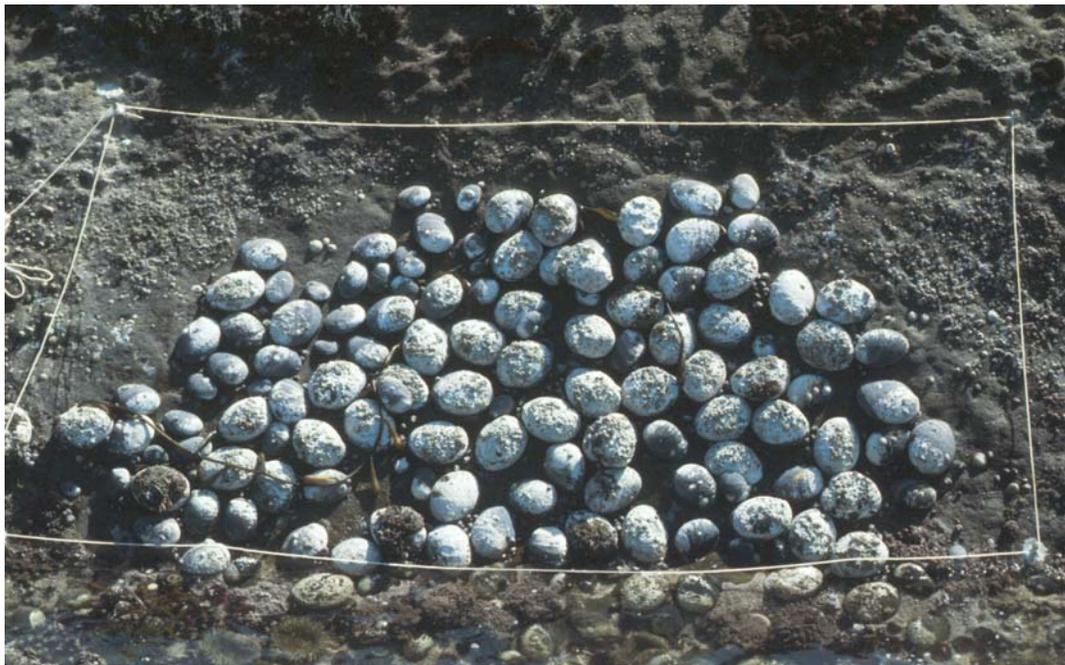


Rocky Intertidal Community Monitoring 1998 Annual Report



Channel Islands National Park

Cover photos: top-Abalone plot 365 at Otter Harbor on San Miguel Island, May 1998
bottom: same plot in March 1985

National Park Service
Channel Islands National Park

Technical Report 2000-03

**Rocky Intertidal Monitoring
Channel Islands National Park
1998 Annual Report**

Daniel V. Richards
and
Derek Lerma
Channel Islands National Park
1901 Spinnaker Drive
Ventura, CA 93001

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Abstract

The 1998 results are presented for the Channel Islands National Park Rocky Intertidal Monitoring Program. Twenty-one permanent sites covering all five park islands were monitored. Permanent photoplots were monitored for changes in percent cover of selected indicator organisms. Species presence/absence, abundance (density) and size distributions of black abalone, *Haliotis cracherodii*, and owl limpets, *Lottia gigantea*, were taken in both fixed plots and in timed searches. Seastar (generally *Pisaster ochraceus*) abundance was measured in timed searches or fixed transects. Temperature loggers collected data at eight sites. The fall 1998 sample marks the first time the National Park Service sampled the six established sites on Santa Cruz Island. General surveys and owl limpet abundance and size distributions were made in the Smuggler's Cove area on East Santa Cruz Island. This area was opened to general park visitation in 1998 following the acquisition of the eastern portion of Santa Cruz Island. Abalone were surveyed at Leuzarder Point on San Miguel Island, an area known to harbor a relatively high number of black abalone. No spring samples were made on Santa Rosa Island because of logistical problems stemming from bad weather. Black abalone populations continued to decline at San Miguel Island. Withered abalone were found at several sites. A number of large abalone (>140 mm) were found giving hope that there may be some resistance to Withering Syndrome. Owl limpet densities in monitoring plots declined at Santa Rosa and San Miguel Islands with no apparent cause. Clearings in mussel beds occurred after El Niño related storms at Anacapa, Santa Cruz and Santa Barbara Islands. Endocladia dieback did not occur as they had after the 1983-1984 El Niño. Rockweed cover was low at most sites throughout 1998.

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Executive Summary

Six intertidal monitoring sites, established in 1994 for the California Coastal Commission, were added to the Channel Islands National Park monitoring program in 1998, bringing the total number of sites to 21 (Figure 1). Each site was visited at least once in 1998 (Table 1). In the spring, weather conditions prevented sampling at Santa Rosa Island and nesting pelicans prevented access to the Sea Lion Rookery site on Santa Barbara Island. A general survey was made of the Smuggler's Cove-Yellowbanks area of East Santa Cruz Island to collect baseline information about the area including species present, owl limpet size and density, and general characteristics before visitation increases on this new portion of the park.

One of the strongest El Niño events ever recorded continued through August of 1998, bringing heavy rainfall and large waves during the winter of 1997-1998. Mussel beds were heavily damaged at Middle Anacapa, Sea Lion Rookery and Willows Anchorage. Barnacle cover was at or near its lowest cover at several sites. Rockweed cover (both *Pelvetia compressa* and *Hesperophycus californicus*) was low at almost all sites.

Two species of note were found on Santa Cruz Island. *Neorhodomela larix*, a red alga, was found at Punta Arena. This has only been found on the north side of Santa Rosa Island at the Channel Islands before. *Stenoplax conspicua*, the conspicuous chiton, was found in the Yellowbanks area, Santa Cruz Island and at Cat Rock, Anacapa Island. This is a southern species, rare to the islands though previously found at Willows Anchorage on Santa Cruz Island (Seapy and Littler 1987).

Haliotis cracherodii numbers are very low at all sites with no site having more than 1% of the 1985 baseline population. Withered black abalone were found indicating Withering Syndrome is still a problem. The persistence of large abalone (>140 mm) provides some hope that there may be some resistant to the bacteria. Few juveniles were found.

Sea stars, mostly *Pisaster ochraceus*, were abundant at Johnson's Lee, Ford Point, Crook Point and Landing Cove (Table 2). The numbers were down somewhat at Landing Cove and Fossil Reef, which has a moderate number. Sea stars seem to be increasing at Otter Harbor.

Lottia gigantea, owl limpet, densities are declining at both San Miguel and Santa Rosa Islands, particularly at Ford Point and Johnson's Lee (Figures 7 & 8). Both of those sites originally had very high densities. No apparent reason for the decline has been discovered.

More than 2,110 people visited the intertidal zone Frenchy's Cove, on West Anacapa Island in 1998, about 30% fewer than in 1997. About 84% of the visitation occurred between February and May, with March and April each having over 600 visitors. Carrying capacity for Frenchy's Cove, based on the work of VTN Oregon (1984) gives a carrying capacity of 643 visitors per month (assuming a visitor day equals a 1 hour visit) beyond which significant impacts occur to the rocky intertidal organisms. We recommend a limit of 500 visitors per month to Frenchy's Cove to protect the marine life there and provide a quality visitor experience.

Introduction

The rocky intertidal zone is a rich and wondrous place at the meeting of marine and terrestrial habitats. Exposed to the air part of each day, the marine organisms living there must survive the drying sun and winds and occasional freshwater rains during low tide. Terrestrial animals taking advantage of the low tide to forage for food (or study the marine life) must flee the incoming tides or risk the consequences. Temperature extremes and wave force reach their maximums here at the shoreline, yet the diversity of life is high. In fact, many organisms are so well adapted to this dual lifestyle that they cannot live without the alternating exposure to both the air and sea.

Channel Islands National Park and National Marine Sanctuary encompasses the four northern Channel Islands and Santa Barbara Island off the coast of Southern California. The park islands and surrounding waters also bear designations as International Biosphere Reserve and State of California Areas of Biological Significance. The State of California maintains jurisdiction over the marine resources and manages them through the California Department of Fish and Game.

The undisturbed tide pools are one of the features specifically mentioned in the enabling legislation for Channel Islands National Park. Rocky intertidal monitoring has been ongoing since 1982 with the following goals: 1) to monitor trends in population dynamics of selected indicator organisms, 2) to determine normal limits of variation, 3) to discover abnormal conditions, 4) to suggest remedies for management issues, and 5) to measure the effectiveness of management actions.

This report summarizes the 1998 calendar year efforts and findings of the Rocky Intertidal Monitoring Program. Monitoring results were previously reported in Richards 1986, 1988, and 1998. Black abalone monitoring results have been presented in Haaker et al. 1992, Davis et al. 1992, and Richards and Davis 1993.

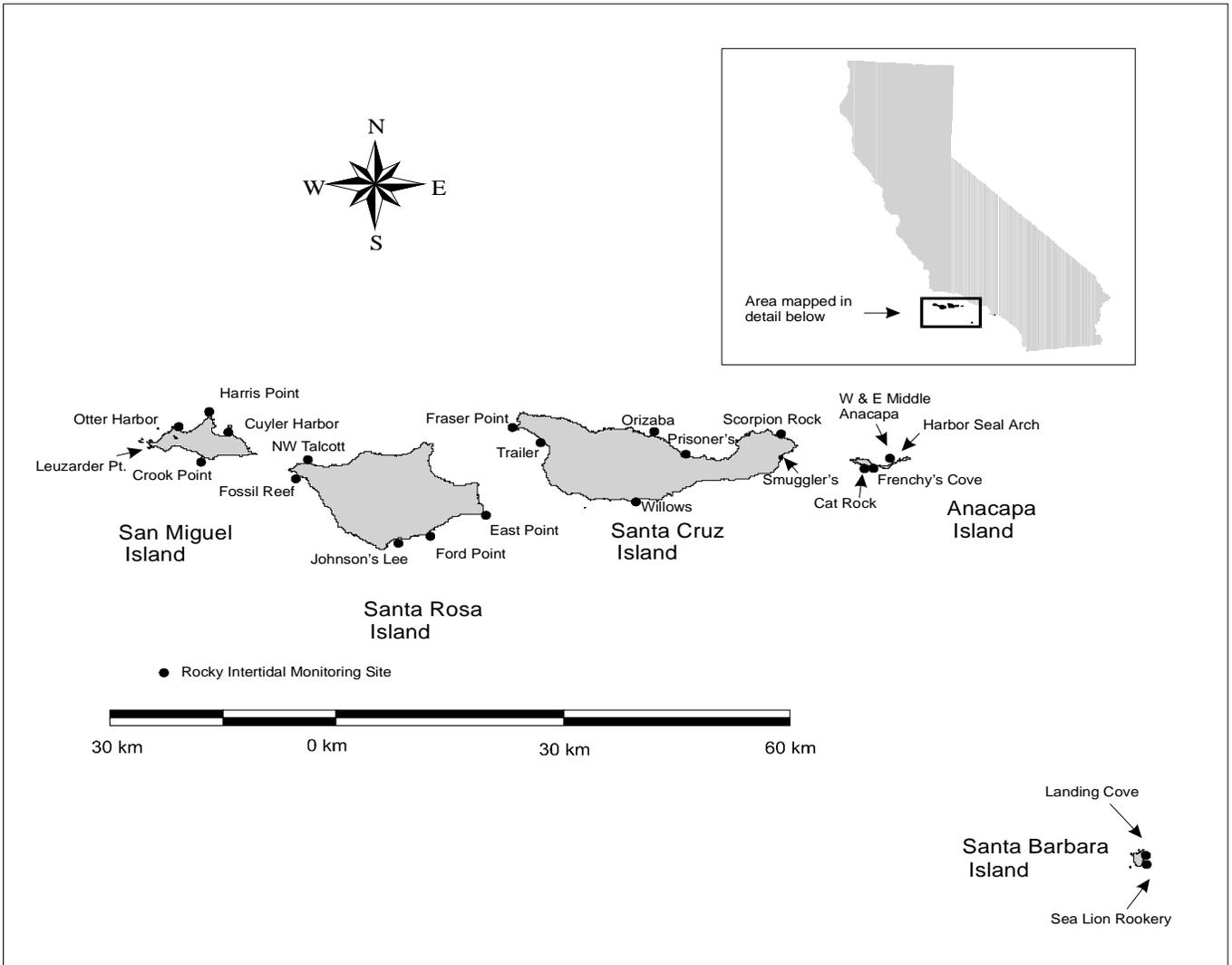


Figure 1. Rocky Intertidal Community Monitoring Site Locations in Channel Islands National Park

Methods

Twenty-one sites on the five park islands were monitored at least once during the 1998 field season in the spring (Feb.-May) and/or fall (Oct.-Jan.) (Figure 1). Sites were originally established to include the various exposures and rock types of each of the islands. Levels of visitation were also considered in site selection, as were accessibility, presence of representative organisms, wildlife disturbance and safety. Sites were established between 1982 and 1994 (Table 1). Six monitoring sites on Santa Cruz Island were added to the National Park Service program in 1998 and monitoring by NPS staff began with the December survey. Scientists at the University of California, Santa Barbara, have collected data at those sites since 1994 for the Coastal Commission

Nearshore Inventory (Engle et al. *In-prep*). Those data are now part of the NPS database.

In May 1998, areas at Smugglers Cove on Santa Cruz Island were surveyed for baseline information including size distribution and abundance of owl limpets, *Lottia gigantea*, species presence and general intertidal zone characteristics. The area was also evaluated as a potential monitoring site location. There was some interest from park concessionaires to land at Smuggler's Cove for tidepool exploration as an alternative to Frenchy's Cove, Anacapa Island. Despite having high relief with a number of boulders, the area has potential as a fixed monitoring site, with suitable locations for plots in several zones. Owl limpets were present in fair numbers and two black abalone were found.

Black abalone, *Haliotis cracherodii*, were surveyed at Leuzarder Point, San Miguel Island. Leuzarder Point has been surveyed for black abalone before (Richards 1998) and this was a follow up survey.

Monitoring protocol is detailed in Richards and Davis 1988. Additional protocol for Santa Cruz Island is detailed in Engle et al. 1998. Because of the addition of the Santa Cruz Island sites and various modifications to sampling protocol, the methods are outlined below.

Photoplots

Fixed 50 x 75 cm photoplots are used to monitor changes in cover of dominant taxa within different intertidal zones. Most photoplots were scored in the field using a string grid with 100 points evenly spaced. When time or conditions did not allow field scoring, percent cover was scored from slides projected onto a grid of 100 points evenly spaced. Where the plot was scored (field or office (from slides)) is recorded in the database.

The Santa Cruz Island sites were established using the same general methods as the earlier NPS sites. Additional zones were chosen with finer delineation among species assemblages when Santa Cruz Island plots were established. Earlier NPS sites recognized only four zones (Richards and Davis 1988) where up to eight zones are recognized on Santa Cruz Island (Engle et al 1998). The *Pollicipes* zone is monitored at

Fraser Point. *Pollicipes polymerus* cover in mussel plots is monitored at all sites; however, no plots specifically targeted concentrations of them except at Fraser Point. Tar is monitored as a distinct zone at Fraser Point to follow weathering and colonization of tar mats. The tar zone is at about the same level as acorn barnacles. Distinct zones were recognized at Santa Cruz Island for each of the rockweeds, *Hesperophycus californicus* and *Pelvetia compressa*. The dominant species defined the zone and both zones may be monitored at a particular site as opposed to the generic rockweed zone at the other island sites. Thatched barnacles or Tetraclita (*Tetraclita rufescens*) and Acorn Barnacle (*Balanus/ Chthamalus*) zones are monitored separately at Santa Cruz Island. The generic barnacle plots at the original sites were generally placed in the *Balanus/ Chthamalus* zone though sometimes were dispersed between the two zones. Scoring categories for all sites were modified to include species identification where possible and fields were added to the database to include these species (most algae were still lumped into Misc. Algae).

Black Abalone

Black abalone, *Haliotis cracherodii*, were counted and measured in fixed plots established around congregations. Plot sizes vary in size and shape (Richards and Davis 1993). Large declines in the abalone population reduced the power of these fixed plots to detect change, so 30-minute searches over the entire site were conducted to locate abalone for a measure of relative abundance. No fixed plots for abalone were ever established at Santa Cruz Island.

Owl Limpets

Owl limpets, *Lottia gigantea*, are measured within abalone plots at San Miguel Island where they occur, and within fixed circular plots, established around *L. gigantea* aggregations at Santa Rosa and Santa Cruz Islands. Circular plots all use a one-meter radius. Plots at Fraser Point on Santa Cruz Island used a 1.5 m radius because of a lower density there. We decided the density was comparable to other sites, and for consistency (and search time requirements) we would use a 1.0 m radius there. For comparisons with past data; however, both 1.0 m and 1.5 m radius plots were counted in December 1998. Owl limpets were measured at South Frenchy's Cove, Anacapa in March 1998 during a timed search for size distribution and relative abundance.

Sea stars

Timed searches are used for counting sea stars (mostly *Pisaster ochraceus*). Search times were usually 30-minutes; however, searches occasionally included two observes for the 30-minutes or covered less time because of limited reef or time available. Sea stars within abalone plots are noted, though the small fixed plots give quite variable results with these mobile animals. Fixed transects were used at Landing Cove (2 x 16 m), Johnson's Lee (2 x 10 m), Fossil Reef (6 x 30 m), and Harris Point (approx. 2 x 12 m) where sea stars consistently occur and the transect areas are easily located.

Surfgrass

Fixed, point-intercept transects were used to monitor Surfgrass, *Phyllospadix* spp., at Fraser Point and Trailer sites on Santa Cruz Island. Surfgrass transects were 10 m long, and marked with stainless steel bolts at each end and usually the center. Cover was recorded every 10 cm (100 points) along a tape stretched between the end bolts.

Species Diversity

Shorebirds and marine mammals were counted upon arrival at each site. A general species list was usually made, though degrees of effort varied with available time and tide. Plot censuses were made, when there was time, by carefully examining the area of each photoplot, and noting every species encountered. Species identifications were field identifications to the best of the biologists' ability.

For this report, algal taxonomy follows Abbott and Hollenberg (1976) with updated nomenclature from Silva and others (1999). Smith and Carlton (1975), McLean (1978), and Morris et al. (1980) serve as the primary references for invertebrates. Name changes can be found in Appendix C with synonyms under the common name field.

Motile Invertebrate Counts

No specific efforts were not made in 1998 to count motile invertebrates (e.g. snails, chitons, limpets, crabs, and sea urchins) within the photoplots as was done in 1997. However, when time permitted, most of the larger gastropod species were enumerated during the plot census.

Physical Measurements

Optic StowAway™ temperature loggers were in place at Harris Point and Crook Point on San Miguel Island, at East Point, Johnson's Lee, and Northwest-Talcott on Santa

Rosa Island, at Frenchy's Cove and Middle-west on Anacapa, and at Landing Cove on Santa Barbara Island. The loggers recorded temperature readings approximately every hour. A PVC tube with screw on end caps was attached to the rock at approximately the +1 ft level. The sealed, waterproof loggers were placed inside the PVC housings that permit some water entry but not flow-through circulation. The loggers were downloaded in the field using an Optic Shuttle™ to temporarily store the data before transferring it to a computer file. This is a cooperative project with Dr. Steve Gaines at the Marine Science Institute at University of California, Santa Barbara. The Gaines lab supplied the temperature loggers and helped install the housings. Observer estimates of wind speed and wave height were recorded at each site visit. Air and water temperatures were generally measured using a handheld thermometer at each site visit.

Data were maintained in Microsoft Access and Excel files at Channel Islands National Park. The downloaded temperature data were kept in files within the CINP IM\TIDEPOOL directory. Temperature data files need to be converted from Excel format to Access files for permanent storage and cleaned to remove the records while the recorders are exposed to air. Further manipulation of the data is needed and data will not be presented in this report.

Monitoring plots were located with a Trimble differential Geographic Positioning System (GPS) at both Santa Barbara Island sites. Files were downloaded into ArcView but have not been cleaned up for finished maps. Sites outlines, prominent features, and each corner of individual plots were mapped.

Results

All monitoring sites in the park were sampled at least once in 1998. Table 1 shows the sampling dates for each site. Specific observations and findings of the 1998 sampling efforts can be found in the trip reports for the year which follow in Appendix D. Fall 1998 was the initial effort for the NPS monitoring at Santa Cruz Island (SCI). Spring sampling was carried out at the SCI sites by biologists from UC Santa Barbara. Santa Rosa Island (SRI) sites were sampled in January 1998, and reported as part of the fall 1997 effort (Richards1998). The fall 1998 sample at SRI was delayed because of rain until January 1999.

Table 1. Sampling dates for Rocky Intertidal Monitoring sites

Site name	Site code	Year established	Spring	Fall
Landing Cove	SBLC	Spring 1985	2/10/98	10/6/98
Sea Lion Rookery	SBSLR	Spring 1985		10/7,10/8/98
Cat Rock	ANCR	Winter 1982	4/23/98	11/18/98
South Frenchy's Cove	ANSFC	Winter 1982	3/10/98	11/18/98
Middle Anacapa-West	ANMW	Winter 1982	3/9/98	11/19/98
Middle Anacapa-East	ANME	Winter 1982	3/9/98	11/17/98
Fraser Cove	SCFC	Spring 1994	4/98**	12/18/98
Trailer	SCTR	Spring 1994	4/98**	12/19/98
Willows Anchorage	SCWA	Spring 1994	4/98**	12/17/98
Scorpion Rock	SCSR	Spring 1994	4/98**	12/3/98
Prisoner's Harbor	SCPH	Spring 1994	4/98**	12/20/98
Orizaba Cove	SCOC	Spring 1994	4/98**	12/3/98
Smuggler's Cove	*		4/21, 4/29/98	
Fossil Reef	SRFR	Spring 1988		1/15/99
Johnson's Lee	SRJL	Fall 1985		1/13/99
Ford Point	SRFP	Fall 1985		1/16/99
Northwest-Talcott	SRNWT	Fall 1986		1/14/99
East Point	SREP	Fall 1986		1/17/99
Cuyler Harbor	SMCH	Spring 1985	5/31/98	11/5/98
Crook Point	SMCP	Spring 1985	5/30/98	11/2/98
Otter Harbor	SMOH	Spring 1985	5/27/98	11/3/98
Harris Point	SMHP	Spring 1985	5/29/98	11/4/98
Leuzarder Point	*		5/28/98	

*Survey site only, **Sampling performed by Engle et al. (see text)

Photoplots

Photoplot summary data are presented in Figures 2-4 for each indicator taxa by zone. Sample mean percent cover values for each site are compared to the range and mean of yearly cover values for all years at that site. Complete photoplot data for 1998 are presented in Appendix A. Summary tables are included in the trip reports in Appendix D. Several species were scored separately, though they were combined with other taxa in the summary tables to match previous reports. Most notably: *Tetraclita rubescens* was included in the Barnacle category; *Pollicipes polymerus* were included as Miscellaneous Animals; *Pelvetia compressa* and *Hesperophycus californicus* were combined as Rockweed. The data for these are stored separately in the database and are available for analysis.

University of California, Santa Barbara biologists under contract to the California Coastal Commission, established Santa Cruz Island sites in fall 1994, and conducted the

monitoring from 1994-1998. Channel Islands National Park biologists assisted with both the site selection, establishment, and monitoring. Data from 1994-1998 have been incorporated in the park database.

Acorn barnacle cover tends to be quite variable both temporally and spatially. No clear trends were discernable. Most of the stations at Santa Cruz Island were at or near the lowest end of their cover range in both the spring and fall (figs. 2&3). As an example of variability on one island; spring barnacle cover at Harris Point (17%) and Otter Harbor (18%) (both with northern exposure) was very low while at the other two San Miguel Island sites, barnacle cover was above the site means (37% and 39% (fig 2)).

Endocladia muricata cover in the spring sample was absent in that zone at Scorpion Rock, with barnacles and *Mazzaella affinis* dominating (Appx. A, page A28). Some *E. muricata* recovery had occurred by fall, but the cover was still very low at 3.4% cover (Appx. A, page A35). At Fraser Cove and Crook Point, *E. muricata* was abundant, near the top of its range, in spring but below the mean at both sites in the fall sample (figs 2 & 3).

Rockweed cover, primarily *Pelvetia compressa* was low at a number of sites in the spring sample but recovered near normal values by fall (figs 2 & 3). *Hesperophycus californicus* cover was below the mean value at all sites throughout 1998 (fig 4). Cuyler Harbor was the only site with above average rockweed cover in the spring sample.

Mytilus californianus was also lower than average at most sites. Willows Anchorage had essentially no mussel cover in spring 1998 (0.4%). Miscellaneous algae (mostly coralline algae and *Ulva* sp.) dominated most of the substrate in those plots. Already at only 25% cover in 1997, mussel cover at Sea lion Rookery dropped to only 11% in the plots after severe storm waves hit in early 1998.

Species Diversity

Photoplot species census tables are presented in Appendix B. These lists show the general species makeup found within a zone but species were not rated for abundance with the exception of the fall San Miguel Island samples. Counts of some of the snails

and chitons were made at some sites as time allowed and are included in these tables. No analysis of these data has been done.

General species lists for all sites are presented in Appendix C. The numbers of species found at a particular site is only a relative representation of that site's diversity. Because of variability in tidal exposure and the amount of time devoted to a search, comparisons between sites should be made with caution. The site with the most species recorded was Northwest-Talcott, Santa Rosa Island, a site with a variety of habitat types and many turnable rocks. Counts of shore birds and marine mammals present at each site are included in the species list (Appx. C.).

General surveys of South Point on Santa Rosa Island, Punta Arena on Santa Cruz Island, Leuzarder Point on San Miguel, and the Smuggler's Cove-Yellowbanks area on Santa Cruz were made in 1998 and notes on these areas are included in the trip reports (Appendix D). These sites are not usually visited during yearly monitoring but add to the general knowledge of habitat characteristics and species distributions. Of particular note was the rich algal flora and large *Lottia gigantea* at South Point, Santa Rosa Island. *Neorhodomela larix*, a red alga not previously recorded on Santa Cruz Island was found at Punta Arena. The Smuggler's Cove-Yellowbanks area was surveyed for baseline data as the most accessible tidepool area of East Santa Cruz Island opened to public visitation in 1997. *Stenoplax conspicua*, a chiton normally distributed further south, was found to be common at Yellowbanks and two were found during the fall sampling at Cat Rock.

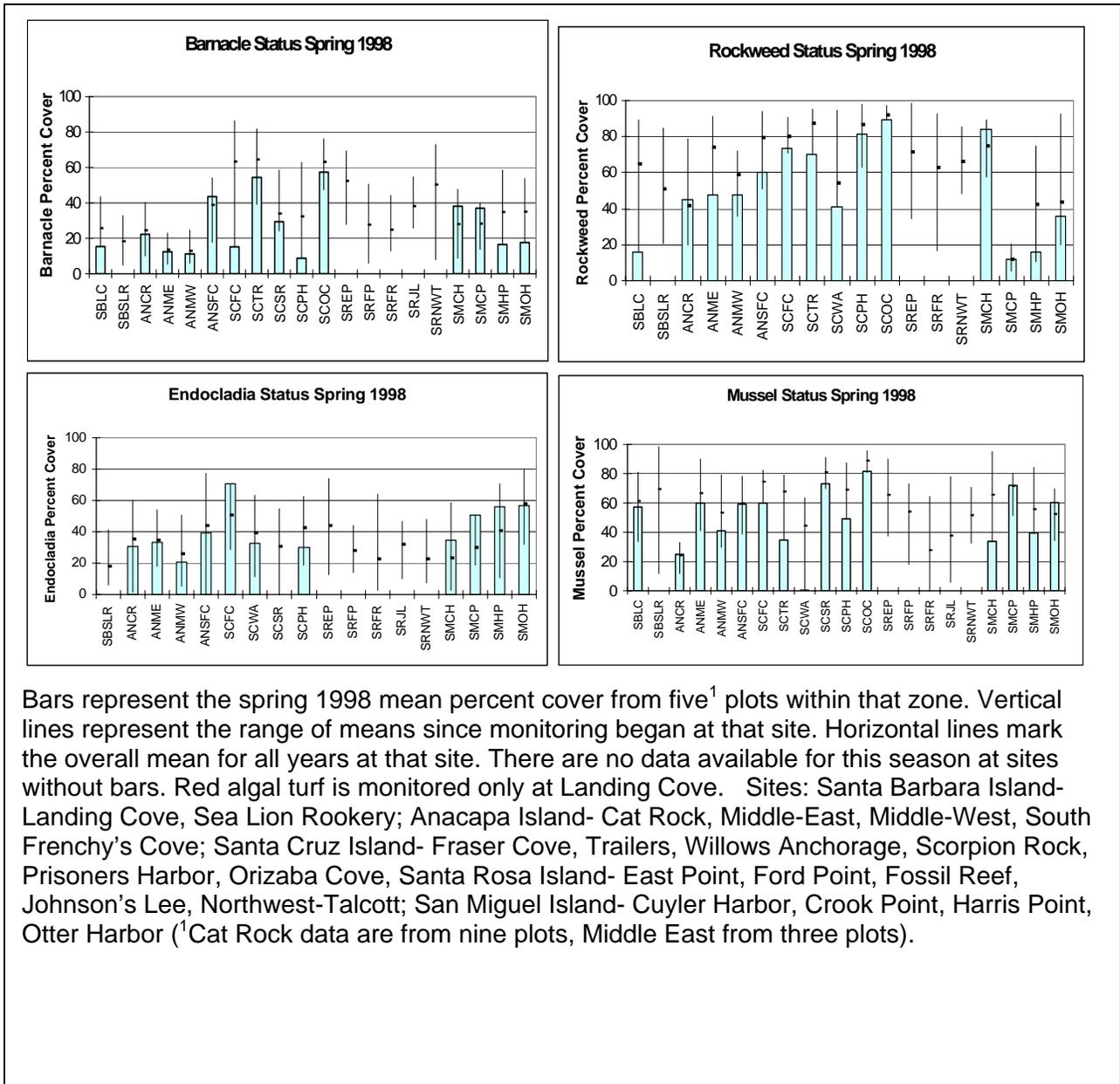
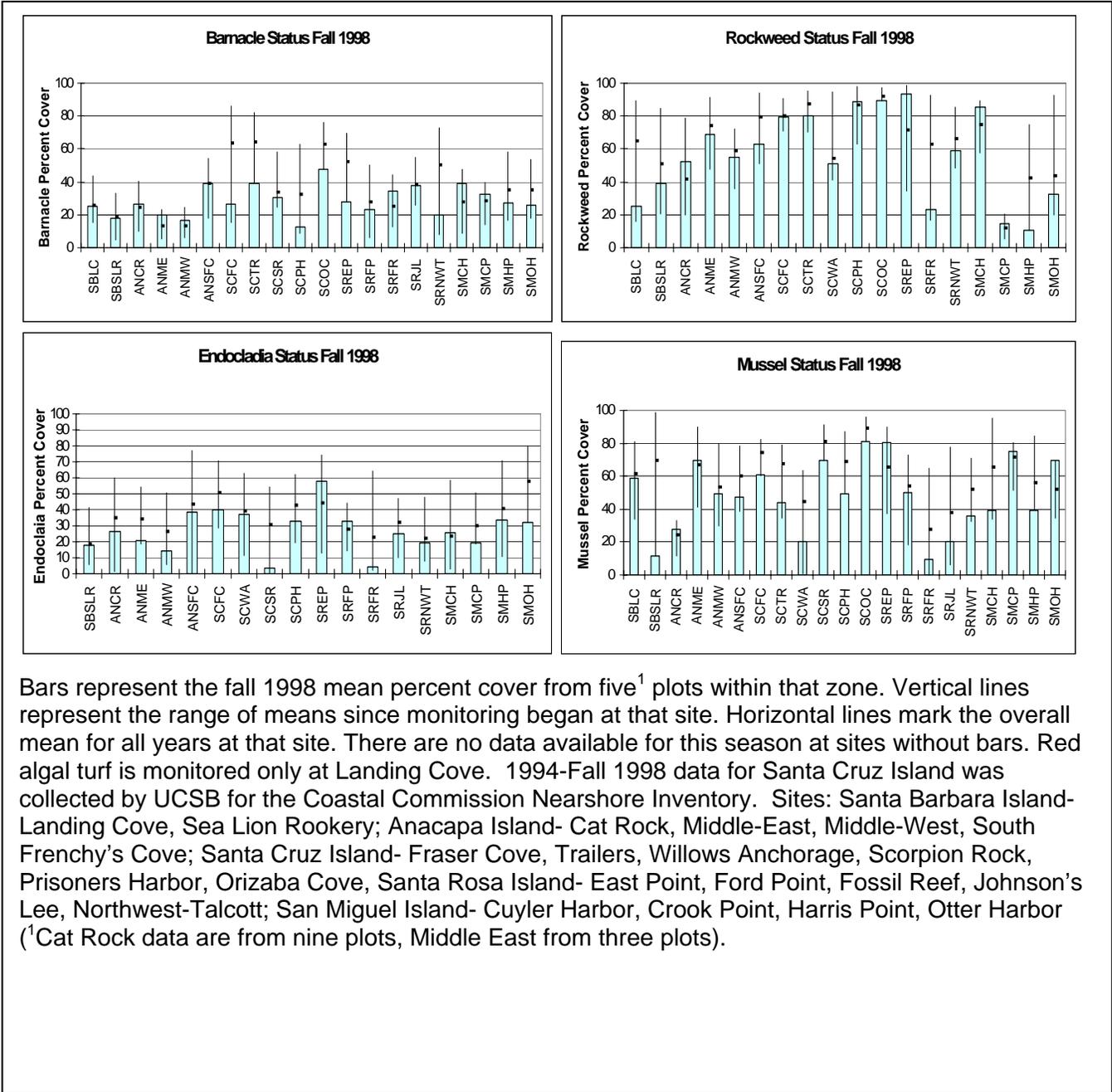
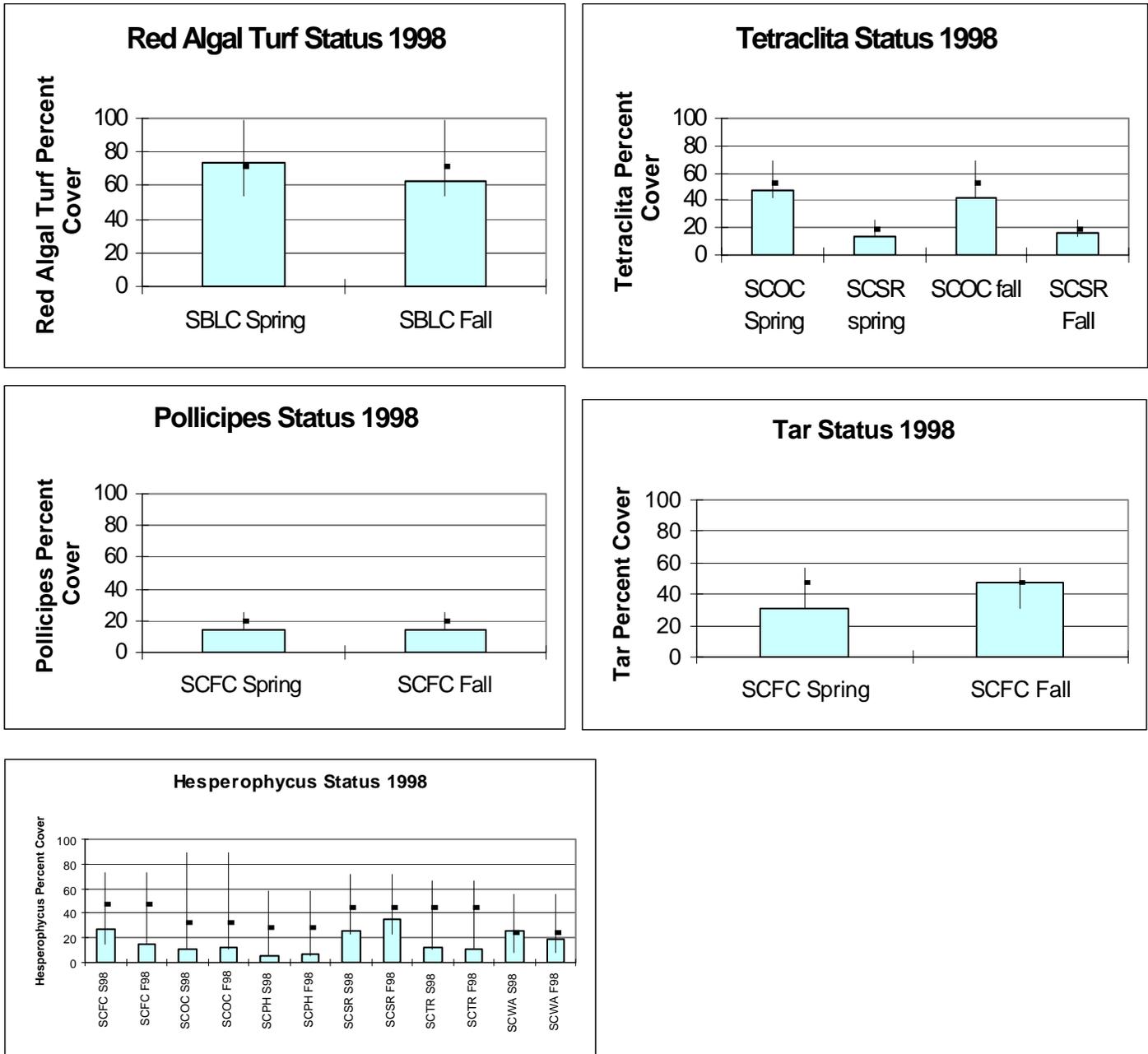


Figure 2 Percent cover of Taxa within fixed plots by zone, spring 1998.



Bars represent the fall 1998 mean percent cover from five¹ plots within that zone. Vertical lines represent the range of means since monitoring began at that site. Horizontal lines mark the overall mean for all years at that site. There are no data available for this season at sites without bars. Red algal turf is monitored only at Landing Cove. 1994-Fall 1998 data for Santa Cruz Island was collected by UCSB for the Coastal Commission Nearshore Inventory. Sites: Santa Barbara Island-Landing Cove, Sea Lion Rookery; Anacapa Island- Cat Rock, Middle-East, Middle-West, South Frenchy's Cove; Santa Cruz Island- Fraser Cove, Trailers, Willows Anchorage, Scorpion Rock, Prisoners Harbor, Orizaba Cove, Santa Rosa Island- East Point, Ford Point, Fossil Reef, Johnson's Lee, Northwest-Talcott; San Miguel Island- Cuyler Harbor, Crook Point, Harris Point, Otter Harbor (¹Cat Rock data are from nine plots, Middle East from three plots).

Figure 3. Percent cover of taxa within fixed plots by zone, fall 1998



Bars represent the 1998 mean percent cover from five¹ plots within that zone. Vertical lines represent the range of means since monitoring began at that site. Horizontal lines mark the overall mean for all years at that site. There are no data available for this season at sites without bars. Red algal turf is monitored only at Landing Cove. Sites: Santa Barbara Island- Landing Cove, Santa Cruz Island- Fraser Cove, Trailers, Willows Anchorage, Scorpion Rock, Prisoners Harbor, Orizaba Cove (¹Cat Rock data are from nine plots, Middle East from three plots).

Figure 4. Percent cover of taxa within fixed plots by zone, (these zones were not represented at all sites) 1998

Black Abalone

Otter Harbor and Harris Point are the only two monitoring sites with more than a handful of black abalone remaining (Table 2). Neither site revealed more than 100 abalone found during extensive searching of the entire reef area. However, Leuzarder Point on southwest San Miguel Island, which is not a regular site but is known to harbor large numbers of abalone, was visited and 99 black abalone were measured (104 found). Under better tide and weather conditions in 1997, we measured 263 black abalone in the same area. Only the three San Miguel Island monitoring sites have any abalone present in the monitoring plots. Based on the monitoring plots, all sites have less than 1% of the 1985 baseline population of black abalone. Withering Syndrome was observed among all abalone populations on San Miguel Island.

Size distributions within plots at San Miguel Island shows that the black abalone are primarily small adults, probably over four years old (between 45-127 mm long) (Figure 5). The California Fish and Game biologists measured larger samples at two sites during the May monitoring with similar size ranges found (Haaker and Taniguchi 1998). Few juveniles were found, indicating that recruitment in recent years had been poor. Large abalone (over 140 mm) were found at both Harris Point and Leuzarder Point. These older abalone indicate that there may be some resistance to the disease.

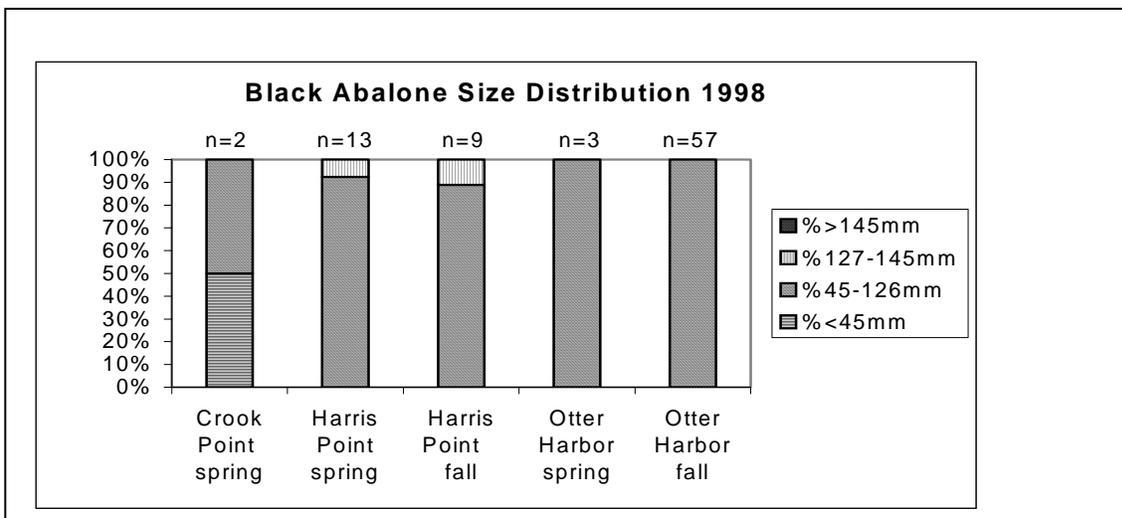


Figure 5. *Haliotis cracherodii* size distribution at San Miguel Island sites in 1998.

Table 2. Sea star and black abalone searches. (- indicates no plot or transect, nc indicate no count performed, PO= *Pisaster ochraceus*, PG= *P. giganteus*)

Site	Seastars in 30 min	Sea stars in transects (dimensions in m)	Abalone in plots	Abalone in timed search (30 min unless noted)
Smuggler's Cove 4/98	0	-	-	2 (general search)
Middle Anacapa 3/98	1 PO	-	0	0
Cat Rock 3/98	0	-	0	0
Otter harbor 5/98	Nc	-	3	52 (2 people x 1 hour)
Harris Point 5/98	Nc	3 PO	13	81 (2 x 1 hour), (3 in transect)
Crook Point 5/98	Nc	8 PO in plots	2	7
Cuyler Harbor 5/98	Nc	-	-	0
Landing Cove 10/98	Nc	9 PO (9x16)	-	
Sea Lion Rookery 10/98	Nc	-	0	0
Crook Point 11/98	Nc	-	0	2 (less than 30 min)
Otter Harbor 11/98	24 PO , 1 PG	-	2	55 (3 x 30 min) +24 outside search
Harris Point 11/98	Nc	3 PO (2x12)	9	4 in transect
Leuzarder Point 11/98	nc	-	-	104 (2 x 30 min)
Cuyler Harbor 11/98	5	-	-	5
Cat Rock 11/98	0	-	0	0
Willows Anch. 12/98	6 PO	-	-	0
Fraser Cove 12/98	Present (NC)	-	-	0
Trailer 12/98	2 PO	-	-	4
Johnson's Lee 1/99	276 PO	33 PO (10x2)	0	2
Northwest Talcott 1/99	0 PO , 1 PG	-	0	1
Fossil Reef 1/99	17 PO	29 PO (15x6)	0	13 (+8 outside search)
Ford Point 1/99	111 PO	-	0	7
East Point 1/99	26 PO	-	0	2

Seastars

Counts of seastars in either timed searches or transects are presented in table 2. Large numbers of *Pisaster ochraceus* were present at Johnson's Lee and Ford Point as has been the case for a number of years. Their presence at Johnson's lee has had a much greater impact on *Mytilus californianus* cover there than at Ford Point. Seastars were abundant at Landing Cove, however the transect counts there are often variable and were quite low in 1998. Heavy surge conditions in October prevented us from conducting a timed search of the reef there. Sea stars were abundant at Crook Point but heavy surge and insufficient time often preclude a count there. Eight sea stars were present inside abalone plots at Crook Point. Sea stars occur in moderate numbers at Otter Harbor.

Owl Limpets

Lottia gigantea were measured in fixed plots at Santa Rosa, San Miguel and Santa Cruz Islands and in selected at Anacapa Island. Combined size distributions are presented in figure 6. Size histograms for each site can be found in individual trip reports in Appendix D. *L. gigantea* were measured in a selected area at Leuzarder Point on San Miguel in May 1998 and are included in the spring San Miguel data (Figure 6). Owl limpet size increased as the density decreased at Santa Rosa Island as one might expect with less competition for food resources (figure 7). At San Miguel Island the sizes did not increase when the density decreased (figure 8). Aggregations of owl limpets were measured in three one-meter radius circle plots at Smugglers cove (the spring Santa Cruz Island sample figure 6).

Owl limpets at Fraser Cove were measured in both 1.0 m radius plots and 1.5 m radius plots (Table 3). Previous sampling at this site only used the larger radius plot. Because of the extra time involved and the use of a 1.0 m radius plot at all other sites, the decision was made to use 1.0 m radius in the future there and this sample serves as a comparison for the two areas. Densities in the smaller plots were slightly greater in all but one plot. However, data are not significant ($\alpha=0.06$) between densities in the 1.0 m and 1.5 m radius plots and they yield a regression coefficient (r^2) of 0.79 ($\alpha=0.04$). Plots were established around the highest aggregations for limpets, so it is not surprising that the smaller plots are located on the highest concentration.

Table 3. Comparison of Owl limpet plot sizes Fraser Cove, December 1998.

		1.0 m radius	1.5 m radius
plot 1	count	20	40
plot 1	density	6.37	5.66
plot 2	count	16	44
plot 2	density	5.09	6.23
plot 3	count	40	75
plot 3	density	12.73	10.61
plot 4	count	33	54
plot 4	density	10.51	7.64
plot 5	count	35	56
plot 5	density	11.14	7.92

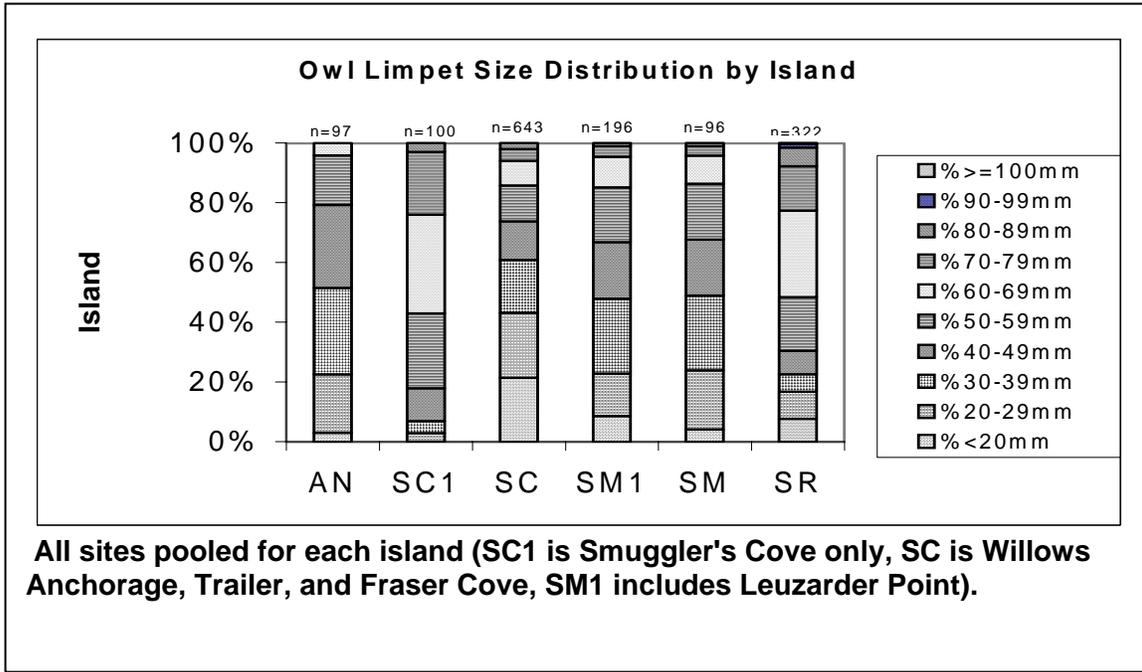


Figure 6. *Lottia gigantea* size distribution by island

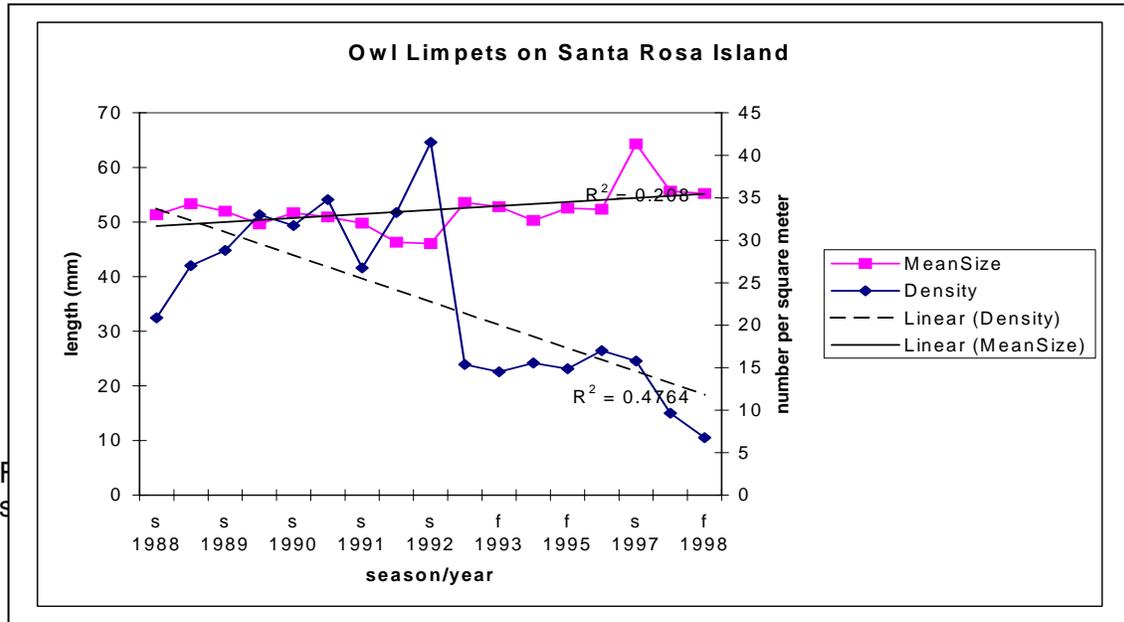


Figure 7. *Lottia gigantea* density and mean size at Santa Rosa Island 1988-1998, all sites combined.

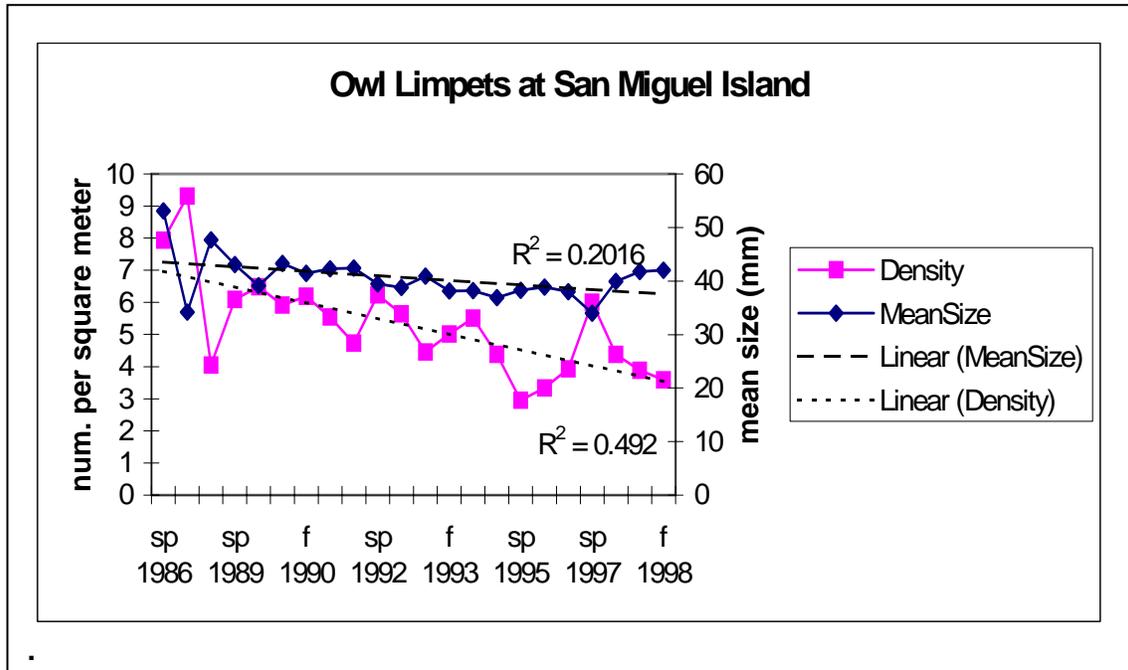


Figure 8. *Lottia gigantea* density and mean size at San Miguel Island, 1986-1998. All sites combined

Surfgrass

Surfgrass transects are established at only two sites, both on Santa Cruz Island. The 1994-1998 data still need to be incorporated into the CINP database. Engle *et al.* (*in prep*) found some seasonal variation in the surfgrass transects but little inter-annual variation. Results from the December 1998 sampling are presented in tables 4 and 5.

Table 4. Percent cover in surfgrass transects at Fraser Cove, Santa Cruz Island. December 18, 1998

Taxa	Transect 1	Transect 2	Transect 3
Rock	6	2	2
Sand	0	3	2
Ulva	0	0	4
Egregia	22	8	0
Endocladia	0	0	1
Corallina vancouveriensis	15	6	4
Erect coralline algae	0	5	2
Encrusting Coralline	3	1	0
Chondracanthus canaliculatus	3	2	4
Prionitis sp.	0	5	0
Gelidium coulteri	1	1	0
Gastroclonium	0	2	2
Other red algae	0	2	3
Phyllospadix sp.	44	60	76
Mytilus californianus	4	2	0
Anthopleura elegantissima	1	0	0
Phragmatopoma	0	1	0
Chthamalus	1	0	0

Table 5. Percent cover in surfgrass transects at Trailer, Santa Cruz Island December 19, 1998

Taxa	Transect 1	Transect 2	Transect 3
Rock	0	3	1
Sand	1	0	0
Egregia	16	17	0
Corallina vancouveriensis	4	1	8
Erect coralline algae	0	0	1
Encrusting Coralline	0	0	2
Chondracanthus canaliculatus	0	2	3
Chondracanthus spinosus	3	0	0
Mastocarpus sp.	0	5	0
Prionitis sp.	4	0	0
Gastroclonium	0	1	0
Other red algae	0	1	1
Phyllospadix sp.	70	66	83
Mytilus californianus	2	2	0
Phragmatopoma	0	2	0
Tetraclita	0	0	1

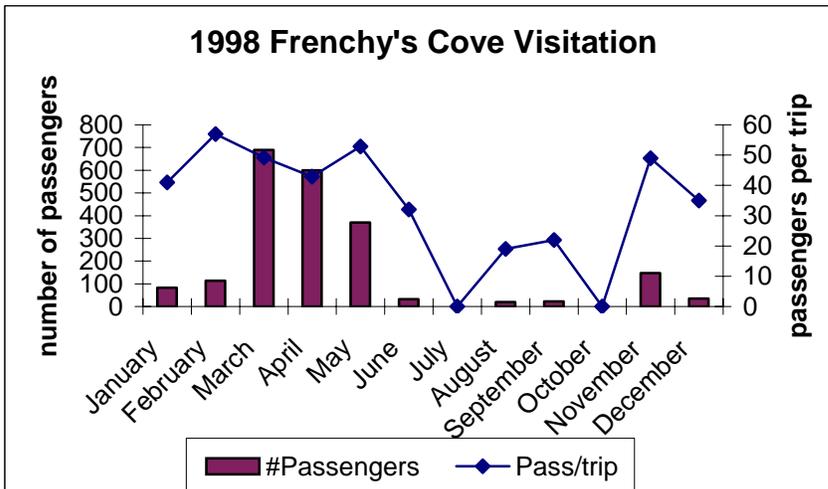
Visitation monitoring

Visitation numbers for Frenchy's Cove are available from monthly reports based on concessionaire reporting (Table 6). Anchorage counts of Frenchy's Cove are from counts conducted by NPS staff stationed on Anacapa Island as part of the daily routine and include the number of both private and commercial fishing and passenger boats observed in the anchorage between 1200 and 1300hrs each day. The anchorage count is the number of visitors based on the number and type of boats anchored at Frenchy's Cove and is given as an indication of the potential visitation from private boaters there. There are no records available for the number of private boaters actually going ashore there. Most of the visitation occurred between February and May with 84% (1,733 of 2,110) of the visitors landing in those months.

Table 6. Visitors to Frenchy's Cove, Anacapa Island in 1998. (See text for data sources)

YEAR	MONTH	#PASSENGERS	#TRIPS	Pass/trip	Anchorage count
1998	January	82	2	41	33
1998	February	114	2	57	3
1998	March	689	14	49	17
1998	April	600	14	43	22
1998	May	370	7	53	25
1998	June	32	1	32	44
1998	July	0	0	0	151
1998	August	19	1	19	159
1998	September	22	1	22	47
1998	October	ND	ND	-	57
1998	November	147	3	49	84
1998	December	35	1	35	3
	Total	1210	59	36	645

Figure 9. Visitation at Frenchy's Cove, Anacapa Island by month in 1998. Island Packers Company visitation figures only (see text).



Trip reports

Summaries of work performed, data collected, weather conditions, and natural and history observations for each sampling event are presented in the individual trip reports in Appendix D. Explanations for missing or incomplete data are usually found here.

Discussion

One of the largest El Niño events on record occurred between May 1997 and August 1998 (McPhaden 1999). Water temperatures well above normal were recorded during this period but increased rainfall and large storm waves were also seen. During January, Santa Barbara Island was particularly hard hit with waves breaking over the top of the landing (over 6 m above sea level), damaging the boathouse and tearing out planks held in place by 25 cm nails. To assess the damage, we surveyed Landing Cove, Santa Barbara Island in February. Surprisingly little damage to the intertidal zone at Landing Cove was evident from the large waves. Some small pieces (<100 cm²) of the reef had broken, leaving clean rock behind. Some surfgrass and mussels were apparently torn out. Mussels were apparently torn out at Sea Lion Rookery where cover was only 12%, about half of the 1997 cover and down from the overall mean for this site of 70% mussel cover. Patches were opened in the mussel beds at Middle Anacapa and at Willows Anchorage, Santa Cruz Island, also apparently damaged by storm waves.

Other less noticeable changes from El Niño events include an overall decline in the numbers of purple sea urchins, *Strongylocentrotus purpuratus* from adjacent subtidal habitats. Sea urchins at the islands have been subjected to a wasting syndrome/disease (Richards and Kushner 1992) causing lesions, loss of spines and eventually death in some cases. Though recruitment has been high in recent years, the numbers of adult sea urchins has declined in many areas (Kushner *et al.* 1999). Sea urchin densities or sizes are not monitored in the rocky intertidal program, but their decline was noticeable to observers conducting the monitoring. Sea stars continue to be present at many sites, without the noticeable occurrence of the wasting disease affecting them so noticeably as it did after the 1983-1984 El Niño (Richards *et al.* 1997).

Endocladia declined dramatically in 1984 at Anacapa Island following the 1983/1984 El Niño (Richards 1994). This was not the case in 1998 when Endocladia cover was near

the overall mean (for all years) at most sites. Generally, there was no apparent change to the percent cover of any of the monitored taxa attributable to the El Niño event. During the 1997-1998 period, many warm water species were found subtidally throughout the southern California Bight (Richards and Engle *in prep*, Engle and Richards *in prep*). However, the only new intertidal specimen found that would indicate an influx of southern biota was the chiton, *Stenoplax conspicua*, found at East Santa Cruz and Cat Rock, Anacapa. *S. conspicua* is rare at the islands, though it was recorded at Willows Anchorage by Seapy and Littler (1987).

The rocky intertidal features and their diversity of life are a specific attraction at Channel Islands National Park. The tidepools at south Frenchy's Cove, Anacapa Island are both the closest to mainland ports and easiest to access with the protected anchorage and gravel beach on the north side of the island. As a result, Frenchy's Cove receives more visitors than any other rocky intertidal area in the park. Visitation figures show that over 2,110 visitors landed at Frenchy's Cove in 1998, of which 84% landed during the months of February-May. These months are typically the most popular times to visit because the daytime low tides are a good time for school groups to visit. The overall visitation to Frenchy's was about a third lower than 1997. Weather and timing of the tides greatly influence the visitation of this site. The opening of East Santa Cruz Island for public visitation may have also had an effect. Intertidal areas on other islands are visited, particularly East Point, Santa Rosa Island, however Frenchy's Cove is the only area easily visited in a day trip.

Impacts from visitation have been a concern since the 1970s (Littler 1978). Experimental scrape and trample plots at Cat Rock still show lower cover of monitored target species in all zones except barnacles. Experimental plots were scraped clear of macro-organisms, stepped on (trample plots) or left as controls in 1982. In each zone the target species had less cover in the experimental plots than in the control plots, indicating that there has not been full recovery after 16 years. These results are confounded somewhat by high variability within plots and things like the occurrence of over 50% cover by rockweed (mostly *Hesperophycus californica*) in the barnacle zone scrape plots. Further analysis is necessary and will be addressed at a later date.

Two months (March and April) each saw over 600 visitors ashore at Frenchy's Cove (Table 6). Experimental data show that visitation greater than or equal to 643 visitor hours per month will cause significant impacts to the Anacapa rocky intertidal organisms that will require 1-9 years to recover (VTN, Oregon 1984). Setting a carrying capacity 22% below that threshold would mean allowing 500 visitors per month to explore the tidepools at Frenchy's Cove with little impairment. The highest visitation month in 1998 was March, with 689 visitors (Table 6). Additionally, there are private boaters and some NPS personnel visiting this area. While the average month sees little more than 100 visitors, the high visitation in spring months may be causing damage to some organisms. The number of private boaters ashore is probably low, though these visitors are not escorted and do not generally receive any education on tidepool etiquette. For comparison, the average number of passengers per trip in 1997 was 33, slightly less than 1998; however, there was often more than 1 boatload ashore at one time.

The addition of East Santa Cruz Island to the park holdings brought about the possibility of increased visitation to the Smugglers Cove area. Island Packers Company inquired about landing school groups in the intertidal at Smuggler's Cove when Northwest winds prevent landing at Frenchy's Cove on Anacapa. We conducted surveys to inventory the area and collect baseline information from the north side of Smugglers Cove beach south to Yellowbanks where the island curves west. Previously, Ron Massengill, a ranger assigned to East Santa Cruz Island, provided verbal reports on species that he had encountered. Other surveys in this area include a comprehensive beach survey in 1995 (Engle *et al. In prep*). One of the findings from that report was that grunion use the beach at Smuggler's for spawning. We found the area to be biologically rich. The richest area, on the north side of the cove, is composed primarily of large boulders covered by diatoms or other micro-algae making them very slippery. Because of the difficulty of walking on the slippery boulders, visitors may not enjoy this site as much as Anacapa Island. To the south, many of the rocks were covered by sand and this may have a negative influence on the biodiversity of this area. It was apparent that winter storms had recently deposited material in the intertidal, washed down from the island streams. In December 1997, a storm cell dropped approximately 30 cm of rain in just 12 hours. A flash flood washed out a number of buildings and equipment at Scorpion Anchorage across the island (Anon. 1998). Several stream mouths near Yellowbanks were cut into

steep gravel banks up to two or more meters deep. Considerable sediment was probably deposited into the intertidal zone and likely affected what we found there.

Besides the regular monitoring sites, brief surveys were done at two other sites. We measured abalone and owl limpets at Leuzarder Point on San Miguel Island because this site was known to have high numbers of black abalone. Fewer abalone were found in May 1998 (104) than in November 1997 (263). Conditions in 1998 were less than optimal with rain and a higher tide, however fresh shells and at least three withered abalone were found indicating that Withering Syndrome was affecting this population. On Santa Cruz Island we casually investigated the intertidal reef between Malva Real and Punta Arena. An expansive flat rocky bench extends unbroken over most of this area. Large stretches of *Pelvetia* and *Hesperophycus* were present. *Neorhodomela larix*, a red alga, uncommon south of Point Conception was found there. This may be a new record for Santa Cruz Island, though a collection was not made. *Tegula funebris* and *Mytilus californianus* were noted as especially common. *Phragmatopoma californica* was present but not abundant. No live abalone were seen, but one fresh black abalone shell was found.

Haliotis cracherodii populations continue to decline. Withered abalone were found at most of the sites with more than a few abalone. At San Miguel Island, we noted whether the abalone were in groups (within 2 meters of others) and found that the majority were solitary. Black abalone are normally a highly gregarious species, once stacked two or three deep on top of each other. Changes in the intertidal zone since abalone populations declined were very noticeable. Red algae dominated the zones where black abalone once thrived. One of the barnacle plots at Otter Harbor was near an abalone aggregation. After the abalone disappeared, the plot went from bare rock and barnacles to nearly complete cover of red algae (*Corallina vancouverensis*, *Mastocarpus papillatus*, and *Mazzaella affinis*). *Phragmatopoma californica* is a common invader into the spaces vacated by the abalone.

Lottia gigantea densities have been declining steadily at both Santa Rosa and San Miguel Islands. Owl limpet plots at both Johnson's Lee and Ford Point had some increase in density through 1992 followed by a precipitous decline (figure 8). The decline at Northwest-Talcott was more similar to Otter Harbor, San Miguel Island (figure 7). *L.*

gigantea were monitored in abalone plots at Crook Point but the plots became covered with *Phragmatopoma californica* after the abalone population declined and we suspect that the limpets cannot compete for space with the worms. The reason for the limpet declines elsewhere is not obvious. The limpets appeared healthy and the immediate environment around the plots had not obviously changed. The plots were established around the highest concentrations of limpets so some decline seems logical if the population was at a maximum. The plots seem to be representative in that the declines appear to be happening over the entire reef at these sites.

Mapping the sites at Santa Barbara Island with Differential-GPS went well. Individual plot corners can be mapped but this is probably not necessary for a site map. Point recordings were used to map each plot and the reef outlines and outstanding features were mapped using the line function; all giving satisfactory results.

Channel Islands National Park continues to participate in the Multi-Agency Rocky Intertidal Network (MARINE). MARINE continues to work towards a more standardized monitoring protocol and database to aid the compatibility of the data. The goal is to allow broader scale analysis of data throughout southern California. The group has also been tackling issues of expanding the monitoring. The Mineral Management Service has an Internet website describing MARINE and the participants at <http://www.mms.gov/omm/pacific/enviro/mint.htm>.

Recommendations for Monitoring:

Continued monitoring of the Santa Cruz Island sites is important to the monitoring program. Oil spill models indicate that Santa Cruz Island is at greatest risk from a spill. This island also spans much of the transition zone providing a better view of the biogeographic changes in the park. Further consideration should be given to establishing a site at Smugglers Cove/Yellowbanks area.

Channel Islands National Park should continue to support and work with the Multi-Agency Rocky Intertidal Network (MARINE) to provide a broader frame of reference to the park resources. Participation in MARINE has helped prepare for the protocol performance review workshop planned for 2000 by formalizing and standardizing protocol for sampling seastars and motile invertebrates. At the June 20, 2000 meeting of

the MARINE science panel the following recommendations were made. For seastars, timed searches should be done every sampling (that conditions allow) at every site where plots do not exist. At sites where seastars are regularly found in abundance, it is recommended that three band-transects or irregular plots be established within the seastar zone. Fixed plots may not always be practical and stratified-random band-transects may be used. The following draft protocol for motile invertebrate counts was submitted to MARINE: Within each fixed 50x75 cm photoplot, count all *Tegula*, predatory snails (such as *Nucella*, *Ocenebra*, and *Acanthina*), Chitons (*Lepidochitona*, *Nuttalina*, *Mopalia*), *Lottia gigantea*, *Fissurella*, and sea urchins. Count crabs, keeping track of shore crabs to avoid double counts as they move around. Count limpets in barnacle plots (not identified to species except *Lottia gigantea*), and estimate juvenile limpets. (Only count limpets over 1 cm in size in other zones). Estimate *Littorina* spp. Counts are done after photographing plots, as algae need to be moved. Sampling is non-destructive, mussels and other organisms are gently moved aside as far as attachments will allow, but are not removed.

Much of the metadata for the database have been completed, though efforts to fill in gaps in the early data are ongoing. Renewed efforts to scan all slides for archiving are needed. Slides have not been archived since spring 1997. Species list information needs to be added to Access database and GIS mapping of sites needs to be completed. GIS mapping continues with only Cat Rock and Middle East Anacapa still to be mapped.

It is recommended that the surveys done for Bureau of Land Management Outer Continental Shelf (BLM-OCS) studies in the late 1970s be repeated. These surveys included exhaustive species list work. Repeating these surveys would allow us to look at shifts in zonation and biogeography. CINP needs to provide financial and logistical support to get these surveys completed.

Recommendations for Management:

- Continue collaboration with other agencies-including support of MARINE.
- Limit visitation to the Frenchy's Cove area to 500 visitors per month.
- Prepare specific plan for assessment of oil spills at the islands (see Richards1998).

- Provide adequate funding to support the marine monitoring programs in the park. Increasing visitation and proposals to establish marine no-take areas add to the need and value of this and other monitoring programs in the park. With the accretion of duties by the staff and the addition of Santa Cruz Island, the need for an additional Marine Biologist to the staff is apparent to complete the monitoring and maintain a high level of confidence in the data.

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Appendix A. Photoquadrat Data

Percent cover of selected taxa in fixed 50 x 75 cm photoquadrats based on 100 points per plot. For reporting purposes, several taxa, though scored separately, were lumped together into larger categories for comparison with past reports. *Tetraclita rubescens* and the acorn barnacles, *Balanus glandula* and *Chthamalus fissus/dalli* are combined in the Barnacle category. *Pollicipes polymerus* is included as Miscellaneous Animals in these tables. *Pelvetia compressa* and *Hesperophycus californicus* are combined as Rockweed. Red algal turf includes *Chondracanthus (Gigartina) canaliculatus*, *Gelidium* sp. and *Pterocladia capillacea*.

Percent Cover of Index Species Cat Rock, Anacapa Island - Spring 1998 (4/23/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-wood	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	31	34	30	28	7	0	1	0	0	0	100
	32	39	13	28	14	0	6	0	0	0	100
	33	20	8	3	66	0	3	0	0	0	100
	35	36	44	10	9	0	1	0	0	0	100
	36	24	4	4	54	0	14	0	0	0	100
	37	24	10	11	46	0	9	0	0	0	100
	38	41	54	3	2	0	0	0	0	0	100
	39	61	32	3	3	0	1	0	0	0	100
	135	20	6	3	64	0	7	0	0	0	100
	Mean	33.22	22.33	10.33	29.44	.00	4.67	.00	.00	.00	.00
StDev	13.20	18.28	10.49	27.43	.00	4.72	.00	.00	.00	.00	.00
Endocladia	13	17	12	47	0	1	20	3	0	0	100
	14	20	13	20	0	2	37	8	0	0	100
	19	17	12	34	33	0	3	1	0	0	100
	51	7	5	8	0	0	78	2	0	0	100
	52	8	6	45	0	3	37	1	0	0	100
	54	24	7	15	0	0	45	9	0	0	100
	212	14	4	38	0	1	42	1	0	0	100
	467	20	12	34	0	2	31	1	0	0	100
	492	28	3	37	9	0	19	4	0	0	100
	Mean	17.22	8.22	30.89	4.67	1.00	34.67	3.33	.00	.00	.00
StDev	6.87	3.99	13.51	11.03	1.12	20.99	3.12	.00	.00	.00	.00
Rockweed	2	18	4	14	49	0	15	0	0	0	100
	3	15	12	12	56	0	5	0	0	0	100
	4	18	4	10	56	0	12	0	0	0	100
	5	15	22	27	4	1	30	1	0	0	100
	6	10	14	0	73	0	3	0	0	0	100
	8	8	2	1	89	0	0	0	0	0	100
	9	5	2	10	77	0	5	1	0	0	100
	10	8	0	4	73	0	12	3	0	0	100
	55	26	14	15	0	1	42	2	0	0	100
	Mean	13.67	8.22	10.33	53.00	.22	13.78	.78	.00	.00	.00
StDev	6.58	7.51	8.29	31.46	.44	13.82	1.09	.00	.00	.00	.00
Mussels	56	16	33	0	0	18	26	7	0	0	100
	164	4	28	1	0	21	38	8	0	0	100
	203	9	11	0	0	37	35	8	0	0	100
	204	4	5	0	0	31	58	2	0	0	100

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468	27	0	0	0	16	46	11	0	0	100
470	34	17	3	0	13	31	2	0	0	100
471	29	11	3	0	9	46	2	0	0	100
472	11	19	0	0	47	19	4	0	0	100
473	28	4	0	0	32	35	1	0	0	100
Mean	18.00	14.22	.78	.00	24.89	37.11	5.00	.00	.00	100.00
StDev	11.64	11.10	1.30	.00	12.54	11.69	3.57	.00	.00	.00

Percent Cover of Index Species Middle-East, Anacapa Island - Spring 1998 (3/9/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	243	26	20	8	0	0	46	0	0	0	100
	244	58	7	25	1	0	7	2	0	0	100
	245	58	10	13	0	1	16	2	0	0	100
	Mean	47.33	12.33	15.33	.33	.33	23.00	1.33	.00	.00	100.00
	StDev	18.48	6.81	8.74	.58	.58	20.42	1.15	.00	.00	.00
Endocladia	240	15	0	47	12	0	25	1	0	0	100
	241	35	8	13	2	3	39	0	0	0	100
	242	28	2	40	7	0	23	0	0	0	100
	Mean	26.00	3.33	33.33	7.00	1.00	29.00	.33	.00	.00	100.00
	StDev	10.15	4.16	17.95	5.00	1.73	8.72	.58	.00	.00	.00
Rockweed	53	8	4	3	31	7	44	3	0	0	100
	237	7	2	2	65	0	24	0	0	0	100
	469	8	6	1	48	2	35	0	0	0	100
	Mean	7.67	4.00	2.00	48.00	3.00	34.33	1.00	.00	.00	100.00
	StDev	.58	2.00	1.00	17.00	3.61	10.02	1.73	.00	.00	.00
Mussels	476	7	2	0	0	58	33	0	0	0	100
	477	20	4	0	0	61	15	0	0	0	100
	478	4	2	0	0	61	32	1	0	0	100
	Mean	10.33	2.67	.00	.00	60.00	26.67	.33	.00	.00	100.00
	StDev	8.50	1.15	.00	.00	1.73	10.12	.58	.00	.00	.00

**Percent Cover of Index Species
Middle-West, Anacapa Island - Spring 1998 (3/9/98)**

Zone	Plot	Bare Rock	Barnacle	Endo- cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	447	34	15	35	0	0	12	4	0	0	100
	448	33	17	16	0	0	34	0	0	0	100
	449	34	6	9	0	0	51	0	0	0	100
	450	27	6	11	3	0	53	0	0	0	100
	451	43	12	22	0	1	20	2	0	0	100
	Mean	34.20	11.20	18.60	.60	.20	34.00	1.20	.00	.00	.00
StDev	5.72	5.07	10.45	1.34	.45	18.23	1.79	.00	.00	.00	.00
Endocladia	457	27	1	14	0	8	49	1	0	0	100
	458	56	5	2	0	3	34	0	0	0	100
	459	25	1	13	0	2	59	0	0	0	100
	460	27	3	35	0	0	35	0	0	0	100
	461	25	0	40	8	0	27	0	0	0	100
	Mean	32.00	2.00	20.80	1.60	2.60	40.80	.20	.00	.00	.00
StDev	13.45	2.00	16.05	3.58	3.29	12.93	.45	.00	.00	.00	.00
Rockweed	452	29	5	10	54	0	2	0	0	0	100
	453	23	0	2	70	0	5	0	0	0	100
	454	27	10	0	0	12	48	3	0	0	100
	455	25	0	4	52	0	18	1	0	0	100
	456	26	0	1	61	3	9	0	0	0	100
	Mean	26.00	3.00	3.40	47.40	3.00	16.40	.80	.00	.00	.00
StDev	2.24	4.47	3.97	27.42	5.20	18.66	1.30	.00	.00	.00	.00
Mussels	462	29	3	2	0	21	42	3	0	0	100
	463	18	1	1	1	11	68	0	0	0	100
	464	24	3	1	0	37	33	2	0	0	100
	465	30	0	0	0	49	18	3	0	0	100
	466	5	0	0	0	87	8	0	0	0	100
	Mean	21.20	1.40	.80	.20	41.00	33.80	1.60	.00	.00	.00
StDev	10.23	1.52	.84	.45	29.56	23.20	1.52	.00	.00	.00	.00

Percent Cover of Index Species S Frenchy's Cove, Anacapa Island - Spring 1998 (3/10/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	249	38	54	6	0	0	0	1	1	0	100
	250	41	43	5	0	0	7	2	2	0	100
	251	41	43	1	0	0	10	5	0	0	100
	252	55	34	1	0	0	3	5	2	0	100
	253	45	44	3	0	0	4	4	0	0	100
	Mean	44.60	43.60	3.20	.00	.00	4.80	3.40	1.00	.00	100.00
StDev	6.63	7.09	2.28	.00	.00	3.83	1.82	1.00	.00	.00	
Endocladia	154	54	13	24	2	0	5	2	0	0	100
	155	46	5	34	10	0	2	3	0	0	100
	256	50	1	34	2	0	11	2	0	0	100
	257	32	0	61	0	0	5	2	0	0	100
	258	21	1	44	34	0	0	0	0	0	100
	Mean	40.60	4.00	39.40	9.60	.00	4.60	1.80	.00	.00	100.00
StDev	13.74	5.39	13.99	14.17	.00	4.16	1.10	.00	.00	.00	
Rockweed	259	5	0	0	83	0	12	0	0	0	100
	260	23	13	3	35	0	26	0	0	0	100
	261	7	0	0	85	0	8	0	0	0	100
	262	55	11	0	13	0	19	2	0	0	100
	263	10	0	0	86	0	4	0	0	0	100
	Mean	20.00	4.80	.60	60.40	.00	13.80	.40	.00	.00	100.00
StDev	20.78	6.61	1.34	34.14	.00	8.79	.89	.00	.00	.00	
Mussels	201	0	0	0	0	31	69	0	0	0	100
	202	0	0	0	0	57	43	0	0	0	100
	264	2	0	0	0	69	28	1	0	0	100
	265	3	0	0	0	63	34	0	0	0	100
	266	7	0	0	0	76	16	1	0	0	100
	Mean	2.40	.00	.00	.00	59.20	38.00	.40	.00	.00	100.00
StDev	2.88	.00	.00	.00	17.27	19.91	.55	.00	.00	.00	

Percent Cover of Index Species Crook Point, San Miguel Island - Spring 1998 (5/30/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	137	71	28	0	0	0	1	0	0	0	100
	147	61	39	0	0	0	0	0	0	0	100
	148	39	61	0	0	0	0	0	0	0	100
	149	75	13	9	0	3	0	0	0	0	100
	495	49	44	7	0	0	0	0	0	0	100
	Mean	59.00	37.00	3.20	.00	.60	.20	.00	.00	.00	.00
StDev	15.03	17.93	4.44	.00	1.34	.45	.00	.00	.00	.00	.00
Endocladia	386	28	1	62	3	0	6	0	0	0	100
	387	26	0	54	0	0	16	4	0	0	100
	388	40	1	57	2	0	0	0	0	0	100
	389	22	0	51	4	21	0	2	0	0	100
	390	51	4	28	2	7	5	3	0	0	100
	Mean	33.40	1.20	50.40	2.20	5.60	5.40	1.80	.00	.00	.00
StDev	11.91	1.64	13.16	1.48	9.13	6.54	1.79	.00	.00	.00	.00
Rockweed	396	41	5	24	13	8	4	5	0	0	100
	397	19	0	1	1	24	55	0	0	0	100
	398	31	3	7	19	10	24	6	0	0	100
	399	47	0	0	6	21	23	3	0	0	100
	400	20	2	49	22	0	7	0	0	0	100
	Mean	31.60	2.00	16.20	12.20	12.60	22.60	2.80	.00	.00	.00
StDev	12.44	2.12	20.71	8.76	9.84	20.26	2.77	.00	.00	.00	.00
Mussels	381	27	2	0	0	54	11	6	0	0	100
	382	2	0	0	0	95	3	0	0	0	100
	383	12	0	0	0	79	9	0	0	0	100
	384	9	1	0	0	74	9	7	0	0	100
	385	17	3	0	0	58	1	21	0	0	100
	Mean	13.40	1.20	.00	.00	72.00	6.60	6.80	.00	.00	.00
StDev	9.34	1.30	.00	.00	16.60	4.34	8.58	.00	.00	.00	.00

Percent Cover of Index Species Cuyler Harbor, San Miguel Island - Spring 1998 (5/31/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	416	44	55	0	0	0	0	0	1	0	100	
	417	46	53	0	0	0	0	0	1	0	100	
	418	52	48	0	0	0	0	0	0	0	100	
	419	85	15	0	0	0	0	0	0	0	100	
	420	76	20	4	0	0	0	0	0	0	100	
	Mean	60.60	38.20	.80	.00	.00	.00	.00	.40	.00	.00	100.00
	StDev	18.68	19.15	1.79	.00	.00	.00	.00	.55	.00	.00	.00
Endocladia	411	60	1	25	0	5	5	4	0	0	100	
	412	44	35	10	0	6	5	0	0	0	100	
	413	40	1	28	27	0	4	0	0	0	100	
	414	25	0	71	0	0	4	0	0	0	100	
	415	53	3	38	0	0	6	0	0	0	100	
	Mean	44.40	8.00	34.40	5.40	2.20	4.80	.80	.00	.00	.00	100.00
StDev	13.35	15.13	22.79	12.07	3.03	.84	1.79	.00	.00	.00	.00	
Rockweed	406	22	2	4	57	0	9	6	0	0	100	
	407	6	0	0	91	0	3	0	0	0	100	
	408	8	0	0	90	0	2	0	0	0	100	
	409	4	0	0	94	0	2	0	0	0	100	
	410	11	0	0	88	0	1	0	0	0	100	
	Mean	10.20	.40	.80	84.00	.00	3.40	1.20	.00	.00	.00	100.00
StDev	7.09	.89	1.79	15.25	.00	3.21	2.68	.00	.00	.00	.00	
Mussels	401	58	9	0	0	1	16	16	0	0	100	
	402	2	0	0	0	70	21	7	0	0	100	
	403	18	1	0	0	67	5	9	0	0	100	
	404	56	7	0	0	15	6	16	0	0	100	
	405	60	3	1	0	16	10	10	0	0	100	
	Mean	38.80	4.00	.20	.00	33.80	11.60	11.60	.00	.00	.00	100.00
StDev	26.93	3.87	.45	.00	32.24	6.80	4.16	.00	.00	.00	.00	

Percent Cover of Index Species Harris Point, San Miguel Island - Spring 1998 (5/29/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	436	54	14	0	0	0	32	0	0	0	100
	437	37	13	0	0	14	31	5	0	0	100
	438	68	12	2	0	0	18	0	0	0	100
	439	68	4	12	0	8	7	1	0	0	100
	440	60	40	0	0	0	0	0	0	0	100
	Mean	57.40	16.60	2.80	.00	4.40	17.60	1.20	.00	.00	100.00
StDev	12.84	13.67	5.22	.00	6.39	14.22	2.17	.00	.00	.00	
Endocladia	431	38	2	48	1	10	1	0	0	0	100
	432	20	5	69	0	0	6	0	0	0	100
	433	5	0	94	0	0	1	0	0	0	100
	434	56	0	39	2	0	3	0	0	0	100
	435	29	0	29	39	0	3	0	0	0	100
	Mean	29.60	1.40	55.80	8.40	2.00	2.80	.00	.00	.00	100.00
StDev	19.14	2.19	25.96	17.13	4.47	2.05	.00	.00	.00	.00	
Rockweed	421	54	0	35	11	0	0	0	0	0	100
	422	59	0	16	11	0	13	1	0	0	100
	423	41	0	54	0	0	5	0	0	0	100
	424	59	0	8	33	0	0	0	0	0	100
	425	74	0	0	24	0	2	0	0	0	100
	Mean	57.40	.00	22.60	15.80	.00	4.00	.20	.00	.00	100.00
StDev	11.84	.00	21.84	12.83	.00	5.43	.45	.00	.00	.00	
Mussels	426	25	1	0	0	46	24	4	0	0	100
	427	55	6	5	0	26	8	0	0	0	100
	428	46	5	1	0	45	3	0	0	0	100
	429	54	6	0	0	37	3	0	0	0	100
	430	28	4	0	0	44	20	4	0	0	100
	Mean	41.60	4.40	1.20	.00	39.60	11.60	1.60	.00	.00	100.00
StDev	14.26	2.07	2.17	.00	8.38	9.81	2.19	.00	.00	.00	

Percent Cover of Index Species Otter Harbor, San Miguel Island - Spring 1998 (5/27/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	370	21	11	0	0	0	68	0	0	0	100
	371	5	11	0	0	0	84	0	0	0	100
	372	63	37	0	0	0	0	0	0	0	100
	373	51	29	0	0	0	13	1	6	0	100
	374	3	0	0	0	0	96	1	0	0	100
	Mean	28.60	17.60	.00	.00	.00	52.20	.40	1.20	.00	100.00
StDev	27.18	15.03	.00	.00	.00	43.13	.55	2.68	.00	.00	
Endocladia	360	22	12	53	10	0	3	0	0	0	100
	361	12	1	51	33	0	3	0	0	0	100
	362	13	0	81	0	3	3	0	0	0	100
	363	5	0	35	46	0	14	0	0	0	100
	364	5	0	65	20	0	10	0	0	0	100
	Mean	11.40	2.60	57.00	21.80	.60	6.60	.00	.00	.00	100.00
StDev	7.02	5.27	17.15	18.23	1.34	5.13	.00	.00	.00	.00	
Rockweed	355	29	0	40	27	0	4	0	0	0	100
	356	5	0	11	64	0	20	0	0	0	100
	357	13	0	35	38	1	13	0	0	0	100
	358	31	0	19	45	0	5	0	0	0	100
	359	25	53	15	6	0	1	0	0	0	100
	Mean	20.60	10.60	24.00	36.00	.20	8.60	.00	.00	.00	100.00
StDev	11.17	23.70	12.77	21.51	.45	7.77	.00	.00	.00	.00	
Mussels	375	16	0	0	0	50	30	4	0	0	100
	376	23	2	2	0	47	25	1	0	0	100
	378	11	1	1	0	64	17	6	0	0	100
	379	16	2	4	0	62	11	5	0	0	100
	380	6	0	0	0	78	15	1	0	0	100
	Mean	14.40	1.00	1.40	.00	60.20	19.60	3.40	.00	.00	100.00
StDev	6.35	1.00	1.67	.00	12.38	7.73	2.30	.00	.00	.00	

Percent Cover of Index Species Cat Rock, Anacapa Island - Fall 1998 (11/18/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-wood	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	31	28	39	11	21	0	1	0	0	0	100
	32	34	16	25	21	0	3	1	0	0	100
	33	18	14	3	63	0	2	0	0	0	100
	35	27	41	11	20	0	0	1	0	0	100
	36	35	11	4	47	0	3	0	0	0	100
	37	28	16	7	48	0	1	0	0	0	100
	38	42	51	2	3	0	1	1	0	0	100
	39	41	44	7	4	0	1	3	0	0	100
	135	24	8	1	66	0	1	0	0	0	100
	Mean		30.78	26.67	7.89	32.56	.00	1.44	.67	.00	.00
StDev		7.89	16.70	7.37	24.00	.00	1.01	1.00	.00	.00	.00
Endocladia	13	22	26	30	0	1	19	2	0	0	100
	14	35	15	15	0	3	27	5	0	0	100
	19	34	1	41	19	0	3	2	0	0	100
	51	5	1	9	0	0	72	13	0	0	100
	52	8	11	24	0	0	57	0	0	0	100
	54	22	13	16	0	1	36	12	0	0	100
	212	20	9	42	0	0	26	3	0	0	100
	467	28	22	29	0	4	14	3	0	0	100
	492	22	12	35	7	0	19	5	0	0	100
	Mean		21.78	12.22	26.78	2.89	1.00	30.33	5.00	.00	.00
StDev		10.23	8.35	11.70	6.47	1.50	21.74	4.53	.00	.00	.00
Rockweed	2	23	10	10	44	0	11	2	0	0	100
	3	24	14	15	38	0	4	5	0	0	100
	4	15	6	10	60	0	9	0	0	0	100
	5	24	25	25	6	0	17	3	0	0	100
	6	13	0	7	75	0	4	0	1	0	100
	8	15	0	2	83	0	0	0	0	0	100
	9	4	3	6	83	0	4	0	0	0	100
	10	10	3	3	82	0	2	0	0	0	100
	55	31	27	9	0	1	27	5	0	0	100
	Mean		17.67	9.78	9.67	52.33	.11	8.67	1.67	.11	.00
StDev		8.43	10.27	6.96	32.58	.33	8.63	2.18	.33	.00	.00
Mussels	56	4	27	0	0	29	0	40	0	0	100
	164	11	26	1	0	31	20	11	0	0	100
	203	18	15	0	0	37	16	14	0	0	100
	204	3	12	0	0	36	45	4	0	0	100

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468	6	12	0	0	9	67	6	0	0	100
470	25	10	0	0	19	39	7	0	0	100
471	20	6	0	0	30	39	5	0	0	100
472	2	18	0	0	47	29	4	0	0	100
473	17	11	2	0	12	53	5	0	0	100
Mean	11.78	15.22	.33	.00	27.78	34.22	10.67	.00	.00	100.00
StDev	8.48	7.19	.71	.00	12.34	20.38	11.51	.00	.00	.00

**Percent Cover of Index Species
Middle-East, Anacapa Island - Fall 1998 (11/17/98)**

Zone	Plot	Bare Rock	Barnacle	Endo- cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	243	46	25	9	0	0	19	1	0	0	100
	244	61	10	17	0	1	9	2	0	0	100
	245	57	25	6	0	0	7	5	0	0	100
	Mean	54.67	20.00	10.67	.00	.33	11.67	2.67	.00	.00	100.00
	StDev	7.77	8.66	5.69	.00	.58	6.43	2.08	.00	.00	.00
Endocladia	240	23	3	37	21	0	14	2	0	0	100
	241	38	19	7	7	5	20	4	0	0	100
	242	37	6	18	28	0	10	1	0	0	100
	Mean	32.67	9.33	20.67	18.67	1.67	14.67	2.33	.00	.00	100.00
	StDev	8.39	8.50	15.18	10.69	2.89	5.03	1.53	.00	.00	.00
Rockweed	53	2	1	0	56	10	28	3	0	0	100
	237	6	0	6	80	0	8	0	0	0	100
	469	3	5	0	71	1	18	2	0	0	100
	Mean	3.67	2.00	2.00	69.00	3.67	18.00	1.67	.00	.00	100.00
	StDev	2.08	2.65	3.46	12.12	5.51	10.00	1.53	.00	.00	.00
Mussels	476	4	0	0	0	68	26	2	0	0	100
	477	1	8	0	0	76	14	1	0	0	100
	478	2	4	0	0	64	25	5	0	0	100
	Mean	2.33	4.00	.00	.00	69.33	21.67	2.67	.00	.00	100.00
	StDev	1.53	4.00	.00	.00	6.11	6.66	2.08	.00	.00	.00

Percent Cover of Index Species Middle-West, Anacapa Island - Fall 1998 (11/19/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	447	27	19	43	0	0	9	0	2	0	100
	448	33	16	13	0	0	38	0	0	0	100
	449	39	15	10	0	0	36	0	0	0	100
	450	36	17	2	2	0	43	0	0	0	100
	451	36	17	22	0	0	25	0	0	0	100
	Mean	34.20	16.80	18.00	.40	.00	30.20	.00	.40	.00	.00
StDev	4.55	1.48	15.70	.89	.00	13.55	.00	.89	.00	.00	.00
Endocladia	457	33	0	16	0	6	45	0	0	0	100
	458	45	18	7	0	3	26	1	0	0	100
	459	34	5	9	0	0	52	0	0	0	100
	460	46	12	14	0	0	27	1	0	0	100
	461	42	2	27	8	0	21	0	0	0	100
	Mean	40.00	7.40	14.60	1.60	1.80	34.20	.40	.00	.00	.00
StDev	6.12	7.47	7.83	3.58	2.68	13.48	.55	.00	.00	.00	.00
Rockweed	452	24	4	9	58	0	5	0	0	0	100
	453	9	0	2	82	0	7	0	0	0	100
	454	12	16	0	1	3	67	1	0	0	100
	455	4	1	1	61	2	31	0	0	0	100
	456	7	0	0	74	4	15	0	0	0	100
	Mean	11.20	4.20	2.40	55.20	1.80	25.00	.20	.00	.00	.00
StDev	7.73	6.80	3.78	31.82	1.79	25.61	.45	.00	.00	.00	.00
Mussels	462	18	6	2	0	32	39	3	0	0	100
	463	15	8	1	0	20	55	1	0	0	100
	464	9	13	1	0	42	35	0	0	0	100
	465	14	8	0	0	66	12	0	0	0	100
	466	2	1	0	0	88	8	1	0	0	100
	Mean	11.60	7.20	.80	.00	49.60	29.80	1.00	.00	.00	.00
StDev	6.27	4.32	.84	.00	27.33	19.61	1.22	.00	.00	.00	.00

**Percent Cover of Index Species
S Frenchy's Cove, Anacapa Island - Fall 1998 (11/18/98)**

Zone	Plot	Bare Rock	Barnacle	Endo- cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	249	41	53	6	0	0	0	0	0	0	100	
	250	60	36	2	0	0	0	0	2	0	100	
	251	63	30	0	0	0	3	0	4	0	100	
	252	60	34	1	0	0	3	1	1	0	100	
	253	52	42	0	0	0	0	2	4	0	100	
	Mean	55.20	39.00	1.80	.00	.00	1.20	.60	2.20	.00	.00	100.00
	StDev	8.93	8.94	2.49	.00	.00	1.64	.89	1.79	.00	.00	.00
Endocladia	154	49	17	26	0	0	8	0	0	0	100	
	155	31	5	54	10	0	0	0	0	0	100	
	256	53	5	25	7	0	10	0	0	0	100	
	257	46	1	53	0	0	0	0	0	0	100	
	258	23	2	34	40	0	1	0	0	0	100	
	Mean	40.40	6.00	38.40	11.40	.00	3.80	.00	.00	.00	.00	100.00
	StDev	12.80	6.40	14.22	16.58	.00	4.82	.00	.00	.00	.00	.00
Rockweed	259	7	0	0	91	0	2	0	0	0	100	
	260	26	9	2	33	0	27	3	0	0	100	
	261	3	0	0	86	0	11	0	0	0	100	
	262	65	15	0	11	0	9	0	0	0	100	
	263	0	0	1	95	0	4	0	0	0	100	
	Mean	20.20	4.80	.60	63.20	.00	10.60	.60	.00	.00	.00	100.00
	StDev	27.01	6.91	.89	38.54	.00	9.86	1.34	.00	.00	.00	.00
Mussels	201	5	0	0	0	23	72	0	0	0	100	
	202	1	0	0	0	44	55	0	0	0	100	
	264	3	0	0	0	64	33	0	0	0	100	
	265	11	0	0	0	40	49	0	0	0	100	
	266	10	0	0	0	64	26	0	0	0	100	
	Mean	6.00	.00	.00	.00	47.00	47.00	.00	.00	.00	.00	100.00
	StDev	4.36	.00	.00	.00	17.41	18.23	.00	.00	.00	.00	.00

Percent Cover of Index Species Crook Point, San Miguel Island - Fall 1998 (11/2/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-wood	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	137	75	24	0	0	0	0	1	0	0	100
	147	62	30	0	0	0	5	3	0	0	100
	148	53	47	0	0	0	0	0	0	0	100
	149	78	18	2	0	0	0	2	0	0	100
	495	54	44	2	0	0	0	0	0	0	100
	Mean	64.40	32.60	.80	.00	.00	1.00	1.20	.00	.00	.00
StDev	11.63	12.56	1.10	.00	.00	2.24	1.30	.00	.00	.00	.00
Endocladia	386	69	1	20	4	0	6	0	0	0	100
	387	30	4	29	0	1	31	5	0	0	100
	388	79	0	12	1	0	4	4	0	0	100
	389	45	4	17	7	24	1	2	0	0	100
	390	53	5	17	2	11	9	3	0	0	100
	Mean	55.20	2.80	19.00	2.80	7.20	10.20	2.80	.00	.00	.00
StDev	19.37	2.17	6.28	2.77	10.47	11.99	1.92	.00	.00	.00	.00
Rockweed	396	35	7	10	22	11	9	6	0	0	100
	397	21	0	0	0	75	3	1	0	0	100
	398	56	2	4	20	11	2	5	0	0	100
	399	53	1	0	5	24	14	3	0	0	100
	400	45	2	15	26	0	6	6	0	0	100
	Mean	42.00	2.40	5.80	14.60	24.20	6.80	4.20	.00	.00	.00
StDev	14.28	2.70	6.57	11.39	29.64	4.87	2.17	.00	.00	.00	.00
Mussels	381	30	0	0	0	45	19	6	0	0	100
	382	1	0	0	0	99	0	0	0	0	100
	383	9	0	0	0	85	6	0	0	0	100
	384	9	0	0	0	81	3	7	0	0	100
	385	18	1	0	0	66	6	9	0	0	100
	Mean	13.40	.20	.00	.00	75.20	6.80	4.40	.00	.00	.00
StDev	11.06	.45	.00	.00	20.57	7.26	4.16	.00	.00	.00	.00

**Percent Cover of Index Species
Cuyler Harbor, San Miguel Island - Fall 1998 (11/5/98)**

Zone	Plot	Bare Rock	Barnacle	Endo- cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	416	57	42	0	0	0	0	0	1	0	100	
	417	47	52	0	0	0	0	1	0	0	100	
	418	49	49	0	0	0	0	2	0	0	100	
	419	78	20	0	0	0	1	1	0	0	100	
	420	65	31	4	0	0	0	0	0	0	100	
	Mean	59.20	38.80	.80	.00	.00	.20	.80	.20	.00	.00	100.00
	StDev	12.70	13.26	1.79	.00	.00	.45	.84	.45	.00	.00	.00
Endocladia	411	61	4	19	0	8	4	4	0	0	100	
	412	39	43	12	0	5	1	0	0	0	100	
	413	43	3	23	29	0	2	0	0	0	100	
	414	40	1	56	0	0	3	0	0	0	100	
	415	76	2	20	0	0	2	0	0	0	100	
	Mean	51.80	10.60	26.00	5.80	2.60	2.40	.80	.00	.00	.00	100.00
	StDev	16.21	18.15	17.25	12.97	3.71	1.14	1.79	.00	.00	.00	.00
Rockweed	406	17	0	2	64	0	12	5	0	0	100	
	407	5	0	0	91	0	4	0	0	0	100	
	408	7	1	0	90	0	0	2	0	0	100	
	409	4	0	0	93	0	3	0	0	0	100	
	410	8	1	0	90	0	1	0	0	0	100	
	Mean	8.20	.40	.40	85.60	.00	4.00	1.40	.00	.00	.00	100.00
	StDev	5.17	.55	.89	12.14	.00	4.74	2.19	.00	.00	.00	.00
Mussels	401	49	19	0	0	11	5	16	0	0	100	
	402	2	0	0	0	78	4	16	0	0	100	
	403	8	1	0	0	72	5	14	0	0	100	
	404	22	15	0	0	18	25	20	0	0	100	
	405	58	15	0	0	16	9	2	0	0	100	
	Mean	27.80	10.00	.00	.00	39.00	9.60	13.60	.00	.00	.00	100.00
	StDev	24.76	8.83	.00	.00	33.03	8.82	6.84	.00	.00	.00	.00

Percent Cover of Index Species Harris Point, San Miguel Island - Fall 1998 (11/4/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	436	35	20	0	0	3	39	3	0	0	100
	437	22	24	1	0	11	39	3	0	0	100
	438	63	25	0	0	0	4	8	0	0	100
	439	42	19	14	0	11	10	4	0	0	100
	440	51	49	0	0	0	0	0	0	0	100
	Mean	42.60	27.40	3.00	.00	5.00	18.40	3.60	.00	.00	100.00
StDev	15.57	12.34	6.16	.00	5.61	19.14	2.88	.00	.00	.00	
Endocladia	431	40	10	35	0	8	7	0	0	0	100
	432	39	7	49	0	0	4	1	0	0	100
	433	47	6	39	0	2	4	2	0	0	100
	434	85	0	9	1	0	3	2	0	0	100
	435	33	2	37	22	0	6	0	0	0	100
	Mean	48.80	5.00	33.80	4.60	2.00	4.80	1.00	.00	.00	100.00
StDev	20.84	4.00	14.87	9.74	3.46	1.64	1.00	.00	.00	.00	
Rockweed	421	61	1	16	21	0	1	0	0	0	100
	422	64	4	17	6	0	7	2	0	0	100
	423	58	1	29	4	0	8	0	0	0	100
	424	75	2	3	18	0	0	2	0	0	100
	425	82	7	1	5	0	2	3	0	0	100
	Mean	68.00	3.00	13.20	10.80	.00	3.60	1.40	.00	.00	100.00
StDev	10.12	2.55	11.45	8.04	.00	3.65	1.34	.00	.00	.00	
Mussels	426	34	1	1	0	52	10	2	0	0	100
	427	50	7	3	0	28	7	5	0	0	100
	428	50	6	1	0	30	9	4	0	0	100
	429	48	9	1	0	36	5	1	0	0	100
	430	22	5	0	0	51	22	0	0	0	100
	Mean	40.80	5.60	1.20	.00	39.40	10.60	2.40	.00	.00	100.00
StDev	12.46	2.97	1.10	.00	11.44	6.66	2.07	.00	.00	.00	

Percent Cover of Index Species Otter Harbor, San Miguel Island - Fall 1998 (11/3/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	370	78	22	0	0	0	0	0	0	0	100
	371	49	43	0	0	0	0	0	8	0	100
	372	69	31	0	0	0	0	0	0	0	100
	373	60	32	0	0	0	0	0	8	0	100
	374	19	0	0	0	0	81	0	0	0	100
	Mean	55.60	25.60	.00	.00	.00	16.20	.00	3.20	.00	100.00
	StDev	22.81	16.13	.00	.00	.00	36.22	.00	4.38	.00	.00
Endocladia	360	29	3	40	12	1	13	2	0	0	100
	361	19	0	35	33	0	12	1	0	0	100
	362	48	2	32	0	4	12	2	0	0	100
	363	17	0	16	49	0	17	0	1	0	100
	364	28	0	37	22	0	13	0	0	0	100
	Mean	28.20	1.00	32.00	23.20	1.00	13.40	1.00	.20	.00	100.00
	StDev	12.28	1.41	9.41	18.89	1.73	2.07	1.00	.45	.00	.00
Rockweed	355	42	0	29	25	0	3	0	1	0	100
	356	6	1	12	71	0	10	0	0	0	100
	357	27	2	18	39	0	13	1	0	0	100
	358	58	0	15	26	0	1	0	0	0	100
	359	51	34	10	2	0	1	0	2	0	100
	Mean	36.80	7.40	16.80	32.60	.00	5.60	.20	.60	.00	100.00
	StDev	20.75	14.89	7.46	25.26	.00	5.55	.45	.89	.00	.00
Mussels	375	9	0	0	0	73	13	5	0	0	100
	376	25	1	0	0	56	18	0	0	0	100
	378	24	0	0	0	58	9	9	0	0	100
	379	15	4	0	0	70	4	7	0	0	100
	380	2	0	0	0	92	6	0	0	0	100
	Mean	15.00	1.00	.00	.00	69.80	10.00	4.20	.00	.00	100.00
	StDev	9.82	1.73	.00	.00	14.43	5.61	4.09	.00	.00	.00

Percent Cover of Index Species Sea Lion Rookery, Santa Barbara Island - Fall 1998 (10/7/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	345	32	16	15	0	0	37	0	0	0	100	
	346	50	17	2	0	0	31	0	0	0	100	
	347	35	14	0	0	0	51	0	0	0	100	
	348	36	17	14	0	0	33	0	0	0	100	
	349	35	26	0	0	0	39	0	0	0	100	
	Mean	37.60	18.00	6.20	.00	.00	38.20	.00	.00	.00	.00	100.00
	StDev	7.09	4.64	7.63	.00	.00	7.82	.00	.00	.00	.00	.00
Endocladia	335	16	10	13	0	0	61	0	0	0	100	
	336	14	5	12	0	0	69	0	0	0	100	
	337	15	8	2	0	6	69	0	0	0	100	
	338	24	8	30	0	0	38	0	0	0	100	
	339	24	12	34	0	0	30	0	0	0	100	
	Mean	18.60	8.60	18.20	.00	1.20	53.40	.00	.00	.00	.00	100.00
	StDev	4.98	2.61	13.39	.00	2.68	18.23	.00	.00	.00	.00	.00
Rockweed	330	20	12	0	9	50	9	0	0	0	100	
	331	11	1	10	51	0	27	0	0	0	100	
	332	8	5	15	49	0	23	0	0	0	100	
	333	22	6	2	33	1	36	0	0	0	100	
	334	6	3	5	53	0	33	0	0	0	100	
	Mean	13.40	5.40	6.40	39.00	10.20	25.60	.00	.00	.00	.00	100.00
	StDev	7.20	4.16	6.11	18.55	22.25	10.57	.00	.00	.00	.00	.00
Mussels	350	0	0	0	0	3	97	0	0	0	100	
	351	0	0	0	0	0	100	0	0	0	100	
	352	0	0	0	0	12	88	0	0	0	100	
	353	0	0	0	0	0	100	0	0	0	100	
	354	1	1	0	0	44	51	3	0	0	100	
	Mean	.20	.20	.00	.00	11.80	87.20	.60	.00	.00	.00	100.00
	StDev	.45	.45	.00	.00	18.66	20.83	1.34	.00	.00	.00	.00

**Percent Cover of Index Species
East Point, Santa Rosa Island - Fall 1998 (1/17/99)**

Zone	Plot	Bare Rock	Barnacle	Endo- cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	575	61	27	0	0	0	5	7	0	0	100
	576	52	19	18	2	1	5	3	0	0	100
	577	34	39	23	2	0	1	1	0	0	100
	578	75	20	1	0	0	0	4	0	0	100
	579	60	34	6	0	0	0	0	0	0	100
	Mean	56.40	27.80	9.60	.80	.20	2.20	3.00	.00	.00	100.00
	StDev	15.01	8.70	10.36	1.10	.45	2.59	2.74	.00	.00	.00
Endocladia	580	22	0	64	11	0	0	3	0	0	100
	581	24	1	56	19	0	0	0	0	0	100
	582	22	0	58	19	0	0	1	0	0	100
	583	28	0	59	9	0	3	1	0	0	100
	584	29	1	52	14	0	2	2	0	0	100
	Mean	25.00	.40	57.80	14.40	.00	1.00	1.40	.00	.00	100.00
	StDev	3.32	.55	4.38	4.56	.00	1.41	1.14	.00	.00	.00
Rockweed	585	0	0	1	91	0	8	0	0	0	100
	586	2	0	0	88	0	9	1	0	0	100
	587	0	0	0	99	0	1	0	0	0	100
	588	1	0	0	98	0	1	0	0	0	100
	589	3	0	3	92	0	2	0	0	0	100
	Mean	1.20	.00	.80	93.60	.00	4.20	.20	.00	.00	100.00
	StDev	1.30	.00	1.30	4.72	.00	3.96	.45	.00	.00	.00
Mussels	590	1	0	0	0	84	12	3	0	0	100
	591	3	8	0	0	52	26	11	0	0	100
	592	1	0	0	0	82	14	3	0	0	100
	593	0	0	0	0	96	4	0	0	0	100
	594	2	2	0	0	88	8	0	0	0	100
	Mean	1.40	2.00	.00	.00	80.40	12.80	3.40	.00	.00	100.00
	StDev	1.14	3.46	.00	.00	16.76	8.32	4.51	.00	.00	.00

Percent Cover of Index Species Ford Point, Santa Rosa Island - Fall 1998 (1/14/99)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	520	82	13	0	0	0	1	4	0	0	100
	521	62	28	1	0	0	5	4	0	0	100
	522	83	14	0	0	0	0	3	0	0	100
	523	56	28	15	0	0	0	1	0	0	100
	524	64	34	0	0	0	0	2	0	0	100
	Mean	69.40	23.40	3.20	.00	.00	1.20	2.80	.00	.00	.00
StDev	12.32	9.37	6.61	.00	.00	2.17	1.30	.00	.00	.00	.00
Endocladia	525	37	2	30	0	3	27	1	0	0	100
	526	50	4	17	0	7	17	5	0	0	100
	527	28	0	41	0	5	23	3	0	0	100
	528	33	2	32	0	4	23	6	0	0	100
	529	39	0	45	0	5	10	1	0	0	100
	Mean	37.40	1.60	33.00	.00	4.80	20.00	3.20	.00	.00	.00
StDev	8.20	1.67	10.89	.00	1.48	6.63	2.28	.00	.00	.00	.00
Mussels	530	58	2	1	0	13	23	3	0	0	100
	531	4	0	0	0	95	0	1	0	0	100
	532	0	0	0	0	97	1	2	0	0	100
	533	29	0	1	0	39	31	0	0	0	100
	534	48	0	0	0	5	45	2	0	0	100
	Mean	27.80	.40	.40	.00	49.80	20.00	1.60	.00	.00	.00
StDev	25.79	.89	.55	.00	44.01	19.47	1.14	.00	.00	.00	.00

Percent Cover of Index Species Fossil Reef, Santa Rosa Island - Fall 1998 (1/15/99)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	605	52	46	0	0	0	0	2	0	0	100	
	606	55	40	0	0	0	1	1	3	0	100	
	607	58	41	0	0	0	0	0	1	0	100	
	608	76	22	0	0	0	2	0	0	0	100	
	609	76	22	0	0	0	2	0	0	0	100	
	Mean	63.40	34.20	.00	.00	.00	1.00	.60	.80	.80	.00	100.00
	StDev	11.70	11.37	.00	.00	.00	1.00	.89	1.30	.00	.00	
Endocladia	610	50	42	3	0	1	1	2	1	0	100	
	611	45	41	0	11	0	0	3	0	0	100	
	612	5	0	0	88	0	5	2	0	0	100	
	613	63	15	19	0	0	3	0	0	0	100	
	614	9	0	0	85	0	6	0	0	0	100	
	Mean	34.40	19.60	4.40	36.80	.20	3.00	1.40	.20	.00	.00	100.00
	StDev	25.90	20.91	8.26	45.60	.45	2.55	1.34	.45	.00	.00	
Rockweed	615	42	3	0	51	0	3	1	0	0	100	
	616	62	20	0	2	0	10	6	0	0	100	
	617	45	0	0	43	0	10	2	0	0	100	
	618	68	5	9	3	0	11	4	0	0	100	
	619	67	9	1	17	0	3	3	0	0	100	
	Mean	56.80	7.40	2.00	23.20	.00	7.40	3.20	.00	.00	.00	100.00
	StDev	12.40	7.77	3.94	22.70	.00	4.04	1.92	.00	.00	.00	
Mussels	620	13	5	1	0	2	43	36	0	0	100	
	621	7	4	0	0	6	58	25	0	0	100	
	622	22	17	0	0	14	35	12	0	0	100	
	623	26	10	0	0	13	41	10	0	0	100	
	624	3	0	0	0	11	34	52	0	0	100	
	Mean	14.20	7.20	.20	.00	9.20	42.20	27.00	.00	.00	.00	100.00
	StDev	9.73	6.53	.45	.00	5.07	9.63	17.49	.00	.00	.00	

Percent Cover of Index Species Johnson's Lee, Santa Rosa Island - Fall 1998 (1/13/99)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	500	51	45	1	0	0	2	1	0	0	100
	501	63	34	0	0	0	0	3	0	0	100
	502	74	21	0	0	1	0	4	0	0	100
	503	34	48	14	0	0	0	4	0	0	100
	504	54	40	0	0	0	0	6	0	0	100
	Mean	55.20	37.60	3.00	.00	.20	.40	3.60	.00	.00	100.00
StDev	14.86	10.69	6.16	.00	.45	.89	1.82	.00	.00	.00	
Endocladia	505	55	3	12	0	26	1	3	0	0	100
	506	68	1	28	0	0	0	3	0	0	100
	507	47	7	30	0	12	3	1	0	0	100
	508	48	5	24	0	15	1	7	0	0	100
	509	50	13	31	0	4	1	1	0	0	100
	Mean	53.60	5.80	25.00	.00	11.40	1.20	3.00	.00	.00	100.00
StDev	8.62	4.60	7.75	.00	10.14	1.10	2.45	.00	.00	.00	
Mussels	510	2	0	0	0	0	61	37	0	0	100
	511	3	0	0	0	2	54	41	0	0	100
	512	27	1	0	0	64	3	5	0	0	100
	513	12	2	0	0	13	17	56	0	0	100
	514	3	0	0	0	24	31	42	0	0	100
	Mean	9.40	.60	.00	.00	20.60	33.20	36.20	.00	.00	100.00
StDev	10.64	.89	.00	.00	26.09	24.42	18.86	.00	.00	.00	

**Percent Cover of Index Species
NW Talcott, Santa Rosa Island - Fall 1998 (1/14/99)**

Zone	Plot	Bare Rock	Barnacle	Endo- cladia	Rock- weed	Mussels	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	560	49	43	1	0	0	2	2	3	0	100
	561	46	49	0	0	0	1	3	1	0	100
	562	82	2	2	0	0	13	1	0	0	100
	563	28	4	1	62	0	5	0	0	0	100
	564	80	0	0	0	0	19	1	0	0	100
	Mean	57.00	19.60	.80	12.40	.00	8.00	1.40	.80	.00	100.00
	StDev	23.35	24.23	.84	27.73	.00	7.75	1.14	1.30	.00	.00
Endocladia	555	28	0	30	31	0	11	0	0	0	100
	556	68	0	16	6	0	10	0	0	0	100
	557	13	0	13	70	0	4	0	0	0	100
	558	48	0	35	0	0	16	1	0	0	100
	559	79	0	1	0	0	19	1	0	0	100
	Mean	47.20	.00	19.00	21.40	.00	12.00	.40	.00	.00	100.00
	StDev	27.31	.00	13.66	30.03	.00	5.79	.55	.00	.00	.00
Rockweed	565	11	0	0	83	0	6	0	0	0	100
	566	17	0	0	82	0	1	0	0	0	100
	567	6	0	0	90	0	1	3	0	0	100
	568	54	0	13	31	0	2	0	0	0	100
	569	77	0	0	10	0	10	3	0	0	100
	Mean	33.00	.00	2.60	59.20	.00	4.00	1.20	.00	.00	100.00
	StDev	31.01	.00	5.81	36.23	.00	3.94	1.64	.00	.00	.00
Mussels	550	20	1	0	0	50	15	14	0	0	100
	551	16	0	0	0	47	31	6	0	0	100
	552	25	0	0	0	42	19	14	0	0	100
	553	20	2	0	0	19	57	2	0	0	100
	554	18	0	0	0	22	50	10	0	0	100
	Mean	19.80	.60	.00	.00	36.00	34.40	9.20	.00	.00	100.00
	StDev	3.35	.89	.00	.00	14.47	18.57	5.22	.00	.00	.00

Percent Cover of Index Species Landing Cove, Santa Barbara Island - Spring 1998 (2/10/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	315	29	10	0	0	0	0	61	0	0	0	100
	316	13	11	0	0	0	0	76	0	0	0	100
	317	14	15	0	0	0	0	71	0	0	0	100
	318	22	24	0	0	13	0	41	0	0	0	100
	319	32	17	0	0	0	0	51	0	0	0	100
	Mean	22.00	15.40	.00	.00	2.60	.00	60.00	.00	.00	.00	.00
StDev	8.57	5.59	.00	.00	5.81	.00	14.32	.00	.00	.00	.00	.00
Rockweed	310	24	0	0	22	9	0	45	0	0	0	100
	311	26	0	0	12	1	0	61	0	0	0	100
	312	18	0	0	23	0	0	59	0	0	0	100
	313	24	1	0	14	0	0	61	0	0	0	100
	314	25	0	0	7	1	0	67	0	0	0	100
	Mean	23.40	.20	.00	15.60	2.20	.00	58.60	.00	.00	.00	.00
StDev	3.13	.45	.00	6.80	3.83	.00	8.17	.00	.00	.00	.00	.00
Mussels	325	10	3	0	0	74	0	11	2	0	0	100
	326	8	0	0	0	28	0	64	0	0	0	100
	327	6	0	0	0	40	0	54	0	0	0	100
	328	19	1	0	0	52	0	28	0	0	0	100
	329	0	1	0	0	92	0	7	0	0	0	100
	Mean	8.60	1.00	.00	.00	57.20	.00	32.80	.40	.00	.00	.00
StDev	6.91	1.22	.00	.00	25.83	.00	25.43	.89	.00	.00	.00	.00
Red Algal	320	0	0	0	0	0	93	7	0	0	0	100
	321	5	0	0	0	0	83	12	0	0	0	100
	322	0	0	0	0	0	49	51	0	0	0	100
	323	16	0	0	0	0	41	43	0	0	0	100
	324	0	0	0	0	0	100	0	0	0	0	100
	Mean	4.20	.00	.00	.00	.00	73.20	22.60	.00	.00	.00	.00
StDev	6.94	.00	.00	.00	.00	26.59	22.85	.00	.00	.00	.00	.00

Percent Cover of Index Species Fraser Cove, Santa Cruz Island - Spring 1998 (4/1/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	876	20	3	50	0	2	0	23	2	0	0	100
	877	7	7	61	0	0	0	25	0	0	0	100
	878	56	30	14	0	0	0	0	0	0	0	100
	879	55	18	27	0	0	0	0	0	0	0	100
	880	5	18	75	0	0	0	2	0	0	0	100
	Mean	28.60	15.20	45.40	.00	.40	.00	10.00	.40	.00	.00	.00
StDev	25.22	10.62	24.83	.00	.89	.00	12.83	.89	.00	.00	.00	.00
Endocladia	881	16	0	29	0	1	0	54	0	0	0	100
	882	20	0	73	0	0	4	3	0	0	0	100
	883	7	0	85	0	0	0	8	0	0	0	100
	884	5	0	94	0	0	0	0	0	0	1	100
	885	19	0	73	0	0	7	1	0	0	0	100
	Mean	13.40	.00	70.80	.00	.20	2.20	13.20	.00	.00	.00	.20
StDev	6.95	.00	24.98	.00	.45	3.19	23.02	.00	.00	.00	.45	.00
Rockweed	896	4	0	9	83	0	0	4	0	0	0	100
	897	17	0	12	60	0	1	10	0	0	0	100
	898	13	0	0	78	0	0	8	1	0	0	100
	899	17	2	8	67	0	0	6	0	0	0	100
	900	16	1	4	78	0	0	1	0	0	0	100
	Mean	13.40	.60	6.60	73.20	.00	.20	5.80	.20	.00	.00	.00
StDev	5.50	.89	4.67	9.42	.00	.45	3.49	.45	.00	.00	.00	.00
Mussels	891	3	0	0	0	53	5	24	15	0	0	100
	892	25	0	0	0	42	3	18	12	0	0	100
	893	8	0	0	0	61	2	19	10	0	0	100
	894	13	0	0	0	70	1	12	4	0	0	100
	895	11	0	0	0	74	1	4	10	0	0	100
	Mean	12.00	.00	.00	.00	60.00	2.40	15.40	10.20	.00	.00	.00
StDev	8.19	.00	.00	.00	12.94	1.67	7.67	4.02	.00	.00	.00	.00
Pollicipes	901	32	3	1	0	19	5	28	12	0	0	100
	902	19	0	1	0	9	6	48	17	0	0	100
	903	2	0	0	0	34	38	12	14	0	0	100
	904	17	0	0	0	40	13	15	15	0	0	100
	905	7	0	0	0	44	14	4	31	0	0	100
	Mean	15.40	.60	.40	.00	29.20	15.20	21.40	17.80	.00	.00	.00
StDev	11.63	1.34	.55	.00	14.75	13.37	17.20	7.60	.00	.00	.00	.00

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Tar	906	1	1	0	0	0	1	48	0	49	0	100
	907	2	0	0	0	0	0	93	0	5	0	100
	908	8	21	0	0	0	0	29	0	42	0	100
	909	13	9	0	0	0	0	53	0	25	0	100
	910	0	2	0	0	0	0	63	0	35	0	100
	Mean	4.80	6.60	.00	.00	.00	.20	57.20	.00	31.20	.00	100.00
StDev	5.54	8.79	.00	.00	.00	.45	23.52	.00	17.12	.00	.00	
Hesperophyc	886	61	1	3	31	0	0	4	0	0	0	100
	887	60	0	6	23	0	0	11	0	0	0	100
	888	54	18	10	18	0	0	0	0	0	0	100
	889	60	4	3	27	0	0	6	0	0	0	100
	890	36	4	10	49	0	0	1	0	0	0	100
	Mean	54.20	5.40	6.40	29.60	.00	.00	4.40	.00	.00	.00	100.00
StDev	10.55	7.27	3.51	11.87	.00	.00	4.39	.00	.00	.00	.00	

Percent Cover of Index Species Orizaba Cove, Santa Cruz Island - Spring 1998 (4/1/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	851	52	43	0	0	0	3	2	0	0	0	100	
	852	25	74	0	0	0	1	0	0	0	0	100	
	853	42	58	0	0	0	0	0	0	0	0	100	
	854	38	51	0	0	1	1	9	0	0	0	100	
	855	33	61	0	0	0	0	6	0	0	0	100	
	Mean	38.00	57.40	.00	.00	.20	1.00	3.40	.00	.00	.00	.00	100.00
	StDev	10.07	11.59	.00	.00	.45	1.22	3.97	.00	.00	.00	.00	.00
Rockweed	866	0	1	0	95	0	0	4	0	0	0	100	
	867	2	0	0	95	0	0	3	0	0	0	100	
	868	0	0	0	97	0	0	3	0	0	0	100	
	869	7	0	0	82	0	0	11	0	0	0	100	
	870	11	0	0	78	0	0	11	0	0	0	100	
	Mean	4.00	.20	.00	89.40	.00	.00	6.40	.00	.00	.00	.00	100.00
	StDev	4.85	.45	.00	8.73	.00	.00	4.22	.00	.00	.00	.00	.00
Mussels	861	19	6	0	0	42	8	25	0	0	0	100	
	862	3	0	0	0	91	0	5	1	0	0	100	
	863	2	0	0	0	98	0	0	0	0	0	100	
	864	12	0	0	0	80	0	8	0	0	0	100	
	865	0	0	0	0	97	0	3	0	0	0	100	
	Mean	7.20	1.20	.00	.00	81.60	1.60	8.20	.20	.00	.00	.00	100.00
	StDev	8.04	2.68	.00	.00	23.27	3.58	9.83	.45	.00	.00	.00	.00
Tetraclita	871	28	53	0	0	5	2	12	0	0	0	100	
	872	19	44	0	0	9	0	27	1	0	0	100	
	873	28	52	0	3	0	6	10	1	0	0	100	
	874	29	40	0	0	2	3	24	2	0	0	100	
	875	24	47	0	0	0	12	17	0	0	0	100	
	Mean	25.60	47.20	.00	.60	3.20	4.60	18.00	.80	.00	.00	.00	100.00
	StDev	4.16	5.45	.00	1.34	3.83	4.67	7.38	.84	.00	.00	.00	.00
Hesperophyc	856	26	4	37	2	0	19	12	0	0	0	100	
	857	25	3	0	57	0	2	13	0	0	0	100	
	858	18	0	0	60	0	2	20	0	0	0	100	
	859	76	5	2	9	0	2	6	0	0	0	100	
	860	75	8	5	5	0	1	6	0	0	0	100	
	Mean	44.00	4.00	8.80	26.60	.00	5.20	11.40	.00	.00	.00	.00	100.00
	StDev	28.92	2.92	15.90	29.25	.00	7.73	5.81	.00	.00	.00	.00	.00

Percent Cover of Index Species Prisoner's Harbor, Santa Cruz Island - Spring 1998 (4/1/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Turf- weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	826	100	0	0	0	0	0	0	0	0	0	100
	827	47	2	0	15	0	21	15	0	0	0	100
	828	46	12	24	3	0	2	13	0	0	0	100
	829	36	26	16	0	0	6	16	0	0	0	100
	830	60	4	14	0	0	5	17	0	0	0	100
	Mean	57.80	8.80	10.80	3.60	.00	6.80	12.20	.00	.00	.00	.00
StDev	25.08	10.64	10.55	6.50	.00	8.29	6.98	.00	.00	.00	.00	.00
Endocladia	831	41	0	23	0	0	13	23	0	0	0	100
	832	44	2	42	6	0	3	3	0	0	0	100
	833	65	14	20	0	0	0	1	0	0	0	100
	834	66	6	24	0	0	3	1	0	0	0	100
	835	46	2	40	8	0	1	3	0	0	0	100
	Mean	52.40	4.80	29.80	2.80	.00	4.00	6.20	.00	.00	.00	.00
StDev	12.10	5.59	10.35	3.90	.00	5.20	9.44	.00	.00	.00	.00	.00
Rockweed	846	4	0	1	85	0	0	10	0	0	0	100
	847	2	0	0	64	1	1	32	0	0	0	100
	848	3	0	0	76	0	0	21	0	0	0	100
	849	1	0	0	88	0	0	11	0	0	0	100
	850	0	0	0	94	0	0	6	0	0	0	100
	Mean	2.00	.00	.20	81.40	.20	.20	16.00	.00	.00	.00	.00
StDev	1.58	.00	.45	11.70	.45	.45	10.51	.00	.00	.00	.00	.00
Mussels	841	14	0	0	0	12	24	50	0	0	0	100
	842	20	0	0	0	58	2	20	0	0	0	100
	843	17	0	0	0	51	0	31	1	0	0	100
	844	14	0	0	0	45	10	31	0	0	0	100
	845	2	1	0	0	80	0	17	0	0	0	100
	Mean	13.40	.20	.00	.00	49.20	7.20	29.80	.20	.00	.00	.00
StDev	6.84	.45	.00	.00	24.65	10.26	12.95	.45	.00	.00	.00	.00
Hesperophyc	836	59	3	26	5	0	7	0	0	0	0	100
	837	73	3	16	7	0	0	1	0	0	0	100
	838	75	2	9	8	0	2	4	0	0	0	100
	839	68	18	5	2	1	1	5	0	0	0	100
	840	78	9	8	5	0	0	0	0	0	0	100
	Mean	70.60	7.00	12.80	5.40	.20	2.00	2.00	.00	.00	.00	.00
StDev	7.44	6.75	8.41	2.30	.45	2.92	2.35	.00	.00	.00	.00	.00

Percent Cover of Index Species Scorpion Rock, Santa Cruz Island - Spring 1998 (4/1/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	801	59	37	0	0	1	0	3	0	0	0	100
	802	84	16	0	0	0	0	0	0	0	0	100
	803	66	34	0	0	0	0	0	0	0	0	100
	804	68	31	0	0	0	0	1	0	0	0	100
	805	69	29	0	0	0	0	2	0	0	0	100
	Mean	69.40	29.40	.00	.00	.20	.00	1.20	.00	.00	.00	.00
StDev	9.15	8.08	.00	.00	.45	.00	1.30	.00	.00	.00	.00	.00
Endocladia	806	52	2	0	0	0	12	34	0	0	0	100
	807	39	2	0	0	1	30	28	0	0	0	100
	808	60	7	0	0	3	23	7	0	0	0	100
	809	74	22	0	0	0	3	1	0	0	0	100
	810	72	4	0	0	0	17	7	0	0	0	100
	Mean	59.40	7.40	.00	.00	.80	17.00	15.40	.00	.00	.00	.00
StDev	14.52	8.41	.00	.00	1.30	10.32	14.60	.00	.00	.00	.00	.00
Mussels	816	0	0	0	0	98	0	1	1	0	0	100
	817	15	0	0	0	82	0	3	0	0	0	100
	818	25	4	0	0	51	2	15	3	0	0	100
	819	8	0	0	0	91	0	1	0	0	0	100
	820	11	7	0	0	44	4	34	0	0	0	100
	Mean	11.80	2.20	.00	.00	73.20	1.20	10.80	.80	.00	.00	.00
StDev	9.20	3.19	.00	.00	24.26	1.79	14.22	1.30	.00	.00	.00	.00
Tetraclita	821	43	19	0	0	22	8	7	1	0	0	100
	822	41	6	0	0	30	2	20	1	0	0	100
	823	47	17	0	0	33	0	2	1	0	0	100
	824	65	23	0	0	9	0	3	0	0	0	100
	825	42	14	0	0	30	1	13	0	0	0	100
	Mean	47.60	15.80	.00	.00	24.80	2.20	9.00	.60	.00	.00	.00
StDev	9.99	6.38	.00	.00	9.73	3.35	7.52	.55	.00	.00	.00	.00
Hesperophyc	811	50	0	30	18	0	1	1	0	0	0	100
	812	21	0	43	32	1	3	0	0	0	0	100
	813	31	0	21	45	0	0	3	0	0	0	100
	814	37	0	16	37	0	2	8	0	0	0	100
	815	50	0	35	10	0	4	1	0	0	0	100
	Mean	37.80	.00	29.00	28.40	.20	2.00	2.60	.00	.00	.00	.00
StDev	12.52	.00	10.79	14.22	.45	1.58	3.21	.00	.00	.00	.00	.00

Percent Cover of Index Species Trailer, Santa Cruz Island - Spring 1998 (4/1/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	911	44	42	13	0	0	0	1	0	0	0	100
	912	67	33	0	0	0	0	0	0	0	0	100
	913	26	63	7	0	0	1	3	0	0	0	100
	914	21	79	0	0	0	0	0	0	0	0	100
	915	45	55	0	0	0	0	0	0	0	0	100
	Mean	40.60	54.40	4.00	.00	.00	.20	.80	.00	.00	.00	.00
StDev	18.20	17.97	5.87	.00	.00	.45	1.30	.00	.00	.00	.00	.00
Rockweed	926	20	0	0	77	0	0	2	1	0	0	100
	927	26	0	0	73	0	0	1	0	0	0	100
	928	28	2	1	62	0	0	7	0	0	0	100
	929	14	0	0	80	0	0	6	0	0	0	100
	930	29	0	0	59	0	0	12	0	0	0	100
	Mean	23.40	.40	.20	70.20	.00	.00	5.60	.20	.00	.00	.00
StDev	6.31	.89	.45	9.26	.00	.00	4.39	.45	.00	.00	.00	.00
Mussels	921	31	1	0	0	57	2	9	0	0	0	100
	922	29	0	0	0	16	14	41	0	0	0	100
	923	39	0	0	0	25	6	30	0	0	0	100
	924	45	0	0	0	34	7	14	0	0	0	100
	925	44	0	0	0	41	5	10	0	0	0	100
	Mean	37.60	.20	.00	.00	34.60	6.80	20.80	.00	.00	.00	.00
StDev	7.33	.45	.00	.00	15.66	4.44	14.10	.00	.00	.00	.00	.00
Hesperophyc	916	76	1	9	10	0	0	4	0	0	0	100
	917	53	0	14	20	0	0	13	0	0	0	100
	918	52	0	6	35	1	0	6	0	0	0	100
	919	56	4	5	34	0	0	1	0	0	0	100
	920	63	5	15	3	0	5	9	0	0	0	100
	Mean	60.00	2.00	9.80	20.40	.20	1.00	6.60	.00	.00	.00	.00
StDev	9.92	2.35	4.55	14.22	.45	2.24	4.62	.00	.00	.00	.00	.00

Percent Cover of Index Species Willows Anchorage, Santa Cruz Island - Spring 1998 (4/1/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Endocladia	931	42	0	53	0	0	1	4	0	0	0	100
	932	64	0	31	1	0	0	4	0	0	0	100
	933	63	0	25	0	0	1	11	0	0	0	100
	934	29	0	44	0	0	0	26	1	0	0	100
	935	70	0	12	0	0	0	18	0	0	0	100
	Mean	53.60	.00	33.00	.20	.00	.40	12.60	.20	.00	.00	.00
StDev	17.36	.00	16.05	.45	.00	.55	9.48	.45	.00	.00	.00	.00
Rockweed	946	68	1	23	0	0	2	6	0	0	0	100
	947	82	0	4	0	0	0	14	0	0	0	100
	948	14	0	1	72	0	0	10	3	0	0	100
	949	1	0	0	87	0	0	12	0	0	0	100
	950	29	0	0	47	0	1	22	1	0	0	100
	Mean	38.80	.20	5.60	41.20	.00	.60	12.80	.80	.00	.00	.00
StDev	34.85	.45	9.86	40.23	.00	.89	5.93	1.30	.00	.00	.00	.00
Mussels	941	34	1	0	0	2	2	61	0	0	0	100
	942	20	0	0	0	0	2	78	0	0	0	100
	943	20	0	0	0	0	6	74	0	0	0	100
	944	21	0	0	0	0	3	76	0	0	0	100
	945	20	0	0	0	0	2	78	0	0	0	100
	Mean	23.00	.20	.00	.00	.40	3.00	73.40	.00	.00	.00	.00
StDev	6.16	.45	.00	.00	.89	1.73	7.13	.00	.00	.00	.00	.00
Hesperophyc	936	2	0	0	0	0	0	0	0	0	98	100
	937	54	1	3	37	0	1	4	0	0	0	100
	938	81	0	0	9	0	0	10	0	0	0	100
	939	16	0	0	39	0	42	3	0	0	0	100
	940	41	0	4	43	0	0	12	0	0	0	100
	Mean	38.80	.20	1.40	25.60	.00	8.60	5.80	.00	.00	19.60	100.00
StDev	31.19	.45	1.95	19.64	.00	18.68	5.02	.00	.00	43.83	.00	

Percent Cover of Index Species Landing Cove, Santa Barbara Island - Fall 1998 (10/6/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	315	73	27	0	0	0	0	0	0	0	0	100
	316	42	22	35	0	0	0	0	1	0	0	100
	317	60	14	23	0	3	0	0	0	0	0	100
	318	29	39	0	0	17	0	14	1	0	0	100
	319	40	24	27	0	0	0	8	1	0	0	100
	Mean	48.80	25.20	17.00	.00	4.00	.00	4.40	.60	.00	.00	.00
StDev	17.51	9.09	16.11	.00	7.38	.00	6.39	.55	.00	.00	.00	.00
Rockweed	310	19	0	18	32	16	3	12	0	0	0	100
	311	22	3	27	21	1	6	20	0	0	0	100
	312	20	2	27	30	0	4	17	0	0	0	100
	313	12	3	41	22	0	20	2	0	0	0	100
	314	17	0	36	20	1	11	14	1	0	0	100
	Mean	18.00	1.60	29.80	25.00	3.60	8.80	13.00	.20	.00	.00	.00
StDev	3.81	1.52	8.93	5.57	6.95	6.98	6.86	.45	.00	.00	.00	.00
Mussels	325	1	9	0	0	66	0	19	5	0	0	100
	326	2	0	0	0	34	0	51	13	0	0	100
	327	0	0	0	0	47	0	51	2	0	0	100
	328	0	0	0	0	67	0	33	0	0	0	100
	329	0	0	0	0	80	0	20	0	0	0	100
	Mean	.60	1.80	.00	.00	58.80	.00	34.80	4.00	.00	.00	.00
StDev	.89	4.02	.00	.00	18.19	.00	15.79	5.43	.00	.00	.00	.00
Red Algal	320	0	0	0	0	0	100	0	0	0	0	100
	321	0	0	0	0	0	88	12	0	0	0	100
	322	0	0	0	0	0	36	64	0	0	0	100
	323	0	0	0	0	0	15	85	0	0	0	100
	324	0	0	0	0	0	73	27	0	0	0	100
	Mean	.00	.00	.00	.00	.00	62.40	37.60	.00	.00	.00	.00
StDev	.00	.00	.00	.00	.00	35.80	35.80	.00	.00	.00	.00	.00

Percent Cover of Index Species Fraser Cove, Santa Cruz Island - Fall 1998 (12/18/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Turf- weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	876	61	14	23	0	1	0	1	0	0	0	100
	877	58	15	19	0	2	0	4	2	0	0	100
	878	75	24	1	0	0	0	0	0	0	0	100
	879	63	31	5	0	0	0	0	0	1	0	100
	880	41	49	8	0	0	0	0	2	0	0	100
	Mean	59.60	26.60	11.20	.00	.60	.00	.00	1.00	.80	.20	.00
StDev	12.24	14.33	9.39	.00	.89	.00	.00	1.73	1.10	.45	.00	.00
Endocladia	881	75	1	14	0	2	0	8	0	0	0	100
	882	41	2	50	0	1	0	6	0	0	0	100
	883	50	0	41	0	1	0	8	0	0	0	100
	884	44	4	51	0	0	0	1	0	0	0	100
	885	44	0	43	0	0	0	12	0	1	0	100
	Mean	50.80	1.40	39.80	.00	.80	.00	7.00	.00	.20	.00	.00
StDev	13.92	1.67	15.06	.00	.84	.00	4.00	.00	.45	.00	.00	.00
Rockweed	896	9	1	3	83	0	0	4	0	0	0	100
	897	11	1	3	68	0	0	17	0	0	0	100
	898	8	1	0	81	0	0	10	0	0	0	100
	899	15	3	0	81	0	0	1	0	0	0	100
	900	10	4	2	84	0	0	0	0	0	0	100
	Mean	10.60	2.00	1.60	79.40	.00	.00	6.40	.00	.00	.00	.00
StDev	2.70	1.41	1.52	6.50	.00	.00	7.09	.00	.00	.00	.00	.00
Mussels	891	11	0	0	0	45	0	11	33	0	0	100
	892	38	0	0	0	42	0	9	11	0	0	100
	893	9	0	0	0	68	0	9	14	0	0	100
	894	9	0	0	0	77	0	1	13	0	0	100
	895	17	0	0	0	71	0	2	10	0	0	100
	Mean	16.80	.00	.00	.00	60.60	.00	6.40	16.20	.00	.00	.00
StDev	12.30	.00	.00	.00	15.98	.00	4.56	9.52	.00	.00	.00	.00
Pollicipes	901	39	8	0	0	27	0	10	16	0	0	100
	902	50	3	0	0	9	0	17	21	0	0	100
	903	2	0	0	0	39	0	14	45	0	0	100
	904	9	1	0	0	47	0	12	31	0	0	100
	905	2	0	0	0	54	0	5	39	0	0	100
	Mean	20.40	2.40	.00	.00	35.20	.00	11.60	30.40	.00	.00	.00
StDev	22.52	3.36	.00	.00	17.75	.00	4.51	12.07	.00	.00	.00	.00

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Tar	906	37	8	0	0	0	0	1	0	54	0	100
	907	35	27	0	0	0	0	0	0	38	0	100
	908	25	18	0	0	0	0	0	0	57	0	100
	909	54	17	0	0	0	0	0	0	29	0	100
	910	32	8	0	0	0	0	0	0	60	0	100
	Mean	36.60	15.60	.00	.00	.00	.00	.20	.00	.00	47.60	.00
StDev	10.74	7.96	.00	.00	.00	.00	.45	.00	.00	13.43	.00	.00
Hesperophyc	886	80	1	9	9	0	0	1	0	0	0	100
	887	67	4	9	2	0	0	18	0	0	0	100
	888	46	20	14	20	0	0	0	0	0	0	100
	889	64	11	5	14	0	0	6	0	0	0	100
	890	27	17	13	41	0	0	2	0	0	0	100
	Mean	56.80	10.60	10.00	17.20	.00	.00	5.40	.00	.00	.00	.00
StDev	20.61	8.14	3.61	14.86	.00	.00	7.40	.00	.00	.00	.00	.00

**Percent Cover of Index Species
Orizaba Cove, Santa Cruz Island - Fall 1998 (12/3/98)**

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	851	65	35	0	0	0	0	0	0	0	0	100	
	852	53	47	0	0	0	0	0	0	0	0	100	
	853	54	46	0	0	0	0	0	0	0	0	100	
	854	47	44	0	0	2	0	3	4	0	0	100	
	855	27	65	0	0	0	0	5	3	0	0	100	
	Mean	49.20	47.40	.00	.00	.40	.00	1.60	1.40	.00	.00	.00	100.00
	StDev	14.01	10.92	.00	.00	.89	.00	2.30	1.95	.00	.00	.00	.00
Rockweed	866	0	0	0	97	0	0	3	0	0	0	100	
	867	1	0	0	91	0	0	8	0	0	0	100	
	868	0	0	0	93	0	0	7	0	0	0	100	
	869	0	0	0	84	0	0	16	0	0	0	100	
	870	8	0	0	83	0	0	9	0	0	0	100	
	Mean	1.80	.00	.00	89.60	.00	.00	8.60	.00	.00	.00	.00	100.00
	StDev	3.49	.00	.00	5.98	.00	.00	4.72	.00	.00	.00	.00	.00
Mussels	861	5	16	0	0	48	0	28	3	0	0	100	
	862	0	5	0	0	87	0	7	1	0	0	100	
	863	0	3	0	0	92	0	4	1	0	0	100	
	864	1	3	0	0	84	0	9	3	0	0	100	
	865	0	0	0	0	93	0	6	1	0	0	100	
	Mean	1.20	5.40	.00	.00	80.80	.00	10.80	1.80	.00	.00	.00	100.00
	StDev	2.17	6.19	.00	.00	18.70	.00	9.78	1.10	.00	.00	.00	.00
Tetraclita	871	18	48	0	0	3	0	29	2	0	0	100	
	872	12	41	0	0	18	0	25	4	0	0	100	
	873	26	50	0	5	0	0	17	2	0	0	100	
	874	25	38	0	0	4	0	25	8	0	0	100	
	875	20	37	0	0	0	0	39	4	0	0	100	
	Mean	20.20	42.80	.00	1.00	5.00	.00	27.00	4.00	.00	.00	.00	100.00
	StDev	5.67	5.89	.00	2.24	7.48	.00	8.00	2.45	.00	.00	.00	.00
Hesperophyc	856	28	8	28	5	0	0	31	0	0	0	100	
	857	15	1	0	75	0	0	9	0	0	0	100	
	858	8	0	0	73	0	0	19	0	0	0	100	
	859	53	16	1	21	0	0	9	0	0	0	100	
	860	72	15	11	0	0	0	2	0	0	0	100	
	Mean	35.20	8.00	8.00	34.80	.00	.00	14.00	.00	.00	.00	.00	100.00
	StDev	26.79	7.52	12.10	36.62	.00	.00	11.27	.00	.00	.00	.00	.00

Percent Cover of Index Species Prisoner's Harbor, Santa Cruz Island - Fall 1998 (12/20/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock- weed	Mussels	Turf- weed	Misc Algae	Misc Animal	Tar	Other	Total	
Barnacle	826	99	0	0	0	0	0	0	1	0	0	100	
	827	29	1	0	29	2	0	35	2	2	0	100	
	828	42	18	20	12	0	0	6	2	0	0	100	
	829	40	32	7	0	0	0	10	11	0	0	100	
	830	47	13	2	7	0	0	23	8	0	0	100	
	Mean	51.40	12.80	5.80	9.60	.40	.00	14.80	4.80	.40	.00	.00	100.00
	StDev	27.41	13.22	8.44	11.97	.89	.00	14.10	4.44	.89	.00	.00	.00
Endocladia	831	50	5	31	0	0	0	14	0	0	0	100	
	832	26	30	38	1	0	0	4	1	0	0	100	
	833	38	38	20	0	0	0	2	2	0	0	100	
	834	38	29	29	0	0	0	4	0	0	0	100	
	835	32	14	48	1	0	0	3	2	0	0	100	
	Mean	36.80	23.20	33.20	.40	.00	.00	5.40	1.00	.00	.00	.00	100.00
	StDev	8.90	13.37	10.47	.55	.00	.00	4.88	1.00	.00	.00	.00	.00
Rockweed	846	2	0	0	91	0	0	7	0	0	0	100	
	847	5	2	0	68	0	0	24	1	0	0	100	
	848	1	0	0	97	0	0	2	0	0	0	100	
	849	1	0	0	94	0	0	4	1	0	0	100	
	850	1	0	0	93	0	0	6	0	0	0	100	
	Mean	2.00	.40	.00	88.60	.00	.00	8.60	.40	.00	.00	.00	100.00
	StDev	1.73	.89	.00	11.72	.00	.00	8.82	.55	.00	.00	.00	.00
Mussels	841	6	1	0	0	15	0	75	3	0	0	100	
	842	0	0	0	0	78	0	19	3	0	0	100	
	843	0	1	0	0	88	0	9	2	0	0	100	
	844	12	0	0	0	56	0	28	4	0	0	100	
	845	12	35	0	0	10	0	40	3	0	0	100	
	Mean	6.00	7.40	.00	.00	49.40	.00	34.20	3.00	.00	.00	.00	100.00
	StDev	6.00	15.44	.00	.00	35.66	.00	25.51	.71	.00	.00	.00	.00
Hesperophyc	836	36	20	31	4	0	0	6	3	0	0	100	
	837	60	19	10	11	0	0	0	0	0	0	100	
	838	64	11	9	7	0	0	8	1	0	0	100	
	839	48	41	7	2	0	0	0	2	0	0	100	
	840	64	25	7	0	0	0	1	3	0	0	100	
	Mean	54.40	23.20	12.80	4.80	.00	.00	3.00	1.80	.00	.00	.00	100.00
	StDev	12.20	11.14	10.26	4.32	.00	.00	3.74	1.30	.00	.00	.00	.00

Percent Cover of Index Species Scorpion Rock, Santa Cruz Island - Fall 1998 (12/3/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	801	57	42	0	0	1	0	0	0	0	0	100
	802	72	27	0	0	0	0	1	0	0	0	100
	803	72	25	0	0	0	0	3	0	0	0	100
	804	71	27	0	0	0	0	2	0	0	0	100
	805	67	31	0	0	0	0	2	0	0	0	100
	Mean	67.80	30.40	.00	.00	.20	.00	1.60	.00	.00	.00	.00
StDev	6.38	6.84	.00	.00	.45	.00	1.14	.00	.00	.00	.00	.00
Endocladia	806	61	5	4	0	0	0	29	1	0	0	100
	807	47	3	2	0	1	0	47	0	0	0	100
	808	43	14	5	0	0	0	36	2	0	0	100
	809	54	27	3	0	1	0	4	11	0	0	100
	810	54	6	3	0	0	0	33	4	0	0	100
	Mean	51.80	11.00	3.40	.00	.40	.00	29.80	3.60	.00	.00	.00
StDev	6.98	9.87	1.14	.00	.55	.00	15.90	4.39	.00	.00	.00	.00
Mussels	816	0	1	0	0	97	0	1	1	0	0	100
	817	8	6	0	0	63	0	12	11	0	0	100
	818	11	19	0	0	50	0	16	4	0	0	100
	819	7	3	0	0	81	0	8	1	0	0	100
	820	0	7	0	0	58	0	31	4	0	0	100
	Mean	5.20	7.20	.00	.00	69.80	.00	13.60	4.20	.00	.00	.00
StDev	4.97	7.01	.00	.00	18.99	.00	11.19	4.09	.00	.00	.00	.00
Tetraclita	821	30	26	0	0	15	0	23	6	0	0	100
	822	24	17	0	0	26	0	30	3	0	0	100
	823	43	16	0	0	34	0	6	1	0	0	100
	824	36	27	0	0	21	0	11	5	0	0	100
	825	34	14	0	0	35	0	16	1	0	0	100
	Mean	33.40	20.00	.00	.00	26.20	.00	17.20	3.20	.00	.00	.00
StDev	7.06	6.04	.00	.00	8.53	.00	9.52	2.28	.00	.00	.00	.00
Hesperophyc	811	30	3	25	38	0	0	4	0	0	0	100
	812	8	1	29	40	0	0	21	1	0	0	100
	813	16	2	20	58	0	0	4	0	0	0	100
	814	17	0	16	49	0	0	18	0	0	0	100
	815	42	0	19	22	0	0	14	3	0	0	100
	Mean	22.60	1.20	21.80	41.40	.00	.00	12.20	.80	.00	.00	.00
StDev	13.41	1.30	5.17	13.45	.00	.00	7.89	1.30	.00	.00	.00	.00

Percent Cover of Index Species Trailer, Santa Cruz Island - Fall 1998 (12/19/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total
Barnacle	911	52	31	8	0	1	0	6	2	0	0	100
	912	68	30	0	0	0	0	2	0	0	0	100
	913	46	52	1	0	0	0	1	0	0	0	100
	914	53	46	0	0	0	0	0	1	0	0	100
	915	58	37	0	0	0	0	0	5	0	0	100
	Mean	55.40	39.20	1.80	.00	.20	.00	1.80	1.60	.00	.00	.00
StDev	8.23	9.58	3.49	.00	.45	.00	2.49	2.07	.00	.00	.00	.00
Rockweed	926	3	1	1	92	0	0	3	0	0	0	100
	927	21	0	1	75	0	0	3	0	0	0	100
	928	35	2	6	54	0	0	3	0	0	0	100
	929	8	1	0	86	0	0	4	1	0	0	100
	930	4	1	0	94	0	0	1	0	0	0	100
	Mean	14.20	1.00	1.60	80.20	.00	.00	2.80	.20	.00	.00	.00
StDev	13.66	.71	2.51	16.41	.00	.00	1.10	.45	.00	.00	.00	.00
Mussels	921	19	1	0	0	62	0	14	4	0	0	100
	922	13	0	0	0	34	0	32	21	0	0	100
	923	11	7	0	0	55	0	20	7	0	0	100
	924	35	1	0	0	33	0	20	11	0	0	100
	925	39	1	0	0	37	0	12	11	0	0	100
	Mean	23.40	2.00	.00	.00	44.20	.00	19.60	10.80	.00	.00	.00
StDev	12.84	2.83	.00	.00	13.37	.00	7.80	6.42	.00	.00	.00	.00
Hesperophyc	916	70	0	8	20	0	0	2	0	0	0	100
	917	51	4	14	28	0	0	3	0	0	0	100
	918	52	2	7	34	0	0	5	0	0	0	100
	919	52	6	7	34	0	0	1	0	0	0	100
	920	54	14	16	8	0	0	7	1	0	0	100
	Mean	55.80	5.20	10.40	24.80	.00	.00	3.60	.20	.00	.00	.00
StDev	8.01	5.40	4.28	11.01	.00	.00	2.41	.45	.00	.00	.00	.00

Percent Cover of Index Species

Willows Anchorage, Santa Cruz Island - Fall 1998 (12/17/98)

Zone	Plot	Bare Rock	Barnacle	Endo-cladia	Rock-weed	Mussels	Turf-weed	Misc Algae	Misc Animal	Tar	Other	Total	
Endocladia	931	52	0	36	0	0	0	10	2	0	0	100	
	932	51	3	44	0	0	0	2	0	0	0	100	
	933	29	0	47	0	0	0	23	1	0	0	100	
	934	26	1	33	0	0	0	35	5	0	0	100	
	935	39	6	27	0	0	0	26	2	0	0	100	
	Mean	39.40	2.00	37.40	.00	.00	.00	19.20	2.00	.00	.00	.00	100.00
	StDev	12.05	2.55	8.14	.00	.00	.00	13.14	1.87	.00	.00	.00	.00
Rockweed	946	45	0	23	0	0	0	31	1	0	0	100	
	947	57	3	5	0	0	0	32	3	0	0	100	
	948	6	0	0	85	0	0	8	1	0	0	100	
	949	1	0	0	97	0	0	2	0	0	0	100	
	950	19	2	2	72	0	0	5	0	0	0	100	
	Mean	25.60	1.00	6.00	50.80	.00	.00	15.60	1.00	.00	.00	.00	100.00
	StDev	24.47	1.41	9.72	47.21	.00	.00	14.67	1.22	.00	.00	.00	.00
Mussels	941	21	12	0	0	32	0	29	6	0	0	100	
	942	13	2	0	0	15	0	66	4	0	0	100	
	943	10	0	0	0	22	0	55	13	0	0	100	
	944	23	1	0	0	9	0	63	4	0	0	100	
	945	10	1	0	0	23	0	59	7	0	0	100	
	Mean	15.40	3.20	.00	.00	20.20	.00	54.40	6.80	.00	.00	.00	100.00
	StDev	6.19	4.97	.00	.00	8.70	.00	14.79	3.70	.00	.00	.00	.00
Hesperophyc	936	88	0	0	0	0	0	8	4	0	0	100	
	937	33	5	2	38	0	0	21	1	0	0	100	
	938	80	2	1	4	0	0	13	0	0	0	100	
	939	29	2	1	63	0	0	5	0	0	0	100	
	940	27	5	11	46	0	0	11	0	0	0	100	
	Mean	51.40	2.80	3.00	30.20	.00	.00	11.60	1.00	.00	.00	.00	100.00
	StDev	29.97	2.17	4.53	27.32	.00	.00	6.07	1.73	.00	.00	.00	.00

Appendix B. Photoplot Species Census

Presence of species within photoplots were noted.

X designates the species presence in that plot.

? indicates identification of that species was not positive.

Numbers indicate the actual number of that species found in the plot (species used in the motile invertebrate count). At San Miguel Island (fall sampling), relative abundance is given as; R= rare, P= present, C= common, A= abundant, X = present but abundance ranking not given.

E indicates eggs of that species present.

Appendix C. General Species List

The species list contains presence/absence and relative abundance data for all species found at a site during the regular visit. Relative abundance values are subjective, relative to the entire site accounting for the appropriate habitat and based on observers' comparison to other areas. The time allotted to general species information gathering varied. Plot census observations were added to the general species list. When time and tide allowed, searches were made to include all the species that could be found on the rocky intertidal bench around a monitoring site. No general species list was collected for sites/dates not listed.

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 the 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
- D drift
- S shell only

Appendix D. Trip Reports

The following are trip reports from 1998 field monitoring. These reports summarize the work done during each monitoring event, provide a quick summary of the data collected, and serve as metadata for those data.

Santa Barbara Island
February 10-12, 1998
(Database event #1998-A)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park

PROCEDURE: Out on the SEA RANGER, arriving on Santa Barbara Island just before noon. We arrived to partly cloudy skies following a week of severe storms with heavy rain and large swells throughout the region. With the lower pier landing gone, we had to skiff onto the rocks in the cove. In January, the pier had been damaged by swells rolling over the top deck. The boathouse door was bashed in, deckboards and their 10 inch nails were pulled out and all but one of the outer pilings were torn off or broken during those swells.

On 2/11 we walked around the island with Randy Nelson, the new SBI ranger. We discussed various resource issues and showed him where the various monitoring sites were. We discovered brown pelicans nesting on the slope below the sea lion rookery overlook so there was no way to conduct monitoring at the sea lion rookery site. We were able to see eggs in some nests, but most were still building nests and courting. We spent the afternoon helping Randy make repairs to the pier. On 2/12 we helped Randy install a radio antenna and base station in the bunkhouse and moved a cabinet to where it will be more usable. The SEA RANGER picked us up at 1130 hrs.

RESULTS:

We began working at the Landing Cove site at 1400 hrs. Low tide was -0.7 ft at 1514 hrs. Air temperature 17°C, Water temperature 17°C, winds 3-5 kts NW, Swell heavy, waves over 6 ft. There were 10 young California sea lions in the cove. Most were quite high on the rocks. A number were resting on the upper pier deck when we arrived. One wandering tattler was the only shorebird present.

Because of the heavy surge we made no attempt to score the plots in the field. I photographed the plots, and completed censuses in all but the mussel plots. I also made some repairs to plot corners, including replacing the numbers for the rockweed plots whose brass tags had worn smooth.

There was surprisingly little apparent damage in the intertidal zone. A few small, fresh rock patches were apparent where rocks had been broken off, but these were for the most part on the order of less than 100 square centimeters. There was a small clearing in plot 323, one of the red turf algae plots, where surfgrass, *Phyllospadix torreyi*, was torn out. The corner bolts of plot 320 were bent over. Mussels had been torn out in several small patches. Part of plot 326 (mussel zone) had been cleared. The corner number tag was exposed revealing how the plot was positioned slightly off when it was relocated. The bolt marking the upper right corner of the new plot was the lower right corner of the original plot.

Barnacle cover remained about where it was last fall, algal cover was high both last fall and this spring but the composition changed from *Gelidium coulteri* and *Mazzaella leptorhyncus* last fall to more *Endarachne binghamiae* and *Endocladia muricata* in the spring. Most of the *Pelvetia compressa* plants were present in the rockweed zone, but

the fronds were shorter and they looked a bit beat up. No further damage appeared in any of the mussel plots. Coralline algae mostly colonized the rock exposed in October.

Photoplot Summary – mean % cover by zone at Landing Cove (*Phyllospadix* is included in misc. algae) (20 plots)

Site	Zone Name	BareRock	Barnacle	Endocladia	TurfWeed	RockWeed	Mussels	MiscAlgae	MiscAnimal
LC	Barnacle	22.0	15.4	0.0	-	0.0	2.6	60.0	0.0
LC	Rockweed	23.4	0.2	0.0	-	15.6	2.2	58.6	0.0
LC	Mussel	8.6	1.0	0.0	-	0.0	57.2	32.8	0.4
LC	Red Algal Turf	4.2	0.0	0.0	73.2	0.0	0.0	22.6	0.0

Heavy surge prevented conducting the sea star transect.

Anacapa Island
March 9-10, 1998
(Database event #1998-B)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park

PROCEDURE: Traveled out on the SEA RANGER both days. On 3/9 we departed Ventura at 1000 hrs, picked up Ranger Darcy MacDonald at East Island, and then proceeded to Middle Island. I photographed then censused plots. Derek scored the plots. Derek downloaded the temperature logger. Area photos were shot of the site including closeups of clearings in the mussel beds. We worked the west site from 1130 to 1330 hrs, then moved to the east site from 1330 to 1500 hrs. Both sites were completed. Keith Duran and Darcy checked the Harbor Seal Arch area for abalone, not finding any. Before leaving we stopped at South Frenchy's Cove to download the temperature logger there. There was no time for measuring owl limpets.

On 3/10, Derek went alone to South Frenchy's Cove, getting dropped off at 1000 hrs while the SEA RANGER continued on to Santa Barbara Island. Harbor seals on the beach prevented access to Cat Rock. Plots at South Frenchy's Cove were photographed and scored and owl limpets were measured during a 30-minute haphazard search.

RESULTS: 3/9/98, Middle Anacapa Island, low tide -0.4 ft at 1408 hrs, conditions were sunny and calm, air temperature 18°C, water temperature 15.5°C, surge light. The tide was very workable at when we arrived at 1000 hrs. Three black oystercatchers were present. March 1997 was the last time we visited the site and we did not monitor the east site at that time.

Only one *Pisaster ochraceus* was found at the site. Several large (>4 m²) bare patches in the mussel zone were observed, presumably a result of the swells that hit this winter. Most of the mussel damage was towards the east end of the site. Purple urchins, *Strongylocentrotus purpuratus*, normally are quite abundant below the mean low tide level. Their numbers were noticeably thinner this time. There was very little macro algae at this level; only a couple of *Halidrys dioica* were present. No *Egregia* or *Macrocystis* was obvious. There were a couple of *Sargassum muticum* plants in a tidepool near plot 457. *Endarachne binghamiae* was very abundant over much of the site, growing both on the rocks and on mussel shells. *Endarachne* obscured much of the *Endocladia*. *Endocladia* and rockweed were about average, with little change from last year. Mussel cover was down in all plots from last year.

Both temperature loggers downloaded successfully. One boatload of visitors was leaving French's Cove when we arrived. We went through the tunnel east of the gap and onto the reef on the south side. A landslide had blocked the entrance to the tunnel, but wave action through the tunnel had opened it again. Owl limpets were quite common on the protected reef.

Photoplot summary – mean % cover by zone at Middle-West Anacapa. (20 plots)

Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal
MW	Barnacle	34.2	11.2	18.6	0.6	0.2	34.0	1.2
MW	Endocladia	32.0	2.0	20.8	1.6	2.6	40.8	0.2
MW	Rockweed	26.0	3.0	3.4	47.4	3.0	16.4	0.8
MW	Mussel	21.2	1.4	0.8	0.2	41.0	33.8	1.6

Photoplot summary – mean % cover by zone at Middle-East Anacapa. (12 plots)

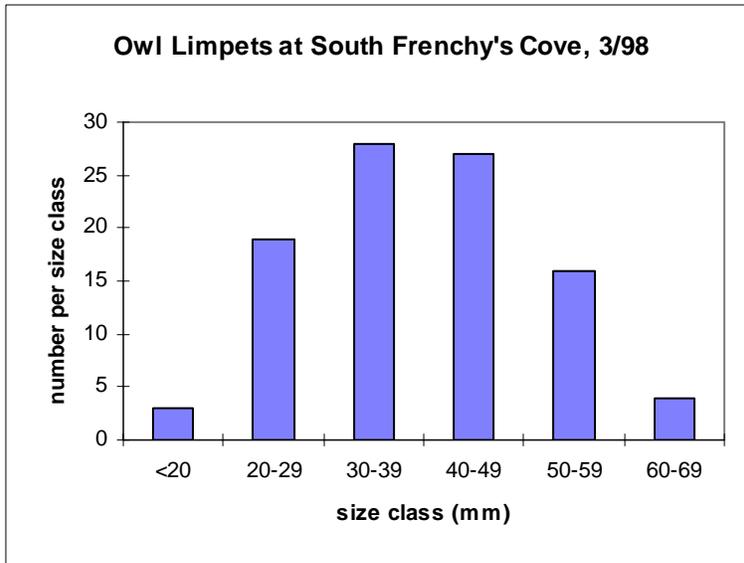
Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal
ME	Barnacle	47.3	12.3	15.3	0.3	0.3	23.0	1.3
ME	Endocladia	26.0	3.3	33.3	7.0	1.0	29.0	0.3
ME	Rockweed	7.7	4.0	2.0	48.0	3.0	34.3	1.0
ME	Mussels	10.3	2.7	0.0	0.0	60.0	26.7	0.3

3/10/98, South Frenchy's Cove, low tide -0.4 ft @ 1438 hrs, conditions sunny and calm, water temperature 17.5°C, surge- light. Derek worked alone this day. He snorkeled next to the site while waiting for the tide to drop and found juvenile lobster and kelp bass to be common. The subtidal algae and surfgrass appeared healthy. An injured tufted puffin was observed on the beach.

IPCO landed two school groups in the afternoon and some time was spent explaining the monitoring. The site was worked from 1200-1530 hrs. Both *Hesperophycus californicus* and *Pelvetia compressa* were present in some plots. Tar was present in four of the five barnacle plots. Owl limpet densities seemed lower than previous years but exactly the same number (97) were measured during a 30-minute search as in 1997. The coralline alga, *Amphiroa zonata*, was abundant in tidepools. Sand was scoured from the beach making the cobble beach at the gap very steep and the step up from the sand to the reef near plot 154 was slightly more than a meter.

Photoplot summary – mean % cover by zone at South Frenchy's Cove. (20 plots)

Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
SFC	Barnacle	44.0	43.6	3.2	0.0	0.0	04.8	3.4	1.0
SFC	Endocladia	40.6	4.0	39.4	9.6	0.0	04.6	1.8	0.0
SFC	Rockweed	20.0	4.8	0.6	60.4	0.0	13.8	0.4	0.0
SFC	Mussel	2.4	0.0	0.0	0.0	59.2	38.0	0.4	0.0



Owl limpet size distribution at South Frenchy's Cove. N=97.

Santa Cruz Island
April 21, 1998
(Database event #1998-C)

PURPOSE: To conduct a reconnaissance of the intertidal zone at Smugglers Cove area on East Santa Cruz Island. Gather photos and base line information on owl limpet populations

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park

PROCEDURE: The OCEAN RANGER dropped us off about 1030 at Scorpion Ranch for the day. We proceeded to Smugglers Cove, then walked north on the beach to the rocky area between Hungryman's cove and Smugglers beach. We looked around, noted dominant species, shot several 35 mm slides of the area, and recorded observations on video. A point near an aggregation of owl limpets, *Lottia gigantea*, was arbitrarily chosen and all owl limpets within a one-meter radius of that point were measured. Three arbitrary plots were measured. We looked at the rocky area on the south end of Smugglers beach and again noted the dominant organisms and took slides and video. We were back to Scorpion at 1430 hrs and the PACIFIC RANGER picked us up about 1530.

RESULTS: Low tide was 0.0 ft at 1253 hrs. Conditions were sunny and calm with 1-3 ft surf. Water temperature was 16°C.

North of beach-The rocky area to the north of the beach is mostly stable boulders. The beach area is narrow with high cliffs backing the rocky shore. Waves cover the shore to the cliffs at the highest tides. The larger rocks are angular volcanic rock. The small rocks are wave polished and smooth. Diatoms covered the lower rocks making them very slippery.

Rock lice, *Ligia occidentalis* were very abundant near the beach but were less noticeable as we moved to the north. Shore crabs, *Pachygrapsus crassipes*, and black turban snails, *Tegula funebris* were also abundant in the rocks near the beach with abundance tapering off to the north. Littorine snails, *Littorina keenae*, and small limpets, mostly *Collisella scabra* and *C. digitalis*, were common on the rocky cliff face.

Approximately 150 m from the beach is an arch in the rock that one walks through to continue along the shore. I refer to this as first arch. Second arch is a high rock with a narrow arch at the next point about 50 m north of first arch. Owl limpets were spotty in occurrence near the beach but were in quite high abundance's near the first arch and continued to be found in high densities to the second arch and beyond. Two plots were measured near the second arch and one near the first arch. The owl limpets seemed to have especially deep shells.

Algal cover was dominated by film and filamentous diatoms and by turfy red algae. *Endocladia muricata* increased in abundance north from the beach. *Chondracanthus canaliculatus* covered the lower rocks *Scytosiphon lomentaria* was especially common and robust in the area of the second arch. Some patches of *Sargassum muticum* were present. Other algae included patches of short *Ulva* sp., *Mazzaella affinis*, *Mastocarpus papillata*, *Mazzaella leptorhyncus*, *Bangia* sp., *Colpomenia* sp and

Endarachne/Petalonia (common). Relatively few plants of *Egregia menziesii* were seen. Some coralline algae, *Corallina vancouveriensis* and *Haliptylon gracile*, were present to the north of the second arch but not in high abundance. Only a few scattered plants of *Pelvetia compressa* were found.

California mussels, *Mytilus californianus*, formed some fair sized patches near first arch and were abundant north of the second arch. Their size seemed to increase to the north also. Gooseneck barnacles, *Pollicipes polymerous*, were present only in small isolated patches. Sandcastle worms, *Phragmatopoma californica*, were present in small patches at the bases of some boulders. Green anemones, *Anthopleura elegantissima*, were common and both colonial and solitary forms were present. Acorn barnacles, *Balanus glandula*, formed dense patches on some rocks. Red-thatched barnacles, *Tetraclita rubescens*, were common in some of the lower rocks but somewhat patchy and never in high density. Other invertebrates noted include *Mopalia muscosa*, *Nuttalina californica*, *Norrisia norrisi*, *Megathura crenulata*, *Collisella limatula*, *Septifer/Brachidontes*. Purple urchins, *Strongylocentrotus purpuratus*, were common. From the distribution and graze marks on the rocks, I suspect that densities were higher and the echinoderm wasting disease impacted them last summer. One black abalone, *Haliotis cracherodii* was found. Its length was approximately 100 mm. It appeared healthy.

South of beach- sedimentary rocks of the kind that make up Yellowbanks dominate the shore there. Cliffs back the shoreline, but the area is a little wider than the north area. More silt was present than at the north area. Though softer material, these rocks seem to remain more angular, and contain more small pits and fissures making them less suitable habitat for owl limpets. Owl limpets were present in low numbers, however. A few volcanic rocks were present with higher densities of owl limpets and mussels. At least one large patch of *Sargassum muticum* was present. *Tetraclita rubescens* was more common and probably larger than the first site. *Egregia menziesii* and *Phyllospadix scouleri* were more common than at the northern site. Algae and invertebrate species were similar at both areas. One apparently healthy black abalone approximately 100 mm long was found.

Recommendations: we surveyed the area because Island Packers Company apparently wants to use Smugglers as an alternative to Frenchy's Cove, Anacapa Island during some weather conditions. Ron Massengill (Island Ranger) has collected some information from East Santa Cruz Is. but we all felt more baseline information was needed, particularly for owl limpet size and density.

There is some advantage to IPCO using this area as well as Frenchy's; there is a broad area for visitors to disperse to and it will relieve some of the pressure on Anacapa Island tidepools. Over 3200 visitors went to Frenchy's in 1997. During the last four years, 75% of the visitation was during February through May. The area is fairly rich, and in fact, I believe I found more macro-invertebrates at Smugglers than I usually find at Frenchy's. However, the shoreline is narrower than Anacapa's, and the walking is very difficult because of the smooth rounded rocks covered with algal film.

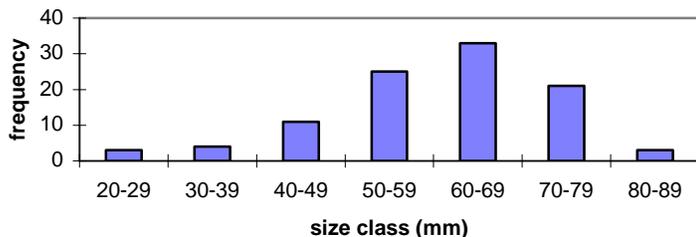
I would like to see the area on a minus tide and work up a complete species list. I would also like to know exactly where IPCO is most likely to go and concentrate more surveys there. Three owl limpet plots is barely enough information. I would like to explore the reef further to the north looking particularly at algal distribution and extent of mussel beds. I would also like to see the area to the south, below Yellowbanks.

The north area especially is suitable for our standard monitoring plots. Limpet plots with a single bolt marking the center can easily be established. Photoplots can be set up in the Endocladia, acorn barnacle, mussel and red algal turf zone. This last zone is used at Landing Cove Santa Barbara Island. This zone is impacted by trampling and would be good to follow. Bolts in at least two corners are necessary in this zone to mark the plots because overgrowth is so rapid and complete. I would also want to collect some baseline information on snails and limpets. I did this last year at most of the established sites and it would be interesting to compare. It would be possible to establish a station here during the June 1998 low tide series.

Owl limpet size distribution.

Island	Site	Year	SizeGroup	CountOfSize
SC	SC	1998	20-29	3
SC	SC	1998	30-39	4
SC	SC	1998	40-49	11
SC	SC	1998	50-59	25
SC	SC	1998	60-69	33
SC	SC	1998	70-79	21
SC	SC	1998	80-89	3

Smugglers Cove Owl Limpets (n=100)



Owl limpets in random plots at Smugglers Cove 4/21/98.

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
1	29	61.34	14.94	25	81	9.233
2	32	63.16	12.26	35	81	10.188
3	39	58.15	9.64	29	74	12.416
Total	100	60.68	12.27	25	81	10.612

Owl limpet size distribution in random plots at Smugglers Cove

Plot	%<20m	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100mm
1	0.00%	6.90%	6.90%	3.45%	17.24%	34.48%	24.14%	6.90%	0.00%	0.00%
2	0.00%	0.00%	6.25%	9.38%	18.75%	28.13%	34.38%	3.13%	0.00%	0.00%
3	0.00%	2.56%	0.00%	17.95%	35.90%	35.90%	7.69%	0.00%	0.00%	0.00%
total	0.00%	3.00%	4.00%	11.00%	25.00%	33.00%	21.00%	3.00%	0.00%	0.00%

Anacapa Island
April 23, 1998
(Database event #1998-D)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
David Kushner, Marine Biologist, Channel Islands National Park

PROCEDURE: Day trip on the PACIFIC RANGER, departed 0930. We landed at Cat Rock about 1130 then Capt. Diane Brooks took ranger Darcy MacDonald over to Scorpion, returning for us about 1400. David and Derek scored all 36 plots in the field; Dan shot photos and censused plots. Derek shot a little video before we departed and David did plot corner repairs, including a new number corner for plot #53. There was no time for any limpet measurements. Abalone plots and the usual locations were briefly checked for the presence of abalone. We departed the beach at 1515, arriving back in Ventura at 1700.

RESULTS: The morning was overcast with heavy drizzle. The tide was a -0.2 ft at 1450 hrs. Wind and seas were calm, but there was a moderate surf break of about 4 ft. No temperatures were taken. Island packers had a large group of children at Frenchy's and the Blowhole area. There were 10 harbor seals on the beach to the west of the site and 15 on the beach to the east. One very thin California sea lion was on the reef. There were two wandering tattlers, two black oystercatchers, one western gull on the reef, and one pelagic cormorant landed on the bluff above while we worked.

All the plots were easily found, and most were in good shape despite the time lapsed since our last visit. The tide and conditions were quite workable. We could have used more time though, as always. With the number of plots at this site, it really helped having three people to get the plots scored.

No black abalone were observed in the brief search, no abalone were present in plots. Owl limpets were present in what appeared to be average densities. Purple sea urchin densities appeared to be much lower than in the past though we have not been monitoring them. Echinoderm disease and winter storms may have impacted their populations.

Black turban snails, *Tegula funebris*, were uncommon in general. The few pockets of turban snails that I did find were all *T. gallina*, the more southern species. Small littorine snails were abundant in some of the plots. *Ocenebra circumtexta* and *Acanthina punctulata* were present in moderate numbers, no other predatory snails were noted. The vermetid snail *Petalochonchus montereyensis* was very common. Red thatched barnacles, *Tetraclita rubescens*, were common. Small California mussels, indicating some recruitment in the last year, were present.

The algae all looked very healthy. *Endocladia muricata* formed a dense cover. Both species of rockweed were present in abundance. There were numerous juvenile *Hesperophycus haveyanus* and *Pelvetia compressa*. These appeared to be new recruits expanding their range into the barnacle plots rather than just new blades coming up from old basal holdfasts. *Chondracanthus canaliculatus* was abundant and seems to be creeping up into higher zones on the reef.

Photoplot summary- mean % cover by zone at Cat Rock (9 plots per zone).

Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussel	MiscAlga	MiscAnimals
CR	Barnacle	33.2	22.3	10.3	29.4	0.0	4.7	0.0
CR	Endocladia	17.2	8.2	30.9	4.7	1.0	34.7	3.3
CR	Rockweed	13.7	8.2	18.4	44.9	0.2	13.4	0.8
CR	Mussel	18.0	14.2	0.8	0.0	24.9	37.1	5.0

San Miguel Island
May 26-31, 1998
(Database event #1998-E)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Shane Anderson, VIP (Collector at UCSB)
Peter Haaker, Marine Biologist, California Department of Fish and Game
Ian Taniguchi, Marine Biologist, California Department of Fish and Game
Aaron Hebshi, Biologist, Point Reyes Bird Observatory

PROCEDURE: We flew out to the Dry Lake airstrip on 5/26, dropping Paige Martin and her volunteer on Santa Rosa to count snowy plovers. Pete and Ian had flown to SRI with the fish and Game plane and were waiting for us there. Bob DeLong, Sharon Meline and Larry --- were conducting sea lion and fur seal work at Point Bennett and hosted us for two nights there while we worked the west end sites. The first afternoon we helped Sharon put up two blinds. The next morning we worked at Otter Harbor. As with the other monitoring sites, Shane recorded for me and we checked black abalone plots, measured owl limpets in plots, photographed photo plots and censused the photoplots. I was able to get a good census of each of the photoplots at every site. Ian and Pete canvassed the reef looking for and measuring black abalone and abalone shells. On 5/28, we visited Leuzarder Point, on the western edge of Tyler Bight to measure abalone during a timed search. I made a general species list and measured owl limpets for size frequency. Mid-day we spent walking across the island with all of our sampling and camping gear to shift our base to the Lester Ranch ranger station. We worked at Harris Point on 5/29, then walked Simonton checking for snowy plovers and general conditions. I scored the five barnacle plots in the field using the field grid. The Rocks and barnacles here are difficult to distinguish on the slides. Pete stayed back because of severe blisters on 5/30 when we went to Crook Point. Ian scored 10 of the photoplots there. Pete stayed back again on 5/31 when we went to Cuyler Harbor. The plane arrived at 1300 to take us back to Camarillo.

I sent new temperature loggers out with Ian Williams and he replaced the Harris Point logger on 6/7 at 1500 hrs and the Crook Point logger on 6/9 at 0645 hrs.

RESULTS: The weather was very good all week except for 5/28 when it rained 0.35 inches. There was some south swell associated with the front but it did not prevent us from completing any tasks. Black abalone continue to decline in number. Density of black abalone at all sites is now less than one per square meter. Less than one percent of the highest count remain in the plots at Cook Point and Otter Harbor. Only 2.4 % of the highest count remain in the Harris Point plots. Withered abalone were found at all sites except Cuyler Harbor where we found no abalone.

Otter Harbor, 5/27/98, low tide -1.3 ft at 0559, clear sky, wind 5 kts NW, surge light, water temperature 13.5° C. We were on site from 0630 to 1100 hrs. There were 3 harbor seals, 13 elephant seals, 2 black oystercatchers, one western gull, and one willet present on the monitoring reef. Numerous elephant seals were on the small beach adjacent to the site but no count was made. Ian had his GPS unit and recorded the site as 34° 03' 9.2" N, 120° 24' 27.4" W.

All of our work was completed and the photos came out fine. Pete and Ian each searched for an hour and found a total of 57 black abalone, *Haliotis cracherodii*, and 29

shells. Four of the 43 abalone measured were withered. They also noted how many abalone were in groups as an indication of likely spawning capability. About 72% were in groups. Only three black abalone were found in plot 369, there were none in the other plots. Last November there were six abalone in the same plot. One ochre sea star was in 369. No search was made, but few sea stars were noticed around the site.

Algae were surprisingly lush after the winter storms and warm El Niño waters of the last year. Endocladia and both rockweeds (*Pelvetia compressa* and *Hesperophycus californicus*) were doing very well. The red alga *Cumagloia andersonii* was fairly common. Red turf algae were very lush. Turban snails, *Tegula funebris*, were common. Littorine snails were common and in some dense patches. Predatory snails (*Acanthina*, *Ocenebra*, and *Nucella*) were common. The tidepool copepod, *Tigriopus californicus*, was common in upper pools. Mussels seem to be doing OK but many are obscured by epiphytes, particularly *Porphyra perforata*.

Photoplot summary: mean % cover by zone at Otter Harbor, May 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	28.6	17.6	0.0	0.0	0.0	52.2	0.4	1.2
Endocladia	11.4	2.6	57.0	21.8	0.6	6.6	0.0	0.0
Rockweed	20.6	10.6	24.0	36.0	0.2	8.6	0.0	0.0
Mussels	14.4	1.0	1.4	0.0	60.2	19.6	3.4	0.0

Black abalone at Otter Harbor

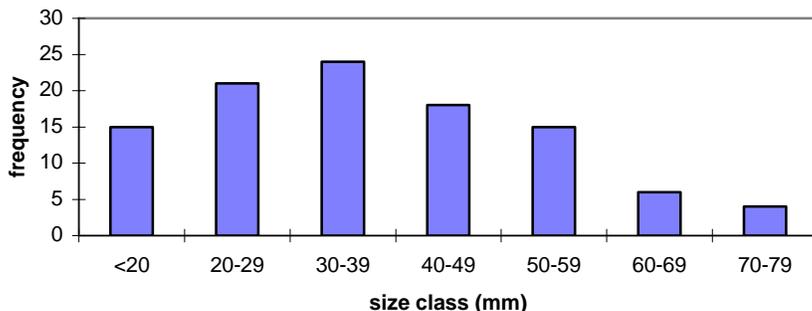
Date	Plot	Count	Avg	StDev	Min	Max
27-May-98	369	3	78.67	18.72	65	100

Owl limpets at Otter Harbor

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
368	7	56.14	16.67	29	78	1.892
369	88	34.59	14.28	15	79	12.941
496	8	54.25	15.17	24	72	.500
total	103	37.58	16.10	15	79	3.887

Plot	%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100mm
368	0.00%	14.29%	0.00%	14.29%	14.29%	42.86%	14.29%	0.00%	0.00%	0.00%
369	17.05%	21.59%	27.27%	18.18%	12.50%	1.14%	2.27%	0.00%	0.00%	0.00%
496	0.00%	12.50%	0.00%	12.50%	37.50%	25.00%	12.50%	0.00%	0.00%	0.00%
total	14.56%	20.39%	23.30%	17.48%	14.56%	5.83%	3.88%	0.00%	0.00%	0.00%

Owl Limpets at Otter Harbor, San Miguel



Size distribution of owl limpets at Otter Harbor. N=103.

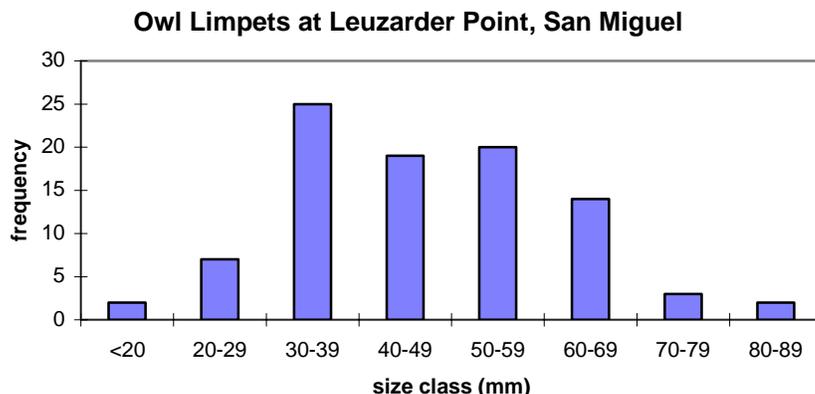
Leuzarder Point, 5/28/98, low tide -1.0 ft at 0648, light rain, wind 6 kts SE, surf 2-4 ft, surge- light. Elephant seals were in the surge channels and on the low rocks around the site, but the rocky reef along the point where we worked is flanked by a steep drop-off. There was one western gull nest above the point.

Pete, Ian, and Shane searched for abalone, with one person recording. They measured 104 black abalone, less than we had found last November here. About 32% were in groups. However, this time we did not work the inner reef because of the seals. Three withered animals were found. There were several shells and one dead abalone.

I measured 92 owl limpets on one rock approximately 3m² in a search time of 16 minutes. Sizes ranged from 16-85 mm. I also conducted a species list of the site, noting 72 species. Shore crabs, *Pachygrapsus crassipes*, seemed especially common here. Algae all looked lush. Some *Pelvetia compressa* was present but *Hesperophycus californicus* was more wide spread. *Laminaria setchellii*, *Halidrys dioica*, and *Egregia menziesii* were common on the drop off. There are some large acorn barnacles (*Balanus glandula*) here. Leaf barnacles, *Pollicipes polymerous*, were common on overhanging rocks. All the California mussels, *Mytilus californianus*, here are small, mostly 2-3 cm.

Owl limpets at Leuzarder Point

Date	Count	Mean Size	StDev	Min Size	Max Size
28-May-98	92	46.45	14.48	16	85



Size distribution of owl limpets at Leuzarder Point. N=92.

Harris Point, 5/29/98, low tide -0.7 ft at 0740, clear sky, wind 10 kts NW, water temperature 13.3°C, waves 2-4 ft, surge light. There were three black oystercatchers in the vicinity. One harbor seal pup was onshore; two elephant seals were in the water nearby. There were no pelagic cormorants nesting on the nearby ridge as there usually are in the spring. Aaron checked over the ridge and found none, but did see a rat nest in a small cave.

Pete and Ian measured abalone around the site and found a total of 81 black abalone (7 were unmeasured) in a one hour search. Two of the abalone were withered. About 24% were in groups. They also measured abalone in the monitoring plots, finding a total of 13, down from 69 in February 1997, and 56 in November 1997. No juveniles were found under rocks. Purple sea urchins, *Strongylocentrotus purpuratus*, now occupy many of the crevice areas once held by abalone. There was abundant algae in the surge channel below plot 445. This area was mostly bare when abalone were abundant in the area.

All the plots were photographed and censused. I scored the five barnacle plots because the rock type here makes it very difficult to distinguish small barnacles on the slides. Three ochre stars, *Pisaster ochraceus*, and three black abalone were found in the transect. In general, the algae looked healthy. *Hesperophycus* was very thin; looking like it had a tough winter. Only one small plant was present in plot 423. The cobble area where we used to find juvenile abalone now has a dense cover of red algae, mostly *Mastocarpus papillata*, *Mazzaella affinis* and some *Ulva* sp. Prickleback eels, flatworms and isopods were common under the cobblestones, as they always have been. The temperature logger failed to transfer data.

Simonton Cove beach had lots of fresh tar on it. We found several sea lion carcasses, mostly small pups (no actual count). Carcasses of a loon, sooty shearwater, and northern fulmar were found. No snowy plovers were observed. One oystercatcher was observed probing for sand crabs.

Photoplot summary: mean % cover by zone at Harris Point, May 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal
Barnacle	57.4	16.6	2.8	0.0	4.4	17.6	1.2
Endocladia	29.6	1.4	55.8	8.4	2.0	2.8	0.0
Rockweed	57.4	0.0	22.6	15.8	0.0	4.0	0.2
Mussels	41.6	4.4	1.2	0.0	39.6	11.6	1.6

Black abalone at Harris Point

Date	Plot	Count	Avg	StDev	Min	Max
29-May-98	441	2	112.50	7.78	107	118
29-May-98	442	1	82.00		82	82
29-May-98	443	4	88.50	25.89	50	106
29-May-98	444	3	100.00	10.15	91	111
29-May-98	445	3	105.33	30.09	86	140

Crook Point, 5/30/98, low tide -0.3 ft at 0835, clear sky, wind 8 kts NW and decreasing, water temperature 12° C, air temperature 16° C, surf to 10 ft, surge moderate. No birds were present when we arrived. Two elephant seals were in the surge channel, and several others were on the adjacent beach.

Ian was somewhat hampered in his search for abalone because of the waves breaking on the reef. He only found seven black abalone in a one-hour search. Shane and I checked the ab plots and found two abalone inside, and two just outside the plots. There were eight ochre stars in the ab plots. I did not see any, but did not make an exhaustive search for owl limpets in the plots. I shot photos of the abalone plots, but I was not able to find two of the upper bolts of the adjacent plots 391 and 392.

There was a lot of *Porphyra perforata* growing over the mussel shells in some plots, partially obscuring them. Ian scored 10 of the plots on the inner reef and scored for the dominant cover, meaning mussels rather than algae. Things in general looked pretty good. Shane shot quite a bit of video with his camera; I may be able to get a copy. We had enough gear and questionable conditions without the park video this week. The temperature logger failed to transfer data.

We checked for snowy plovers on the range pole beach and east to the "Danger No Landing" sign where there is a colony of Brant's cormorants with 34 nests at the sign. The only way past the canyon is along the rocks below the cormorants or over San Miguel Hill so we did not check the southeast beaches.

Photoplot summary: mean % cover by zone at Crook Point, May 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal
Barnacle	59.0	37.0	3.2	0.0	0.6	0.2	0.0
Endocladia	33.4	1.2	50.4	2.2	5.6	5.4	1.8

Rockweed	31.6	2.0	16.2	12.2	12.6	22.6	2.8
Mussels	13.4	1.2	0.0	0.0	72.0	6.6	6.8

Black abalone at Crook Point

Date	Plot	Count	Avg	StDev	Min	Max
30-May-98	392	1	90.00		90	90
30-May-98	394	1	20.00		20	20

Cuyler Harbor, 5/31/98, low tide +0.1 ft at 0933, clear sky, wind 6 kts NW and increasing, surge light. There were approximately 26 brown pelicans and 30 western gulls at the middle rocks, some surf scoters and cormorants offshore. One black oystercatcher was on the beach at the east end. No snowy plovers were seen.

Ian looked for abalone and found none. The plots were found easily and all were photographed and censused. Mussel cover is very thin in some plots. Large, old mussels dominate, though there are some small mussels. Plot 401 has only some small mussels. The algae all looks healthy and lush. *Phragmatopoma californica* tubes were knocked back some this winter and the new tubes are mostly confined to crevices.

Cuyler Harbor beach seemed very wide this year. The middle rocks were exposed and easily walked around. Small mussels and green algae were common on the rocks, and *Gracilaria* sp. was common in the sand. There were lots of sand crabs, *Emerita analoga*, cast up on the beach. Each had a peck mark through the carapace. We suspected whimbrels (or oystercatchers) were spearing the crabs but unable or unwilling to eat the large crabs. *Cirrolana* isopods were all over the dead crabs in the wet sand. Gull droppings had red crab remains in them, but we saw no red crabs.

I made a very quick check east of the site where a fishing boat had run aground last year some time. I did not see any overt signs of damage.

Before leaving, I collected some *Coreopsis* seed heads (<30) and beet leaves (3) from the ranch area for researchers at Sarah Chaney's request.

Abalone data collected from Fish and Game is in the California Department of Fish and Game, Marine Region, Field Report 98-SMI-1 Nearshore Invertebrate Project.

Photoplot summary: mean % cover by zone at Cuyler Harbor, May 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	60.6	38.2	0.8	0.0	0.0	0.0	0.0	0.4
Endocladia	44.4	8.0	34.4	5.4	2.2	4.8	0.8	0.0
Rockweed	10.2	0.4	0.8	84.0	0.0	3.4	1.2	0.0
Mussels	38.8	4.0	0.2	0.0	33.8	11.6	11.6	0.0

Santa Barbara Island
October 6-8, 1998
(Database event #1998-F)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Jonathon Shaffer, Biological Technician, Channel Islands National Park
Sarah Chaney, Ecologist, Channel Islands National Park

PROCEDURE: Out to the island on the SEA RANGER. We spent the early part of each day mapping trails and shooting vegetation photopoints. We used the new digital Canon Optura video camera as well as regular 35-mm film to shoot photo points. At each intertidal site Dan shot the photoplots. The fixed 15.8x1.6 m sea star transect was counted at Landing Cove. Species censuses of photoplots were conducted at Sea Lion Rookery. Sarah and Jonathon mapped the reef outlines, each photplot, and prominent features with the Trimble differential GPS.

RESULTS: Landing Cove, October 6, 1998, low tide -0.3 ft at 1631 hrs, conditions clear and calm with moderate surge from swells. We worked the site from 1530-1800 hrs. Only one juvenile California sea lion was in the Cove; three black oystercatchers and three western gulls were present. The seastar transect had nine *Pisaster ochraceus*. *P. ochraceus* were common around the site but a general search and count would have been difficult with the swells. Only one corner bolt of plot 320 was found, but the cover was uniform all around with *Pterocladia* sp. appearing to be the dominant algae. *Ocenebra circumtexta* were noted as present in several of the plots.

Southeast Sea Lion, October 7, 1998, low tide -0.3 ft at 1722 hrs, conditions clear and calm, Air temperature 22° C, water 19° C. The site was worked from 1445-1800 hrs. Two black oystercatchers and 3 black turnstones were present. Approximately 300 California sea lions were in the vicinity. The abalone plots were all carefully checked and no black abalone were found. Jonathon conducted a thirty-minute search and found no abalone. Sea stars were not counted but there were at least 7-10 on the reef. The GPS mapping did not go well as most of the satellites set right around low tide. All the plots were found but plot 350 appears to be missing one corner and one of the marker bolts was loose. All the bolts were obscured with growth. Mussels were mostly gone from all the plots. A large area surrounding the mussel plots had extensive damage typical of heavy wave action. Turf algae composed mainly of various coralline algae, *Chondracanthus canaliculatus*, and *Mazzaella affinis*, grew in dense mats over much of the area. *Enderachne binghamiae* was abundant on both rocks and mussel shells. *Egregia menziesii* and *Halidrys dioica* were abundant in the disturbed area.

The upper plots showed disturbance from the sea lions hauling out here. *Ulva* sp. dominates the upper rocks. Some *Endocladia muricata* and *Mazzaella affinis* is still present but only as short plants, protected by crevices or on vertical surfaces. *Tegula gallina* was about the only gastropod among the upper rocks. Some *Ocenebra circumtexta* were noted on some of the lower rocks.

8 October 1998, low tide -0.2 ft at 1817 hrs, conditions clear and calm. We returned to Southeast Sea lion and worked the site from 1715-1900 hrs. A ruddy duck was in one of the tidepools. Dan located plots corners and censused 11 of the photoplots before darkness became a factor. The main reason for returning to this site was to map the site

with GPS. The mapping went much better with a full range of satellites available at the time we were there.

Other birds noted on this trip were an immature bald eagle, a pair of peregrine falcon, two burrowing owls, numerous barn owls at night, Say's phoebe, northern flickers, rufous-sided towhee, hermit thrush, meadowlarks, American Kestrels, mourning doves, and blackbirds (juv. yellow-headed blackbird?).

Photoplot summary: mean % cover by zone at Sea Lion Rookery, October 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal
Barnacle	37.6	18.0	6.2	0.0	0.0	38.2	0.0
Endocladia	18.6	8.6	18.2	0.0	1.2	53.4	0.0
Rockweed	13.4	5.4	6.4	39.0	10.2	25.6	0.0
Mussels	0.2	0.2	0.0	0.0	11.8	87.2	0.6

Photoplot summary: mean % cover by zone at Landing Cove, October 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Turfweed	Misc Algae	Misc Animal
Barnacle	48.8	25.2	17.0	0.0	4.0	0.0	4.4	0.6
Rockweed	18.0	1.6	29.8	25.0	3.6	8.8	13.0	0.2
Mussels	0.6	1.8	0.0	0.0	58.8	0.0	34.8	4.0
Red Algal Turf	0.0	0.0	0.0	0.0	0.0	62.4	37.6	0.0

San Miguel Island
November 2-6, 1998
(Database event #1998-G)

PERSONNEL: Derek Lerma, Biological Technician, Channel Islands National Park
David Kushner, Marine Biologist, Channel Islands National Park
David Steichen, Validation Specialist, Berkley, California

PROCEDURE: Personnel departed Camarillo on an islander at 0930 and landed at San Miguel Island at approximately 1030. All four regular sites; Cuyler Harbor, Crook Point, Otter Harbor, and Harris Point were visited. At each site, photoplots were photographed, scored, and censused for species. Limpets and abalone were measured and counted within fixed plots. Timed searches were performed at some sites to enumerate sea stars, abalone, and limpets when applicable. Physical observations, shorebird counts, and pinniped counts were done at each site. Optic Stowaway temperature loggers were downloaded at the two sites they were present. On November 6, 1998 a search for Pampas grass was done on the North side of San Miguel hill, where it had reportedly been sighted a month before. A lone plant was located and removed although the seedpods had already dispersed and a close look out should remain in effect in this area. Weather was clear and windy with winds averaging 30 mph. An early flight departure on November 6 was made due to the cancellation of boat transportation later in the week.

RESULTS:

Nov. 2, 1998 Crook Point – Low tide –0.2 ft at 1421, Air temp 14°C, Water temp 14°C, Wind 25+ NW, Surge Moderate. There were 16 pelagic cormorants on the reef. Northern elephant seals were common both east and west of the sample area and several harbor seals were observed in the nearby waters.

Difficulties finding the exact reef were encountered and sampling finally began at 1320. A volunteer from the fox study, Stella Quicoli, accompanied us during sampling and helped record. The tide was still dropping when sampling began but the swell continued to wash over the outer reef on occasion. The photoplots were scored and photographed. Species census was performed at only seven of the twenty plots due to large swell conditions but a representative plot of each zone was encompassed. No video documentation was shot. Plot corners were repaired and abalone plots surveyed. No abalone were present in any of the fixed plots and only one owl limpet (25mm) was located within the abalone plots. Two healthy black abalone were measured (122 mm, 125mm) just outside of plot 391. David Kushner recorded temperatures, weather conditions, and downloaded the temperature logger. The green algae *Ulva sp.* was abundant throughout the site and *Pisaster ochraceus* were common on the lower reef. Sea star transects were not counted due to high surf and limited time.

Overall things appeared healthy and no significant disturbances were visible. *Phragmatopoma californica* were common in the lower zones. *Endocladia muricata* cover was low and its condition was poor. *Endocladia* plots contained only about 20% cover of this alga. *Pelvetia compressa* had moderate cover in plots and was the only rockweed present in any of the plots. *Mytilus californianus* plots appeared healthy with cover averaging 70%. *Ulva sp.* was present in a majority of the mussel plots. *Ulva sp.* notably covered many of the mussel plots as usual for this site. However, mussels are the primary substrate therefore they were counted in the in-situ sampling. Note: If these

mussel plots were scored in the office it is likely there would be a higher coverage of *Ulva* and a lower coverage of mussels. Endocladia cover was down from the spring sampling and has continued to decline since spring 1997. Rockweed cover continues to remain low at this site averaging approximately 16%. David Kushner collected a sample of copepods *Tigriopus californicus* for genetic studies by Ron Burton, UCSD.

Mean % Cover for Photoplots at Crook Point, San Miguel Island (20 Plots)

	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals
Barnacle	64.4	32.6	0.8	0.0	0.0	01.0	1.2
Endocladia	55.2	2.8	19.0	2.8	7.2	10.2	2.8
Rockweed	42.0	2.4	5.8	14.6	24.2	06.8	4.2
Mussels	13.4	0.2	0.0	0.0	75.2	06.8	4.4

November 3, 1998 Otter Harbor- Low tide -0.7ft at 1506, Air temp 16°C, Water temp 15°C, Wind 25+ NW, Surge moderate. Seventy elephant seals occupied the cove just east of the site and eight more were present in the long pools just in front of the monitoring area. Twenty-nine harbor seals were on the outer portion of the site and dispersed upon our arrival. Seabirds consisted of one pelagic cormorant, 70 willets, 12 black turnstones, one oystercatcher, and two western gulls. An abundance of bird droppings consisting of mostly pelagic red crabs covered a majority of the site.

Photoplots were all scored, photographed, and censused. Repairs to plot corners were done as needed. All abalone plots were surveyed producing only two abalone in plot 369 (94mm & 59mm). A three person 30-minute search for abalone and sea stars was done and produced 54 abalone and 24 *Pisaster ochraceus*. An additional 24 abalone were sighted after the 30-minute search time. One *Pisaster giganteus* was seen. No abalone were observed with withering syndrome and the majority of the abalone were in the 70-90 mm range suggesting some recruitment since the withering syndrome was identified. Limpet plots were surveyed and the corresponding size classes and counts are listed below. Owl limpet numbers appear to have remained relatively consistent over the past several years.

The algae at this site appeared healthy with both rockweeds (*Hesperophycus* and *Pelvetia*) present. *Pelvetia compressa* was more abundant than *Hesperophycus californicus*. *Endocladia* was common, though cover was down from the fall 1997 sampling. A variety of red alga was present at the site including *Chondracanthus canaliculatus*, *Microcladia Sp.*, *Gelidium coulteri* and *Prionitis lanceolata*. *Ulva sp.* was common throughout the site, especially in the Endocladia plots. The limpet's *Collissella limatula* and *C. scabra* were common. Several species of other gastropods were common within the monitoring area. Owl limpet numbers and size have remained similar since the April 1997 sampling.

Mean % Cover for Photoplots at Otter Harbor, San Miguel Island (20 Plots)

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Tar
Barnacle	55.0	25.6	0.0	0.0	0.0	16.2	0.0	3.2
Endocladia	28.2	1.0	32.0	23.2	1.0	13.4	1.0	0.2
Rockweed	36.8	7.4	16.8	32.6	0.0	05.6	0.2	0.6
Mussels	15.0	1.0	0.0	0.0	69.8	10.0	4.2	0.0

Owl Limpets at Otter Harbor, San Miguel Island Nov. 3, 1998

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
368	20	46.05	16.63	20	80	5.405
369	64	39.80	13.95	18	79	9.412
496	11	49.27	17.29	22	74	.688
total	95	42.21	15.20	18	80	3.585

Owl limpet size distributions in fixed plots at Otter Harbor

Plot	%<20 mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100 mm
368	0.00%	20.00%	20.00%	15.00%	20.00%	20.00%	0.00%	5.00%	0.00%	0.00%
369	6.25%	20.31%	26.56%	21.88%	17.19%	4.69%	3.13%	0.00%	0.00%	0.00%
496	0.00%	9.09%	27.27%	9.09%	27.27%	18.18%	9.09%	0.00%	0.00%	0.00%
total	4.21%	18.95%	25.26%	18.95%	18.95%	9.47%	3.16%	1.05%	0.00%	0.00%

Black abalone at Otter Harbor, San Miguel Island

Date	Plot	Count	MeanSize	StDev	MinSize	MaxSize
11/3/98	369	2	76.50	24.75	59	94
11/3/98	GS	55	75.53	14.75	50	108

* GS = 30 minute general search

November 4, 1998 Harris Point- Low tide -1.0 ft at 1553, Air temp 14°C, Water temp 14.5°C, Wind 25-35 NW, Surge Heavy. Seabirds were noticeably absent from the sampling site with only 4 western gulls present and one brown pelican observed during sampling. Photoplots were all scored, photographed, and censused for species composition. All plots were in good shape and no repairs were required. Abalone plots were surveyed and numbers were markedly lower than previous years. A total of 9 abalone were measured in the plots. No fresh shells were found in adjacent or outlying areas. The large crack below plot 435 contained 4 abalone and 3 *Pisaster ochraceus*. Purple urchins (*Strongylocentrotus purpuratus*) were common and appeared healthy. *Pelvetia compressa* was noticeably missing from this site. Additional time was spent surveying the site for species list. Several subtidal macroalgae were observed and recorded. *Ulva sp.* was common throughout the site accounting for the majority of Misc. Algae in the barnacle plots. David Kushner downloaded the temperature unit after scoring photoplots. After sampling was completed we attempted to obtain black abalone

tissue samples for Dr. Ron Burton but the sampling gear supplied was insufficient for collections.

Mean % Cover for Photoplots at Harris Point, San Miguel Island (20 Plots)

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals
Barnacle	42.6	27.4	3.0	0.0	5.0	18.4	3.6
Endocladia	48.8	5.0	33.8	4.6	2.0	04.8	1.0
Rockweed	68.0	3.0	13.2	10.8	0.0	03.6	1.4
Mussels	40.8	5.6	1.2	0.0	39.4	10.6	2.4

Black Abalone at Harris Point, San Miguel Island

Date	Plot	Count	MeanSize	StDev	MinSize	MaxSize
11/4/98	442	3	80.67	30.17	46	101
11/4/98	443	3	98.67	22.48	74	118
11/4/98	444	1	104.00		104	104
11/4/98	445	2	117.00	33.94	93	141

November 5, 1998 Cuyler Harbor – Low tide –1.0 ft at 1643, Air temp 14°C, Water temp 14.5°C, Sunny, Wind 35+ NW, surge heavy but not a problem with the good low tide. Two snowy plovers were observed on the beach just north of the sample site and two oystercatchers were present at the site when we arrived. Photoplots were scored, photographed, and censused for species composition. Algae cover was lush throughout the site with *Pelvetia compressa* dominating in cover over the entire site. Small recently settled mussels were common at the site and overall mussels were abundant. A 20-minute general search for abalone and sea stars produced only 5 *Pisaster ochraceus*. No live black abalone or shells were found during monitoring. *Phragmatopoma californica* were abundant at this site and dominated cracks and crevices that used to be primary habitat for abalone. Plot corners were repaired and extra time was spent surveying the entire site for relative abundance of species.

Mean % Cover for Photoplots at Cuyler Harbor, San Miguel Island (20 Plots)

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Tar
Barnacle	59.2	38.8	0.8	0.0	0.0	00.2	0.8	0.2
Endocladia	51.8	10.6	26.0	5.8	2.6	02.4	0.8	0.0
Rockweed	8.2	0.4	0.4	85.6	0.0	04.0	1.4	0.0
Mussels	27.8	10.0	0.0	0.0	39.0	09.6	13.6	0.0

Anacapa Island
November 17-19, 1998
(Database event #1998-H)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
Larry Basch, Coastal Ecologist, Southern Alaska Coastal Parks Cluster

PROCEDURE: We landed by skiff at the various points to conduct the monitoring each afternoon using the Pacific Ranger for a base. David Kushner, John Brooks and Phillip Hooge were practicing with rebreathers this week and I dove with Larry to complete his NPS certification dives. We had planned to survey for white abalone but strong currents made it unwise to use the rebreathers in the current.

Dan Richards shot the photoplots and conducted species census in the photoplots. Derek Lerma scored the photoplots in the field at Middle-East and Cat Rock. Derek conducted a 30-minute search for black abalone at Cat Rock, including in the permanent abalone plots. Dan and Larry Basch checked the plots and conducted a general search for 20 minutes each at Harbor Seal Arch. The temperature logger was successfully downloaded at south Frenchy's Cove but the Middle Island logger failed to transfer data and was sent up to UCSB for replacement/repair. Photoplots from South Frenchy's Cove and Middle-West will be scored from slides.

RESULTS: November 17, 1998 Middle Anacapa, low tide +0.1 ft at 1454 hrs, conditions were clear with strong winds and moderate surge. We worked the site from 1400-1600 hrs completing only the east or test area with this tide and increasing waves while we were ashore. The condition of the plots was fine. Nothing unusual was noted. Only one black turnstone was present. There was a dead harbor seal floating near the reef.

Photoplot summary: mean % cover at Middle-East Anacapa, November 1998 (12 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal
Barnacle	54.7	20.0	10.7	0.0	0.3	11.7	2.7
Endocladia	32.7	9.3	20.7	18.7	1.7	14.7	2.3
Rockweed	3.7	2.0	2.0	69.0	3.7	18.0	1.7
Mussels	2.3	4.0	0.0	0.0	69.3	21.7	2.7

November 18, 1998, West Anacapa Island, low tide 0.0 ft at 1525 hrs, conditions clear and calm with light surge. We landed on the cobble beach next to the Cat Rock site and monitored the area from 1300-1700 hrs. One Western gull was present. Species census was conducted in 20 of the photoplots on the outer portion of the reef. Dan then hiked to South Frenchy's Cove to shoot the photoplots there and download temperature logger. Nothing unusual was noted, but there was only time for a quick look around. A canyon wren, black phoebe and peregrine falcon were noted on the walk to Frenchy's Cove.

All of the Cat Rock photoplots were scored in the field. No abalone or seastars were found during the search of the reef area. Derek measured 30 owl limpets for size

frequency. The algae all looked healthy at this site. Rockweeds were abundant and lush. At least two of the conspicuous chitons (*Stenoplax conspicua*) were found at Cat Rock, probably a new species for this site. *Petalconchus montereyensis*, a worm-like gastropod with shells cemented to the rocks are particularly common here, more than any of our other sites.

Photoplot summary: mean % cover at Cat Rock, Anacapa, November 1998 (36 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
	30.8	26.7	7.9	32.6	0.0	1.4	0.7	0.0
Endocladia	21.8	12.2	26.8	2.9	1.0	30.3	5.0	0.0
Rockweed	17.7	9.8	9.7	52.3	0.1	8.7	1.7	0.1
Mussels	11.8	16.4	0.3	0.0	27.8	34.2	10.7	0.0

Photoplot summary: mean % cover at South Frenchy's Cove, Anacapa, November 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	55.2	39.0	1.8	0.0	0.0	1.2	0.6	2.2
Endocladia	40.4	6.0	38.4	11.4	0.0	3.8	0.0	0.0
Rockweed	20.2	4.8	0.6	63.2	0.0	10.6	0.6	0.0
Mussels	6.0	0.0	0.0	0.0	47.0	47.0	0.0	0.0

November 19, 1998, Middle Anacapa Island, low tide -0.1 ft at 1557 hrs, conditions were clear with variable light winds and light surge. Photoplots were shot and censused at the west site from 1430-1615 hrs. We searched for black abalone at Harbor Seal Arch (HSA) area finding only two shells both about 50 mm long. Another of that size was found at the photoplot area. Brown algae were common in the shallows at HSA. Purple urchins were present at HSA but their density appears to be much lower than it has been in recent years and algae were much more common. No seastars were noted but a search of the photoplot area was not conducted. Predatory snails, *Acanthina punctulata*, *Ocenebra circumtexta*, were common, while *Nucella emarginata* were rare.

Photoplot summary: mean % cover at Middle-West, Anacapa, November 1998 (20 plots)

Zone	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	34.2	16.8	18.0	0.4	0.0	30.2	0.0	0.4
Endocladia	40.0	7.4	14.6	1.6	1.8	34.2	0.4	0.0
Rockweed	11.2	4.2	2.4	55.2	1.8	25.0	0.2	0.0
Mussels	11.6	7.2	0.8	0.0	49.6	29.8	1.0	0.0

Santa Cruz Island
 December 3, 1998
 (Database event #1998-I)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
 Derek Lerma, Biological Technician, Channel Islands National Park
 Sarah Fangman, Research Coordinator, Channel Islands National Marine
 Sanctuary
 Shoshanna Housmann, Volunteer

PROCEDURE: We utilized the Scorpion Ranch run on the SEA RANGER and after dropping off personnel at Scorpion, went to Orizaba Cove. The Scorpion Anchorage site was visited later and island personnel were picked up while we finished. At each site, all 25 photo plots were photographed and censused for species diversity. Necessary repairs were made to plot corners. We returned to Ventura by 1700 hrs.

RESULTS: Low tide -1.3 ft at 1539 hrs. Water temperature 15° C. conditions cloudy with light breeze. Light rain in afternoon. Seas were calm near shore but moderate swells made some strong surge.

At **Orizaba Cove**, 10 harbor seals were in the cove across from the monitoring site, one wandering tattler and three black oystercatchers were on the reef. Orizaba Rock had as many as 15 oystercatchers and numerous western gulls. We had no problems finding the plots as all are marked with stainless steel bolts in three corners and epoxy on the forth. The only mix up is that the reference bolt 1 has two cuts in the head and reference bolt 2 has 1 cut. The rockweeds *Hesperophycus californicus* and *Pelvetia compressa* are each represented as separate zones at this site. The other zones are acorn barnacles, *Balanus/Chthamalus*, thatched barnacles, *Tetraclita rubescens*, and mussels, *Mytilus Californianus*. All the plots seemed very lush. Large barnacles dense in the barnacle plots. *Tetraclita* were abundant in the thatched barnacle plots. The snails, *Ocenebra circumtexta* and *Nucella emarginata* were common. Sea stars, *Pisaster ochraceus* were present but not abundant. Purple sea urchins were common in the lower zones but algae were also abundant.

Photoplot summary-mean % cover by zone at Orizaba Cove, Santa Cruz Island (25 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	49.2	47.4	0.0	0.0	0.4	1.6	1.4	0.0
Pelvetia	1.8	0.0	0.0	89.6	0.0	8.6	0.0	0.0
Mussels	1.2	5.4	0.0	0.0	80.8	10.8	1.8	0.0
Tetraclita	20.2	42.8	0.0	1.0	5.0	27.0	4.0	0.0
Hesperophycus	35.2	8.0	8.0	34.8	0.0	14.0	0.0	0.0

Two black oystercatchers were present at **Scorpion Rock**. Cormorants and brown pelicans were roosting on Scorpion Rock. The *Hesperophycus* plots are near the tall arch-rock, but all the others; *Endocladia*, thatched barnacles, acorn barnacles, and mussels are on a low rock next to the main island, inside Scorpion Rock. Some of the mussel plot bolts were nearly overgrown, but all were eventually found. Repairs were made to one loose bolt. Very little *Endocladia muricata* was present. *Mastocarpus papillatus* seemed more abundant in the Endocladia plots. Purple sea urchins were common in the lower zones. There were fewer snails than at Orizaba Cove.

Photoplot summary-mean % cover by zone at Scorpion Rock, Santa Cruz Island. (25 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	67.8	30.4	0.0	0.0	0.2	1.6	0.0	0.0
Endocladia	51.8	11.0	3.4	0.0	0.4	29.8	3.6	0.0
Mussels	5.2	7.2	0.0	0.0	69.8	13.6	4.2	0.0
Tetraclita	33.4	20.0	0.0	0.0	26.2	17.2	3.2	0.0
Hesperophycus	22.6	1.2	21.8	41.4	0.0	12.2	0.8	0.0

Santa Cruz Island
December 17-22, 1998
(Database event #1998-J)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
David Kushner, Marine Biologist, Channel Islands National Park
Sarah Chaney, Botanist, Channel Islands National Park
Jessie Altstatt, University of California, Santa Barbara

PROCEDURE: The OCEAN RANGER delivered us to the island. Jeff Howarth met us on the beach with a vehicle. Sarah got another vehicle from The Nature Conservancy since she was doing GPS work on the vegetation transect locations. Three nights were spent at the research station bunkhouse and two nights at the trailer on the West End. This was the first time for the NPS monitoring of these sites. The sites were established in 1994 by the Coastal Commission Northern Islands (CCNI) project. Plots were located at each site using maps from the CCNI project. David and Dan had both been to the sites and Jessie was very familiar with them from working on the CCNI project so there were no problems finding plots. Each plot is marked with bolts making it especially easy to locate. The maps are very good and the site instructions were helpful.

Generally at each site, Dan photographed the plots and conducted a species census in each photoplot. Dan also shot video of each site. David scored the photoplots in the field. Jessie measured owl limpets in the circular plots and read the surfgrass transects. Derek either helped Jessie or David depending on the most pressing need. Sarah mapped each plot with the digital GPS. David generally made a 30-minute search over the entire reef for black abalone and seastars at each site.

The weather was very good, though cold, all week. It was convenient to stay at the west end trailer and not have to drive all the way back to the valley when doing the two sites there. It was a great help having Jessie along with her experience in monitoring and knowledge of the sites.

For database management ease, we assigned individual plot numbers (800 and 900 series) to the photoplots for all sites. *Hesperophycus californicus* and *Pelvetia compressa* have previously been combined as rockweed when scoring plots at other NPS sites. For this report both species are presented as rockweed; however, they were scored separately and the information is available in the database.

RESULTS:

Willows Anchorage: December 17, clear skies, air temperature 25°C, water 14°C wind calm, surge calm inside cove but a large ground swell was affecting the limpet plots, low tide -0.3 ft at 1523 hrs. The drive from the research station to Willow Canyon takes approximately 45 minutes to one hour, then another 20 minutes to walk to the site. We were on site from 1340 to 1630 hrs. One western gull was the only bird on the site. There were more gulls on the rock offshore and two harbor seals were playing in the cove.

Endocladia was abundant on the first shelf. *Scytosiphon dotyii* was common. *Chthamalus barnacles* were abundant on the upper rocks. Sand Castle worms, *Phragmatopoma californica*, formed short dense mats on the lower rocks. *Sargassum*

muticum was common in pools. Purple urchins were common in patches and all seemed to be healthy. This site has fixed plots in both the *Hesperophycus* and *Pelvetia* zones. *Hesperophycus* seemed sparse in most plots, though *Pelvetia* was doing very well. *Hesperophycus* plot 1 was almost bare and is apparently often covered by sand. Sand was not infringing on any of the plots.

Both the mussel and Endocladia plots appeared to be suffering from large wave impacts. Mussels were small and in dense patches, usually an indication of recent recruitment. *Endocladia* plants were all very small and cover was low. *Chondracanthus canaliculatus* was rare on the lower rocks. *Halidrys dioica* was common but all plants were immature. Owl limpets were not especially common here and were difficult to find among the mussels and coralline algae in the plots. David looked for abalone and found none. There were six *Pisaster ochraceus* on the monitoring area reef.

Photoplot summary-mean % cover by zone at Willows Anchorage, Santa Cruz Island (20 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Endocladia	39.4	2.0	37.4	0.0	0.0	19.2	2.0	0.0
Pelvetia	25.6	1.0	6.0	50.8	0.0	15.6	1.0	0.0
Mussels	15.4	3.2	0.0	0.0	20.2	54.4	6.8	0.0
Hesperophycus	51.4	2.8	3.0	30.2	0.0	11.6	1.0	0.0

Owl limpets in fixed plots at Willows Anchorage

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
1	38	23.24	9.56	15	50	12.098
2	11	22.27	8.17	16	42	3.502
3	44	24.45	8.06	15	45	14.008
4	31	26.10	11.03	15	58	9.869
5	22	24.59	9.02	15	45	7.004
total	146	24.34	9.25	15	58	9.296

Owl Limpet size distributions in fixed plots at Willows Anchorage

Plot	%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100mm
1	50.00%	21.05%	18.42%	7.89%	2.63%	0.00%	0.00%	0.00%	0.00%	0.00%
2	54.55%	27.27%	9.09%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3	34.09%	38.64%	20.45%	6.82%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
4	41.94%	19.35%	25.81%	9.68%	3.23%	0.00%	0.00%	0.00%	0.00%	0.00%
5	40.91%	31.82%	18.18%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
total	42.47%	28.08%	19.86%	8.22%	1.37%	0.00%	0.00%	0.00%	0.00%	0.00%

Fraser Cove: December 18, overcast, calm, and cool conditions, air 14°C, water 13.5°C, surge was light, tide -0.5 ft at 1555 hrs. The drive from the research station to *Fraser Point* took about two hours. We were able to access the *Hesperophycus* and *Pelvetia* plots on the Forney's Cove side early on. This site is only about one mile from the research trailer. We were on site from 1230-1700 hrs. Two black oystercatchers were flying around the site while we were there.

No abalone were found in a 20-minute search at Forney's. We looked for, but did not find any live olive snails for Dr. Kennett at UCSB who requested we collect some for C-14 ratio comparison to shells from middens. There were plenty of hermit crabs around with olive shell houses, but the live snails must all be deeper. *Tegula funebris* were

common and a few *T. gallina* were found. Both *Pelvetia* and *Hesperophycus* were abundant in the Forney's Cove area. Surfgrass, *Phyllospadix torreyi*, was abundant on both sides of the point.

Pisaster ochraceus were present at Fraser Cove but no count was made. The usual protocol for owl limpets at this site is to measure them within a 1.5 m radius while other sites only use 1.0 m. Jessie and Derek tracked the counts to note how many were within 1.0 m and 1.5 m so that in the future we might just measure with in a one-meter radius. All other island sites use a 1 m radius.

Endocladia was lush here. Both *Balanus glandula* and *Chthamalus* sp. were common but many were dead in the lower zones. Both *Mytilus californianus* and *Pollicipes polymerus* seemed to be doing well.

Photoplot summary-mean % cover by zone at Fraser Cove, Santa Cruz Island (35 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	59.6	26.6	11.2	0.0	0.6	1.0	0.8	0.2
Endocladia	50.8	1.4	39.8	0.0	0.8	7.0	0.0	0.2
Pelvetia	10.6	2.0	1.6	79.4	0.0	6.4	0.0	0.0
Mussels	16.8	0.0	0.0	0.0	60.6	6.4	16.2	0.0
Pollicipes	20.4	2.4	0.0	0.0	35.2	11.6	30.4	0.0
Tar	41.2	14.8	0.8	2.3	0.0	1.2	0.0	39.7
Hesperophycus	55.0	10.5	11.3	18.0	0.0	5.3	0.0	0.0

Owl limpets in fixed plots at Fraser Cove

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
1	40	42.50	17.80	17	78	5.660
2	44	42.18	16.53	15	69	6.226
3	76	30.37	12.36	15	68	10.754
4	54	33.22	10.61	16	60	7.641
5	56	39.13	13.04	15	59	7.924
total	270	36.48	14.63	15	78	7.641

Owl Limpet size distributions in fixed plots at Fraser Cove

Plot	%<20m m	%20- 29mm	%30- 39mm	%40- 49mm	%50- 59mm	%60- 69mm	%70- 79mm	%80- 89mm	%90- 99mm	%>=100mm
1	15.00%	15.00%	12.50%	15.00%	22.50%	15.00%	5.00%	0.00%	0.00%	0.00%
2	15.91%	11.36%	9.09%	29.55%	15.91%	18.18%	0.00%	0.00%	0.00%	0.00%
3	21.05%	30.26%	31.58%	7.89%	5.26%	3.95%	0.00%	0.00%	0.00%	0.00%
4	11.11%	24.07%	37.04%	20.37%	5.56%	1.85%	0.00%	0.00%	0.00%	0.00%
5	7.14%	17.86%	26.79%	17.86%	30.36%	0.00%	0.00%	0.00%	0.00%	0.00%
total	14.44%	21.11%	25.19%	17.04%	14.81%	6.67%	0.74%	0.00%	0.00%	0.00%

Trailer: December 19, partly cloudy and cold, air 14°C, water 13.5°C, wind 5 kts-NW, surge moderate, tide -0.5 ft at 1628 hrs. This site is only a five-minute walk from the research trailer. We were on site from 1300 to 1700 hrs. The morning was spent helping Sarah locate vegetation transect points and weed populations, and pulled weeds. Three black oystercatchers and at least one western gull were present at the site.

David conducted a thirty minute search and found four black abalone (all over 100 mm) and two *Pisaster ochraceus*. After the timed search he looked farther to the south and

found five abalone and three *P. ochraceus*. The area to the south has more boulders. The lower zones also get less of the northwest surf action and there is much more *Eisenia arborea* and less surfgrass than the reef at the monitoring site.

Pelvetia was abundant; *Hesperophycus* was somewhat sparse. *Chthamalus* was present in high density in all the barnacle plots. Mussels were mostly small and cover was only an average of 44%.

Several bolts marking plots were missing (replaced) and no marker was found for the north end of the surfgrass transect number 3.

Photoplot summary-mean % cover by zone at Trailer, Santa Cruz Island (20 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	55.4	39.2	1.8	0.0	0.2	1.8	1.6	0.0
Pelvetia	14.2	1.0	1.6	80.2	0.0	2.8	0.2	0.0
Mussels	23.4	2.0	0.0	0.0	44.2	19.6	10.8	0.0
Hesperophycus	55.8	5.2	10.4	24.8	0.0	3.6	0.2	0.0

Owl limpets in fixed plots at Trailer

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
1	50	51.60	25.42	15	87	15.918
2	64	43.78	22.86	15	87	20.376
3	37	35.95	19.45	15	83	11.780
4	54	48.46	15.28	18	72	17.192
5	23	40.91	22.73	15	82	7.323
total	228	45.04	21.84	15	87	14.518

Owl Limpet size distributions in fixed plots at Trailer

Plot	%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100mm
1	12.00%	22.00%	2.00%	6.00%	8.00%	18.00%	14.00%	18.00%	0.00%	0.00%
2	25.00%	12.50%	7.81%	9.38%	12.50%	14.06%	15.63%	3.13%	0.00%	0.00%
3	29.73%	18.92%	8.11%	18.92%	13.51%	8.11%	0.00%	2.70%	0.00%	0.00%
4	1.85%	18.52%	5.56%	12.96%	33.33%	25.93%	1.85%	0.00%	0.00%	0.00%
5	13.04%	30.43%	21.74%	8.70%	0.00%	0.00%	21.74%	4.35%	0.00%	0.00%
total	16.23%	18.86%	7.46%	10.96%	15.35%	15.35%	10.09%	5.70%	0.00%	0.00%

Prisoner's Harbor: December 20, cloudy and cold with intermittent rain in the morning, air 11°C, water 12.5°C, wind 5 kts-NW, surge light, tide -0.5 ft at 1654 hrs. This site is less than thirty minutes drive from the research station. We were on site from 1515 to 1715 hrs. No birds were on the reef but 6 killdeer were on the beach adjacent to the site.

Endocladia cover appeared to be in good shape. *Hesperophycus* cover was thin with less than 10% cover in most plots. The brown algae, *Endarachne binghamiae* was common and quite large here. There is a lot of overlap in the zones with barnacle and *Pelvetia* plots in particular being placed next to each other on about the same tidal level. The mussel plots are on the same shelf and seemingly only a few inches lower elevation. Plot B-2 (barnacle zone) had few barnacles and a mix of *Pelvetia*, red algae, and horse mussels, *Septifer/Brachidontes*. Plot B-1 was partially covered by cobblestones and the few organisms present were all in the small crack running through

the plot. On 12/22 we visited the site again to add epoxy to the B-1 bolts and mark the lower left corner hole where the bolt is missing. The cobblestones were no longer in the plot. Many of the *Mytilus* plots appeared to have been partially cleared, with new recruits filling in. At least some of the new mussel recruits appeared to be *M. galloprovincialis*. Only a few minutes of video was shot because of the late tide and dark clouds.

Photoplot summary-mean % cover by zone at Prisoner's Harbor, Santa Cruz Island (25 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Misc Algae	Misc Animal	Tar
Barnacle	51.4	12.8	5.8	9.6	0.4	14.8	4.8	0.4
Endocladia	36.8	23.2	33.2	0.4	0.0	5.4	1.0	0.0
Pelvetia	2.0	0.4	0.0	88.6	0.0	8.6	0.4	0.0
Mussels	6.0	7.4	0.0	0.0	49.4	34.2	3.0	0.0
Hesperophycus	54.4	23.2	12.8	4.8	0.0	3.0	1.8	0.0

Punta Arena: We visited this site on December 21 under partly cloudy skies. The day was cold but sea conditions were calm and the swell was light.

We drove to Laguna Canyon where we saw several feral pigs in the stream. There was a sizable shallow lagoon at the canyon mouth. Barnacles mostly covered rocks in the intertidal zone near the mouth of Laguna Canyon. The area appears to be a high wave impact zone and the reef was very similar to the outer reef at Willows Anchorage. The rocks drop off quite abruptly into deeper water. It was a fair hike over the hill to Malva Real Canyon with its small lagoon and cobble beach. A little farther towards Punta Arena, there is an extensive rocky tidal flat.

We counted two Willets, three Black Oystercatchers, several Western Gulls and 12 harbor seals. The later on the west side of the point. On the reef were large stretches of *Pelvetia compressa* and some *Hesperophycus californicus*. *Scytosiphon lomentaria* and *Endarachne binghamiae* were common. There was a red alga that appears to be *Neorhodomela larix*, though it was somewhat stunted or otherwise deformed. This would be a new record for the island. *N. larix* is known from the west end of Santa Rosa Island. *Tegula funebris* were abundant throughout the area. *Mytilus californianus* was doing very well; we did not find any *M. galloprovincialis*. Some of the other algae present included *Lithothrix aspergillum*, *Chaetomorpha lineum*, *Cladophora columbiana*, *Codium fragile*, and *Porphyra perforata*. *Phragmatopoma californica* was present but not abundant. *Cirrolana harfordi* were found under rocks. A few, small *Aplysia californica* were present. No live abalone were seen, but one fresh black abalone shell was found.

Santa Rosa Island
January 12-20, 1999
(Database event #1998-K)

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
Bonnie Becker, Marine Biologist, Cabrillo National Monument
Mark Senning, Island Ranger, Channel Islands National Park (1/15)

PROCEDURE: This sampling is considered the fall 1998 sample for analysis. At each site, photoplots were photographed, scored, and censused. Abalone plots were checked and black abalone were counted and measured during a 30-minute search. Sea stars were counted during a 30-minute search. Owl limpets were measured and counted in fixed plots at Ford Point, Johnson's Lee, and Northwest-Talcott. A general species list was made at each site. Video documentation was taped at each site.

RESULTS:

1/12/99- The OCEAN RANGER arrived at Santa Rosa Island about 1130 hrs. The afternoon was spent at the coastal lagoons. About 90 waterfowl were present on the Old Ranch House Canyon lagoon including Mallards, American Wigeon, Cinnamon Teal (?), and American Coots. There was considerable erosion in the upper end of the lagoon since last year. The mouth of the lagoon was closed and the lagoon was full.

1/13/99 **Johnson's Lee:** low tide 0.1 ft at 1406 hrs, air 17.5°C, water 14°C, wind and surge light, pleasant conditions with only high cirrus clouds. There were two black oystercatchers and two western gulls at the site.

Black abalone were absent from the plots and only two were found during a 30-minute search (95, 106 mm). One appeared weak and slightly withered. There were 33 ochre stars in the 10 x 2 m transect and 276 found during a 30-minute search.

Rock isopods were common. Turban snails, hermit crabs, and chitons all seemed numerous. *Phragmatopoma* and green anemones, as in past years, dominated the lower mussel zones, but there did seem to be a number of California mussels settling on the lower shelf. *Phragmatopoma* dominated all of the abalone plots and several of the mussel photoplots. The coralline algae, *Lithothrix aspergillum* was common in the large tidepool.

Owl limpet densities were only 13.5% of the January 1988 sample. Owl limpets at this site have been declining steadily since the population peaked in 1992. The 1999 density was only 7.5% of the 1992 population peak and only 64.5% of the January 1998 density.

The temperature logger was downloaded successfully.

A brief stop was made at Jolla Vieja and numerous porcelain crabs, *Petrolisthes* sp., and shore crabs, *Hemigrapsus nudus*, were found. Chitons, *Mopalia muscosa*, were common under rocks as were turban snails, *Tegula funebris*, and lined shore crabs, *Pachygrapsus crassipes*.

Photoplot Summary- mean % cover by zone at Johnson's Lee, Santa Rosa Island (15 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Turfweed	Misc Algae	Misc Animal	Tar
Barnacle	55.2	37.6	3.0	0.0	0.2	0.0	0.4	3.6	0.0
Endocladia	53.6	5.8	25.0	0.0	11.4	0.0	1.2	3.0	0.0
Mussels	9.4	0.6	0.0	0.0	20.6	0.0	33.2	36.2	0.0

Owl limpets in fixed plots at Johnson's Lee

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
595	5	54.40	5.18	46	60	1.592
596	21	56.86	10.08	28	69	6.686
597	4	59.75	7.59	49	66	1.273
598	19	44.00	20.45	15	73	6.049
599	22	32.00	17.59	15	68	7.004
total	71	45.70	18.63	15	73	4.521

Owl limpet size distributions in fixed plots at Johnson's Lee

Plot	%<20m m	%20- 29mm	%30- 39mm	%40- 49mm	%50- 59mm	%60- 69mm	%70- 79mm	%80- 89mm	%90- 99mm	%>=100 mm
595	0.00%	0.00%	0.00%	20.00%	60.00%	20.00%	0.00%	0.00%	0.00%	0.00%
596	0.00%	4.76%	0.00%	14.29%	23.81%	57.14%	0.00%	0.00%	0.00%	0.00%
597	0.00%	0.00%	0.00%	25.00%	0.00%	75.00%	0.00%	0.00%	0.00%	0.00%
598	21.05%	10.53%	10.53%	10.53%	15.79%	21.05%	10.53%	0.00%	0.00%	0.00%
599	36.36%	22.73%	9.09%	9.09%	9.09%	13.64%	0.00%	0.00%	0.00%	0.00%
total	16.90%	11.27%	5.63%	12.68%	18.31%	32.39%	2.82%	0.00%	0.00%	0.00%

1/14/99 **Northwest-Talcott**: low tide -0.2 ft at 1428 hrs, air 18°C, water 14°C, wind and surge light, cloud cover increased in the afternoon. At the site there were 36 Black Oystercatchers, 3 Royal Terns, 2 Western Gulls and one Great Blue Heron when we arrived. One Ruddy Turnstone and 2 Snowy Egrets were seen later in the day on the reef flat. There were two elephant seals on the beach near the access and 10 Brown Pelicans, several terns, and cormorants on the point.

Only one black abalone was found in a 30-minute search, none of the plots had abalone. *Phragmatopoma* and coralline turf algae dominated the abalone plots but it was generally not overwhelming. One giant-spined sea star was found and a few bat stars, *Asterina miniata*, were found under rocks, but there were no ochre stars. Owl limpet densities declined slightly with only 87% of the January 1998 density.

Sargassum muticum was present. Black turban snails were abundant. Small sculpins, pricklebacks, and monkeyface-eels were common. The temperature logger downloaded successfully.

Photoplot Summary- mean % cover by zone at Northwest-Talcott, Santa Rosa Island (20 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Turfweed	Misc Algae	Misc Animal	Tar
Barnacle	57.0	19.6	0.8	12.4	0.0	0.0	8.0	1.4	0.8
Endocladia	47.2	0.0	19.0	21.4	0.0	0.0	12.0	0.4	0.0
Rockweed	33.0	0.0	2.6	59.2	0.0	0.0	4.0	1.2	0.0
Mussels	19.8	0.6	0.0	0.0	36.0	0.0	34.4	9.2	0.0

Owl limpets in fixed plots at Northwest-Talcott

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
701	22	68.41	22.40	17	100	7.004
702	24	67.21	11.00	42	85	7.641
703	25	55.36	17.87	20	77	7.959
704	20	64.15	10.32	38	77	6.367
705	13	55.77	11.83	25	72	4.139
total	104	62.60	16.46	17	100	6.622

Owl limpet size distributions in fixed plots at Northwest-Talcott

Plot	%<20 mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100 mm
701	4.55%	0.00%	13.64%	4.55%	4.55%	18.18%	4.55%	40.91%	4.55%	4.55%
702	0.00%	0.00%	0.00%	4.17%	16.67%	37.50%	25.00%	16.67%	0.00%	0.00%
703	0.00%	16.00%	4.00%	12.00%	8.00%	36.00%	24.00%	0.00%	0.00%	0.00%
704	0.00%	0.00%	5.00%	5.00%	20.00%	40.00%	30.00%	0.00%	0.00%	0.00%
705	0.00%	7.69%	0.00%	15.38%	23.08%	46.15%	7.69%	0.00%	0.00%	0.00%
total	0.96%	4.81%	4.81%	7.69%	13.46%	34.62%	19.23%	12.50%	0.96%	0.96%

1/15/99 **Fossil Reef**: low tide -0.5 ft at 1509 hrs, air 17.5°C, water 14.5°C, wind 12 kts NW, surge light, high clouds. There were six Pelagic Cormorants, six Black Oystercatchers, and 33 Western Gulls at the site. Elephant seals were counted around Sandy Point in the morning with 210 pups, 412 females, 90 males, and 25 yearlings on the beaches. There were only two harbor seals in the area. Elephant seals were seen on the beach east of the site for the first time this year. Mark Senning counted those on 1/17 and reported six pups, 23 females, 8 males and one yearling. Many of the elephant seal females were still pregnant so the pup count will increase. A peregrine falcon was observed flying along the bluffs and two immature western gull carcasses were found on the point.

Thirteen black abalone were found during a 30-minute search, the sizes ranged from 62-138 mm. An additional eight were found east of the site after 30-minute search. All the abalone seemed healthy. The boulder that was in plot 528 since the site was established, was moved inshore about 20 meters. No owl limpet plots have been established at this site. There are considerable densities of owl limpets east of the site, however. A quick check was made and the population looks normal with a high density of large limpets.

The sea star transect was 15x 6 m long as the sea conditions prevented the full 30 m. Twenty-nine ochre stars were found in the transect. During the 30-minute search, 17 ochre stars were counted, but much of the time was spent looking under boulders in black abalone habitat.

Phragmatopoma was abundant over most of the reef flat and lower shelves of the slopes. The corners of the mussel plots were obscured by *Phragmatopoma* and were difficult to find. Mussels were sparse with the plots dominated by *Phragmatopoma*. Ochre stars are typically found feeding on mussels and the high density of sea stars is the likely reason for the low mussel density. Mussels are more abundant higher on the reef than the plots. *Endocladia* was present but most of the plots in that zone were bare or dominated by rockweed. *Pelvetia compressa* was lush throughout the rockweed zone. *Chthamalus sp.* was the dominant barnacle.

Photoplot Summary- mean % cover by zone at Fossil Reef, Santa Rosa Island (20 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Turfweed	Misc Algae	Misc Animal	Tar
Barnacle	63.4	34.2	0.0	0.0	0.0	0.0	1.0	0.6	0.8
Endocladia	34.4	19.6	4.4	36.8	0.2	0.0	3.0	1.4	0.2
Rockweed	56.8	7.4	2.0	23.2	0.0	0.0	7.4	3.2	0.0
Mussels	14.2	7.2	0.2	0.0	9.2	0.0	42.2	27.0	0.0

1/16/99 **Ford Point**: low tide -0.7 ft at 1540 hrs, air 18°C, water 14°C, wind 5-8 kts NW, surge light to moderate with 3 ft surf, high clouds with dense fog on north side of island. Two western gulls were the only birds at the site.

No black abalone were present in the fixed plots. Seven black abalone were found during the 30-minute search with two found after the timed search. The size range was 74-127 mm. Owl limpets were abundant and the plot densities seemed fine because there were so many. However comparison to previous samples showed that the 1999 density was only 64% of the 1998 density which was almost the same as the 1988 density. None of the tags placed on owl limpets last year remain.

During a 30-minute search, 111 ochre stars were found. Two of the mussel plots had high cover of mussels (>95%) and two had low cover (5 and 13%). *Phragmatopoma* and green anemones dominate the lowest reef shelf.

Photoplot Summary- mean % cover by zone at Ford Point, Santa Rosa Island (15 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Turfweed	Misc Algae	Misc Animal	Tar
Barnacle	69.4	23.4	3.2	0.0	0.0	0.0	1.2	2.8	0.0
Endocladia	37.4	1.6	33.0	0.0	4.8	0.0	20.0	3.2	0.0
Mussels	27.8	0.4	0.4	0.0	49.8	0.0	20.0	1.6	0.0

Owl limpets in fixed plots at Ford Point

Plot	Count	MeanSize	StDev	MinSize	MaxSize	Density
600	13	55.69	18.09	20	77	4.139
601	32	57.47	5.11	49	71	10.188
602	35	63.66	19.22	15	96	11.143
603	31	58.84	19.59	18	86	9.869
604	33	37.52	22.53	15	81	10.506

total	144	54.53	20.21	15	96	9.169
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Owl limpet size distributions in fixed plots at Ford Point

Plot	%<20m m	%20- 29mm	%30- 39mm	%40- 49mm	%50- 59mm	%60- 69mm	%70- 79mm	%80- 89mm	%90- 99mm	%>=100 mm
600	0.00%	15.38%	7.69%	0.00%	7.69%	61.54%	7.69%	0.00%	0.00%	0.00%
601	0.00%	0.00%	0.00%	3.13%	53.13%	40.63%	3.13%	0.00%	0.00%	0.00%
602	2.86%	0.00%	11.43%	5.71%	20.00%	11.43%	34.29%	5.71%	8.57%	0.00%
603	3.23%	9.68%	9.68%	9.68%	9.68%	16.13%	29.03%	12.90%	0.00%	0.00%
604	30.30%	24.24%	6.06%	6.06%	9.09%	12.12%	9.09%	3.03%	0.00%	0.00%
total	8.33%	9.03%	6.94%	5.56%	21.53%	23.61%	18.06%	4.86%	2.08%	0.00%

1/17/99 **East Point:** low tide -0.8 ft at 1612 hrs, air 18°C, water 13.9°C, wind calm at the site and 12-15 kts NW offshore, surge light, pleasant conditions. There were 60 Brown Pelicans, about 40 cormorants, one Black Oystercatcher, approximately 100 gulls- both Western and Heermann's and one Western Sandpiper at the point. There were 116 harbor seals hauled out on Abalone Rocks near low tide.

Two black abalone (72 and 93 mm) were found during a 30-minute search. Twenty-six ochre stars were found in 30 minutes.

Mussels were abundant, forming a dense cover throughout the zone. *Phragmatopoma* was common under the mussels and obscured most of the plot corners.

Aplysia californica was abundant in the surge channel on the north side of the site. Both species of surfgrass were abundant.

The temperature logger downloaded successfully. The housing was covered by *Phragmatopoma* and was partially filled with sand.

Photoplot Summary- mean % cover by zone at East Point, Santa Rosa Island (20 plots)

Zone Name	Bare Rock	Barnacle	Endocladia	Rockweed	Mussels	Turfweed	Misc Algae	Misc Animal	Tar
Barnacle	56.4	27.8	9.6	0.8	0.2	0.0	2.2	3.0	0.0
Endocladia	25.0	0.4	57.8	14.4	0.0	0.0	1.0	1.4	0.0
Rockweed	1.2	0.0	0.8	93.6	0.0	0.0	4.2	0.2	0.0
Mussels	1.4	2.0	0.0	0.0	80.4	0.0	12.8	3.4	0.0

Black abalone abundance and size distribution at Santa Rosa Island-all sites combined

Count	MeanSize	StDev	MinSize	MaxSize	%<45mm	%45- 126mm	%127- 145mm	%>145mm
35	103.00	20.94	62	142	0.00%	85.71%	14.29%	0.00%

1/18/99 **South Point/ Cluster Point:** low tide -0.8 ft at 1645 hrs, wind 5 kts NW, surf 4-6 ft. dense fog and drizzle. There were 48 elephant seals including 7 pups at Cluster Point. To the west there was a Great Blue Heron and an American Pipit. Near South Point, there were two black Oystercatchers, about 20 gulls including Western, Ring-billed, and California. One elephant seal bull was on the beach. A peregrine falcon was also seen.

The area had both a large reef flat and boulder zone. There was a terrific diversity of algae in this area. *Laminaria setchellii* was abundant. *Gracilaria*, *Gymnogongrus leptophyllus*, *Odonthalia flocossa*, *Stenogramme interrupta*, *Sarcodiotheca gaudichaudii*

and *Laurencia spendens* were some of the more unusual species of red algae present. Mussels were not particularly common. They appeared over a large area of the reef but *Phragmatopoma* and coralline turf dominated large areas. Ochre stars were present but not very common. *Tegula funebris* was common and *T. gallina* was present in fair numbers. The lined-chiton, *Tonicella lineata*, was present there. *Collisella digitalis* were abundant and were particularly large there.

Owl limpets were abundant and reached large sizes here. One was measured at 112 mm long and 90 mm wide, the largest recorded in our studies. Ten black abalone were found with approximate sizes ranging from 60-140 mm.

