	SCIGI	45-54	1981
7	Santa Cruz	Fry's Harbor	SCIFH	39-42	1981
8	Santa Cruz	Pelican Bay	SCIPB	21-27	1981
9	Santa Cruz	Scorpion Anchorage	SCISA	15-20	1981
10	Santa Cruz	Yellowbanks	SCIYB	48-51	1986
11	Anacapa	Admiral's Reef	ANIAR	42-49	1981
12	Anacapa	Cathedral Cove	ANICC	20-35	1981
13	Anacapa	Landing Cove	ANILC	15-40	1981
14	Santa Barbara	SE Sea Lion Rookery	SBISESL		

40-46	1981			
15	Santa Barbara	Arch Point		SBIAP
22-27	1981			
16	Santa Barbara	Cat Canyon		SBICC
22-30	1986			

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

TECHNIQUE	SAMPLE SIZE	NUMBER OF REPLICATES
Quadrat count	1 m X 2 m	20 / site
Band Transect count	3 m X 20 m	12 / site
Random Point count	40 points (0.5 x 3 m)	25 / site
Visual Fish transect	2(w) X 3(h) X 100(l) m 5 minutes	8 / site
Video transects	5 minutes/100 m	4 / site
Size frequency	30 to 100 / species	1 / site
Photogrammetric plots	20 m^2 (80-0.5 x 0.5 m)	1 / site
Species checklist	30 - 90 minutes	1 / site

STATION RESULTS AND DISCUSSION

Sampling was completed at all 16 monitoring sites by 44 divers during seven five-day cruises and three one-day cruises (Table 5). A total of 759 dives were completed for a total bottom time of 521 hours.

Following are summaries of the 1990 monitoring site status and important observations made at each site. Summary tables for quadrats, band transects, random point contact quadrats (RPCs), fish transects, and size frequencies for all 16 stations can be found in Appendix A. Species lists for the 16 stations are in Appendix B.

Station: Wyckoff Ledge, San Miguel Island

Site #1 SMIWL

1990 sampling dates: 7/24, 9/25

1990 status: Dense mature kelp forest.

The kelp at Wyckoff ledge was abundant and healthy in 1990. There was no sign of the damage done by kelp curler amphipods observed in 1989. Mean holdfast width (24 cm) did not change appreciably from the 1989 mean. This holdfast width and stipe

number (11/plant) are indicative of a mature kelp forest. Foliose red algae were abundant and diverse with over 70% coverage of the bottom, the most for any station. Acid weed was present (9% cover), but not as abundant as it was in 1988 when its peak density of 73% was recorded. The relatively low coverage (17%) of giant kelp, southern sea palm, and California sea palm was a reflection of the low abundance of the understory kelps seen in the quadrat counts. Forty-two species of algae were noted on the species list searches.

Both red and purple sea urchins were present at low densities. Wyckoff ledge was one of the few sites where red sea urchins were more numerous than purple sea urchins. Size frequencies for red sea urchins in 1989 and 1990 showed little change in mean size (59 mm) or range, and both years showed a distinct bimodality. In 1990, white sea urchins were recorded (band transects) for the first time. The densities of white sea urchins were very low.

Red abalone density was recorded at its lowest level since monitoring began ($0.028/m^2$). This density decrease; however, may simply be an artifact of random sampling and patchiness. The smallest abalone measured was 82 mm. Most of the abalone observed were hidden in crevices.

At Wyckoff Ledge, red turban snails appear to completely replace wavy turban snails which are common around the eastern islands. The ornate tube worm, was an important species occupying over 10% of the substrate. This may be related to Wyckoff Ledge being one of the sandiest sites, with over 20% sand. Another worm, Pista elongata was one of the most abundant miscellaneous invertebrates on RPC's.

Sunflower star density declined somewhat in 1990. Sizes from 8 to 260 mm were found. Giant-spined sea star density increased slightly to the highest level since monitoring began. The mean size was a relatively small 64 mm. Bat star density declined in the mid-1980's, though not as dramatically as at some of the southern stations. Density has increased since, though the 1990 density was still less than that of 1982.

Rock crabs (Cancer antennarius) were abundant at the site. Several crabs were observed feeding on a large red abalone. The kelp crab (Pugettia producta) was also abundant.

Kelpfish (Gibbonsia sp.) and tubesnouts (Aulorhynchus flavidus) were both abundant at the site. Sheephead and

rockfish seemed abundant during general observation, though were only moderately abundant on transect counts. Juvenile rockfish of several species were present in moderate to abundant densities.

Station: Hare Rock, San Miguel Island

Site #2 SMIHR

1990 sampling dates: 7/23, 7/25, 9/25

1990 status: red sea urchin barren with ephemeral algae and high density of strawberry anemones.

Only one small kelp plant grew on the transect, however there were some dense patches of algae (Ulva, Polysiphonia, sea tongue, and acid weed). Green algae was one of the most abundant organisms on RPCs. Only 10% of the substrate was considered bare compared to 23% in 1989. Seventeen species of algae were noted on the species list, mostly ephemeral, weedy species.

No sea hares, grazers of ephemeral algae, appeared on the band transects. Juvenile sea hares were observed during searches. Strawberry anemones were very abundant covering nearly 17% of the substrate. Orange and La Jolla cup corals were common.

Chestnut cowries were extremely abundant at the east end of the line, although the quadrat counts were not particularly high.

Red sea urchin density ($9/m^2$) was the highest of all the monitored sites and even higher than purple sea urchin density ($2.5/m^2$) for this site. The largest red sea urchin collected for size frequencies was 87 mm in test diameter; the mean was 58 mm.

Red abalone were not found on the band transects for the first time since 1983. Densities have been decreasing since 1986. Nearly all of the abalone found at the site for size frequency measurements were juveniles under 40 mm. This was one of the most positive signs of recent abalone recruitment seen in 1990.

Bat stars were common ($1.4/m^2$) and showed a bimodal size distribution in both 1989 and 1990. The giant-spined sea star population ($0.68/m^2$) is second only to Johnson's Lee North in density, and appears to be composed of young (small) size classes. Both large and small sunflower stars were found in moderate density ($.0278/m^2$).

Numerous large rockfish were observed at the site. Juvenile rockfish of several species were abundant. Señorita wrasses were present for the first time in several years, including young-of-year. Blue rockfish juveniles were present in moderate numbers. Kelp rockfish were abundant.

Station: Johnson's Lee North, Santa Rosa Island

Site #3 SRIJLNO

1990 sampling dates: 8/7, 8/8, 9/13

1990 status: dense maturing kelp forest with few sea urchins.

In 1990, Johnson's Lee North had a very dense kelp forest (greatest recorded density for all monitoring sites) with a surprising amount of understory algae despite a thick upper canopy. Data suggests a general maturation of the kelp forest. The number of giant kelp plants declined from 1989 densities, to about $2/m^2$, a process expected as the community matures and the forest opens. This was primarily because of a decline in juvenile plants from $8/m^2$ to $1/m^2$. Mean holdfast width increased from 22 cm in 1989 to 36 cm in 1990, while the mean number of stipes per kelp plant did not change. The percent cover of giant kelp, California sea palm, and southern

sea palm dropped from a mean of 61% in 1989, to 42% in 1990. California sea palm was the most numerous understory kelp. The opening of the canopy allowed increases in red algae, miscellaneous brown algae, and bladder chain kelp. Thirty-three species of algae were recorded. Articulated coralline algae were fairly common, while crustose coralline algae were covered by other organisms. Only 6% of the substrate was recorded as bare.

Many kelp holdfasts were encrusted with colonial sand-tube worms which increased in percent cover from zero in 1988 to 14% cover in 1990. Colonial sand-tube worm density peaked previously in 1985 when kelp was scarce. Bryozoans and hydroids were common encrusting invertebrates in 1990. Hydroids (Aglaophenia latirostris and Plumularia sp.) were the most common miscellaneous invertebrates (RPC's). Small sea cucumbers, (Pachythyone rubra and Cucumaria sp.) which were very abundant during the sea urchin-barren years, were absent from the site.

Both purple and red sea urchins were primarily restricted to the undersides of ledges and rocks. Red sea urchin density ($0.18/m^2$) dropped to the lowest level ever recorded at this site. Both species tended to be clumped; however, the highest

quadrat count for purple sea urchins was only 8 (compared to 78 in 1982 and 153 in 1984) and the variability in density was the lowest since monitoring began in 1982. The presence of few individuals in small size classes seems to indicate that there was little recruitment between 1989 and 1990. The recruitment seen in 1989 in both sea urchin species may correspond with the increase in mid-sized sea urchins observed in 1990.

Red abalone were found on band transects for the first time in three years. Sub-legal red abalone (<178 mm) were fairly common, especially under the red sea urchin spine canopy. Measured shell lengths covered a broad range with several individuals found in the one to two year-old size classes. The mean size continued its downward trend in 1990 possibly indicating recent recruitment.

Abalone recruitment modules were placed at this site on September 12, 1989. Surveys were conducted throughout the year. Experimental results were most favorable here with 27% of the hatchery abalone surviving after 10 months. Native abalone were found in the modules during five 1990 surveys (in prep.). Juvenile rockfish, sea stars, octopus, and many other invertebrates were observed utilizing the modules. Sculpins

laid eggs in the modules.

The sunflower star and bat star populations both increased sharply in 1990. The density of bat stars is still only one-fifth the density at Johnson's Lee South and one-fifth the 1982 density. Many young giant-spined sea stars were noted living in the abalone recruitment modules along with medium-sized sunflower stars. Size frequencies for sunflower stars indicate a fairly young population, but cover a broad range.

Young-of-year surfperch (kelp, pile, striped, and black) and rockfish (kelp, olive, and blue) were present. Kelp rockfish abundance remained steady after increasing along with kelp density in the previous few years. Kelp bass abundance increased slightly after decreasing during previous years.

Kelp isopods (Idotea resecata) were abundant despite a high abundance of kelp surfperch and giant kelpfish which would be expected to prey heavily on these isopods.

Station: Johnson's Lee South, Santa Rosa Island

Site #4 SRIJLSO

1990 sampling dates: 8/7, 8/8, 9/13

1990 status: dense mature kelp forest.

This site had a healthy kelp forest that was much more open than that of Johnson's Lee North. Kelp densities have not changed since 1989; however, the percent cover of understory kelps, such as juvenile giant kelp, southern sea palm and California sea palm decreased from 60% in 1989, to 17%. This site had the greatest density of California sea palm (0.53/m^2) for all sites in 1990 even though the density was one-fifth the 1989 density. The percent cover of kelp for this site was nearly equal to Wyckoff Ledge, San Miguel Island. The kelp population was mostly comprised of large plants with a mean holdfast width of 43 cm and a mean of 14 stipes per plant.

Ornate tube worms were abundant in sandy patches. Bryozoans and hydroids were also abundant. Hydroids, Aglaophenia sp., and small sea cucumbers, Cucumaria sp., were the most common miscellaneous invertebrates (RPCs). Colonial sand-tube worms which were so common at Johnson's Lee North, were absent here. The stalked tunicate was common at both Johnson's Lee sites.

Red gorgonians were common (0.2/m^2), though density was half that of 1986 when recruitment was very high. This site experiences high currents as do the other stations with high

gorgonian densities (SCIYB, ANIAR, SBISESL).

The trend for red sea urchin density ($1/m^2$) has been a slow decline since the peak of $9/m^2$ in 1986. Purple sea urchin densities have increased over the last two years from a low in 1988 to $11/m^2$ in 1990.

Red abalone densities have declined greatly since 1986 and are reaching the limits of detectability on band transects. Kellet's whelk and giant-key-hole limpet densities also seem to be declining.

This site had the greatest mean density of bat stars ($2.6/m^2$) of all the monitoring sites. Sunflower star density doubled between 1989 and 1990 to $0.26/m^2$. Nearly half of the individuals measured were relatively small (less than 100 mm radius). Giant-spined sea star densities remained low, and most of the measured population was small (<70 mm).

Station: Rodes Reef, Santa Rosa Island

Site #5 SRIRR

1990 sampling dates: 7/9, 7/10, 9/24

1990 status: mature kelp forest with dense canopy.

In general, the kelp canopy at Rodes Reef was very dense; however, many kelp plants on the eastern half of the site had been cut off at about two feet from the substrate as a result of storm damage or possibly being cut by urchin divers attempting to prevent entanglement with their air hoses. This disturbance to the kelp canopy was partially responsible for the much reduced kelp densities recorded in 1990 (0.15 /m^2 and 6% cover) when compared with 1989 and 1988 (1.0/m^2, 21% and 1.9/m^2, 34% respectively).

Juvenile giant kelp density was higher in 1990 (2.2/m^2) compared with 1989 (0.7/m^2). Many of these juvenile kelps showed a very strong growth between subsequent visits to this site in 1990. Size frequency modes reflect the abundance of juvenile kelp.

Under the kelp canopy it was dark with very little understory algae. Understory brown algae was rare or absent. In the cleared area, red foliose algae were more common. The red algae matured to reproductive age between visits. Overall cover of miscellaneous red algae and crustose coralline algae declined from last year; however, articulated coralline algae increased in percent cover. Acid weed, an annual species with

a peak percent cover (54%) in 1988, continued its decline in abundance to only 0.1% in 1990.

Cover of southern staghorn bryozoans increased from lows of less than 1% for the last four years to 6% in 1990 giving Rodes Reef nearly the highest percent cover for this bryozoan, second only to Anacapa's Landing Cove.

The sponges Leucosolenia eleanor and Leucetta losangelensis were common. The orange puffball sponge density increased in 1990, maintaining Rodes Reef's record for having the highest density of this species for all sites monitored.

Large Tealia columbiana were common here, one of the few places we typically see these large anemones. The snails Mitra idae were abundant in July when they were observed laying eggs.

Red sea urchin density increased from $4/m^2$ in 1989 to $7/m^2$ in 1990. Purple sea urchin density declined in from $3.2/m^2$ in 1989 to $1.3/m^2$ in 1990. Overall sea urchin density increased, maintaining the historical inverse correlation between sea urchin densities and kelp densities at this site (Fig. 2). Red sea urchins may have moved into the area in response to

increased drift algae from kelp. Sea urchins were not found on the east end of the transect where the kelp was gone.

Pink and red abalone remain rare at this site. Pink abalone were only observed during species list searches, red abalone were not found at all in 1990. Red turban snail, kellet's whelk, giant keyhole limpet, and rock scallop density declined in 1990.

A diverse assemblage of eight species of sea stars is typically found at this site. Sunflower star density at Rodes Reef is typically among the highest of all the monitoring sites. Sunflower star density dropped from 0.283/m^2 in 1989 to 0.1125/m^2 in 1990. There was an increase in mean radius over the last two years in this species, with few individuals less than 50 mm measured. A reduction in sunflower star density typically correlates with an increase in sea urchin density as is indicated at this site in 1990. Giant-spined sea stars were noted as abundant at this site. Bat stars and warty sea cucumbers were observed exhibiting symptoms of wasting disease.

Fish were abundant at this site. Blue Rockfish and Sheephead were more common in 1990 than in 1989. Tubesnouts were

present on the first visit, but not in September.

Station: Gull Island, Santa Cruz Island

Site #6 SCIGI

1990 sampling dates: 8/9, 9/12, 10/3

1990 status: moderately developed, patchy kelp forest.

Giant kelp and southern sea palm densities increased in 1990. These kelps cover much of the southern three quarters of the site. The northern quarter of the site was characterized by a more patchy, open distribution of kelp. Though there was fairly good coverage of kelp along the transect, most of the stipes did not reach the surface and many of the blades were in poor condition with perforations and heavy bryozoan growth. In general all large macroalgae densities and percent covers increased in 1990, suggesting a continuing recovery from the low values which occurred in 1986 through 1988. Juvenile kelp numbers increased dramatically from $0.2/m^2$ in 1989 to $2.2/m^2$ in 1990, suggesting a vigorous recruitment. The many young kelp plants on neighboring reefs may herald a strong general recovery of the kelp beds around Gull Island. Miscellaneous red algae and coralline algae coverage also increased in 1990. The percentage of bare substrate decreased significantly from

the 1988 and 1989 levels.

The strawberry anemone percent-cover declined significantly in 1990 to just 7% from the highest levels at any site last year (20%). The related La Jolla cup coral and the brown and red gorgonians also declined in density in 1990. These declines seem to be correlated with the return of algal cover.

The California hydrocoral, was found in significant numbers at this site only. The occurrence of the hydrocoral around the channel islands is very patchy.

Purple sea urchin densities remain extremely high at $40/m^2$. A reduction in these voracious grazers may correspond with the increase in algal cover; however, the high densities of sea urchins at this site are more indicative of sea urchin barren sites such as those at Santa Barbara Island and Scorpion Anchorage, Santa Cruz Island. Red sea urchin density remained steady at $2/m^2$. Red sea urchin mean test diameter (32 mm) remained consistent with previous years, though this is relatively small when compared to other sites and is similar to the test diameters observed for red sea urchins at Pelican Bay and Scorpion Anchorage. White sea urchin densities declined for the second year in a row to $0.6/m^2$.

Though pink and red abalone were found during species list surveys, abalone were not detected on band transects. Experimental recruitment modules were placed here on October 2, 1989. The results here were the most disappointing, with the fewest native abalone found at any of the three sites. Survival of the transplanted abalone was 31% based on the number of shells found; however, most of the abalone had disappeared.

Wavy turban snails remained scarce again in 1990 and have yet to show signs of recovery from the low densities that followed the demise of the kelp in 1988. Large sea hares were found at the north end of the transect where ephemeral algae were dominant.

Sunflower stars were detected on the band transects in 1990 for the first time in seven years. Relative abundance was also noted as increasing on species list surveys. Bat stars and giant-spined stars remained at moderate density levels.

Young-of-the-year kelp bass, giant kelpfish, señorita, and rockfish (olive, blue, and kelp) were observed. Abundances of blacksmith and sheephead were lower, while señoritas were more

abundant in 1990 than during the previous three years.

Station: Fry's Harbor, Santa Cruz Island

Site #7 SCIFH

1990 sampling dates: 7/11, 7/26, 9/26

1990 status: barrens dominated by small aggregated red cucumbers and white sea urchins.

Kelp and other large brown macroalgae were essentially absent at this site and have been since 1986. There were a few southern sea palms at the northern end of the transect. The percent cover of miscellaneous red algae increased steadily over the last two years from 1% in 1988 to 9% in 1990. The percent of bare substrate declined over the same time period.

Sponges were recorded at their highest percent-cover since 1985 and the La Jolla cup coral increased to 31%, the highest of all the monitoring sites. The southern staghorn bryozoan as well as other miscellaneous bryozoans declined in percent cover at this site.

Sea urchin abundance remained relatively steady with red sea urchins at 1.6/m^2 and purple sea urchins at 9.8/m^2. These sea

urchin densities were lower than those typically occurring at other barrens around the Channel Islands where purple sea urchin density is usually greater than 40/m^2. The white sea urchin density increased slightly, to 2.2/m^2, maintaining a steady increase since 1987. Most of the white sea urchins were found on sand along the deeper areas of the transect.

Abalone were not found during the standardized survey methods; however, pink abalone were found for the first time in three years during the species list survey. Densities of the wavy turban snail, giant keyhole limpet, and rock scallop declined slightly in 1990. Hermit crabs were found inhabiting many empty wavy turban snail shells.

Red gorgonians were found in moderate abundance with many large individuals recorded. The sizes covered broad ranges: 9-71 cm high and 6-117 cm wide.

Bat star density increased again in 1990 to nearly one individual per square meter. Individual sea stars were found in September with symptoms of the wasting disease.

Recorded abundance of juvenile blue rockfish was 100 times greater in 1990 than in 1989. Juvenile painted greenling were

also very common.

Aggregated red sea cucumbers, Pachythione rubra, were extremely abundant. These small cucumbers were recorded at 12% cover on RPCs, but impressions were that it was a much higher coverage. The cucumber's distribution was patchy in sandy areas and in the deeper areas near the center of the transect. Of all the monitored sites, Fry's Harbor had the highest recorded density of the larger warty sea cucumber (2.6/m^2).

Station: Pelican Bay, Santa Cruz Island

Site #8 SCIPB

1990 sampling dates: 7/12, 7/26, 9/26

1990 status: silty barrens.

This site remains barren of kelp and other macroalgae. During the 1982-1983 El Niño event, Pelican Bay underwent one of the more dramatic losses of kelp cover of all the monitoring sites, and to this date has shown no signs of recovery. Small filamentous green algae (miscellaneous green algae on RPC's) was found in relative abundance (14%) over much of the rock surface. San Miguel Island's Hare Rock was another relatively shallow site with abundant green algae.

Miscellaneous invertebrates at this site were primarily barnacles, which occupied a greater percent cover (31%) than at any other site. This site also showed a relatively high percent cover of the La Jolla cup coral (16%), second only to Fry's Harbor.

As in the case of Fry's Harbor, sea urchin densities were lower at Pelican Bay than would be found in the typical sea urchin barren. The red sea urchin densities were $2.7/m^2$ and purple sea urchins were found at densities of $10/m^2$. The red sea urchin size distribution showed a distinct shift toward smaller sizes in 1990 with the mean test diameter being reduced to 35 mm, nearly half that of last year. White sea urchin densities continued to decline steadily to a mean of less than 1 per 100 square meters in 1990.

A pink abalone was found on the band transects for the first time in three years, though there have usually been individual juveniles found under rocks during species list searches conducted over the years.

Though the density has been declining since 1987, the wavy turban snail density was still among the highest for all sites

at 1.5/m^2 in 1990. At most of the monitoring sites, wavy turban snail abundance generally increased during or shortly after the decline of the kelp. As kelp returned, wavy turban snail abundance declined.

Red gorgonians were relatively large and exhibited a very tight range for both height (21-50 cm) and width (23-48 cm). Though remaining more abundant at Pelican Bay than at any other monitoring site, blackeye gobies continued a steady three year decline in abundance to 5.1/m^2 in 1990. Kelp rockfish abundance declined to the point where they were absent from transects. Blacksmith were present at a lower abundance than at any other monitoring site.

We are curious as to why kelp has not shown any sign of recovery at this site because sea urchin density is much lower than that of a typical sea urchin barren. A possible reason may be the high level of siltation present at this site. The silt may prevent growth of the kelp gametophytes and young sporophytes. Pelican Bay has averaged the highest percent sand substrate (including silt) of all the monitoring sites and currently has the third highest percent sand at 21.2%. Trash was observed in the bay, apparently from the boaters in this popular anchorage.

Station: Scorpion Anchorage, Santa Cruz Island

Site #9 SCISA

1990 sampling dates: 7/26, 9/26, 10/29

1990 status: purple sea urchin barren.

This site was characterized by bare rock and encrusting coralline algae. No macroalgae were present along the transect though there was some kelp located to both the north and to the west. Kelp has been absent from this site since its demise in 1985 and 1986. Miscellaneous red algae cover was only 1.5%. Green algae (mostly small filaments) covered 2% of the substrate in 1990. Encrusting coralline algae cover remained high at 37%.

The Christmas-tree worm Spirobranchus spinosus and barnacles were the dominant encrusting invertebrates. The La Jolla cup coral percent cover declined slightly in 1990 and individuals were frequently found covered with silt. Though siltation appeared to be nearly as strong here as at Pelican Bay, sand (including silt) only accounted for 8.6% of the substrate composition. Both sites had a fine silt layer over the rocks.

Sea urchin densities at Scorpion were among the highest of all the monitoring sites. The red sea urchin was present at 1.35/m^2 and the purple sea urchin was present at 53/m^2. As is typical of shallow sites, there was no evidence of bimodality in the red sea urchin size distribution. All red sea urchins measured, with the exception of one, were found to be less than the legal harvest limit of 76 mm in diameter. The mean size of purple sea urchins was relatively small at 25 mm.

Similar to Pelican Bay, the wavy turban snail density increased simultaneous to the disappearance of the kelp in 1985. Although the population has undergone a decline, the density at 1.6 snails per square meter is relatively high (second only to Cathedral Cove, Anacapa Island).

Bat stars with symptoms of the wasting disease were noted at Scorpion Anchorage. The density of bat stars remained at a relatively low 0.025/m^2. While still visibly present, the giant-spined sea star density declined to zero in quadrat counts.

Fish abundance and diversity was low at this site when compared with the other monitoring sites. Blackeye goby density declined somewhat from 2/m2 in 1989 to 0.7/m^2 in 1990.

Blacksmith and señoritas were quite abundant at this site due to the presence of large numbers of young of the year. Sheephead were fairly rare at Scorpion Anchorage (0.1 per transect) compared with other sites, especially SCIFH and SCIPB (6.3 and 2.5 individuals per transect respectively). Sheephead are sea urchin predators and this may partly account for the differences in sea urchin densities between these sites.

Scorpion Anchorage has typically had the highest percentage of bare substrate with 1990 being no exception at 38%. In general, bare substrate percentages go up when sea urchin densities go up.

Station: Yellowbanks, Santa Cruz Island

Site # 10

1990 sampling dates: 8/10, 9/10, 9/11

1990 status: dense kelp forest, well developed understory kelp. High abundance of white sea urchins.

The kelp canopy was very full in 1990. Understory kelp such as southern sea palm, California sea palm, and oar weed were well developed. These algae continued an increasing trend in

percent cover to reach 36%, third highest of all monitoring sites. Adult and juvenile giant kelp density declined in quadrat counts. Decreasing quadrat densities coupled with increasing percent cover are an indication of maturing plants. The mean number of stipes per plant (18), was second only to Rodes Reef. Oar weed percent cover was among the highest of all sites at 8% with an increase in 1990. Bladder chain kelp percent cover, typically highest at Yellowbanks, increased to an all time high of 29%. Miscellaneous brown algae increased to a high of 12%. Articulated coralline algae were present at an all time high for this site of 18%, the second highest percent cover for all the monitoring sites in 1990.

Encrusting invertebrate percent cover increased in 1990. Colonial sand-tube worms made their first appearance on RPCs in five years at 0.1% cover. Percent cover for southern staghorn bryozoan (5%) and other bryozoans (14%) increased sharply in 1990.

Gorgonians were relatively abundant at Yellowbanks. The brown gorgonian's density was the highest recorded at any monitoring site. Ten individuals were recorded during band transect counts. The California golden gorgonian was also very common. The red gorgonian was very abundant with 84 individuals

recorded on band transects (one individual per 10 square meters).

Red sea urchin density dropped to 0.38/m^2 in 1990. Mean test diameter of these sea urchins decreased in 1990, with no individuals found that were greater than 100 mm in diameter. Purple sea urchin density dropped to 9.85/m^2. White sea urchins were still present in high densities of 20/m^2.

Pink abalone were present, but in typically low densities. Five individuals were found on band transects in 1990. Abalone recruitment modules were placed here on October 11, 1989. The experimental results were intermediate to those of Johnson's Lee and Gull Island, both in survival of transplants and in numbers of native recruits found.

Sea stars with symptoms of the wasting disease were observed at the end of the summer. Both bat stars and giant-spined sea stars were present in low abundance. Sunflower stars were not found at this site in 1990.

Blacksmith abundance increased dramatically at this site with the presence of large numbers of juveniles. Over the last four years counts per fish transect increased from 1.2 in

1987, to 151 in 1990. We observed similar patterns for all the Anacapa Island monitoring sites as well. Señorita abundance declined over the last four years from 36.5/m^2 to 4.6/m^2 in 1990. Kelp bass abundance declined steadily, as well, with 1.5 individuals noted per transect in 1990. Garibaldi have never been seen at this site.

Station: Admiral's Reef, Anacapa Island

Site #11 ANIAR

1990 sampling dates: 6/22, 7/13, 7/27, 8/24, 9/27

1990 status: dense kelp forest. High abundance of white sea urchins.

Admiral's reef was characterized by a well developed kelp forest with a relatively high abundance of most monitoring target species. Large macroalgae were present in densities among the highest of all sites. These densities are consistent with those of previous years. Giant kelp, southern sea palm, and California sea palm covered 15% of the transect. Juvenile kelp densities were low indicating a poor recruitment year. Size frequency data also suggest a shift in age composition of the giant kelp toward more mature plants. Kelp plants had a mean of 11.8 stipes per holdfast with

holdfast diameter of 22 cm. Oar weed and bladder chain kelp were abundant. Many kelp curler amphipods were observed in the canopy, however no major damage to the giant kelp was observed.

Bryozoan percent cover increased to 11% in 1990. Tunicate (4%) and miscellaneous invertebrate (30%) cover also increased to levels among the highest found in the monitoring program. Gorgonians were relatively abundant at Admiral's reef with respect to other sites. Mean sizes for both species of the brown gorgonian were largest here when compared with other sites.

We found red sea urchins in the second greatest density of any site (7.85/m^2). Purple sea urchins were also moderately abundant at 6.68/m^2. White sea urchins were very abundant at nearly 20/m^2. Most of the white sea urchins were concentrated on the eastern half of the transect

California spiny lobsters are regularly noted here on species list surveys; however, they are only rarely found on band transects. Only one lobster was found during band transects in 1990.

Red abalone were recorded on band transects for the first time (3 individuals or 0.0042/m^2) since 1985. Pink abalone, most abundant here of any site, declined to 0.032/m^2 in 1990, continuing a slow reduction in density begun in 1984 when density was recorded as 0.12/m^2.

Other mollusks such as the giant keyhole limpet (0.05/m^2, highest density for this site since 1984) and the rock scallop (0.08/m^2) increased slightly in abundance in 1990. Distribution of sizes for the rock scallop remain generally positively skewed suggesting a fairly steady rate of recruitment.

Bat stars were moderately abundant in 1990 (0.7/m^2). Many juvenile (<20 mm) bat stars were found under rocks. The giant-spined sea star was not recorded in quadrats and was uncommon around the reef.

In general, fish were abundant at this site. All target species were observed at this site during fish transects, with the exception of blue and olive rockfish, and striped surfperch. Blacksmith were abundant and were observed congregating around crevices in June, possibly spawning.

Station: Cathedral Cove, Anacapa Island

Site #12 ANICC

1990 sampling dates: 8/21, 9/14, 9/27

1990 status: some kelp with sandy rock barrens.

Kelp was present but sparse at the southern end of the transect and along the margin of the talus slope on the western edge of the transect line. The northern end of the transect was characterized by rocks and sand. Quadrat data for 1990 suggest an increase in adult kelp density, though there was slightly less juvenile kelp. Kelp size frequency measurements indicated a maturation of the kelp. Mean holdfast diameter increased to 16.5 cm in 1990 while the stipe count remained at 7 stipes/holdfast. Giant kelp percent cover maintained 10%, while bladder chain kelp cover increased to 2%, its highest percent cover since 1982. Miscellaneous red and green algae together accounted for over 19% cover.

Red gorgonians were not recorded on band transects or found during species list surveys in 1990, suggesting a decline in abundance of this species. This shallow site gets little current action favorable for gorgonian growth.

The red sea urchin density increased to 6/m^2 in 1990. Mean test diameter remained fairly steady at 74 mm. Purple sea urchin density declined slightly to 3.13/m^2, though overall the population seems stable at this site. This site had one of the largest mean test diameters for purple sea urchins at 34 mm.

The mean size of pink abalone increased from 91 mm to 140 mm between 1986 and 1990 and overall numbers found declined. Rock scallop density increased slightly to the highest level for this site (0.117/m^2). The mean size has remained relatively steady (71 mm in 1990). The California sea hare has been relatively abundant at this site with densities that appear to be stable over time.

Bat stars and giant-spined sea stars were not detected in quadrats in 1990. This represents a decline for bat stars. California spiny lobsters were seen at this site in moderate numbers.

Blackeye gobies declined to a three year low of 1.03/m^2 in 1990. Juvenile topsmelt, giant kelp fish, señoritas, and blacksmith were abundant. Blacksmith and señoritas were particularly abundant in 1990 with 183/transect and

53/transect respectively. Blue rockfish were common at 4/transect, an increase over previous years. Kelp bass were abundant at 10/transect.

Station: Landing Cove, Anacapa Island

Site #13 ANILC

1990 sampling dates: 8/20, 9/27

1990 status: kelp forest with well developed understory algae.

Giant kelp was healthy at this site, with a moderate recruitment of young plants in 1990. The giant kelp canopy was complimented by a lush understory assemblage of southern sea palm, oar weed and California sea palm with densities of these algae among the highest of all monitoring sites. All macroalgae densities show a remarkable degree of stability over time and 1990 densities were consistent with those of previous years. The percent cover for kelp at Landing Cove was by far the highest of all the monitoring sites at 52% (largely due to southern sea palm, particularly in the shallower areas). Giant kelp stipes/holdfast (7.4) and holdfast diameter (15 cm) indicate a moderately aged stand. Oar weed density was exceptionally high at this site at 2.3/m^2

and 30% cover. Percent cover of bladder chain kelp increased to its highest level since 1982 (5% in 1990). A high of 9% cover of green algae at this site was likely due to the observer noting the green film on rocks that is usually recorded as bare by other observers. Miscellaneous red algae, articulated coralline algae, and agar weed percent cover all increased between 1989 and 1990.

Southern staghorn bryozoan increased slightly (at 7%, the highest of all sites) while tunicate percent cover decreased slightly. The presence of stalked tunicates on quadrat counts is somewhat questionable.

Red sea urchins (1.25/m^2) were more abundant than purple sea urchins (0.58/m^2) which had one of the lowest densities for all the sites. Mean test diameter of the red sea urchins (83 mm) was the largest of any of the monitoring sites and the only site where mean diameter exceeded the legal commercial size limit (76 mm) attesting to the effectiveness of the ecological reserve. Purple sea urchins had a large mean size of 33 mm and a broad range of sizes, from 6 to 67 mm. Bimodality was visible in the 1990 red sea urchin size distribution with a dip between 30 mm and 80 mm.

Adult pink abalone were abundant in the cove (0.03/m^2); however, few juveniles were found. The mean size (143 mm) has changed little since 1987 when a fair number of smaller recruits were found.

The giant keyhole limpet density declined to the lowest level recorded at this site (0.03/m^2) following a steady decline from 0.12/m^2 in 1986. Mean size declined and fewer individuals were found for size frequency measurements (n = 38 in 1987, 7 in 1990). The chestnut cowrie and the wavy turban snail densities declined as well; however, the rock scallop density increased slightly to its highest level ever recorded for this site (0.78/m^2). This density was the highest rock scallop density of any monitoring site, possibly due to the marine reserve protection. Size frequencies tend to vary greatly from year to year, possibly because of diver bias when searching for these very cryptic bivalves.

Adult warty sea cucumber density was high (1.5/m^2) and several juveniles were found. Bat stars, though present at this site, were not found on quadrats for the fourth year in a row. The numbers of individuals found for size frequency determination declined over this time period suggesting a decline in an already small population (sample sizes declined from 19 to 9

since 1987). The mean radius in these small samples remained relatively constant over time (19 mm in 1990) and the small size suggests that the population is composed primarily of juveniles which tend to live under rocks. Giant-spined sea stars remained rare here with only one individual found in quadrats, and too few observed to measure for size frequency determination. Sea stars with wasting disease symptoms were observed in the area. Why there were so few sea stars at this site is a question open for hypotheses.

Blacksmith were very abundant in 1990 with a strong presence of juveniles. Black surfperch were not seen during fish transects in 1990, but have been common in the past. Juvenile fish were abundant, particularly blacksmith, giant kelpfish, señoritas, and kelp bass.

Station: Southeast Sea Lion, Santa Barbara Island

Site #14 SBISESL

1990 sampling dates: 6/19, 6/20, 8/22

1990 status: purple sea urchin barren. Moderate density of white sea urchins.

This site was mostly barren of algae; however, some giant kelp

plants were noted at the south end of the transect. Juvenile giant kelp were detected in the quadrats for the first time in four years, but remained rare. This suggests that some recruitment occurred, though survival in the presence of the grazing sea urchins may be severely limited. The percentage of bare substrate remained steady at 34% which was the second highest percentage bare for all the monitoring sites, second only to Scorpion Anchorage. The percent cover of sand increased.

Miscellaneous invertebrate percent cover doubled to 15% in 1990, dominated by the Christmas-tree worm (Spirobranchus spinosus), hydroids, and the soft coral Clavularia sp.. The purple encrusting bryozoan Lichenopora novae-zelandiae and the tunicate Botryllus sp. were also very common. The orange puffball sponge density increased to approximately one individual per ten square meters, second in density only to Rodes Reef.

Red gorgonians were found in the highest densities for all sites here (increasing to $0.21/m^2$ in 1990). The brown and California golden gorgonians were also relatively abundant at this site.

Red sea urchin density remained fairly steady at 1.3/m^2. Mean test diameter in 1990 (43.9 mm) was also essentially unchanged with respect to previous years' means with size frequencies exhibiting a very pronounced bimodality. Purple sea urchin density remained at the highest level of all sites, but declined over the previous two years to 77.5/m^2 in 1990. This reduction in density was accompanied by a reduction in mean test diameter from 18 mm in 1989 to 14.7 mm in 1990. White sea urchin mean density remained high (12.3/m^2), but declined over 50% since 1988. The mean radius of white sea urchins was only 14 mm.

Pink abalone were present, but rare (0.0014/m^2). Other mollusks such as Kellet's whelk, the giant keyhole limpet and the rock scallop were present, but also relatively rare. Of these, only the rock scallop was found on band transects (0.0042/m^2). The wavy turban snail was present at 0.2250/m^2. Its size frequency distribution shifted from positive to negative skew suggesting that a reduction in recruitment may have occurred over the last two or three years.

The California brown sea hare was most abundant at Santa Barbara Island and, of all sites, second most abundant at Southeast Sea Lion (0.069/m^2).

Bat stars continued an increasing trend in density, doubling to 0.2250/m^2 in 1990. Accompanying the increased density was an increase in mean radius occurring over the last three years. Some bat stars were observed to be feeding on the bryozoan Lichenopora. The commensal polychaete worm Ophiodromus pugettensis was found in abundance living in the ambulacral grooves of most bat stars at this site. The sunflower star has never been found in band transects at Santa Barbara Island.

Blackeye gobies increased in density from 0.88/m^2 last year to 1.18/m^2 in 1990. This may also correspond to the increase in percent sand substrate. Island kelpfish density remained steady at 0.53/m^2.

Bat rays, also associated with sandy bottoms, were plentiful in 1990. In general, however, fish densities and abundances were relatively low as is typical of sites lacking algal cover. Kelp bass abundance dropped to 1.5 per transect in 1990. Opaleye, though present at other Santa Barbara Island sites, have never been observed at this site. Interesting observations made at this site included a plainfin midshipmen found under a rock guarding a nest of large orange eggs with

embryos (eyespots visible and embryo length of 1 cm).

Station: Arch Point, Santa Barbara Island

Site #15 SBIAP

1990 sampling dates: 6/18, 6/19, 6/21, 8/23

1990 status: purple sea urchin barren, developing kelp forest.

This site has had high sea urchin densities and relatively low levels of large macroalgae since 1982. In 1990, the northern half of the site was generally devoid of algae, though a fair amount of giant kelp and understory algae was present at the south end of the line. The mean percent cover of kelp tripled (to 2.4%) in 1990. Giant kelp size frequency distribution showed a very strong positive skew with relatively small holdfasts and a mean of only six stipes per holdfast. This suggests a dynamic and young kelp forest structure, perhaps prevented from maturing by the large densities of sea urchins present. The only other large macroalga detected in quadrats was a single oar weed.

Purple sea urchin density was high at over 66/m^2. Red sea urchins, present at 1.7/m^2, had a mean size of only 51 mm.

The mean white sea urchin density declined in 1990 from 0.5/m^2 last year to 0.04/m^2 in 1990. Mean test diameter correspondingly increased from 13.1 mm in 1989 to 15.2 mm in 1990.

Pink abalone were rare at this site. Juvenile pink abalone were observed and fresh shells of both pink and red abalone were found. Wavy turban snail density continued a three year decline at this site to 0.725/m^2 in 1990. Kellet's whelks were not found at all in 1990, though their eggs were found during the species list survey. Only one rock scallop was found on band transects in 1990.

Large bat stars were rare and were absent from quadrat counts. Juvenile bat stars were common under rocks. Two large bat stars had ephemeral algae growing on their aboral sides and high numbers of the polychaete Ophiodromus pugettensis were observed in the bat stars' ambulacral grooves. Giant-spined sea stars were scattered over the entire area and were found in greater densities (0.1250/m^2) than in the previous year. The mean radius of 114 mm changed little since 1988, but the minimum size in 1990 grew to 52 mm.

Island kelp fish were present in the second highest density of

all the monitoring sites at 0.7/m^2. Blackeye gobies on the other hand were present in relatively low densities when compared to other sites (0.275/m^2). Blacksmith and señoritas were very abundant in 1990 (159 and 25 per fish transect respectively) due to the presence of juveniles. Garibaldi were present in the highest abundance of all the monitoring sites (8 individuals per fish transect). Garibaldi tagged in 1984 were still present. Opaleye showed a dramatic increase in abundance at this site in 1990 rising to 12.8 per transect, the highest abundance for this species of all monitoring sites.

Station: Cat Canyon, Santa Barbara Island

Site #16 SBICC

1990 sampling dates: 6/20, 6/21, 8/23

1990 status: purple sea urchin barren with small remnant kelp forest.

Generally, the largest portion of this site resembled an sea urchin barren with little algal cover. There was some kelp off the east end and a small kelp forest from 70 to 80 meters on the transect line. Percent cover of kelp at Cat Canyon was the highest of all Santa Barbara sites (3%). Giant kelp

density was 0.2/m^2. Giant kelp size frequency measurements suggest a maturation of the small kelp forest associated with this site (1988: 3.7 stipes/holdfast, 7.8 cm mean diameter, strong positive skew; 1990: 11.8 stipes/holdfast, 29.6 cm mean diameter, more normal distribution). Miscellaneous red algae cover climbed to 10%, while articulated coralline algae cover declined to 8% (from 63% in 1986). Crustose coralline algae covered 30% of the substrate here.

Red gorgonians, present at the other two Santa Barbara sites, were absent at Cat Canyon. This may be due to heavy surge and drifting sand encountered at this site. Encrusting animals such as the scaled tube shell and the colonial sand-castle worm were relatively abundant in comparison with other sites. Percent cover for both declined between 1989 and 1990.

Red sea urchins were present at a moderate density of 2.5/m^2. Red sea urchin mean test diameter was 59 mm, with a mode of 40 mm. Purple sea urchin density was a high 42.3/m^2 showing little change over the last few years.

Pink abalone declined slightly in abundance in 1990, but were still present at 0.0042/m^2 (3 individuals counted on band transects). Mean size remained fairly steady at 139 mm;

however, the number of individuals found for measuring decreased to only 15 in 1990. No juvenile abalone were found.

California brown sea hare density increased to 0.0611/m^2. This increase in sea hare density may be related to the increase in edible red algae noted at this site.

Bat stars were not found in quadrats. However, they have consistently been found during species list surveys as juveniles under rocks. Giant-spined sea stars were common at the steady density of 0.125/m^2, a value consistent with the other Santa Barbara monitoring sites.

Island kelpfish density doubled to 0.9/m^2 in 1990, the highest density for this species at any site. Opaleye abundance increased over the last two years from 0.1/transect in 1988 to 3.4/transect in 1990. Garibaldi remained at the remarkably consistent abundance of 3/transect over the last three years. Blacksmith abundance increased dramatically with the presence of large numbers of juveniles (78/transect in 1990). Clouds of juvenile blacksmith and señorita were observed in August. Kelp surfperch and juvenile giant kelpfish were also seen in 1990.

Table 4. Kelp forest monitoring site status 1990.

San Miguel Island	
Wyckoff Ledge	Dense mature kelp forest with high diversity.
Hare Rock	Red sea urchin barren.
Santa Rosa Island	
Johnson's Lee North	Dense maturing kelp forest with few sea urchins.
Johnson's Lee South	Dense mature kelp forest.
Rodes Reef	Mature kelp forest with dense canopy.
Santa Cruz Island	
Gull Island	Moderately developed, patchy kelp forest.
Fry's Harbor	Barrens, dominated by small aggregated red cucumbers and white sea urchins.
Pelican Bay	Silty barrens.
Scorpion Anchorage	Purple sea urchin barren.
Yellowbanks	Dense kelp forest, well developed understory kelp. High abundance of white sea urchins.
Anacapa Island	
Admiral's Reef	Dense kelp forest. High abundance of white sea urchins.
Cathedral Cove	Sparse kelp with sandy rock barrens.
Landing Cove	Kelp forest, well developed understory algae.
Santa Barbara Island	
SE Sea Lion Rookery	Purple sea urchin barren. Moderate density of white sea urchins.
Arch Point	Purple sea urchin barren, developing kelp forest.
Cat Canyon	Purple sea urchin barren with a small remnant kelp forest.

GENERAL DISCUSSION

The water around the islands in 1990 was typically 16-20°C all summer. Wyckoff ledge was 12-13°C. This was slightly warmer than normal. In 1990, we observed an increase in the occurrence of the sea star wasting disease that was so devastating in 1984, possibly because of the warmer waters. We observed a decline in the kelp canopy by the end of the summer. The sloughing of fronds and the general poor conditions of the canopy may also be a result of warmer than normal temperatures with its attendant low nutrient concentrations.

Sunflower stars were found on band transects at only the six western-most sites. This is fairly typical for this more northern ranging sea star. A few individual sunflower stars are occasionally observed at other sites but always in low numbers. Sunflower stars are important invertebrate predators, and possibly the most important predator on sea urchins at the northern islands.

Sea stars affected by the wasting disease were observed at Rodes Reef, Santa Rosa Island; Fry's Harbor, Pelican Bay, Scorpion Anchorage, and Yellow Banks, Santa Cruz Island; and

Landing Cove, and Admiral's Reef, Anacapa Island. Bat stars, giant-spined sea stars, and comet stars Linkia columbiana were all observed to be affected by the disease. A warty sea cucumber with symptoms of wasting disease was noted at Rodes Reef. The wasting disease was first observed in our area in 1983 and 1984. The affected seastars develop white lesions that may spread over the affected star. Heavily affected individuals appear to be rotting. The cause seems to be a bacterial infection (Schroeter and Dixon 1988), but no conclusive work has been published.

Warm water conditions were noted off Santa Catalina with temperatures near those of the 1982-1984 El Niño (W. MacFarland, Catalina Island Marine Science Center, personal communication). Diseased and dying sea urchins and sea stars were observed at Santa Catalina island in 1990 (J. Engle, Tatman Foundation, personal communication).

Seven sites (SMIHR, SCIFH, SCIPB, SCISA, SBIAP, SBISESL, SBICC) were primarily barren of kelp in 1990. Four of those (SCISA, SBISESL, SBIAP, SBICC) had purple sea urchin densities greater than $40/m^2$. The purple sea urchin density at Gull Island was $40/m^2$, but kelp was abundant at the site. The highest red sea urchin density for the 16 stations was at Hare

Rock where densities were 9/m^2. The purple sea urchin density at Hare Rock was only 2/m^2.

White sea urchins were noted as abundant at Southeast Sea Lion, Admiral's Reef, and Yellow Banks. All three sites had mean densities over 10/m^2. At Gull Island, white sea urchins were common, though scattered and found mostly in the sand next to the transect reef.

In general there was very good fish recruitment in 1990. Juvenile señorita were seen in abundance at every island. Young-of-year sheephead, kelp bass, rock wrasse, giant kelpfish, and topsmelt were commonly seen at many sites east of Gull Island. Juvenile blacksmith were very common at all stations on Santa Cruz, Anacapa, and Santa Barbara Islands. Adult blacksmith were counted on transects at every station except Wyckoff Ledge. Juvenile garibaldi were observed only on Anacapa and Santa Barbara Islands. Young-of-year rockfish and painted greenling were observed mostly west of Pelican Bay. The abundance of rockfish juveniles decreased eastward from San Miguel. Juvenile surfperch were most abundant and diverse at Santa Rosa Island, but were also observed at Arch Point. Adult striped surfperch were not counted on transects east of Santa Rosa Island, though one was seen at Anacapa

Landing . Adult garibaldi were rare west of Fry's Harbor, and absent at San Miguel Island.

In 1990, the kelp forest monitoring and the decline in abalone populations were featured on CNN news and in the Challenge of the Seas television series on the Arts and Entertainment network. We also provided advice to a British television series filming the underwater kelp forests, and provided photos to the Star Free Press for an article on global warming.

Recommendations

We need to improve size frequency sampling to insure that our samples are representative of the larger population. To test if our methods are adequate we need to conduct some duplicate sampling and run statistical analysis. Ways to improve the present sampling may include a random starting point approach and improved training for species ID and search image for divers. Our concern stems from the occasional inability of volunteer divers to find juveniles of some species which may be present but hidden.

Towards a more complete understanding of the kelp forest

community we should examine temporal questions relating to the population dynamics and diversity of the kelp forest. Quarterly sampling at selected sites would provide insight to the seasonal changes and to the mechanisms of annual changes. Selected sampling at night, especially for sea stars and lobster, might generate some interesting information useful in understanding their habits and dynamics.

There has been recent interest in the amount of food getting to the drift algae feeders and in how the amount of drift kelp relates to the living canopy. We need to develop methods to quantify drift kelp. A probable beginning would be to collect drift kelp in the quadrats and quantify it by weight.

There may be a quick and easy way to determine the amount of silt present in the substrate at each site. A quantitative comparison of siltation at various sites might aid in explaining some of the differences in recruitment (settling) of various organisms.

It would be of extreme value to conduct regular aerial surveys of the kelp beds around the islands. Kelp forest canopy cover could then be readily entered into a permanent GIS file. This information would provide a valuable overview to the

underwater kelp forest monitoring work, suggest kelp recruitment sources, and add a valuable dimension to our record of natural resources around the islands.

Table 5. 1990 Kelp Forest Monitoring Program participant and cruise list.

PARTICIPANTS	AFFILIATION	CRUISES PARTICIPATED
Dean Antonio	Moss Landing Marine Lab	1
Bill Avery	Channel Islands N.P.	1,2,3,4,5,6,7,8,9,10
Kristine Barsky	Calif. Dept. Fish & Game	3
Steve Barsky	Viking Diving Equipment	3
Randy Bidwell	Channel Islands N.P.	9
Susan Bower	Univ. of So. Calif.	2
Kent Bullard	Channel Islands N.P.	5
Don Canestro	U. C. Santa Barbara	4
Dave Compton	Catalina Isl. Marine Inst.	6
John Conti	Truth Aquatics	2
Melinda Conti	Truth Aquatics	2
Ronnie Damico	CSU Long Beach	3
Gary Davis	Channel Islands N.P.	1,8,9,10
Dennis Divins	U. C. Santa Barbara	4
Matt Edwards	U. C. Santa Barbara	2
Jack Engle	Tatman Foundation	9
Kip Evan	U. C. Santa Barbara	5
Kate Faulkner	Channel Islands N.P.	5,8
Perry Ferguson	Channel Isl. Council Div.	9
Constance Gramlich	Channel Islands N.P.	1,2,3
Pete Haaker	Calif. Dept. Fish & Game	7,9
Dan Heilprin	Moss Landing Marine Lab	1
John Heine	Moss Landing Marine Lab	3
Karl Huggins	Univ. of Michigan	3
Kelly Kiefer	Catalina Isl. Marine Inst.	7
Hans Kuck	L.A. Mus. Nat. History	5
David Kushner	Channel Islands N.P.	2,3,4,5,6,7,8,9,10
Bud Laurent	Calif. Dept. Fish & Game	6
Steve Lonhart	Catalina Mar. Sci. Center	7
Dave Meyer	Teacher	5
Mike McNulty	Moss Landing Marine Lab	1
Ron McPeak	Kelco	7
John Provo	Channel Islands N.P.	1,2,3,4,5,6,7,10
Paul Reilly	Calif. Dept. Fish & Game	4
Dan Richards	Channel Islands N.P.	1,2,3,4,5,6,7,8,9,10

Diane Richardson	Channel Islands N.P.	1,2,3,4,6,7,10
Ken Schiff	S. Ca. Cst. Wtr. Res. Prj.	8
Mack Shaver	Channel Islands N.P.	4,9
Rob Sherlock	Catalina Isl. Marine Inst.	6
Dave Steichen	U. C. Santa Barbara	1
Dave Stoltz	Channel Islands N.P.	5,8
Jim Thompson	Santa Cruz	6
Bob Todd	Redwood N.P.	7
John Trone	City of San Francisco	4

Table 5. continued.

Cruise Dates 1990	
CRUISE # 1	June 18-22, 1990
CRUISE # 2	July 9-13, 1990
CRUISE # 3	July 23-27, 1990
CRUISE # 4	August 6-10, 1990
CRUISE # 5	August 20-24, 1990
CRUISE # 6	September 10-14, 1990 CRUISE # 7 September 24-28, 1990
CRUISE # 8	October 2-3, 1990
CRUISE # 9	October 4, 1990
CRUISE #10	October 25, 1990

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Appendix A. 1990 Station Data - All Sampling Methods

Introduction

Following are data gathered in 1990 for all 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 1m X 2m quadrats, each the sum of two individual divers' counts in 1m X 1m quadrats.

BAND TRANSECTS. Means represent average counts obtained from 12 stratified random 3m X 20m transects, each the sum of two individual divers' counts on 3m X 10m 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 100m transect line and observing fishes passing within a 2m X 3m "window" centered on the line. Cases listed refer to the total number of passes made during fish surveys for the year. Adults and juveniles as well as counts for specific transect pass, date, and time are available as raw data. Horizontal sechi measurements were made on each dive. 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, Cypraea, 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; Parastichopus-contracted body length in cm; 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.

LOCATION 1 SAN MIGUEL ISLAND - WYCKOFF LEDGE

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.7000	0.9921	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0500	0.1539	20
Laminaria farlowii	0.0000	0.0000	20
Macrocystis pyrifera juvenile	0.3750	0.6463	20
Macrocystis pyrifera all	0.1250	0.3932	20
Cypraea spadicea	0.0000	0.0000	20
Astraea undosa	0.0000	0.0000	20
Astraea gibberosa	0.0750	0.1832	20
Patiria miniata	1.1500	1.0144	20
Pisaster giganteus	0.3750	0.5350	20
Strongylocentrotus franciscanus	2.5000	9.3598	20
Strongylocentrotus purpuratus	0.5000	1.0761	20
Parastichopus parvimensis	0.1500	0.3285	20
Styela monteryensis	0.0500	0.2236	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.1250	0.3932	20
Alloclinus holderi	0.0750	0.1832	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0458	0.0513	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.1986	0.1953	12
Lophogorgia chilensis	0.0014	0.0048	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0028	0.0065	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0931	0.0524	12
Megathura crenulata	0.0000	0.0000	12
Hinnites giganteus	0.0000	0.0000	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0125	0.0161	12
Lytechinus anamesus	0.0042	0.0104	12

1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.0000	0.0000	25
Miscellaneous brown algae	0.5000	1.2500	25
Desmarestia spp.	8.8000	13.1323	25
Laminaria farlowii	0.1000	0.5000	25
Cystoseira spp.	2.1000	5.2381	25
Macrocystis, Eisenia, Pterygophora	17.8000	19.5299	25
Miscellaneous red algae	71.9000	16.9601	25
Articulated coralline algae	7.9000	7.5581	25
Crustose coralline algae	13.6000	7.0000	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	4.2000	4.3732	25
Miscellaneous plants	0.0000	0.0000	25
Sponges	0.5000	1.4434	25
Corynactis californica	0.2000	0.6922	25
Balanophyllia elegans	1.6000	2.5900	25
Astrangia lajollaensis	0.2000	0.6922	25
Diopatra ornata	12.6000	11.5578	25
Phragmatopoma californica	0.5000	1.7678	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans, other	8.5000	8.6903	25
Diaperoecia californica	0.5000	1.4434	25
Tunicates	2.4000	4.7588	25
Miscellaneous invertebrates	6.6000	5.5846	25
Bare substrate	7.5000	13.8067	25
Rock	74.3000	23.5576	25
Cobble	2.3000	3.4551	25
Sand	23.4000	21.7931	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	1.0833	2.7015	96
Chromis punctipinnis	0.0000	0.0000	8
Oxyjulis californica	7.0000	6.1179	8
Sebastes mystinus	1.8750	2.6959	8
Sebastes serranoides	0.1250	0.3536	8
Sebastes atrovirens	0.8750	0.8345	8
Paralabrax clathratus	0.2500	0.7071	8
Semicossyphus pulcher	0.8750	1.1260	8
Embiotoca jacksoni	0.2500	0.4629	8
Embiotoca lateralis	1.6250	1.5980	8
Damalichthys vacca	0.1250	0.3536	8
Hypsypops rubicundus	0.0000	0.0000	8
Girella nigricans	0.0000	0.0000	8

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/date)	Mean	Std Dev	Cases
Chromis punctipinnis adult		0.0000	0.0000	8
	900724	0.0000	0.0000	4
	900925	0.0000	0.0000	4
Chromis punctipinnis juvenile		0.0000	0.0000	8
	900724	0.0000	0.0000	4
	900925	0.0000	0.0000	4
Oxyjulis californica adult		5.0000	5.6315	8
	900724	0.7500	1.5000	4
	900925	9.2500	4.8563	4
Oxyjulis californica juvenile		2.0000	1.8516	8
	900724	2.0000	1.4142	4
	900925	2.0000	2.4495	4
Sebastes mystinus adult		1.6250	2.6693	8
	900724	0.7500	0.9574	4
	900925	2.5000	3.6968	4
Sebastes mystinus juvenile		0.2500	0.7071	8
	900724	0.0000	0.0000	4
	900925	0.5000	1.0000	4
Sebastes serranoides adult		0.1250	0.3536	8
	900724	0.0000	0.0000	4
	900925	0.2500	0.5000	4

Sebastes serranoides juvenile		0.0000	0.0000
8			
	900724	0.0000	0.0000
4			
	900925	0.0000	0.0000
4			
Sebastes atrovirens adult		0.3750	0.5175
8			
	900724	0.5000	0.5774
4			
	900925	0.2500	0.5000
4			
Sebastes atrovirens juvenile		0.5000	0.7559
8			
	900724	0.0000	0.0000
4			
	900925	1.0000	0.8165
4			
Paralabrax clathratus adult		0.0000	0.0000
8			
	900724	0.0000	0.0000
4			
	900925	0.0000	0.0000
4			

Paralabrax clathratus juvenile		0.2500	0.7071	8
	900724	0.5000	1.0000	4
	900925	0.0000	0.0000	4
Semicossyphus pulcher male		0.2500	0.4629	8
	900724	0.0000	0.0000	4
	900925	0.5000	0.5774	4
Semicossyphus pulcher female		0.6250	1.1877	8
	900724	1.2500	1.5000	4
	900925	0.0000	0.0000	4
Embiotoca jacksoni adult		0.2500	0.4629	8
	900724	0.0000	0.0000	4
	900925	0.5000	0.5774	4
Embiotoca jacksoni juvenile		0.0000	0.0000	8
	900724	0.0000	0.0000	4
	900925	0.0000	0.0000	4
Embiotoca lateralis adult		1.1250	1.3562	8
	900724	0.7500	0.9574	4
	900925	1.5000	1.7321	4
Embiotoca lateralis juvenile		0.5000	1.4142	8
	900724	0.0000	0.0000	4
	900925	1.0000	2.0000	4
Damalichthys vacca adult		0.0000	0.0000	8
	900724	0.0000	0.0000	4

	900925	0.0000	0.0000
4			
Damalichthys vacca juvenile		0.1250	0.3536
8			
	900724	0.0000	0.0000
4			
	900925	0.2500	0.5000
4			
Hypsypops rubicundus adult		0.0000	0.0000
8			
	900724	0.0000	0.0000
4			
	900925	0.0000	0.0000
4			
Hypsypops rubicundus juvenile		0.0000	0.0000
8			
	900724	0.0000	0.0000
4			
	900925	0.0000	0.0000
4			
Girella nigricans adult		0.0000	0.0000
8			
	900724	0.0000	0.0000
4			
	900925	0.0000	0.0000
4			
Girella nigricans juvenile		0.0000	0.0000
8			
	900724	0.0000	0.0000
4			
	900925	0.0000	0.0000
4			

1990 SIZE FREQUENCIES

Tethya aurantia

(cases) N=	31
< 10	0.0
10 - 19	0.0
20 - 29	3.2%
30 - 39	3.2%
40 - 49	6.5%
50 - 59	12.9%
60 - 69	16.1%
70 - 79	9.7%
80 - 89	12.9%
90 - 99	12.9%
> 99	22.6%
min size (mm)	25
max size (mm)	122
mean	78
mode	45

Kelletia kelletii

(cases) N=	38
< 40	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	5.3%
70 - 79	10.5%
80 - 89	15.8%
90 - 99	31.6%
100 - 109	26.3%
110 - 119	7.9%
120 - 129	2.6%
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	66
max size (mm)	120
mean	96
mode	96

Haliotis rufescens

(cases) N=	18
< 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	5.6%
85 - 90	0.0
90 - 94	5.6%
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
110 - 114	5.6%
115 - 119	0.0
120 - 124	0.0
125 - 129	5.6%
130 - 134	5.6%
135 - 139	11.1%
140 - 144	0.0
145 - 149	0.0
150 - 154	0.0
155 - 159	11.1%
160 - 164	5.6%
165 - 169	0.0
170 - 174	16.7%
175 - 179	0.0
180 - 184	0.0
185 - 189	5.6%
190 - 194	5.6%
195 - 199	0.0
> 199	16.7%
min size (mm)	80
max size (mm)	210
mean	156
mode	80

Astraea gibberosa

(cases) N=	25
< 10	0.0
10 - 19	4.0%
20 - 29	0.0
30 - 39	8.0%
40 - 49	32.0%
50 - 59	52.0%
60 - 69	4.0%
70 - 79	0.0
80 - 89	0.0
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	14
max size (mm)	61
mean	48
mode	42

Patiria miniata

(cases) N=	54
< 10	0.0
10 - 19	0.0
20 - 29	1.9%
30 - 39	1.9%
40 - 49	1.9%
50 - 59	9.3%
60 - 69	37.0%
70 - 79	35.2%
80 - 89	11.1%
90 - 99	1.9%
> 99	0.0
min size (mm)	29
max size (mm)	90
mean	69
mode	63

Pisaster giganteus

(cases) N=	49
< 20	0.0
20 - 39	2.0%
40 - 59	49.0%
60 - 79	34.7%
80 - 99	6.1%
100 - 119	6.1%
120 - 139	0.0
140 - 159	2.0%
160 - 179	0.0
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	36
max size (mm)	140
mean	64
mode	46

Pycnopodia helianthoides

(cases) N=	19
< 20	5.3%
20 - 39	5.3%
40 - 59	26.3%
60 - 79	5.3%
80 - 99	31.6%
100 - 119	5.3%
120 - 139	0.0
140 - 159	0.0
160 - 179	5.3%
180 - 199	5.3%
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	10.5%
280 - 299	0.0
> 299	0.0
min size (mm)	6
max size (mm)	260
mean	97
mode	49

Strongylocentrotus franciscanus

(cases) N=	106
< 5	0.0
5 - 9	0.0
10 - 14	1.9%
15 - 19	4.7%
20 - 24	9.4%
25 - 29	3.8%
30 - 34	4.7%
35 - 39	3.8%
40 - 44	1.9%
45 - 49	3.8%
50 - 54	5.7%
55 - 59	2.8%
60 - 64	3.8%
65 - 69	4.7%
70 - 74	7.5%
75 - 79	13.2%
80 - 84	17.0%
85 - 90	8.5%
90 - 94	0.0
95 - 99	1.9%
100 - 104	0.9%
105 - 109	0.0
> 109	0.0
min size (mm)	13
max size (mm)	104
mean	59
mode	84

Strongylocentrotus purpuratus

(cases) N=	16
< 5	0.0
5 - 9	0.0
10 - 14	6.3%
15 - 19	12.5%
20 - 24	43.8%
25 - 29	18.8%
30 - 34	6.3%
35 - 39	0.0
40 - 44	0.0
45 - 49	6.3%
50 - 54	6.3%
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
> 109	0.0
min size (mm)	10
max size (mm)	52
mean	26
mode	21

Parastichopus parvimensis

(cases) N=	30
< 5	0.0
5 - 6	0.0
7 - 8	6.7%
9 - 10	20.0%
11 - 12	26.7%
13 - 14	30.0%
15 - 16	13.3%
17 - 18	3.3%
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	8
max size (cm)	18
mean	12
mode	11

Macrocystis pyrifera numbers of stipes.

(cases) N=	126
< 3	0.8%
3 - 5	15.9%
6 - 8	25.4%
9 - 11	19.0%
12 - 14	17.5%
15 - 17	5.6%
18 - 20	4.0%
21 - 23	7.1%
24 - 26	2.4%
27 - 29	1.6%
30 - 32	0.8%
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
>44	0.0
min number	2
max number	32
mean	11
mode	8

Macrocystis pyrifera holdfast diameters.

(cases) N=	126
< 6	0.0
6 - 11	2.4%
12 - 17	16.7%
18 - 23	27.8%
24 - 29	23.0%
30 - 35	17.5%
36 - 41	7.1%
42 - 47	1.6%
48 - 53	2.4%
54 - 59	0.0
60 - 65	1.6%
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
>89	0.0
min width (cm)	11
max width (cm)	64
mean	26
mode	32

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.0250	0.1118	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	0.2500	0.3441	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	1.4250	0.9770	20
Pisaster giganteus	0.6750	0.9358	20
Strongylocentrotus franciscanus	9.2250	6.7268	20
Strongylocentrotus purpuratus	2.4500	6.1321	20
Parastichopus parvimensis	0.2500	0.4730	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.4750	0.6382	20
Alloclinus holderi	0.0000	0.0000	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0139	0.0172	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0111	0.0148	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	0.0000	0.0000	12
Hinnites giganteus	0.0014	0.0048	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0278	0.0164	12
Lytechinus anamesus	0.0028	0.0096	12

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	19.1000	23.2724	25
Miscellaneous brown algae	1.7000	3.4400	25
Desmarestia spp.	15.3000	26.0340	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	0.8000	3.5148	25
Miscellaneous red algae	18.6000	15.2937	25
Articulated coralline algae	0.1000	0.5000	25
Crustose coralline algae	40.5000	19.6850	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	1.0000	3.5355	25
Miscellaneous plants	10.1000	11.1915	25
Sponges	0.0000	0.0000	25
Corynactis californica	17.0000	17.3805	25
Balanophyllia elegans	3.7000	3.8270	25
Astrangia lajollaensis	3.1000	4.9096	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans, other	1.6000	2.7839	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	0.1000	0.5000	25
Miscellaneous invertebrates	16.5000	16.2179	25
Bare substrate	9.9000	9.8816	25
Rock	78.2000	25.2747	25
Cobble	16.0000	24.2061	25
Sand	5.8000	8.7714	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	12.9167	39.4142	144
Chromis punctipinnis	10.4167	18.8654	12
Oxyjulis californica	121.9167	73.7014	12
Sebastes mystinus	9.5000	8.9798	12
Sebastes serranoides	4.1667	4.3658	12
Sebastes atrovirens	0.6667	1.1547	12
Paralabrax clathratus	0.0000	0.0000	12
Semicossyphus pulcher	0.7500	0.7538	12
Embiotoca jacksoni	0.8333	1.0299	12
Embiotoca lateralis	4.5000	1.8829	12
Damalichthys vacca	2.2500	2.2613	12
Hypsypops rubicundus	0.0000	0.0000	12
Girella nigricans	0.0000	0.0000	12

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		8.7500	19.3020	12
	900725	1.0000	2.0000	4
	900925	12.6250	23.0709	8
Chromis punctipinnis juvenile		1.6667	3.8925	12
	900725	0.0000	0.0000	4
	900925	2.5000	4.6291	8
Oxyjulis californica adult		120.7500	75.1727	12
	900725	22.2500	10.7510	4
	900925	170.0000	22.6779	8
Oxyjulis californica juvenile		1.1667	1.9924	12
	900725	3.2500	2.3629	4
	900925	0.1250	0.3536	8
Sebastes mystinus adult		1.4167	1.6765	12
	900725	1.5000	3.0000	4
	900925	1.3750	0.7440	8
Sebastes mystinus juvenile		8.0833	8.5116	12
	900725	12.7500	14.1980	4
	900925	5.7500	2.9641	8
Sebastes serranoides adult		1.2500	2.0057	12
	900725	2.0000	3.3665	4
	900925	0.8750	0.9910	8

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

Sebastes serranoides	juvenile		2.9167	2.7455
12				
	900725		6.0000	2.7080
4				
	900925		1.3750	0.7440
8				
Sebastes atrovirens	adult		0.4167	0.5149
12				
	900725		0.5000	0.5774
4				
	900925		0.3750	0.5175
8				
Sebastes atrovirens	juvenile		0.2500	0.8660
12				
	900725		0.7500	1.5000
4				
	900925		0.0000	0.0000
8				
Paralabrax clathratus	adult		0.0000	0.0000
12				
	900725		0.0000	0.0000
4				
	900925		0.0000	0.0000
8				

Paralabrax clathratus juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Semicossyphus pulcher male		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Semicossyphus pulcher female		0.7500	0.7538
12			
	900725	0.5000	1.0000
4			
	900925	0.8750	0.6409
8			
Embiotoca jacksoni adult		0.8333	1.0299
12			
	900725	0.7500	0.9574
4			
	900925	0.8750	1.1260
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Embiotoca lateralis adult		3.4167	1.4434
12			
	900725	2.5000	1.7321
4			
	900925	3.8750	1.1260
8			
Embiotoca lateralis juvenile		1.0833	1.1645
12			
	900725	0.5000	0.5774
4			
	900925	1.3750	1.3025
8			
Damalichthys vacca adult		2.2500	2.2613
12			
	900725	0.2500	0.5000
4			

	900925	3.2500	2.1213
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Hypsypops rubicundus adult		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Girella nigricans adult		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	900925	0.0000	0.0000
8			

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK
1990 SIZE FREQUENCY DISTRIBUTIONS

Tethya aurantia

(cases) N=	58
< 10	0.0
10 - 19	0.0
20 - 29	5.2%
30 - 39	15.5%
40 - 49	8.6%
50 - 59	22.4%
60 - 69	22.4%
70 - 79	15.5%
80 - 89	6.9%
90 - 99	1.7%
> 99	1.7%
min size (mm)	22
max size (mm)	104
mean	58
mode	36

Cypraea spadicea

(cases) N=	43
< 30	2.3%
30 - 34	0.0
35 - 39	2.3%
40 - 44	23.3%
45 - 49	34.9%
50 - 54	30.2%
55 - 59	4.7%
> 59	0.0
min size (mm)	9
max size (mm)	60
mean	47
mode	50

Haliotis rufescens

(cases) N=	24
< 25	58.3%
25 - 29	16.7%
30 - 34	16.7%
35 - 39	4.2%
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	0.0
115 - 119	0.0
120 - 124	0.0
125 - 129	0.0
130 - 134	0.0
135 - 139	0.0
140 - 144	0.0
145 - 149	0.0
150 - 154	0.0
155 - 159	0.0
160 - 164	0.0
165 - 169	0.0
170 - 174	4.2%
175 - 179	0.0
180 - 184	0.0
185 - 189	0.0
190 - 194	0.0
195 - 199	0.0
> 199	0.0
min size (mm)	10
max size (mm)	173
mean	30
mode	22

Patiria miniata

(cases) N=	51
< 10	2.0%
10 - 19	7.8%
20 - 29	5.9%
30 - 39	0.0
40 - 49	9.8%
50 - 59	19.6%
60 - 69	37.3%
70 - 79	17.6%
80 - 89	0.0
90 - 99	0.0
> 99	0.0
min size (mm)	6
max size (mm)	75
mean	54
mode	62

Pisaster giganteus

(cases) N=	51
< 20	0.0
20 - 39	2.0%
40 - 59	27.5%
60 - 79	33.3%
80 - 99	21.6%
100 - 119	9.8%
120 - 139	3.9%
140 - 159	0.0
160 - 179	0.0
180 - 199	2.0%
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	34
max size (mm)	193
mean	77
mode	68

Pycnopodia helianthoides

(cases) N=	46
< 20	0.0
20 - 39	4.3%
40 - 59	2.2%
60 - 79	0.0
80 - 99	10.9%
100 - 119	6.5%
120 - 139	19.6%
140 - 159	4.3%
160 - 179	8.7%
180 - 199	8.7%
200 - 219	10.9%
220 - 239	10.9%
240 - 259	4.3%
260 - 279	6.5%
280 - 299	2.2%
> 299	0.0
min size (mm)	29
max size (mm)	293
mean	163
mode	182

Parastichopus parvimensis

(cases) N=	30
< 5	0.0
5 - 6	0.0
7 - 8	0.0
9 - 10	0.0
11 - 12	0.0
13 - 14	10.0%
15 - 16	26.7%
17 - 18	36.7%
19 - 20	20.0%
21 - 22	3.3%
> 22	3.3%
min size (cm)	14
max size (cm)	24
mean	17
mode	18

LOCATION 2 SAN MIGUEL ISLAND - HARE ROCK

Strongylocentrotus franciscanus	
(cases) N=	102
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.0
20 - 24	0.0
25 - 29	2.9%
30 - 34	4.9%
35 - 39	3.9%
40 - 44	10.8%
45 - 49	3.9%
50 - 54	5.9%
55 - 59	10.8%
60 - 64	21.6%
65 - 69	15.7%
70 - 74	10.8%
75 - 79	5.9%
80 - 84	2.0%
85 - 90	1.0%
90 - 94	0.0
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
> 109	0.0
min size (mm)	28
max size (mm)	87
mean	58
mode	60

Strongylocentrotus purpuratus	
(cases) N=	110
< 5	0.0
5 - 9	0.9%
10 - 14	0.0
15 - 19	0.0
20 - 24	1.8%
25 - 29	5.5%
30 - 34	26.4%
35 - 39	35.5%
40 - 44	18.2%
45 - 49	6.4%
50 - 54	1.8%
55 - 59	1.8%
60 - 64	1.8%
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
> 109	0.0
min size (mm)	6
max size (mm)	63
mean	37
mode	38

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	1.2000	1.0183	20
Eisenia arborea	0.0250	0.1118	20
Pterygophora californica	0.3250	0.4064	20
Laminaria farlowii	0.1750	0.2936	20
Macrocystis pyrifera juvenile	0.9250	1.4260	20
Macrocystis pyrifera all	2.1250	1.6212	20
Cypraea spadicea	0.4000	0.5758	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	0.5500	0.6048	20
Pisaster giganteus	1.0000	0.8429	20
Strongylocentrotus franciscanus	0.1750	0.5911	20
Strongylocentrotus purpuratus	1.1000	2.0686	20
Parastichopus parvimensis	0.5750	0.5200	20
Styela monteryensis	1.2750	1.2511	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0250	0.1118	20
Alloclinus holderi	0.0500	0.1539	20

1990 BAND TRANSECT: MEAN NUMBER PER M^2

Tethya aurantia	0.0181	0.0241	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0153	0.0207	12
Lophogorgia chilensis	0.0028	0.0065	12
Muricea fruticosa	0.0000	0.0000	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0083	0.0241	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0014	0.0048	12
Megathura crenulata	0.0222	0.0205	12
Hinnites giganteus	0.0139	0.0172	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.2458	0.0856	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.1000	0.5000	25
Miscellaneous brown algae	2.6000	3.7832	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.8000	2.3629	25
Cystoseira spp.	9.1000	19.1877	25
Macrocystis, Eisenia, Pterygophora	41.8000	21.6449	25
Miscellaneous red algae	27.8000	14.1480	25
Articulated coralline algae	8.1000	7.5788	25
Crustose coralline algae	16.2000	7.2212	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.4000	1.9203	25
Sponges	3.2000	3.9870	25
Corynactis californica	3.9000	6.3361	25
Balanophyllia elegans	6.2000	4.7390	25
Astrangia lajollaensis	1.2000	2.6141	25
Diopatra ornata	1.2000	4.0260	25
Phragmatopoma californica	14.0000	9.3541	25
Serpulorbis squamigerus	0.1000	0.5000	25
Bryozoans, other	15.0000	11.0161	25
Diaperoecia californica	0.8000	1.3919	25
Tunicates	4.5000	3.5355	25
Miscellaneous invertebrates	14.6000	7.9281	25
Bare substrate	5.9000	6.2032	25
Rock	90.3000	11.3496	25
Cobble	1.3000	2.1794	25
Sand	8.4000	11.7898	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	2.1111	3.2712	144
Chromis punctipinnis	3.2500	4.1806	12
Oxyjulis californica	3.5000	5.6003	12
Sebastes mystinus	0.2500	0.4523	12
Sebastes serranoides	0.2500	0.4523	12
Sebastes atrovirens	2.0000	1.4142	12
Paralabrax clathratus	0.4167	0.6686	12
Semicossyphus pulcher	0.7500	0.7538	12
Embiotoca jacksoni	6.8333	3.5119	12
Embiotoca lateralis	5.5833	3.5792	12
Damalichthys vacca	1.1667	1.1934	12
Hypsypops rubicundus	0.9167	0.6686	12
Girella nigricans	0.4167	0.6686	12

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		1.7500	3.1370	12
	900808	1.0000	1.4142	4
	900915	2.1250	3.7583	8
Chromis punctipinnis juvenile		1.5000	2.6112	12
	900808	4.0000	3.3665	4
	900915	0.2500	0.7071	8
Oxyjulis californica adult		1.0833	1.9752	12
	900808	3.2500	2.2174	4
	900915	0.0000	0.0000	8
Oxyjulis californica juvenile		2.4167	5.7597	12
	900808	0.0000	0.0000	4
	900915	3.6250	6.8648	8
Sebastes mystinus adult		0.2500	0.4523	12
	900808	0.0000	0.0000	4
	900915	0.3750	0.5175	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	900808	0.0000	0.0000	4
	900915	0.0000	0.0000	8
Sebastes serranoides adult		0.2500	0.4523	12
	900808	0.2500	0.5000	4
	900915	0.2500	0.4629	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900808	0.0000	0.0000
4			
	900915	0.0000	0.0000
8			
Sebastes atrovirens adult		2.0000	1.4142
12			
	900808	1.7500	1.5000
4			
	900915	2.1250	1.4577
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900808	0.0000	0.0000
4			
	900915	0.0000	0.0000
8			
Paralabrax clathratus adult		0.4167	0.6686
12			
	900808	0.7500	0.9574
4			
	900915	0.2500	0.4629
8			

Paralabrax clathratus juvenile		0.0000	0.0000
12			
	900808	0.0000	0.0000
4			
	900915	0.0000	0.0000
8			
Semicossyphus pulcher male		0.0000	0.0000
12			
	900808	0.0000	0.0000
4			
	900915	0.0000	0.0000
8			
Semicossyphus pulcher female		0.7500	0.7538
12			
	900808	0.7500	0.9574
4			
	900915	0.7500	0.7071
8			
Embiotoca jacksoni adult		5.8333	3.6886
12			
	900808	5.2500	3.5000
4			
	900915	6.1250	3.9799
8			
Embiotoca jacksoni juvenile		1.0000	1.4771
12			
	900808	1.7500	2.3629
4			
	900915	0.6250	0.7440
8			
Embiotoca lateralis adult		4.5000	3.3439
12			
	900808	4.0000	2.8284
4			
	900915	4.7500	3.7321
8			
Embiotoca lateralis juvenile		1.0833	1.6214
12			
	900808	1.7500	2.3629
4			
	900915	0.7500	1.1650
8			
Damalichthys vacca adult		0.7500	0.8660
12			
	900808	0.7500	0.9574
4			

	900915	0.7500	0.8864
8			
Damalichthys vacca juvenile		0.4167	1.1645
12			
	900808	1.0000	2.0000
4			
	900915	0.1250	0.3536
8			
Hypsypops rubicundus adult		0.9167	0.6686
12			
	900808	1.5000	0.5774
4			
	900915	0.6250	0.5175
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900808	0.0000	0.0000
4			
	900915	0.0000	0.0000
8			
Girella nigricans adult		0.4167	0.6686
12			
	900808	0.7500	0.9574
4			
	900915	0.2500	0.4629
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900808	0.0000	0.0000
4			
	900915	0.0000	0.0000
8			

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH
1990 SIZE FREQUENCY DISTRIBUTIONS

Tethya aurantia

(cases) N=	23
< 10	0.0
10 - 19	0.0
20 - 29	13.0%
30 - 39	13.0%
40 - 49	13.0%
50 - 59	13.0%
60 - 69	4.3%
70 - 79	13.0%
80 - 89	4.3%
90 - 99	4.3%
> 99	17.4%
min size (mm)	26
max size (mm)	107
mean	65
mode	78

Astraea undosa

(cases) N=	11
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	9.1%
60 - 69	0.0
70 - 79	0.0
80 - 89	9.1%
90 - 99	9.1%
100 - 109	54.5%
110 - 119	9.1%
> 119	9.1%
min size (mm)	53
max size (mm)	154
mean	104
mode	105

Cypraea spadicea

(cases) N=	44
< 30	0.0
30 - 34	0.0
35 - 39	2.3%
40 - 44	18.2%
45 - 49	47.7%
50 - 54	27.3%
55 - 59	4.5%
> 59	0.0
min size (mm)	38
max size (mm)	56
mean	48
mode	46

Haliotis rufescens

(cases) N=	33
< 25	0.0
25 - 29	3.0%
30 - 34	3.0%
35 - 39	0.0
40 - 44	9.1%
45 - 49	3.0%
50 - 54	6.1%
55 - 59	9.1%
60 - 64	3.0%
65 - 69	6.1%
70 - 74	3.0%
75 - 79	0.0
80 - 84	0.0
85 - 90	3.0%
90 - 94	9.1%
95 - 99	3.0%
100 - 104	3.0%
105 - 109	3.0%
110 - 114	3.0%
115 - 119	0.0
120 - 124	3.0%
125 - 129	0.0
130 - 134	3.0%
135 - 139	0.0
140 - 144	0.0
145 - 149	6.1%
150 - 154	0.0
155 - 159	6.1%
160 - 164	0.0
165 - 169	3.0%
170 - 174	0.0
175 - 179	0.0
180 - 184	6.1%
185 - 189	0.0
190 - 194	3.0%
195 - 199	0.0
> 199	0.0
min size (mm)	28
max size (mm)	190
mean	95
mode	59

Megathura crenulata

(cases) N=	24
< 10	0.0
10 - 19	4.2%
20 - 29	4.2%
30 - 39	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	4.2%
70 - 79	8.3%
80 - 89	4.2%
90 - 99	16.7%
100 - 109	25.0%
110 - 119	12.5%
> 119	20.8%
min size (mm)	18
max size (mm)	129
mean	96
mode	102

Hinnites giganteus

(cases) N=	27
< 10	0.0
10 - 19	0.0
20 - 29	7.4%
30 - 39	3.7%
40 - 49	0.0
50 - 59	7.4%
60 - 69	14.8%
70 - 79	14.8%
80 - 89	11.1%
90 - 99	3.7%
100 - 109	7.4%
110 - 119	18.5%
120 - 129	3.7%
130 - 139	0.0
140 - 149	3.7%
> 149	3.7%
min size (mm)	29
max size (mm)	154
mean	85
mode	29

Patiria miniata

(cases) N=	50
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	2.0%
40 - 49	12.0%
50 - 59	28.0%
60 - 69	30.0%
70 - 79	24.0%
80 - 89	2.0%
90 - 99	2.0%
> 99	0.0
min size (mm)	35
max size (mm)	90
mean	62
mode	59

Pisaster giganteus

(cases) N=	53
< 20	1.9%
20 - 39	7.5%
40 - 59	11.3%
60 - 79	34.0%
80 - 99	34.0%
100 - 119	5.7%
120 - 139	1.9%
140 - 159	0.0
160 - 179	1.9%
180 - 199	1.9%
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	17
max size (mm)	187
mean	78
mode	63

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

Pycnopodia helianthoides

(cases) N=	48
< 20	0.0
20 - 39	2.1%
40 - 59	8.3%
60 - 79	18.8%
80 - 99	22.9%
100 - 119	29.2%
120 - 139	6.3%
140 - 159	2.1%
160 - 179	2.1%
180 - 199	0.0
200 - 219	0.0
220 - 239	2.1%
240 - 259	4.2%
260 - 279	2.1%
280 - 299	0.0
> 299	0.0
min size (mm)	33
max size (mm)	270
mean	104
mode	100

Parastichopus parvimensis

(cases) N=	39
< 5	0.0
5 - 6	2.6%
7 - 8	0.0
9 - 10	12.8%
11 - 12	30.8%
13 - 14	35.9%
15 - 16	17.9%
17 - 18	0.0
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	6
max size (cm)	16
mean	13
mode	13

Strongylocentrotus franciscanus

(cases) N=	94
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.0
20 - 24	0.0
25 - 29	5.3%
30 - 34	5.3%
35 - 39	2.1%
40 - 44	4.3%
45 - 49	5.3%
50 - 54	3.2%
55 - 59	5.3%
60 - 64	7.4%
65 - 69	8.5%
70 - 74	11.7%
75 - 79	11.7%
80 - 84	10.6%
85 - 90	5.3%
90 - 94	6.4%
95 - 99	3.2%
100 - 104	1.1%
105 - 109	2.1%
> 109	0.0
min size (mm)	25
max size (mm)	110
mean	67
mode	92

Strongylocentrotus purpuratus

(cases) N=	111
< 5	0.0
5 - 9	0.0
10 - 14	6.3%
15 - 19	9.0%
20 - 24	8.1%
25 - 29	10.8%
30 - 34	18.9%
35 - 39	19.8%
40 - 44	18.0%
45 - 49	4.5%
50 - 54	3.6%
55 - 59	0.9%
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
> 109	0.0
min size (mm)	10
max size (mm)	59
mean	33
mode	39

LOCATION 3 SANTA ROSA ISLAND - JOHNSON'S LEE NORTH

Macrocystis pyrifera numbers of stipes.

(cases) N=	102
< 3	8.8%
3 - 5	20.6%
6 - 8	25.5%
9 - 11	21.6%
12 - 14	14.7%
15 - 17	6.9%
18 - 20	0.0
21 - 23	1.0%
24 - 26	1.0%
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	24
mean	8
mode	8

Macrocystis pyrifera holdfast diameters.

(cases) N=	102
< 6	0.0
6 - 11	2.0%
12 - 17	4.9%
18 - 23	7.8%
24 - 29	14.7%
30 - 35	12.7%
36 - 41	19.6%
42 - 47	21.6%
48 - 53	8.8%
54 - 59	7.8%
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)	8
max width (cm)	59
mean	36
mode	39

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.4750	0.5955	20
Eisenia arborea	0.0500	0.1539	20
Pterygophora californica	0.5250	1.0572	20
Laminaria farlowii	0.4000	0.4757	20
Macrocystis pyrifera juvenile	0.1750	0.4667	20
Macrocystis pyrifera all	0.6500	0.7797	20
Cypraea spadicea	0.4250	0.5911	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	2.5750	1.7492	20
Pisaster giganteus	0.1750	0.4064	20
Strongylocentrotus franciscanus	1.0250	1.4000	20
Strongylocentrotus purpuratus	11.0500	17.8192	20
Parastichopus parvimensis	0.1250	0.2751	20
Styela monteryensis	0.8750	0.9580	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.4250	0.7826	20
Alloclinus holderi	0.1250	0.2751	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0764	0.0597	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0625	0.0823	12
Lophogorgia chilensis	0.1931	0.0633	12
Muricea fruticosa	0.0014	0.0048	12
Panulirus interruptus	0.0000	0.0000	12
Haliotis rufescens	0.0028	0.0065	12
Haliotis corrugata	0.0000	0.0000	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0069	0.0111	12
Megathura crenulata	0.0028	0.0065	12
Hinnites giganteus	0.0097	0.0207	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.2597	0.1810	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.0000	0.0000	25
Miscellaneous brown algae	1.5000	2.7003	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	2.1000	3.0345	25
Cystoseira spp.	1.0000	1.6137	25
Macrocystis, Eisenia, Pterygophora	17.1000	16.9509	25
Miscellaneous red algae	18.0000	8.2285	25
Articulated coralline algae	6.9000	6.6646	25
Crustose coralline algae	19.0000	10.1807	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	2.5000	4.0825	25
Miscellaneous plants	0.4000	0.9354	25
Sponges	1.3000	2.1794	25
Corynactis californica	4.1000	8.0971	25
Balanophyllia elegans	10.8000	7.2428	25
Astrangia lajollaensis	1.3000	2.1794	25
Diopatra ornata	7.2000	6.3459	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans, others	17.3000	7.5319	25
Diaperoecia californica	0.5000	1.6137	25
Tunicates	3.8000	5.5019	25
Miscellaneous invertebrates	26.8000	14.0223	25
Bare substrate	10.4000	8.0906	25
Rock	82.2000	12.7949	25
Cobble	2.1000	2.9475	25
Sand	15.7000	12.5938	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	2.2431	3.0640	144
Chromis punctipinnis	5.1667	4.8959	12
Oxyjulis californica	1.0833	1.6214	12
Sebastes mystinus	5.4167	5.3845	12
Sebastes serranoides	0.3333	0.6513	12
Sebastes atrovirens	1.8333	1.4668	12
Paralabrax clathratus	0.5000	0.6742	12
Semicossyphus pulcher	2.7500	1.4848	12
Embiotoca jacksoni	2.3333	1.9228	12
Embiotoca lateralis	3.4167	2.4293	12
Damalichthys vacca	3.7500	2.8002	12
Hypsypops rubicundus	0.0000	0.0000	12
Girella nigricans	0.3333	0.8876	12

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		4.3333	4.0302	12
	900807	2.0000	2.1602	4
	900913	5.5000	4.3425	8
Chromis punctipinnis juvenile		0.8333	2.8868	12
	900807	0.0000	0.0000	4
	900913	1.2500	3.5355	8
Oxyjulis californica adult		1.0833	1.6214	12
	900807	0.0000	0.0000	4
	900913	1.6250	1.7678	8
Oxyjulis californica juvenile		0.0000	0.0000	12
	900807	0.0000	0.0000	4
	900913	0.0000	0.0000	8
Sebastes mystinus adult		1.0833	1.4434	12
	900807	0.2500	0.5000	4
	900913	1.5000	1.6036	8
Sebastes mystinus juvenile		4.3333	4.5991	12
	900807	0.0000	0.0000	4
	900913	6.5000	4.1404	8
Sebastes serranoides adult		0.0833	0.2887	12
	900807	0.0000	0.0000	4
	900913	0.1250	0.3536	8

Sebastes serranoides juvenile		0.2500	0.4523
12			
	900807	0.0000	0.0000
4			
	900913	0.3750	0.5175
8			
Sebastes atrovirens adult		1.8333	1.4668
12			
	900807	1.5000	1.9149
4			
	900913	2.0000	1.3093
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			
Paralabrax clathratus adult		0.4167	0.6686
12			
	900807	0.7500	0.9574
4			
	900913	0.2500	0.4629
8			

Paralabrax clathratus juvenile		0.0833	0.2887
12			
	900807	0.2500	0.5000
4			
	900913	0.0000	0.0000
8			
Semicossyphus pulcher male		0.4167	0.5149
12			
	900807	0.7500	0.5000
4			
	900913	0.2500	0.4629
8			
Semicossyphus pulcher female		2.3333	1.4355
12			
	900807	1.5000	1.2910
4			
	900913	2.7500	1.3887
8			
Embiotoca jacksoni adult		2.3333	1.9228
12			
	900807	1.0000	1.4142
4			
	900913	3.0000	1.8516
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			
Embiotoca lateralis adult		3.4167	2.4293
12			
	900807	3.0000	2.0000
4			
	900913	3.6250	2.7223
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			
Damalichthys vacca adult		3.7500	2.8002
12			
	900807	2.2500	1.5000
4			

	900913	4.5000	3.0706
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			
Hypsypops rubicundus adult		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			
Girella nigricans adult		0.3333	0.8876
12			
	900807	0.0000	0.0000
4			
	900913	0.5000	1.0690
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900807	0.0000	0.0000
4			
	900913	0.0000	0.0000
8			

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH
1990 SIZE FREQUENCY DISTRIBUTIONS

Tethya aurantia

(cases) N=	36
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	2.8%
40 - 49	33.3%
50 - 59	11.1%
60 - 69	22.2%
70 - 79	13.9%
80 - 89	5.6%
90 - 99	5.6%
> 99	5.6%
min size (mm)	35
max size (mm)	110
mean	62
mode	42

Cypraea spadicea

(cases) N=	29
< 30	0.0
30 - 34	0.0
35 - 39	6.9%
40 - 44	20.7%
45 - 49	48.3%
50 - 54	20.7%
55 - 59	3.4%
> 59	0.0
min size (mm)	38
max size (mm)	56
mean	46
mode	46

Patiria miniata

(cases) N=	51
< 10	0.0
10 - 19	0.0
20 - 29	3.9%
30 - 39	5.9%
40 - 49	9.8%
50 - 59	27.5%
60 - 69	25.5%
70 - 79	21.6%
80 - 89	3.9%
90 - 99	2.0%
> 99	0.0
min size (mm)	21
max size (mm)	93
mean	60
mode	53

Hinnites giganteus

(cases) N=	30
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	10.0%
50 - 59	13.3%
60 - 69	33.3%
70 - 79	20.0%
80 - 89	10.0%
90 - 99	10.0%
100 - 109	0.0
110 - 119	0.0
120 - 129	3.3%
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	40
max size (mm)	120
mean	70
mode	62

Pisaster giganteus

(cases) N=	62
< 20	0.0
20 - 39	9.7%
40 - 59	56.5%
60 - 79	24.2%
80 - 99	1.6%
100 - 119	1.6%
120 - 139	1.6%
140 - 159	3.2%
160 - 179	0.0
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	1.6%
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	27
max size (mm)	252
mean	63
mode	50

Pycnopodia helianthoides

(cases) N=	50
< 20	0.0
20 - 39	0.0
40 - 59	2.0%
60 - 79	12.0%
80 - 99	36.0%
100 - 119	16.0%
120 - 139	10.0%
140 - 159	4.0%
160 - 179	0.0
180 - 199	10.0%
200 - 219	2.0%
220 - 239	2.0%
240 - 259	2.0%
260 - 279	0.0
280 - 299	0.0
> 299	2.0%
min size (mm)	42
max size (mm)	310
mean	123
mode	84

Parastichopus parvimensis

(cases) N=	34
< 5	0.0
5 - 6	0.0
7 - 8	0.0
9 - 10	2.9%
11 - 12	8.8%
13 - 14	44.1%
15 - 16	29.4%
17 - 18	11.8%
19 - 20	0.0
21 - 22	2.9%
> 22	0.0
min size (cm)	10
max size (cm)	21
mean	14
mode	14

Strongylocentrotus franciscanus

(cases) N=	106
< 5	0.0
5 - 9	0.0
10 - 14	0.9%
15 - 19	4.7%
20 - 24	4.7%
25 - 29	7.5%
30 - 34	6.6%
35 - 39	8.5%
40 - 44	6.6%
45 - 49	6.6%
50 - 54	4.7%
55 - 59	3.8%
60 - 64	7.5%
65 - 69	2.8%
70 - 74	10.4%
75 - 79	1.9%
80 - 84	6.6%
85 - 90	7.5%
90 - 94	2.8%
95 - 99	2.8%
100 - 104	0.9%
105 - 109	0.9%
> 109	0.9%
min size (mm)	12
max size (mm)	118
mean	56
mode	36

Strongylocentrotus purpuratus

(cases) N=	127
< 5	0.0
5 - 9	0.0
10 - 14	0.8%
15 - 19	0.8%
20 - 24	5.5%
25 - 29	4.7%
30 - 34	12.6%
35 - 39	23.6%
40 - 44	25.2%
45 - 49	18.1%
50 - 54	5.5%
55 - 59	1.6%
60 - 64	1.6%
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
> 109	0.0
min size (mm)	11
max size (mm)	62
mean	39
mode	37

LOCATION 4 SANTA ROSA ISLAND - JOHNSON'S LEE SOUTH

Macrocystis pyrifera numbers of stipes.

(cases) N=	106
< 3	2.8%
3 - 5	3.8%
6 - 8	12.3%
9 - 11	17.9%
12 - 14	17.0%
15 - 17	17.9%
18 - 20	11.3%
21 - 23	8.5%
24 - 26	3.8%
27 - 29	3.8%
30 - 32	0.0
33 - 35	0.9%
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
>44	0.0
min number	2
max number	35
mean	14
mode	11

Macrocystis pyrifera holdfast diameters.

(cases) N=	106
< 6	0.0
6 - 11	0.0
12 - 17	1.9%
18 - 23	4.7%
24 - 29	6.6%
30 - 35	13.2%
36 - 41	14.2%
42 - 47	25.5%
48 - 53	14.2%
54 - 59	13.2%
60 - 65	6.6%
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
>89	0.0
min width (cm)	13
max width (cm)	64
mean	43
mode	45

Lophogorgia chilensis widths

(cases) N=	60
< 5	0.0
5 - 8	5.0%
9 - 12	3.3%
13 - 16	16.7%
17 - 20	10.0%
21 - 24	11.7%
25 - 28	21.7%
29 - 32	18.3%
33 - 36	10.0%
37 - 40	3.3%
41 - 44	0.0
45 - 48	0.0
49 - 52	0.0
>53	0.0
min width (cm)	6
max width (cm)	38
mean	24
mode	27

Lophogorgia chilensis heights

(cases) N=	60
< 5	0.0
5 - 8	1.7%
9 - 12	1.7%
13 - 16	0.0
17 - 20	13.3%
21 - 24	15.0%
25 - 28	31.7%
29 - 32	20.0%
33 - 36	10.0%
37 - 40	3.3%
41 - 44	3.3%
45 - 48	0.0
49 - 52	0.0
>53	0.0
min height (cm)	8
max height (cm)	44
mean	27
mode	26

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.1500	0.2351	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	2.2000	6.3957	20
Macrocystis pyrifera all	2.3500	6.3497	20
Cypraea spadicea	0.1000	0.3479	20
Astraea undosa	0.0000	0.0000	20
Astraea gibberosa	0.0250	0.1118	20
Patiria miniata	1.9250	1.1387	20
Pisaster giganteus	0.3500	0.5643	20
Strongylocentrotus franciscanus	6.9250	8.5182	20
Strongylocentrotus purpuratus	1.2500	2.9222	20
Parastichopus parvimensis	0.0250	0.1118	20
Styela monteryensis	0.1250	0.3193	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.0250	0.1118	20
Alloclinus holderi	0.0250	0.1118	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.1361	0.0855	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0417	0.0306	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	0.0028	0.0065	12
Megathura crenulata	0.0097	0.0086	12
Hinnites giganteus	0.0042	0.0104	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.1125	0.0689	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 5 SANTA ROSA ISLAND - RODES REEF
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.0000	0.0000	25
Miscellaneous brown algae	0.2000	0.6922	25
Desmarestia spp.	0.1000	0.5000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	6.0000	10.3078	25
Miscellaneous red algae	15.7000	20.0588	25
Articulated coralline algae	0.7000	1.1456	25
Crustose coralline algae	15.9000	10.5297	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	4.7000	5.6972	25
Sponges	1.2000	1.7854	25
Corynactis californica	0.3000	0.8292	25
Balanophyllia elegans	6.6000	4.3229	25
Astrangia lajollaensis	10.0000	10.0519	25
Diopatra ornata	4.5000	6.8845	25
Phragmatopoma californica	3.5000	6.1237	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans, other	11.8000	12.6351	25
Diaperoecia californica	6.2000	6.9267	25
Tunicates	3.4000	3.2977	25
Miscellaneous invertebrates	12.1000	10.5987	25
Bare substrate	5.9000	8.5355	25
Rock	84.1000	19.7758	25
Cobble	6.1000	6.9252	25
Sand	9.8000	15.3080	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	4.5000	7.2228	96
Chromis punctipinnis	13.5000	11.2758	8
Oxyjulis californica	10.5000	17.4274	8
Sebastes mystinus	6.5000	3.8545	8
Sebastes serranoides	3.7500	3.7702	8
Sebastes atrovirens	6.2500	1.6690	8
Paralabrax clathratus	0.8750	1.2464	8
Semicossyphus pulcher	5.3750	2.5036	8
Embiotoca jacksoni	2.1250	1.1260	8
Embiotoca lateralis	4.7500	2.3146	8
Damalichthys vacca	0.3750	0.5175	8
Hypsypops rubicundus	0.0000	0.0000	8
Girella nigricans	0.0000	0.0000	8

LOCATION 5 SANTA ROSA ISLAND - RODES REEF
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		12.6250	11.9515	8
	900709	20.5000	11.9583	4
	900924	4.7500	4.9917	4
Chromis punctipinnis juvenile		0.8750	2.1002	8
	900709	0.0000	0.0000	4
	900924	1.7500	2.8723	4
Oxyjulis californica adult		10.5000	17.4274	8
	900709	20.5000	21.0000	4
	900924	0.5000	1.0000	4
Oxyjulis californica juvenile		0.0000	0.0000	8
	900709	0.0000	0.0000	4
	900924	0.0000	0.0000	4
Sebastes mystinus adult		5.0000	4.5356	8
	900709	8.5000	3.7859	4
	900924	1.5000	1.0000	4
Sebastes mystinus juvenile		1.5000	1.9272	8
	900709	0.7500	1.5000	4
	900924	2.2500	2.2174	4
Sebastes serranoides adult		3.7500	3.7702	8
	900709	7.0000	2.1602	4
	900924	0.5000	0.5774	4

Sebastes serranoides juvenile		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			
Sebastes atrovirens adult		5.3750	1.9955
8			
	900709	6.7500	0.9574
4			
	900924	4.0000	1.8257
4			
Sebastes atrovirens juvenile		0.8750	1.2464
8			
	900709	0.0000	0.0000
4			
	900924	1.7500	1.2583
4			
Paralabrax clathratus adult		0.8750	1.2464
8			
	900709	1.7500	1.2583
4			
	900924	0.0000	0.0000
4			

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

Paralabrax clathratus juvenile		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			
Semicossyphus pulcher male		1.2500	0.7071
8			
	900709	1.2500	0.9574
4			
	900924	1.2500	0.5000
4			
Semicossyphus pulcher female		4.1250	2.5319
8			
	900709	3.7500	2.2174
4			
	900924	4.5000	3.1091
4			
Embiotoca jacksoni adult		2.0000	1.0690
8			
	900709	1.5000	1.2910
4			
	900924	2.5000	0.5774
4			
Embiotoca jacksoni juvenile		0.1250	0.3536
8			
	900709	0.2500	0.5000
4			
	900924	0.0000	0.0000
4			
Embiotoca lateralis adult		4.2500	2.3146
8			
	900709	2.5000	1.0000
4			
	900924	6.0000	1.8257
4			
Embiotoca lateralis juvenile		0.5000	1.0690
8			
	900709	0.7500	1.5000
4			
	900924	0.2500	0.5000
4			
Damalichthys vacca adult		0.3750	0.5175
8			
	900709	0.5000	0.5774
4			

	900924	0.2500	0.5000
4			
Damalichthys vacca juvenile		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			
Hypsypops rubicundus adult		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			
Hypsypops rubicundus juvenile		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			
Girella nigricans adult		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			
Girella nigricans juvenile		0.0000	0.0000
8			
	900709	0.0000	0.0000
4			
	900924	0.0000	0.0000
4			

LOCATION 5 SANTA ROSA ISLAND - RODES REEF
1990 SIZE FREQUENCY DISTRIBUTIONS

Tethya aurantia

(cases) N=	35
< 10	0.0
10 - 19	0.0
20 - 29	8.6%
30 - 39	8.6%
40 - 49	14.3%
50 - 59	17.1%
60 - 69	17.1%
70 - 79	20.0%
80 - 89	2.9%
90 - 99	11.4%
> 99	0.0
min size (mm)	24
max size (mm)	94
mean	61
mode	58

Patiria miniata

(cases) N=	53
< 10	0.0
10 - 19	0.0
20 - 29	9.4%
30 - 39	22.6%
40 - 49	11.3%
50 - 59	22.6%
60 - 69	13.2%
70 - 79	13.2%
80 - 89	5.7%
90 - 99	1.9%
> 99	0.0
min size (mm)	21
max size (mm)	95
mean	52
mode	32

Pisaster giganteus

(cases) N=	50
< 20	0.0
20 - 39	10.0%
40 - 59	32.0%
60 - 79	46.0%
80 - 99	10.0%
100 - 119	0.0
120 - 139	0.0
140 - 159	2.0%
160 - 179	0.0
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	22
max size (mm)	143
mean	63
mode	54

Pycnopodia helianthoides

(cases) N=	49
< 20	0.0
20 - 39	2.0%
40 - 59	6.1%
60 - 79	36.7%
80 - 99	14.3%
100 - 119	8.2%
120 - 139	12.2%
140 - 159	12.2%
160 - 179	0.0
180 - 199	0.0
200 - 219	6.1%
220 - 239	2.0%
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	38
max size (mm)	225
mean	104
mode	67

LOCATION 5 SANTA ROSA ISLAND - RODES REEF

Strongylocentrotus franciscanus

(cases) N=	130
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.8%
20 - 24	0.0
25 - 29	0.8%
30 - 34	2.3%
35 - 39	4.6%
40 - 44	6.9%
45 - 49	3.8%
50 - 54	5.4%
55 - 59	3.8%
60 - 64	7.7%
65 - 69	6.9%
70 - 74	9.2%
75 - 79	22.3%
80 - 84	17.7%
85 - 90	5.4%
90 - 94	2.3%
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
> 109	0.0
min size (mm)	16
max size (mm)	92
mean	67
mode	78

Strongylocentrotus purpuratus

(cases) N=	132
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	3.8%
20 - 24	7.6%
25 - 29	7.6%
30 - 34	10.6%
35 - 39	15.2%
40 - 44	17.4%
45 - 49	18.2%
50 - 54	11.4%
55 - 59	6.8%
60 - 64	0.8%
65 - 69	0.8%
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
> 109	0.0
min size (mm)	16
max size (mm)	65
mean	40
mode	39

Macrocystis pyrifera numbers of stipes.

(cases) N=	98
< 3	0.0
3 - 5	4.1%
6 - 8	7.1%
9 - 11	8.2%
12 - 14	9.2%
15 - 17	11.2%
18 - 20	16.3%
21 - 23	9.2%
24 - 26	15.3%
27 - 29	6.1%
30 - 32	1.0%
33 - 35	3.1%
36 - 38	2.0%
39 - 41	3.1%
42 - 44	1.0%
>44	2.0%
min number	3
max number	53
mean	20
mode	18

Macrocystis pyrifera holdfast diameters.

(cases) N=	98
< 6	0.0
6 - 11	0.0
12 - 17	3.1%
18 - 23	6.1%
24 - 29	17.3%
30 - 35	20.4%
36 - 41	21.4%
42 - 47	17.3%
48 - 53	13.3%
54 - 59	0.0
60 - 65	1.0%
66 - 71	0.0
72 - 77	0.0
78 - 83	0.0
84 - 89	0.0
>89	0.0
min width (cm)	12
max width (cm)	62
mean	36
mode	36

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.3750	0.6664	20
Eisenia arborea	0.2500	0.8959	20
Pterygophora californica	0.1250	0.4552	20
Laminaria farlowii	0.1500	0.2856	20
Macrocystis pyrifera juvenile	2.1750	3.0100	20
Macrocystis pyrifera all	2.5500	3.3043	20
Cypraea spadicea	0.6000	1.1192	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	1.2000	1.1630	20
Pisaster giganteus	0.4750	0.3796	20
Strongylocentrotus franciscanus	2.4500	2.5438	20
Strongylocentrotus purpuratus	39.9500	39.0273	20
Parastichopus parvimensis	1.7250	0.9101	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	1.2750	1.3521	20
Alloclinus holderi	0.4000	0.6198	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0097	0.0111	12
Allopora californica	0.0139	0.0199	12
Tealia lofotensis	0.0014	0.0048	12
Lophogorgia chilensis	0.0694	0.0465	12
Muricea fruticosa	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	0.0528	0.0324	12
Megathura crenulata	0.1319	0.0657	12
Hinnites giganteus	0.0153	0.0166	12
Aplysia californica	0.0125	0.0247	12
Pycnopodia helianthoides	0.0153	0.0132	12
Lytechinus anamesus	0.6417	1.1969	12

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	2.5000	4.2081	25
Miscellaneous brown algae	1.3000	3.1557	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.2000	1.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	19.6000	29.5864	25
Miscellaneous red algae	16.8000	14.6401	25
Articulated coralline algae	1.4000	3.1524	25
Crustose coralline algae	46.8000	16.1135	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	7.5000	8.8093	25
Sponges	0.4000	1.1815	25
Corynactis californica	7.4000	8.2120	25
Balanophyllia elegans	10.1000	10.7160	25
Astrangia lajollaensis	1.4000	2.1747	25
Diopatra ornata	0.3000	0.8292	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.1000	0.5000	25
Bryozoans, other	2.2000	3.3323	25
Diaperoecia californica	2.8000	3.4095	25
Tunicates	0.3000	0.8292	25
Miscellaneous invertebrates	8.2000	7.3428	25
Bare substrate	10.1000	8.7939	25
Rock	93.0000	11.8585	25
Cobble	2.4000	3.9843	25
Sand	4.6000	9.0046	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	2.4688	6.7511	96
Chromis punctipinnis	4.7500	6.3189	8
Oxyjulis californica	3.6250	3.8891	8
Sebastes mystinus	16.3750	16.7497	8
Sebastes serranoides	1.2500	2.7646	8
Sebastes atrovirens	0.1250	0.3536	8
Paralabrax clathratus	1.1250	1.3562	8
Semicossyphus pulcher	1.2500	1.6690	8
Embiotoca jacksoni	0.1250	0.3536	8
Embiotoca lateralis	0.0000	0.0000	8
Damalichthys vacca	0.7500	0.8864	8
Hypsypops rubicundus	0.2500	0.4629	8
Girella nigricans	0.0000	0.0000	8

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		2.7500	3.0589	8
	900809	1.7500	2.2174	4
	900912	3.7500	3.7749	4
Chromis punctipinnis juvenile		2.0000	5.2644	8
	900809	0.0000	0.0000	4
	900912	4.0000	7.3485	4
Oxyjulis californica adult		3.6250	3.8891	8
	900809	4.5000	5.7446	4
	900912	2.7500	0.5000	4
Oxyjulis californica juvenile		0.0000	0.0000	8
	900809	0.0000	0.0000	4
	900912	0.0000	0.0000	4
Sebastes mystinus adult		1.0000	1.1952	8
	900809	0.7500	1.5000	4
	900912	1.2500	0.9574	4
Sebastes mystinus juvenile		15.3750	16.6557	8
	900809	5.0000	3.6515	4
	900912	25.7500	18.6257	4
Sebastes serranoides adult		1.1250	2.7999	8
	900809	0.0000	0.0000	4
	900912	2.2500	3.8622	4

Sebastes serranoides juvenile		0.1250	0.3536
8			
	900809	0.2500	0.5000
4			
	900912	0.0000	0.0000
4			
Sebastes atrovirens adult		0.1250	0.3536
8			
	900809	0.0000	0.0000
4			
	900912	0.2500	0.5000
4			
Sebastes atrovirens juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Paralabrax clathratus adult		1.1250	1.3562
8			
	900809	0.2500	0.5000
4			
	900912	2.0000	1.4142
4			

Paralabrax clathratus juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Semicossyphus pulcher male		0.6250	0.9161
8			
	900809	0.5000	1.0000
4			
	900912	0.7500	0.9574
4			
Semicossyphus pulcher female		0.6250	1.0607
8			
	900809	0.0000	0.0000
4			
	900912	1.2500	1.2583
4			
Embiotoca jacksoni adult		0.1250	0.3536
8			
	900809	0.2500	0.5000
4			
	900912	0.0000	0.0000
4			
Embiotoca jacksoni juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Embiotoca lateralis adult		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Embiotoca lateralis juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Damalichthys vacca adult		0.7500	0.8864
8			
	900809	1.2500	0.9574
4			

	900912	0.2500	0.5000
4			
Damalichthys vacca juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Hypsypops rubicundus adult		0.2500	0.4629
8			
	900809	0.0000	0.0000
4			
	900912	0.5000	0.5774
4			
Hypsypops rubicundus juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Girella nigricans adult		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			
Girella nigricans juvenile		0.0000	0.0000
8			
	900809	0.0000	0.0000
4			
	900912	0.0000	0.0000
4			

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH
1990 SIZE FREQUENCY DISTRIBUTIONS

Cypraea spadicea

(cases) N=	26
< 30	0.0
30 - 34	0.0
35 - 39	11.5%
40 - 44	15.4%
45 - 49	50.0%
50 - 54	23.1%
55 - 59	0.0
> 59	0.0
min size (mm)	36
max size (mm)	53
mean	46
mode	45

Kelletia kelletii

(cases) N=	22
< 40	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	9.1%
80 - 89	18.2%
90 - 99	40.9%
100 - 109	22.7%
110 - 119	9.1%
120 - 129	0.0
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	73
max size (mm)	115
mean	93
mode	73

Megathura crenulata

(cases) N=	37
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	2.7%
50 - 59	5.4%
60 - 69	32.4%
70 - 79	37.8%
80 - 89	10.8%
90 - 99	10.8%
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	49
max size (mm)	97
mean	73
mode	69

Patiria miniata

(cases) N=	49
< 10	0.0
10 - 19	0.0
20 - 29	2.0%
30 - 39	16.3%
40 - 49	10.2%
50 - 59	22.4%
60 - 69	16.3%
70 - 79	14.3%
80 - 89	12.2%
90 - 99	4.1%
> 99	2.0%
min size (mm)	27
max size (mm)	107
mean	60
mode	59

Pisaster giganteus

(cases) N=	52
< 20	0.0
20 - 39	0.0
40 - 59	1.9%
60 - 79	7.7%
80 - 99	55.8%
100 - 119	26.9%
120 - 139	0.0
140 - 159	0.0
160 - 179	5.8%
180 - 199	0.0
200 - 219	1.9%
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	45
max size (mm)	212
mean	101
mode	90

Pycnopodia helianthoides

(cases) N=	13
< 20	0.0
20 - 39	0.0
40 - 59	0.0
60 - 79	0.0
80 - 99	0.0
100 - 119	0.0
120 - 139	0.0
140 - 159	0.0
160 - 179	0.0
180 - 199	0.0
200 - 219	30.8%
220 - 239	23.1%
240 - 259	30.8%
260 - 279	0.0
280 - 299	0.0
> 299	7.7%
min size (mm)	200
max size (mm)	310
mean	238
mode	200

Lytechinus anamesus

(cases) N=	154
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	13.0%
20 - 24	66.9%
25 - 29	18.8%
30 - 34	1.3%
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
> 49	0.0
min size (mm)	16
max size (mm)	30
mean	23
mode	22

Parastichopus parvimensis

(cases) N=	72
< 5	0.0
5 - 6	0.0
7 - 8	4.2%
9 - 10	15.3%
11 - 12	36.1%
13 - 14	30.6%
15 - 16	11.1%
17 - 18	2.8%
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	7
max size (cm)	17
mean	12
mode	11

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

Strongylocentrotus purpuratus

(cases) N=	143
< 5	0.0
5 - 9	1.4%
10 - 14	6.3%
15 - 19	35.7%
20 - 24	43.4%
25 - 29	13.3%
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
> 109	0.0
min size (mm)	6
max size (mm)	29
mean	20
mode	19

Strongylocentrotus franciscanus

(cases) N=	102
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	7.8%
20 - 24	10.8%
25 - 29	20.6%
30 - 34	28.4%
35 - 39	17.6%
40 - 44	9.8%
45 - 49	1.0%
50 - 54	1.0%
55 - 59	1.0%
60 - 64	0.0
65 - 69	2.0%
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
> 109	0.0
min size (mm)	15
max size (mm)	67
mean	32
mode	32

Macrocystis pyrifera numbers of stipes.

(cases) N=	99
< 3	25.3%
3 - 5	32.3%
6 - 8	13.1%
9 - 11	11.1%
12 - 14	5.1%
15 - 17	4.0%
18 - 20	3.0%
21 - 23	3.0%
24 - 26	0.0
27 - 29	0.0
30 - 32	2.0%
33 - 35	1.0%
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
>44	0.0
min number	1
max number	34
mean	7
mode	2

Macrocystis pyrifera holdfast diameters.

(cases) N=	99
< 6	12.1%
6 - 11	40.4%
12 - 17	16.2%
18 - 23	15.2%
24 - 29	9.1%
30 - 35	6.1%
36 - 41	1.0%
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)	38
mean	14
mode	8

LOCATION 6 SANTA CRUZ ISLAND - GULL ISLAND SOUTH

Lophogorgia chilensis widths

(cases) N=	50
< 5	2.0%
5 - 8	10.0%
9 - 12	2.0%
13 - 16	6.0%
17 - 20	20.0%
21 - 24	8.0%
25 - 28	4.0%
29 - 32	4.0%
33 - 36	6.0%
37 - 40	8.0%
41 - 44	4.0%
45 - 48	0.0
49 - 52	4.0%
53 - 56	2.0%
57 - 60	8.0%
61 - 64	4.0%
65 - 68	2.0%
69 - 72	2.0%
73 - 76	0.0
77 - 80	2.0%
81 - 84	2.0%
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)	83
mean	33
mode	19

Lophogorgia chilensis heights

(cases) N=	50
< 5	2.0%
5 - 8	0.0
9 - 12	0.0
13 - 16	4.0%
17 - 20	2.0%
21 - 24	4.0%
25 - 28	18.0%
29 - 32	14.0%
33 - 36	8.0%
37 - 40	6.0%
41 - 44	6.0%
45 - 48	12.0%
49 - 52	2.0%
53 - 56	6.0%
57 - 60	6.0%
61 - 64	0.0
65 - 68	0.0
69 - 72	0.0
73 - 76	4.0%
77 - 80	4.0%
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	2.0%
97 - 100	0.0
>100	0.0
min height (cm)	4
max height (cm)	93
mean	40
mode	27

Allopora californica widths

(cases) N=	51
< 3	15.7%
3 - 4	9.8%
5 - 6	11.8%
7 - 8	5.9%
9 - 10	7.8%
11 - 12	7.8%
13 - 14	5.9%
15 - 16	3.9%
17 - 18	3.9%
19 - 20	7.8%
21 - 22	5.9%
23 - 24	7.8%
25 - 26	3.9%
27 - 28	0.0
29 - 30	0.0
>30	2.0%
min width (cm)	1
max width (cm)	37
mean	12
mode	1

Allopora californica heights

(cases) N=	51
< 3	23.5%
3 - 4	23.5%
5 - 6	13.7%
7 - 8	11.8%
9 - 10	7.8%
11 - 12	5.9%
13 - 14	7.8%
15 - 16	3.9%
17 - 18	2.0%
19 - 20	0.0
21 - 22	0.0
23 - 24	0.0
25 - 26	0.0
27 - 28	0.0
29 - 30	0.0
>30	0.0
min height (cm)	1
max height (cm)	18
mean	6
mode	1

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

1990 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	0.3500	0.5155	20
Astraea undosa	0.0500	0.1539	20
Patiria miniata	0.7750	0.8656	20
Pisaster giganteus	0.3250	0.4375	20
Strongylocentrotus franciscanus	1.6250	1.2017	20
Strongylocentrotus purpuratus	9.8250	7.4803	20
Parastichopus parvimensis	2.6250	2.1452	20
Styela monteryensis	0.1250	0.4552	20
Lythrypnus dalli	0.4000	0.7363	20
Coryphopterus nicholsii	1.1750	0.8156	20
Alloclinus holderi	0.4500	0.7052	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0153	0.0194	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0028	0.0065	12
Lophogorgia chilensis	0.0667	0.0527	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	0.0166	12
Megathura crenulata	0.1319	0.0683	12
Hinnites giganteus	0.0236	0.0111	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	2.2167	2.6785	12

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	2.8000	3.1721	25
Miscellaneous brown algae	0.1000	0.5000	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	0.0000	0.0000	25
Miscellaneous red algae	8.6000	7.3272	25
Articulated coralline algae	0.2000	0.6922	25
Crustose coralline algae	23.0000	15.2069	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.2000	2.5125	25
Sponges	0.6000	1.3070	25
Corynactis californica	3.0000	4.3899	25
Balanophyllia elegans	0.7000	1.8428	25
Astrangia lajollaensis	30.4000	12.1980	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	1.0000	2.1651	25
Bryozoans, other	4.7000	4.2279	25
Diaperoecia californica	6.2000	5.0580	25
Pachythyone rubra	11.6000	19.7099	25
Tunicates	0.6000	1.3070	25
Miscellaneous invertebrates	15.7000	8.6759	25
Bare substrate	7.9000	8.8294	25
Rock	82.9000	17.7758	25
Cobble	14.7000	14.0557	25
Sand	2.4000	5.4715	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	17.3056	47.9850	144
Chromis punctipinnis	157.2500	74.5095	12
Oxyjulis californica	3.4167	4.7950	12
Sebastes mystinus	25.7500	17.1789	12
Sebastes serranoides	0.3333	0.6513	12
Sebastes atrovirens	2.0000	1.2792	12
Paralabrax clathratus	8.7500	10.9555	12
Semicossyphus pulcher	6.2500	3.4674	12
Embiotoca jacksoni	1.6667	1.0731	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.9167	0.6686	12
Hypsypops rubicundus	1.0833	0.7930	12
Girella nigricans	0.2500	0.4523	12

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		89.9167	56.3148	12
	900711	93.2500	90.7722	4
	900726	88.2500	37.9840	8
Chromis punctipinnis juvenile		67.3333	43.1874	12
	900711	53.0000	29.6536	4
	900726	74.5000	48.7647	8
Oxyjulis californica adult		3.4167	4.7950	12
	900711	7.0000	7.0711	4
	900726	1.6250	1.9226	8
Oxyjulis californica juvenile		0.0000	0.0000	12
	900711	0.0000	0.0000	4
	900726	0.0000	0.0000	8
Sebastes mystinus adult		0.0000	0.0000	12
	900711	0.0000	0.0000	4
	900726	0.0000	0.0000	8
Sebastes mystinus juvenile		25.7500	17.1789	12
	900711	29.0000	17.0685	4
	900726	24.1250	18.1615	8
Sebastes serranoides adult		0.3333	0.6513	12
	900711	0.7500	0.9574	4
	900726	0.1250	0.3536	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Sebastes atrovirens adult		1.8333	1.2673
12			
	900711	1.7500	1.7078
4			
	900726	1.8750	1.1260
8			
Sebastes atrovirens juvenile		0.1667	0.5774
12			
	900711	0.0000	0.0000
4			
	900726	0.2500	0.7071
8			
Paralabrax clathratus adult		8.6667	10.8739
12			
	900711	0.7500	1.5000
4			
	900726	12.6250	11.4510
8			

Paralabrax clathratus juvenile		0.0833	0.2887
12			
	900711	0.0000	0.0000
4			
	900726	0.1250	0.3536
8			
Semicossyphus pulcher male		0.0833	0.2887
12			
	900711	0.2500	0.5000
4			
	900726	0.0000	0.0000
8			
Semicossyphus pulcher female		6.1667	3.2706
12			
	900711	8.2500	3.4034
4			
	900726	5.1250	2.8504
8			
Embiotoca jacksoni adult		1.6667	1.0731
12			
	900711	2.0000	0.8165
4			
	900726	1.5000	1.1952
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Damalichthys vacca adult		0.9167	0.6686
12			
	900711	0.7500	0.5000
4			

	900726	1.0000	0.7559
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Hypsypops rubicundus adult		1.0833	0.7930
12			
	900711	1.5000	0.5774
4			
	900726	0.8750	0.8345
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Girella nigricans adult		0.2500	0.4523
12			
	900711	0.0000	0.0000
4			
	900726	0.3750	0.5175
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900711	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR
1990 SIZE FREQUENCY DISTRIBUTIONS

Tethya aurantia

(cases) N=	13
< 10	0.0
10 - 19	7.7%
20 - 29	15.4%
30 - 39	53.8%
40 - 49	23.1%
50 - 59	0.0
60 - 69	0.0
70 - 79	0.0
80 - 89	0.0
90 - 99	0.0
> 99	0.0
min size (mm)	19
max size (mm)	45
mean	35
mode	32

Cypraea spadicea

(cases) N=	30
< 30	0.0
30 - 34	3.3%
35 - 39	13.3%
40 - 44	36.7%
45 - 49	40.0%
50 - 54	3.3%
55 - 59	3.3%
> 59	0.0
min size (mm)	34
max size (mm)	59
mean	44
mode	45

Megathura crenulata

(cases) N=	30
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	3.3%
60 - 69	23.3%
70 - 79	56.7%
80 - 89	16.7%
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	57
max size (mm)	84
mean	72
mode	74

Hinnites giganteus

(cases) N=	58
< 10	0.0
10 - 19	0.0
20 - 29	5.2%
30 - 39	25.9%
40 - 49	20.7%
50 - 59	20.7%
60 - 69	5.2%
70 - 79	12.1%
80 - 89	5.2%
90 - 99	3.4%
100 - 109	1.7%
110 - 119	0.0
120 - 129	0.0
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	29
max size (mm)	101
mean	52
mode	30

Patiria miniata

(cases) N=	90
< 10	0.0
10 - 19	0.0
20 - 29	2.2%
30 - 39	10.0%
40 - 49	14.4%
50 - 59	23.3%
60 - 69	34.4%
70 - 79	13.3%
80 - 89	2.2%
90 - 99	0.0
> 99	0.0
min size (mm)	20
max size (mm)	83
mean	57
mode	67

LOCATION 7 SANTA CRUZ ISLAND - FRY'S HARBOR

Pisaster giganteus

(cases) N=	76
< 20	0.0
20 - 39	0.0
40 - 59	0.0
60 - 79	1.3%
80 - 99	11.8%
100 - 119	34.2%
120 - 139	19.7%
140 - 159	19.7%
160 - 179	9.2%
180 - 199	1.3%
200 - 219	2.6%
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	69
max size (mm)	208
mean	128
mode	110

Lytechinus anamesus

(cases) N=	113
< 5	0.0
5 - 9	0.0
10 - 14	3.5%
15 - 19	39.8%
20 - 24	49.6%
25 - 29	6.2%
30 - 34	0.9%
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
> 49	0.0
min size (mm)	13
max size (mm)	32
mean	20
mode	20

Strongylocentrotus franciscanus

(cases) N=	105
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.0
20 - 24	4.8%
25 - 29	1.0%
30 - 34	1.9%
35 - 39	8.6%
40 - 44	2.9%
45 - 49	4.8%
50 - 54	8.6%
55 - 59	4.8%
60 - 64	6.7%
65 - 69	7.6%
70 - 74	13.3%
75 - 79	8.6%
80 - 84	6.7%
85 - 90	8.6%
90 - 94	5.7%
95 - 99	2.9%
100 - 104	1.9%
105 - 109	1.0%
> 109	0.0
min size (mm)	20
max size (mm)	107
mean	65
mode	81

Strongylocentrotus purpuratus

(cases) N=	118
< 5	0.0
5 - 9	0.8%
10 - 14	2.5%
15 - 19	10.2%
20 - 24	33.9%
25 - 29	33.1%
30 - 34	18.6%
35 - 39	0.8%
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
> 109	0.0
min size (mm)	8
max size (mm)	39
mean	25
mode	22

Parastichopus parvimensis

(cases) N=	30
< 5	0.0
5 - 6	0.0
7 - 8	3.3%
9 - 10	20.0%
11 - 12	36.7%
13 - 14	33.3%
15 - 16	6.7%
17 - 18	0.0
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	8
max size (cm)	15
mean	12
mode	12

Lophogorgia chilensis widths.

(cases) N=	63
< 5	0.0
5 - 8	4.8%
9 - 12	11.1%
13 - 16	17.5%
17 - 20	15.9%
21 - 24	11.1%
25 - 28	7.9%
29 - 32	7.9%
33 - 36	1.6%
37 - 40	0.0
41 - 44	3.2%
45 - 48	1.6%
49 - 52	1.6%
53 - 56	0.0
57 - 60	6.3%
61 - 64	0.0
65 - 68	3.2%
69 - 72	0.0
73 - 76	3.2%
77 - 80	1.6%
81 - 84	0.0
85 - 88	0.0
89 - 92	0.0
93 - 96	0.0
97 - 100	0.0
> 100	1.6%
min width (cm)	6
max width (cm)	117
mean	29
mode	13

Lophogorgia chilensis heights.

(cases) N=	63
< 5	0.0
5 - 8	0.0
9 - 12	4.8%
13 - 16	17.5%
17 - 20	20.6%
21 - 24	14.3%
25 - 28	9.5%
29 - 32	4.8%
33 - 36	1.6%
37 - 40	4.8%
41 - 44	1.6%
45 - 48	1.6%
49 - 52	3.2%
53 - 56	3.2%
57 - 60	3.2%
61 - 64	6.3%
65 - 68	1.6%
69 - 72	1.6%
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)	9
max height (cm)	71
mean	29
mode	19

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY

1990 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	0.1500	0.5643	20
Astraea undosa	1.4750	1.3905	20
Patiria miniata	0.1500	0.2856	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	2.7250	1.1639	20
Strongylocentrotus purpuratus	9.9750	8.7951	20
Parastichopus parvimensis	1.9000	0.8522	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.1250	0.3932	20
Coryphopterus nicholsii	5.0750	1.2061	20
Alloclinus holderi	0.2000	0.7847	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0056	0.0082	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.0708	0.0782	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	0.0014	0.0048	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0208	0.0215	12
Megathura crenulata	0.0111	0.0192	12
Hinnites giganteus	0.1000	0.0937	12
Aplysia californica	0.0042	0.0075	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0069	0.0150	12

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	14.5000	9.6825	25
Miscellaneous brown algae	2.2000	3.9739	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	0.0000	0.0000	25
Miscellaneous red algae	2.4000	3.9184	25
Articulated coralline algae	0.9000	1.4216	25
Crustose coralline algae	18.3000	12.3474	25
Gelidium spp.	0.2000	0.6922	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	2.0000	3.0619	25
Sponges	0.1000	0.5000	25
Corynactis californica	1.8000	2.3408	25
Balanophyllia elegans	0.4000	0.9354	25
Astrangia lajollaensis	16.1000	8.8412	25
Diopatra ornata	0.3000	1.0992	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	1.1000	1.6266	25
Bryozoans, other	2.5000	2.9756	25
Diaperoecia californica	1.3000	1.9257	25
Tunicates	0.8000	1.3919	25
Miscellaneous invertebrates	30.9000	9.8921	25
Bare substrate	18.6000	13.8459	25
Rock	63.8000	17.6352	25
Cobble	14.9000	12.8184	25
Sand	21.2000	16.8498	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	3.6944	11.1927	144
Chromis punctipinnis	27.3333	29.7973	12
Oxyjulis californica	0.0833	0.2887	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0833	0.2887	12
Paralabrax clathratus	5.1667	2.2896	12
Semicossyphus pulcher	2.5000	0.9045	12
Embiotoca jacksoni	5.7500	2.8324	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	1.3333	3.0847	12
Hypsypops rubicundus	2.0833	1.3790	12
Girella nigricans	0.0000	0.0000	12

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		4.8333	6.5759	12
	900712	0.5000	0.5774	4
	900726	7.0000	7.1913	8
Chromis punctipinnis juvenile		22.5000	30.6609	12
	900712	47.5000	41.4447	4
	900726	10.0000	14.3328	8
Oxyjulis californica adult		0.0833	0.2887	12
	900712	0.0000	0.0000	4
	900726	0.1250	0.3536	8
Oxyjulis californica juvenile		0.0000	0.0000	12
	900712	0.0000	0.0000	4
	900726	0.0000	0.0000	8
Sebastes mystinus adult		0.0000	0.0000	12
	900712	0.0000	0.0000	4
	900726	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	900712	0.0000	0.0000	4
	900726	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	900712	0.0000	0.0000	4
	900726	0.0000	0.0000	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Sebastes atrovirens adult		0.0833	0.2887
12			
	900712	0.0000	0.0000
4			
	900726	0.1250	0.3536
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Paralabrax clathratus adult		5.1667	2.2896
12			
	900712	3.5000	1.2910
4			
	900726	6.0000	2.2678
8			

Paralabrax clathratus juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Semicossyphus pulcher male		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Semicossyphus pulcher female		2.5000	0.9045
12			
	900712	2.7500	0.9574
4			
	900726	2.3750	0.9161
8			
Embiotoca jacksoni adult		5.7500	2.8324
12			
	900712	4.7500	0.9574
4			
	900726	6.2500	3.3700
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Damalichthys vacca adult		1.3333	3.0847
12			
	900712	0.7500	0.5000
4			

	900726	1.6250	3.8149
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Hypsypops rubicundus adult		2.0833	1.3790
12			
	900712	2.7500	1.8930
4			
	900726	1.7500	1.0351
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Girella nigricans adult		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900712	0.0000	0.0000
4			
	900726	0.0000	0.0000
8			

LOCATION 8 SANTA CRUZ ISLAND - PELICAN BAY
1990 SIZE FREQUENCY DISTRIBUTIONS

Haliotis corrugata

(cases) N=	2
< 25	50.0%
25 - 29	0.0
30 - 34	50.0%
35 - 39	0.0
>40	0.0
min size (mm)	20
max size (mm)	33
mean	27
mode	20

Cypraea spadicea

(cases) N=	39
< 30	0.0
30 - 34	2.6%
35 - 39	12.8%
40 - 44	41.0%
45 - 49	35.9%
50 - 54	7.7%
55 - 59	0.0
> 59	0.0
min size (mm)	32
max size (mm)	52
mean	43
mode	40

Astraea undosa

(cases) N=	62
< 10	0.0
10 - 19	0.0
20 - 29	1.6%
30 - 39	0.0
40 - 49	0.0
50 - 59	35.5%
60 - 69	58.1%
70 - 79	4.8%
80 - 89	0.0
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	20
max size (mm)	78
mean	61
mode	62

Megathura crenulata

(cases) N=	23
< 10	0.0
10 - 19	8.7%
20 - 29	8.7%
30 - 39	0.0
40 - 49	8.7%
50 - 59	0.0
60 - 69	8.7%
70 - 79	34.8%
80 - 89	21.7%
90 - 99	4.3%
100 - 109	4.3%
110 - 119	0.0
> 119	0.0
min size (mm)	15
max size (mm)	100
mean	66
mode	72

Hinnites giganteus

(cases) N=	53
< 10	0.0
10 - 19	0.0
20 - 29	7.5%
30 - 39	7.5%
40 - 49	17.0%
50 - 59	20.8%
60 - 69	18.9%
70 - 79	15.1%
80 - 89	3.8%
90 - 99	3.8%
100 - 109	0.0
110 - 119	1.9%
120 - 129	0.0
130 - 139	3.8%
140 - 149	0.0
> 149	0.0
min size (mm)	25
max size (mm)	134
mean	61
mode	43

Patiria miniata

(cases) N=	54
< 10	0.0
10 - 19	11.1%
20 - 29	9.3%
30 - 39	0.0
40 - 49	7.4%
50 - 59	11.1%
60 - 69	40.7%
70 - 79	14.8%
80 - 89	5.6%
90 - 99	0.0
> 99	0.0
min size (mm)	11
max size (mm)	88
mean	56
mode	67

Pisaster giganteus

(cases) N=	44
< 20	0.0
20 - 39	2.3%
40 - 59	2.3%
60 - 79	0.0
80 - 99	0.0
100 - 119	0.0
120 - 139	11.4%
140 - 159	18.2%
160 - 179	11.4%
180 - 199	20.5%
200 - 219	18.2%
220 - 239	9.1%
240 - 259	2.3%
260 - 279	4.5%
280 - 299	0.0
> 299	0.0
min size (mm)	28
max size (mm)	275
mean	177
mode	180

Strongylocentrotus franciscanus

(cases) N=	102
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	6.9%
20 - 24	7.8%
25 - 29	21.6%
30 - 34	13.7%
35 - 39	20.6%
40 - 44	14.7%
45 - 49	4.9%
50 - 54	2.9%
55 - 59	2.0%
60 - 64	2.0%
65 - 69	2.0%
70 - 74	0.0
75 - 79	0.0
80 - 84	0.0
85 - 90	1.0%
90 - 94	0.0
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
> 109	0.0
min size (mm)	18
max size (mm)	88
mean	35
mode	28

Strongylocentrotus purpuratus

(cases) N=	126
< 5	0.0
5 - 9	0.0
10 - 14	0.8%
15 - 19	2.4%
20 - 24	23.8%
25 - 29	39.7%
30 - 34	19.8%
35 - 39	10.3%
40 - 44	3.2%
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
> 109	0.0
min size (mm)	14
max size (mm)	43
mean	28
mode	24

Parastichopus parvimensis

(cases) N=	30
< 5	0.0
5 - 6	0.0
7 - 8	6.7%
9 - 10	30.0%
11 - 12	53.3%
13 - 14	6.7%
15 - 16	3.3%
17 - 18	0.0
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	8
max size (cm)	15
mean	11
mode	12

Lophogorgia chilensis widths

(cases) N=	30
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	6.7%
17 - 20	16.7%
21 - 24	10.0%
25 - 28	13.3%
29 - 32	6.7%
33 - 36	23.3%
37 - 40	10.0%
41 - 44	3.3%
45 - 48	10.0%
49 - 52	0.0
53 - 56	0.0
>57	0.0
min width (cm)	13
max width (cm)	48
mean	30
mode	18

Lophogorgia chilensis heights

(cases) N=	30
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	0.0
17 - 20	0.0
21 - 24	6.7%
25 - 28	6.7%
29 - 32	13.3%
33 - 36	40.0%
37 - 40	13.3%
41 - 44	10.0%
45 - 48	3.3%
49 - 52	6.7%
53 - 56	0.0
>57	0.0
min height (cm)	21
max height (cm)	50
mean	35
mode	36

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

1990 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	1.5500	1.2763	20
Patiria miniata	0.0250	0.1118	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	1.3500	1.1596	20
Strongylocentrotus purpuratus	52.6250	17.8987	20
Parastichopus parvimensis	0.4750	0.3796	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.6250	0.5098	20
Alloclinus holderi	0.0000	0.0000	20

1990 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	0.0000	0.0000	12
Muricea fruticosa	0.0000	0.0000	12
Muricea californica	0.0000	0.0000	12
Panulirus interruptus	0.0014	0.0048	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	0.0625	0.0356	12
Hinnites giganteus	0.0056	0.0109	12
Aplysia californica	0.0028	0.0065	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0333	0.0807	12

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	2.3000	5.6329	25
Miscellaneous brown algae	0.0000	0.0000	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	0.0000	0.0000	25
Miscellaneous red algae	1.6000	2.1506	25
Articulated coralline algae	2.1000	2.3585	25
Crustose coralline algae	37.0000	11.7704	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.3000	1.0992	25
Sponges	0.0000	0.0000	25
Corynactis californica	0.0000	0.0000	25
Balanophyllia elegans	0.3000	0.8292	25
Astrangia lajollaensis	2.1000	2.2454	25
Diopatra ornata	0.2000	0.6922	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	6.4000	4.8455	25
Bryozoans, other	0.0000	0.0000	25
Diaperoecia californica	0.1000	0.5000	25
Tunicates	0.0000	0.0000	25
Miscellaneous invertebrates	9.6000	8.8588	25
Bare substrate	38.4000	13.2461	25
Rock	83.9000	11.3670	25
Cobble	6.6000	4.8348	25
Sand	9.5000	11.5470	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	16.2917	69.0044	144
Chromis punctipinnis	174.5000	178.4685	12
Oxyjulis californica	12.0833	10.2908	12
Sebastes mystinus	0.1667	0.5774	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0000	0.0000	12
Paralabrax clathratus	3.5833	2.6097	12
Semicossyphus pulcher	0.1667	0.3892	12
Embiotoca jacksoni	0.7500	0.8660	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.5000	0.5222	12
Hypsypops rubicundus	0.7500	0.8660	12
Girella nigricans	3.0000	2.5226	12

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

Species	Date (year/month/date)	Mean	Std Dev	Cases
Chromis punctipinnis	adult	10.9167	9.2683	12
	900725	7.0000	8.0416	4
	901025	12.8750	9.7018	8
Chromis punctipinnis	juvenile	163.5833	173.5393	12
	900725	2.0000	4.0000	4
	901025	244.3750	157.9204	8
Oxyjulis californica	adult	3.2500	2.3404	12
	900725	1.0000	0.8165	4
	901025	4.3750	1.9955	8
Oxyjulis californica	juvenile	8.8333	8.9120	12
	900725	0.0000	0.0000	4
	901025	13.2500	7.6111	8
Sebastes mystinus	adult	0.0000	0.0000	12
	900725	0.0000	0.0000	4
	901025	0.0000	0.0000	8
Sebastes mystinus	juvenile	0.1667	0.5774	12
	900725	0.5000	1.0000	4
	901025	0.0000	0.0000	8
Sebastes serranoides	adult	0.0000	0.0000	12
	900725	0.0000	0.0000	4
	901025	0.0000	0.0000	8
Sebastes serranoides	juvenile	0.0000	0.0000	

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE

12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Sebastes atrovirens adult		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Paralabrax clathratus adult		2.6667	1.9695
12			
	900725	0.7500	0.9574
4			
	901025	3.6250	1.5980
8			

Paralabrax clathratus juvenile		0.9167	0.9962
12			
	900725	0.0000	0.0000
4			
	901025	1.3750	0.9161
8			
Semicossyphus pulcher male		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Semicossyphus pulcher female		0.1667	0.3892
12			
	900725	0.2500	0.5000
4			
	901025	0.1250	0.3536
8			
Embiotoca jacksoni adult		0.7500	0.8660
12			
	900725	0.2500	0.5000
4			
	901025	1.0000	0.9258
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Damalichthys vacca adult		0.5000	0.5222
12			
	900725	0.5000	0.5774
4			

	901025	0.5000	0.5345
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Hypsypops rubicundus adult		0.7500	0.8660
12			
	900725	0.2500	0.5000
4			
	901025	1.0000	0.9258
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900725	0.0000	0.0000
4			
	901025	0.0000	0.0000
8			
Girella nigricans adult		1.2500	1.5448
12			
	900725	0.2500	0.5000
4			
	901025	1.7500	1.6690
8			
Girella nigricans juvenile		1.7500	1.8153
12			
	900725	0.0000	0.0000
4			
	901025	2.6250	1.5980
8			

LOCATION 9 SANTA CRUZ ISLAND - SCORPION ANCHORAGE
1990 SIZE FREQUENCY DISTRIBUTIONS

Cypraea spadicea

(cases) N=	32
< 30	0.0
30 - 34	6.3%
35 - 39	18.8%
40 - 44	31.3%
45 - 49	25.0%
50 - 54	18.8%
55 - 59	0.0
> 59	0.0
min size (mm)	32
max size (mm)	53
mean	44
mode	44

Astraea undosa

(cases) N=	54
< 10	0.0
10 - 19	1.9%
20 - 29	0.0
30 - 39	5.6%
40 - 49	7.4%
50 - 59	27.8%
60 - 69	53.7%
70 - 79	3.7%
80 - 89	0.0
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	12
max size (mm)	75
mean	57
mode	60

Patiria miniata

(cases) N=	47
< 10	0.0
10 - 19	4.3%
20 - 29	4.3%
30 - 39	2.1%
40 - 49	19.1%
50 - 59	27.7%
60 - 69	23.4%
70 - 79	8.5%
80 - 89	8.5%
90 - 99	2.1%
> 99	0.0
min size (mm)	13
max size (mm)	92
mean	57
mode	53

Megathura crenulata

(cases) N=	22
< 10	0.0
10 - 19	9.1%
20 - 29	4.5%
30 - 39	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	18.2%
80 - 89	50.0%
90 - 99	13.6%
100 - 109	4.5%
> 109	0.0
min size (mm)	17
max size (mm)	101
mean	75
mode	81

Hinnites giganteus

(cases) N=	18
< 20	0.0
20 - 29	5.6%
30 - 39	16.7%
40 - 49	11.1%
50 - 59	22.2%
60 - 69	11.1%
70 - 79	5.6%
80 - 89	11.1%
90 - 99	0.0
100 - 109	0.0
110 - 119	11.1%
120 - 129	0.0
130 - 139	0.0
140 - 149	5.6%
> 149	0.0
min size (mm)	27
max size (mm)	140
mean	65
mode	27

Parastichopus parvimensis

(cases) N=	31
< 9	0.0
9 - 10	16.1%
11 - 12	35.5%
13 - 14	32.3%
15 - 16	16.1%
> 16	0.0
min size (cm)	9
max size (cm)	16
mean	12
mode	11

Pisaster giganteus

(cases) N=	12
< 20	0.0
20 - 39	0.0
40 - 59	0.0
60 - 79	0.0
80 - 99	0.0

100 - 119	0.0
120 - 139	8.3%
140 - 159	25.0%
160 - 179	25.0%
180 - 199	8.3%
200 - 219	8.3%
220 - 239	16.7%
240 - 259	8.3%
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	129
max size (mm)	240
mean	180
mode	220

Strongylocentrotus franciscanus

(cases) N=	109
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.9%
20 - 24	6.4%
25 - 29	13.8%
30 - 34	42.2%
35 - 39	18.3%
40 - 44	10.1%
45 - 49	0.9%
50 - 54	1.8%
55 - 59	1.8%
60 - 64	0.0
65 - 69	1.8%
70 - 74	0.0
75 - 79	0.9%
80 - 84	0.9%
85 - 90	0.0
90 - 94	0.0
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
> 109	0.0
min size (mm)	18
max size (mm)	81
mean	35
mode	32

Lytechinus anamesus

(cases) N=	117
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	9.4%
20 - 24	57.3%
25 - 29	31.6%
30 - 34	1.7%
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
> 49	0.0
min size (mm)	15
max size (mm)	30
mean	23
mode	21

Strongylocentrotus purpuratus

(cases) N=	124
< 5	0.0
5 - 9	2.4%
10 - 14	2.4%
15 - 19	10.5%
20 - 24	13.7%
25 - 29	62.1%
30 - 34	4.0%
35 - 39	4.0%
40 - 44	0.0
45 - 49	0.8%
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
> 109	0.0
min size (mm)	5
max size (mm)	46
mean	25
mode	27

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.2750	0.3432	20
Eisenia arborea	0.1000	0.2052	20
Pterygophora californica	0.6000	0.7539	20
Laminaria farlowii	0.6000	1.0336	20
Macrocystis pyrifera juvenile	0.3250	0.4375	20
Macrocystis pyrifera all	0.6000	0.5982	20
Cypraea spadicea	0.500	0.1539	20
Astraea undosa	0.7000	0.6959	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.1000	0.2052	20
Lytechinus anamesus	19.9250	45.1691	20
Strongylocentrotus franciscanus	0.3750	0.8252	20
Strongylocentrotus purpuratus	9.8500	9.3444	20
Parastichopus parvimensis	0.4750	0.7340	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.7500	0.7522	20
Alloclinus holderi	0.1750	0.4064	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0083	0.0112	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0028	0.0096	12
Lophogorgia chilensis	0.1167	0.0628	12
Muricea fruticosa	0.0139	0.0172	12
Muricea californica	0.0069	0.0111	12
Panulirus interruptus	0.0042	0.0104	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0069	0.0132	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0528	0.0502	12
Megathura crenulata	0.0306	0.0199	12
Hinnites giganteus	0.0042	0.0104	12
Aplysia californica	0.0000	0.0000	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.1000	0.5000	25
Miscellaneous brown algae	11.9000	19.1115	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	8.4000	9.0393	25
Cystoseira spp.	29.3000	15.8857	25
Macrocystis, Eisenia, Pterygophora	36.1000	24.7075	25
Miscellaneous red algae	2.9000	5.1881	25
Articulated coralline algae	18.1000	8.3317	25
Crustose coralline algae	54.1000	15.4090	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.2000	2.7119	25
Sponges	0.8000	1.3919	25
Corynactis californica	0.7000	1.8428	25
Balanophyllia elegans	0.3000	0.8292	25
Astrangia lajollaensis	2.5000	2.6021	25
Diopatra ornata	0.2000	0.6922	25
Phragmatopoma californica	0.1000	0.5000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans, other	13.5000	9.2983	25
Diaperoecia californica	4.6000	6.4420	25
Tunicates	0.3000	0.8292	25
Miscellaneous invertebrates	8.5000	7.5691	25
Bare substrate	16.4000	12.5225	25
Rock	76.1000	24.4106	25
Cobble	15.8000	18.1533	25
Sand	8.1000	13.3127	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	13.3125	60.5449	96
Chromis punctipinnis	151.0000	161.4338	8
Oxyjulis californica	4.6250	4.8972	8
Sebastes mystinus	0.0000	0.0000	8
Sebastes serranoides	0.0000	0.0000	8
Sebastes atrovirens	0.1250	0.3536	8
Paralabrax clathratus	1.5000	1.1952	8
Semicossyphus pulcher	1.6250	1.5980	8
Embiotoca jacksoni	0.6250	1.0607	8
Embiotoca lateralis	0.1250	0.3536	8
Damalichthys vacca	0.1250	0.3536	8
Hypsypops rubicundus	0.0000	0.0000	8
Girella nigricans	0.0000	0.0000	8

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		1.0000	1.9272	8
	900810	0.0000	0.0000	4
	900910	2.0000	2.4495	4
Chromis punctipinnis juvenile		150.0000	160.3567	8
	900810	0.0000	0.0000	4
	900910	300.0000	0.0000	4
Oxyjulis californica adult		4.6250	4.8972	8
	900810	4.5000	5.4467	4
	900910	4.7500	5.1235	4
Oxyjulis californica juvenile		0.0000	0.0000	8
	900810	0.0000	0.0000	4
	900910	0.0000	0.0000	4
Sebastes mystinus adult		0.0000	0.0000	8
	900810	0.0000	0.0000	4
	900910	0.0000	0.0000	4
Sebastes mystinus juvenile		0.0000	0.0000	8
	900810	0.0000	0.0000	4
	900910	0.0000	0.0000	4
Sebastes serranoides adult		0.0000	0.0000	8
	900810	0.0000	0.0000	4
	900910	0.0000	0.0000	4

Sebastes serranoides juvenile		0.0000	0.0000
8			
	900810	0.0000	0.0000
4			
	900910	0.0000	0.0000
4			
Sebastes atrovirens adult		0.1250	0.3536
8			
	900810	0.2500	0.5000
4			
	900910	0.0000	0.0000
4			
Sebastes atrovirens juvenile		0.0000	0.0000
8			
	900810	0.0000	0.0000
4			
	900910	0.0000	0.0000
4			
Paralabrax clathratus adult		1.5000	1.1952
8			
	900810	2.2500	0.9574
4			
	900910	0.7500	0.9574
4			

Paralabrax clathratus juvenile		0.0000	0.0000
8			
	900810	0.0000	0.0000
4			
	900910	0.0000	0.0000
4			
Semicossyphus pulcher male		0.0000	0.0000
8			
	900810	0.0000	0.0000
4			
	900910	0.0000	0.0000
4			
Semicossyphus pulcher female		1.6250	1.5980
8			
	900810	3.0000	0.8165
4			
	900910	0.2500	0.5000
4			
Embiotoca jacksoni adult		0.6250	1.0607
8			
	900810	1.0000	1.4142
4			
	900910	0.2500	0.5000
4			
Embiotoca jacksoni juvenile		0.0000	0.0000
8			
	900810	0.0000	0.0000
4			
	900910	0.0000	0.0000
4			
Embiotoca lateralis adult		0.1250	0.3536
8			
	900810	0.2500	0.5000
4			
	900910	0.0000	0.0000
4			
Embiotoca lateralis juvenile		0.0000	0.0000
8			
	900810	0.0000	0.0000
4			
	900910	0.0000	0.0000
4			
Damalichthys vacca adult		0.1250	0.3536
8			
	900810	0.2500	0.5000
4			

900910	0.0000	0.0000
4		
Damalichthys vacca juvenile	0.0000	0.0000
8		
900810	0.0000	0.0000
4		
900910	0.0000	0.0000
4		
Hypsypops rubicundus adult	0.0000	0.0000
8		
900810	0.0000	0.0000
4		
900910	0.0000	0.0000
4		
Hypsypops rubicundus juvenile	0.0000	0.0000
8		
900810	0.0000	0.0000
4		
900910	0.0000	0.0000
4		
Girella nigricans adult	0.0000	0.0000
8		
900810	0.0000	0.0000
4		
900910	0.0000	0.0000
4		
Girella nigricans juvenile	0.0000	0.0000
8		
900810	0.0000	0.0000
4		
900910	0.0000	0.0000
4		

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS
1990 SIZE FREQUENCY DISTRIBUTIONS

Cypraea spadicea

(cases) N=	15
< 30	13.3%
30 - 34	26.7%
35 - 39	20.0%
40 - 44	20.0%
45 - 49	13.3%
50 - 54	6.7%
55 - 59	0.0
> 59	0.0
min size (mm)	25
max size (mm)	51
mean	38
mode	34

Kelletia kelletii

(cases) N=	49
< 40	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	6.1%
80 - 89	20.4%
90 - 99	34.7%
100 - 109	30.6%
110 - 119	8.2%
120 - 129	0.0
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	77
max size (mm)	115
mean	96
mode	93

Patiria miniata

(cases) N=	29
< 10	0.0
10 - 19	0.0
20 - 29	3.4%
30 - 39	6.9%
40 - 49	6.9%
50 - 59	10.3%
60 - 69	24.1%
70 - 79	31.0%
80 - 89	13.8%
90 - 99	3.4%
> 99	0.0
min size (mm)	22
max size (mm)	94
mean	66
mode	73

Astraea undosa

(cases) N=	55
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	3.6%
50 - 59	0.0
60 - 69	3.6%
70 - 79	7.3%
80 - 89	34.5%
90 - 99	21.8%
100 - 109	20.0%
110 - 119	3.6%
> 119	3.6%
min size (mm)	43
max size (mm)	134
mean	92
mode	87

Megathura crenulata

(cases) N=	36
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	8.3%
80 - 89	41.7%
90 - 99	30.6%
100 - 109	11.1%
110 - 119	8.3%
> 119	0.0
min size (mm)	73
max size (mm)	112
mean	91
mode	90

Parastichopus parvimensis

(cases) N=	43
< 5	0.0
5 - 6	0.0
7 - 8	34.9%
9 - 10	44.2%
11 - 12	14.0%
13 - 14	7.0%
> 14	0.0
min size (cm)	7
max size (cm)	14
mean	9
mode	9

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

Pisaster giganteus

(cases) N=	27
< 20	0.0
20 - 39	0.0
40 - 59	14.8%
60 - 79	66.7%
80 - 99	3.7%
100 - 119	0.0
120 - 139	3.7%
140 - 159	3.7%
160 - 179	0.0
180 - 199	0.0
200 - 219	3.7%
220 - 239	3.7%
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	54
max size (mm)	239
mean	84
mode	72

Lytechinus anamesus

(cases) N=	148
< 5	0.0
5 - 9	2.7%
10 - 14	10.1%
15 - 19	23.0%
20 - 24	47.3%
25 - 29	13.5%
30 - 34	3.4%
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
> 49	0.0
min size (mm)	7
max size (mm)	32
mean	20
mode	21

Strongylocentrotus franciscanus

(cases) N=	55
< 5	0.0
5 - 9	1.8%
10 - 14	0.0
15 - 19	1.8%
20 - 24	5.5%
25 - 29	3.6%
30 - 34	14.5%
35 - 39	10.9%
40 - 44	3.6%
45 - 49	18.2%
50 - 54	10.9%
55 - 59	1.8%
60 - 64	9.1%
65 - 69	5.5%
70 - 74	1.8%
75 - 79	3.6%
80 - 84	1.8%
85 - 90	1.8%
90 - 94	3.6%
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
> 109	0.0
min size (mm)	8
max size (mm)	94
mean	48
mode	38

Strongylocentrotus purpuratus

(cases) N=	118
< 5	0.0
5 - 9	5.1%
10 - 14	5.1%
15 - 19	8.5%
20 - 24	14.4%
25 - 29	7.6%
30 - 34	17.8%
35 - 39	9.3%
40 - 44	12.7%
45 - 49	3.4%
50 - 54	10.2%
55 - 59	5.1%
60 - 64	0.8%
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
> 109	0.0
min size (mm)	5
max size (mm)	60
mean	32
mode	31

LOCATION 10 SANTA CRUZ ISLAND - YELLOWBANKS

Macrocystis pyrifera numbers of stipes.

(cases) N=	101
< 3	8.9%
3 - 5	2.0%
6 - 8	2.0%
9 - 11	8.9%
12 - 14	11.9%
15 - 17	14.9%
18 - 20	14.9%
21 - 23	9.9%
24 - 26	7.9%
27 - 29	6.9%
30 - 32	0.0
33 - 35	5.9%
36 - 38	2.0%
39 - 41	2.0%
42 - 44	1.0%
>44	1.0%
min number	2
max number	49
mean	19
mode	2

Macrocystis pyrifera holdfast diameters.

(cases) N=	101
< 6	7.9%
6 - 11	5.9%
12 - 17	10.9%
18 - 23	15.8%
24 - 29	14.9%
30 - 35	17.8%
36 - 41	15.8%
42 - 47	5.0%
48 - 53	5.0%
54 - 59	1.0%
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)	56
mean	27
mode	4

Lophogorgia chilensis heights

(cases) N=	48
< 5	0.0
5 - 8	0.0
9 - 12	14.6%
13 - 16	8.3%
17 - 20	18.8%
21 - 24	16.7%
25 - 28	16.7%
29 - 32	16.7%
33 - 36	4.2%
37 - 40	4.2%
41 - 44	0.0
45 - 48	0.0
49 - 52	0.0
>53	0.0
min height (cm)	9
max height (cm)	37
mean	22
mode	31

Lophogorgia chilensis widths

(cases) N=	48
< 5	2.1%
5 - 8	6.3%
9 - 12	12.5%
13 - 16	22.9%
17 - 20	29.2%
21 - 24	12.5%
25 - 28	4.2%
29 - 32	10.4%
33 - 36	0.0
37 - 40	0.0
41 - 44	0.0
45 - 48	0.0
49 - 52	0.0
>53	0.0
min width (cm)	4
max width (cm)	32
mean	18
mode	19

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.4500	0.6262	20
Eisenia arborea	0.4750	0.8656	20
Pterygophora californica	0.0250	0.1118	20
Laminaria farlowii	0.4250	1.0295	20
Macrocystis pyrifera juvenile	0.0500	0.2236	20
Macrocystis pyrifera all	0.5000	0.6689	20
Cypraea spadicea	0.3000	0.4702	20
Astraea undosa	0.0000	0.0000	20
Patiria miniata	0.7000	0.7327	20
Pisaster giganteus	0.0000	0.0000	20
Lytechinus anamesus	19.6250	31.4964	20
Strongylocentrotus franciscanus	7.8500	4.3076	20
Strongylocentrotus purpuratus	6.6750	5.3096	20
Parastichopus parvimensis	1.5500	1.1344	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	1.0500	1.0625	20
Alloclinus holderi	0.0000	0.0000	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0208	0.0276	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0306	0.0563	12
Lophogorgia chilensis	0.1056	0.0519	12
Muricea fruticosa	0.0125	0.0161	12
Muricea californica	0.0181	0.0311	12
Panulirus interruptus	0.0014	0.0048	12
Haliotis rufescens	0.0042	0.0075	12
Haliotis corrugata	0.0319	0.0270	12
Haliotis fulgens	0.0014	0.0048	12
Kelletia kelletii	0.0056	0.0148	12
Megathura crenulata	0.0500	0.0466	12
Hinnites giganteus	0.0833	0.0508	12
Aplysia californica	0.0028	0.0065	12
Pycnopodia helianthoides	0.0000	0.0000	12

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.8000	1.7260	25
Miscellaneous brown algae	5.4000	5.8931	25
Desmarestia spp.	0.1000	0.5000	25
Laminaria farlowii	2.4000	4.9728	25
Cystoseira spp.	3.3000	5.7155	25
Macrocystis, Eisenia, Pterygophora	14.7000	15.3826	25
Miscellaneous red algae	13.6000	10.8513	25
Articulated coralline algae	1.0000	1.4434	25
Crustose coralline algae	27.3000	10.5060	25
Gelidium spp.	0.3000	1.0992	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.6000	1.8085	25
Sponges	3.2000	3.7165	25
Corynactis californica	1.7000	3.3634	25
Balanophyllia elegans	1.8000	3.1885	25
Astrangia lajollaensis	6.4000	4.3946	25
Diopatra ornata	0.2000	1.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.5000	1.0206	25
Bryozoans, other	10.8000	7.6621	25
Diaperoecia californica	2.8000	3.5590	25
Tunicates	4.2000	5.2401	25
Miscellaneous invertebrates	29.5000	11.6145	25
Bare substrate	10.7000	15.7870	25
Rock	83.1000	23.0068	25
Cobble	11.0000	17.2301	25
Sand	5.9000	10.7983	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	35.9444	149.9654	144
Chromis punctipinnis	415.7500	347.2906	12
Oxyjulis californica	4.3333	4.1414	12
Sebastes mystinus	4.1667	5.5076	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.2500	0.6216	12
Paralabrax clathratus	1.2500	1.0553	12
Semicossyphus pulcher	1.2500	1.4222	12
Embiotoca jacksoni	0.7500	0.6216	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.4167	0.6686	12
Hypsypops rubicundus	1.4167	0.7930	12
Girella nigricans	1.7500	2.1373	12

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		30.6667	24.9193	12
	900622	62.5000	12.5565	4
	900927	14.7500	6.2963	8
Chromis punctipinnis juvenile		385.0833	364.2895	12
	900622	5.7500	2.5000	4
	900927	574.7500	291.8888	8
Oxyjulis californica adult		4.1667	4.1960	12
	900622	7.2500	6.6521	4
	900927	2.6250	0.7440	8
Oxyjulis californica juvenile		0.1667	0.5774	12
	900622	0.0000	0.0000	4
	900927	0.2500	0.7071	8
Sebastes mystinus adult		0.0000	0.0000	12
	900622	0.0000	0.0000	4
	900927	0.0000	0.0000	8
Sebastes mystinus juvenile		4.1667	5.5076	12
	900622	0.0000	0.0000	4
	900927	6.2500	5.7259	8
Sebastes serranoides adult		0.0000	0.0000	12
	900622	0.0000	0.0000	4
	900927	0.0000	0.0000	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Sebastes atrovirens adult		0.2500	0.6216
12			
	900622	0.7500	0.9574
4			
	900927	0.0000	0.0000
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Paralabrax clathratus adult		1.2500	1.0553
12			
	900622	1.5000	1.2910
4			
	900927	1.1250	0.9910
8			

Paralabrax clathratus juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Semicossyphus pulcher male		0.1667	0.3892
12			
	900622	0.2500	0.5000
4			
	900927	0.1250	0.3536
8			
Semicossyphus pulcher female		1.0833	1.0836
12			
	900622	1.5000	1.2910
4			
	900927	0.8750	0.9910
8			
Embiotoca jacksoni adult		0.7500	0.6216
12			
	900622	0.7500	0.9574
4			
	900927	0.7500	0.4629
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Damalichthys vacca adult		0.4167	0.6686
12			
	900622	0.5000	0.5774
4			

	900927	0.3750	0.7440
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Hypsypops rubicundus adult		1.4167	0.7930
12			
	900622	1.5000	0.5774
4			
	900927	1.3750	0.9161
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Girella nigricans adult		1.7500	2.1373
12			
	900622	3.5000	3.0000
4			
	900927	0.8750	0.8345
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900622	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			

1990 SIZE FREQUENCY DISTRIBUTIONS

Haliotis corrugata

(cases) N=	27
< 70	0.0
70 - 74	0.0
75 - 79	0.0
80 - 84	3.7%
85 - 90	0.0
90 - 94	0.0
95 - 99	0.0
100 - 104	3.7%
105 - 109	11.1%
110 - 114	11.1%
115 - 119	11.1%
120 - 124	14.8%
125 - 129	11.1%
130 - 134	3.7%
135 - 139	11.1%
140 - 144	7.4%
145 - 149	7.4%
150 - 154	0.0
155 - 159	3.7%
160 - 164	0.0
> 165	0.0
min size (mm)	82
max size (mm)	157
mean	123
mode	115

Pisaster giganteus

(cases) N=	34
< 20	0.0
20 - 39	0.0

40 - 59	0.0
60 - 79	0.0
80 - 99	5.9%
100 - 119	41.2%
120 - 139	35.3%
140 - 159	8.8%
160 - 179	8.8%
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	98
max size (mm)	174
mean	125
mode	107

Cypraea spadicea

(cases) N=	56
< 30	0.0
30 - 34	12.5%
35 - 39	33.9%
40 - 44	30.4%
45 - 49	17.9%
50 - 54	5.4%
55 - 59	0.0
> 59	0.0
min size (mm)	31
max size (mm)	50
mean	41
mode	39

Kelletia kelletii

(cases) N=	14
< 40	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	0.0
70 - 79	0.0
80 - 89	14.3%
90 - 99	21.4%
100 - 109	7.1%
110 - 119	28.6%
120 - 129	28.6%
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	88
max size (mm)	122
mean	107
mode	122

Lytechinus anamesus

(cases) N=	105
< 5	0.0
5 - 9	1.0%
10 - 14	0.0
15 - 19	1.0%
20 - 24	7.6%
25 - 29	60.0%
30 - 34	29.5%
35 - 39	1.0%
40 - 44	0.0
45 - 49	0.0
> 49	0.0
min size (mm)	8
max size (mm)	35
mean	28
mode	29

Astraea undosa

(cases) N=	36
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	0.0
60 - 69	5.6%
70 - 79	2.8%
80 - 89	19.4%
90 - 99	22.2%
100 - 109	33.3%
110 - 119	16.7%
> 119	0.0
min size (mm)	67
max size (mm)	115
mean	97
mode	98

Megathura crenulata

(cases) N=	12
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	16.7%
60 - 69	33.3%
70 - 79	33.3%
80 - 89	8.3%
90 - 99	8.3%
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	51
max size (mm)	92
mean	69
mode	61

Parastichopus parvimensis

(cases) N=	29
< 5	0.0
5 - 6	0.0
7 - 8	3.4%
9 - 10	31.0%
11 - 12	20.7%
13 - 14	34.5%
15 - 16	10.3%
17 - 18	0.0
> 18	0.0
min size (cm)	8
max size (cm)	16
mean	12
mode	10

Hinnites giganteus

(cases) N=	47
< 10	0.0
10 - 19	4.3%
20 - 29	14.9%
30 - 39	21.3%
40 - 49	17.0%
50 - 59	23.4%
60 - 69	12.8%
70 - 79	2.1%
80 - 89	2.1%
90 - 99	2.1%
100 - 109	0.0
110 - 119	0.0
120 - 129	0.0
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	18
max size (mm)	92
mean	45
mode	40

Patiria miniata

(cases) N=	61
< 10	0.0
10 - 19	6.6%
20 - 29	1.6%
30 - 39	0.0
40 - 49	11.5%
50 - 59	27.9%
60 - 69	27.9%
70 - 79	16.4%
80 - 89	6.6%
90 - 99	1.6%
> 99	0.0
min size (mm)	14
max size (mm)	93
mean	59
mode	42

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

Strongylocentrotus franciscanus

(cases) N=	97
< 5	0.0
5 - 9	0.0
10 - 14	2.1%
15 - 19	3.1%
20 - 24	1.0%
25 - 29	0.0
30 - 34	2.1%
35 - 39	1.0%
40 - 44	2.1%
45 - 49	2.1%
50 - 54	5.2%
55 - 59	12.4%
60 - 64	5.2%
65 - 69	11.3%
70 - 74	18.6%
75 - 79	9.3%
80 - 84	8.2%
85 - 90	6.2%
90 - 94	6.2%
95 - 99	1.0%
100 - 104	1.0%
105 - 109	1.0%
> 109	1.0%
min size (mm)	11
max size (mm)	122
mean	67
mode	73

Strongylocentrotus purpuratus

(cases) N=	117
< 5	0.0
5 - 9	1.7%
10 - 14	4.3%
15 - 19	7.7%
20 - 24	11.1%
25 - 29	4.3%
30 - 34	6.0%
35 - 39	11.1%
40 - 44	15.4%
45 - 49	12.0%
50 - 54	15.4%
55 - 59	3.4%
60 - 64	6.8%
65 - 69	0.9%
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
> 109	0.0
min size (mm)	7
max size (mm)	66
mean	38
mode	20

Macrocystis pyrifera numbers of stipes.

(cases) N=	99
< 3	15.2%
3 - 5	12.1%
6 - 8	15.2%
9 - 11	15.2%
12 - 14	11.1%
15 - 17	11.1%
18 - 20	5.1%
21 - 23	6.1%
24 - 26	2.0%
27 - 29	1.0%
30 - 32	1.0%
33 - 35	2.0%
36 - 38	2.0%
39 - 41	1.0%
42 - 44	0.0
>44	0.0
min number	1
max number	41
mean	12
mode	2

Macrocystis pyrifera holdfast diameters.

(cases) N=	99
< 6	0.0
6 - 11	18.2%
12 - 17	20.2%
18 - 23	21.2%
24 - 29	14.1%
30 - 35	13.1%
36 - 41	9.1%
42 - 47	3.0%
48 - 53	1.0%
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)	6
max width (cm)	51
mean	22
mode	22

LOCATION 11 ANACAPA ISLAND - ADMIRAL'S REEF

Lophogorgia chilensis widths

(cases) N=	31
< 5	0.0
5 - 8	3.2%
9 - 12	3.2%
13 - 16	12.9%
17 - 20	12.9%
21 - 24	22.6%
25 - 28	12.9%
29 - 32	6.5%
33 - 36	3.2%
37 - 40	0.0
41 - 44	0.0
45 - 48	0.0
49 - 52	0.0
53 - 56	9.7%
57 - 60	3.2%
61 - 64	3.2%
65 - 68	3.2%
69 - 72	0.0
70 - 76	0.0
77 - 80	0.0
81 - 84	0.0
85 - 88	3.2%
>89	0.0
min width (cm)	8
max width (cm)	88
mean	31
mode	27

Muricea californica widths

(cases) N=	30
< 17	0.0
17 - 20	3.3%
21 - 24	0.0
25 - 28	0.0
29 - 32	3.3%
33 - 36	6.7%
37 - 40	10.0%
41 - 44	3.3%
45 - 48	3.3%
49 - 52	3.3%
53 - 56	10.0%
57 - 60	0.0
61 - 64	6.7%
65 - 68	0.0
69 - 72	3.3%
73 - 76	6.7%
77 - 80	6.7%
81 - 84	0.0
85 - 88	10.0%
89 - 92	6.7%
93 - 96	6.7%
97 - 100	6.7%
>100	3.3%
min width (cm)	19
max width (cm)	107
mean	66
mode	38

Lophogorgia chilensis heights

(cases) N=	31
< 5	3.2%
5 - 8	3.2%
9 - 12	9.7%
13 - 16	9.7%
17 - 20	29.0%
21 - 24	9.7%
25 - 28	9.7%
29 - 32	3.2%
33 - 36	0.0
37 - 40	0.0
41 - 44	0.0
45 - 48	0.0
49 - 52	9.7%
53 - 56	0.0
57 - 60	0.0
61 - 64	3.2%
65 - 68	3.2%
69 - 72	0.0
73 - 76	6.5%
77 - 80	0.0
81 - 84	0.0
85 - 88	0.0
> 88	0.0
min height (cm)	0
max height (cm)	75
mean	27
mode	19

Muricea californica heights

(cases) N=	30
< 17	0.0
17 - 20	3.3%
21 - 24	3.3%
25 - 28	6.7%
29 - 32	3.3%
33 - 36	13.3%
37 - 40	6.7%
41 - 44	6.7%
45 - 48	10.0%
49 - 52	6.7%
53 - 56	10.0%
57 - 60	3.3%
61 - 64	6.7%
65 - 68	3.3%
69 - 72	10.0%
73 - 76	0.0
77 - 80	6.7%
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)	17
max height (cm)	78
mean	48
mode	35

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.3500	0.8445	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.1250	0.3193	20
Macrocystis pyrifera juvenile	0.9750	2.6081	20
Macrocystis pyrifera all	1.3250	3.3650	20
Cypraea spadicea	0.0250	0.1118	20
Astraea undosa	2.4750	1.3325	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0000	0.0000	20
Strongylocentrotus franciscanus	6.0250	4.5407	20
Strongylocentrotus purpuratus	3.1250	4.9174	20
Parastichopus parvimensis	1.5500	1.2344	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	1.0250	0.7518	20
Alloclinus holderi	0.1000	0.2052	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.0042	0.0104	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
Panulirus interruptus	0.0042	0.0075	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0125	0.0226	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0125	0.0226	12
Hinnites giganteus	0.1167	0.1367	12
Aplysia californica	0.0194	0.0264	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	9.2000	13.0248	25
Miscellaneous brown algae	4.7000	6.0947	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.4000	1.5612	25
Cystoseira spp.	1.9000	3.1689	25
Macrocystis, Eisenia, Pterygophora	9.5000	15.7123	25
Miscellaneous red algae	10.1000	14.2610	25
Articulated coralline algae	9.0000	8.2916	25
Crustose coralline algae	45.1000	24.1035	25
Gelidium spp.	0.2000	0.6922	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	2.0000	5.6366	25
Sponges	0.1000	0.5000	25
Corynactis californica	0.1000	0.5000	25
Balanophyllia elegans	0.1000	0.5000	25
Astrangia lajollaensis	1.7000	2.3629	25
Diopatra ornata	0.9000	1.7500	25
Phragmatopoma californica	0.3000	0.8292	25
Serpulorbis squamigerus	4.0000	4.5644	25
Bryozoans, other	1.2000	2.8062	25
Diaperoecia californica	0.1000	0.5000	25
Tunicates	2.1000	2.6693	25
Miscellaneous invertebrates	14.8000	9.7340	25
Bare substrate	24.6000	22.0638	25
Rock	58.2000	25.7747	25
Cobble	14.5000	11.8145	25
Sand	27.3000	25.4841	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	55.9792	196.7206	144
Chromis punctipinnis	613.5833	362.3488	12
Oxyjulis californica	24.0000	26.8768	12
Sebastes mystinus	2.5000	1.5076	12
Sebastes serranoides	2.4167	2.6785	12
Sebastes atrovirens	0.0833	0.2887	12
Paralabrax clathratus	8.1667	3.5633	12
Semicossyphus pulcher	11.5000	21.3435	12
Embiotoca jacksoni	3.1667	1.9924	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.1667	0.3892	12
Hypsypops rubicundus	4.4167	1.3790	12
Girella nigricans	1.7500	1.5448	12

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		12.0000	15.7596	12
	900821	7.0000	2.1602	4
	900914	14.5000	19.1535	8
Chromis punctipinnis juvenile		601.5833	360.8400	12
	900821	176.0000	151.1203	4
	900914	814.3750	198.9335	8
Oxyjulis californica adult		2.4167	1.7299	12
	900821	1.2500	1.2583	4
	900914	3.0000	1.6903	8
Oxyjulis californica juvenile		21.5833	27.5366	12
	900821	51.2500	17.5000	4
	900914	6.7500	17.4908	8
Sebastes mystinus adult		0.0000	0.0000	12
	900821	0.0000	0.0000	4
	900914	0.0000	0.0000	8
Sebastes mystinus juvenile		2.5000	1.5076	12
	900821	4.0000	0.0000	4
	900914	1.7500	1.2817	8
Sebastes serranoides adult		0.0000	0.0000	12
	900821	0.0000	0.0000	4
	900914	0.0000	0.0000	8

Sebastes serranoides juvenile		2.4167	2.6785
12			
	900821	0.0000	0.0000
4			
	900914	3.6250	2.5036
8			
Sebastes atrovirens adult		0.0000	0.0000
12			
	900821	0.0000	0.0000
4			
	900914	0.0000	0.0000
8			
Sebastes atrovirens juvenile		0.0833	0.2887
12			
	900821	0.0000	0.0000
4			
	900914	0.1250	0.3536
8			
Paralabrax clathratus adult		5.9167	2.8749
12			
	900821	7.5000	3.1091
4			
	900914	5.1250	2.5877
8			

Paralabrax clathratus juvenile		2.2500	1.8153
12			
	900821	3.0000	1.6330
4			
	900914	1.8750	1.8851
8			
Semicossyphus pulcher male		1.1667	0.9374
12			
	900821	2.0000	0.8165
4			
	900914	0.7500	0.7071
8			
Semicossyphus pulcher female		10.3333	21.4321
12			
	900821	2.0000	2.1602
4			
	900914	14.5000	25.6960
8			
Embiotoca jacksoni adult		2.3333	2.1462
12			
	900821	4.5000	1.2910
4			
	900914	1.2500	1.5811
8			
Embiotoca jacksoni juvenile		0.8333	1.5859
12			
	900821	0.2500	0.5000
4			
	900914	1.1250	1.8851
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900821	0.0000	0.0000
4			
	900914	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900821	0.0000	0.0000
4			
	900914	0.0000	0.0000
8			
Damalichthys vacca adult		0.1667	0.3892
12			
	900821	0.0000	0.0000
4			

	900914	0.2500	0.4629
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900821	0.0000	0.0000
4			
	900914	0.0000	0.0000
8			
Hypsypops rubicundus adult		4.4167	1.3790
12			
	900821	5.2500	1.5000
4			
	900914	4.0000	1.1952
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900821	0.0000	0.0000
4			
	900914	0.0000	0.0000
8			
Girella nigricans adult		1.5833	1.3790
12			
	900821	2.2500	0.9574
4			
	900914	1.2500	1.4880
8			
Girella nigricans juvenile		0.1667	0.5774
12			
	900821	0.0000	0.0000
4			
	900914	0.2500	0.7071
8			

LOCATION 12 ANACAPA ISLAND - CATHEDRAL COVE
1990 SIZE FREQUENCY DISTRIBUTIONS

Haliotis corrugata

(cases) N=	8
< 60	0.0
60 - 64	0.0
65 - 69	0.0
70 - 74	0.0
75 - 79	0.0
80 - 84	12.5%
85 - 90	0.0
90 - 94	0.0
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	12.5%
130 - 134	0.0
135 - 139	12.5%
140 - 144	25.0%
145 - 149	12.5%
150 - 154	0.0
155 - 159	0.0
160 - 164	0.0
165 - 169	0.0
170 - 174	12.5%
175 - 179	12.5%
180 - 184	0.0
185 - 189	0.0
> 189	0.0
min size (mm)	84
max size (mm)	177
mean	141
mode	84

Parastichopus parvimensis

(cases) N=	61
< 7	0.0
7 - 8	4.9%
9 - 10	23.0%
11 - 12	42.6%
13 - 14	19.7%
15 - 16	6.6%
17 - 18	3.3%
> 18	0.0
min size (cm)	7
max size (cm)	17
mean	12
mode	12

Cypraea spadicea

(cases) N=	32
< 30	0.0
30 - 34	6.3%
35 - 39	25.0%
40 - 44	43.8%
45 - 49	12.5%
50 - 54	9.4%
55 - 59	3.1%
> 59	0.0
min size (mm)	33
max size (mm)	59
mean	42
mode	41

Astraea undosa

(cases) N=	28
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	14.3%
40 - 49	17.9%
50 - 59	25.0%
60 - 69	25.0%
70 - 79	14.3%
80 - 89	3.6%
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	36
max size (mm)	81
mean	57
mode	39

Megathura crenulata

(cases) N=	16
< 10	0.0
10 - 19	31.3%
20 - 29	6.3%
30 - 39	0.0
40 - 49	0.0
50 - 59	12.5%
60 - 69	25.0%
70 - 79	18.8%
80 - 89	6.3%
90 - 99	0.0
100 - 109	0.0
> 109	0.0
min size (mm)	14
max size (mm)	87
mean	50
mode	14

Hinnites giganteus

(cases) N=	51
< 10	0.0

10 - 19	0.0
20 - 29	0.0
30 - 39	2.0%
40 - 49	11.8%
50 - 59	7.8%
60 - 69	31.4%
70 - 79	17.6%
80 - 89	13.7%
90 - 99	7.8%
100 - 109	2.0%
110 - 119	5.9%
120 - 129	0.0
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	35
max size (mm)	117
mean	71
mode	64

Patiria miniata

(cases) N=	28
< 10	35.7%
10 - 19	42.9%
20 - 29	7.1%
30 - 39	7.1%
40 - 49	3.6%
50 - 59	0.0
60 - 69	3.6%
70 - 79	0.0
80 - 89	0.0
90 - 99	0.0
> 99	0.0
min size (mm)	5
max size (mm)	68
mean	17
mode	8

Strongylocentrotus franciscanus

(cases) N=	86
< 5	1.2%
5 - 9	0.0
10 - 14	0.0
15 - 19	1.2%
20 - 24	0.0
25 - 29	0.0
30 - 34	2.3%
35 - 39	3.5%
40 - 44	4.7%
45 - 49	2.3%
50 - 54	4.7%
55 - 59	4.7%
60 - 64	4.7%
65 - 69	7.0%
70 - 74	9.3%
75 - 79	11.6%
80 - 84	8.1%
85 - 90	5.8%
90 - 94	7.0%
95 - 99	12.8%
100 - 104	2.3%
105 - 109	3.5%
> 109	3.5%
min size (mm)	4
max size (mm)	120
mean	74
mode	76

Strongylocentrotus purpuratus

(cases) N=	126
< 5	1.6%
5 - 9	3.2%
10 - 14	4.8%
15 - 19	8.7%
20 - 24	8.7%
25 - 29	8.7%
30 - 34	7.1%
35 - 39	11.1%
40 - 44	19.0%
45 - 49	15.9%
50 - 54	8.7%
55 - 59	2.4%
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
> 109	0.0
min size (mm)	3
max size (mm)	58
mean	34
mode	42

Macrocystis pyrifera numbers of stipes.

(cases) N=	102
< 3	32.4%
3 - 5	29.4%
6 - 8	11.8%
9 - 11	10.8%
12 - 14	2.9%
15 - 17	1.0%
18 - 20	4.9%
21 - 23	1.0%
24 - 26	2.0%
27 - 29	1.0%
30 - 32	2.0%
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	1.0%
>44	0.0
min number	1
max number	43
mean	7
mode	2

Macrocystis pyrifera holdfast diameters.

(cases) N=	102
< 6	5.9%
6 - 11	26.5%
12 - 17	31.4%
18 - 23	14.7%
24 - 29	11.8%
30 - 35	7.8%
36 - 41	1.0%
42 - 47	1.0%
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)	43
mean	16
mode	14

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.4750	0.5495	20
Eisenia arborea	0.5750	0.9358	20
Pterygophora californica	0.4000	1.0834	20
Laminaria farlowii	2.2750	2.3026	20
Macrocystis pyrifera juvenile	0.7250	0.6584	20
Macrocystis pyrifera all	1.2000	1.0311	20
Cypraea spadicea	0.0500	0.1539	20
Astraea undosa	1.0500	1.7911	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.0250	0.1118	20
Strongylocentrotus franciscanus	1.2500	1.6975	20
Strongylocentrotus purpuratus	0.5750	1.0036	20
Parastichopus parvimensis	0.7000	1.0438	20
Styela monteryensis	0.0750	0.1832	20
Lythrypnus dalli	0.2250	0.7340	20
Coryphopterus nicholsii	0.2750	0.5250	20
Alloclinus holderi	0.0750	0.1832	20

1990 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	0.0028	0.0065	12
Muricea fruticosa	0.0000	0.0000	12
Panulirus interruptus	0.0111	0.0192	12
Haliotis rufescens	0.0014	0.0048	12
Haliotis corrugata	0.0306	0.0324	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0292	0.0176	12
Hinnites giganteus	0.7764	0.5322	12
Aplysia californica	0.0042	0.0104	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 13 ANACAPA ISLAND - LANDING COVE
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	9.3000	11.9138	25
Miscellaneous brown algae	3.0000	3.6084	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	29.8000	34.0643	25
Cystoseira spp.	5.1000	7.4470	25
Macrocystis, Eisenia, Pterygophora	52.1000	26.2071	25
Miscellaneous red algae	22.5000	19.9870	25
Articulated coralline algae	30.5000	21.5421	25
Crustose coralline algae	41.7000	20.9752	25
Gelidium spp.	20.8000	33.4922	25
Gigartina spp.	0.5000	1.2500	25
Miscellaneous plants	0.9000	2.3805	25
Sponges	6.8000	7.8899	25
Corynactis californica	3.9000	5.9983	25
Balanophyllia elegans	0.2000	0.6922	25
Astrangia lajollaensis	1.8000	2.9333	25
Diopatra ornata	0.6000	1.4930	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	3.0000	3.3072	25
Bryozoans, other	12.7000	14.0668	25
Diaperoecia californica	7.2000	9.2792	25
Tunicates	1.5000	2.8868	25
Miscellaneous invertebrates	18.0000	18.4983	25
Bare substrate	13.1000	18.8646	25
Rock	80.0000	25.1143	25
Cobble	4.5000	6.2500	25
Sand	15.5000	22.5693	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	14.7222	75.0927	144
Chromis punctipinnis	161.9167	217.9034	12
Oxyjulis californica	1.5833	2.1088	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.3333	1.1547	12
Sebastes atrovirens	0.1667	0.3892	12
Paralabrax clathratus	3.8333	1.6422	12
Semicossyphus pulcher	1.5000	1.0871	12
Embiotoca jacksoni	0.9167	1.2401	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	3.7500	1.8153	12
Girella nigricans	2.6667	0.9847	12

LOCATION 13 ANACAPA ISLAND - LANDING COVE
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		17.2500	23.0498	12
	900820	44.2500	20.2382	4
	900927	3.7500	5.8737	8
Chromis punctipinnis juvenile		144.6667	203.2331	12
	900820	363.5000	228.0256	4
	900927	35.2500	39.6872	8
Oxyjulis californica adult		1.4167	1.9287	12
	900820	1.0000	1.1547	4
	900927	1.6250	2.2638	8
Oxyjulis californica juvenile		0.1667	0.3892	12
	900820	0.0000	0.0000	4
	900927	0.2500	0.4629	8
Sebastes mystinus adult		0.0000	0.0000	12
	900820	0.0000	0.0000	4
	900927	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	900820	0.0000	0.0000	4
	900927	0.0000	0.0000	8
Sebastes serranoides adult		0.1667	0.5774	12
	900820	0.0000	0.0000	4
	900927	0.2500	0.7071	8

Sebastes serranoides juvenile		0.1667	0.5774
12			
	900820	0.0000	0.0000
4			
	900927	0.2500	0.7071
8			
Sebastes atrovirens adult		0.1667	0.3892
12			
	900820	0.0000	0.0000
4			
	900927	0.2500	0.4629
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Paralabrax clathratus adult		2.5833	1.4434
12			
	900820	2.0000	1.6330
4			
	900927	2.8750	1.3562
8			

Paralabrax clathratus juvenile		1.2500	1.0553
12			
	900820	1.2500	0.5000
4			
	900927	1.2500	1.2817
8			
Semicossyphus pulcher male		0.3333	0.4924
12			
	900820	0.2500	0.5000
4			
	900927	0.3750	0.5175
8			
Semicossyphus pulcher female		1.1667	1.1934
12			
	900820	1.7500	1.5000
4			
	900927	0.8750	0.9910
8			
Embiotoca jacksoni adult		0.9167	1.2401
12			
	900820	0.0000	0.0000
4			
	900927	1.3750	1.3025
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Damalichthys vacca adult		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			

	900927	0.0000	0.0000
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Hypsypops rubicundus adult		3.7500	1.8153
12			
	900820	4.2500	2.0616
4			
	900927	3.5000	1.7728
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900820	0.0000	0.0000
4			
	900927	0.0000	0.0000
8			
Girella nigricans adult		2.5833	0.9962
12			
	900820	3.0000	1.1547
4			
	900927	2.3750	0.9161
8			
Girella nigricans juvenile		0.0833	0.2887
12			
	900820	0.0000	0.0000
4			
	900927	0.1250	0.3536
8			

LOCATION 13 ANACAPA ISLAND - LANDING COVE
1990 SIZE FREQUENCY DISTRIBUTIONS

Haliotis corrugata

(cases) N=	46
< 25	0.0
25 - 29	0.0
30 - 34	2.2%
35 - 39	0.0
40 - 44	2.2%
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	2.2%
115 - 119	0.0
120 - 124	2.2%
125 - 129	6.5%
130 - 134	8.7%
135 - 139	6.5%
140 - 144	13.0%
145 - 149	13.0%
150 - 154	10.9%
155 - 159	8.7%
160 - 164	15.2%
165 - 169	6.5%
170 - 174	2.2%
175 - 179	0.0
> 179	0.0
min size (mm)	34
max size (mm)	174
mean	143
mode	152

Parastichopus parvimensis

(cases) N=	50
< 5	6.0%
5 - 6	0.0
7 - 8	16.0%
9 - 10	18.0%
11 - 12	30.0%
13 - 14	22.0%
15 - 16	6.0%
17 - 18	2.0%
> 18	0.0
min size (cm)	2
max size (cm)	17
mean	11
mode	12

Astraea undosa

(cases) N=	45
< 10	0.0
10 - 19	2.2%
20 - 29	0.0
30 - 39	8.9%
40 - 49	11.1%
50 - 59	13.3%
60 - 69	20.0%
70 - 79	17.8%
80 - 89	22.2%
90 - 99	4.4%
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	18
max size (mm)	91
mean	64
mode	58

Hinnites giganteus

(cases) N=	55
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	9.1%
40 - 49	18.2%
50 - 59	5.5%
60 - 69	16.4%
70 - 79	10.9%
80 - 89	16.4%
90 - 99	9.1%
100 - 109	7.3%
110 - 119	7.3%
120 - 129	0.0
130 - 139	0.0
140 - 149	0.0
> 149	0.0
min size (mm)	30
max size (mm)	115
mean	71
mode	47

Strongylocentrotus franciscanus

(cases) N=	92
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.0
20 - 24	2.2%
25 - 29	7.6%
30 - 34	5.4%
35 - 39	0.0
40 - 44	1.1%
45 - 49	0.0
50 - 54	2.2%
55 - 59	2.2%
60 - 64	1.1%
65 - 69	5.4%
70 - 74	4.3%
75 - 79	4.3%
80 - 84	12.0%
85 - 90	8.7%
90 - 94	7.6%
95 - 99	3.3%
100 - 104	9.8%
105 - 109	5.4%
> 109	16.3%
min size (mm)	20
max size (mm)	133
mean	82
mode	91

Strongylocentrotus purpuratus

(cases) N=	68
< 5	0.0
5 - 9	5.9%
10 - 14	4.4%
15 - 19	10.3%
20 - 24	8.8%
25 - 29	13.2%
30 - 34	8.8%
35 - 39	13.2%
40 - 44	10.3%
45 - 49	13.2%
50 - 54	5.9%
55 - 59	2.9%
60 - 64	1.5%
65 - 69	1.5%
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
> 109	0.0
min size (mm)	6
max size (mm)	67
mean	33
mode	38

Macrocystis pyrifera numbers of stipes.

(cases) N=	103
< 3	47.6%
3 - 5	16.5%
6 - 8	8.7%
9 - 11	3.9%
12 - 14	4.9%
15 - 17	2.9%
18 - 20	5.8%
21 - 23	1.9%
24 - 26	1.0%
27 - 29	1.0%
30 - 32	4.9%
33 - 35	0.0
36 - 38	1.0%
39 - 41	0.0
42 - 44	0.0
>44	0.0
min number	1
max number	37
mean	7
mode	2

Macrocystis pyrifera holdfast diameters.

(cases) N=	103
< 6	21.4%
6 - 11	37.9%
12 - 17	7.8%
18 - 23	9.7%
24 - 29	3.9%
30 - 35	9.7%
36 - 41	7.8%
42 - 47	1.9%
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)	3
max width (cm)	47
mean	15
mode	6

1990 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	0.0250	0.1118	20
Macrocystis pyrifera all	0.0250	0.1118	20
Cypraea spadicea	0.0750	0.2447	20
Astraea undosa	0.2250	0.4128	20
Patiria miniata	0.2750	0.4128	20
Pisaster giganteus	0.1250	0.2221	20
Strongylocentrotus franciscanus	1.2750	1.4732	20
Strongylocentrotus purpuratus	77.5250	40.8352	20
Parastichopus parvimensis	1.3000	0.9090	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	1.1750	1.0915	20
Alloclinus holderi	0.5750	0.5911	20

1990 BAND TRANSECT DATA: MEAN NUMBER PER M^2

Tethya aurantia	0.1056	0.0538	12
Allopora californica	0.0000	0.0000	12
Tealia lofotensis	0.0000	0.0000	12
Lophogorgia chilensis	0.2083	0.0665	12
Muricea fruticosa	0.0125	0.0176	12
Muricea californica	0.0278	0.0205	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	0.0000	0.0000	12
Hinnites giganteus	0.0042	0.0104	12
Aplysia californica	0.0694	0.0375	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	12.3139	6.9813	12

1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.3000	0.8292	25
Miscellaneous brown algae	0.0000	0.0000	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	0.0000	0.0000	25
Miscellaneous red algae	3.3000	3.2048	25
Articulated coralline algae	1.4000	1.9203	25
Crustose coralline algae	29.5000	12.5000	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	0.0000	0.0000	25
Sponges	1.0000	1.2500	25
Corynactis californica	2.5000	5.3522	25
Balanophyllia elegans	6.1000	8.7226	25
Astrangia lajollaensis	4.0000	4.0182	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.0000	0.0000	25
Bryozoans, other	3.6000	4.8455	25
Diaperoecia californica	0.2000	0.6922	25
Tunicates	2.8000	2.5331	25
Miscellaneous invertebrates	14.6000	7.2053	25
Bare substrate	34.4000	15.2971	25
Rock	78.2000	25.7140	25
Cobble	8.1000	10.4652	25
Sand	13.7000	20.7304	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	4.3056	13.1225	144
Chromis punctipinnis	43.2500	18.5086	12
Oxyjulis californica	5.3333	7.7381	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0000	0.0000	12
Paralabrax clathratus	1.5000	1.3143	12
Semicossyphus pulcher	0.5000	0.9045	12
Embiotoca jacksoni	0.0000	0.0000	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	1.0833	0.7930	12
Girella nigricans	0.0000	0.0000	12

LOCATION 14 SANTA BARBARA ISLAND - SOUTHEAST SEA LION ROOKERY
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		30.7500	13.8638	12
	900619	35.5000	8.8129	4
	900822	28.3750	15.7927	8
Chromis punctipinnis juvenile		12.5000	17.2653	12
	900619	0.0000	0.0000	4
	900822	18.7500	18.2893	8
Oxyjulis californica adult		1.5833	3.2039	12
	900619	4.2500	4.7871	4
	900822	0.2500	0.4629	8
Oxyjulis californica juvenile		3.7500	7.6530	12
	900619	0.5000	1.0000	4
	900822	5.3750	9.0859	8
Sebastes mystinus adult		0.0000	0.0000	12
	900619	0.0000	0.0000	4
	900822	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	900619	0.0000	0.0000	4
	900822	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	900619	0.0000	0.0000	4
	900822	0.0000	0.0000	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Sebastes atrovirens adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Paralabrax clathratus adult		1.5000	1.3143
12			
	900619	0.5000	0.5774
4			
	900822	2.0000	1.3093
8			

Paralabrax clathratus juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Semicossyphus pulcher male		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Semicossyphus pulcher female		0.5000	0.9045
12			
	900619	1.2500	1.2583
4			
	900822	0.1250	0.3536
8			
Embiotoca jacksoni adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Damalichthys vacca adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			

	900822	0.0000	0.0000
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Hypsypops rubicundus adult		1.0833	0.7930
12			
	900619	1.2500	0.9574
4			
	900822	1.0000	0.7559
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Girella nigricans adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900822	0.0000	0.0000
8			

1990 SIZE FREQUENCY DISTRIBUTIONS

Tethya aurantia

(cases) N=	30
< 10	0.0
10 - 19	10.0%
20 - 29	6.7%
30 - 39	3.3%
40 - 49	6.7%
50 - 59	16.7%
60 - 69	40.0%
70 - 79	6.7%
80 - 89	0.0
90 - 99	10.0%
> 99	0.0
min size (mm)	16
max size (mm)	97
mean	57
mode	65

Haliotis fulgens

(cases) N=	3
< 25	66.7%
25 - 29	33.3%
30 - 34	0.0
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
>50	0.0
min size (mm)	0
max size (mm)	28
mean	17
mode	22

Astraea undosa

(cases) N=	25
< 10	0.0
10 - 19	0.0
20 - 29	4.0%
30 - 39	4.0%
40 - 49	16.0%
50 - 59	8.0%
60 - 69	60.0%
70 - 79	8.0%
80 - 89	0.0
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	26
max size (mm)	71
mean	59
mode	61

Patiria miniata

(cases) N=	52
< 10	0.0
10 - 19	0.0
20 - 29	3.8%
30 - 39	21.2%
40 - 49	21.2%
50 - 59	23.1%
60 - 69	19.2%
70 - 79	7.7%
80 - 89	3.8%
90 - 99	0.0
> 99	0.0
min size (mm)	20
max size (mm)	89
mean	51
mode	42

Pisaster giganteus

(cases) N=	44
< 20	0.0
20 - 39	2.3%
40 - 59	4.5%
60 - 79	22.7%
80 - 99	50.0%
100 - 119	15.9%
120 - 139	2.3%
140 - 159	2.3%
160 - 179	0.0
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	37
max size (mm)	151
mean	87
mode	85

Lytechinus anamesus

(cases) N=	108
< 5	0.0
5 - 9	0.0
10 - 14	43.5%
15 - 19	54.6%
20 - 24	1.9%
25 - 29	0.0
30 - 34	0.0
35 - 39	0.0
40 - 44	0.0
45 - 49	0.0
> 49	0.0
min size (mm)	10
max size (mm)	23
mean	15
mode	15

Strongylocentrotus franciscanus

(cases) N=	100
< 5	0.0
5 - 9	0.0
10 - 14	2.0%
15 - 19	9.0%
20 - 24	40.0%
25 - 29	12.0%
30 - 34	1.0%
35 - 39	2.0%
40 - 44	0.0
45 - 49	0.0
50 - 54	0.0
55 - 59	0.0
60 - 64	0.0
65 - 69	2.0%
70 - 74	0.0
75 - 79	7.0%
80 - 84	6.0%
85 - 90	6.0%
90 - 94	6.0%
95 - 99	4.0%
100 - 104	2.0%
105 - 109	1.0%
> 109	0.0
min size (mm)	14
max size (mm)	105
mean	44
mode	21

Strongylocentrotus purpuratus

(cases) N=	106
< 5	0.0
5 - 9	1.9%
10 - 14	58.5%
15 - 19	28.3%
20 - 24	9.4%
25 - 29	1.9%
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
> 109	0.0
min size (mm)	9
max size (mm)	27
mean	15
mode	13

Parastichopus parvimensis

(cases) N=	31
< 5	0.0
5 - 6	3.2%
7 - 8	16.1%
9 - 10	25.8%
11 - 12	38.7%
13 - 14	16.1%
15 - 16	0.0
17 - 18	0.0
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	6
max size (cm)	14
mean	10
mode	11

Lophogorgia chilensis widths

(cases) N=	37
< 5	2.7%
5 - 8	2.7%
9 - 12	16.2%
13 - 16	10.8%
17 - 20	18.9%
21 - 24	10.8%
25 - 28	5.4%
29 - 32	8.1%
33 - 36	5.4%
37 - 40	2.7%
41 - 44	2.7%
45 - 48	0.0
49 - 52	5.4%
53 - 56	0.0
57 - 60	5.4%
61 - 64	0.0
65 - 68	2.7%
>69	0.0
min width (cm)	4
max width (cm)	65
mean	25
mode	20

Muricea californica widths

(cases) N=	31
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	0.0
17 - 20	0.0
21 - 24	0.0
25 - 28	0.0
29 - 32	0.0
33 - 36	6.5%
37 - 40	9.7%
41 - 44	3.2%
45 - 48	3.2%
49 - 52	3.2%
53 - 56	6.5%
57 - 60	6.5%
61 - 64	6.5%
65 - 68	3.2%
69 - 72	6.5%
73 - 76	0.0
77 - 80	9.7%
81 - 84	6.5%
85 - 88	3.2%
89 - 92	0.0
93 - 96	3.2%
97 - 100	9.7%
>100	12.9%
min width (cm)	35
max width (cm)	113
mean	70
mode	97

Lophogorgia chilensis heights

(cases) N=	37
< 5	0.0
5 - 8	2.7%
9 - 12	8.1%
13 - 16	13.5%
17 - 20	16.2%
21 - 24	10.8%
25 - 28	8.1%
29 - 32	8.1%
33 - 36	10.8%
37 - 40	0.0
41 - 44	8.1%
45 - 48	5.4%
49 - 52	5.4%
53 - 56	0.0
57 - 60	0.0
61 - 64	2.7%
65 - 68	0.0
>69	0.0
min height (cm)	5
max height (cm)	61
mean	27
mode	12

Muricea californica heights

(cases) N=	31
< 5	0.0
5 - 8	0.0
9 - 12	0.0
13 - 16	0.0
17 - 20	3.2%
21 - 24	9.7%
25 - 28	9.7%
29 - 32	0.0
33 - 36	9.7%
37 - 40	3.2%
41 - 44	0.0
45 - 48	19.4%
49 - 52	12.9%
53 - 56	16.1%
57 - 60	6.5%
61 - 64	3.2%
65 - 68	0.0
69 - 72	0.0
73 - 76	3.2%
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	3.2%
min height (cm)	18
max height (cm)	110
mean	46
mode	46

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASE
Macrocystis pyrifera adult	0.0000	0.0000	20
Eisenia arborea	0.0000	0.0000	20
Pterygophora californica	0.0000	0.0000	20
Laminaria farlowii	0.0250	0.1118	20
Macrocystis pyrifera juvenile	0.0000	0.0000	20
Macrocystis pyrifera all	0.0000	0.0000	20
Cypraea spadicea	0.1000	0.2052	20
Astraea undosa	0.7250	0.9662	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.1250	0.2751	20
Strongylocentrotus franciscanus	1.7000	1.7199	20
Strongylocentrotus purpuratus	66.5250	32.5574	20
Parastichopus parvimensis	0.3750	0.5590	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.2750	0.4128	20
Alloclinus holderi	0.7000	0.7504	20

1990 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	0.0000	0.0000	12
Panulirus interruptus	0.0056	0.0082	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	0.0014	0.0048	12
Aplysia californica	0.1236	0.0793	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0403	0.0505	12

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	2.4000	3.0173	25
Miscellaneous brown algae	4.2000	4.8261	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.0000	0.0000	25
Macrocystis, Eisenia, Pterygophora	2.4000	7.6879	25
Miscellaneous red algae	15.7000	10.2956	25
Articulated coralline algae	9.3000	16.1135	25
Crustose coralline algae	36.3000	15.5309	25
Gelidium spp.	0.0000	0.0000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	2.3000	3.0551	25
Sponges	0.0000	0.0000	25
Corynactis californica	7.3000	7.8369	25
Balanophyllia elegans	0.3000	0.8292	25
Astrangia lajollaensis	1.3000	2.1794	25
Diopatra ornata	0.0000	0.0000	25
Phragmatopoma californica	0.0000	0.0000	25
Serpulorbis squamigerus	0.4000	1.1815	25
Bryozoans, other	3.1000	4.4651	25
Diaperoecia californica	0.0000	0.0000	25
Tunicates	0.3000	1.0992	25
Miscellaneous invertebrates	8.2000	4.8153	25
Bare substrate	21.6000	11.1074	25
Rock	83.3000	12.0269	25
Cobble	10.0000	9.8160	25
Sand	6.7000	7.8965	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	17.4028	53.0097	144
Chromis punctipinnis	158.5833	102.7578	12
Oxyjulis californica	25.0000	39.0478	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0000	0.0000	12
Paralabrax clathratus	3.2500	2.6328	12
Semicossyphus pulcher	1.0000	1.3484	12
Embiotoca jacksoni	0.2500	0.4523	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0833	0.2887	12
Hypsypops rubicundus	7.9167	2.0652	12
Girella nigricans	12.7500	4.7697	12

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		21.1667	37.4938	12
	900619	62.5000	41.6693	4
	900823	0.5000	0.7559	8
Chromis punctipinnis juvenile		137.4167	123.9409	12
	900619	0.0000	0.0000	4
	900823	206.1250	89.1827	8
Oxyjulis californica adult		24.5833	39.3064	12
	900619	70.5000	37.9693	4
	900823	1.6250	1.6850	8
Oxyjulis californica juvenile		0.4167	1.4434	12
	900619	0.0000	0.0000	4
	900823	0.6250	1.7678	8
Sebastes mystinus adult		0.0000	0.0000	12
	900619	0.0000	0.0000	4
	900823	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	900619	0.0000	0.0000	4
	900823	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	900619	0.0000	0.0000	4
	900823	0.0000	0.0000	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Sebastes atrovirens adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Paralabrax clathratus adult		3.0833	2.6785
12			
	900619	0.5000	1.0000
4			
	900823	4.3750	2.2638
8			

Paralabrax clathratus juvenile		0.1667	0.3892
12			
	900619	0.2500	0.5000
4			
	900823	0.1250	0.3536
8			
Semicossyphus pulcher male		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Semicossyphus pulcher female		1.0000	1.3484
12			
	900619	0.7500	0.9574
4			
	900823	1.1250	1.5526
8			
Embiotoca jacksoni adult		0.2500	0.4523
12			
	900619	0.0000	0.0000
4			
	900823	0.3750	0.5175
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Damalichthys vacca adult		0.0833	0.2887
12			
	900619	0.2500	0.5000
4			

	900823	0.0000	0.0000
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Hypsypops rubicundus adult		7.9167	2.0652
12			
	900619	6.0000	0.8165
4			
	900823	8.8750	1.8077
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Girella nigricans adult		12.7500	4.7697
12			
	900619	8.5000	4.9329
4			
	900823	14.8750	3.1368
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900619	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			

LOCATION 15 SANTA BARBARA ISLAND - ARCH POINT
1990 SIZE FREQUENCY DISTRIBUTIONS

Cypraea spadicea

(cases) N=	27
< 30	0.0
30 - 34	18.5%
35 - 39	33.3%
40 - 44	40.7%
45 - 49	7.4%
50 - 54	0.0
55 - 59	0.0
> 59	0.0
min size (mm)	32
max size (mm)	47
mean	39
mode	38

Astraea undosa

(cases) N=	60
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	5.0%
40 - 49	1.7%
50 - 59	3.3%
60 - 69	43.3%
70 - 79	33.3%
80 - 89	11.7%
90 - 99	1.7%
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	31
max size (mm)	95
mean	68
mode	70

Patiria miniata

(cases) N=	24
< 10	0.0
10 - 19	20.8%
20 - 29	16.7%
30 - 39	8.3%
40 - 49	16.7%
50 - 59	20.8%
60 - 69	8.3%
70 - 79	4.2%
80 - 89	0.0
90 - 99	4.2%
> 99	0.0
min size (mm)	12
max size (mm)	92
mean	40
mode	12

Pisaster giganteus

(cases) N=	50
< 20	0.0
20 - 39	0.0
40 - 59	2.0%
60 - 79	4.0%
80 - 99	26.0%
100 - 119	34.0%
120 - 139	18.0%
140 - 159	8.0%
160 - 179	2.0%
180 - 199	4.0%
200 - 219	2.0%
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	52
max size (mm)	215
mean	114
mode	132

Lytechinus anamesus

(cases) N=	108
< 5	0.9%
5 - 9	5.6%
10 - 14	36.1%
15 - 19	45.4%
20 - 24	11.1%
25 - 29	0.0
30 - 34	0.9%
35 - 39	0.0
> 39	0.0
min size (mm)	4
max size (mm)	33
mean	15
mode	17

Parastichopus parvimensis

(cases) N=	31
< 5	0.0
5 - 6	6.5%
7 - 8	9.7%
9 - 10	12.9%
11 - 12	41.9%
13 - 14	16.1%
15 - 16	12.9%
> 16	0.0
min size (cm)	6
max size (cm)	15
mean	11
mode	11

Strongylocentrotus franciscanus

(cases) N=	165
< 5	0.0
5 - 9	0.6%
10 - 14	0.6%
15 - 19	0.6%
20 - 24	6.7%

25 - 29	7.9%
30 - 34	5.5%
35 - 39	6.1%
40 - 44	10.3%
45 - 49	6.7%
50 - 54	12.1%
55 - 59	9.7%
60 - 64	9.7%
65 - 69	8.5%
70 - 74	3.0%
75 - 79	4.8%
80 - 84	3.0%
85 - 90	0.6%
90 - 94	1.2%
95 - 99	1.2%
100 - 104	1.2%
105 - 109	0.0
> 109	0.0
min size (mm)	6
max size (mm)	101
mean	51
mode	42

Macrocystis pyrifera numbers of stipes.

(cases) N=	84
< 3	45.2%
3 - 5	25.0%
6 - 8	14.3%
9 - 11	3.6%
12 - 14	1.2%
15 - 17	0.0
18 - 20	1.2%
21 - 23	3.6%
24 - 26	1.2%
27 - 29	3.6%
30 - 32	0.0
33 - 35	0.0
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
>44	1.2%
min number	1
max number	50
mean	6
mode	2

Strongylocentrotus purpuratus

(cases) N=	159
< 5	4.4%
5 - 9	8.8%
10 - 14	12.6%
15 - 19	17.6%
20 - 24	25.8%
25 - 29	22.0%
30 - 34	5.7%
35 - 39	1.3%
40 - 44	1.3%
45 - 49	0.6%
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
> 109	0.0
min size (mm)	2
max size (mm)	47
mean	20
mode	21

Macrocystis pyrifera holdfast diameters.

(cases) N=	84
< 6	15.5%
6 - 11	50.0%
12 - 17	14.3%
18 - 23	2.4%
24 - 29	7.1%
30 - 35	6.0%
36 - 41	2.4%
42 - 47	1.2%
48 - 53	0.0
54 - 59	1.2%
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)	59
mean	13
mode	9

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON

1990 QUADRAT DATA: MEAN NUMBER PER M^2

Species	MEAN	STD DEV	CASES
Macrocystis pyrifera adult	0.0500	0.1539	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	0.1500	0.4894	20
Macrocystis pyrifera all	0.2000	0.6366	20
Cypraea spadicea	0.0250	0.1118	20
Astraea undosa	0.5000	0.7609	20
Patiria miniata	0.0000	0.0000	20
Pisaster giganteus	0.1250	0.2221	20
Strongylocentrotus franciscanus	2.5500	2.1145	20
Strongylocentrotus purpuratus	42.2500	18.2313	20
Parastichopus parvimensis	0.4000	0.4472	20
Styela monteryensis	0.0000	0.0000	20
Lythrypnus dalli	0.0000	0.0000	20
Coryphopterus nicholsii	0.2500	0.3804	20
Alloclinus holderi	0.9500	0.7931	20

1990 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	0.0000	0.0000	12
Panulirus interruptus	0.0111	0.0192	12
Haliotis rufescens	0.0000	0.0000	12
Haliotis corrugata	0.0042	0.0104	12
Haliotis fulgens	0.0000	0.0000	12
Kelletia kelletii	0.0000	0.0000	12
Megathura crenulata	0.0042	0.0075	12
Hinnites giganteus	0.0014	0.0048	12
Aplysia californica	0.0611	0.0524	12
Pycnopodia helianthoides	0.0000	0.0000	12
Lytechinus anamesus	0.0000	0.0000	12

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON
1990 RANDOM POINT CONTACT DATA: MEAN PERCENT COVER

Species	MEAN	STD DEV	CASES
Green algae	0.9000	1.8930	25
Miscellaneous brown algae	0.8000	2.2500	25
Desmarestia spp.	0.0000	0.0000	25
Laminaria farlowii	0.0000	0.0000	25
Cystoseira spp.	0.4000	1.1815	25
Macrocystis, Eisenia, Pterygophora	3.3000	9.8879	25
Miscellaneous red algae	10.0000	7.4652	25
Articulated coralline algae	7.9000	9.8340	25
Crustose coralline algae	29.8000	15.0852	25
Gelidium spp.	0.1000	0.5000	25
Gigartina spp.	0.0000	0.0000	25
Miscellaneous plants	1.0000	4.0182	25
Sponges	0.6000	1.3070	25
Corynactis californica	0.0000	0.0000	25
Balanophyllia elegans	2.4000	3.4970	25
Astrangia lajollaensis	0.9000	1.5943	25
Diopatra ornata	0.2000	0.6922	25
Phragmatopoma californica	8.1000	5.1680	25
Serpulorbis squamigerus	2.7000	2.9686	25
Bryozoans, other	2.5000	6.7315	25
Diaperoecia californica	0.6000	2.1985	25
Tunicates	2.4000	3.6429	25
Miscellaneous invertebrates	17.5000	8.1650	25
Bare substrate	33.0000	10.7287	25
Rock	89.7000	13.1719	25
Cobble	1.3000	3.2372	25
Sand	9.0000	10.3330	25

1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

TOTAL FISH ABUNDANCE	7.8681	29.0216	144
Chromis punctipinnis	76.4167	72.1910	12
Oxyjulis californica	8.2500	7.9100	12
Sebastes mystinus	0.0000	0.0000	12
Sebastes serranoides	0.0000	0.0000	12
Sebastes atrovirens	0.0000	0.0000	12
Paralabrax clathratus	1.7500	1.2154	12
Semicossyphus pulcher	1.8333	1.0299	12
Embiotoca jacksoni	0.2500	0.4523	12
Embiotoca lateralis	0.0000	0.0000	12
Damalichthys vacca	0.0000	0.0000	12
Hypsypops rubicundus	2.5000	1.3143	12
Girella nigricans	3.4167	3.1467	12

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON
1990 FISH TRANSECT DATA: MEAN NUMBER PER TRANSECT

Species	Date (year/month/day)	Mean	Std Dev	Cases
Chromis punctipinnis adult		35.0000	17.0507	12
	900620	48.5000	8.5829	4
	900823	28.2500	16.4034	8
Chromis punctipinnis juvenile		41.4167	71.0729	12
	900620	0.0000	0.0000	4
	900823	62.1250	80.4211	8
Oxyjulis californica adult		8.2500	7.9100	12
	900620	10.5000	11.7898	4
	900823	7.1250	5.8661	8
Oxyjulis californica juvenile		0.0000	0.0000	12
	900620	0.0000	0.0000	4
	900823	0.0000	0.0000	8
Sebastes mystinus adult		0.0000	0.0000	12
	900620	0.0000	0.0000	4
	900823	0.0000	0.0000	8
Sebastes mystinus juvenile		0.0000	0.0000	12
	900620	0.0000	0.0000	4
	900823	0.0000	0.0000	8
Sebastes serranoides adult		0.0000	0.0000	12
	900620	0.0000	0.0000	4
	900823	0.0000	0.0000	8

Sebastes serranoides juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Sebastes atrovirens adult		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Sebastes atrovirens juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Paralabrax clathratus adult		1.5000	1.3143
12			
	900620	0.5000	0.5774
4			
	900823	2.0000	1.3093
8			

Paralabrax clathratus juvenile		0.2500	0.6216
12			
	900620	0.7500	0.9574
4			
	900823	0.0000	0.0000
8			
Semicossyphus pulcher male		0.0833	0.2887
12			
	900620	0.2500	0.5000
4			
	900823	0.0000	0.0000
8			
Semicossyphus pulcher female		1.7500	1.1382
12			
	900620	1.2500	1.2583
4			
	900823	2.0000	1.0690
8			
Embiotoca jacksoni adult		0.2500	0.4523
12			
	900620	0.7500	0.5000
4			
	900823	0.0000	0.0000
8			
Embiotoca jacksoni juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Embiotoca lateralis adult		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Embiotoca lateralis juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Damalichthys vacca adult		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			

	900823	0.0000	0.0000
8			
Damalichthys vacca juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Hypsypops rubicundus adult		2.5000	1.3143
12			
	900620	3.5000	1.0000
4			
	900823	2.0000	1.1952
8			
Hypsypops rubicundus juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			
Girella nigricans adult		3.4167	3.1467
12			
	900620	0.0000	0.0000
4			
	900823	5.1250	2.3566
8			
Girella nigricans juvenile		0.0000	0.0000
12			
	900620	0.0000	0.0000
4			
	900823	0.0000	0.0000
8			

LOCATION 16 SANTA BARBARA ISLAND - CAT CANYON
1990 SIZE FREQUENCY DISTRIBUTIONS

Haliotis corrugata

(cases) N=	15
< 95	0.0
95 - 99	0.0
100 - 104	0.0
105 - 109	0.0
110 - 114	6.7%
115 - 119	13.3%
120 - 124	13.3%
125 - 129	6.7%
130 - 134	13.3%
135 - 139	6.7%
140 - 144	13.3%
145 - 149	6.7%
150 - 154	0.0
155 - 159	0.0
160 - 164	0.0
165 - 169	6.7%
170 - 174	6.7%
175 - 179	6.7%
180 - 184	0.0
185 - 189	0.0
190 - 194	0.0
195 - 199	0.0
> 199	0.0
min size (mm)	110
max size (mm)	178
mean	138
mode	122

Parastichopus parvimensis

(cases) N=	53
< 5	0.0
5 - 6	0.0
7 - 8	9.4%
9 - 10	32.1%
11 - 12	28.3%
13 - 14	28.3%
15 - 16	1.9%
17 - 18	0.0
19 - 20	0.0
21 - 22	0.0
> 22	0.0
min size (cm)	7
max size (cm)	15
mean	11
mode	13

Astraea undosa

(cases) N=	51
< 10	0.0
10 - 19	0.0
20 - 29	0.0
30 - 39	0.0
40 - 49	0.0
50 - 59	23.5%
60 - 69	60.8%
70 - 79	15.7%
80 - 89	0.0
90 - 99	0.0
100 - 109	0.0
110 - 119	0.0
> 119	0.0
min size (mm)	50
max size (mm)	76
mean	63
mode	65

Pisaster giganteus

(cases) N=	49
< 20	0.0
20 - 39	0.0
40 - 59	0.0
60 - 79	8.2%
80 - 99	30.6%
100 - 119	51.0%
120 - 139	6.1%
140 - 159	4.1%
160 - 179	0.0
180 - 199	0.0
200 - 219	0.0
220 - 239	0.0
240 - 259	0.0
260 - 279	0.0
280 - 299	0.0
> 299	0.0
min size (mm)	71
max size (mm)	151
mean	104
mode	119

Strongylocentrotus franciscanus

(cases) N=	100
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.0
20 - 24	0.0
25 - 29	0.0
30 - 34	5.0%
35 - 39	7.0%
40 - 44	15.0%
45 - 49	10.0%
50 - 54	11.0%
55 - 59	5.0%
60 - 64	7.0%
65 - 69	11.0%
70 - 74	8.0%
75 - 79	7.0%
80 - 84	7.0%
85 - 90	2.0%
90 - 94	3.0%
95 - 99	0.0
100 - 104	1.0%
105 - 109	0.0
> 109	1.0%
min size (mm)	32
max size (mm)	123
mean	59
mode	40

Strongylocentrotus purpuratus

(cases) N=	104
< 5	0.0
5 - 9	0.0
10 - 14	0.0
15 - 19	0.0
20 - 24	1.0%
25 - 29	30.8%
30 - 34	35.6%
35 - 39	20.2%
40 - 44	5.8%
45 - 49	6.7%
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
> 109	0.0
min size (mm)	21
max size (mm)	49
mean	33
mode	27

Macrocystis pyrifera numbers of stipes.

(cases) N=	99
< 3	15.2%
3 - 5	13.1%
6 - 8	10.1%
9 - 11	9.1%
12 - 14	16.2%
15 - 17	12.1%
18 - 20	9.1%
21 - 23	6.1%
24 - 26	5.1%
27 - 29	1.0%
30 - 32	2.0%
33 - 35	1.0%
36 - 38	0.0
39 - 41	0.0
42 - 44	0.0
>44	0.0
min number	1
max number	34
mean	12
mode	1

Macrocystis pyrifera holdfast diameters.

(cases) N=	99
< 6	8.1%
6 - 11	11.1%
12 - 17	4.0%
18 - 23	3.0%
24 - 29	15.2%
30 - 35	19.2%
36 - 41	20.2%
42 - 47	11.1%
48 - 53	6.1%
54 - 59	1.0%
60 - 65	1.0%
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)	65
mean	30
mode	24

Appendix B. 1990 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. Organisms 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 - hypsypops nest turf
- dis - diseased

Station names are listed in Table 3 of the text.