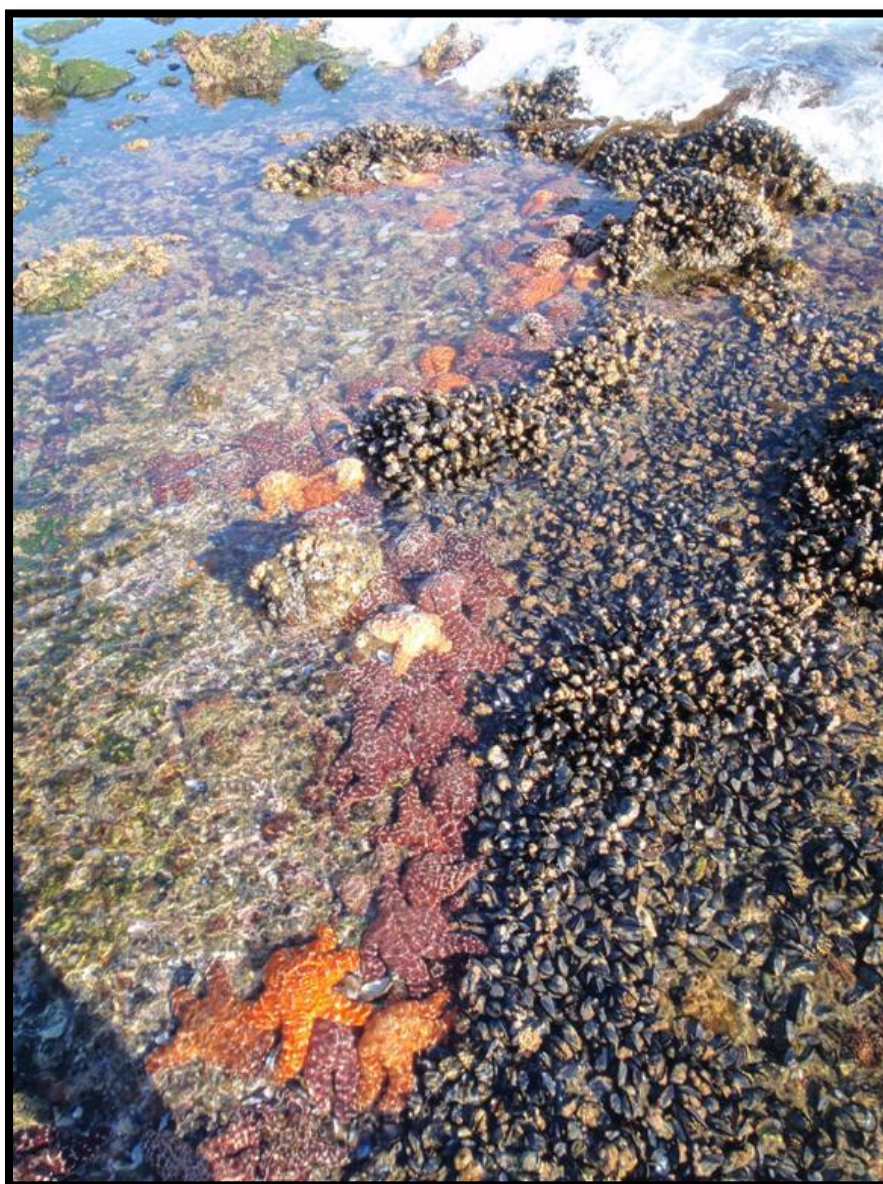




Rocky Intertidal Community Monitoring at Channel Islands National Park

2009 Annual Report

Natural Resource Data Series NPS/CHIS/NRDS—2012/372



ON THE COVER

Ochre seastars feeding on mussels at East Point, Santa Rosa Island
Photograph by: Dan Richards

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September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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The Natural Resource Data Series is intended for timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Please cite this publication as:

Richards, D. V., and S. G. Whitaker. 2012. Rocky intertidal community monitoring at Channel Islands National Park: 2009 annual report. Natural Resource Data Series NPS/CHIS/NRDS—2012/372. National Park Service, Fort Collins, Colorado.

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Executive Summary

Channel Islands National Park (CINP) includes the five northern islands off the coast of southern California and the surrounding waters out one nautical mile. Approximately 176 miles of coastline surround the islands; 80% of which is composed of rock. The diverse and undisturbed nature of the tidepools of this rocky coastline was recognized as a special feature of the islands in the enabling legislation. To conserve these communities unimpaired for future generations, the NPS has been monitoring the rocky intertidal communities at the islands since 1982. Sites were established between 1982 and 1994 using judgment sampling and considering visitation, accessibility, presence of representative organisms, wildlife disturbance, and safety. This report summarizes the 2009 sampling year efforts (from March 2009 to January 2010) and findings of the CINP Rocky Intertidal Monitoring Program. Our specific, long-term monitoring objectives are: 1) to determine the long-term trends in percent cover of key sessile organisms in the rocky intertidal ecosystem (Table 1), and 2) to determine population dynamics of *Haliotis cracherodii*, *Lottia gigantea*, and *Pisaster ochraceus*.

Thirteen key species or assemblages are monitored twice per year at 21 sites on the five park islands (Figure 1) as part of the Rocky Intertidal Monitoring Program. Fixed photoplots were used to monitor the percent cover of thatched and acorn barnacles (*Tetraclita rubescens*, *Balanus glandula*/*Chthamalus* spp.), mussels (*Mytilus californianus*), rockweeds (*Silvetia compressa*, and *Hesperophycus californicus*), turfweed (*Endocladia muricata*), red algal turf (*Pterocladia* spp. and *Gelidium* spp.), goose barnacles (*Pollicipes polymerus*), and tar. Point-intercept transects are used to determine the percent cover of surfgrass (*Phyllospadix* spp.). Information about size distribution (i.e. “size-frequency” data) is collected for owl limpets (*Lottia gigantea*) in circular plots. Size distribution and relative abundance of black abalone (*Haliotis cracherodii*) and ochre seastars (*Pisaster ochraceus*) are determined using timed searches. Shorebirds and pinnipeds are counted at each site. Visitor numbers for the Anacapa tidepools reported by the concession boats are presented here.

During the 2009 sampling season, we monitored all 21 sites at least once. Seventeen sites were monitored in both spring and fall, but due to logistical problems one of the Anacapa Island and Santa Cruz Island sites was not monitored in spring. Additionally, to avoid disturbing nesting California brown pelicans, we only monitored the Santa Barbara Island sites in fall. Conditions, specifically low tides occurring at dawn and large wave events, limited some sampling efforts, particularly the abalone and sea star searches.

Most key species or assemblages targeted in the photoplots were highly variable among sites but remained fairly comparable between sampling seasons in 2009. Compared with previous years, the mean percent cover of mussels, *Mytilus californianus*, and both rockweeds, *Silvetia compressa* and *Hesperophycus californicus*, decreased substantially at 70% or more of sites while *Chthamalus*/*Balanus* cover decreased at more than half the study sites in fall. Other core species such as *Endocladia muricata*, *Pollicipes polymerus*, and *Tetraclita rubescens* remained somewhat stable and consistent over time.

One black abalone, *Haliotis cracherodii*, was found in a fixed-monitoring plot in spring and fall at Otter Harbor, San Miguel Island. Another black abalone was found on a *P. ochraceus* fixed transect at East Point, Santa Rosa Island in spring. As in previous years following the population crash, the majority of sites had fewer than 10 black abalone located during timed or site-wide searches. Small *H. cracherodii* (< 50 mm) were only found at four locations indicating low recruitment overall. One live animal was found at Trailer, Santa Cruz Island and one dead specimen was found at Harris Point, San Miguel Island with the appearance of symptoms related to Withering Syndrome. Black abalone population levels at the islands still remain less than one percent of 1985 population levels (Richards 1988, Richards and Davis 1993).

Ochre seastars, *P. ochraceus*, were especially abundant this year at most sites around the islands with the exception of San Miguel. Seven sites had more than 500 *P. ochraceus* counted during 30-minute searches. At two of the locations, East Point and Sealion Rookery on Santa Rosa and Santa Barbara Islands, respectively, nearly 1,000 or more ochre seastars were counted in half an hour. The majority of *P. ochraceus* were under 40 mm at Ford Point and <30 mm at Willow's Anchorage perhaps indicative of recruitment events.

Giant owl limpets, *L. gigantea*, ranged in density from a mean of 5.4 m⁻² at Anacapa Island to 7.35 m⁻² at San Miguel. Overall, the densities are comparable at Anacapa and Santa Cruz Islands to what they were a decade ago. At San Miguel and especially Santa Rosa, densities have decreased 40 and 75%, respectively, over the past 10 years. Mean sizes ranged from 35 mm at San Miguel to 54 mm at Santa Rosa. The largest *L. gigantea* measured was 104 mm at Northwest-Talcott.

Surfgrasses, *Phyllospadix* spp., were monitored in fixed transects at four sites. Two out of three transects at Frasier Cove and one at Northwest-Talcott had less than 50% *Phyllospadix* cover. Abundances have remained relatively stable over the years with the exceptions of Transect-1 and especially Transect-3 at Northwest-Talcott which both decreased markedly during 2009.

As in previous years, black oystercatchers were the most common shorebird and were seen at all sites throughout the year. The greatest number of black oystercatchers seen at one time was 12 at Trailer on Santa Cruz. American oystercatchers were only seen at Otter Harbor though it appeared that the same bird was observed in both spring and fall. Black turnstones were not seen at any sites during spring, but were present in low numbers at six locations in fall.

Harbor seals were seen in the vicinity of several sites but were most numerous (up to 23 individuals) at Otter Harbor in both spring and fall. California sea-lions were highly abundant (approximately 300 individuals observed at Sealion Rookery) at both Santa Barbara Island sites. Elephant seals prefer sand beaches and were seen in the vicinity of eight sites in spring and four sites in fall. Abundances ranged 1-23 elephant seals per site in spring; a maximum of five elephant seals was seen at a site (Johnsons Lee, Santa Rosa Island) in fall.

South Frenchy's Cove is the most visited rocky intertidal area at the park, due to its close proximity to the mainland and relative ease of access. In 2009, Island Packers Company ran 20 trips to Frenchy's Cove, Anacapa to visit the tidepools. Total visitation was 1519 passengers. Most visitors (79%) accessed South Frenchy's Cove during the months of January through April with March being the busiest month (419 visitors).

Acknowledgments

The National Park Service, CINP funded this program. California Department of Fish and Game and Channel Islands National Marine Sanctuary (CINMS) provided staff time and general assistance on several events. Boat time (three days in spring and four in fall) was provided by CINMS. As with any large project there are many people “behind the scenes” that make it possible to actually conduct the work. We are indebted to the administrative clerks, dispatchers, boat operators, maintenance workers, and rangers of Channel Islands National Park that help with the day to day operations.

In 2009 we received funding from the National Marine Fisheries Service Endangered Species Program to hire an intern and conduct additional sampling for black abalone. Jacob Elliott worked as a Student Conservation Association (SCA) intern from Nov 2008 –Aug 2009 for the intertidal monitoring program. His assistance in the field along with digital file management and GIS map work was greatly appreciated.

Special thanks to the CINMS for providing boat time and staff assistance with the monitoring. This work was performed in part at the University of California Natural Reserve System, Santa Cruz Island Reserve on property owned and managed by The Nature Conservancy. Thanks to Dr. Lyndal Laughrin and staff at the UC reserve field station for their assistance. Thanks also to Carol Blanchette and others from the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) Marine Science Institute, University of California, Santa Barbara (UCSB) and UC Santa Cruz (UCSC) for their collaboration.

We are grateful to the many people that assisted with the monitoring during the 2009 sampling seasons including: Jessie Altstatt, Santa Barbara Channel Keepers, Kevin Barnes NPS, Carol Blanchette PISCO-UCSB, Cynthia Button NMFS, Rachel Clausing UCLA, Lisa Drake CINP, Jacob Elliott, SCA intern, Laura Francis CINMS, Reg Greenwood CINMS, Nick Griesse CINP, Christy Hand CINP, Melissa Hayashida SCA intern, Connie Jenkins volunteer, Charlie Lara CINMS, Danielle Lipski CINMS, Ken Niessen volunteer, Benjamin Pister Cabrillo National Monument, and Terrence Shinn CINMS.

List of Acronyms

<i>Acronym</i>	<i>Description</i>
ANI	Anacapa Island
CDFG	California Department of Fish and Game
CINP	Channel Islands National Park
CINMS	Channel Islands National Marine Sanctuary
ENSO	El Niño Southern Oscillation
GIS	Geographic Information System
MARINe	Multi-Agency Rocky Intertidal Network
MLLW	Mean Lower Low Water
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NPS	National Park Service
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
PIT	Passive Integrated Transponder
SCA	Student Conservation Association
SBI	Santa Barbara Island
SCI	Santa Cruz Island
SMCA	State Marine Conservation Area
SMI	San Miguel Island
SMR	State Marine Reserve
SRI	Santa Rosa Island
TNC	The Nature Conservancy
UCLA	University of California Los Angeles
UCSB	University of California Santa Barbara
UCSC	University of California Santa Cruz
WS	Withering Syndrome

Introduction

The rocky intertidal zone is a compact and biologically-diverse area between marine and terrestrial habitats. Marine organisms living within this zone are highly adapted to physical disturbance and severe-temperature fluctuations and are subject to both marine and terrestrial predators. The intense pressure from both physical and biological entities has promoted highly-diverse invertebrate and algal assemblages within the rocky intertidal zone as indicated by the vast number of organisms that cannot live without the alternating exposure to both air and sea.

CINP and CINMS encompass the four northern Channel Islands and Santa Barbara Island off the coast of southern California. The park islands and surrounding waters bear the designation of an International Biosphere Reserve and State of California Areas of Special Biological Significance. The State of California maintains jurisdiction over the marine resources and manages them through the California Department of Fish and Game (CDFG). In 2003, a network of marine reserves was established around the Channel Islands. Four of the Rocky Intertidal monitoring sites fall inside State Marine Reserves and two more are immediately adjacent to reserve boundaries (Figure 1).

The “undisturbed tide pools” are unique features specifically mentioned in the enabling legislation for CINP. The law establishing the park (16-USC-410) also mandated the development of inventories and monitoring of natural resources in the park. Rocky intertidal monitoring began in 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 provide remedies for management problems, and 5) to measure the success of management actions.

Specific monitoring objectives are: 1) to determine the long-term trends in percent cover of key sessile organisms in the rocky intertidal ecosystem (Table 1), and 2) to determine population dynamics of *Haliotis cracherodii*, *Lottia gigantea*, and *Pisaster ochraceus*. Objectives are met by monitoring percent cover of core species in target intertidal zones using fixed photoplots and fixed transects, monitoring species composition and abundance of motile invertebrates using photoplots, measuring size frequency and abundance of black abalone, owl limpets, and seastars using fixed plots or timed searches. Monitoring is done twice each year during spring and fall to monitor the effects of winter storms and summer warm water.

Rocky intertidal monitoring began at Anacapa Island (VTN Oregon 1984) initially with an emphasis on monitoring trampling effects, based on concerns for visitor impacts (Littler 1978). The program was expanded in 1985 to include the other park islands and to look more broadly at the ecology and possible impacts in other areas. Impacts from harvest, oil spills, and climate change may be of particular interest as future management concerns. Sampling site locations for this monitoring effort were chosen subjectively based on the location of target organisms. This sampling design was selected in an attempt to maximize our ability to detect changes in species distribution and abundance. Because intertidal areas are so heterogeneous, an impractically large number of plots would be necessary to detect temporal changes in species abundance using probability-based sampling (Ambrose et al. 2002, 1995b). The disadvantage of this sampling design is that results from plots cannot be extrapolated to the larger, unsampled population (Engle 2008).

CINP Rocky Intertidal Monitoring is part of a government and non-government consortium called the Multi-Agency Rocky Intertidal Network (MARINe) (Dunaway et al. 1998). Within MARINe, we are working to standardize collection of data and make it available to member groups in a centralized database (Engle 2008). Within the MARINe network, there are sites from Baja California to Alaska, including the Channel Islands. By working with MARINe we have access to consistent data collected using a standardized protocol that can be used for a much broader regional analysis of changes to the intertidal communities.

This report summarizes the 2009 sampling year efforts (from March 2009 to January 2010) and documents activities and observations of the CINP Rocky Intertidal Monitoring Program. Monitoring results were previously reported in Richards 1986, 1988, 1998, Richards and Lerma 2000, 2002 2005a, 2005b, Richards et al. 2010, and Richards and Rich 2009, 2010. Additional black abalone monitoring results have been presented in Haaker et al. 1992, Davis et al. 1992, and Richards and Davis 1993.

Methods

Study Area

The California Channel Islands are comprised of eight islands in the Southern California Bight, five of which are within the CINP. The five park islands have about 323 kilometers (176 miles) of coastline, the majority of which is rocky shore (approximately 80%). Rock types vary from hard weathered volcanic basalt or breccias to easily eroded Monterey shale and sandstone. Sites were originally established to include the various exposures and rock types of each of the islands, though broad rocky benches were targeted.

The park islands span the transition zone between cooler waters of the Oregonian biogeographic province and the warmer Californian waters from the south. Mean annual air temperature along the mainland in this area is 15°C. Mean rainfall is about 38 cm per year (Daily et al. 1993). There is a climatic gradient across the island chain with San Miguel Island having the most precipitation, most cloud cover, and most wind. Santa Barbara Island to the southeast is the warmest and driest. The mean monthly sea temperatures range from 13°C in April at San Miguel Island to nearly 20°C at Santa Barbara Island in August and September (Engle and Richards 2001). Swell varies through the year with winter storms bringing high northwest wind and waves during the winter and spring, and distant southern hemisphere storms sending large swells to the south facing shores in summer.

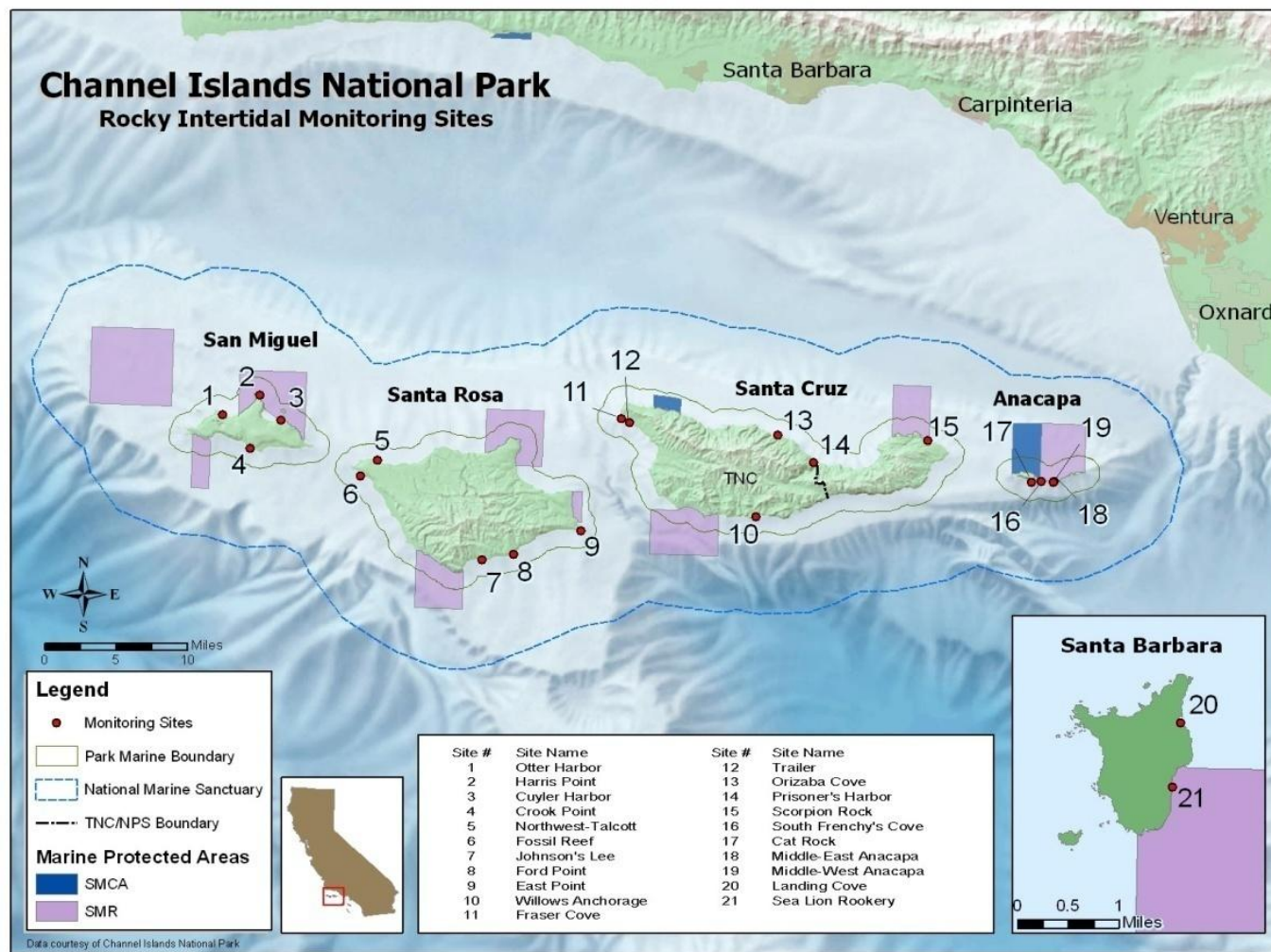


Figure 1. Rocky Intertidal Community Monitoring Site Locations in Channel Islands National Park. Note: TNC= The Nature Conservancy, SMCA= State Marine Conservation Area, SMR= State Marine Reserve, Sites 18 and 19 are on adjacent reefs.

Monitoring

The CINP Rocky Intertidal Monitoring Program has 21 sites on the five park islands (Figure 1) that were established between 1982 and 1994. Sites generally consist of an array of 15-35 photoplots, 3-5 irregular and circular plots used to monitor black abalone and owl limpet densities, respectively, and *P. ochraceus* transects. Four sites have three surfgrass transects. Site selection considered visitation, accessibility, presence of representative organisms, wildlife disturbance, and safety. Sampling is usually conducted twice each year, once in spring and fall. In 2009, monitoring occurred at 17 sites in spring (March-May) and 21 sites in fall (October - January 2010). Monitoring protocols detailed in Richards and Davis (1988) and Engle *et al.* (1998) were followed. Updated protocol summaries can be found in Richards and Lerma (2000), Richards *et al.* (2010), and Engle (2008). See Appendix A for additional notes about the 2009 program.

Data are maintained in Microsoft Access databases and Excel files in the Channel Islands National Park network and MARINE. Past annual reports are available on the internet at <http://science.nature.nps.gov/im/units/medn/>.

Thirteen core species or assemblages are targeted for monitoring in fixed photoplots to determine percent cover (Table 1). These target species and assemblages are often common and generally used to define a band or zone within the intertidal zone. Target species and assemblages include thatched and acorn barnacles (*Tetraclita rubescens*, *Balanus glandula*/*Chthamalus* spp.), mussels (*Mytilus californianus*), rockweeds (*Silvetia compressa*, and *Hesperophycus californicus*), turfweed (*Endocladia muricata*), red algal turf (*Pterocladia* spp. and *Gelidium* spp.), goose (or leaf) barnacles (*Pollicipes polymerus*), and tar which occurs naturally from oil seeps in the channel and can form a thick persistent cover over substrata. An additional 32 taxa or substrata are also monitored when present (see Table 1 for list of taxa¹). Fixed plots (50 x 75 cm) are photographed on each visit. In most cases, there are five replicate plots in each zone, initially established over high densities of the target species. Not all core species (zones) are represented at each site. Four new *M. californianus* plots were established in the *Mytilus* zone at Johnson's Lee in fall 2008 to replace plots that have been devoid of mussels for over 15 years (Richards and Whitaker 2008 Annual Report *in prep*).

¹ Taxa are defined as species or groups of similar species that may not be easily separated in the field. Core taxa are those identified by MARINE as species to be searched for and counted by all groups (Engle 2008).

Table 1. Core Species, Higher Taxa, and Substrata Scored in Photoplots, Point Intercept Transects, Circular Plots, Abalone/Seastars, and Mobile Invertebrate Counts at all CINP Sites in 2009.

(Target species are shown in bold.)	<i>Photo plots</i>	<i>Surfgrass Transects</i>	<i>Circular Plots</i>	<i>Abalone/ Sea star</i>	<i>Motile Inverts</i>
GREEN ALGAE					
<i>Cladophora columbiana</i>	X				
<i>Ulva/Enteromorpha</i>	X				
Other Green Algae (any greens not listed above)*	X	X			
BROWN ALGAE					
<i>Egregia menziesii</i> (Boa Kelp)	X	X			
<i>Eisenia arborea</i>		X			
<i>Endarachne/Petalonia</i>	X				
<i>Halidrys dioica/Cystoseira</i> spp.		X			
<i>Hesperophycus californicus</i> (= <i>H. harveyanus</i>)	X				
<i>Sargassum muticum</i>		X			
<i>Scytosiphon</i> spp.	X				
<i>Silvetia compressa</i> (= <i>Pelvetia fastigiata</i>)(Rockweed)	X				
Other Brown Algae (any browns not listed above)*	X	X			
Ephemeral browns	X				
RED ALGAE					
<i>Endocladia muricata</i> (Turfweed)	X				
<i>Chondracanthus canaliculatus</i> (= <i>Gigartina canaliculata</i>)	X				
<i>Chondracanthus spinosus</i>	X				
<i>Gelidium coulteri/ Pterocladia capillaceum</i>	X				
<i>Mastocarpus papillatus</i> (blade)	X				
<i>Mazzaella affinis</i> (= <i>Rhodoglossum affine</i>)	X				
<i>Mazzaella</i> spp. (= <i>Iridaea</i> spp.)	X				
<i>Porphyra</i> spp.	X				
<i>Prionitis</i> spp.	X				
Articulated Corallines (Erect Corallines)	X	X			
Crustose Corallines (Encrusting Corallines)	X	X			
Other Red Algae (any reds not listed above)*	X	X			
ALGAE/PLANTS					
<i>Phyllospadix scouleri/torreyi</i> (Surfgrass)	X	X			
Non-Coralline Crusts (reds and browns)	X	X			
Other Plant/Algae*		X			
ANEMONES					
<i>Anthopleura elegantissima/sola</i> (Green Anemone)	X	X			
POLYCHAETE WORMS					
<i>Phragmatopoma californica</i>	X	X			

Table 1. Core Species, Higher Taxa, and Substrata Scored in Photoplots, Point Intercept Transects, Circular Plots, Abalone/Seastars, and Mobile Invertebrate Counts at all CINP Sites in 2009 (continued).

(Target species are shown in bold.)	<i>Photoplots</i>	<i>Surfgrass Transects</i>	<i>Circular Plots</i>	<i>Abalone/ Sea star</i>	<i>Motile Inverts</i>
MOLLUSCS					
<i>Acanthina</i> spp.					X
Chitons	X				X
<i>Fissurella volcano</i>					X
<i>Haliotis cracherodii</i> (Black Abalone)				X	
<i>Lepidochitona hartwegii</i>					X
<i>Littorina</i> spp.					X
<i>Lottia gigantea</i> (Owl Limpet)			X		X
<i>Mopalia</i> spp.					X
<i>Mytilus californianus</i> (California Mussel)	X	X			
<i>Nucella emarginata</i>					X
<i>Nuttalina</i> spp.					X
<i>Ocenebra circumtexta</i>					X
<i>Chlorostoma funebris</i> (= <i>Tegula funebris</i>)					X
<i>Chlorostoma gallina</i> (= <i>Tegula gallina</i>)					X
<i>Chlorostoma</i> spp. (= <i>Tegula</i> spp.)	X				
Limpets	X				
Large Limpets > 15mm (excluding <i>L. gigantea</i>)					X
Medium Limpets 5-15mm					X
Small Limpets < 5mm					X
<i>Littorina</i> spp.	X				X
<i>Septifer/Brachydontes</i>	X				
BARNACLES					
<i>Chthamalus dalli/fissus</i> & <i>Balanus glandula</i> (Acorn Barnacle)	X				
<i>Tetraclita rubescens</i> (Thatched Barnacle)	X				
<i>Pollicipes polymerus</i> (Goose Barnacle)	X				
Barnacles*		X			
Other Barnacles (any barnacles not listed above)*	X				
ECHINODERMS					
<i>Pisaster ochraceus</i> (Ochre Star)	X	X		X	X
<i>Pisaster giganteus</i>				X	X
<i>Patiria miniata</i>				X	X
<i>Strongylocentrotus purpuratus</i>					X
CRUSTACEANS					
<i>Pachygrapsus crassipes</i>					X
<i>Pagurus</i> spp.					X
INVERTEBRATES					
Other Invertebrates (Other Animals) (any inverts not listed above)*	X	X			
SUBSTRATES					
Rock (Bare Rock)	X	X			
Sand	X	X			
Tar	X	X			
UNDETERMINED					
Unidentified (cannot tell if plant, invert or substratum)	X	X			
* The specific definitions of these categories are different for photoplots compared to transects.					

In 2009, all photoplots were photographed with a digital camera, either an Olympus Camedia Z-5050 or Olympus Stylus 1030. The percent cover of core organisms was determined either in the

field by laying a grid (50 x 75 cm) of one hundred evenly-spaced points (10 x 10) over the plot (Figure 2), or in rare cases in the office from the digital images, when conditions were unfavorable or insufficient time was available. In the office, a digitized grid was created in Adobe Photoshop and overlaid on the image to provide complete coverage of the plot. Under both scoring protocols, layered organisms were not counted separately. Therefore the total cover of the top-most layer (with few exceptions – see Engle 2008) summed 100%. Data were recorded onto pre-printed data sheets, transcribed into the computer database and reviewed for errors



Figure 2. Stephen Whitaker scoring photoplots at Trailer, Santa Cruz Island.

Relative abundance and size structure was collected for three species. *Haliotis cracherodii*, black abalone, were counted and measured in fixed irregular plots ranging in size (0.5m² - 11.2m²) (5 plots per site) at eleven sites where plots have been established.. At each site, a search of a defined area of the reef or defined period of time was made to obtain a relative abundance of abalone. *Lottia gigantea*, giant owl limpets, were measured within fixed circular plots of one-meter radius (3 to 5 plots per site). *Pisaster ochraceus*, ochre seastars, were counted along with other species of seastars (*Pisaster giganteus*, *Patiria miniata*, *Pycnopodia helianthoides*, and *Leptasterias hexactis*) in a general search of the reef (for 30-minutes). When possible, 50-100 *P. ochraceus* were measured (center of disk to tip of longest ray) for size distribution. At three sites (Johnson's Lee, Fossil Reef, and Landing Cove) where *P. ochraceus* were abundant, fixed transects (variable sizes between sites) were used as a rough measure of density within that area.

Motile invertebrates (Table 1) were counted by carefully searching each photoplot (Figure 3). Select species were measured for size-frequency distribution. Abundant littorine snails and small

limpets were sub-sampled in three small plots (either 20cm x 20cm or 10cm x 10cm, depending on density) within the photoplot area. This sub-sampling is a shift from previous sub-sampling and is now standardized with other MARINE sampling. Motile- invertebrate sampling is usually done in spring, alternating with *Lottia gigantea* counts in fall.



Figure 3. Stephen Whitaker counting motile invertebrates at East Point with volunteer, Connie Jenkins, recording.

Phyllospadix spp., surfgrass, cover was measured on fixed point-intercept transects (10 m long, 100 points) (three transects per site) at four sites (Trailer, Fraser Cove, East Point, Northwest-Talcott). Special circumstances and general conditions that may have affected sampling were described on daily logs, and reported in the trip reports. Surfgrass transect scoring methods follow the MARINE protocol, adding *Phyllospadix* spp. understory for surfgrass covered by algae.

Shorebird and pinniped observations were made on arrival and throughout the day at each site visit. The numbers reported for each species were the greatest number observed at any one time while working at a site. Visitor numbers were reported by concessioners (Island Packers Company and Truth Aquatics) to the park. No independent counts of visitors were made to verify reported figures.

Field work was conducted during low tides, generally below mean low water (minus tides) known as spring tides, as opposed to neap tides. Spring tides occur twice each month but often at night. Sampling dates for spring and fall seasons were chosen for minus tide series occurring during daylight hours. Sampling was conducted by Dan Richards and Stephen Whitaker with

assistance from others, primarily for data recording and sea star counts. Notes about sampling variations, personnel changes, and equipment are documented in trip reports in Appendix C.

Optic Stowaway temperature loggers from Onset Computer Corporation were placed in PVC (Polyvinyl Chloride) pipe housings epoxied to rocks near the mean tide line. Units were downloaded in the field to an Optic Shuttle device and processed with Onset's Boxcar software.

Taxonomy and nomenclature follow Smith and Carlton (1975), Carlton (2007), Abbott and Hollenberg (1976), McLean (1978), Morris et al. (1980), and <http://ucjeps.berkeley.edu/californiaseaweeds.html>. Note that in this report, we have adopted the taxonomy of Carlton (2007) with the generic name change from *Tegula* to *Chlorostoma* for turban snails.

Data Analysis

The purpose of this report is to present data collected in 2009. Advanced statistical analyses on the data have not been performed. Any trends presented are simple summary statistics and should be viewed as preliminary. Basic trends of percent cover, averaged by zone, were graphed for key species in photoplots (acorn barnacles, thatched barnacles, mussels, rockweeds [*Silvetia* and *Hesperophycus*], goose barnacles, red algal turf, and tar) using stock charts in Microsoft Excel. These charts provide a quick view of the cover by season compared to the overall range and mean of values through time for each taxon at each site. To minimize variability, photoplot target types were not pooled from different zones for analysis. For example, the percent cover of mussels in only mussel zone plots was considered. Descriptive statistics (density, average size, minimum and maximum size), averaged by site were determined for all circular owl-limpet plots, and the trend through time was graphed by sampling event. Readers are cautioned that although densities are provided for comparative purposes, plots were chosen within high density areas and should not be considered to be representative of larger areas. Surfgrass trends were plotted for temporal reference.

Photoplots, circular plots, and line transects were all “fixed” or measured in the same location every season. It is not possible to extrapolate trends in the plots to entire sites without using additional information specific to the area (Murray *et al.* 2006). Therefore, results from photoplots, transects, and circular plots should be interpreted with care.

Results

2009 Sampling Events

We sampled 17 sites in spring and all 21 sites in fall (Table 2). The two sites at Santa Barbara Island were not sampled in spring because of difficulties with access due to nesting California brown pelicans. Two other sites, Cat Rock and Scorpion Rock, also were not sampled in spring because of logistical difficulties as these sites require vessel support to access.

Table 2. 2009 Sampling dates for Rocky Intertidal Monitoring sites.

<i>Site</i>	<i>Site Codes</i>	<i>Spring</i>	<i>Fall</i>
Cuyler Harbor, SMI	SMCH	4/6/09	11/16/09
Crook Point, SMI	SMCP	4/5/09	11/14/09
Otter Harbor, SMI	SMOH	4/4/09	11/13,17/09
Harris Point, SMI	SMHP	4/3/09	11/15/09
Fossil Reef, SRI	SRFR	5/30/09	1/15/10
Johnson's Lee, SRI	SRJL	5/26/09	1/11/10
Ford Point, SRI	SRFP	5/27/09	1/12/10
Northwest-Talcott, SRI	SRNWT	5/29/09	1/14/10
East Point, SRI	SREP	5/28/09	1/13/10
Fraser Cove/Forney Cove, SCI	SCFC	4/28/09	11/3/09
Trailer, SCI	SCTR	4/27/09	11/4/09
Willows Anchorage, SCI	SCWA	4/29/09	11/2/09
Scorpion Rock, SCI	SCSR	*	12/1/09
Prisoner's Harbor, SCI	SCPH	4/30/09	11/1/09
Orizaba Cove, SCI	SCOC	3/7/09	12/14/09
Cat Rock, ANI	ANCR	*	11/30/09
South Frenchy's Cove, ANI	ANSFC	3/9/09	12/2/09
Middle Anacapa-West	ANMW	3/8/09	12/15/09
Middle Anacapa-East	ANME	3/8/09	12/15/09
Landing Cove, SBI	SBLC	--	10/15, 17/09
Sealion Rookery, SBI	SBSLR	--	10/16/09

--no spring sample because of nesting pelicans

* no sampling due to logistical problems

Photoplots

Photoplot data are summarized in Figures 4-6 for each target zone and season. Mean percent cover is pooled for all replicate plots per zone by site and season, and is compared to the range and mean cover across all years. Percent cover values of core taxa in each plot are presented in Appendix B. Summary tables (by zone) for each site can be found in the trip reports (Appendix C).

The mean percent cover of most targeted species in 2009 was highly variable among sites but remained fairly comparable between spring and fall sampling seasons (Figures 4-6). Compared with previous years, the mean percent cover of mussels, *Mytilus californianus*, and both rockweeds, *Silvetia compressa* and *Hesperophycus californicus*, appeared to have decreased substantially (more than one standard error below overall mean for combined years at each site) at 70% or more of sites while *Chthamalus/Balanus* cover decreased at more than half the study sites in fall. Other core species such as *Endocladia muricata*, *Pollicipes polymerus*, and *Tetraclita rubescens* appeared to remain relatively stable and consistent at most sites compared to the combined mean of previous years. Marked declines in *Mytilus californianus* appeared to primarily occur at north-facing sites (Anacapa Middle East, Anacapa Middle West, Orizaba Cove, Prisoners Harbor, Scorpion Rock, Northwest-Talcott, Cuyler Harbor, Harris Point and Otter Harbor) while abundances at most south-facing sites (Cat Rock, Willows Anchorage, Trailer and Crook Point) persisted at or near the mean of past years (Figures 4-5). *M. californianus* at several of the north-facing sites, two at Anacapa Island (Anacapa Middle East and West) and three at Santa Cruz Island (Orizaba Cove, Prisoners Harbor and Scorpion Rock), reached the lowest recorded abundances (0%).

Some south and east-facing sites primarily on Santa Rosa Island (Sealion Rookery, East Point, Ford Point, Fossil Reef and Johnsons Lee) also trended towards decreased abundances of *M. californianus* compared with previous years.

Mean mussel cover in the four new plots established in the *Mytilus* zone at Johnson's Lee was 73.5 % in spring and 78.8% in fall. Mean *Mytilus* cover in the original plots was only 12.0% and 14.4% in spring and fall, respectively.

High levels of recruitment (i.e. numerous juvenile *M. californianus*) were observed at Johnson's Lee as well as Willow's Anchorage, and moderate numbers of recruits were noted at Middle Anacapa West and Trailer during spring (see trip reports, Appendix C).

For *Silvetia compressa* and *Hesperophycus californicus*, there were no apparent geographical trends in regard to percent cover within plots. However, cover of both rockweeds was extremely low during both seasons at nearly all sites (Figs. 4-6). Several sites including Anacapa Middle West and Middle East, Otter Harbor and Crook Point on San Miguel Island, Willows Anchorage on Santa Cruz, and Landing Cove on Santa Barbara Island had little or no *S. compressa* within monitoring plots; instead plots were mostly dominated by bare rock. At Anacapa Middle West and East sites, Otter Harbor and Willows Anchorage, relatively precipitous declines began in the early to mid 2000s. *S. compressa* abundances ranged 35-65% at said sites prior to decreasing. Crook Point and Landing Cove experienced marked declines in rockweed cover during the mid to late 1990s and have yet to recover. *S. compressa* abundance at Landing Cove was approximately 80% in 1993.

Fossil Reef at Santa Rosa was the only site that supported more *S. compressa* in 2009 (mean = 67.8%, measured in fall) than previous years (mean = 43.2 %,) (Figs. 4-5). Northwest-Talcott had comparable *S. compressa* cover during both seasons (mean = 55%) to the long-term mean (63.8%). At Trailer, *S. compressa* cover was 57.6-63.4% in 2009; nearly 20% less than the long-term mean (81.5%). *Hesperophycus californicus* cover increased during spring (mean = 27.2%) at Harris Point, San Miguel and then decreased in fall (mean = 22.0%) to levels comparable to previous estimates (long term mean = 17.6%). Cover of *H. californicus* also increased to the long-term mean at Orizaba Cove and East Point whereby new recruits from previous years appeared to have become larger plants. *Endocladia muricata* cover decreased at nearly half the sites in spring (Fig. 4) but became more conspicuous in fall as it was equal to or above the long-term average at nearly 80% of sites sampled (Fig. 5). *E. muricata* appeared particularly healthy at all locations on Santa Rosa and South Frenchy's Cove during both seasons and at Willow's Anchorage during fall. At Harris Point on San Miguel, *E. muricata* cover measured slightly above the long-term mean in spring but fell markedly below average in fall plummeting to approximately 5%. Cover was also below average at Anacapa Middle East, Prisoner's Harbor and Fraser Cove during both spring and fall.

Barnacle, *Chthamalus dalli/fissus* and *Balanus glandula*, abundances in 2009 were comparable (within one standard error) to previous years at nearly 70% of the sites in spring and 45% of sites in fall. In spring, five out of 16 sites had below average barnacle cover (Fig. 4), and over half the sites sampled in fall were lower (Fig. 5). No sites had high abundances of barnacles relative to the long-term mean during spring or fall.

Red algal turf, composed of *Gelidium* sp., *Pterocladia* sp. and *Chondracanthus canaliculatus*, is only monitored at Landing Cove. The algal assemblage is typically very stable and usually dominates the lower intertidal zone at most sites. At Landing Cove, it is conspicuous in three out of five plots, yet the surfgrass, *Phyllospadix torreyi*, has increasingly become more established in two of the plots over the past several years. In 2009, red algal turf abundance fell markedly below the long-term mean, and was replaced primarily by articulated corallines and *Egregia menziesii* (Appendix B). One of the plots typically dominated by surfgrass could not be accurately located because three corner markers were missing. However, we do not believe the inexact location of the plot resulted in any difference as *P. torreyi* was noticeably less abundant within the general area of the plot and red algal turf cover is typically low in that plot.

Pollicipes polymerus zone plots have only been established at Fraser Cove. There, goose barnacle cover has declined slowly over time. However, no substantial change in *P. polymerus* cover was documented in 2009 (Fig. 6).

Tetraclita rubescens is monitored at three sites (Fig 6.). Below average cover was measured at Orizaba Cove both seasons. At Harris Point, *T. rubescens* cover was comparable to the long-term mean in spring and increased above the average in fall. Scorpion Rock showed no change from past years.

Tar is monitored at Fraser Cove where it is naturally deposited from seeps in the Santa Barbara Channel onto extensive substrata in the upper intertidal. There was only a slight decline (3-5%) in tar cover during both seasons from the long-term mean (50%) (Fig. 6).

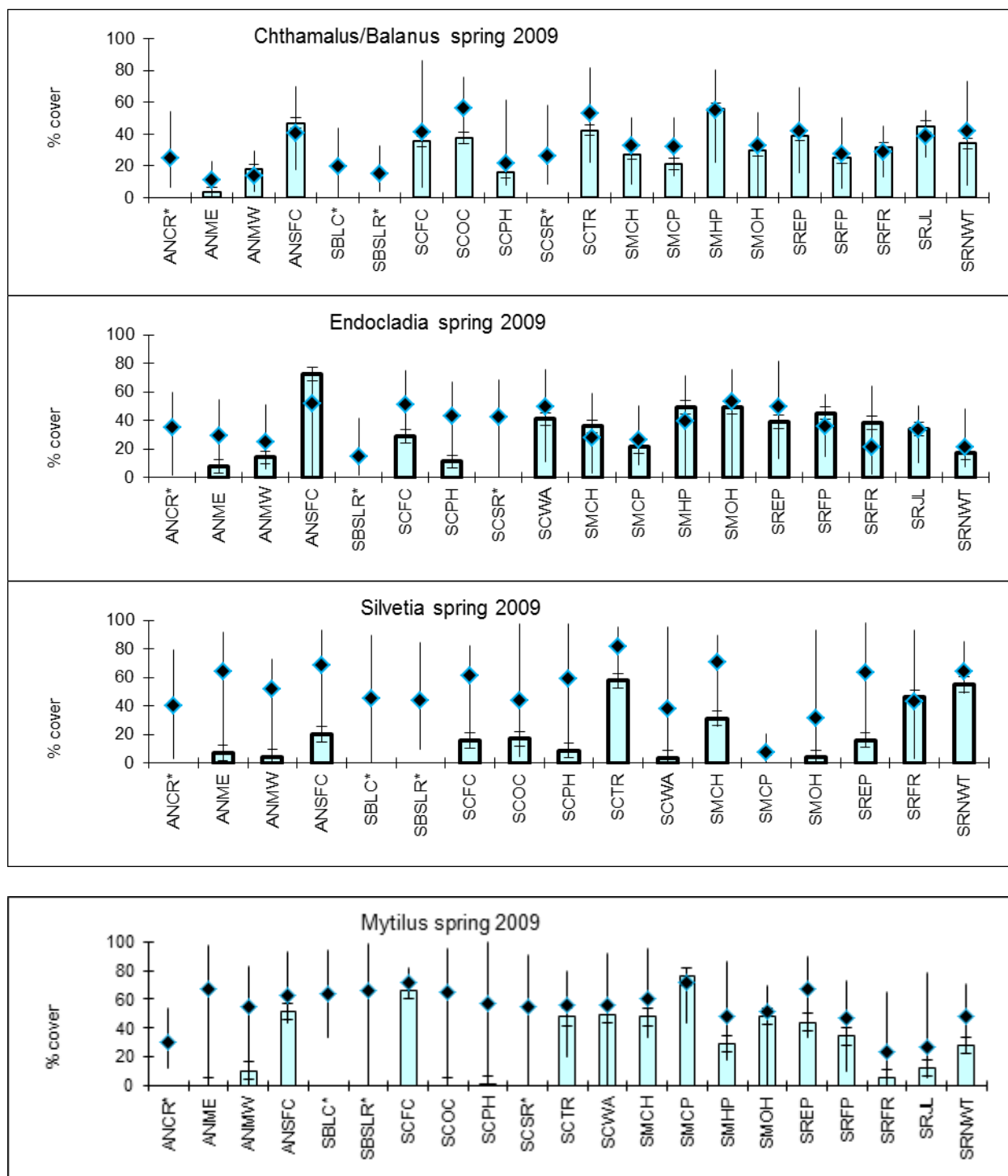


Figure 4. Percent cover of target species (*Chthamalus/Balanus*, *Endocladia muricata*, *Silvetia compressa*, and *Mytilus californianus*) in fixed plots by zone in spring 2009. Bars represent the seasonal mean percent cover from five plots within that zone; error bars represent ± 1 standard error of the plot abundances at that site. Vertical lines represent the range of means since monitoring began at that site. Diamonds represent the overall mean for all years at that site. See Table 2 for site codes. (* denotes no sample in spring).

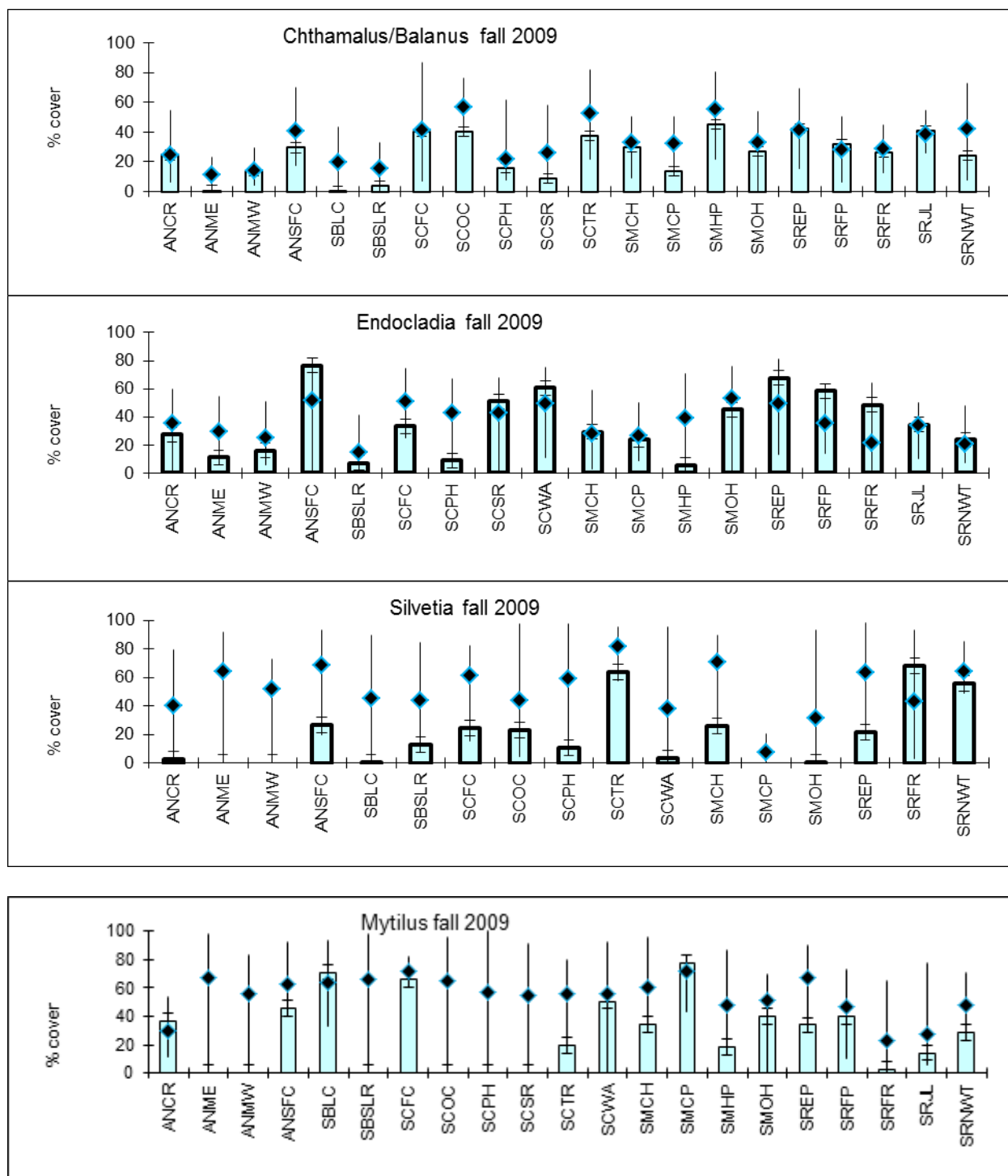


Figure 5. Percent cover of target species (*Chthamalus/Balanus*, *Endocladia muricata*, *Silvetia compressa*, and *Mytilus californianus*) in fixed plots by zone in fall 2009. Bars represent the seasonal mean percent cover from five plots within that zone; error bars represent ± 1 standard error of the plot abundances at that site. Vertical lines represent the range of means since monitoring began at that site. Diamonds represent the overall mean for all years at that site. See Table 2 for site codes.

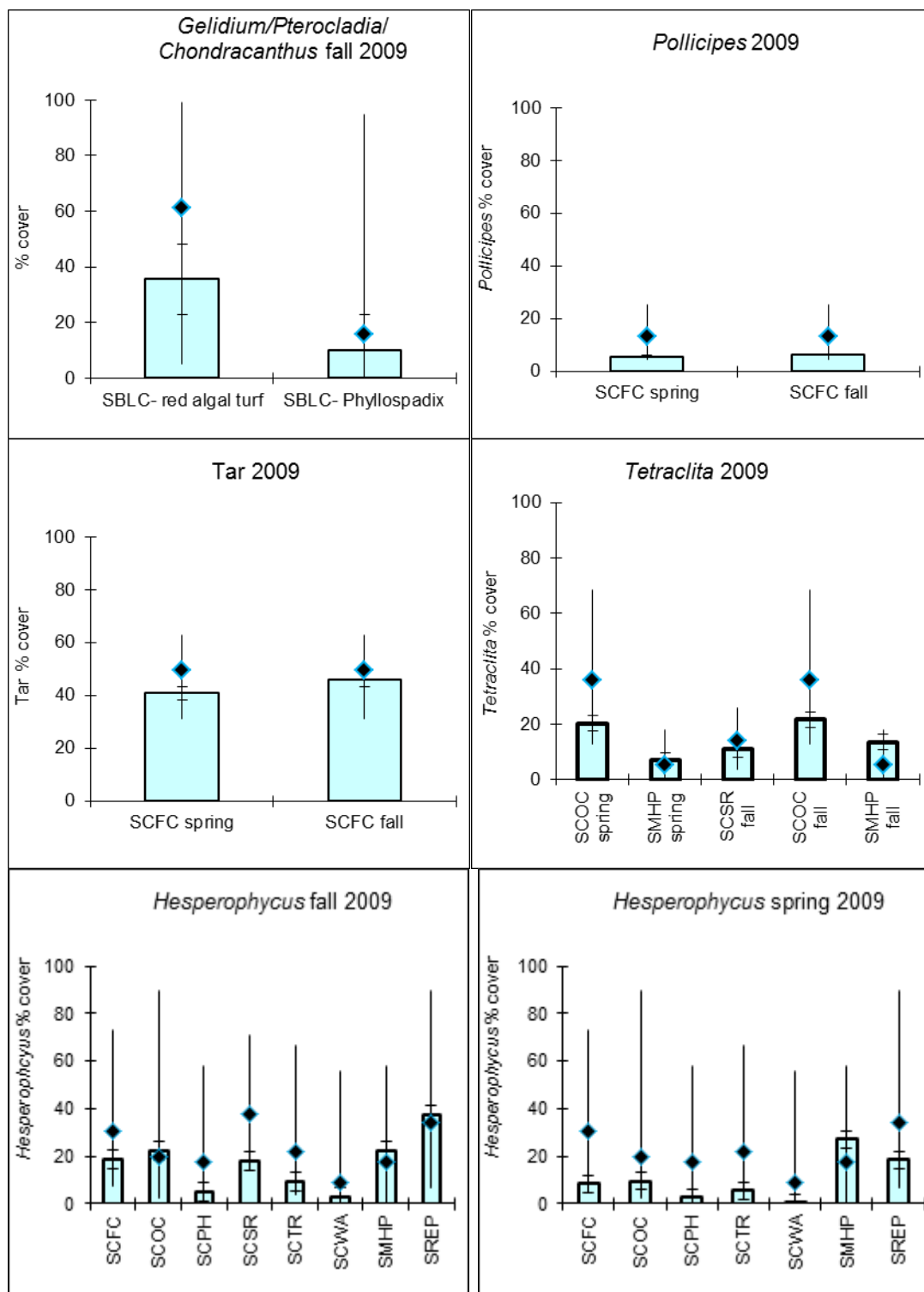


Figure 6. Percent cover of target taxa (Red algal turf, Tar, *Tetraclita rubescens*, *Pollicipes polymerus*, and *Hesperophycus californicus*) in fixed plots by zone in 2009. Bars represent the seasonal mean percent cover from five plots within that zone; error bars represent ± 1 standard error of the plot abundances at that site. Vertical lines represent the range of means since monitoring began at that site. Diamonds represent the overall mean for all years at that site. See Table 2 for site codes.

Motile Invertebrates

Compared with previous years, the abundances of motile invertebrate species, with the exceptions of the gastropods *Chlorostoma funebris* and *Nucella emarginata*, appeared to have varied minimally (Figure 7). Note that all species in Figure 7 were pooled across all photoplots at each site since many species occur in significant abundances within more than one photozone. *C. funebris* was common in the *Silvetia* zone at many sites, and particularly abundant at Fossil Reef and Trailer (Appendix D and Figure 7). In fact, the mean number of *C. funebris* at Fossil Reef more than doubled in fall 2009 compared to the overall mean of previous years. *C. funebris* abundances declined markedly however at Frasier Cove in 2009 compared with all prior measurements.

The predatory dogwinkle, *N. emarginata*, decreased substantially in the *Mytilus* zone in 2009. As in the past, more *N. emarginata* were found at Cuyler Harbor than other sites and high numbers were also counted at Otter Harbor. However, *N. emarginata* abundances were lowest in 2009 compared with previous years at Orizaba Cove, Prisoners Harbor, Cuyler Harbor, Crook Point, and Harris Point. Note that Orizaba Cove and Prisoners Harbor had zero percent mussel cover in plots, thus there was minimal habitat for *N. emarginata*.

Densities of small (<5mm) and medium-sized (5-15mm) limpets along with *Littorina* spp. subsampled in the plots either remained stable or increased in all zones during 2009 compared to previous densities. The most pronounced change in abundance occurred for *Littorina* spp. in the *Silvetia* and *Endocladia* assemblages whereby >50% increases were observed in 2009 over earlier abundances. Two sites at Santa Rosa Island, Johnson's Lee and Ford Point, had especially high numbers of limpets and littorine snails in the barnacle zone.

The chitons *Lepidochitona* spp. and *Nuttalina* spp. were common at most sites in all zones except *Chthamalus/Balanus*, yet plot densities varied little from previous seasons. *Chlorostoma gallina* was present (usually only one or two) at half the sites.

Size distribution data collected for motile invertebrates in 2009 appear to be similar to measurements recorded in previous years. However, further analysis is needed to draw any inferences among sites.

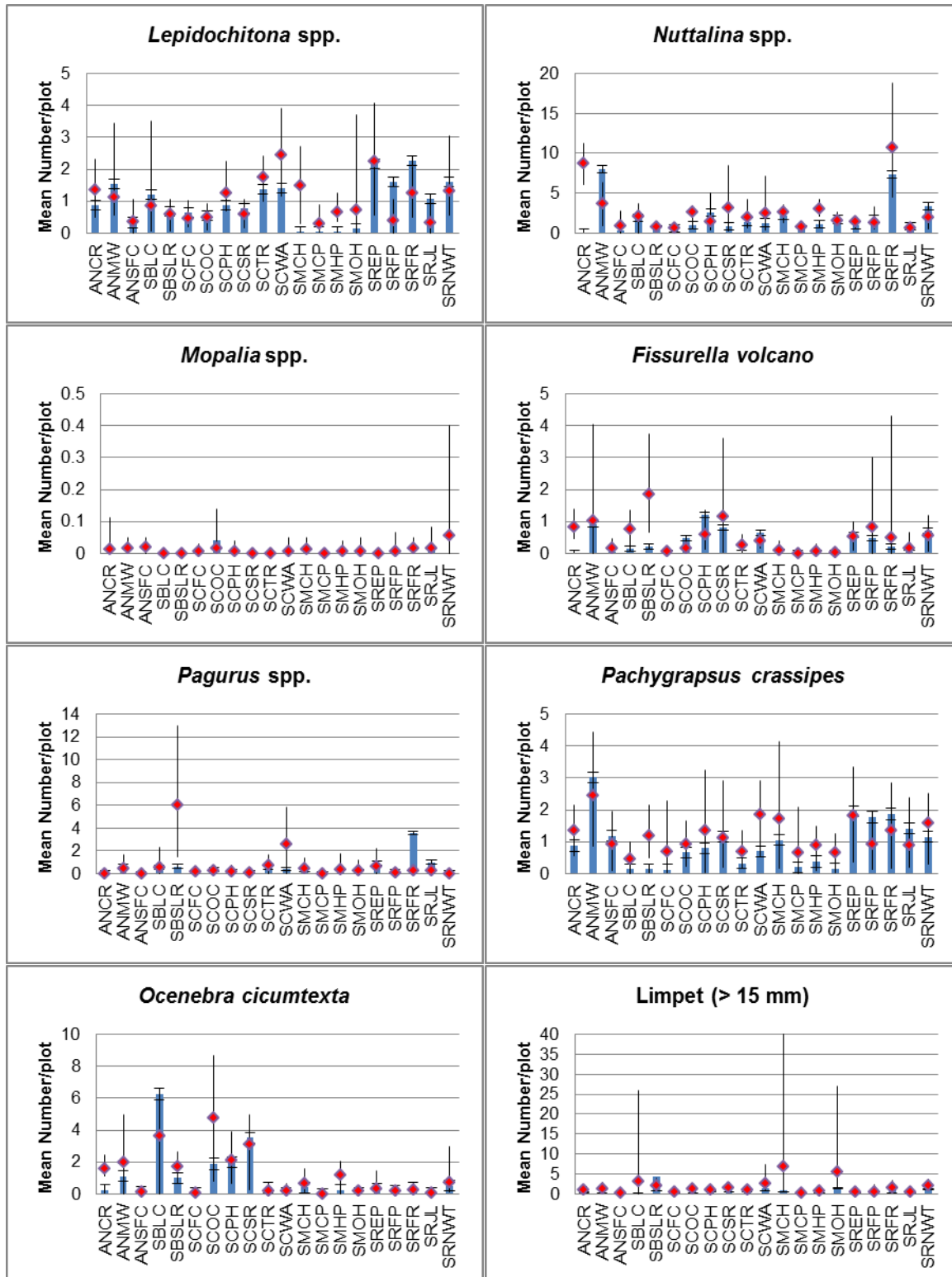


Figure 7. Species mean abundances for 2009 at each site. Bars represent the mean abundance for 2009. Lines indicate the maximum and minimum distribution of mean abundances from combined previous years. Diamonds display overall mean for combined years. Note that y-axes vary by graph. See Table 2 for site codes.

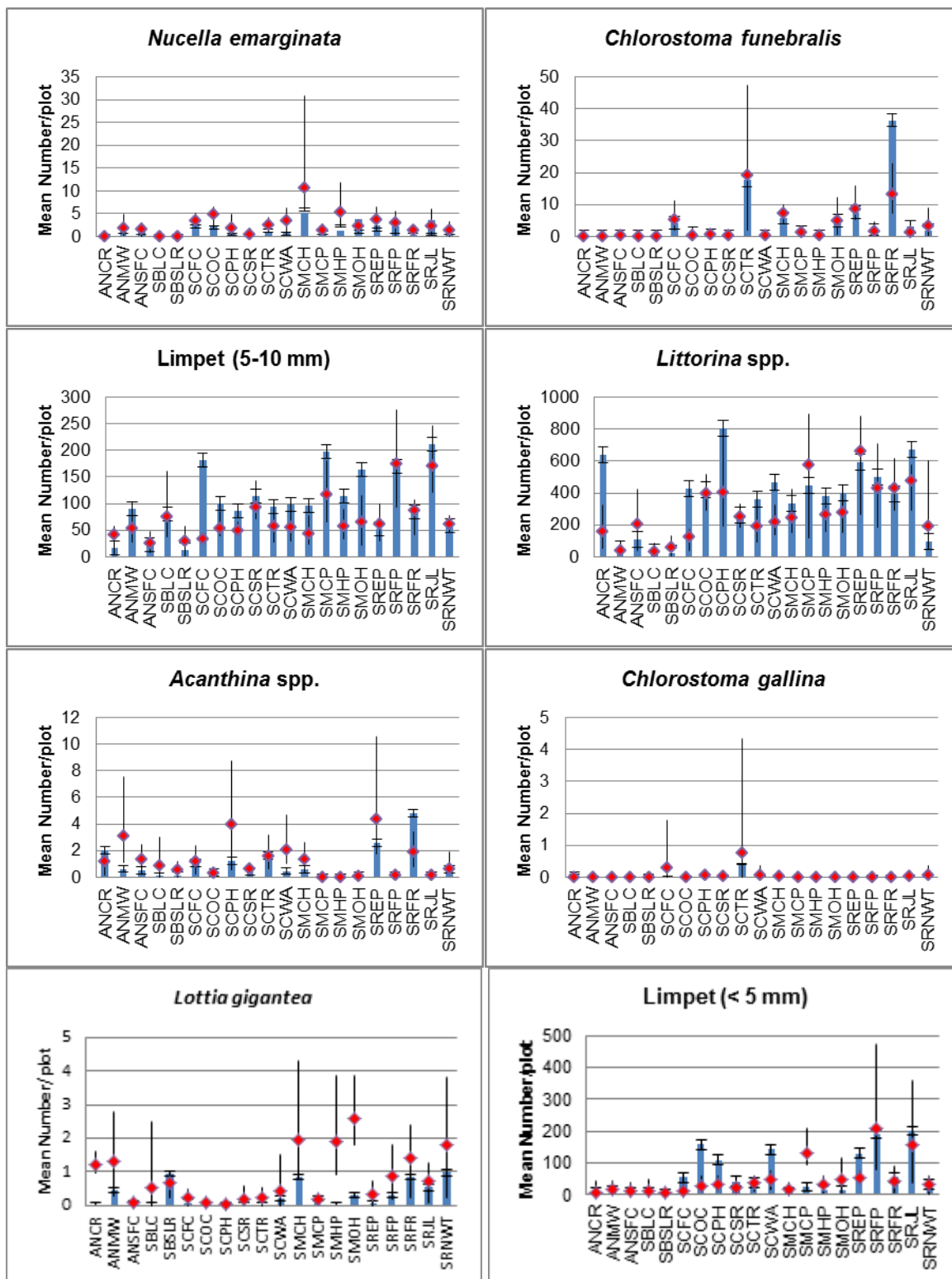


Figure 7. Species mean abundances for 2009 at each site. Bars represent the mean abundance for 2009. Lines indicate the maximum and minimum distribution of mean abundances from combined previous years. Diamonds display overall mean for combined years. Note that y-axes vary by graph. See Table 2 for site codes. (continued).

Haliotis cracherodii

Table 3 and Figures 9-11 present the count and size distributions for *H. cracherodii* measured in 2009 at each island (all sites combined by island in Table 3). Note that all abalone counted may not have been measured due to inaccessibility or limited time. It is also possible that additional abalone were found while making measurements that were not observed during the 30-minute search. Mean sizes were lowest at Anacapa and Santa Cruz Islands where continued recruitment was observed.

Tables 4 and 5 present the numbers of abalone and seastars counted at each site. At Willows Anchorage, 175 *H. cracherodii* were found during a three-hour search in spring, 2009, and 143 *H. cracherodii* were observed during a reduced search effort (90 minutes) in fall. At Otter Harbor we spent three hours searching in spring (n=143) and 90 minutes in the fall (n=180).

H. cracherodii were observed in fixed plots at Harris Point, Ford Point and East Point during 2009 (Table 4 and 5). Timed searches at most sites yielded comparable counts of *H. cracherodii* (Tables 4 and 5, Figure 9) to that of recent years. At Trailer we found 14 *H. cracherodii* in spring and an additional 27 individuals during an extended search (30 minutes) on adjacent reefs. At Santa Cruz Island, primarily Willow's Anchorage, abalone numbers increased markedly during the last several years (Figure 9). Figure 8 is included here to show the changes we have been seeing at each of the islands since black abalone monitoring began. Prior to the early 1990s abalone were only counted in fixed plots. Site-wide surveys or timed counts were initiated during different years at many sites. For example, the NPS began monitoring abalone at Santa Cruz Island sites in 1998.

No abalone were found at Cuyler Harbor, Northwest-Talcott, South Frenchy's Cove, Sea Lion Rookery or Landing Cove in 2009. Note that part of the Harbor Seal Arch portion of Anacapa Middle West site was not sampled in 2009 due to time restrictions and sea conditions.

We found large (>180mm) adult abalone at all of the islands except Santa Barbara in 2009. At least one juvenile abalone (<45mm) was found at each of the northern islands. Further signs of recruitment are the relatively small (e.g. <30 mm) individuals found at several sites as these are believed to be only 1-2 years old (Haaker et al. 1995). Yet, black abalone population levels at the islands still remain less than one percent of 1985 population levels (Richards 1988, Richards and Davis 1993). One dead specimen was found at Harris Point, San Miguel Island with the appearance of symptoms related to Withering Syndrome. One slightly shrunken *H. cracherodii* was found alive at Trailer in the spring sample. It was a large (157 mm) adult

Table 3. *Haliotis cracherodii*, black abalone, counts from 2009 sampling. Data from sites are combined by island. CountRandom is the number of abalone from 30-minute search, CountInPlot is the number of abalone found in fixed plots (not all sites were monitored each season, thus area size is different).

Island	Year	Season	Count	Count	Area	Density	Count	Mean	StDev	Min	Max
Code			Random	InPlots	(m ²)	(m ⁻²)	Sized	Size		Size	Size
ANI	2009	spring	17	0		.000	17	61.82	27.94	30	138
SCI	2009	spring	208	0		.000	200	61.10	24.82	24	186
SMI	2009	spring	175	1	58.20	.017	176	103.44	23.79	45	185
SRI	2009	spring	35	3	143.0	.021	38	110.76	39.75	30	185
ANI	2009	fall	13	0		.000	13	91.23	44.52	21	180
SBI	2009	fall	0	0	31.30	.000	0				
SCI	2009	fall	175	0		.000	80	71.78	26.17	30	135
SRI	2009	fall	25	1	143.0	.007	26	127.42	34.66	60	186
SMI	2009	fall	239	1	2.50	.400	101	106.32	26.91	40	151

Table 4. Sea star and black abalone searches in spring 2009. (x indicates no plot or transect, nc indicates no count performed, P.o.= *Pisaster ochraceus*, P.g.=*P. giganteus*, P.b.= *Pisaster brevispinous*, P.h.=*Pycnopodia helianthoides*, P.m.= *Patiria miniata*, L.h.= *Leptasterias hexactis*).

Site	Sampling Date	Seastars in 30 min	Seastars in transects	Abalone in plots	Abalone search
Cuyler Harbor, SMI	4/6	102 P.o.	x	x	0
Crook Point, SMI	4/5	66 P.o., L.h. present	x	0	24
Otter Harbor, SMI	4/4	118 P.o., 3P.g., 6 P.m.	x	0	143
Harris Point, SMI	4/3	7 P.o. 2 P.m.	x	1	19
Fossil Reef, SRI	5/30	327 P.o., 2 P.h., 2 P.g., 2 P.m.	99 (30x6m)	0	6
Johnson's Lee, SRI	5/26	586 P.o., 1 P.g.	41 (10x2m)	0	3
Ford Point, SRI	5/27	529 P.o.	x	2	18
Northwest-Talcott, SRI	5/29	0 P.o., 1 P.g., 1 P.m.	x	0	0
East Point, SRI	5/28	983 P.o.	x	1(transect)	10
Fraser Cove, SCI	4/28	329 P.o.	x	x	2
Trailer, SCI	4/27	289 P.o.	x	x	14
Willows Anchorage, SCI	4/29	631 P.o., 2 P.m., L.h. present	x	x	175
Scorpion Rock, SCI	ns	ns	nc	nc	nc
Prisoner's Harbor, SCI	4/30	110 P.o., 1 P.g.	x	x	1
Orizaba Cove, SCI	3/7	738 P.o., 6 P.g. 4 P.m.	x	x	13
Cat Rock, ANI	ns	ns	nc	nc	nc
South Frenchy's Cove, ANI	3/9	26 P.o.	x	x	0
Middle Anacapa-West	3/8	556 P.o.	x	nc	17

Table 5. Sea star and black abalone searches in fall 2009. (x indicates no plot or transect, nc indicates no count performed, P.o.= *Pisaster ochraceus*, P.g.=*P. giganteus*, P.b.= *Pisaster brevispinus*, P.h.=*Pycnopodia helianthoides*, P.m.= *Patiria miniata*, L.h.= *Leptasterias hexactis*).

Site	Sampling Date	Seastars in 30 min	Seastars in transects	Abalone in plots	Abalone search
Cuyler Harbor, SMI	11/16	141 P.o.	x	x	0
Crook Point, SMI	11/14	154 P.o.	x	0	52
Otter Harbor, SMI	11/13	130 P.o., 16 P.g., 3 P.m.	x	0	180
Harris Point, SMI	11/15	19 P.o., 2 P.g., 4 L.h, 3 P.h., 10 P.m.	x	1	14
Fossil Reef, SRI	1/15/10	ns	nc	nc	nc
Johnson's Lee, SRI	1/11/10	396 P.o.	24	0	3
Ford Point, SRI	1/13/10	304 P.o.	x	1	11
Northwest-Talcott, SRI	1/14/10	1 P.o., 2 P.g., 1 P.m.	x	0	0
East Point, SRI	1/12/10	652 P.o., 3 P.m.	x	x	11
Fraser Cove, SCI	11/1	263 P.o.	x	x	0
Trailer, SCI	11/4	217 P.o.	x	x	14
Willows Anchorage, SCI	11/2	294 P.o.	x	x	114
Scorpion Rock, SCI	12/1	133 P.o., 1 P.g.	x	x	9
Prisoner's Harbor, SCI	11/1	62 P.o.	x	x	1
Orizaba Cove, SCI	12/14	517 P.o., 1 P.m., 1 P.h.	x	x	8
Cat Rock, ANI	11/30	7 P.o.	x	0	3
South Frenchy's Cove, ANI	12/2	34 P.o.	x	x	0
Middle Anacapa-West	12/15	110 P.o.	x	x	10
Sea Lion Rookery, SBI	10/16	1024 P.o.	x	0	0
Landing Cove, SBI	10/15	381 P.o.	35	x	0

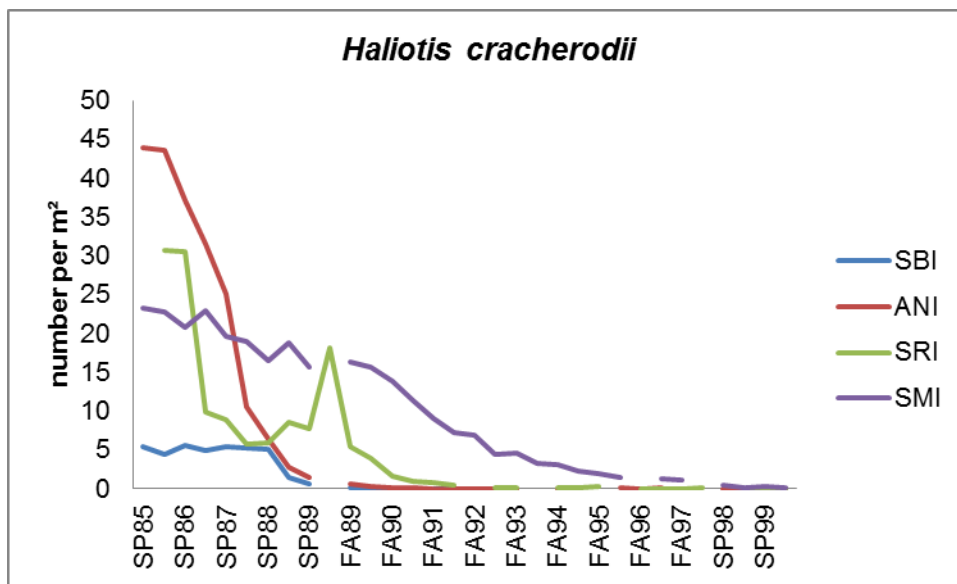


Figure 8. *Haliotis cracherodii* density estimates at all islands except Santa Cruz from 1985-1999. Note that Santa Cruz Island was not sampled for black abalone until 1998.

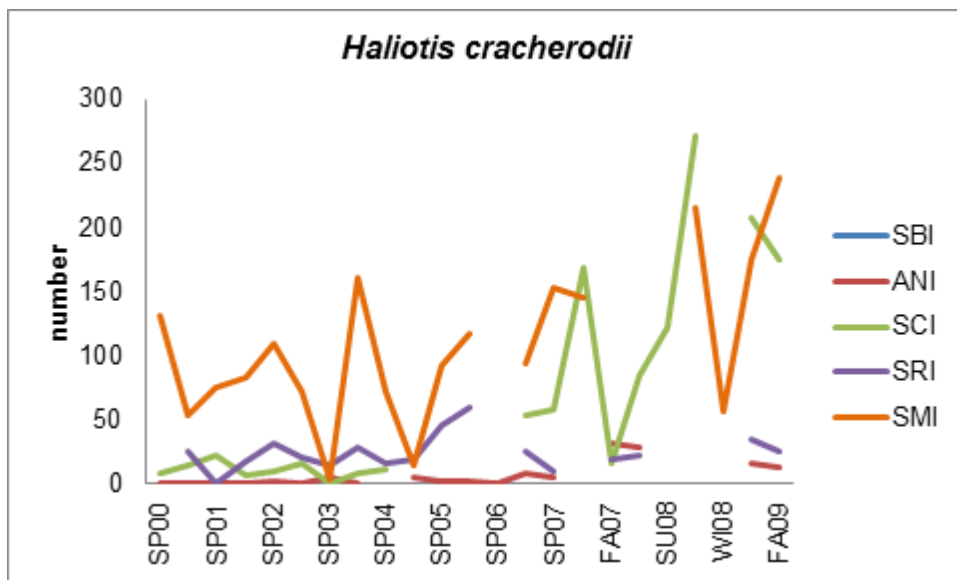


Figure 9. *Haliotis cracherodii* counts at all islands from 2000-2009. Count data are derived from site-wide and timed searches.

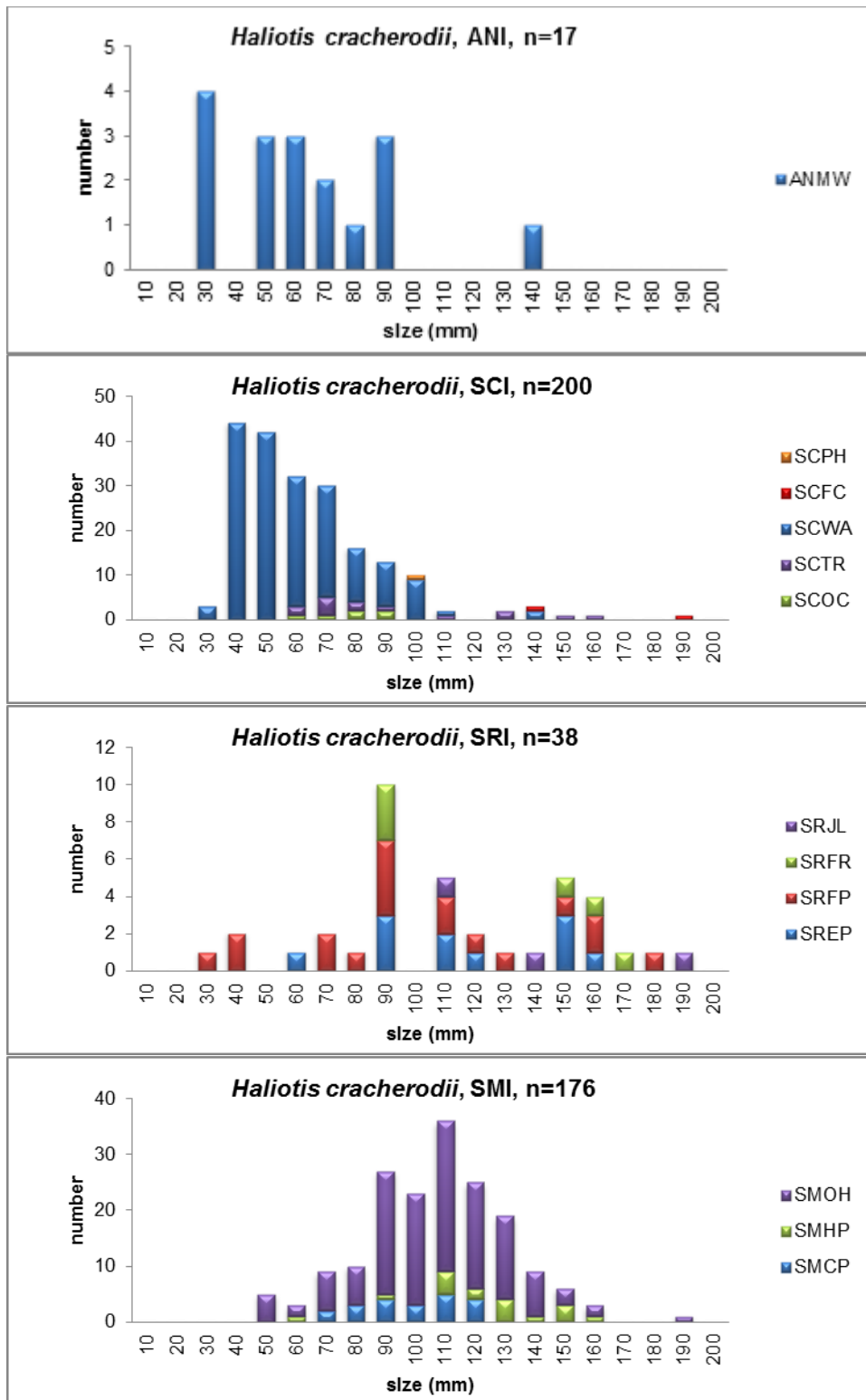


Figure 10. *Haliotis cracherodii* size distributions in spring 2009. All sampled sites were combined by island in each histogram. Note differences in scale of y-axes. See Table 2 for site codes.

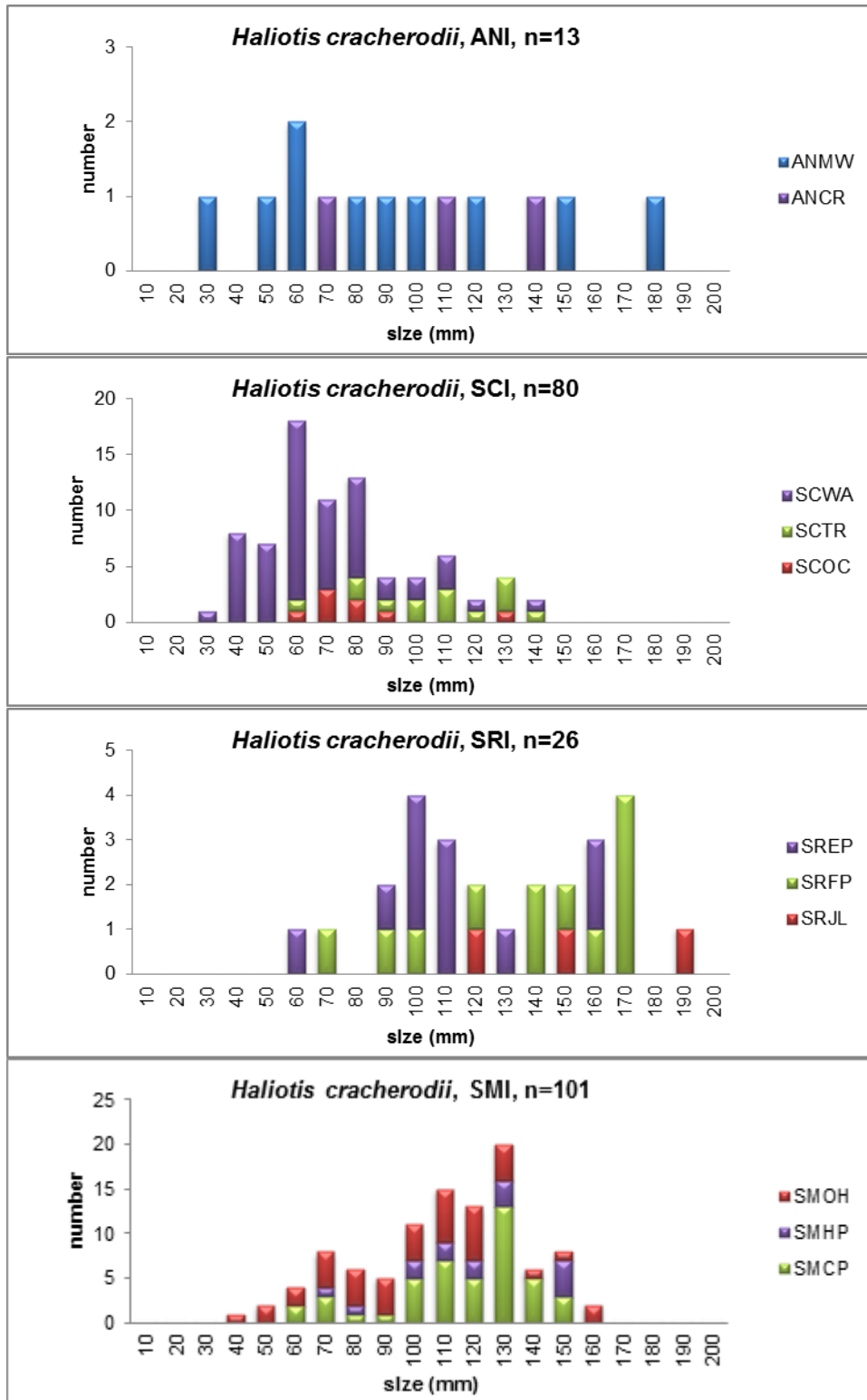


Figure 11. *Haliotis cracherodii* size distributions in fall 2009. All sampled sites were combined by island in each histogram. Note differences of scale of y-axes. See Table 2 for site codes.

Lottia gigantea

Lottia gigantea are typically sampled only in fall, alternating with motile invertebrate counts in spring. We did however sample *Lottia gigantea* at three sites on Santa Rosa and two sites on Anacapa Island during both seasons. *L. gigantea* size frequencies are displayed in Figures 12-13. Owl limpet populations have been fairly stable at most sites over the past 10 yrs or more; however, four sites (Fraser Cove, Trailer, Ford Point and Johnson's Lee) have experienced noticeable decreases in density (Figures 14-17).

At Willow's Anchorage and Otter Harbor, densities have fluctuated throughout the course of the monitoring program, but have been gradually increasing from 2007 to 2009. Fossil Reef had the highest density (13.8 m^{-2}) of owl limpets averaged across all plots and Ford Point had the lowest (1.7 m^{-2}). Data are presented for individual plots in the trip reports (Appendix C)

Mean shell length of *L. gigantea* in 2009 varied greatly among islands, sites, and plots. Similar to previous years, the smallest owl limpets were measured at Willow's Anchorage (mean = 30 mm) and largest were observed at Northwest-Talcott (mean = 76 mm) (Table 6).

At San Miguel, the mean sizes of owl limpets have remained relatively stable over time at both monitoring sites. Both populations appeared to be normally distributed in 2009, though owl limpets at Otter Harbor were slightly skewed towards larger individuals. The mode at Harris Point (28%) was 30-39 mm and at Otter Harbor (38%) was 20-29 mm (Figure 13, fall trip report – Appendix C-53).

Santa Rosa sites had the largest owl limpets in 2009 compared with pooled sites from other islands. Northwest-Talcott had the largest mean shell lengths of all the sites. Owl limpets at Fossil Reef, Northwest-Talcott followed a normal size distribution (Figures 12-13). The most populated size class at Fossil Reef in spring and fall (30%) were 50-59 mm (Table 6). The mode at Northwest-Talcott (27%) was 80-89 mm and the mode at Johnson's Lee (23%) was 20-29 mm. At Ford Point, *L. gigantea* were oddly-distributed during both seasons with 30 percent measuring <20 mm indicating strong recruitment. Data for individual sites can be found in the field logs in Appendix C.

Santa Cruz sites also had high variability in regard to the mean sizes of owl limpets. As mentioned, Willow's Anchorage had the smallest owl limpets compared with those measured at other Santa Cruz sites, while the largest were sampled at Trailer, and sizes at Fraser ranked intermediate (Appendix C). Size distributions for all three Santa Cruz sites are skewed towards smaller sizes, possibly indicating recent recruitment in the plots (Figure 13). Such trends at Santa Cruz Island have remained persistent throughout most monitoring years. The majority of owl limpets at Fraser Cove (65%), Trailer (48%), and Willow's Anchorage (91%) measured <50 mm (Figure 13).

L. gigantea at Anacapa displayed similar size structure at the two sites monitored in 2009 which was also comparable to populations at most other sites throughout the islands. The most populated size classes at South Frenchy's Cove (39%) and Cat Rock (36%) were small to medium-sized (30-39 mm) (Appendix C).

We do not have fixed plots for sampling owl limpets at Santa Barbara Island; however, we did randomly collect size frequency measurements at Sea Lion Rookery (Figure 13). Mean shell lengths of *L. gigantea* measured at Sea Lion Rookery were intermediate in size compared with individuals measured at other islands, and size classes were normally distributed with most (75%) measuring 40-59 mm.

Table 6. *Lottia gigantea* plot count and size information. All sites poled by island (Santa Rosa spring sample was only two sites). AN=Anacapa, SB= Santa Barbara, SC=Santa Cruz, SM= San Miguel, SR=Santa Rosa.

IslandCode	Year	Season	Count	Area	Density	MeanSize	StDev	MinSize	MaxSize
AN	2009	spring	138	18.84	7.324	36.59	9.52	17	62
SR	2009	spring	305	43.97	6.936	54.44	19.34	9	104
AN	2009	fall	153	28.27	5.413	35.89	10.54	15	63
SB	2009	fall	60	n/a	n/a	45.90	8.83	17	70
SC	2009	fall	231	40.83	5.657	39.29	20.83	14	97
SM	2009	fall	231	31.41	7.354	35.38	13.93	14	79
SR	2009	fall	375	62.82	5.969	50.09	20.71	8	104

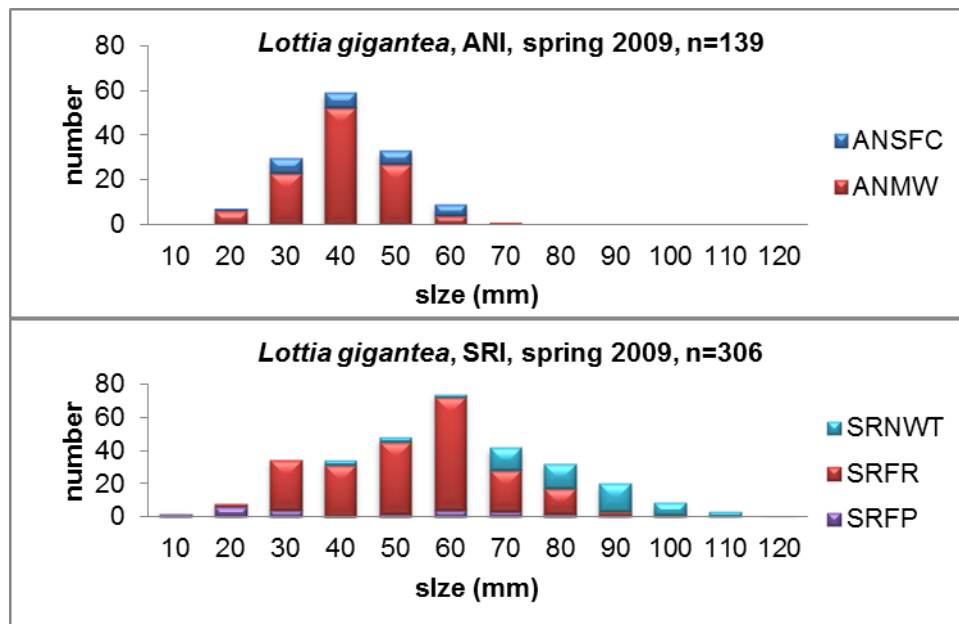


Figure 12. *Lottia gigantea* size distributions in spring 2009. All sampled sites were combined by island in each histogram.

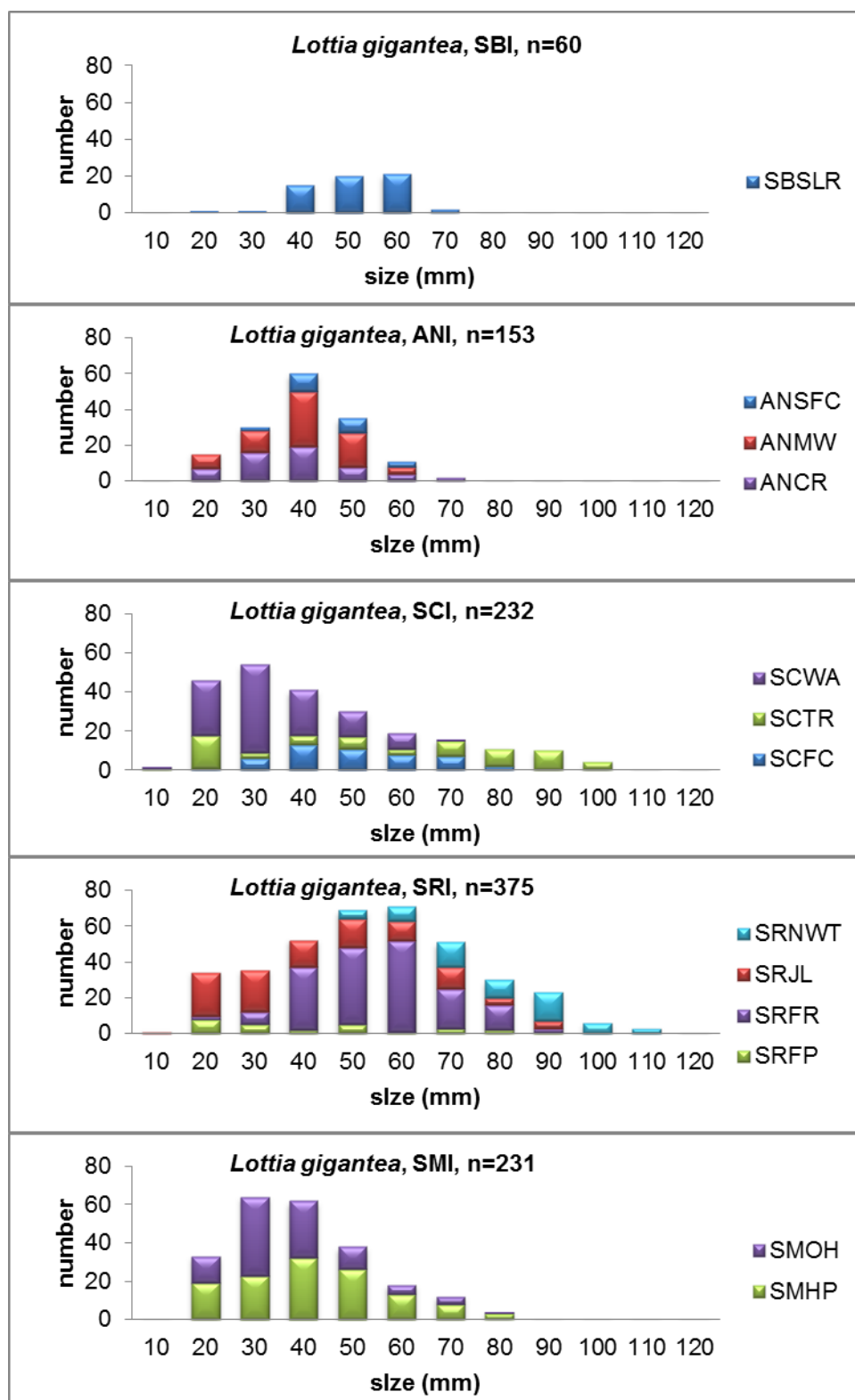


Figure 13. *Lottia gigantea* size distributions in fall 2009. All sampled sites were combined by island in each histogram.

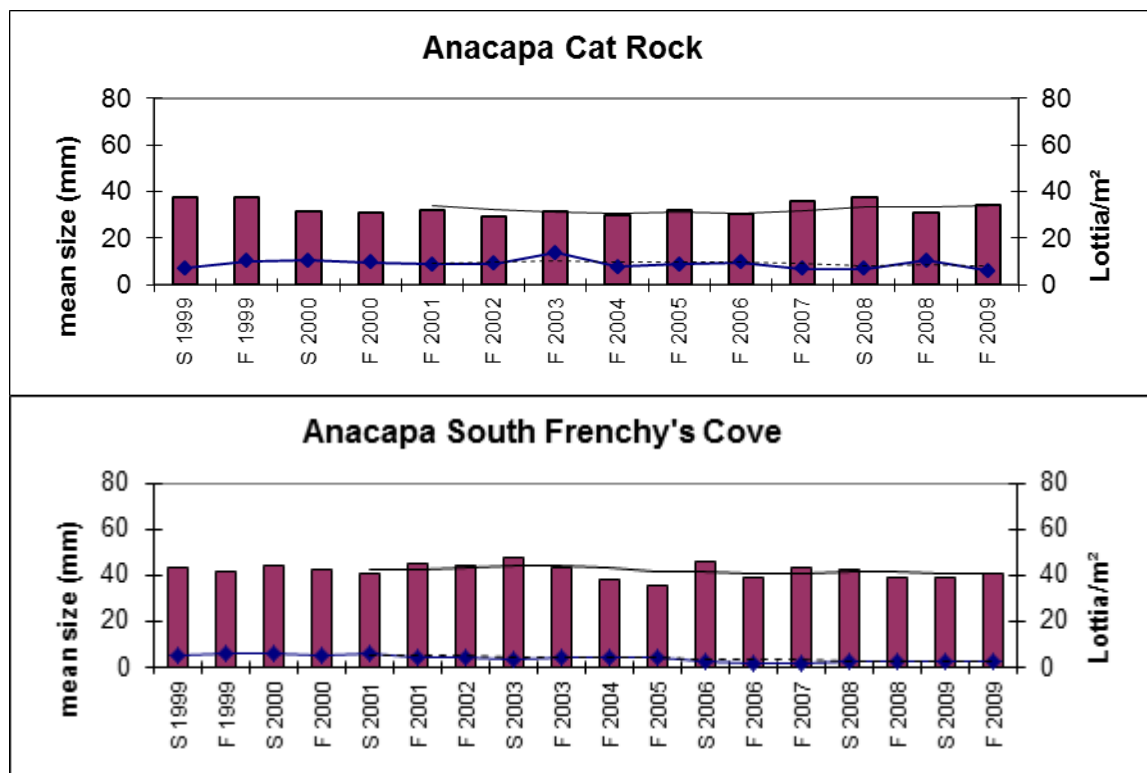


Figure 14. *Lottia gigantea* at Anacapa Island 1999-2009. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from three fixed plots, black lines indicate five-sample moving trend for mean size and dashed lines indicate five-sample moving trend for mean density. S=spring samples, F=fall samples.

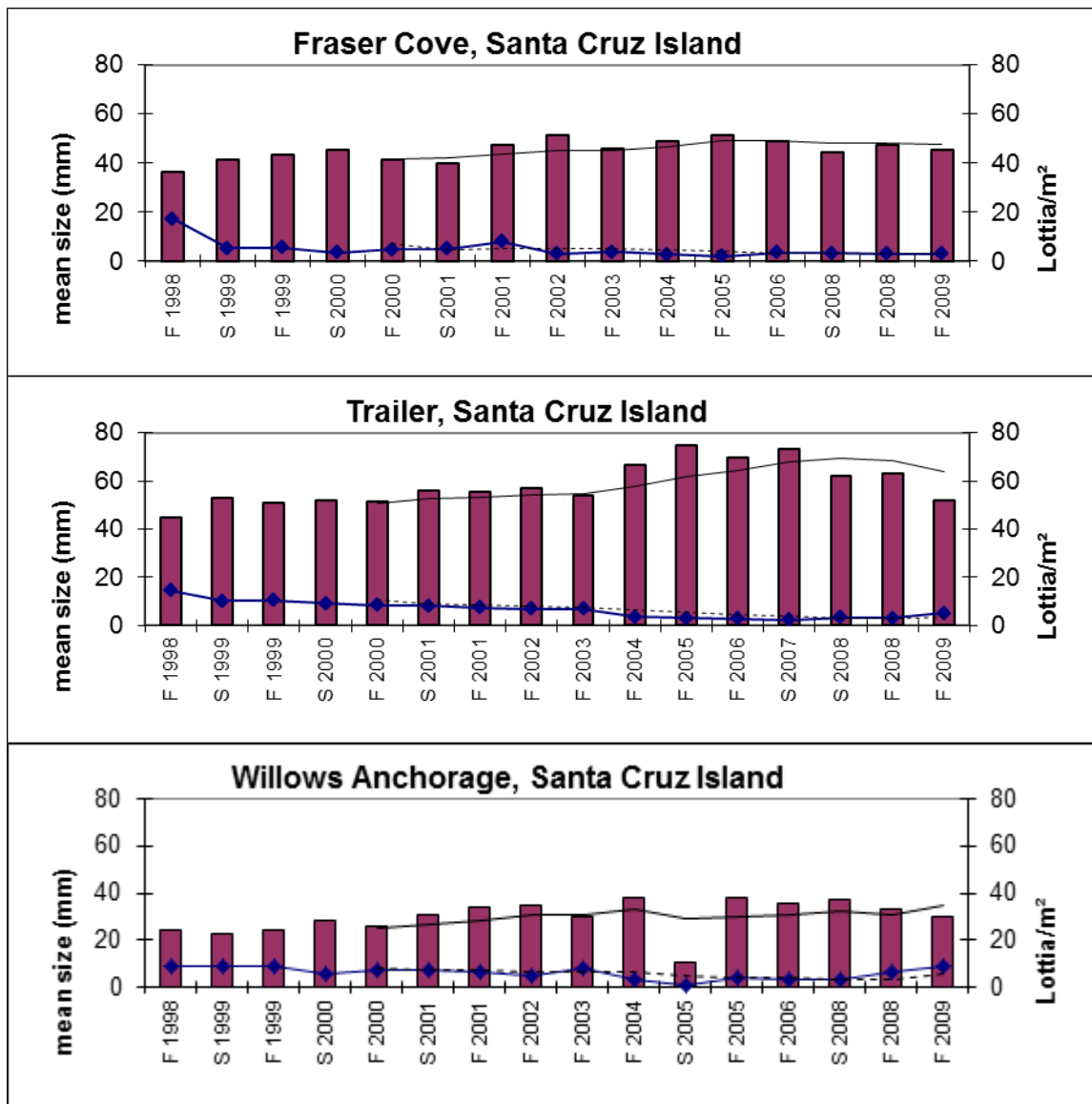


Figure 15. *Lottia gigantea* at Santa Cruz Island 1998-2009. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from five fixed plots, black lines indicate five-sample moving trend for mean size and dashed lines indicate five-sample moving trend for mean density. S=spring samples, F=fall samples.



Figure 16. *Lottia gigantea* at Santa Rosa Island 1998-2009. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from five fixed plots, black lines indicate five-sample moving trend for mean size and dashed lines indicate five-sample moving trend for mean density. S=spring samples, F=fall samples.

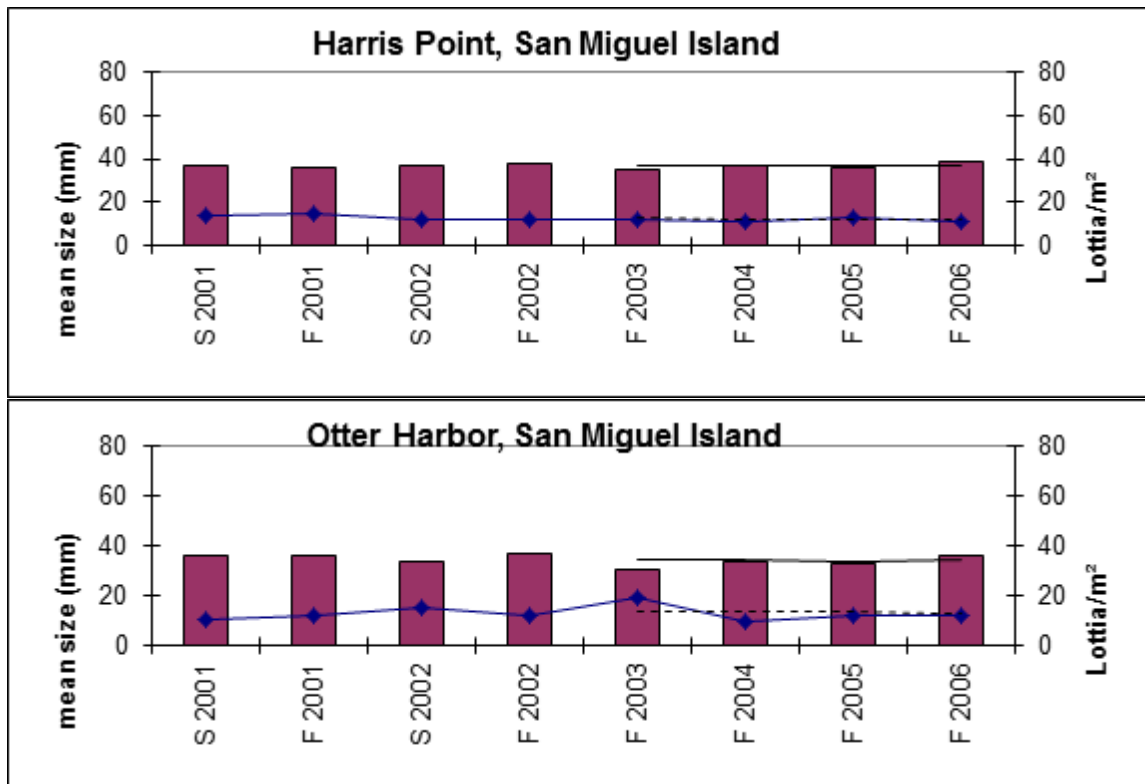


Figure 17. *Lottia gigantea* at San Miguel Island 2001-2009. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from five fixed plots, black lines indicate five-sample moving trend for mean size and dashed lines indicate five-sample moving trend for mean density. S=spring samples, F=fall samples.

Pisaster ochraceus

Over time, the abundances of *P. ochraceus* have fluctuated markedly at most sites, with the exceptions of Cat Rock, Harris Point, Northwest-Talcott, and South Frenchy's Cove where populations of seastars have remained at very low numbers. Compared with previous years, seastars were highly abundant at nearly all sites in 2009 (Tables 4 and 5). More than 500 *P. ochraceus* were observed in 30-minute intervals at Johnson's Lee, East Point, Willow's Anchorage, Orizaba Cove, and Sea Lion Rookery during spring, fall, or both seasons in some cases. At most other sites, more than 100 stars were located during the timed counts.

Size frequency measurements were collected whenever possible and reported in the trip reports (Figures 18 and 19 and Appendix C). *P. ochraceus* populations at most sites followed a normal size frequency distribution with a mode typically between 80 mm and 100 mm. Exceptions were at Prisoner's Harbor, Otter Harbor, Cuyler Harbor, Sealion Rookery and East Point where the majority of seastars were larger (110-130 mm). Positively-skewed populations were observed during spring at Johnson's Lee, Ford Point, and Willow's Anchorage which were composed primarily of small individuals measuring <40 mm providing strong evidence of recent recruitment. Harris Point had the largest *P. ochraceus* measured in 2009, but data are excluded from Figures 13 and 14 because only 7 individuals were observed. Size frequency measurements from South Frenchy's Cove (mode=100 mm) in spring were also excluded due to low *P. ochraceus* counts.

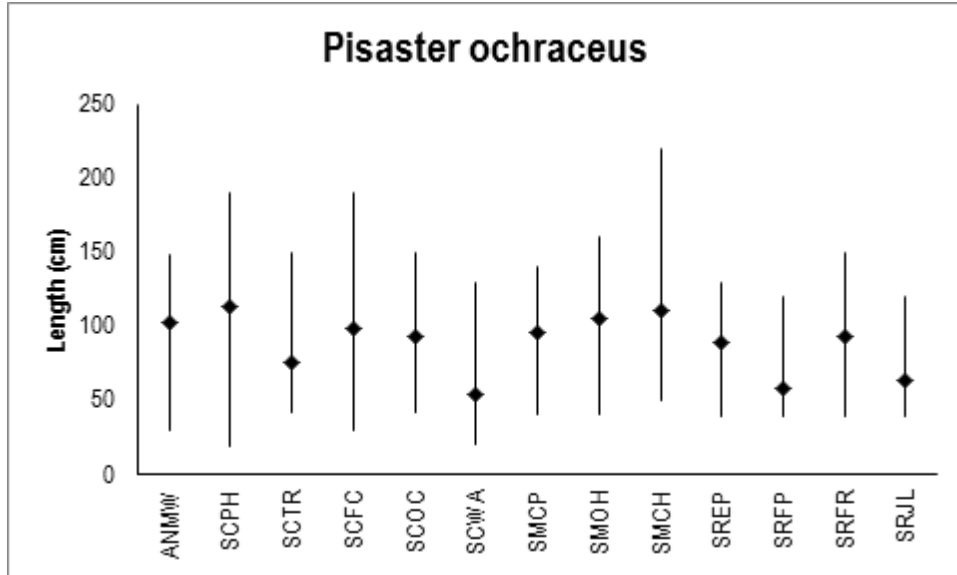


Figure 18. *Pisaster ochraceus* sampled in spring 2009. Diamonds represent the mean length (measured as longest ray), and vertical lines represent the range of lengths. N>60 *P. ochraceus* were measured at each site.

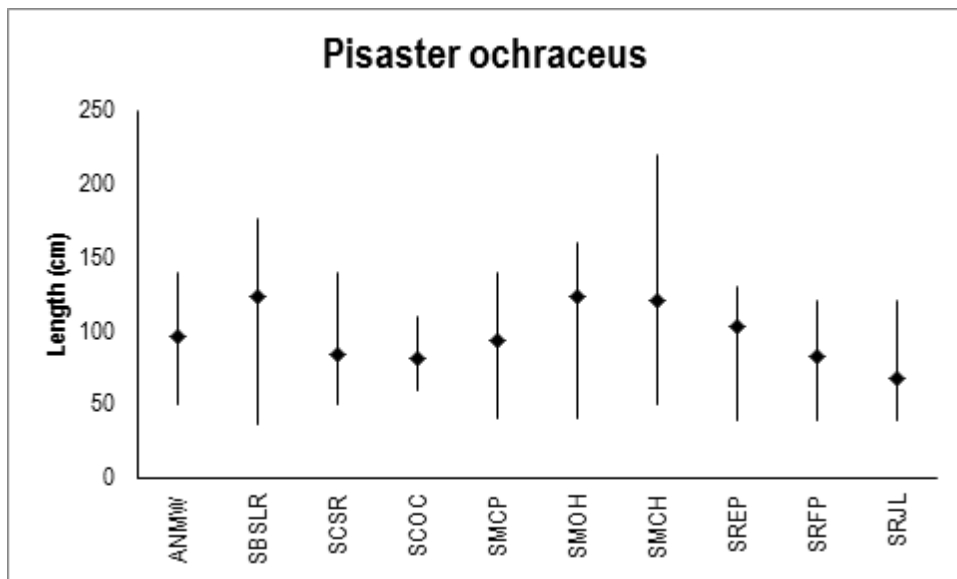


Figure 19. *Pisaster ochraceus* sampled in fall 2009. Diamonds represent the mean length (measured as longest ray), and vertical lines represent the range of lengths. N>60 *P. ochraceus* were measured at each site.

***Phyllospadix* spp.**

Phyllospadix spp., surfgrass cover has been monitored at two sites on Santa Cruz Island since fall 1998, and at two sites on Santa Rosa Island since spring 2002 (Figure 20 and Appendix C). The four sites were chosen for study based on the relatively high density of surfgrass habitat present when sites were set-up. *Phyllospadix torreyi* has been the dominant species in most transects but some *P. scouleri* has also been present.

Strong seasonal patterns have been observed over the years at Fraser Cove and Trailer whereby surfgrass overstory cover has routinely declined in spring and increased in fall. The same trends occurred in 2009 on all six Santa Cruz transects with the exception of Transect-3 on Trailer. Transect-1 at Fraser Cove displayed the most extreme variability as surfgrass declined to the lowest recorded abundance (20%) in spring and then increased substantially in fall. Surfgrass abundances at the five other transects on Santa Cruz were comparable to previous years.

Santa Rosa sites, East Point and Northwest-Talcott, typically have not displayed a strong seasonal pattern in *Phyllospadix* spp. abundances. Instead, surfgrass on all three transects at East Point and two at Northwest-Talcott has remained relatively stable over time. Transect-3 surfgrass at the latter site has fluctuated markedly over the monitoring period declining rapidly several times by as much as 40% followed by gradual increases in cover. In spring 2009, surfgrass overstory cover on Transect-3 at Northwest-Talcott was reduced below that of previous years, but increased slightly during the fall. Transect-1 at Northwest-Talcott displayed a decreasing trend in surfgrass abundance beginning in spring 2008 and continued to drop in abundance throughout 2009.

Phyllospadix spp. blades were typically bleached and/or abraded in the transects, particularly at Trailer and East Point. However surfgrass occurring in the lowest intertidal zones appeared healthy at all four sites. Epiphytic cover (composed of *Smithora naiadum* and *Melobesia mediocris*) was high on the surfgrass at both Santa Rosa sites.

Red algae, composed primarily of *Chondracanthus canaliculatus*, *Prionitis lanceolata*, and *Mazzaella affinis*, were common on the three transects at both Fraser Cove and Trailer in 2009. Abundances at the two sites ranged 10% to 46% across all transects and seasonal means were between 23% and 38%. The ephemeral green algae, *Ulva* spp., dominated Transect-3 at Northwest-Talcott comprising 77% of the total cover in fall 2009 (Figure 21). Articulated corallines and feather boa kelp, *Egregia menziesii*, were commonly observed in low abundances on most transects at all four sites.

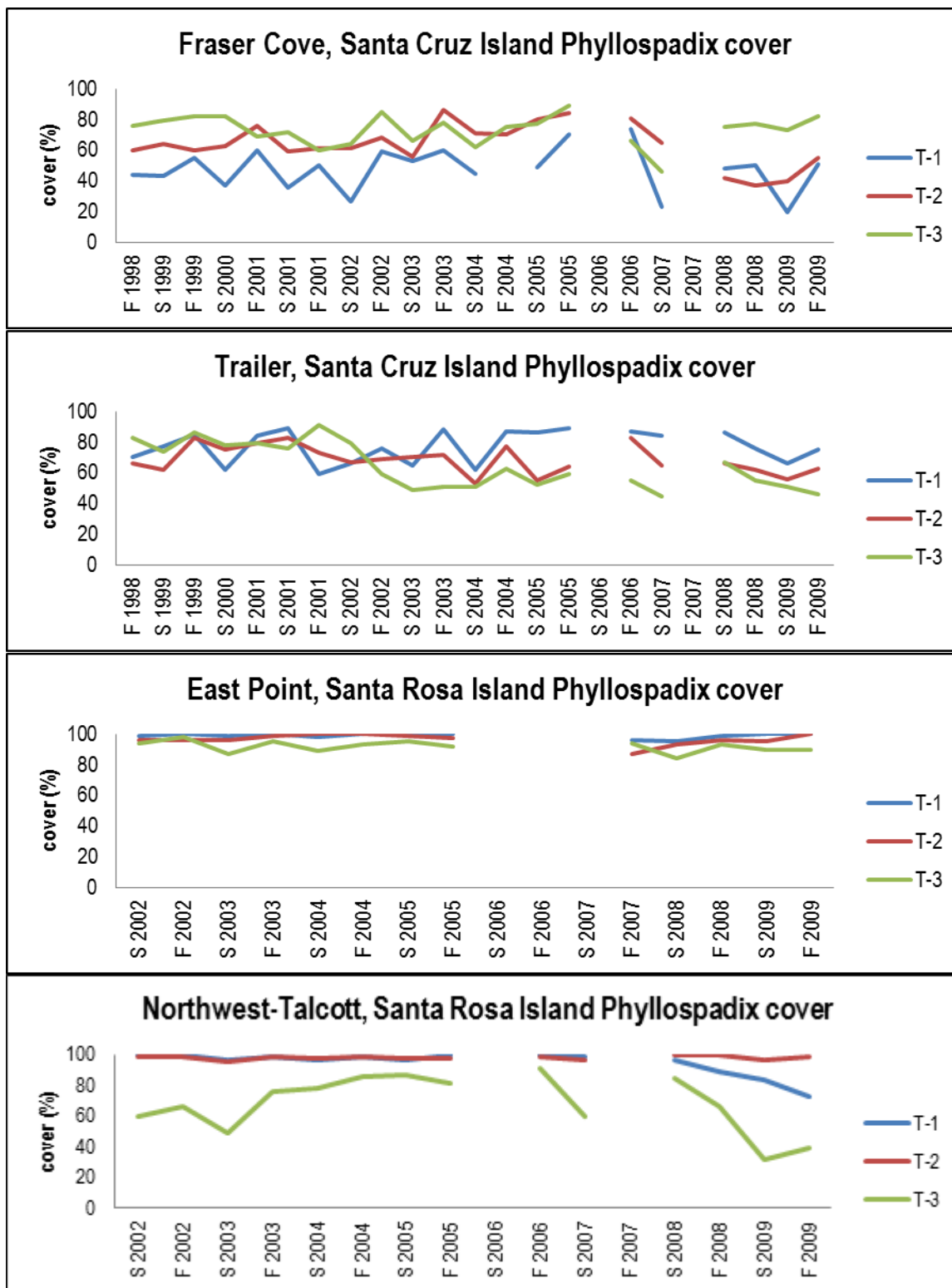


Figure 20. Surfgrass, *Phyllospadix* spp., cover trends on 10m point-intercept transects at Fraser Cove and Trailer on Santa Cruz Island and East Point and Northwest-Talcott on Santa Rosa Island. S=spring samples, F=fall samples.



Figure 21. *Phyllospadix* Transect-3 at Northwest-Talcott, Santa Rosa Island, spring 2009. High cover of *Ulva* sp. dominated the area and surfgrass blades were highly abraded.

Shorebirds and Pinnipeds

The maximum number of shorebirds and pinnipeds observed at any one time during a visit to the sites in 2009 is summarized in Tables 7 and 8. One American oystercatcher was sighted at Fraser Cove in spring and at Otter Harbor during both spring and fall. Other shorebirds observed included 23 black turnstones in fall (Figure 22), three western sandpipers, and several wandering tattlers. Less common birds observed included an individual long-billed curlew, peregrine falcon, blue heron, green heron, black phoebe, rock wren and snowy egret. These are mostly vagrants or terrestrial visitors. As in previous years, black oystercatchers were the most common shorebird at each site in 2009 and seasonal abundances were relatively comparable to those observed in recent years. Seabirds such as, pelicans and cormorants were frequently observed using rocky points (e.g. East Point and Fossil Reef) and islets (e.g. Scorpion Rock and Orizaba Cove) as roosting areas. Western gulls were often seen foraging among the mussel beds and adjacent beaches.

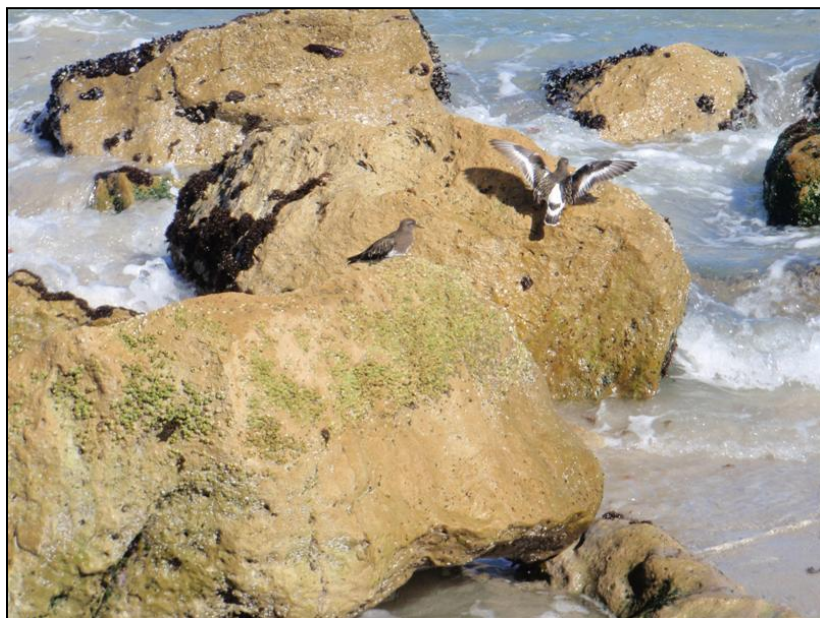


Figure 22. Black turnstones near Cuyler Harbor.

Harbor seals, *Phoca vitulina*, were observed within the immediate vicinity of ten sites in 2009. At three sites (Middle West, Harris Point, and Otter Harbor), harbor seals were seen in both spring and fall. At Harris Point we were surprised to find a harbor seal pup covered by tar, lying on the tar coated rocks (Figure 23). They were most numerous at Otter Harbor where they often haul out on the protected flat rocky bench to rest at low tide. Northern elephant seals, *Mirounga angustirostris*, usually prefer sandy beaches over rocky shelves to haul out. They are common sights near Cuyler Harbor, Crook Point, and Fossil Reef in spring when we find weaned pups that haven't gone to sea yet or adults coming ashore to molt. Adult seals also were common at times bobbing in surge channels at sites. In 2009, elephant seals were most abundant at Ford Point, Fossil Reef, Johnson's Lee, Northwest-Talcott, and Crook Point, particularly in spring. Some of these sightings were seals that were in the water just off shore or on a beach adjacent to the site. California sealions, *Zalophus californianus*, were abundant at both Santa Barbara Island

sites (Figure 24). At Sea Lion Rookery, numerous sealions were observed trampling the upper reef and emitting wastes.



Figure 23. Juvenile harbor seal covered with tar at Harris Point. The pup appeared to be healthy otherwise. The tar is from a natural seep north of San Miguel Island.



Figure 24. *Zalophus californianus* at Sea lion rookery, Santa Barbara Island. *Z. californianus* are on rocks in upper left. Bare rock and *Ulva* sp. dominate the foreground rocks where numerous sea lions typically haul out throughout the year.

Table 7. Shorebirds and Pinnipeds at monitoring sites in spring 2009 (maximum seen at any one time).
 (*= nearby but not on monitoring reef).

Spring 2009						
Site	Black Oystercatcher/ (American)	Black Turnstone	Other birds	<i>Phoca vitulina</i>	<i>Mirounga Angustirostris</i>	<i>Zalophus californianus</i>
ANCR	0	0	0	0	0	0
ANMW	5	0	8 western gulls, brown pelicans*	1	0	0
ANSFC	7	0	6 black oystercatchers*, 1 western sandpiper*	1	0	0
SCFC (Fraser)	4	0	1 American oystercatcher (hybrid), 3 black oystercatchers*, gulls*	0	0	0
SCTR	12	0	1 wandering tattler*, 14 black oystercatchers*,	0	1	0
SCWA	6	0	western gulls*, 50-60 cormorants*	1	0	0
SCSR	0	0	0	0	0	0
SCPH	2	0	0	0	0	0
SCOC	2	0	0	0	0	0
SREP	6	0	2 common ravens, 1 peregrine falcon*	0	0	0
SRFP	3	0	0	0	8	0
SRFR	5	0	10 western gulls	1	6	0
SRJL	4	0	1 song sparrow, 2 wandering tattlers	0	8	0
SRNWT	3	0	2 western gulls	0	23*	0
SMCH	4	2*	16 whimbrels*	0	1	0
SMCP	7	0	15 double-crested cormorants*	0	17	1
SMHP	3	0	2 western gulls	2	0	0
SMOH	6	0	15-30 western gulls, 1 American oystercatcher	17	4	0

Table 8. Shorebirds and Pinnipeds at monitoring sites in fall 2009 (maximum seen at any one time).
 (*= nearby but not on monitoring reef).

<i>Fall 2009</i>						
Site	Black Oyster- catcher/ (American)	Black Turnstone	other birds	<i>Phoca vitulina</i>	<i>Mirounga Angustirostris</i>	<i>Zalophus californianus</i>
SBLC	2	2	1 wandering tattler, western gulls*	0	0	20
SBSLR	3	6	6 western gulls, 8 royal terns, 1 green heron	0	0	300
ANCR	4	0	2 western gulls, 1 rock wren	4	0	0
ANSFC	2	0	0	0	0	0
ANME, ANMW	0	0	0	6	0	0
SCFC	10	0	gulls*, 13 royal terns*, 1 black oystercatcher*, 1 long-billed curlew*, brown pelicans*, cormorants*	0	0	0
SCTR	3	2	2 gulls*, 1 blue heron*, 1 royal tern*, 1 snowy egret*	0	0	0
SCPH	0	0	1 wandering tattler, 1 western sandpiper, 2 royal terns	1	0	0
SCWA	1	0	1 gull, pelicans*, gulls*	0	0	0
SCSR	4	0	1 western gull	1	0	0
SCOC	0	0	16 black oystercatchers*	7	0	0
SREP	6	0	4 brown pelicans, ~60 Brandt's cormorants, 2 terns, 2 western sandpipers, brown pelicans*, Brandt's cormorants*	0	1	0
SRFP	6	0	2 gulls, 1 song sparrow, black oystercatchers*	0	1	0
SRFR	8	0	15 cormorants (mix), 40 western gulls,	0	0	0
SRJL	5	9	5 gulls, 4 common ravens	0	5, 4*	0
SRNWT	5	0	2 western gulls	0	1	0
SMCH	1	2	1 western gull, 1 black phoebe, 4 common ravens*, 8 whimbrels*	0	4*	0
SMCP	3	2	20 cormorants, 2 western gulls	0	4	0
SMHP	2	0	2 common ravens	5	0	0
SMOH	5	0	4 western gulls*, 1 cormorant*, 1 American oystercatcher (hybrid)*, 2 common ravens*	23	0	0

Visitation

Most visitors accessed the rocky intertidal at Frenchy's Cove, though some visitors also explored East Point and Prisoner's Harbor tidepools on Santa Rosa and Santa Cruz Islands, respectively. At South Frenchy's Cove and adjacent reefs, Island Packers Company conducts classroom programs for school groups which combine oceanography and tidepooling typically during winter and spring months.

Visitation statistics for Frenchy's Cove are available from monthly reports based on concessionaire reporting from Island Packers Company and Truth Aquatics (Table 9, Figure 25). No records are available for the number of private boaters that went ashore at any of the Channel Islands in the National Park. Additionally, there are no records for the number of visitors that accessed the intertidal zone at East Point or Prisoner's Harbor.

The total number of visitors from concession boats in 2009 was 1519 passengers in 20 trips (Table 10) which was less than the 1760 passengers in 2008, but more than the number of passengers in 2007 (Figure 26). March was once again the top month for visitation with 419 passengers on 4 trips. Sixty-five percent of the visitation occurred in spring (February-May). Visitation by the concession boats was spread throughout the year but no visitation occurred in May, June, or September.

Table 9. Visitors to South Frenchy's Cove, Anacapa Island in 2009 (visitation with Island Packers).

<i>MONTH</i>	<i>#Passengers</i>	<i>#TRIPS</i>	<i>Average No Passengers/trip</i>
January	199	2	100
February	206	3	69
March	419	4	105
April	369	4	92
May	0	0	0
June	0	0	0
July	61	2	31
August	18	1	18
September	0	0	0
October	68	1	68
November	168	2	84
December	11	1	11
Total	1519	20	76

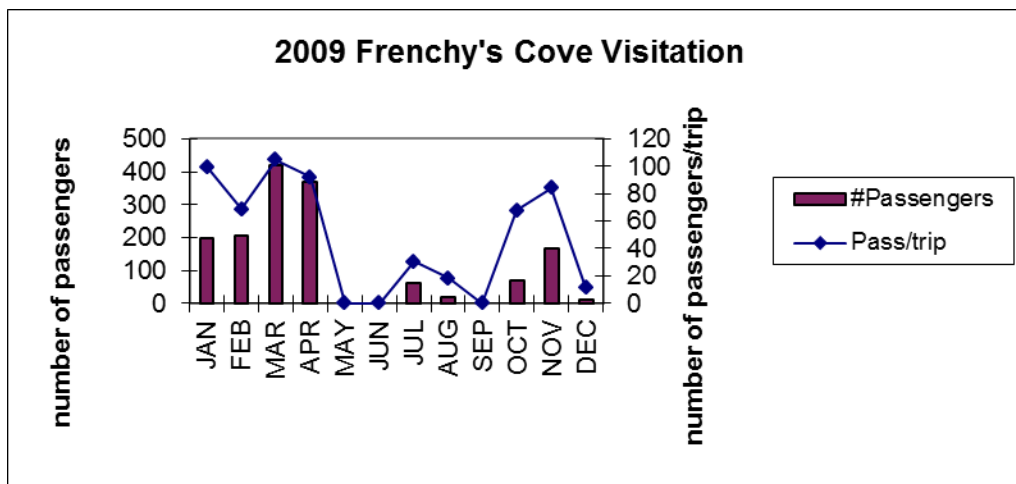


Figure 25. Monthly visitation at Frenchy's Cove, Anacapa (Island Packers visitors).

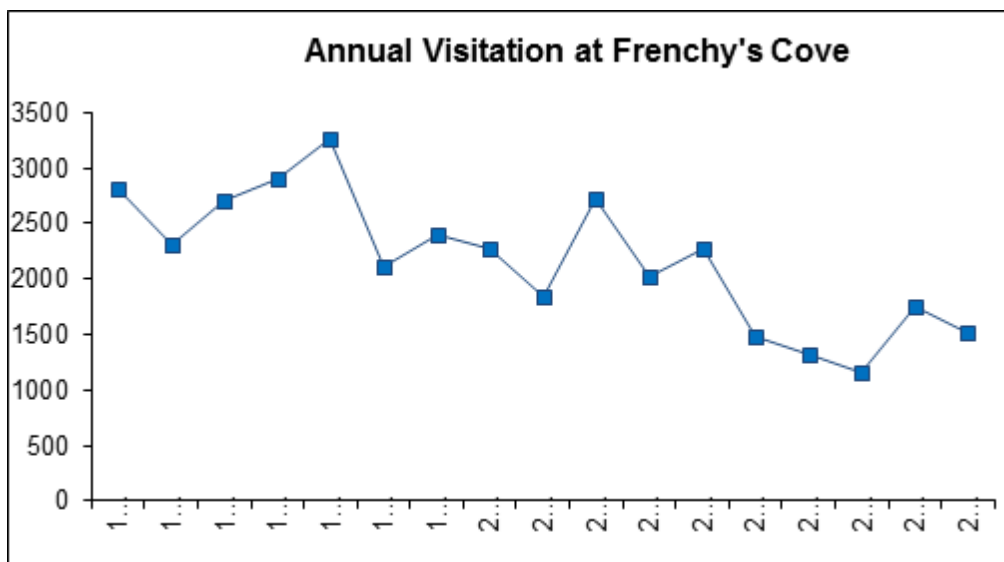


Figure 26. Annual Commercial Visitation at Frenchy's Cove, Anacapa (Island Packers visitors) 1993-2009.

Trip Reports

Trip reports were written by Dan Richards and Stephen Whitaker. Summaries of work performed, data collected, weather conditions, and natural history observations for each sampling event are presented in the individual trip reports in Appendix C. Explanations for missing or incomplete data are usually included in the trip reports. Summary tables and figures in the trip reports present additional information on species monitored. For simplicity, non-core species are reported in photo-plot data tables as miscellaneous algae, miscellaneous animals, or other. More detailed results of sea star, surfgrass, and motile invertebrate sampling are presented in the daily logs.

Trip reports contain information on beach surveys or other work done at the islands. Beachwalk surveys were conducted on the same trips as the rocky intertidal monitoring at San Miguel and Santa Rosa Islands in the spring and fall. The purpose of those surveys was primarily to collect information on live and dead seabirds and marine mammals. Beachwalk data will be reported separately.

Discussion

Mussels, *Mytilus californianus*, decreased substantially in 2009 at more than 70% of sites, primarily those that are north-facing. At most sites, declines started occurring in 2008. Mussel cover plummeted from abundances at or near the long term mean in 2007 to below 5% in 2009 at Middle Anacapa East and West, Prisoner's Harbor, Orizaba Cove, Fossil Reef, Sea Lion Rookery, and Scorpion Rock.

As predicted several years ago, the very dense mussel beds that once dominated Middle Anacapa West have since disappeared likely due to disturbance from storm waves as the majority of individuals were layered on each other rather than rock (Figure 27).



Figure 27. Mussel bed at Anacapa Middle West dominated by coralline algae in absence of *Mytilus californianus*.

Mussel beds are susceptible to large swell events, especially when they are multi-layered, since individuals may be anchored to other mussel shells rather than rocky substrata (Paine and Levin 1981) (Figure 28). In the past we have observed dense beds that subsequently lost large patches at several sites, particularly Landing Cove and Middle Anacapa West. Such events are usually followed by a large settlement of juvenile mussels within a few months from our observations. In 2008 and 2009, there were at least two large wave events (both originated from the southern

hemisphere) that had the potential to cause extensive damage to the mussel communities in the northern Channel Islands (NOAA 2010).



Figure 28. Young *Mytilus californianus* recruits settling onto mature individuals at Otter Harbor.

In 2008, there were at least three different observations of gaping and dead mussels at Middle Anacapa West, Prisoners Harbor and Otter Harbor (2008 Rocky Intertidal Monitoring Report *in prep*). Observations of gaping mussels usually occur on warm days with mid-day low tides. Even a moderate die-off of mussels can lead to instability in the bed structure where byssal threads are attached to other shells rather than solid rock.

Our observations support conclusions that *P. ochraceus* are significant predators on *Mytilus californianus* (Connell 1970). We commonly find *P. ochraceus* feeding on mussels (Figure 29). In spring 2009, *P. ochraceus* numbers increased markedly at nearly all sites. Likely as a result, lower portions of mussel beds have subsequently disappeared at sites with large aggregations of seastars. At high densities, *Pisaster ochraceus* can affect entire reef communities. For example, in the early 1990s at Johnsons Lee, the former mussel bed on the lower shelf was transformed to a mix of *Phragmatopoma californica* and *Anthopleura sola* which have remained dominant through 2009. Populations of seastar declined in the mid-1980s following a series of El Niño events when a wasting disease became epidemic (Richards et al. 1997, Schroeter and Dixon 1988). *Pisaster ochraceus* returned in high numbers to the reef in the early 1990s and preyed on *M. californianus*. However, mussels are still present at the site on a higher shelf, as indicated by the relatively high percent coverage of *M. californianus* in the four additional plots established in the *Mytilus* zone at Johnson's Lee in fall 2008 (see Results).



Figure 29. *Pisaster ochraceus* at East Point, Santa Rosa Island fall 2009.

M. californianus situated at higher elevations within mussel zones tend to escape predation from *P. ochraceus* since the seastars have a relatively low tolerance for desiccation and cannot remain on the higher zones long enough to feed (Connell 1970). As a result, the location of the mussel zone monitoring plots on the reef is an important consideration. Mussel plots at Willows are located relatively high on the reef and cover has remained relatively high. *M. californianus* in the lower intertidal at Willows have diminished markedly, but the mussel plots appear to be higher than most *P. ochraceus* can tolerate. The original mussel plots at Johnson's Lee were low on the reef and no longer have any mussel cover; however, the new plots higher on the reef have high cover. Future changes in sea level could affect this dynamic.

At Cuyler Harbor, a different situation exists. There is both a large *P. ochraceus* population and a seemingly stable *M. californianus* population throughout most of the mussel zone. Mussels at Cuyler are some of the largest seen at any site. Laboratory feeding trials have indicated that increased size may provide mussels refuge from predation (Robles and Robb 1993). Also the reef can be quite exposed creating an environment that may be too turbulent for seastars.

Another possible explanation for the marked decline in *M. californianus* observed at most sites may be decreased levels of recruitment. Mussels have a pelagic larval stage that is strongly influenced by ocean currents. As a result, recruitment levels may be significantly altered by changes in oceanographic conditions such as those commonly associated with an El Nino Southern Oscillation (ENSO) event (Navarette et al. 2002). In spring of 2009, there seemed to be a shutdown of the upwelling system for several weeks when calm wind prevailed. The lack of upwelling appeared to be enough to cause severe starvation among California sealions and the subsequent loss of almost 75% of the pups on San Miguel Island (R. DeLong pers. com.). There was also high abandonment of sea bird nests, particularly those associated with pelicans and

cormorants (L. Harvey pers. com.). The 2009 ENSO event may have altered circulation enough to significantly reduce recruitment levels disproportionately some sites contributing to lower settlement of *M. californianus*.

Anecdotally, high mussel recruitment was qualitatively observed at Johnson's Lee and Willow's Anchorage on Santa Cruz Island, and moderate recruitment was noted at Middle Anacapa West and Trailer during spring (see comments in spring trip reports). All four sites, with the exception of Middle Anacapa West, are south-facing. The most severe mussel declines were observed on north-facing shores.

Other organisms such as snails, primarily *Nucella emarginata*, *Ocenebra circumtexta*, and *Ceratostoma nuttallii*, may also play significant roles in regulating mussel abundances by preying on small recruits (Robles 1997). All three species however, occurred in relatively low abundances at most sites in 2009. Additionally, some fishes such as *Halichoeres semisinctus* and *Semicossyphus pulcher*, black oystercatchers (*Haematopus bachmani*) and lobsters (*Panulirus interruptus*) can have significant impacts on mussels (Robles 1997), and all can be relatively abundant at the northern Channel Islands. Still, we do not have any direct evidence indicating that such species significantly reduced mussel abundances at our sites. Fishing and other exploitive activities from humans and sea otters (*Enhydra lutris*) can be detrimental to mussel beds, but people seldom utilize the rocky intertidal zone throughout the park and sea otters are rarely observed south of Point Conception.

Both species of rockweed, *Silvetia compressa* and *Hesperophycus californicus*, decreased substantially in cover at nearly all sites in 2009. Yet, no apparent geographical trends were observed. Rockweeds are highly vulnerable to large waves which can damage fronds or remove entire plants. As mentioned, there were at least two wave events that may have had the potential to cause extensive damage to some of the rockweed communities at our sites in the last two years.

Intertidal invertebrates such as chitons, limpets, turban snails (*Chlorostoma*), shore crabs (*Pachygrapsus*), hermit crabs (*Pagurus*), littorinid snails (*Littorina* spp.), as well as many micro-herbivores such as amphipods, isopods, copepods, and ostracods can potentially impact rockweed populations by consuming or damaging seaweed thalli (Dethier et al. 2005). Our sampling protocols do not provide any abundance information on micro-herbivores, but we do count the larger invertebrates. The herbivore, *Chlorostoma funebris*, is the most common turban snail at the northern islands and is typically found in the vicinity of rockweeds. The snails can grow to be quite large and may be significant grazers on both species of rockweeds found at our sites. In 2009, *C. funebris* numbers remained high and similar to earlier estimates at nearly all sites with the exceptions of Fossil Reef where the number of individuals more than doubled, and Trailer where numbers decreased slightly from previous years. *C. funebris* seek cover under rockweed canopies and so the increase their numbers might be expected along with the high cover of *Silvetia compressa* at the Fossil Reef in 2009. Turban snails seemed abundant at Trailer but may have been concentrated in areas other than the monitoring plots. The omnivorous shore crabs, *Pachygrapsus crassipes*, were not particularly common at any sites in 2009 compared with the combined means for previous years. Chiton, *Lepidochitona* spp., were not especially abundant in 2009 at most sites either. Most of these small herbivores prefer smaller algae and are unlikely to have a large impact on the rockweed density.

Rockweeds are also susceptible to trampling activities from humans (Denis and Murray 2001). At the Channel Islands National Park, most visitors only access the rocky intertidal at Frenchy's Cove, though some visitors explore East Point and Prisoner's Harbor tidepools. While rockweed cover was markedly lower at these sites compared to earlier years, cover was also substantially reduced at other sites that likely receive significantly less trampling activity. Therefore trampling is unlikely to be the cause of the decline.

Recruitment can be problematic when rockweed populations dwindle or disappear from a site since dispersal distances are typically close (<1m) to parent populations (Williams and Di Fiori 1996). Additionally, as is the case for many seaweeds, the post-settlement mortality of *S. compressa* (and likely *H. californicus*) is extremely high (Brawley and Johnson 1991, Johnson and Brawley 1998, Moeller 2002). For example, Moeller (2002) estimated mortality of early post-settlement phases (zygotes and germlings up to 15 mm in size) of *S. compressa* in southern California to be more than a million-fold.

In recent years, *S. compressa* and occasionally *H. californicus* thalli that were blackened have been observed. In all cases, thalli appeared unhealthy but intact. Thus, there was no indication that rockweeds with blackened blades were related to the observed widespread declines of rockweed communities. Only a few thalli were affected at East Point in 2009; markedly fewer instances of the black thalli than were seen the previous year. After examining photographs, Steve Murray (Cal State Fullerton, pers. com.) thought it may be a fungal infection that he has witnessed in the past. Kathy-Ann Miller (UC Berkeley, pers. com.) thought it might be phlorotannins oxidizing in response to high ultra-violet radiation.

H. californicus at Harris Point has very different morphology than other populations of the rockweed in the region: it is both shorter and narrower, closely resembling *Pelvetiopsis limita* except for the sterile hairs in the conceptacles typical of *Hesperophycus*. We have been aware of this difference for some time and have observed that the morphology has remained consistent. We have also noticed that the smaller form has appeared occasionally at other locations and may constitute a new taxon. Voucher specimens were collected and sent to Kathy-Ann Miller at UC Berkeley for identification purposes.

Other core species monitored in the photoplots remained relatively stable in 2009 aside from *Endocladia muricata* which decreased at nearly half the sites in spring but was equal to or above the long-term mean at most sites in fall. Oddly, at Harris Point *E. muricata* cover was slightly above average in spring but plummeted in fall. *E. muricata* cover normally fluctuates between sampling seasons but remains relatively stable in abundance over time. The marked declines at Harris Point as well as Anacapa Middle East, Prisoner's Harbor, and Fraser Cove may have resulted from drying winds that occurred during daytime low-tide events. Large swells may also have been associated with the declines but our sampling frequency does not allow for direct correlation of this kind.

Haliotis cracherodii was federally listed as an Endangered Species in January 2009. Monitoring data from Channel Islands National Park played an integral role in the listing. In general, *H. cracherodii* remain in peril at the islands with less than one percent of the 1985 population level still present. Although *Haliotis cracherodii* increased at a few sites on Santa Cruz and Anacapa, recruitment has remained low at most sites. Numbers have been too low to count inside the

limited area of fixed abalone monitoring plots. Instead, we have been using timed counts for several years to provide a measure of presence/absence and relative abundance. Timed counts have their limitations since there is no standard density measurement that can be used for comparisons among sites, and there typically is variability among observers. We have tried to define the reef area so that the timed counts are done with some consistency. However, variability among observers is difficult to overcome. It is necessary to cover a large area, and it takes experience to know where to focus the search. Even experienced observers can have difficulty searching when conditions are poor.

At Willow's Anchorage, black abalone numbers increased rapidly over the last several years. In 2009, nearly as many abalone were counted at Willow's as Otter Harbor; a site that routinely has more animals than all other sites. The increase is considered to be real and large since less than ten abalone were counted at the site each year from 1999 to 2005. Additionally, size distribution data for abalone at Willow's (and all other sites combined) indicated that recruitment is likely occurring as there appears to be multiple age classes and relatively small (ex. <30 mm) individuals present that are believed to be only 1-2 years old (Haaker et al. 1995). Slight increases were seen at other locations on Santa Cruz Island and Middle Anacapa. Still, no abalone were found at Cuyler Harbor, Northwest-Talcott, South Frenchy's Cove, Sea Lion Rookery or Landing Cove.

The discovery of a shrunken abalone at Trailer and a dead abalone at Harris Point with muscle still attached to the shell, might indicate that Withering Syndrome is still present and somewhat active in the area. The observed symptoms; however, are similar to those for other illnesses and no definitive tests were performed. Additionally, several shells were found at Otter Harbor and Willows Anchorage for which no cause of death could be attributed.

An abundance of drift kelp was observed during spring which filled many of the crevices at Otter Harbor. Abalone presumably use crevices partly because drift kelp accumulates within them, but large abundances of the kelp likely cause anoxic conditions in the pools below. Perhaps as a result of this inundation of kelp, it appeared that some abalone left their usual locations.

Lottia gigantea densities have fluctuated throughout the course of the monitoring program particularly at Willow's Anchorage, Trailer, and Otter Harbor. From 2007 to 2009, densities gradually increased. The increased densities may have resulted from combined effects of multiple recruitment events and individuals emigrating from surrounding habitat.

Mean shell lengths of *L. gigantea* also varied greatly among sites as well as islands and plots in 2009. Similar to previous years, the smallest limpets were measured at Willow's Anchorage (mean = 30 mm) and largest were observed at Northwest-Talcott (mean = 76 mm). Plots at Willows are in a mussel bed while those at Northwest-Talcott are located higher up on the reef where smooth shale is almost completely dominated by *L. gigantea*. The flat, smooth shale may allow *L. gigantea* to dominate other species because it offers optimal foraging conditions which subsequently allow the limpets to attain large sizes and prevent barnacles and mussels from becoming established.

The predatory dogwinkle, *N. emarginata*, decreased substantially in the *Mytilus* zone in 2009. The decrease was perhaps, in part, related to the marked decline of *M. californianus* at most sites

since the snails may subsist primarily on *Mytilus* spp. (Sanford et al. 2003) and live interstitially among the mussel shells. Alternatively, snails may also have been missed if they were buried amongst tightly packed mussels. As in previous years, more *N. emarginata* were found at Cuyler Harbor than other sites in 2009 perhaps because mussels at Cuyler are relatively abundant and especially large offering plentiful habitat and large gaps between shells allowing for easy detection.

One of the benefits of a long-term monitoring program at a network of sites is the capability to recognize and document the colonization and spread of non-native species. The invasive red alga, *Caulacanthus ustulatus*, has been observed at Anacapa Middle East and West sites since 2005. It was first documented in southern California in 1999 and has since exceeded the cover of several native red algal species at mainland sites south of Santa Monica Bay. It was still present at Anacapa Middle East and West in 2009, but did not appear to be increasing in abundance. The small alga forms a low-lying turf that is similar in appearance to *Endocladia muricata*. Both algae occupy the same tidal range and likely compete for space. We have not observed *C. ustulatus* at any other sites, but continue to monitor for its presence.

Another invasive alga that we continue to survey for is the brown alga, *Sargassum horneri*. It was first observed in southern California in Long Beach Harbor in October 2003. Since then, it has appeared in numerous subtidal locations along the mainland as far south as Baja, CA and around the islands: San Clemente, Catalina, Santa Barbara, Anacapa, and Santa Cruz. *Sargassum horneri* was documented in the intertidal zone at one of the MARINe monitoring sites at Shaw's Cove in Laguna Beach in fall 2009 (J. Smith pers. com.). This species is not expected to impact the intertidal zone like it does in the subtidal, but it may occur anywhere from 0 ft MLLW to about 20 m depth and form dense thickets that may shade out other species. Its palatability is unknown at this time but it does not appear to be a preferred food item.

Uncommon native algal species are also recorded when observed. *Sargassum agardhianum* is a native species of sargassum that is located in the lower intertidal and shallow subtidal. It is commonly found at the southern islands, Santa Catalina and San Clemente, but rarely observed at the northern Channel Islands. In 2009, it was observed in low abundances at Cat Rock at Anacapa. Another brown alga, *Analipus japonica*, is more common north of Point Conception, and has been observed at Crook Point for several years. *A. japonica* appears to be expanding in abundance at the site. *Colpomenia bullosa* is a sac-like brown alga that is also more commonly distributed above Point Conception. It has recently been identified at Fossil Reef.

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Appendix A: Program Notes

Dan Richards and Stephen Whitaker led the 2009 sampling effort. Stephen was hired in April 2009 to work on the intertidal monitoring program. Through funding from the National Marine Fisheries Service Endangered Species Recovery Program we hired Jacob Elliott as a Conservation Intern from the Student Conservation Association.

We experienced excellent working conditions at Anacapa and Santa Cruz Islands in March. However, the weather shifted in April as high wind and a strong northwest swell impacted the first couple days of sampling at San Miguel preventing us from scoring the lowest plots in the *Mytilus* and *Tetraclita* zones. At Santa Cruz in late-April, we experienced more cold strong wind but little swell and surge during the first couple days of the trip followed by beautiful weather. Conditions during our tour on Santa Rosa Island in late-May were generally excellent all week long with overcast skies, light wind, minimal swell and cool temperatures. Sampling at Santa Barbara Island during the first week of October coincided with the first rainfall (0.25 inches) of the season. Light rain persisted through much of the first day followed by several days of nice conditions with the exception of a powerful northwest swell. The high swells were problematic at Sea Lion Rookery preventing us from field-scoring the mussel plots. In November, at Santa Cruz, we had excellent conditions all week long. High wind and seas were encountered once again at San Miguel in mid-November during most of the trip with the exception of a couple of pleasant working days. We had generally good conditions in December and January at Anacapa, Santa Cruz, and Santa Rosa Islands, though at Fossil Reef, large swells coupled with only a moderately-low tide prevented the completion of sea star and abalone searches.

We had the NOAA Vessel Shearwater scheduled for three days in March to take us to Anacapa and Santa Cruz on day trips for the spring monitoring. We did not sample at Cat rock or Scorpion Rock in the spring due to a combination of lack of transportation, lack of enough workable tides and harbor seals with pups present at Cat Rock. We had five days on the Shearwater later in November and December enabling us to complete all the Anacapa and East Santa Cruz Island sites. We were not able to sample black abalone at Harbor Seal Arch (Anacapa Middle West) due to time limitations during the fall sampling, however.

Temperature loggers were installed at Anacapa Middle West and South Frenchy's Cove. TidBit loggers were placed inside PVC housings epoxied to rock in sheltered areas representative of black abalone habitat. These two sites follow the installation of loggers at Willows Anchorage, Johnson's Lee, Northwest-Talcott, Fossil Reef, and Otter Harbor in 2008. The housing and logger placed at East Point in fall 2008 broke off and was lost. There was apparently a problem with the delayed start on the temperature logger at Willows so data before April were lost.

In 2009, Jacob Elliot and Melissa Hayashida (SCA intern) filled in gaps in the GIS maps that we have created in the last few years. We also collected range and bearing information for the plots at South Frenchy's Cove, something that had never been done and will be invaluable if we lose a plot.

This was the first full year of monitoring the new mussel plots at Johnson's Lee. We set up four new photoplots in the *Mytilus* zone at Johnson's Lee in January 2009. The new plots are on the higher shelf where few seastars occur. These were set up because the four mussel plots on the

lower shelf show no signs of recovery after 17 years or more and we are not adequately monitoring the current population of *Mytilus* which seem to be doing fine on the higher shelf. We will continue to monitor the lower reef plots which are dominated by *Phragmatopoma californica* in most plots.

Benjamin Pister from Cabrillo National Monument assisted us with sampling at Anacapa Island. Benjamin provided us with valuable sampling skills and we were able to compare notes from our two programs to look at similarities and discuss potential collaboration.

We participated in the MARINe workshop at Golden Gate National Recreation Area. Discussions centered on Natural Resource Damage Assessments but we could not discuss the Cosco Busan spill due to ongoing litigation at the time.

In fall 2009, *Sargassum horneri* was confirmed to be growing at Anacapa Island. It was first photographed by a diver in spring 2009, but was not relocated. An invasive alga from Asia, *S. horneri* was first discovered in southern California in 2003. It was first seen at Santa Catalina Island in 2006, and by 2007 was documented to have formed heavy forests at both Catalina and San Clemente Islands in 2007. *Sargassum horneri* was documented in the intertidal zone at one of the MARINe monitoring sites at Shaw's Cove in Laguna Beach in fall 2009. This species is not expected to impact the intertidal zone like it does in the subtidal, but it may occur anywhere from 0 ft MSW to about 60 ft depth and forms dense thickets that may shade out other species. Its palatability is unknown at this time but it does not appear to be a preferred food item.

Beachwalk surveys (shorebirds, pinnipeds and carcass counts) were conducted in conjunction with the rocky intertidal monitoring on San Miguel and Santa Rosa Islands making use of the personnel and island time. Western snowy plover surveys on Santa Rosa Island were conducted during January and March overlapping with rocky intertidal monitoring. Sand beach monitoring was conducted during the summer and those data will be reported separately.

Appendix B. Photoquadrat Data Tables

Percent cover of selected taxa in fixed 50 x 75 cm photoquadrats are based on 100 points per plot. Target taxa are presented in the tables for each site and each sampling season (spring and fall). Acorn barnacle taxa include *Balanus glandula* and *Chthamalus fissus/dalli*. *Pollicipes polymerus* is listed as leaf barnacle. Turf-weed taxa are only used at Landing Cove Santa Barbara Island and include *Chondracanthus (Gigartina) canaliculatus*, *Gelidium* sp. and *Pterocladia capillacea*. The mussel taxa are *Mytilus* spp. with *Mytilus californianus* dominating at all sites. In 2004, horse mussels, *Septifer bifurcates* or *Brachidontes adamsianus* were scored as their own category, but are included in miscellaneous invertebrates in the tables. Misc. Algae and Misc. Animals include a variety of different species. Since 2001, we have identified most organisms to the species level and have added them to the database; however, because most are rare and to facilitate comparisons with past data, most species are lumped for convenience. Bare Rock is just that, however we had no way to detect the presence of Cyanobacteria. The *Other* category is a “catch-all” category including unidentified points.

Percent Cover of Index Species

Middle-East, Anacapa Island - Spring 2009 (3/8/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	243	68	4	20	0	0	0	1	0	0	7	0	0	0	100
	244	86	5	4	4	0	0	0	0	0	1	0	0	0	100
	245	77	1	9	4	0	0	5	0	0	4	0	0	0	100
	Mean	77.00	3.33	11.00	2.67	.00	.00	2.00	.00	.00	4.00	.00	.00	.00	100.00
	StDev	9.00	2.08	8.19	2.31	.00	.00	2.65	.00	.00	3.00	.00	.00	.00	.00
Endocladia	240	74	2	0	17	0	0	0	0	0	7	0	0	0	100
	241	71	0	13	4	0	0	8	0	0	4	0	0	0	100
	242	87	4	6	2	0	0	0	0	0	1	0	0	0	100
	Mean	77.33	2.00	6.33	7.67	.00	.00	2.67	.00	.00	4.00	.00	.00	.00	100.00
	StDev	8.50	2.00	6.51	8.14	.00	.00	4.62	.00	.00	3.00	.00	.00	.00	.00
Silvetia	53	61	0	4	11	0	0	13	0	0	9	2	0	0	100
	237	59	3	0	4	0	21	0	0	0	13	0	0	0	100
	469	72	0	13	0	0	0	2	0	0	12	1	0	0	100
	Mean	64.00	1.00	5.67	5.00	.00	7.00	5.00	.00	.00	11.33	1.00	.00	.00	100.00
	StDev	7.00	1.73	6.66	5.57	.00	12.12	7.00	.00	.00	2.08	1.00	.00	.00	.00
Mussels	476	39	0	0	0	0	0	0	0	0	60	1	0	0	100
	477	31	3	26	0	0	0	0	0	0	40	0	0	0	100
	478	25	0	3	0	0	0	0	0	0	71	1	0	0	100
	Mean	31.67	1.00	9.67	.00	.00	.00	.00	.00	.00	57.00	.67	.00	.00	100.00
	StDev	7.02	1.73	14.22	.00	.00	.00	.00	.00	.00	15.72	.58	.00	.00	.00

Percent Cover of Index Species

Middle-West, Anacapa Island - Spring 2009 (3/8/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	447	45	54	0	0	0	0	0	0	0	1	0	0	0	100
	448	57	2	1	9	0	0	1	1	0	29	0	0	0	100
	449	69	11	0	0	0	0	0	0	0	20	0	0	0	100
	450	66	18	1	4	0	0	0	0	0	11	0	0	0	100
	451	75	4	0	16	0	0	0	0	0	5	0	0	0	100
	Mean	62.40	17.80	.40	5.80	.00	.00	.20	.20	.00	13.20	.00	.00	.00	100.00
	StDev	11.70	21.19	.55	6.80	.00	.00	.45	.45	.00	11.37	.00	.00	.00	.00
Endocladia	457	25	0	0	30	0	0	0	4	0	41	0	0	0	100
	458	65	1	3	15	0	0	0	0	0	13	3	0	0	100
	459	73	0	0	7	0	0	1	0	0	18	1	0	0	100
	460	62	20	0	17	0	0	0	0	0	1	0	0	0	100
	461	77	19	0	1	0	0	0	0	0	3	0	0	0	100
	Mean	60.40	8.00	.60	14.00	.00	.00	.20	.80	.00	15.20	.80	.00	.00	100.00
	StDev	20.68	10.51	1.34	11.00	.00	.00	.45	1.79	.00	16.04	1.30	.00	.00	.00
Silvetia	452	63	6	1	0	0	14	0	0	0	15	1	0	0	100
	453	66	8	2	0	0	5	0	0	0	19	0	0	0	100
	454	31	0	0	13	0	0	0	3	0	53	0	0	0	100
	455	68	0	0	7	0	1	0	0	0	20	4	0	0	100
	456	69	0	2	1	0	1	0	0	0	25	2	0	0	100
	Mean	59.40	2.80	1.00	4.20	.00	4.20	.00	.60	.00	26.40	1.40	.00	.00	100.00
	StDev	16.04	3.90	1.00	5.72	.00	5.81	.00	1.34	.00	15.29	1.67	.00	.00	.00
Mussels	462	35	1	6	0	0	0	8	6	0	42	2	0	0	100
	463	50	0	3	0	0	0	7	1	0	37	2	0	0	100
	464	30	0	2	0	0	0	37	2	0	27	2	0	0	100
	465	28	0	21	0	0	0	0	4	0	46	1	0	0	100
	466	24	0	0	0	0	0	0	0	0	75	1	0	0	100
	Mean	33.40	.20	6.40	.00	.00	.00	10.40	2.60	.00	45.40	1.60	.00	.00	100.00
	StDev	10.09	.45	8.44	.00	.00	.00	15.34	2.41	.00	18.01	.55	.00	.00	.00

Percent Cover of Index Species
S. Frenchy's Cove, Anacapa Island - Spring 2009 (3/9/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	249	23	56	0	13	0	0	0	0	0	5	1	2	0	100
	250	27	41	0	26	0	0	0	0	0	5	0	1	0	100
	251	47	45	0	3	0	0	0	0	0	4	1	0	0	100
	252	42	37	0	5	0	0	0	0	0	16	0	0	0	100
	253	20	56	0	20	0	0	0	0	0	4	0	0	0	100
	Mean	31.80	47.00	.00	13.40	.00	.00	.00	.00	.00	6.80	.40	.60	.00	100.00
	StDev	11.99	8.69	.00	9.76	.00	.00	.00	.00	.00	5.17	.55	.89	.00	.00
Endocladia	154	22	2	0	74	0	2	0	0	0	0	0	0	0	100
	155	11	0	0	75	0	10	0	1	0	3	0	0	0	100
	256	16	0	0	69	2	1	0	2	0	10	0	0	0	100
	257	26	0	0	72	0	0	0	0	0	2	0	0	0	100
	258	10	1	0	72	0	17	0	0	0	0	0	0	0	100
	Mean	17.00	.60	.00	72.40	.40	6.00	.00	.60	.00	3.00	.00	.00	.00	100.00
	StDev	6.93	.89	.00	2.30	.89	7.31	.00	.89	.00	4.12	.00	.00	.00	.00
Silvetia	259	37	6	0	0	0	10	0	0	0	46	1	0	0	100
	260	42	10	0	7	0	28	0	0	0	14	0	0	0	101
	261	19	1	0	0	0	12	0	0	0	68	0	0	0	100
	262	53	3	0	37	0	2	0	0	0	5	0	0	0	100
	263	46	3	0	0	0	48	0	0	0	3	0	0	0	100
	Mean	39.40	4.60	.00	8.80	.00	20.00	.00	.00	.00	27.20	.20	.00	.00	100.20
	StDev	12.82	3.51	.00	16.05	.00	18.28	.00	.00	.00	28.60	.45	.00	.00	.45
Mussels	201	14	0	0	0	0	0	45	6	0	30	5	0	0	100
	202	19	0	0	0	0	0	53	10	0	17	1	0	0	100
	264	14	0	0	0	0	0	42	20	0	23	1	0	0	100
	265	6	0	0	0	0	0	76	4	0	14	0	0	0	100
	266	49	0	0	0	0	0	41	1	0	8	1	0	0	100
	Mean	20.40	.00	.00	.00	.00	.00	51.40	8.20	.00	18.40	1.60	.00	.00	100.00
	StDev	16.65	.00	.00	.00	.00	.00	14.54	7.36	.00	8.44	1.95	.00	.00	.00

Percent Cover of Index Species

Crook Point, San Miguel Island - Spring 2009 (4/5/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	137	83	17	0	0	0	0	0	0	0	0	0	0	0	100
	147	85	15	0	0	0	0	0	0	0	0	0	0	0	100
	148	69	31	0	0	0	0	0	0	0	0	0	0	0	100
	149	77	9	0	12	0	0	1	0	0	0	1	0	0	100
	495	61	34	0	5	0	0	0	0	0	0	0	0	0	100
	Mean	75.00	21.20	.00	3.40	.00	.00	.20	.00	.00	.00	.20	.00	.00	100.00
	StDev	10.00	10.78	.00	5.27	.00	.00	.45	.00	.00	.00	.45	.00	.00	.00
Endocladia	386	70	3	0	24	0	0	2	0	0	0	1	0	0	100
	387	56	1	0	32	0	0	0	0	0	10	1	0	0	100
	388	72	9	0	12	0	0	0	0	0	6	1	0	0	100
	389	27	1	1	27	5	0	35	0	2	2	0	0	0	100
	390	58	6	0	11	0	0	9	0	3	13	0	0	0	100
	Mean	56.60	4.00	.20	21.20	1.00	.00	9.20	.00	1.00	6.20	.60	.00	.00	100.00
	StDev	17.99	3.46	.45	9.31	2.24	.00	14.89	.00	1.41	5.40	.55	.00	.00	.00
Silvetia	396	45	4	0	37	1	0	11	0	1	1	0	0	0	100
	397	2	0	0	0	0	0	96	0	0	2	0	0	0	100
	398	76	2	0	6	0	0	11	0	2	3	0	0	0	100
	399	51	4	0	0	0	0	0	6	0	38	1	0	0	100
	400	49	0	0	43	6	0	1	0	0	1	0	0	0	100
	Mean	44.60	2.00	.00	17.20	1.40	.00	23.80	1.20	.60	9.00	.20	.00	.00	100.00
	StDev	26.75	2.00	.00	21.06	2.61	.00	40.70	2.68	.89	16.23	.45	.00	.00	.00
Mussels	381	30	1	0	0	0	0	61	0	1	7	0	0	0	100
	382	6	0	0	0	0	0	91	0	0	3	0	0	0	100
	383	8	0	0	0	0	0	87	0	0	5	0	0	0	100
	384	19	0	1	0	0	0	75	0	1	3	1	0	0	100
	385	27	0	1	0	0	0	65	0	3	4	0	0	0	100
	Mean	18.00	.20	.40	.00	.00	.00	75.80	.00	1.00	4.40	.20	.00	.00	100.00
	StDev	10.84	.45	.55	.00	.00	.00	13.16	.00	1.22	1.67	.45	.00	.00	.00

Percent Cover of Index Species

Cuyler Harbor, San Miguel Island - Spring 2009 (4/6/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	416	33	66	0	0	0	0	0	0	0	0	1	0	0	100
	417	54	24	0	22	0	0	0	0	0	0	0	0	0	100
	418	53	38	0	9	0	0	0	0	0	0	0	0	0	100
	419	47	6	0	47	0	0	0	0	0	0	0	0	0	100
	420	33	3	0	64	0	0	0	0	0	0	0	0	0	100
	Mean	44.00	27.40	.00	28.40	.00	.00	.00	.00	.00	.00	.20	.00	.00	100.00
	StDev	10.39	25.82	.00	26.63	.00	.00	.00	.00	.00	.00	.45	.00	.00	.00
Endocladia	411	65	0	1	11	0	0	17	0	0	6	0	0	0	100
	412	27	24	0	27	0	0	17	2	0	3	0	0	0	100
	413	51	0	0	24	0	22	0	0	0	3	0	0	0	100
	414	47	0	0	47	0	0	4	0	0	2	0	0	0	100
	415	22	0	0	70	0	0	2	2	0	4	0	0	0	100
	Mean	42.40	4.80	.20	35.80	.00	4.40	8.00	.80	.00	3.60	.00	.00	.00	100.00
	StDev	17.74	10.73	.45	23.06	.00	9.84	8.34	1.10	.00	1.52	.00	.00	.00	.00
Silvetia	406	21	0	0	14	0	30	1	0	0	13	21	0	0	100
	407	27	0	0	0	0	72	0	0	0	1	0	0	0	100
	408	49	0	4	2	0	35	0	0	0	9	1	0	0	100
	409	63	0	0	0	0	14	0	0	0	15	8	0	0	100
	410	67	0	7	2	0	5	1	0	0	11	7	0	0	100
	Mean	45.40	.00	2.20	3.60	.00	31.20	.40	.00	.00	9.80	7.40	.00	.00	100.00
	StDev	20.76	.00	3.19	5.90	.00	25.80	.55	.00	.00	5.40	8.38	.00	.00	.00
Mussels	401	38	9	15	0	0	0	9	3	6	2	18	0	0	100
	402	9	0	3	0	0	0	66	4	1	6	11	0	0	100
	403	11	0	3	0	0	0	70	0	4	2	10	0	0	100
	404	32	0	13	0	0	0	33	1	1	1	19	0	0	100
	405	25	0	3	0	0	0	61	0	1	0	10	0	0	100
	Mean	23.00	1.80	7.40	.00	.00	.00	47.80	1.60	2.60	2.20	13.60	.00	.00	100.00
	StDev	12.75	4.02	6.07	.00	.00	.00	26.09	1.82	2.30	2.28	4.51	.00	.00	.00

Percent Cover of Index Species

Harris Point, San Miguel Island - Spring 2009 (4/3/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	440	34	62	0	4	0	0	0	0	0	0	0	0	0	100
	441	31	67	0	1	0	0	0	0	0	0	1	0	0	100
	442	43	48	0	9	0	0	0	0	0	0	0	0	0	100
	443	52	39	0	0	0	0	0	0	0	0	0	9	0	100
	444	35	64	0	1	0	0	0	0	0	0	0	0	0	100
	Mean	39.00	56.00	.00	3.00	.00	.00	.00	.00	.00	.00	.20	1.80	.00	100.00
	StDev	8.51	11.98	.00	3.67	.00	.00	.00	.00	.00	.00	.45	4.02	.00	.00
Endocladia	431	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	432	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	433	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	434	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	435	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	StDev	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Mussels	426	28	0	0	6	1	0	51	0	3	10	1	0	0	100
	427	49	1	0	14	8	0	1	0	0	26	1	0	0	100
	428	75	2	0	6	3	0	0	1	0	13	0	0	0	100
	429	46	10	0	3	0	0	31	0	0	9	1	0	0	100
	430	10	5	3	0	0	0	64	1	1	14	1	0	1	100
	Mean	41.60	3.60	.60	5.80	2.40	.00	29.40	.40	.80	14.40	.80	.00	.20	100.00
	StDev	24.36	4.04	1.34	5.22	3.36	.00	28.88	.55	1.30	6.80	.45	.00	.45	.00
Tetraclita	436	27	13	6	0	0	0	41	0	0	13	0	0	0	100
	437	48	3	16	0	0	0	18	0	0	15	0	0	0	100
	438	16	0	0	6	0	0	0	25	0	53	0	0	0	100
	439	61	0	4	4	0	0	11	0	0	19	1	0	0	100
	445	64	2	9	0	0	0	20	0	0	3	2	0	0	100
	Mean	43.20	3.60	7.00	2.00	.00	.00	18.00	5.00	.00	20.60	.60	.00	.00	100.00
	StDev	21.06	5.41	6.00	2.83	.00	.00	15.05	11.18	.00	19.05	.89	.00	.00	.00
Hesperophycus	421	34	0	0	28	38	0	0	0	0	0	0	0	0	100
	422	33	0	0	14	52	0	0	0	0	0	1	0	0	100
	423	20	0	0	52	28	0	0	0	0	0	0	0	0	100
	424	49	0	0	40	8	0	0	0	0	3	0	0	0	100
	425	74	1	0	14	10	0	0	0	0	1	0	0	0	100
	Mean	42.00	.20	.00	29.60	27.20	.00	.00	.00	.00	.80	.20	.00	.00	100.00
	StDev	20.63	.45	.00	16.58	18.69	.00	.00	.00	.00	1.30	.45	.00	.00	.00

Percent Cover of Index Species

Otter Harbor, San Miguel Island - Spring 2009 (4/4/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	370	93	7	0	0	0	0	0	0	0	0	0	0	0	100
	371	53	42	0	0	0	0	0	0	0	1	0	4	0	100
	372	57	41	0	0	0	0	0	0	0	0	2	0	0	100
	373	42	58	0	0	0	0	0	0	0	0	0	0	0	100
	374	1	0	0	0	0	0	0	26	0	73	0	0	0	100
	Mean	49.20	29.60	.00	.00	.00	.00	.00	5.20	.00	14.80	.40	.80	.00	100.00
	StDev	33.05	24.89	.00	.00	.00	.00	.00	11.63	.00	32.54	.89	1.79	.00	.00
Endocladia	360	32	21	3	30	0	9	2	0	0	3	0	0	0	100
	361	62	12	0	22	0	0	0	0	0	3	0	1	0	100
	362	8	0	0	89	0	1	0	0	1	1	0	0	0	100
	363	41	1	0	44	0	0	0	0	0	14	0	0	0	100
	364	32	0	0	59	0	3	0	0	0	6	0	0	0	100
	Mean	35.00	6.80	.60	48.80	.00	2.60	.40	.00	.20	5.40	.00	.20	.00	100.00
	StDev	19.44	9.42	1.34	26.53	.00	3.78	.89	.00	.45	5.13	.00	.45	.00	.00
Silvetia	355	74	24	0	0	0	0	0	0	0	0	1	1	0	100
	356	24	0	2	53	0	12	0	0	0	9	0	0	0	100
	357	13	0	0	75	0	6	0	0	0	6	0	0	0	100
	358	26	46	0	27	0	0	0	0	0	1	0	0	0	100
	359	30	55	0	11	0	1	0	0	0	1	1	1	0	100
	Mean	33.40	25.00	.40	33.20	.00	3.80	.00	.00	.00	3.40	.40	.40	.00	100.00
	StDev	23.55	25.46	.89	30.71	.00	5.22	.00	.00	.00	3.91	.55	.55	.00	.00
Mussels	375	34	2	0	0	0	0	56	0	3	5	0	0	0	100
	376	34	2	1	0	0	0	50	1	2	9	1	0	0	100
	378	24	0	0	1	0	0	56	0	12	7	0	0	0	100
	379	59	10	0	3	0	0	20	0	0	8	0	0	0	100
	380	33	0	0	0	0	0	59	0	3	5	0	0	0	100
	Mean	36.80	2.80	.20	.80	.00	.00	48.20	.20	4.00	6.80	.20	.00	.00	100.00
	StDev	13.10	4.15	.45	1.30	.00	.00	16.10	.45	4.64	1.79	.45	.00	.00	.00

Percent Cover of Index Species

Fraser Cove, Santa Cruz Island - Spring 2009 (4/28/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	876	40	55	0	0	0	0	3	0	0	1	1	0	0	100
	877	28	22	0	0	0	0	3	0	0	47	0	0	0	100
	878	44	50	0	0	0	0	0	0	0	0	0	6	0	100
	879	64	33	0	0	0	0	0	0	0	0	1	2	0	100
	880	79	17	0	0	0	0	0	0	0	4	0	0	0	100
	Mean	51.00	35.40	.00	.00	.00	.00	1.20	.00	.00	10.40	.40	1.60	.00	100.00
	StDev	20.32	16.74	.00	.00	.00	.00	1.64	.00	.00	20.53	.55	2.61	.00	.00
Endocladia	881	57	10	0	17	0	0	14	0	0	1	1	0	0	100
	882	83	9	0	4	0	0	3	0	0	1	0	0	0	100
	883	89	3	0	7	0	0	0	0	0	0	1	0	0	100
	884	18	8	0	74	0	0	0	0	0	0	0	0	0	100
	885	31	20	0	42	0	0	0	0	0	5	2	0	0	100
	Mean	55.60	10.00	.00	28.80	.00	.00	3.40	.00	.00	1.40	.80	.00	.00	100.00
	StDev	31.17	6.20	.00	29.35	.00	.00	6.07	.00	.00	2.07	.84	.00	.00	.00
Silvetia	896	29	6	0	24	11	0	0	0	0	30	0	0	0	100
	897	49	6	0	7	6	9	0	6	0	10	4	0	3	100
	898	52	0	0	5	0	33	0	3	0	3	4	0	0	100
	899	72	10	0	5	0	4	0	0	0	4	5	0	0	100
	900	19	11	0	3	35	32	0	0	0	0	0	0	0	100
	Mean	44.20	6.60	.00	8.80	10.40	15.60	.00	1.80	.00	9.40	2.60	.00	.60	100.00
	StDev	20.75	4.34	.00	8.61	14.50	15.76	.00	2.68	.00	12.07	2.41	.00	1.34	.00
Mussels	891	11	0	0	0	0	0	67	0	0	3	19	0	0	100
	892	31	0	0	0	0	0	63	0	0	0	6	0	0	100
	893	12	0	0	0	0	0	78	0	0	0	10	0	0	100
	894	26	1	0	0	0	0	62	0	1	1	9	0	0	100
	895	28	0	1	0	0	0	60	0	0	2	9	0	0	100
	Mean	21.60	.20	.20	.00	.00	.00	66.00	.00	.20	1.20	10.60	.00	.00	100.00
	StDev	9.40	.45	.45	.00	.00	.00	7.18	.00	.45	1.30	4.93	.00	.00	.00
Pollicipes	901	37	3	2	0	0	0	55	0	2	0	1	0	0	100
	902	56	12	5	6	0	0	0	0	0	8	13	0	0	100
	903	15	0	0	0	0	0	60	0	10	0	15	0	0	100
	904	25	0	2	0	0	0	55	0	6	4	8	0	0	100
	905	17	0	2	0	0	0	50	0	10	9	12	0	0	100
	Mean	30.00	3.00	2.20	1.20	.00	.00	44.00	.00	5.60	4.20	9.80	.00	.00	100.00
	StDev	16.91	5.20	1.79	2.68	.00	.00	24.85	.00	4.56	4.27	5.54	.00	.00	.00

Percent Cover of Index Species
Fraser Cove, Santa Cruz Island - Spring 2009 (4/28/09) (continued)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Tar	906	52	15	0	0	0	0	0	0	0	0	0	33	0	100
	907	54	12	0	0	0	0	0	0	0	0	0	34	0	100
	908	50	8	0	0	0	0	0	0	0	0	0	42	0	100
	909	52	10	0	0	0	0	0	0	0	0	0	38	0	100
	910	36	7	0	0	0	0	0	0	0	0	0	57	0	100
	Mean	48.80	10.40	.00	.00	.00	.00	.00	.00	.00	.00	.00	40.80	.00	100.00
	StDev	7.29	3.21	.00	.00	.00	.00	.00	.00	.00	.00	.00	9.73	.00	.00
Hesperophycus	886	66	3	0	24	7	0	0	0	0	0	0	0	0	100
	887	68	9	0	9	2	0	1	6	0	5	0	0	0	100
	888	40	13	0	37	10	0	0	0	0	0	0	0	0	100
	889	68	7	0	8	2	3	0	0	0	12	0	0	0	100
	890	31	8	0	26	21	14	0	0	0	0	0	0	0	100
	Mean	54.60	8.00	.00	20.80	8.40	3.40	.20	1.20	.00	3.40	.00	.00	.00	100.00
	StDev	17.74	3.61	.00	12.28	7.83	6.07	.45	2.68	.00	5.27	.00	.00	.00	.00

Percent Cover of Index Species

Orizaba Cove, Santa Cruz Island - Spring 2009 (3/7/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	851	57	35	5	0	0	0	0	0	0	3	0	0	0	100
	852	42	56	0	0	0	0	0	0	0	2	0	0	0	100
	853	65	35	0	0	0	0	0	0	0	0	0	0	0	100
	854	55	38	5	0	0	0	1	0	0	1	0	0	0	100
	855	69	24	0	0	0	0	0	0	0	6	1	0	0	100
	Mean	57.60	37.60	2.00	.00	.00	.00	.20	.00	.00	2.40	.20	.00	.00	100.00
	StDev	10.43	11.59	2.74	.00	.00	.00	.45	.00	.00	2.30	.45	.00	.00	.00
Silvetia	866	42	0	9	0	0	0	16	0	0	33	0	0	0	100
	867	50	0	5	3	0	7	0	0	0	35	0	0	0	100
	868	31	0	2	3	0	13	4	0	0	47	0	0	0	100
	869	25	0	8	8	3	46	0	0	0	10	0	0	0	100
	870	45	1	4	11	0	18	0	0	0	21	0	0	0	100
	Mean	38.60	.20	5.60	5.00	.60	16.80	4.00	.00	.00	29.20	.00	.00	.00	100.00
	StDev	10.31	.45	2.88	4.42	1.34	17.66	6.93	.00	.00	14.15	.00	.00	.00	.00
Mussels	861	18	0	8	0	0	0	0	0	0	74	0	0	0	100
	862	9	0	0	0	0	0	0	2	0	86	3	0	0	100
	863	27	0	0	0	0	0	0	0	0	73	0	0	0	100
	864	13	0	2	0	0	0	0	0	0	82	3	0	0	100
	865	15	0	0	0	0	0	0	0	0	85	0	0	0	100
	Mean	16.40	.00	2.00	.00	.00	.00	.00	.40	.00	80.00	1.20	.00	.00	100.00
	StDev	6.77	.00	3.46	.00	.00	.00	.00	.89	.00	6.12	1.64	.00	.00	.00
Tetraclita	871	85	1	11	0	0	0	0	0	0	3	0	0	0	100
	872	67	1	9	0	0	0	0	0	0	22	1	0	0	100
	873	59	0	37	0	0	0	0	0	0	1	3	0	0	100
	874	44	0	36	0	0	0	0	0	0	20	0	0	0	100
	875	71	0	8	0	0	0	0	0	0	20	1	0	0	100
	Mean	65.20	.40	20.20	.00	.00	.00	.00	.00	.00	13.20	1.00	.00	.00	100.00
	StDev	15.14	.55	14.92	.00	.00	.00	.00	.00	.00	10.28	1.22	.00	.00	.00
Hesperophycus	856	23	6	0	50	4	0	6	0	0	11	0	0	0	100
	857	31	0	5	28	12	0	1	0	0	22	1	0	0	100
	858	29	0	1	18	20	9	0	0	0	23	0	0	0	100
	859	68	5	0	24	0	0	0	0	0	3	0	0	0	100
	860	48	0	0	41	11	0	0	0	0	0	0	0	0	100
	Mean	39.80	2.20	1.20	32.20	9.40	1.80	1.40	.00	.00	11.80	.20	.00	.00	100.00
	StDev	18.29	3.03	2.17	13.05	7.73	4.02	2.61	.00	.00	10.57	.45	.00	.00	.00

Percent Cover of Index Species

Prisoner's Harbor, Santa Cruz Island - Spring 2009 (4/30/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	826	89	3	0	0	0	0	0	0	0	7	1	0	0	100
	827	51	36	0	3	0	0	0	1	0	2	7	0	0	100
	828	41	30	0	8	0	0	0	2	0	1	18	0	0	100
	829	69	11	1	7	0	0	0	0	0	1	11	0	0	100
	830	53	0	1	40	3	0	0	0	0	2	1	0	0	100
	Mean	60.60	16.00	.40	11.60	.60	.00	.00	.60	.00	2.60	7.60	.00	.00	100.00
	StDev	18.78	16.17	.55	16.20	1.34	.00	.00	.89	.00	2.51	7.20	.00	.00	.00
Endocladia	831	69	2	1	20	0	0	0	0	0	8	0	0	0	100
	832	75	10	0	5	4	0	0	0	0	2	4	0	0	100
	833	75	17	0	6	0	0	0	0	0	1	1	0	0	100
	834	75	5	0	17	0	0	0	0	0	1	2	0	0	100
	835	71	0	0	7	5	0	1	0	0	12	4	0	0	100
	Mean	73.00	6.80	.20	11.00	1.80	.00	.20	.00	.00	4.80	2.20	.00	.00	100.00
	StDev	2.83	6.83	.45	6.96	2.49	.00	.45	.00	.00	4.97	1.79	.00	.00	.00
Silvetia	846	30	50	0	14	1	0	0	2	0	2	1	0	0	100
	847	35	41	4	8	0	0	0	2	0	3	7	0	0	100
	848	49	3	5	3	0	0	0	2	0	38	0	0	0	100
	849	25	0	5	8	0	25	0	1	0	36	0	0	0	100
	850	37	1	6	0	0	18	0	0	0	38	0	0	0	100
	Mean	35.20	19.00	4.00	6.60	.20	8.60	.00	1.40	.00	23.40	1.60	.00	.00	100.00
	StDev	9.01	24.42	2.35	5.37	.45	12.03	.00	.89	.00	19.10	3.05	.00	.00	.00
Mussels	841	40	19	0	0	0	0	0	1	0	31	9	0	0	100
	842	24	25	0	0	0	0	1	3	0	24	23	0	0	100
	843	21	47	8	0	0	0	0	0	0	3	21	0	0	100
	844	23	8	3	0	0	0	1	4	0	22	36	0	3	100
	845	21	11	18	0	0	0	1	3	0	21	25	0	0	100
	Mean	25.80	22.00	5.80	.00	.00	.00	.60	2.20	.00	20.20	22.80	.00	.60	100.00
	StDev	8.04	15.49	7.56	.00	.00	.00	.55	1.64	.00	10.38	9.65	.00	1.34	.00
Hesperophycus	836	64	0	0	12	1	1	0	0	0	18	4	0	0	100
	837	45	0	0	10	1	0	0	0	0	44	0	0	0	100
	838	19	0	0	2	5	0	0	0	0	73	1	0	0	100
	839	88	7	0	4	1	0	0	0	0	0	0	0	0	100
	840	49	17	0	2	6	0	0	0	0	26	0	0	0	100
	Mean	53.00	4.80	.00	6.00	2.80	.20	.00	.00	.00	32.20	1.00	.00	.00	100.00
	StDev	25.41	7.46	.00	4.69	2.49	.45	.00	.00	.00	27.75	1.73	.00	.00	.00

Percent Cover of Index Species

Trailer, Santa Cruz Island - Spring 2009 (4/27/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	911	90	6	0	3	0	0	0	0	0	0	1	0	0	100
	912	33	66	0	0	0	0	0	0	0	0	1	0	0	100
	913	60	25	0	12	0	0	2	0	0	0	1	0	0	100
	914	17	82	0	0	0	0	0	0	0	0	1	0	0	100
	915	67	33	0	0	0	0	0	0	0	0	0	0	0	100
	Mean	53.40	42.40	.00	3.00	.00	.00	.40	.00	.00	.00	.80	.00	.00	100.00
	StDev	28.76	30.99	.00	5.20	.00	.00	.89	.00	.00	.00	.45	.00	.00	.00
Silvetia	926	5	3	0	1	0	83	0	0	0	8	0	0	0	100
	927	62	11	0	1	0	20	0	0	0	6	0	0	0	100
	928	32	1	0	13	0	45	0	0	0	9	0	0	0	100
	929	8	0	0	1	0	80	0	0	0	11	0	0	0	100
	930	24	1	0	0	0	60	0	0	0	15	0	0	0	100
	Mean	26.20	3.20	.00	3.20	.00	57.60	.00	.00	.00	9.80	.00	.00	.00	100.00
	StDev	22.92	4.49	.00	5.50	.00	26.10	.00	.00	.00	3.42	.00	.00	.00	.00
Mussels	921	5	2	3	0	0	0	1	5	0	63	21	0	0	100
	922	2	0	0	0	0	0	5	2	0	79	12	0	0	100
	923	3	0	0	0	0	0	89	0	0	0	8	0	0	100
	924	6	4	1	0	0	0	76	0	0	7	6	0	0	100
	925	28	0	1	0	0	0	68	0	0	0	3	0	0	100
	Mean	8.80	1.20	1.00	.00	.00	.00	47.80	1.40	.00	29.80	10.00	.00	.00	100.00
	StDev	10.85	1.79	1.22	.00	.00	.00	41.60	2.19	.00	38.14	6.96	.00	.00	.00
Hesperophycus	916	26	5	0	10	13	45	0	0	0	1	0	0	0	100
	917	26	13	0	19	8	30	0	0	0	4	0	0	0	100
	918	10	4	0	12	6	65	0	0	0	3	0	0	0	100
	919	55	33	0	12	0	0	0	0	0	0	0	0	0	100
	920	47	6	0	19	6	19	0	0	0	3	0	0	0	100
	951	81	10	0	9	0	0	0	0	0	0	0	0	0	100
	Mean	40.83	11.83	.00	13.50	5.50	26.50	.00	.00	.00	1.83	.00	.00	.00	100.00
	StDev	25.47	10.91	.00	4.42	4.97	25.68	.00	.00	.00	1.72	.00	.00	.00	.00

Percent Cover of Index Species

Willows Anchorage, Santa Cruz Island - Spring 2009 (4/29/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Endocladia	931	69	0	0	30	0	0	0	0	0	0	1	0	0	100
	932	57	0	0	38	0	0	0	0	0	1	4	0	0	100
	933	50	1	0	48	0	0	0	0	0	0	1	0	0	100
	934	36	0	0	59	0	0	0	0	0	4	1	0	0	100
	935	48	0	9	29	0	0	0	0	0	13	1	0	0	100
	Mean	52.00	.20	1.80	40.80	.00	.00	.00	.00	.00	3.60	1.60	.00	.00	100.00
	StDev	12.14	.45	4.02	12.72	.00	.00	.00	.00	.00	5.50	1.34	.00	.00	.00
Silvetia	946	73	0	0	18	0	0	0	0	0	7	2	0	0	100
	947	61	1	0	21	0	0	0	0	0	15	2	0	0	100
	948	72	7	0	2	0	0	0	0	0	12	7	0	0	100
	949	44	0	0	0	0	16	0	0	0	24	16	0	0	100
	950	53	0	0	9	0	0	0	0	0	36	2	0	0	100
	Mean	60.60	1.60	.00	10.00	.00	3.20	.00	.00	.00	18.80	5.80	.00	.00	100.00
	StDev	12.42	3.05	.00	9.35	.00	7.16	.00	.00	.00	11.43	6.10	.00	.00	.00
Mussels	941	12	0	14	0	0	0	61	0	0	11	2	0	0	100
	942	37	0	3	0	0	0	31	11	0	18	0	0	0	100
	943	13	0	3	0	0	0	47	6	0	28	3	0	0	100
	944	23	0	9	0	0	0	49	9	0	10	0	0	0	100
	945	4	0	6	0	0	0	58	1	1	25	5	0	0	100
	Mean	17.80	.00	7.00	.00	.00	.00	49.20	5.40	.20	18.40	2.00	.00	.00	100.00
	StDev	12.68	.00	4.64	.00	.00	.00	11.76	4.83	.45	8.08	2.12	.00	.00	.00
Hesperophycus	936	26	1	0	73	0	0	0	0	0	0	0	0	0	100
	937	67	12	0	0	0	0	0	0	0	21	0	0	0	100
	938	68	6	0	3	0	0	0	0	0	22	1	0	0	100
	939	69	3	0	0	0	0	0	0	0	28	0	0	0	100
	940	64	5	0	8	3	4	0	0	0	16	0	0	0	100
	Mean	58.80	5.40	.00	16.80	.60	.80	.00	.00	.00	17.40	.20	.00	.00	100.00
	StDev	18.43	4.16	.00	31.59	1.34	1.79	.00	.00	.00	10.62	.45	.00	.00	.00

Percent Cover of Index Species

East Point, Santa Rosa Island - Spring 2009 (5/28/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	575	55	45	0	0	0	0	0	0	0	0	0	0	0	100
	576	39	45	0	10	3	0	0	0	0	1	2	0	0	100
	577	23	12	0	37	26	2	0	0	0	0	0	0	0	100
	578	71	28	0	0	0	0	0	0	0	0	0	1	0	100
	579	29	66	0	5	0	0	0	0	0	0	0	0	0	100
	Mean	43.40	39.20	.00	10.40	5.80	.40	.00	.00	.00	.20	.40	.20	.00	100.00
	StDev	19.62	20.32	.00	15.44	11.37	.89	.00	.00	.00	.45	.89	.45	.00	.00
Endocladia	580	37	0	0	58	5	0	0	0	0	0	0	0	0	100
	581	67	0	0	32	1	0	0	0	0	0	0	0	0	100
	582	77	0	0	22	0	0	0	0	0	0	1	0	0	100
	583	72	0	0	27	1	0	0	0	0	0	0	0	0	100
	584	42	2	0	55	0	0	0	0	0	0	1	0	0	100
	Mean	59.00	.40	.00	38.80	1.40	.00	.00	.00	.00	.00	.40	.00	.00	100.00
	StDev	18.23	.89	.00	16.57	2.07	.00	.00	.00	.00	.00	.55	.00	.00	.00
Silvetia	585	67	0	0	26	2	1	0	0	0	4	0	0	0	100
	586	63	0	0	32	2	2	0	0	0	0	1	0	0	100
	587	82	0	0	7	0	11	0	0	0	0	0	0	0	100
	588	36	0	0	4	0	49	0	0	0	10	1	0	0	100
	589	75	0	0	1	0	16	1	0	0	1	6	0	0	100
	Mean	64.60	.00	.00	14.00	.80	15.80	.20	.00	.00	3.00	1.60	.00	.00	100.00
	StDev	17.59	.00	.00	14.02	1.10	19.59	.45	.00	.00	4.24	2.51	.00	.00	.00
Mussels	590	17	1	0	0	0	0	0	13	0	49	20	0	0	100
	591	13	4	0	0	0	0	0	27	0	52	4	0	0	100
	592	13	0	0	0	0	0	61	1	0	15	10	0	0	100
	593	4	0	0	0	0	0	86	1	0	4	5	0	0	100
	594	14	2	0	0	0	0	74	1	0	7	2	0	0	100
	Mean	12.20	1.40	.00	.00	.00	.00	44.20	8.60	.00	25.40	8.20	.00	.00	100.00
	StDev	4.87	1.67	.00	.00	.00	.00	41.31	11.52	.00	23.29	7.22	.00	.00	.00
Hesperophycus	570	19	0	0	67	14	0	0	0	0	0	0	0	0	100
	571	19	0	0	56	25	0	0	0	0	0	0	0	0	100
	572	29	0	0	47	24	0	0	0	0	0	0	0	0	100
	573	14	9	0	60	17	0	0	0	0	0	0	0	0	100
	574	43	3	0	36	13	2	0	0	0	2	1	0	0	100
	Mean	24.80	2.40	.00	53.20	18.60	.40	.00	.00	.00	.40	.20	.00	.00	100.00
	StDev	11.54	3.91	.00	12.03	5.59	.89	.00	.00	.00	.89	.45	.00	.00	.00

Percent Cover of Index Species

Ford Point, Santa Rosa Island - Spring 2009 (5/27/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	520	72	19	0	0	0	0	0	0	0	0	9	0	0	100
	521	65	31	0	0	0	0	1	0	0	1	2	0	0	100
	522	74	23	0	0	0	0	0	0	0	0	3	0	0	100
	523	48	4	0	47	0	0	0	0	0	0	1	0	0	100
	524	50	49	0	1	0	0	0	0	0	0	0	0	0	100
	Mean	61.80	25.20	.00	9.60	.00	.00	.20	.00	.00	.20	3.00	.00	.00	100.00
	StDev	12.17	16.53	.00	20.91	.00	.00	.45	.00	.00	.45	3.54	.00	.00	.00
Endocladia	525	38	0	0	52	0	0	6	0	0	0	4	0	0	100
	526	43	11	0	38	0	0	7	0	0	0	1	0	0	100
	527	52	7	1	31	0	0	3	0	0	5	1	0	0	100
	528	31	2	0	55	0	0	0	0	0	8	4	0	0	100
	529	42	3	0	49	0	0	0	0	0	4	2	0	0	100
	Mean	41.20	4.60	.20	45.00	.00	.00	3.20	.00	.00	3.40	2.40	.00	.00	100.00
	StDev	7.66	4.39	.45	10.12	.00	.00	3.27	.00	.00	3.44	1.52	.00	.00	.00
Mussels	530	65	0	0	0	0	0	26	0	0	0	9	0	0	100
	531	14	0	0	0	0	0	82	0	1	0	3	0	0	100
	532	2	7	0	0	0	0	0	19	0	41	31	0	0	100
	533	33	1	0	0	0	0	64	0	0	1	1	0	0	100
	534	7	3	0	0	0	0	0	21	0	27	42	0	0	100
	Mean	24.20	2.20	.00	.00	.00	.00	34.40	8.00	.20	13.80	17.20	.00	.00	100.00
	StDev	25.67	2.95	.00	.00	.00	.00	37.35	10.98	.45	19.10	18.28	.00	.00	.00

Percent Cover of Index Species

Fossil Reef, Santa Rosa Island - Spring 2009 (5/30/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	605	55	43	0	1	0	0	0	0	0	0	1	0	0	100
	606	62	33	0	0	0	0	0	0	0	0	1	4	0	100
	607	54	39	0	7	0	0	0	0	0	0	0	0	0	100
	608	79	21	0	0	0	0	0	0	0	0	0	0	0	100
	609	79	21	0	0	0	0	0	0	0	0	0	0	0	100
	Mean	65.80	31.40	.00	1.60	.00	.00	.00	.00	.00	.00	.40	.80	.00	100.00
	StDev	12.44	10.14	.00	3.05	.00	.00	.00	.00	.00	.00	.55	1.79	.00	.00
Endocladia	610	35	34	0	30	0	0	0	0	0	1	0	0	0	100
	611	47	9	0	12	0	32	0	0	0	0	0	0	0	100
	612	31	14	0	52	0	0	0	0	0	2	1	0	0	100
	613	37	11	0	47	0	3	0	0	0	1	1	0	0	100
	614	47	1	0	50	0	0	0	0	0	1	1	0	0	100
	Mean	39.40	13.80	.00	38.20	.00	7.00	.00	.00	.00	1.00	.60	.00	.00	100.00
	StDev	7.27	12.28	.00	17.04	.00	14.04	.00	.00	.00	.71	.55	.00	.00	.00
Silvetia	615	24	20	0	44	0	10	0	0	0	0	2	0	0	100
	616	52	0	0	36	0	9	0	0	0	2	1	0	0	100
	617	40	2	0	16	0	41	0	0	0	0	1	0	0	100
	618	15	0	0	9	0	74	0	0	0	1	1	0	0	100
	619	4	0	0	0	0	96	0	0	0	0	0	0	0	100
	Mean	27.00	4.40	.00	21.00	.00	46.00	.00	.00	.00	.60	1.00	.00	.00	100.00
	StDev	19.21	8.76	.00	18.47	.00	38.65	.00	.00	.00	.89	.71	.00	.00	.00
Mussels	620	19	0	0	0	0	0	2	4	0	64	11	0	0	100
	621	43	0	4	1	0	0	1	0	0	47	4	0	0	100
	622	54	0	10	0	0	0	3	0	0	33	0	0	0	100
	623	43	0	8	1	0	0	22	0	1	18	7	0	0	100
	624	4	0	1	0	0	0	0	17	0	64	14	0	0	100
	Mean	32.60	.00	4.60	.40	.00	.00	5.60	4.20	.20	45.20	7.20	.00	.00	100.00
	StDev	20.48	.00	4.34	.55	.00	.00	9.24	7.36	.45	19.99	5.54	.00	.00	.00

Percent Cover of Index Species

Johnson's Lee, Santa Rosa Island - Spring 2009 (5/26/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	500	54	46	0	0	0	0	0	0	0	0	0	0	0	100
	501	50	50	0	0	0	0	0	0	0	0	0	0	0	100
	502	63	35	0	0	0	0	0	0	0	0	2	0	0	100
	503	27	47	0	25	0	0	0	0	0	0	1	0	0	100
	504	49	46	1	0	0	0	0	0	0	0	4	0	0	100
	Mean	48.60	44.80	.20	5.00	.00	.00	.00	.00	.00	.00	1.40	.00	.00	100.00
	StDev	13.28	5.72	.45	11.18	.00	.00	.00	.00	.00	.00	1.67	.00	.00	.00
Endocladia	505	83	1	0	1	0	0	11	0	0	0	4	0	0	100
	506	45	2	0	50	0	0	1	0	0	0	2	0	0	100
	507	40	0	0	48	0	0	11	0	0	0	1	0	0	100
	508	32	5	0	34	0	0	24	0	3	0	2	0	0	100
	509	42	17	2	36	0	0	0	0	0	0	3	0	0	100
	Mean	48.40	5.00	.40	33.80	.00	.00	9.40	.00	.60	.00	2.40	.00	.00	100.00
	StDev	19.93	6.96	.89	19.65	.00	.00	9.71	.00	1.34	.00	1.14	.00	.00	.00
Mussels	510	8	3	0	0	0	0	1	9	0	1	78	0	0	100
	511	4	0	1	0	0	0	1	2	0	1	91	0	0	100
	512	29	0	1	0	0	0	58	0	5	0	7	0	0	100
	513	25	0	0	0	0	0	0	10	0	29	36	0	0	100
	514	4	0	0	0	0	0	0	7	0	6	83	0	0	100
	515	18	0	0	0	0	0	78	0	0	0	4	0	0	100
	516	17	1	2	0	0	0	72	0	7	0	1	0	0	100
	517	24	0	0	0	0	0	67	0	3	1	5	0	0	100
	518	17	0	0	0	0	0	77	0	0	0	6	0	0	100
	Mean	16.22	.44	.44	.00	.00	.00	39.33	3.11	1.67	4.22	34.56	.00	.00	100.00
	StDev	9.16	1.01	.73	.00	.00	.00	37.30	4.28	2.69	9.48	38.62	.00	.00	.00

Percent Cover of Index Species

Northwest-Talcott, Santa Rosa Island - Spring 2009 (5/29/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	560	52	47	0	0	0	0	0	0	0	0	0	1	0	100
	561	51	45	0	0	0	1	0	0	0	3	0	0	0	100
	562	14	62	0	4	0	17	0	0	0	0	3	0	0	100
	563	29	6	0	6	0	58	0	0	0	1	0	0	0	100
	564	72	11	0	0	0	17	0	0	0	0	0	0	0	100
	Mean	43.60	34.20	.00	2.00	.00	18.60	.00	.00	.00	.80	.60	.20	.00	100.00
	StDev	22.48	24.43	.00	2.83	.00	23.52	.00	.00	.00	1.30	1.34	.45	.00	.00
Endocladia	555	62	0	0	18	0	20	0	0	0	0	0	0	0	100
	556	57	1	0	21	0	21	0	0	0	0	0	0	0	100
	557	60	2	0	6	0	26	0	0	0	4	2	0	0	100
	558	49	5	1	34	0	2	0	0	0	6	3	0	0	100
	559	78	0	0	5	0	0	0	0	0	14	3	0	0	100
	Mean	61.20	1.60	.20	16.80	.00	13.80	.00	.00	.00	4.80	1.60	.00	.00	100.00
	StDev	10.62	2.07	.45	11.95	.00	11.92	.00	.00	.00	5.76	1.52	.00	.00	.00
Silvetia	565	18	0	0	0	0	79	0	0	0	3	0	0	0	100
	566	63	0	0	0	0	36	0	0	0	0	0	1	0	100
	567	32	0	0	0	0	65	0	0	0	2	1	0	0	100
	568	4	0	0	1	0	93	0	0	0	2	0	0	0	100
	569	81	1	0	16	0	2	0	0	0	0	0	0	0	100
	Mean	39.60	.20	.00	3.40	.00	55.00	.00	.00	.00	1.40	.20	.20	.00	100.00
	StDev	31.83	.45	.00	7.06	.00	36.37	.00	.00	.00	1.34	.45	.45	.00	.00
Mussels	550	53	0	0	0	0	0	17	1	4	19	6	0	0	100
	551	16	0	0	0	0	0	55	1	0	21	7	0	0	100
	552	33	0	0	0	0	0	28	2	1	31	5	0	0	100
	553	44	0	1	0	0	0	26	0	5	21	3	0	0	100
	554	35	0	1	0	0	0	15	3	6	36	4	0	0	100
	Mean	36.20	.00	.40	.00	.00	.00	28.20	1.40	3.20	25.60	5.00	.00	.00	100.00
	StDev	13.81	.00	.55	.00	.00	.00	15.99	1.14	2.59	7.47	1.58	.00	.00	.00

Percent Cover of Index Species

Cat Rock, Anacapa Island - Fall 2009 (11/30/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	31	65	32	0	3	0	0	0	0	0	0	0	0	0	100
	32	77	15	0	8	0	0	0	0	0	0	0	0	0	100
	33	66	19	0	10	0	0	0	0	0	4	0	0	1	100
	35	73	22	0	4	0	0	0	0	0	1	0	0	0	100
	36	59	33	0	5	2	0	0	0	0	1	0	0	0	100
	37	61	23	0	10	0	0	0	0	0	6	0	0	0	100
	38	94	6	0	0	0	0	0	0	0	0	0	0	0	100
	39	67	33	0	0	0	0	0	0	0	0	0	0	0	100
	135	60	38	0	0	0	0	0	0	0	2	0	0	0	100
	Mean	69.11	24.56	.00	4.44	.22	.00	.00	.00	.00	1.56	.00	.00	.11	100.00
	StDev	11.06	10.33	.00	4.13	.67	.00	.00	.00	.00	2.13	.00	.00	.33	.00
Endocladia	13	38	3	4	39	0	0	6	0	0	10	0	0	0	100
	14	37	10	16	15	0	0	10	0	0	12	0	0	0	100
	19	66	1	0	29	0	1	0	0	0	3	0	0	0	100
	51	17	2	4	8	0	0	0	9	0	59	1	0	0	100
	52	13	0	2	28	0	0	18	4	0	35	0	0	0	100
	54	20	2	3	20	0	0	4	5	0	46	0	0	0	100
	212	36	2	1	47	0	0	6	0	0	8	0	0	0	100
	467	33	1	5	21	0	0	25	0	0	14	1	0	0	100
	492	32	4	2	41	0	1	1	0	0	18	1	0	0	100
	Mean	32.44	2.78	4.11	27.56	.00	.22	7.78	2.00	.00	22.78	.33	.00	.00	100.00
	StDev	15.66	2.95	4.73	12.90	.00	.44	8.61	3.28	.00	19.33	.50	.00	.00	.00
Silvetia	2	35	17	0	25	19	0	0	0	0	4	0	0	0	100
	3	55	32	0	11	2	0	0	0	0	0	0	0	0	100
	4	58	22	0	17	2	0	0	0	0	1	0	0	0	100
	5	44	8	1	23	1	3	3	0	0	16	1	0	0	100
	6	52	3	0	10	11	8	1	0	0	11	4	0	0	100
	8	82	4	0	6	0	2	0	0	0	6	0	0	0	100
	9	74	3	0	5	2	13	0	0	0	3	0	0	0	100
	10	88	5	0	5	0	0	0	0	0	1	1	0	0	100
	55	41	19	5	18	0	0	0	0	0	17	0	0	0	100
	Mean	58.78	12.56	.67	13.33	4.11	2.89	.44	.00	.00	6.56	.67	.00	.00	100.00
	StDev	18.66	10.38	1.66	7.70	6.55	4.62	1.01	.00	.00	6.54	1.32	.00	.00	.00

Percent Cover of Index Species
Cat Rock, Anacapa Island - Fall 2009 (11/30/09) (continued)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra- clita	Endo- cladia	Hespero- phycus	Silvetia	Mussels	Turf- weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Mussels	56	8	0	9	0	0	0	40	1	0	39	3	0	0	100
	164	18	1	20	0	0	0	37	1	0	21	2	0	0	100
	203	25	1	8	1	0	0	29	3	0	30	3	0	0	100
	204	10	0	9	0	0	0	56	3	0	13	9	0	0	100
	468	17	0	7	0	0	0	24	1	0	50	1	0	0	100
	470	29	1	17	6	0	0	23	2	0	21	1	0	0	100
	471	22	0	7	8	0	0	34	0	0	28	1	0	0	100
	472	8	0	8	0	0	0	62	0	0	16	6	0	0	100
	473	37	0	10	0	0	0	27	4	0	22	0	0	0	100
	Mean	19.33	.33	10.56	1.67	.00	.00	36.89	1.67	.00	26.67	2.89	.00	.00	100.00
	StDev	9.97	.50	4.67	3.08	.00	.00	13.84	1.41	.00	11.70	2.89	.00	.00	.00

Percent Cover of Index Species Middle-East, Anacapa Island - Fall 2009 (12/15/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra- clita	Endo- cladia	Hespero- phycus	Silvetia	Mussels	Turf- weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	243	61	1	19	0	0	0	0	0	0	19	0	0	0	100
	244	70	1	3	8	0	0	0	0	0	16	2	0	0	100
	245	76	0	6	5	0	0	1	0	0	8	4	0	0	100
	Mean	69.00	.67	9.33	4.33	.00	.00	.33	.00	.00	14.33	2.00	.00	.00	100.00
	StDev	7.55	.58	8.50	4.04	.00	.00	.58	.00	.00	5.69	2.00	.00	.00	.00
Endocladia	240	45	1	1	11	0	0	0	1	0	41	0	0	0	100
	241	40	0	15	7	0	0	0	0	0	37	1	0	0	100
	242	69	3	3	16	0	0	0	0	0	9	0	0	0	100
	Mean	51.33	1.33	6.33	11.33	.00	.00	.00	.33	.00	29.00	.33	.00	.00	100.00
	StDev	15.50	1.53	7.57	4.51	.00	.00	.00	.58	.00	17.44	.58	.00	.00	.00
Silvetia	53	48	0	8	0	0	0	0	2	0	42	0	0	0	100
	237	34	3	0	2	0	0	0	11	0	50	0	0	0	100
	469	73	0	4	0	0	0	0	0	0	22	1	0	0	100
	Mean	51.67	1.00	4.00	.67	.00	.00	.00	4.33	.00	38.00	.33	.00	.00	100.00
	StDev	19.76	1.73	4.00	1.15	.00	.00	.00	5.86	.00	14.42	.58	.00	.00	.00
Mussels	476	3	0	9	0	0	0	0	6	0	80	2	0	0	100
	477	4	0	14	0	0	0	0	5	0	76	1	0	0	100
	478	3	0	5	0	0	0	0	3	0	89	0	0	0	100
	Mean	3.33	.00	9.33	.00	.00	.00	.00	4.67	.00	81.67	1.00	.00	.00	100.00
	StDev	.58	.00	4.51	.00	.00	.00	.00	1.53	.00	6.66	1.00	.00	.00	.00

Percent Cover of Index Species

Middle-West, Anacapa Island - Fall 2009 (12/15/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	447	61	35	0	0	0	0	0	0	0	4	0	0	0	100
	448	50	4	4	10	0	0	1	3	0	28	0	0	0	100
	449	55	10	1	1	0	0	0	0	0	30	3	0	0	100
	450	62	12	0	3	0	0	0	0	0	23	0	0	0	100
	451	64	6	0	19	0	0	0	0	0	11	0	0	0	100
	Mean	58.40	13.40	1.00	6.60	.00	.00	.20	.60	.00	19.20	.60	.00	.00	100.00
	StDev	5.77	12.48	1.73	7.96	.00	.00	.45	1.34	.00	11.26	1.34	.00	.00	.00
Endocladia	457	9	0	2	35	0	0	0	5	0	48	1	0	0	100
	458	43	0	3	29	0	0	0	1	0	24	0	0	0	100
	459	57	1	3	5	0	0	0	0	0	34	0	0	0	100
	460	68	17	0	8	0	0	0	0	0	6	1	0	0	100
	461	85	10	0	2	0	0	0	0	0	3	0	0	0	100
	Mean	52.40	5.60	1.60	15.80	.00	.00	.00	1.20	.00	23.00	.40	.00	.00	100.00
	StDev	28.72	7.64	1.52	15.09	.00	.00	.00	2.17	.00	18.95	.55	.00	.00	.00
Silvetia	452	89	7	0	0	0	0	0	0	0	2	2	0	0	100
	453	82	1	4	0	0	0	0	0	0	13	0	0	0	100
	454	13	0	3	13	0	0	0	9	0	62	0	0	0	100
	455	48	0	4	11	0	0	0	0	0	33	4	0	0	100
	456	60	0	9	3	0	0	0	1	0	27	0	0	0	100
	Mean	58.40	1.60	4.00	5.40	.00	.00	.00	2.00	.00	27.40	1.20	.00	.00	100.00
	StDev	30.27	3.05	3.24	6.19	.00	.00	.00	3.94	.00	22.81	1.79	.00	.00	.00
Mussels	462	24	0	13	3	0	0	0	14	0	43	3	0	0	100
	463	17	0	18	1	0	0	0	2	0	62	0	0	0	100
	464	19	0	9	0	0	0	0	11	0	60	1	0	0	100
	465	1	0	24	0	0	0	0	23	0	52	0	0	0	100
	466	2	0	4	1	0	0	0	2	0	89	2	0	0	100
	Mean	12.60	.00	13.60	1.00	.00	.00	.00	10.40	.00	61.20	1.20	.00	.00	100.00
	StDev	10.45	.00	7.77	1.22	.00	.00	.00	8.85	.00	17.25	1.30	.00	.00	.00

Percent Cover of Index Species

S. Frenchy's Cove, Anacapa Island - Fall 2009 (12/2/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	249	30	28	0	42	0	0	0	0	0	0	0	0	0	100
	250	31	36	0	28	0	0	0	0	0	5	0	0	0	100
	251	60	32	0	5	0	0	0	0	0	1	2	0	0	100
	252	66	17	0	11	0	0	0	0	0	3	1	2	0	100
	253	21	34	0	43	1	0	0	0	0	1	0	0	0	100
	Mean	41.60	29.40	.00	25.80	.20	.00	.00	.00	.00	2.00	.60	.40	.00	100.00
	StDev	20.03	7.54	.00	17.43	.45	.00	.00	.00	.00	2.00	.89	.89	.00	.00
Endocladia	154	4	0	0	93	0	3	0	0	0	0	0	0	0	100
	155	9	0	0	77	0	9	0	0	0	5	0	0	0	100
	256	9	0	0	73	1	3	0	1	0	13	0	0	0	100
	257	11	0	0	87	0	0	0	0	0	2	0	0	0	100
	258	14	0	0	53	0	31	0	0	0	2	0	0	0	100
	Mean	9.40	.00	.00	76.60	.20	9.20	.00	.20	.00	4.40	.00	.00	.00	100.00
	StDev	3.65	.00	.00	15.39	.45	12.62	.00	.45	.00	5.13	.00	.00	.00	.00
Silvetia	259	22	9	0	0	0	24	0	0	0	45	0	0	0	100
	260	26	3	0	13	0	43	0	0	0	15	0	0	0	100
	261	19	3	0	1	0	23	0	0	0	54	0	0	0	100
	262	34	4	0	20	0	5	0	0	0	35	2	0	0	100
	263	55	0	0	1	0	38	0	0	0	5	1	0	0	100
	Mean	31.20	3.80	.00	7.00	.00	26.60	.00	.00	.00	30.80	.60	.00	.00	100.00
	StDev	14.45	3.27	.00	9.03	.00	14.88	.00	.00	.00	20.45	.89	.00	.00	.00
Mussels	201	3	0	0	0	0	0	50	27	0	19	1	0	0	100
	202	8	0	0	0	0	0	45	19	0	24	4	0	0	100
	264	5	0	0	0	0	0	38	31	0	25	1	0	0	100
	265	4	0	0	0	0	0	75	6	0	15	0	0	0	100
	266	13	0	0	0	0	0	22	6	0	55	4	0	0	100
	Mean	6.60	.00	.00	.00	.00	.00	46.00	17.80	.00	27.60	2.00	.00	.00	100.00
	StDev	4.04	.00	.00	.00	.00	.00	19.35	11.61	.00	15.84	1.87	.00	.00	.00

Percent Cover of Index Species

Crook Point, San Miguel Island - Fall 2009 (11/14/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	137	84	16	0	0	0	0	0	0	0	0	0	0	0	100
	147	92	8	0	0	0	0	0	0	0	0	0	0	0	100
	148	90	10	0	0	0	0	0	0	0	0	0	0	0	100
	149	79	6	0	11	0	0	3	0	0	0	1	0	0	100
	495	68	27	0	5	0	0	0	0	0	0	0	0	0	100
	Mean	82.60	13.40	.00	3.20	.00	.00	.60	.00	.00	.00	.20	.00	.00	100.00
	StDev	9.63	8.47	.00	4.87	.00	.00	1.34	.00	.00	.00	.45	.00	.00	.00
Endocladia	386	75	5	0	16	0	0	0	0	0	0	4	0	0	100
	387	21	0	0	43	0	0	0	0	0	36	0	0	0	100
	388	71	16	0	7	0	0	0	0	0	3	3	0	0	100
	389	15	0	0	34	5	0	36	0	3	6	1	0	0	100
	390	50	4	0	18	0	0	9	0	0	17	2	0	0	100
	Mean	46.40	5.00	.00	23.60	1.00	.00	9.00	.00	.60	12.40	2.00	.00	.00	100.00
	StDev	27.69	6.56	.00	14.57	2.24	.00	15.59	.00	1.34	14.67	1.58	.00	.00	.00
Silvetia	396	35	1	0	38	1	0	12	0	1	11	1	0	0	100
	397	2	0	0	0	0	0	94	0	0	4	0	0	0	100
	398	65	1	0	10	0	0	14	0	4	5	1	0	0	100
	399	62	0	0	0	0	0	0	9	0	25	4	0	0	100
	400	44	1	0	52	2	0	1	0	0	0	0	0	0	100
	Mean	41.60	.60	.00	20.00	.60	.00	24.20	1.80	1.00	9.00	1.20	.00	.00	100.00
	StDev	25.40	.55	.00	23.71	.89	.00	39.52	4.02	1.73	9.77	1.64	.00	.00	.00
Mussels	381	22	0	0	0	0	0	60	0	2	15	1	0	0	100
	382	1	0	0	0	0	0	94	0	0	4	1	0	0	100
	383	3	0	0	0	0	0	94	0	0	2	1	0	0	100
	384	11	1	1	0	0	0	76	0	0	11	0	0	0	100
	385	22	1	0	0	0	0	65	0	1	6	5	0	0	100
	Mean	11.80	.40	.20	.00	.00	.00	77.80	.00	.60	7.60	1.60	.00	.00	100.00
	StDev	10.03	.55	.45	.00	.00	.00	15.88	.00	.89	5.32	1.95	.00	.00	.00

Percent Cover of Index Species

Cuyler Harbor, San Miguel Island - Fall 2009 (11/16/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	416	35	65	0	0	0	0	0	0	0	0	0	0	0	100
	417	68	12	0	20	0	0	0	0	0	0	0	0	0	100
	418	47	52	0	1	0	0	0	0	0	0	0	0	0	100
	419	76	14	0	10	0	0	0	0	0	0	0	0	0	100
	420	47	6	0	47	0	0	0	0	0	0	0	0	0	100
	Mean	54.60	29.80	.00	15.60	.00	.00	.00	.00	.00	.00	.00	.00	.00	100.00
	StDev	16.86	26.76	.00	19.32	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Endocladia	411	51	2	7	16	0	0	16	0	0	5	3	0	0	100
	412	29	21	0	25	0	0	17	1	1	5	0	1	0	100
	413	53	0	0	22	0	18	0	0	0	6	1	0	0	100
	414	51	5	0	35	0	0	0	2	0	7	0	0	0	100
	415	38	0	0	49	0	0	0	1	0	12	0	0	0	100
	Mean	44.40	5.60	1.40	29.40	.00	3.60	6.60	.80	.20	7.00	.80	.20	.00	100.00
	StDev	10.48	8.85	3.13	12.93	.00	8.05	9.04	.84	.45	2.92	1.30	.45	.00	.00
Silvetia	406	11	0	0	10	0	44	0	4	0	23	8	0	0	100
	407	10	0	0	0	0	81	0	0	0	7	2	0	0	100
	408	89	0	1	5	0	2	0	0	0	2	1	0	0	100
	409	88	2	0	2	0	1	0	1	0	3	3	0	0	100
	410	85	0	9	1	0	0	0	0	0	3	2	0	0	100
	Mean	56.60	.40	2.00	3.60	.00	25.60	.00	1.00	.00	7.60	3.20	.00	.00	100.00
	StDev	42.11	.89	3.94	4.04	.00	36.14	.00	1.73	.00	8.82	2.77	.00	.00	.00
Mussels	401	19	3	24	0	0	0	0	2	2	42	8	0	0	100
	402	1	6	0	0	0	0	53	10	0	20	10	0	0	100
	403	7	0	1	0	0	0	53	9	1	21	8	0	0	100
	404	17	0	19	0	0	0	13	11	1	28	11	0	0	100
	405	34	0	5	0	0	0	53	0	3	2	3	0	0	100
	Mean	15.60	1.80	9.80	.00	.00	.00	34.40	6.40	1.40	22.60	8.00	.00	.00	100.00
	StDev	12.64	2.68	10.99	.00	.00	.00	25.88	5.03	1.14	14.48	3.08	.00	.00	.00

Percent Cover of Index Species

Harris Point, San Miguel Island - Fall 2009 (11/15/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	440	51	49	0	0	0	0	0	0	0	0	0	0	0	100
	441	42	58	0	0	0	0	0	0	0	0	0	0	0	100
	442	52	47	0	0	0	0	0	0	0	1	0	0	0	100
	443	63	31	0	0	0	0	0	0	0	0	0	6	0	100
	444	59	41	0	0	0	0	0	0	0	0	0	0	0	100
	Mean	53.40	45.20	.00	.00	.00	.00	.00	.00	.00	.20	.00	1.20	.00	100.00
	StDev	8.08	10.01	.00	.00	.00	.00	.00	.00	.00	.45	.00	2.68	.00	.00
Endocladia	431	39	28	1	8	0	0	6	0	0	18	0	0	0	100
	432	51	9	0	13	0	0	0	0	0	27	0	0	0	100
	433	63	11	0	5	0	0	0	0	0	21	0	0	0	100
	434	97	1	0	1	0	0	0	0	0	1	0	0	0	100
	435	13	0	0	2	61	0	0	0	0	23	1	0	0	100
	Mean	52.60	9.80	.20	5.80	12.20	.00	1.20	.00	.00	18.00	.20	.00	.00	100.00
	StDev	30.96	11.26	.45	4.87	27.28	.00	2.68	.00	.00	10.05	.45	.00	.00	.00
Mussels	426	43	0	1	0	0	0	44	0	4	7	1	0	0	100
	427	56	6	2	8	6	0	2	0	0	15	5	0	0	100
	428	78	13	1	0	4	0	1	0	0	1	2	0	0	100
	429	58	31	0	1	0	0	1	0	0	7	2	0	0	100
	430	17	0	4	0	0	0	44	0	1	34	0	0	0	100
	Mean	50.40	10.00	1.60	1.80	2.00	.00	18.40	.00	1.00	12.80	2.00	.00	.00	100.00
	StDev	22.48	12.90	1.52	3.49	2.83	.00	23.37	.00	1.73	12.85	1.87	.00	.00	.00
Tetraclita	436	22	7	18	0	0	0	29	0	0	21	3	0	0	100
	437	24	0	22	0	0	0	13	0	0	38	3	0	0	100
	438	15	0	0	1	0	0	0	23	0	60	1	0	0	100
	439	59	0	15	0	0	0	15	0	0	9	2	0	0	100
	445	51	0	13	0	0	0	13	0	1	18	4	0	0	100
	Mean	34.20	1.40	13.60	.20	.00	.00	14.00	4.60	.20	29.20	2.60	.00	.00	100.00
	StDev	19.49	3.13	8.32	.45	.00	.00	10.30	10.29	.45	20.17	1.14	.00	.00	.00
Hesperophycus	421	52	1	0	17	30	0	0	0	0	0	0	0	0	100
	422	64	5	0	9	6	0	0	0	0	14	2	0	0	100
	423	24	1	0	22	33	0	0	0	0	20	0	0	0	100
	424	100	0	0	0	0	0	0	0	0	0	0	0	0	100
	425	59	0	0	0	41	0	0	0	0	0	0	0	0	100
	Mean	59.80	1.40	.00	9.60	22.00	.00	.00	.00	.00	6.80	.40	.00	.00	100.00
	StDev	27.28	2.07	.00	9.91	17.93	.00	.00	.00	.00	9.55	.89	.00	.00	.00

Percent Cover of Index Species

Otter Harbor, San Miguel Island - Fall 2009 (11/13/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	370	95	5	0	0	0	0	0	0	0	0	0	0	0	100
	371	53	25	0	0	0	0	0	0	0	0	0	22	0	100
	372	56	43	0	0	0	0	0	0	0	0	1	0	0	100
	373	39	61	0	0	0	0	0	0	0	0	0	0	0	100
	374	1	0	0	0	0	0	0	22	0	77	0	0	0	100
	Mean	48.80	26.80	.00	.00	.00	.00	.00	4.40	.00	15.40	.20	4.40	.00	100.00
	StDev	33.86	25.64	.00	.00	.00	.00	.00	9.84	.00	34.44	.45	9.84	.00	.00
Endocladia	360	36	8	7	26	0	10	6	0	1	5	1	0	0	100
	361	69	10	0	20	0	0	0	0	0	1	0	0	0	100
	362	21	0	0	77	0	0	0	0	1	0	1	0	0	100
	363	49	3	0	41	0	0	0	0	0	5	2	0	0	100
	364	34	0	0	62	0	0	0	0	0	3	1	0	0	100
	Mean	41.80	4.20	1.40	45.20	.00	2.00	1.20	.00	.40	2.80	1.00	.00	.00	100.00
	StDev	18.16	4.60	3.13	24.06	.00	4.47	2.68	.00	.55	2.28	.71	.00	.00	.00
Silvetia	355	61	32	0	1	0	0	0	0	0	3	2	1	0	100
	356	49	0	0	35	1	1	0	0	1	13	0	0	0	100
	357	56	2	0	40	0	0	2	0	0	0	0	0	0	100
	358	42	44	0	13	0	0	0	0	0	0	1	0	0	100
	359	50	37	0	4	0	0	0	0	0	2	4	3	0	100
	Mean	51.60	23.00	.00	18.60	.20	.20	.40	.00	.20	3.60	1.40	.80	.00	100.00
	StDev	7.23	20.54	.00	17.90	.45	.45	.89	.00	.45	5.41	1.67	1.30	.00	.00
Mussels	375	12	0	3	0	0	0	45	0	8	32	0	0	0	100
	376	16	0	0	0	0	0	50	0	1	32	1	0	0	100
	378	11	0	1	1	0	0	43	3	16	24	1	0	0	100
	379	41	3	1	6	0	0	15	2	6	24	2	0	0	100
	380	31	0	0	0	0	0	48	0	3	18	0	0	0	100
	Mean	22.20	.60	1.00	1.40	.00	.00	40.20	1.00	6.80	26.00	.80	.00	.00	100.00
	StDev	13.22	1.34	1.22	2.61	.00	.00	14.34	1.41	5.81	6.00	.84	.00	.00	.00

Percent Cover of Index Species

Landing Cove, Santa Barbara Island - Fall 2009 (10/15/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Phyllo-spadiX	Total
Chthamalus/Balanus	315	78	0	5	5	0	0	0	0	0	12	0	0	0	100
	316	38	0	2	4	0	0	0	0	0	55	1	0	0	100
	317	44	0	5	3	0	0	5	3	0	40	0	0	0	100
	318	17	0	29	0	0	0	38	0	0	14	2	0	0	100
	319	38	1	19	9	0	0	2	0	0	29	2	0	0	100
	Mean	43.00	.20	12.00	4.20	.00	.00	9.00	.60	.00	30.00	1.00	.00	.00	100.00
	StDev	22.09	.45	11.58	3.27	.00	.00	16.34	1.34	.00	18.07	1.00	.00	.00	.00
Silvetia	310	53	0	0	0	0	0	1	4	0	42	0	0	0	100
	311	64	0	0	0	0	0	1	2	0	32	1	0	0	100
	312	55	3	0	0	0	0	1	8	0	33	0	0	0	100
	313	52	0	0	0	0	0	0	7	0	41	0	0	0	100
	314	49	0	0	0	0	3	0	8	0	38	2	0	0	100
	Mean	54.60	.60	.00	.00	.00	.60	.60	5.80	.00	37.20	.60	.00	.00	100.00
	StDev	5.68	1.34	.00	.00	.00	1.34	.55	2.68	.00	4.55	.89	.00	.00	.00
Mussels	325	3	0	3	0	0	0	75	10	0	8	1	0	0	100
	326	0	0	0	0	0	0	97	0	0	3	0	0	0	100
	327	0	0	0	0	0	0	99	0	1	0	0	0	0	100
	328	1	0	5	0	0	0	83	0	0	11	0	0	0	100
	329	18	0	40	0	0	0	2	3	0	33	4	0	0	100
	Mean	4.40	.00	9.60	.00	.00	.00	71.20	2.60	.20	11.00	1.00	.00	.00	100.00
	StDev	7.70	.00	17.13	.00	.00	.00	39.94	4.34	.45	13.02	1.73	.00	.00	.00
Red Algal Turf	320	0	0	0	0	0	0	0	93	0	7	0	0	0	100
	321	2	0	0	0	0	0	23	43	0	32	0	0	0	100
	322	9	0	0	0	0	0	19	0	0	66	0	0	6	100
	323	0	0	0	0	0	0	37	1	0	10	7	0	45	100
	324	0	0	0	0	0	0	0	41	0	59	0	0	0	100
	Mean	2.20	.00	.00	.00	.00	.00	15.80	35.60	.00	34.80	1.40	.00	10.20	100.00
	StDev	3.90	.00	.00	.00	.00	.00	15.90	38.22	.00	27.18	3.13	.00	19.63	.00

Percent Cover of Index Species

Sea Lion Rookery, Santa Barbara Island - Fall 2009 (10/16/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	345	29	2	0	1	0	0	7	0	0	61	0	0	0	100
	346	59	4	1	0	0	0	0	0	0	36	0	0	0	100
	347	43	3	0	0	0	0	0	0	0	54	0	0	0	100
	348	26	4	0	2	0	0	0	0	0	68	0	0	0	100
	349	37	5	0	0	0	0	0	0	0	58	0	0	0	100
	Mean	38.80	3.60	.20	.60	.00	.00	1.40	.00	.00	55.40	.00	.00	.00	100.00
	StDev	13.12	1.14	.45	.89	.00	.00	3.13	.00	.00	11.99	.00	.00	.00	.00
Endocladia	335	34	1	1	3	0	0	0	0	0	61	0	0	0	100
	336	19	0	1	1	0	0	0	0	0	79	0	0	0	100
	337	11	0	2	7	0	0	10	2	5	62	1	0	0	100
	338	27	1	2	10	0	0	2	0	0	58	0	0	0	100
	339	15	0	8	15	0	0	1	0	0	61	0	0	0	100
	Mean	21.20	.40	2.80	7.20	.00	.00	2.60	.40	1.00	64.20	.20	.00	.00	100.00
	StDev	9.28	.55	2.95	5.59	.00	.00	4.22	.89	2.24	8.41	.45	.00	.00	.00
Silvetia	330	44	0	4	0	0	0	20	1	0	25	6	0	0	100
	331	19	0	0	3	0	33	4	2	0	39	0	0	0	100
	332	28	0	0	1	0	8	3	10	0	50	0	0	0	100
	333	3	0	0	0	0	11	4	45	0	37	0	0	0	100
	334	15	0	0	1	0	12	1	10	0	60	1	0	0	100
	Mean	21.80	.00	.80	1.00	.00	12.80	6.40	13.60	.00	42.20	1.40	.00	.00	100.00
	StDev	15.32	.00	1.79	1.22	.00	12.24	7.70	18.06	.00	13.33	2.61	.00	.00	.00
Mussels	350	0	0	4	0	0	0	0	0	0	84	12	0	0	100
	351	0	0	3	0	0	0	0	0	0	94	3	0	0	100
	352	3	0	6	0	0	0	0	0	0	91	0	0	0	100
	353	0	0	0	0	0	0	0	0	0	99	1	0	0	100
	354	7	0	6	0	0	0	0	10	0	76	1	0	0	100
	Mean	2.00	.00	3.80	.00	.00	.00	.00	2.00	.00	88.80	3.40	.00	.00	100.00
	StDev	3.08	.00	2.49	.00	.00	.00	.00	4.47	.00	8.98	4.93	.00	.00	.00

Percent Cover of Index Species

Fraser Cove, Santa Cruz Island - Fall 2009 (11/3/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	876	41	55	0	0	0	0	2	0	0	1	0	1	0	100
	877	36	51	0	4	0	0	5	0	0	4	0	0	0	100
	878	55	38	0	1	0	0	0	0	0	0	0	6	0	100
	879	56	36	0	5	0	0	0	0	0	0	0	3	0	100
	880	77	21	0	0	0	0	0	0	0	0	0	2	0	100
	Mean	53.00	40.20	.00	2.00	.00	.00	1.40	.00	.00	1.00	.00	2.40	.00	100.00
	StDev	15.98	13.48	.00	2.35	.00	.00	2.19	.00	.00	1.73	.00	2.30	.00	.00
Endocladia	881	39	0	0	32	0	0	16	0	0	11	2	0	0	100
	882	69	8	0	16	0	0	3	0	0	4	0	0	0	100
	883	63	4	28	0	0	0	0	0	0	5	0	0	0	100
	884	14	3	0	81	0	0	0	0	0	2	0	0	0	100
	885	16	36	0	37	0	0	0	0	0	10	1	0	0	100
	Mean	40.20	10.20	5.60	33.20	.00	.00	3.80	.00	.00	6.40	.60	.00	.00	100.00
	StDev	25.61	14.70	12.52	30.41	.00	.00	6.94	.00	.00	3.91	.89	.00	.00	.00
Silvetia	896	62	0	0	11	11	0	0	0	0	16	0	0	0	100
	897	21	8	0	6	13	12	0	15	0	24	0	0	1	100
	898	31	0	0	4	1	50	0	2	0	12	0	0	0	100
	899	65	6	0	7	4	1	0	1	0	15	1	0	0	100
	900	8	6	0	0	26	60	0	0	0	0	0	0	0	100
	Mean	37.40	4.00	.00	5.60	11.00	24.60	.00	3.60	.00	13.40	.20	.00	.20	100.00
	StDev	25.21	3.74	.00	4.04	9.72	28.37	.00	6.43	.00	8.71	.45	.00	.45	.00
Mussels	891	3	0	0	0	0	0	69	0	0	12	16	0	0	100
	892	14	0	0	0	0	0	61	0	0	10	15	0	0	100
	893	8	0	0	0	0	0	77	0	0	3	12	0	0	100
	894	17	7	2	0	0	0	64	0	0	0	10	0	0	100
	895	14	5	1	0	0	0	57	0	4	14	5	0	0	100
	Mean	11.20	2.40	.60	.00	.00	.00	65.60	.00	.80	7.80	11.60	.00	.00	100.00
	StDev	5.63	3.36	.89	.00	.00	.00	7.73	.00	1.79	6.02	4.39	.00	.00	.00
Pollicipes	901	22	11	7	0	0	0	54	0	3	3	0	0	0	100
	902	23	27	4	11	0	0	0	2	0	17	16	0	0	100
	903	9	3	0	0	0	0	59	0	8	6	15	0	0	100
	904	13	3	1	0	0	0	62	0	9	5	7	0	0	100
	905	2	7	0	0	0	0	56	1	11	18	5	0	0	100
	Mean	13.80	10.20	2.40	2.20	.00	.00	46.20	.60	6.20	9.80	8.60	.00	.00	100.00
	StDev	8.87	9.96	3.05	4.92	.00	.00	26.00	.89	4.55	7.12	6.80	.00	.00	.00

Percent Cover of Index Species
Fraser Cove, Santa Cruz Island - Fall 2009 (11/3/09) (continued)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra- clita	Endo- cladia	Hespero- phycus	Silvetia	Mussels	Turf- weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Tar	906	41	15	0	0	0	0	0	0	0	0	0	44	0	100
	907	53	9	0	0	0	0	0	0	0	0	0	38	0	100
	908	44	5	0	0	0	0	0	0	0	0	1	50	0	100
	909	61	7	0	0	0	0	0	0	0	0	0	32	0	100
	910	31	3	0	0	0	0	0	0	0	0	0	66	0	100
	Mean	46.00	7.80	.00	.00	.00	.00	.00	.00	.00	.00	.20	46.00	.00	100.00
	StDev	11.49	4.60	.00	.00	.00	.00	.00	.00	.00	.00	.45	13.04	.00	.00
Hesperophycus	886	55	0	0	19	25	0	0	0	0	1	0	0	0	100
	887	69	3	0	11	6	0	0	4	0	7	0	0	0	100
	888	42	5	0	35	18	0	0	0	0	0	0	0	0	100
	889	57	3	0	11	9	4	0	0	0	16	0	0	0	100
	890	23	2	0	22	37	15	0	0	0	1	0	0	0	100
	Mean	49.20	2.60	.00	19.60	19.00	3.80	.00	.80	.00	5.00	.00	.00	.00	100.00
	StDev	17.50	1.82	.00	9.89	12.55	6.50	.00	1.79	.00	6.75	.00	.00	.00	.00

Percent Cover of Index Species

Orizaba Cove, Santa Cruz Island - Fall 2009 (12/14/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	851	77	19	0	0	0	0	0	0	0	4	0	0	0	100
	852	42	50	0	0	0	0	0	0	0	8	0	0	0	100
	853	43	54	0	0	0	0	0	0	0	3	0	0	0	100
	854	48	37	5	0	0	0	3	0	0	7	0	0	0	100
	855	58	41	0	0	0	0	0	0	0	1	0	0	0	100
	Mean	53.60	40.20	1.00	.00	.00	.00	.60	.00	.00	4.60	.00	.00	.00	100.00
	StDev	14.54	13.66	2.24	.00	.00	.00	1.34	.00	.00	2.88	.00	.00	.00	.00
Silvetia	866	48	0	6	0	0	0	0	0	0	46	0	0	0	100
	867	43	3	3	4	0	13	0	0	0	34	0	0	0	100
	868	26	0	4	9	1	27	1	0	0	32	0	0	0	100
	869	20	0	10	13	0	48	0	0	0	9	0	0	0	100
	870	33	0	3	18	1	28	0	0	0	16	1	0	0	100
	Mean	34.00	.60	5.20	8.80	.40	23.20	.20	.00	.00	27.40	.20	.00	.00	100.00
	StDev	11.60	1.34	2.95	7.12	.55	17.99	.45	.00	.00	14.83	.45	.00	.00	.00
Mussels	861	5	0	24	0	0	0	0	0	0	70	1	0	0	100
	862	5	0	11	0	0	0	0	0	0	78	6	0	0	100
	863	9	0	9	0	0	1	0	0	0	79	2	0	0	100
	864	4	0	6	0	0	0	0	2	0	88	0	0	0	100
	865	4	0	3	0	0	0	0	2	0	91	0	0	0	100
	Mean	5.40	.00	10.60	.00	.00	.20	.00	.80	.00	81.20	1.80	.00	.00	100.00
	StDev	2.07	.00	8.08	.00	.00	.45	.00	1.10	.00	8.41	2.49	.00	.00	.00
Tetraclita	871	37	19	24	0	0	0	0	0	0	18	2	0	0	100
	872	31	4	22	0	0	0	0	0	0	41	2	0	0	100
	873	41	6	31	0	0	0	0	0	0	20	2	0	0	100
	874	19	1	14	2	0	0	0	0	0	64	0	0	0	100
	875	35	14	17	1	0	0	0	0	0	33	0	0	0	100
	Mean	32.60	8.80	21.60	.60	.00	.00	.00	.00	.00	35.20	1.20	.00	.00	100.00
	StDev	8.41	7.46	6.58	.89	.00	.00	.00	.00	.00	18.67	1.10	.00	.00	.00
Hesperophycus	856	18	7	0	48	5	0	3	0	0	19	0	0	0	100
	857	22	8	4	19	36	0	0	0	0	9	2	0	0	100
	858	28	0	0	12	48	5	0	0	0	7	0	0	0	100
	859	69	6	0	20	2	0	1	0	0	1	0	1	0	100
	860	45	4	0	28	20	0	0	0	0	3	0	0	0	100
	Mean	36.40	5.00	.80	25.40	22.20	1.00	.80	.00	.00	7.80	.40	.20	.00	100.00
	StDev	20.94	3.16	1.79	13.85	19.78	2.24	1.30	.00	.00	7.01	.89	.45	.00	.00

Percent Cover of Index Species

Prisoner's Harbor, Santa Cruz Island - Fall 2009 (11/1/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	826	69	8	0	0	0	0	0	0	0	21	2	0	0	100
	827	60	11	0	2	0	0	0	0	0	27	0	0	0	100
	828	37	33	0	15	0	0	0	3	0	10	2	0	0	100
	829	65	20	1	4	0	0	0	2	0	6	2	0	0	100
	830	44	8	0	33	6	0	0	1	0	3	5	0	0	100
	Mean	55.00	16.00	.20	10.80	1.20	.00	.00	1.20	.00	13.40	2.20	.00	.00	100.00
	StDev	13.84	10.70	.45	13.70	2.68	.00	.00	1.30	.00	10.21	1.79	.00	.00	.00
Endocladia	831	67	2	0	25	0	0	0	0	0	6	0	0	0	100
	832	69	28	0	0	2	0	0	0	0	1	0	0	0	100
	833	81	14	0	4	0	0	0	0	0	0	1	0	0	100
	834	80	4	0	10	0	0	0	0	0	3	3	0	0	100
	835	84	0	0	5	2	0	0	0	0	7	2	0	0	100
	Mean	76.20	9.60	.00	8.80	.80	.00	.00	.00	.00	3.40	1.20	.00	.00	100.00
	StDev	7.66	11.61	.00	9.73	1.10	.00	.00	.00	.00	3.05	1.30	.00	.00	.00
Silvetia	846	47	8	2	15	5	0	0	0	0	23	0	0	0	100
	847	49	7	0	1	0	0	0	0	0	41	1	0	1	100
	848	66	3	4	5	0	0	0	0	0	22	0	0	0	100
	849	25	1	0	6	0	39	0	0	0	29	0	0	0	100
	850	17	1	4	0	0	13	0	0	0	65	0	0	0	100
	Mean	40.80	4.00	2.00	5.40	1.00	10.40	.00	.00	.00	36.00	.20	.00	.20	100.00
	StDev	19.73	3.32	2.00	5.94	2.24	16.95	.00	.00	.00	17.89	.45	.00	.45	.00
Mussels	841	20	0	1	0	0	0	0	3	0	24	0	0	52	100
	842	22	0	9	0	0	0	0	7	0	31	6	0	25	100
	843	28	1	7	0	0	0	0	0	0	19	14	0	31	100
	844	8	0	1	0	0	0	0	2	0	63	2	0	24	100
	845	6	1	19	0	0	0	0	4	0	68	2	0	0	100
	Mean	16.80	.40	7.40	.00	.00	.00	.00	3.20	.00	41.00	4.80	.00	26.40	100.00
	StDev	9.44	.55	7.40	.00	.00	.00	.00	2.59	.00	22.84	5.59	.00	18.58	.00
Hesperophycus	836	89	1	0	7	0	0	0	0	0	2	1	0	0	100
	837	92	2	0	5	0	0	0	0	0	1	0	0	0	100
	838	87	0	0	0	10	0	0	0	0	0	3	0	0	100
	839	43	52	0	0	4	0	0	0	0	0	1	0	0	100
	840	71	16	0	4	9	0	0	0	0	0	0	0	0	100
	Mean	76.40	14.20	.00	3.20	4.60	.00	.00	.00	.00	.60	1.00	.00	.00	100.00
	StDev	20.37	22.12	.00	3.11	4.77	.00	.00	.00	.00	.89	1.22	.00	.00	.00

Percent Cover of Index Species

Scorpion Rock, Santa Cruz Island - Fall 2009 (12/1/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	801	50	4	0	46	0	0	0	0	0	0	0	0	0	100
	802	67	14	0	19	0	0	0	0	0	0	0	0	0	100
	803	89	2	0	6	0	0	0	0	0	1	2	0	0	100
	804	66	6	0	28	0	0	0	0	0	0	0	0	0	100
	805	82	17	0	0	0	0	0	0	0	1	0	0	0	100
	Mean	70.80	8.60	.00	19.80	.00	.00	.00	.00	.00	.40	.40	.00	.00	100.00
	StDev	15.22	6.54	.00	18.28	.00	.00	.00	.00	.00	.55	.89	.00	.00	.00
Endocladia	806	10	2	0	72	0	0	0	0	0	16	0	0	0	100
	807	7	0	1	64	0	0	2	0	0	26	0	0	0	100
	808	47	1	0	42	0	0	1	0	0	9	0	0	0	100
	809	61	1	0	33	0	0	0	0	0	5	0	0	0	100
	810	39	0	0	45	0	0	0	0	1	13	2	0	0	100
	Mean	32.80	.80	.20	51.20	.00	.00	.60	.00	.20	13.80	.40	.00	.00	100.00
	StDev	23.56	.84	.45	16.21	.00	.00	.89	.00	.45	7.98	.89	.00	.00	.00
Mussels	816	11	0	32	0	0	0	0	5	0	50	2	0	0	100
	817	17	0	24	0	0	0	0	3	0	49	7	0	0	100
	818	26	0	46	0	0	0	0	2	0	23	3	0	0	100
	819	33	0	32	1	0	0	0	1	0	30	3	0	0	100
	820	25	0	16	0	0	0	0	2	0	52	5	0	0	100
	Mean	22.40	.00	30.00	.20	.00	.00	.00	2.60	.00	40.80	4.00	.00	.00	100.00
	StDev	8.53	.00	11.14	.45	.00	.00	.00	1.52	.00	13.33	2.00	.00	.00	.00
Tetraclita	821	51	0	18	11	0	0	0	0	0	18	2	0	0	100
	822	62	0	8	1	0	0	0	0	0	24	5	0	0	100
	823	41	0	15	1	0	0	0	0	0	40	3	0	0	100
	824	82	0	9	0	0	0	0	0	0	6	3	0	0	100
	825	79	0	5	2	0	0	0	0	0	12	2	0	0	100
	Mean	63.00	.00	11.00	3.00	.00	.00	.00	.00	.00	20.00	3.00	.00	.00	100.00
	StDev	17.65	.00	5.34	4.53	.00	.00	.00	.00	.00	13.04	1.22	.00	.00	.00
Hesperophycus	811	48	0	1	12	39	0	0	0	0	0	0	0	0	100
	812	27	0	0	31	30	1	4	0	0	7	0	0	0	100
	813	22	0	0	26	13	37	0	0	0	2	0	0	0	100
	814	76	0	0	19	0	2	0	0	0	2	1	0	0	100
	815	43	0	0	24	7	23	0	0	0	3	0	0	0	100
	Mean	43.20	.00	.20	22.40	17.80	12.60	.80	.00	.00	2.80	.20	.00	.00	100.00
	StDev	21.28	.00	.45	7.23	16.24	16.65	1.79	.00	.00	2.59	.45	.00	.00	.00

Percent Cover of Index Species

Trailer, Santa Cruz Island - Fall 2009 (11/4/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	911	92	3	0	3	0	0	0	0	0	0	2	0	0	100
	912	41	59	0	0	0	0	0	0	0	0	0	0	0	100
	913	61	23	0	14	0	0	2	0	0	0	0	0	0	100
	914	30	69	0	0	0	0	0	0	0	0	1	0	0	100
	915	64	34	0	0	0	0	0	0	0	0	2	0	0	100
	Mean	57.60	37.60	.00	3.40	.00	.00	.40	.00	.00	.00	1.00	.00	.00	100.00
	StDev	23.84	26.77	.00	6.07	.00	.00	.89	.00	.00	.00	1.00	.00	.00	.00
Silvetia	926	6	0	0	0	0	92	0	0	0	2	0	0	0	100
	927	69	3	0	1	0	23	0	0	0	4	0	0	0	100
	928	19	0	0	11	3	62	0	0	0	5	0	0	0	100
	929	4	0	0	0	0	83	0	0	0	13	0	0	0	100
	930	27	1	0	1	0	57	0	1	0	13	0	0	0	100
	Mean	25.00	.80	.00	2.60	.60	63.40	.00	.20	.00	7.40	.00	.00	.00	100.00
	StDev	26.35	1.30	.00	4.72	1.34	26.82	.00	.45	.00	5.22	.00	.00	.00	.00
Mussels	921	10	3	0	0	0	0	0	9	0	69	9	0	0	100
	922	4	0	0	0	0	0	0	0	0	56	40	0	0	100
	923	4	0	0	0	0	0	0	3	0	42	42	0	9	100
	924	7	4	0	0	0	0	18	3	0	24	44	0	0	100
	925	15	1	0	0	0	0	80	0	0	2	2	0	0	100
	Mean	8.00	1.60	.00	.00	.00	.00	19.60	3.00	.00	38.60	27.40	.00	1.80	100.00
	StDev	4.64	1.82	.00	.00	.00	.00	34.65	3.67	.00	26.42	20.19	.00	4.02	.00
Hesperophycus	916	13	3	0	10	12	61	0	0	0	1	0	0	0	100
	917	30	1	0	21	10	35	0	0	0	1	0	2	0	100
	918	6	0	0	5	15	74	0	0	0	0	0	0	0	100
	919	70	21	0	9	0	0	0	0	0	0	0	0	0	100
	920	48	2	0	14	18	17	0	0	0	1	0	0	0	100
	951	83	12	0	4	0	0	0	0	0	0	1	0	0	100
	Mean	41.67	6.50	.00	10.50	9.17	31.17	.00	.00	.00	.50	.17	.33	.00	100.00
	StDev	30.92	8.31	.00	6.28	7.60	31.25	.00	.00	.00	.55	.41	.82	.00	.00

Percent Cover of Index Species

Willows Anchorage, Santa Cruz Island - Fall 2009 (11/2/09)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Endocladia	931	34	0	0	65	0	0	0	0	0	1	0	0	0	100
	932	38	0	0	61	0	0	0	0	0	1	0	0	0	100
	933	33	0	0	60	0	0	0	0	0	7	0	0	0	100
	934	16	0	0	74	0	0	0	0	0	10	0	0	0	100
	935	20	0	5	44	0	0	0	0	0	25	6	0	0	100
	Mean	28.20	.00	1.00	60.80	.00	.00	.00	.00	.00	8.80	1.20	.00	.00	100.00
	StDev	9.60	.00	2.24	10.89	.00	.00	.00	.00	.00	9.86	2.68	.00	.00	.00
Silvetia	946	45	0	0	27	0	0	0	0	0	12	16	0	0	100
	947	19	0	0	30	0	0	0	0	0	29	22	0	0	100
	948	68	1	0	2	0	0	0	0	0	27	2	0	0	100
	949	50	0	0	0	0	18	0	0	0	30	2	0	0	100
	950	46	0	0	6	0	0	0	0	0	41	7	0	0	100
	Mean	45.60	.20	.00	13.00	.00	3.60	.00	.00	.00	27.80	9.80	.00	.00	100.00
	StDev	17.53	.45	.00	14.35	.00	8.05	.00	.00	.00	10.38	8.90	.00	.00	.00
Mussels	941	5	0	9	0	0	0	73	0	0	13	0	0	0	100
	942	5	0	2	0	0	0	0	9	0	82	2	0	0	100
	943	6	0	0	0	0	0	33	5	0	46	10	0	0	100
	944	4	0	1	0	0	0	58	11	1	24	1	0	0	100
	945	0	0	1	0	0	0	89	0	0	10	0	0	0	100
	Mean	4.00	.00	2.60	.00	.00	.00	50.60	5.00	.20	35.00	2.60	.00	.00	100.00
	StDev	2.35	.00	3.65	.00	.00	.00	35.00	5.05	.45	29.83	4.22	.00	.00	.00
Hesperophycus	936	27	0	0	58	0	0	0	0	0	15	0	0	0	100
	937	74	4	0	1	0	0	0	0	0	21	0	0	0	100
	938	77	0	0	5	0	0	0	0	0	18	0	0	0	100
	939	67	3	0	0	0	0	0	0	0	30	0	0	0	100
	940	49	2	0	6	15	4	0	0	0	23	1	0	0	100
	Mean	58.80	1.80	.00	14.00	3.00	.80	.00	.00	.00	21.40	.20	.00	.00	100.00
	StDev	20.84	1.79	.00	24.73	6.71	1.79	.00	.00	.00	5.68	.45	.00	.00	.00

Percent Cover of Index Species

East Point, Santa Rosa Island - Fall 2009 (1/13/10)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	575	49	44	0	0	0	0	0	0	0	3	4	0	0	100
	576	37	46	0	6	10	0	0	0	0	1	0	0	0	100
	577	9	27	0	29	27	5	0	0	0	2	1	0	0	100
	578	67	29	0	0	0	0	0	0	0	2	0	2	0	100
	579	32	66	0	2	0	0	0	0	0	0	0	0	0	100
	Mean	38.80	42.40	.00	7.40	7.40	1.00	.00	.00	.00	1.60	1.00	.40	.00	100.00
	StDev	21.43	15.73	.00	12.32	11.78	2.24	.00	.00	.00	1.14	1.73	.89	.00	.00
Endocladia	580	13	3	0	78	5	0	0	0	0	0	0	1	0	100
	581	14	13	0	72	1	0	0	0	0	0	0	0	0	100
	582	12	14	0	72	0	0	0	0	0	1	1	0	0	100
	583	25	11	0	64	0	0	0	0	0	0	0	0	0	100
	584	24	21	0	53	0	0	0	0	0	2	0	0	0	100
	Mean	17.60	12.40	.00	67.80	1.20	.00	.00	.00	.00	.60	.20	.20	.00	100.00
	StDev	6.35	6.47	.00	9.65	2.17	.00	.00	.00	.00	.89	.45	.45	.00	.00
Silvetia	585	51	0	0	35	1	1	0	1	0	11	0	0	0	100
	586	37	0	0	16	0	0	0	1	0	46	0	0	0	100
	587	51	0	0	3	4	28	0	0	0	14	0	0	0	100
	588	18	0	0	3	0	66	0	0	0	12	1	0	0	100
	589	24	21	0	1	0	14	0	0	0	40	0	0	0	100
	Mean	36.20	4.20	.00	11.60	1.00	21.80	.00	.40	.00	24.60	.20	.00	.00	100.00
	StDev	15.16	9.39	.00	14.38	1.73	27.21	.00	.55	.00	16.96	.45	.00	.00	.00
Mussels	590	4	0	0	0	0	0	0	17	0	66	13	0	0	100
	591	4	1	0	0	0	0	0	36	0	55	4	0	0	100
	592	3	0	0	0	0	0	0	14	0	83	0	0	0	100
	593	1	0	0	0	0	0	92	1	0	4	2	0	0	100
	594	4	4	0	0	0	0	77	0	0	9	6	0	0	100
	Mean	3.20	1.00	.00	.00	.00	.00	33.80	13.60	.00	43.40	5.00	.00	.00	100.00
	StDev	1.30	1.73	.00	.00	.00	.00	46.59	14.64	.00	35.18	5.00	.00	.00	.00
Hesperophycus	570	18	0	0	56	22	1	0	0	0	3	0	0	0	100
	571	16	0	0	21	62	1	0	0	0	0	0	0	0	100
	572	6	0	0	27	64	3	0	0	0	0	0	0	0	100
	573	7	10	0	54	24	3	1	0	0	0	1	0	0	100
	574	15	22	0	40	15	1	0	0	0	7	0	0	0	100
	Mean	12.40	6.40	.00	39.60	37.40	1.80	.20	.00	.00	2.00	.20	.00	.00	100.00
	StDev	5.50	9.74	.00	15.66	23.62	1.10	.45	.00	.00	3.08	.45	.00	.00	.00

Percent Cover of Index Species

Ford Point, Santa Rosa Island - Fall 2009 (1/12/10)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	520	58	32	1	0	0	0	0	0	0	0	9	0	0	100
	521	54	40	0	0	0	0	4	0	0	0	2	0	0	100
	522	69	31	0	0	0	0	0	0	0	0	0	0	0	100
	523	19	10	0	71	0	0	0	0	0	0	0	0	0	100
	524	50	47	0	3	0	0	0	0	0	0	0	0	0	100
	Mean	50.00	32.00	.20	14.80	.00	.00	.80	.00	.00	.00	2.20	.00	.00	100.00
	StDev	18.72	13.91	.45	31.44	.00	.00	1.79	.00	.00	.00	3.90	.00	.00	.00
Endocladia	525	18	2	0	64	0	0	10	1	0	5	0	0	0	100
	526	19	20	0	51	0	0	7	1	0	1	1	0	0	100
	527	27	7	2	44	0	0	5	1	0	14	0	0	0	100
	528	13	3	0	62	0	0	0	4	0	17	1	0	0	100
	529	19	3	0	71	0	0	0	0	0	7	0	0	0	100
	Mean	19.20	7.00	.40	58.40	.00	.00	4.40	1.40	.00	8.80	.40	.00	.00	100.00
	StDev	5.02	7.52	.89	10.78	.00	.00	4.39	1.52	.00	6.57	.55	.00	.00	.00
Mussels	530	57	4	0	0	0	0	32	0	2	2	3	0	0	100
	531	6	0	0	0	0	0	88	0	0	6	0	0	0	100
	532	5	1	0	0	0	0	0	16	0	28	50	0	0	100
	533	17	1	0	0	0	0	79	0	0	0	3	0	0	100
	534	7	1	0	0	0	0	0	52	0	8	32	0	0	100
	Mean	18.40	1.40	.00	.00	.00	.00	39.80	13.60	.40	8.80	17.60	.00	.00	100.00
	StDev	22.11	1.52	.00	.00	.00	.00	42.10	22.56	.89	11.19	22.32	.00	.00	.00

Percent Cover of Index Species

Fossil Reef, Santa Rosa Island - Fall 2009 (1/15/10)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	605	54	45	0	0	0	0	0	0	0	0	1	0	0	100
	606	64	28	0	0	0	0	0	0	0	3	0	5	0	100
	607	73	21	0	4	0	0	0	0	0	0	2	0	0	100
	608	80	18	0	0	0	0	0	0	0	2	0	0	0	100
	609	79	20	0	0	0	0	0	0	0	1	0	0	0	100
	Mean	70.00	26.40	.00	.80	.00	.00	.00	.00	.00	1.20	.60	1.00	.00	100.00
	StDev	10.98	11.06	.00	1.79	.00	.00	.00	.00	.00	1.30	.89	2.24	.00	.00
Endocladia	610	32	27	0	40	0	0	0	0	0	1	0	0	0	100
	611	30	0	0	13	0	56	0	0	0	0	1	0	0	100
	612	25	2	0	65	0	6	0	0	0	2	0	0	0	100
	613	28	8	0	50	0	9	0	0	0	3	2	0	0	100
	614	21	1	0	75	0	0	0	0	0	2	1	0	0	100
	Mean	27.20	7.60	.00	48.60	.00	14.20	.00	.00	.00	1.60	.80	.00	.00	100.00
	StDev	4.32	11.28	.00	24.03	.00	23.69	.00	.00	.00	1.14	.84	.00	.00	.00
Silvetia	615	30	3	0	18	0	49	0	0	0	0	0	0	0	100
	616	39	1	0	22	0	33	0	0	0	4	1	0	0	100
	617	19	0	0	4	0	77	0	0	0	0	0	0	0	100
	618	11	0	0	4	0	83	0	0	0	2	0	0	0	100
	619	1	0	0	2	0	97	0	0	0	0	0	0	0	100
	Mean	20.00	.80	.00	10.00	.00	67.80	.00	.00	.00	1.20	.20	.00	.00	100.00
	StDev	15.03	1.30	.00	9.27	.00	26.14	.00	.00	.00	1.79	.45	.00	.00	.00
Mussels	620	12	0	1	0	0	0	0	4	0	71	12	0	0	100
	621	18	0	3	1	0	0	0	0	0	74	4	0	0	100
	622	31	0	7	0	0	0	0	0	1	60	1	0	0	100
	623	37	0	9	0	0	0	14	0	2	34	4	0	0	100
	624	12	0	0	0	0	0	0	6	0	23	59	0	0	100
	Mean	22.00	.00	4.00	.20	.00	.00	2.80	2.00	.60	52.40	16.00	.00	.00	100.00
	StDev	11.42	.00	3.87	.45	.00	.00	6.26	2.83	.89	22.77	24.38	.00	.00	.00

Percent Cover of Index Species

Johnson's Lee, Santa Rosa Island - Fall 2009 (1/11/10)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	500	43	57	0	0	0	0	0	0	0	0	0	0	0	100
	501	51	49	0	0	0	0	0	0	0	0	0	0	0	100
	502	73	27	0	0	0	0	0	0	0	0	0	0	0	100
	503	31	41	0	28	0	0	0	0	0	0	0	0	0	100
	504	63	29	4	0	0	0	0	0	0	1	3	0	0	100
	Mean	52.20	40.60	.80	5.60	.00	.00	.00	.00	.00	.20	.60	.00	.00	100.00
	StDev	16.47	12.84	1.79	12.52	.00	.00	.00	.00	.00	.45	1.34	.00	.00	.00
Endocladia	505	72	5	0	2	0	0	12	0	0	3	6	0	0	100
	506	31	9	0	57	0	0	2	0	0	0	1	0	0	100
	507	40	12	2	31	0	0	12	0	1	0	2	0	0	100
	508	19	9	0	45	0	0	26	0	1	0	0	0	0	100
	509	27	34	1	37	0	0	0	0	0	0	1	0	0	100
	Mean	37.80	13.80	.60	34.40	.00	.00	10.40	.00	.40	.60	2.00	.00	.00	100.00
	StDev	20.56	11.56	.89	20.56	.00	.00	10.33	.00	.55	1.34	2.35	.00	.00	.00
Mussels	510	13	0	0	0	0	0	0	3	0	1	83	0	0	100
	511	3	0	0	0	0	0	0	0	0	20	77	0	0	100
	512	23	0	1	0	0	0	72	0	3	0	1	0	0	100
	513	21	0	0	0	0	0	0	0	0	5	74	0	0	100
	514	20	0	0	0	0	0	0	0	0	6	74	0	0	100
	515	12	0	0	0	0	0	82	0	0	1	5	0	0	100
	516	18	0	0	0	0	0	74	0	3	0	5	0	0	100
	517	13	0	1	0	0	0	83	0	1	1	1	0	0	100
	518	23	0	0	0	0	0	76	0	0	0	1	0	0	100
	Mean	16.22	.00	.22	.00	.00	.00	43.00	.33	.78	3.78	35.67	.00	.00	100.00
	StDev	6.57	.00	.44	.00	.00	.00	40.94	1.00	1.30	6.48	39.33	.00	.00	.00

Percent Cover of Index Species

Northwest-Talcott, Santa Rosa Island - Fall 2009 (1/14/10)

Zone	Plot	Bare Rock	Acorn Barnacle	Tetra-clita	Endo-cladia	Hespero-phycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	560	59	36	0	4	0	0	0	0	0	1	0	0	0	100
	561	52	48	0	0	0	0	0	0	0	0	0	0	0	100
	562	17	29	0	6	0	38	0	0	0	9	1	0	0	100
	563	14	4	0	5	0	66	0	0	0	10	1	0	0	100
	564	35	3	0	0	0	31	0	0	0	31	0	0	0	100
	Mean	35.40	24.00	.00	3.00	.00	27.00	.00	.00	.00	10.20	.40	.00	.00	100.00
	StDev	20.18	19.91	.00	2.83	.00	27.91	.00	.00	.00	12.48	.55	.00	.00	.00
Endocladia	555	52	1	0	25	0	22	0	0	0	0	0	0	0	100
	556	47	0	0	22	0	27	0	0	0	3	1	0	0	100
	557	39	2	0	24	0	27	0	0	0	8	0	0	0	100
	558	23	18	0	41	0	5	0	0	0	12	1	0	0	100
	559	50	0	0	7	0	0	0	0	0	38	5	0	0	100
	Mean	42.20	4.20	.00	23.80	.00	16.20	.00	.00	.00	12.20	1.40	.00	.00	100.00
	StDev	11.82	7.76	.00	12.07	.00	12.79	.00	.00	.00	15.14	2.07	.00	.00	.00
Silvetia	565	17	0	0	0	0	83	0	0	0	0	0	0	0	100
	566	51	2	0	0	0	44	0	0	0	2	0	1	0	100
	567	36	0	0	0	0	60	0	0	0	4	0	0	0	100
	568	5	0	0	2	0	90	0	0	0	3	0	0	0	100
	569	77	1	0	17	0	1	0	0	0	3	1	0	0	100
	Mean	37.20	.60	.00	3.80	.00	55.60	.00	.00	.00	2.40	.20	.20	.00	100.00
	StDev	28.38	.89	.00	7.43	.00	35.60	.00	.00	.00	1.52	.45	.45	.00	.00
Mussels	550	28	2	1	0	0	0	20	8	2	35	4	0	0	100
	551	15	0	0	0	0	0	56	2	2	20	5	0	0	100
	552	25	0	0	0	0	0	24	2	2	42	5	0	0	100
	553	25	0	2	0	0	0	28	1	8	35	1	0	0	100
	554	27	1	1	0	0	0	16	3	3	47	2	0	0	100
	Mean	24.00	.60	.80	.00	.00	.00	28.80	3.20	3.40	35.80	3.40	.00	.00	100.00
	StDev	5.20	.89	.84	.00	.00	.00	15.85	2.77	2.61	10.18	1.82	.00	.00	.00

Appendix C. Trip Reports

The following are trip reports from the Rocky Intertidal Monitoring 2009 field season (March 2009 through January 2010). Reports were prepared by Stephen Whitaker and Dan Richards. The reports summarize the work done during each monitoring event, provide a quick summary of the data collected, include many of the data tables and site-specific graphs, and serve as metadata for the information collected.

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Spring 2009 Rocky Intertidal Monitoring Trip Reports

Anacapa/Santa Cruz Island March 7-9, 2009

(Database event #2009-A)

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biological Technician, Channel Islands National Park
Jacob Elliott, S.C.A. intern, Channel Islands National Park
Melissa Hayashida, SCA intern, Channel Islands National Park
Danielle Lipski, Channel Islands National Marine Sanctuary
Laura Francis, Channel Islands National Marine Sanctuary
Terrance Shinn, Channel Islands National Marine Sanctuary
Charlie Lara, Channel Islands National Marine Sanctuary
Reg Greenwood, Channel Islands National Marine Sanctuary

Procedure and General Notes

Transportation was provided by the Channel Islands National Marine Sanctuary by means of the R/V *Shearwater* for the intertidal monitoring. Day trips were made from Ventura Harbor. Middle West, Middle East, and South Frenchy's Cove sites at Anacapa Island and Orizaba Cove at Santa Cruz Island were monitored. With only three days of boat time (and a shortage of workable tides this spring), we did not monitor plots at Cat Rock or Scorpion Anchorage in spring 2009. Standard procedures were followed for photographing and counting motile invertebrates in fixed plots. Percent cover of photo plots was determined for all sites in the field except for Middle East, which will be scored from digital images. Stephen did the motile invertebrate counts and Dan scored plots. Black abalone, *Haliotis cracherodii*, and seastars were counted in 30-minute searches and measured for size distribution. Owl limpets, *Lottia gigantea*, were measured in fixed one-meter radius plots at Middle West and South Frenchy's Cove. The highest number of shorebirds and pinnipeds seen at any one time was recorded. Jacob and Melissa mapped sites with GPS units. A temperature logger was installed at Middle West.

Results (Daily and Site Description)

March 7, 2009. Orizaba Cove, Santa Cruz Island. Low tide -0.0 ft at 1333 hrs.

Clear skies, light wind and swell, excellent conditions. There was about 0.5 inches of rain and high winds in the week prior to this trip. Two humpback whales were seen on the trip out. Two black oystercatchers were seen in the area. There were no harbor seals in the cove. We worked the site from 1115-1600 hrs.

There were no problems finding plots, and all bolts were in good shape. Stephen, Jacob, and Dan were monitoring this day.

Balanus glandula were large and appeared to be common but approximately 50% of the tests were empty. *Tetraclita rubescens* was common with many large individuals. The barnacles were starting to die back in fall 2008 and many of the tests seemed to be persisting. *Endocladia muricata* was abundant. Young *Hesperophycus californicus* were common in the *Hesperophycus* zone plots. There were some mature *H. californicus* in the *Silvetia* zone plots.

The mussel plots were mostly devoid of *Mytilus californianus*. There were patches of *M. californianus* higher on the reef including in the *Silvetia* zone plots.

Jacob counted seastars finding 738 *Pisaster ochraceus*, 6 *P. giganteus* and 4 *Patiria miniata*. Thirteen *Haliotis cracherodii* were counted in the 30-minute search. Because we needed to leave to return to the mainland, there was not time to measure abalone.

March 8, 2009. Middle Anacapa Island. Low tide -1.0 ft at 1510 hrs. Clear skies, calm wind and seas, warm and pleasant conditions. Brown pelicans were nesting on Middle Island this year and there were a number in the *Opuntia* just up slope from the landing site that did not seem to care about our presence there. One harbor seal was seen watching us from just offshore and there were five black oystercatchers and eight western gulls on the reef. We were on site from 1115-1645 hrs.

Jacob and Melissa photographed the Middle East site. We did not have time to visit Harbor Seal Arch area so no abalone count was done there. Abalone and seastar counts are typically only done at Middle West. Jacob counted seastars then abalone, finding 556 *Pisaster ochraceus* in the 30-minute search. *Pisaster* did not seem to be common at the west end of the reef, but there were some dense pockets of seastars towards the eastern end. Sizes ranged from 23-165 mm with most just over 100 mm. Jacob found 17 *H. cracherodii* with approximate sizes from 30-138 mm (calipers were not used to measure the abalone). This is about half of the count we had in the fall. *Lottia gigantea* were measured in the three new plots finding 110 with sizes ranging from 17-55 mm.

A new temperature logger was installed with PVC housing between *Lottia* plot 1 and mussel plot 466, about two meters west of plot 466. It is in habitat similar to where we find most of the abalone at this site.

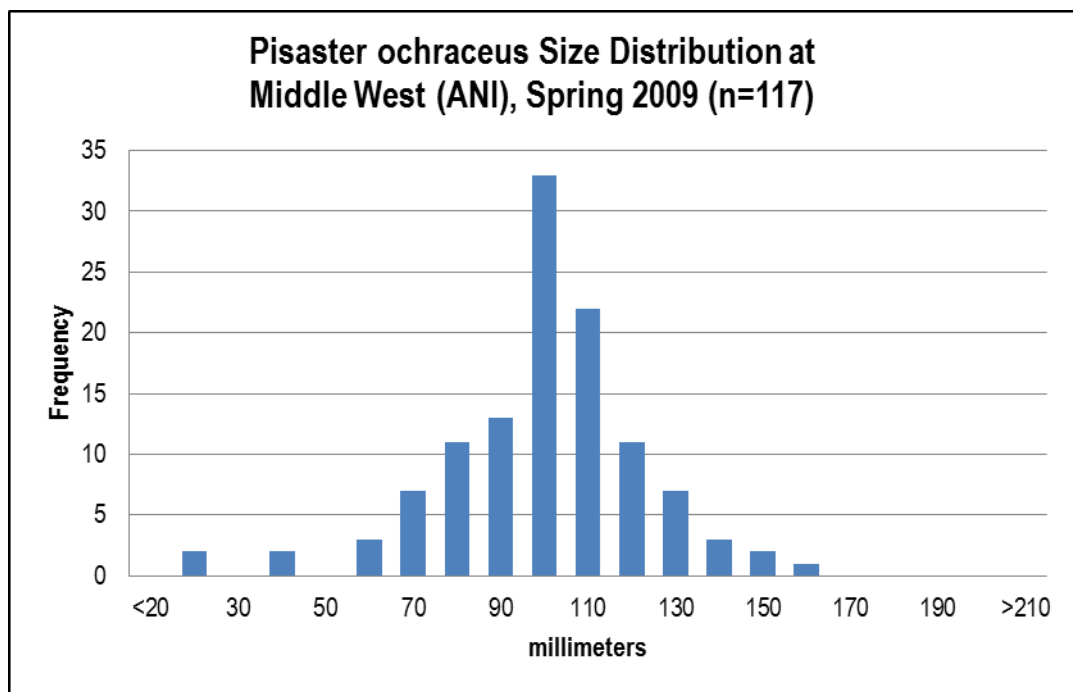
Mytilus californianus was mostly gone from the plots though there are some patches of large mussels in the mid-intertidal, higher on the reef than the plots and out of reach of the *P. ochraceus*. There were numerous patches of young mussels about 20 mm long, indicative of recent recruitment. *Silvetia compressa* looked terrible with low densities and heavily damaged, presumably by wave stress. The invasive algae *Caulacanthus ustulatus* was abundant around plot 460 and the high zones around plots 450/451. Small colonies of *C. ustulatus* were scattered along the reef. *Sargassum muticum* seemed to be common with a number of small plants scattered across the mussel zone. Without the mussels, it was apparent that *Psuedochama exogyra* were common at the site.

March 9. South Frenchy's Cove. Low tide -0.9 ft at 1543 hrs. We had partly cloudy conditions with moderate NW wind but it was calm at the site and working conditions were excellent. Several humpback whales were seen mid-channel on the way out with several breaching. At the site, there were seven black oystercatchers and one harbor seal was watching us from the water. We did not visit Cat Rock partly because of harbor seals hauled out there this time of year. On the north shore of Frenchy's Cove, there were six black oystercatchers and one western sandpiper. We were on site from 1130-1530 hrs.

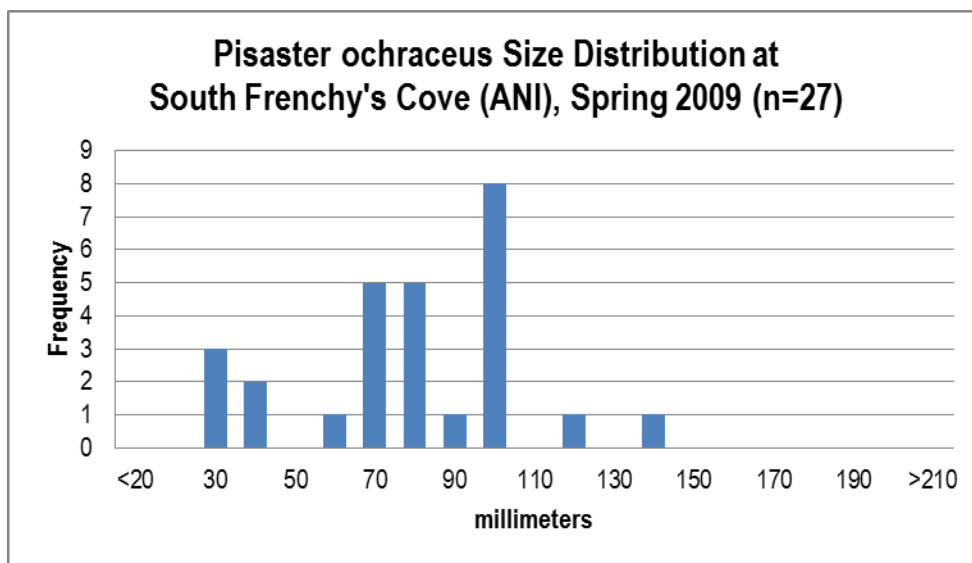
A new temperature logger housing and Tidbit logger were installed near *Lottia* plot 2. The sand level was very high between the reefs, which made it a little easier for us to get around.

Phyllospadix spp. in the area was mostly brown appearing bleached out. Few *Anthopleura* spp. were seen and no *A. elegantissima* colonies were found during a brief search. *Silvetia* and *Hesperophycus* were sparse and abraded. *Endocladia muricata* however looked great and was common. There was not noticeable recruitment among *Mytilus californianus*, but the adults looked viable. One *Cancer antennarius* was found in a tidepool on the outer reef.

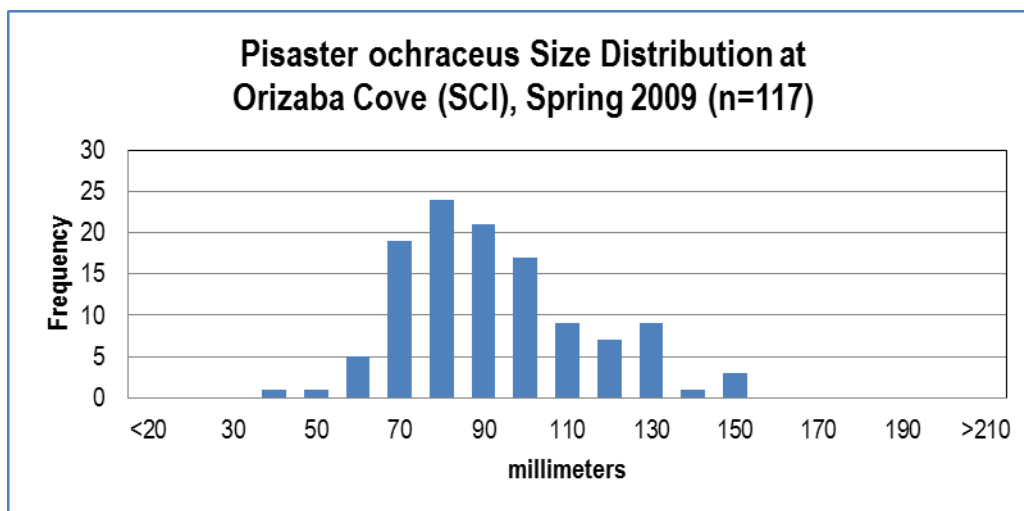
Laura and I measured inter-plot distance and bearings, something that has never been done at South Frenchy's Cove in all these years of monitoring. No abalone were found, which is typical for this site. Jacob counted 26 *Pisaster ochraceus* but none were measured. Only 22 *Lottia gigantea* were found in the three plots, one less than last year. Sizes ranged from 20-56 mm. Several of the photo plots were covered by sand, which may have contributed to the lower motile invertebrate numbers. Overall, motile invertebrate numbers were low.



ANMW Pisaster Totals	
count	117
min size	30
max size	148
mean size	102.23
StDev	25.00



ANSFC Pisaster Totals	
count	27
min size	30
max size	148
mean size	83.59
StDev	28.98



SCOC Pisaster Totals	
count	117
min size	42
max size	150
mean size	92.48
StDev	22.20

Haliotis cracherodii (black abalone) counts at Orizaba Cove, Santa Cruz Island, spring 2009.

Timed count	Mean Size	StDev	Min Size	Max Size	%<45mm	%45-126 mm	%127-145 mm	%>145 mm
14	73.00	11.40	54	85	-	100.00	-	-

Haliotis cracherodii (black abalone) counts at Anacapa Island, spring 2009.

Site Code	Timed count	Mean Size	StDev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
MW	17	61.82	27.94	30	138	23.53	70.59	5.88	-
SFC	-	-	-	-	-	-	-	-	-

Lottia gigantea counts in plots at Anacapa Island, spring 2009.

Site Code	Plot	Number In plot	Density	Count Sized	Mean Size	StDev	Min Size	Max Size
MW	1	62	19.745	62	37.76	9.13	18	62
MW	2	13	4.140	13	29.85	5.41	18	38
MW	3	37	11.783	37	35.54	8.27	17	55
SFC	1	4	1.273	4	39.25	9.74	29	49
SFC	2	15	4.776	15	36.47	11.03	20	56
SFC	3	7	2.229	7	43.14	15.77	22	56

Lottia gigantea size distribution in plots at Anacapa Island, spring 2009.

Site Code	Plot	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm	%≥70 mm
ANMW	1	1.61	17.74	37.10	37.10	4.84	1.61	-
ANMW	2	7.69	23.08	69.23	0.00	0.00	-	-
ANMW	3	2.70	18.92	54.05	18.92	5.41	-	-
ANSFC	1	0.00	25.00	25.00	50.0	0.00	-	-
ANSFC	2	0.00	33.33	26.67	33.33	6.67	-	-
ANSFC	3	0.00	28.57	14.29	0.00	57.14	-	-

Photoplot summary - mean percent cover by zone at Anacapa Middle-East, spring 2009 (3 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetracelia</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
<i>Chthamalus Balanus</i>	77.0	3.3	11.0	2.7	0.0	0.0	2.0	0.0	0.0	4.0	0.0	0.0
<i>Endocladia</i>	77.3	2.0	6.3	7.7	0.0	0.0	2.7	0.0	0.0	4.0	0.0	0.0
<i>Silvetia</i>	64.0	1.0	5.7	5.0	0.0	7.0	5.0	0.0	0.0	11.3	1.0	0.0
Mussels	31.7	1.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	57.0	0.7	0.0

Photoplot summary – mean percent cover by zone at Anacapa Middle-West, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetracelia</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
<i>Chthamalus Balanus</i>	62.4	17.8	0.4	5.8	0.0	0.0	0.2	0.2	0.0	13.2	0.0	0.0
<i>Endocladia</i>	60.4	8.0	0.6	14.0	0.0	0.0	0.2	0.8	0.0	15.2	0.8	0.0
<i>Silvetia</i>	59.4	2.8	1.0	4.2	0.0	4.2	0.0	0.6	0.0	26.4	1.4	0.0
Mussels	33.4	0.2	6.4	0.0	0.0	0.0	10.4	2.6	0.0	45.4	1.6	0.0

Photoplot summary – mean percent cover by zone at Anacapa, S. Frenchy's Cove, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetracclita</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
<i>Chthamalus Balanus</i>	31.8	47.0	0.0	13.4	0.0	0.0	0.0	0.0	0.0	6.8	0.4	0.6
<i>Endocladia</i>	17.0	0.6	0.0	72.4	0.4	6.0	0.0	0.6	0.0	3.0	0.0	0.0
<i>Silvetia</i>	39.4	4.6	0.0	8.8	0.0	20.0	0.0	0.0	0.0	27.2	0.2	0.0
Mussels	20.4	0.0	0.0	0.0	0.0	0.0	51.4	8.2	0.0	18.4	1.6	0.0

Photoplot summary – mean percent cover by zone at Santa Cruz, Orizaba Cove, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetracclita</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
<i>Chthamalus Balanus</i>	57.6	37.6	2.0	0.0	0.0	0.0	0.2	0.0	0.0	2.4	0.2	0.0
<i>Silvetia</i>	38.6	0.2	5.6	5.0	0.6	16.8	4.0	0.0	0.0	29.2	0.0	0.0
Mussels	16.4	0.0	2.0	0.0	0.0	0.0	0.0	0.4	0.0	80.0	1.2	0.0
<i>Tetracclita</i>	65.2	0.4	20.2	0.0	0.0	0.0	0.0	0.0	0.0	13.2	1.0	0.0
<i>Hespero-phycus</i>	39.8	2.2	1.2	32.2	9.4	1.8	1.4	0.0	0.0	11.8	0.2	0.0

San Miguel Island April 2-7, 2009

(Database event #2009-B))

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biological Technician, Channel Islands National Park
Jacob Elliott, SCA Intern, Channel Islands National Park
Cynthia Button, Postdoc., National Marine Fisheries Service

Procedure and General Observations

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 5050-Z digital camera. Motile invertebrates were counted in the photoplots. Seastars and black abalone were counted and measured at all sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers were downloaded from Crook Point, and Otter Harbor in black abalone habitat.

Results (Daily and Site Description)

2 April, Simonton Cove. Low tide -0.1 ft at 1029 hrs. Conditions were cool and windy. The sky was mostly cloudy. We were scheduled for a 0800 departure but fog at the island prevented us from leaving Camarillo until 1130. Having missed low tide by the time we arrived at the island, we surveyed Simonton Cove Beach in the afternoon.

We surveyed from 1544-1642 hrs. We found 14 elephant seal pups, 1 American oystercatcher, 12 black oystercatchers, 6 western gulls, and 6 common ravens. We found numerous carcasses including four elephant seal pups, seven California sea lion (mostly immature and female), one northern fulmar that was not scavenged, one pelagic cormorant that had been preyed on, and striped keels of a brown pelican and a large cormorant. Tar pancakes were abundant on the beach. Fishing floats were the most apparent debris items but other common items included plastic and glass bottles, light bulbs, and balloons. There was a moderate amount of wrack.

3 April 3, 2009, Harris Point, low tide -0.3 at 1135 hrs. Conditions were poor with heavy northwest swell and high wind. There were two western gulls, three black oystercatchers on the reef. There was a mother and pup harbor seal on the reef when we arrived but the pup was not discovered until later. The pup was caked with tar. Fresh tar was common at the site. We were on sight from 0900- 1400 hrs.

Steve counted motile invertebrates in 20 plots. We did not count the lowest *Mytilus* and *Tetraclita* plots because of the high waves. Most of the plots had low numbers of motile invertebrates except for large *Littorina* and limpets. Due to heavy surf, only 10 of the plots were scored in the field. Jacob collected GPS points for the *Lottia* plots and reference points. The abalone search yielded 19 *Haliotis cracherodii* and 1 *Haliotis rufescens*. One *H. cracherodii* was in Abalone plot 3 as usual. *Tegula funebris* was abundant in crevices of the abalone plots. Only 7 *Pisaster ochraceus* and 2 *Patiria miniata* were found. The last few photos of plots were slightly blurred by water on the lens after we took a wave on the outer reef.

Mazzaella affinis, *Mastocarpus papillatus*, and *Chondracanthus canaliculatus* were abundant. *Mytilus californianus* were not very abundant. *Balanus glandula* were common and there was some recent recruitment. *Tetraclita rubescens*, however, were not very common. *Hesperophycus californicus* was not especially abundant, but most of the plants were young and fairly small.

4 April, Otter Harbor. Low tide -0.4 ft at 1225 hrs. Conditions were good with clear sky, and moderate and decreasing wind and swell. There were 15-30 western gulls, 6 black oystercatchers, one American oystercatcher at the site. Gulls were hanging around on the bluff but no nests were documented. Four elephant seals were on the beach adjacent to the site and 17 harbor seals were on the reef when we arrived. Fresh tar was common at the site and large globs were floating in the surge channels. We were on site from 1010-1600 hrs.

A few plot corner repairs were needed but everything was in good shape otherwise. Jacob filled in some features on the site map with GPS points, including the *Lottia* plots. Stephen counted motile invertebrates finding generally low numbers in most plots. *Tegula funebris* were abundant around the site. Large *Pachygrapsus* were common. *Mytilus* seemed common with moderate recruitment. *Endocladia* was abundant and there were some very dense patches. *Silvetia* was mostly restricted to one area around plots 356-357 and was mostly abraded. *Hesperophycus* was common but plants were fairly small and immature. *Chthamalus/Balanus* were abundant site-wide, however the plots may not indicate that. The *Egorgia menziesii* were resprouting after coping with significant wave stress. *Mazzaella affinis* was very dense especially on the slope by plots 365-374.

Abalone were measured, yielding a total of 143, down from the 194 last fall. We may have stopped a little short of where we went last time because of the incoming tide, but some crevices did have fewer abalone. There were piles of *Macrocystis* drift in several crevices that could suggest anoxic and inhabitable conditions for abalone, suggesting future migrations. We only found 28 tagged abalone compared to 34 last January. Only 19 could be identified due to broken tags.

Jacob counted seastars finding 118 *Pisaster ochraceus*, 3 *P. giganteus*, and 6 *Patiria miniata*. The temperature loggers were downloaded. The housing in plot 366 needed to be re-epoxied but it was holding fine. The air temperature was measured at 10.5° C and water temperature at 10° C.

5 April, Crook Point. Low tide -0.4 ft at 1406 hrs. We had excellent conditions with light southeast winds and moderate swell. There were 7 black oystercatchers and 7 Black turnstones at the site. Fifteen double-crested cormorants were on the reef when we arrived. There were 17 elephant seal weaners in the sand channel at the site, and one sea lion came up to investigate us from the surf. We were on site from 1015-1545 hrs.

The plots looked relatively unchanged. Jacob made the repairs to plot corners. He also shot plot area photos and got GPS points for OT bolts and the BLM eyebolts. *Balanus/Chthamalus* were dense in some patches on the reef, but overall cover was low within the plots. *Endocladia* cover was generally low but it was widespread on the reef and looked healthy. *Silvetia* and

Hesperophycus were uncommon. *Hesperophycus* has been present at Crook Pt. in the smaller morphology similar to that seen at Harris Pt., San Miguel Island. *Mytilus* were common and especially dense on the inner reef. Presently only exclusive to this site, *Analipus japonica* was abundant and was present on the basal pads. It has spread over much of the outer reef. When it was first documented here several years ago, it was restricted to one small area near plot 392. *Plocamium borealis* was present, but not in the densities we sometimes see. *Porphyra perforata* was present in patches mostly along the inshore side of the outer reef. *Chondracanthus* and *Mazzaella* were abundant along the surge channel also.

Dan searched for black abalone and only found 24 plus 3-4 that were in the wave zone. Last spring we found 43 here. Stephen counted seastars and only found 66 *P. ochraceus*. It seemed that there were quite a few juvenile stars tucked around the reef.

Dan downloaded the temperature logger and it seemed to function well. The cap had a hole in it but since the housing filled with sand, I decided to plug the hole after cleaning out the sand. The temperature may be affected by the sand around it.

6 April, Cuyler Harbor. Low tide -0.3 ft at 1442 hrs. Excellent conditions with clear sky and calm winds but moderate swell. There were 4 black oystercatchers at the site. One elephant seal pup was swimming around the site. There were about 30 elephant seals on the east end of Cuyler Beach. There were 16 Whimbrel and 2 black turnstones on the beach and middle rocks during the walk back. We were on site from 1215-1630 hrs.

There were missing corners of mussel plots that repairs were not made, as the plots are not hard to find. Jacob mapped the site with GPS, including the BLM transect markers. There was high density of mussels and high recruitment on either side of the site but the site is dominated by very large mussels some measured at up to 18 cm long. No abalone were found. Dan searched for seastars and found 102 over the reef ranging from 5-22 cm radius. There was considerable algal bleaching especially the *Chondracanthus canaliculatus* that was mostly a lavender color. Several other species including some *Endocladia* showed some sign of bleaching. *Silvetia* on the lower reef looked good but in the upper reef plots most of the *Silvetia* was abraded, some down to the basal holdfast. *Laminaria setchelli* was common.

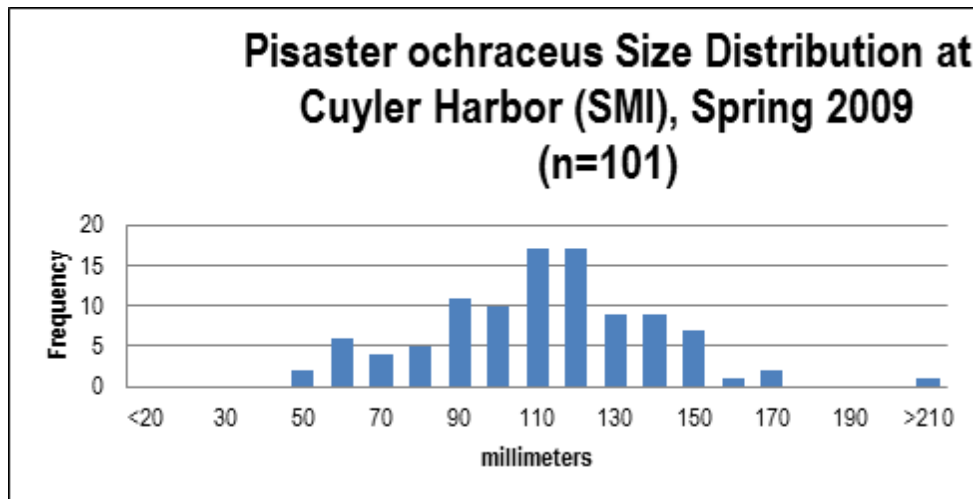
Motile invertebrates were common here and Steve found high numbers of *Tegula funebris*, *Nucella emarginata*, *Nuttalina* sp. and a variety of other snails and crabs.



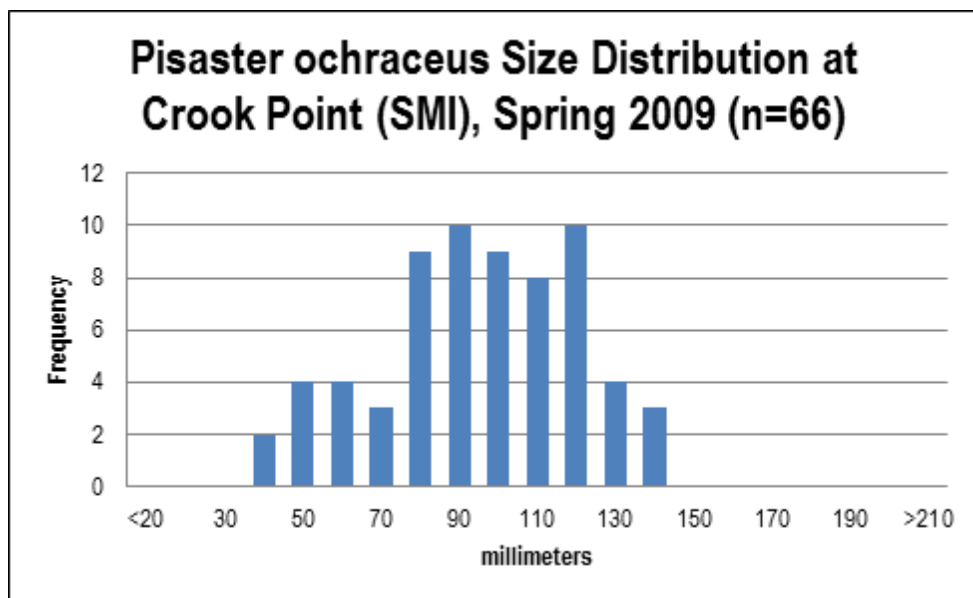
Panorama photo of intertidal research site at Otter Harbor, San Miguel Island (SMOH).

Haliotis cracherodii (black abalone) counts at Santa Rosa Island, spring 2009.

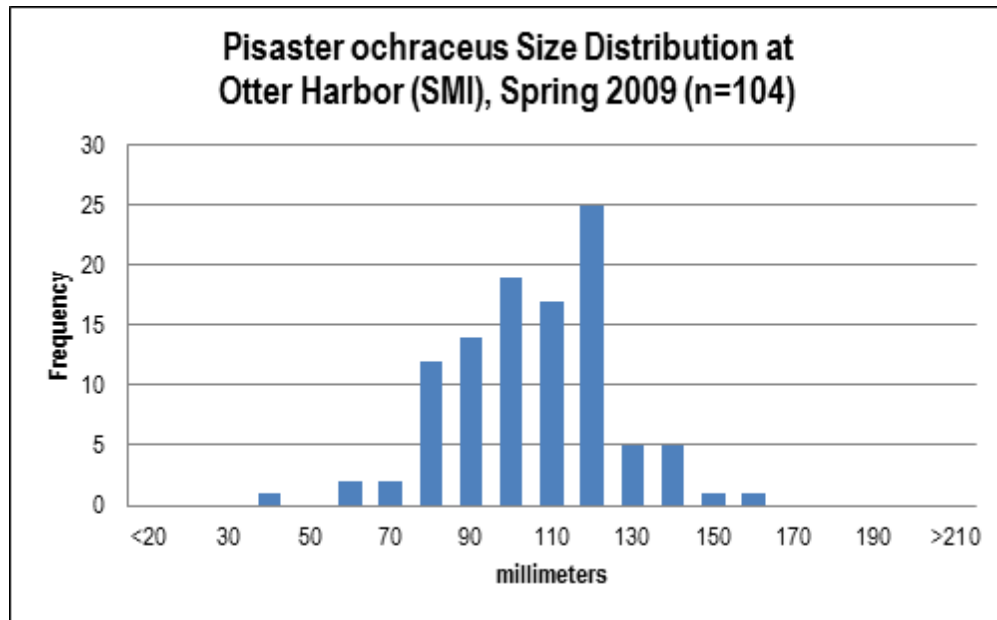
Site Code	Timed count	Number in plots	Mean Size	St Dev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
SMCH	0	0	-	-	-	-	-	-	-	-
SMCP	21	0	95.67	16.03	65	119	-	100.00	-	-
SMHP	16	1	118.82	24.51	52	153	-	58.82	29.41	11.76
SMOH	138	0	102.72	24.00	45	185	-	85.51	10.87	3.62



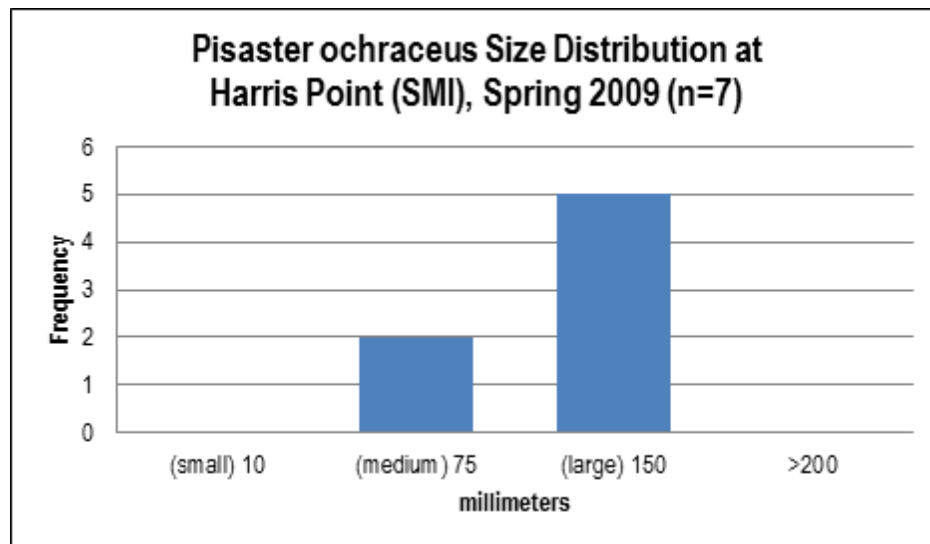
SMCH Pisaster Totals	
count	101
min size	50
max size	220
mean size	111.29
StDev	29.11



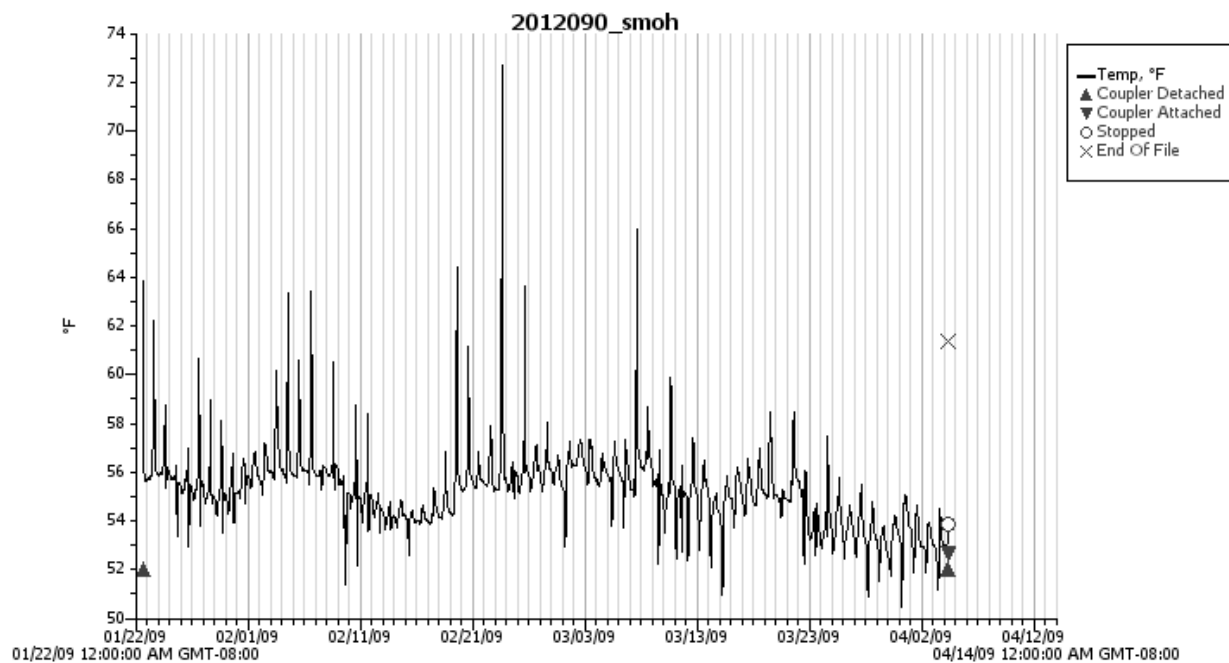
SMCP Pisaster Totals	
count	66
min size	40
max size	140
mean size	95.30
StDev	25.13



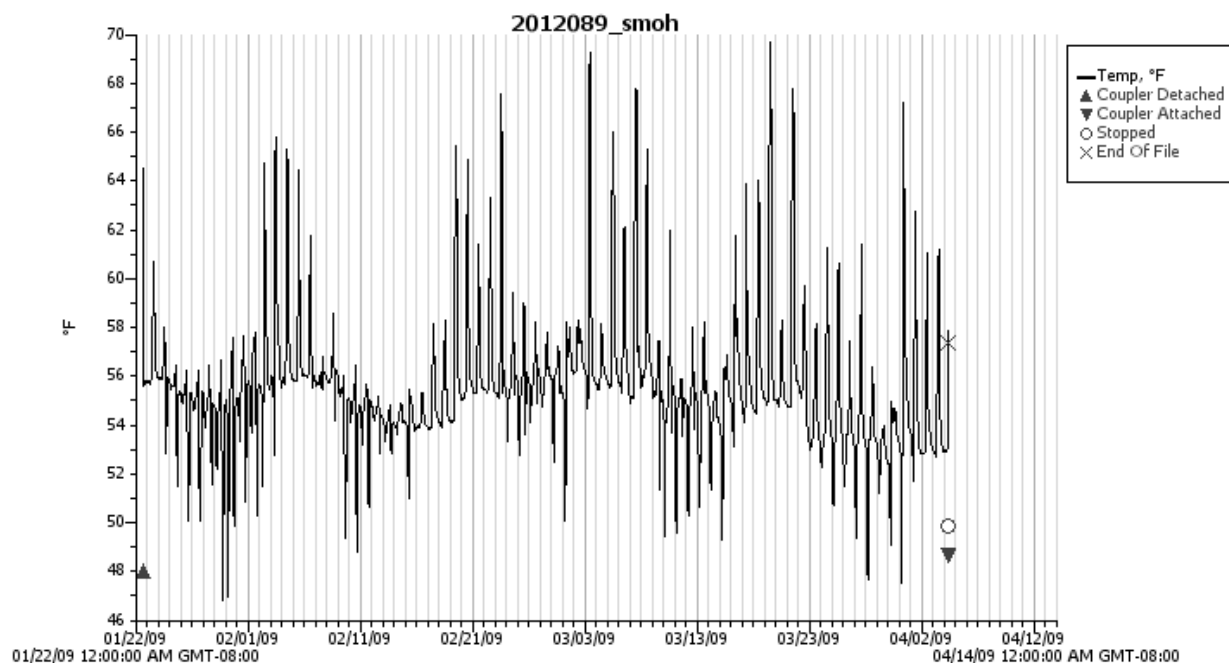
SMOH Pisaster Totals	
count	104
min size	40
max size	160
mean size	105.29
StDev	20.24



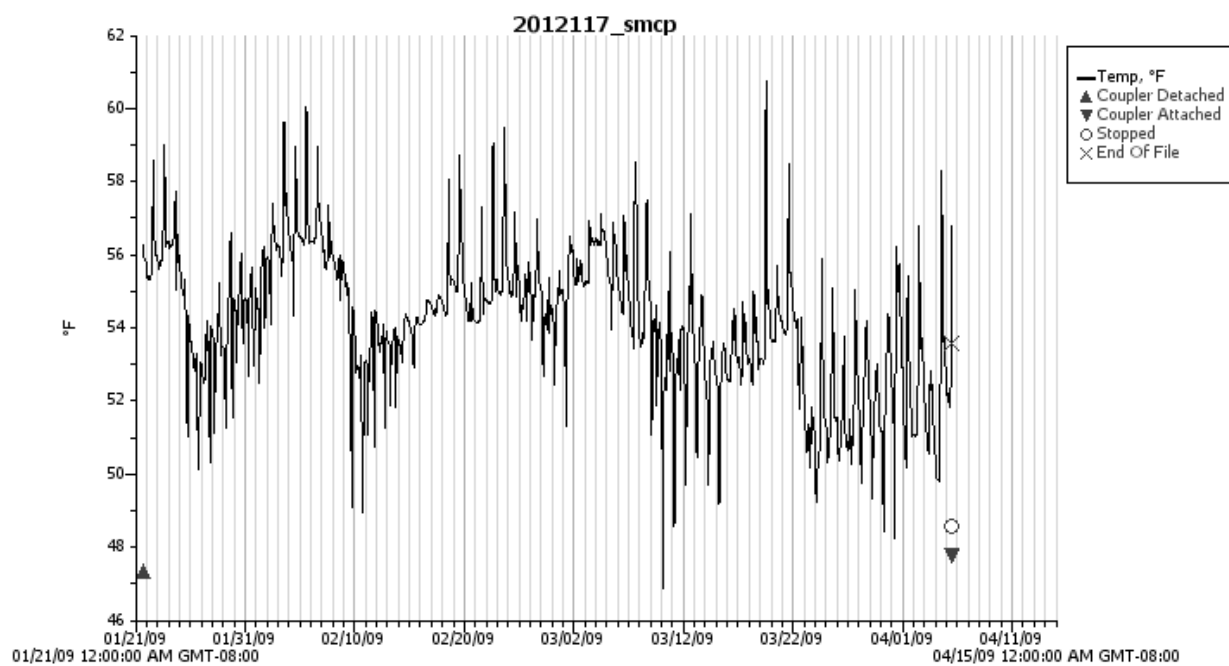
SMHP Pisaster Totals	
count	7
min size	75
max size	150
mean size	128.58
StDev	36.60



Shaded temperature logger data from Otter Harbor. Logger placed in crevice under overhang.



Sunny temperature logger data from Otter Harbor. Logger placed in open in abalone plot 366.



Temperature logger data from Crook Point. Logger placed in semi-open crevice in plot 391.

Photoplot summary – mean percent cover by zone at Cuyler Harbor, San Miguel Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	44.0	27.4	0.0	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
<i>Endocladia</i>	42.4	4.8	0.2	35.8	0.0	4.4	8.0	0.8	0.0	3.6	0.0	0.0	0.0
<i>Silvetia</i>	45.4	0.0	2.2	3.6	0.0	31.2	0.4	0.0	0.0	9.8	7.4	0.0	0.0
Mussels	23.0	1.8	7.4	0.0	0.0	0.0	47.8	1.6	2.6	2.2	13.6	0.0	0.0

Photoplot summary – mean percent cover by zone at Crook Point, San Miguel Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	75.0	21.2	0.0	3.4	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0
<i>Endocladia</i>	56.6	4.0	0.2	21.2	1.0	0.0	9.2	0.0	1.0	6.2	0.6	0.0	0.0
<i>Silvetia</i>	44.6	2.0	0.0	17.2	1.4	0.0	23.8	1.2	0.6	9.0	0.2	0.0	0.0
Mussels	18.0	0.2	0.4	0.0	0.0	0.0	75.8	0.0	1.0	4.4	0.2	0.0	0.0

Photoplot summary – mean percent cover by zone at Harris Point, San Miguel Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	39.0	56.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.8	0.0
<i>Endocladia</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mussels	41.6	3.6	0.6	5.8	2.4	0.0	29.4	0.4	0.8	14.4	0.8	0.0	0.2
<i>Tetraclita</i>	43.2	3.6	7.0	2.0	0.0	0.0	18.0	5.0	0.0	20.6	0.6	0.0	0.0
<i>Hesperophycus</i>	42.0	0.2	0.0	29.6	27.2	0.0	0.0	0.0	0.0	0.8	0.2	0.0	0.0

Photoplot summary – mean percent cover by zone at Otter Harbor, San Miguel Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	49.2	29.6	0.0	0.0	0.0	0.0	0.0	5.2	0.0	14.8	0.4	0.8	0.0
<i>Endocladia</i>	35.0	6.8	0.6	48.8	0.0	2.6	0.4	0.0	0.2	5.4	0.0	0.2	0.0
<i>Silvetia</i>	33.4	25.0	0.4	33.2	0.0	3.8	0.0	0.0	0.0	3.4	0.4	0.4	0.0
Mussels	36.8	2.8	0.2	0.8	0.0	0.0	48.2	0.2	4.0	6.8	0.2	0.0	0.0

Santa Cruz Island April 26-30, 2009

(Database event #2009-C))

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
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Procedure and General Observations

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 5050-Z digital camera. Motile invertebrates were counted in the photoplots. Photoplots were field scored except for the 10-rockweed zone plots at Trailer. Seastars and black abalone were counted and measured at all sites. Owl limpets were not counted, however photos were taken of the plots. The maximum number of shorebirds and pinnipeds observed at each site was recorded. The Hobotemp Tidbit temperature logger was downloaded from Willows Anchorage, however the unit was not working properly and no data were recovered. We used Island Packers for transportation both ways. We camped at the west end lean-to two nights and the research station two nights. Summary tables of the data are presented at the end.

Results (Daily and Site Description)

27 April, Trailer. Low tide -1.0 ft at 0616 hrs. Conditions were cold and windy. Water temperature was 9.5 C°. The sky was partly cloudy with high clouds. Despite the strong wind, we had surprisingly light surge and the conditions were good. 12 black oystercatchers were seen at the south end of the reef. One wandering tattler was seen at the cobble beach and one harbor seal was watching us from the water. We were on site from 0620-1045 hrs.

Mussel cover was generally low but there was some recruitment occurring. *Pisaster ochraceus* were common with 289 found by Jacob in the 30-minute count along with 2 *Patiria miniata*. *Piaster* sizes ranged from 24-120 mm. Dan found 14 *Haliotis cracherodii* within the site area in a 30-minute search. I continued an additional 30-minute search to measure abalone in the boulders to the south of the site and the south point of the reef finding 27 more, all large adults. One slightly shrunken and weak abalone (157 mm) was found in the boulder area.

Surfgrass looked healthy in the lower zones, but the cover in the transects was marginal. Total *Phyllospadix* cover ranged from 49-64% for the three transects. Bleaching and abrasion in the transects was fairly high but only moderate when including the low zones. Epiphyte cover was low.

Only the *Mytilus* and barnacle zone plots were scored in the field. *Mytilus* cover ran the full range from 1 to 89% cover. *Porphyra perforata* covered some of the mussels and was abundant on the reef. *Chthamalus fissus/dalli* were abundant and cover in the plots was generally high. There were empty tests in some areas but the number of new barnacle recruits was quite high. Steve found high numbers of motile invertebrates in plots. *Tegula funebris* were abundant in the *Silvetia* plots especially. Both *T. funebris* and *T. gallina* were common, though the former is still most numerous. *Silvetia* and *Hesperophycus* were both common but not dense. There

were some small *Hesperophycus* sprouting up around the reef but not in high numbers. Tar was present but nearly all was in the high zone and weathered.

In the afternoon, we worked at Fraser Cove from 1500-1800, scoring and counting motile invertebrates in photoplots in the barnacle, Endocladia and tar zones. 10 black oystercatchers were present at the site.

28 April, Fraser Cove, low tide -0.8 at 0714 hrs. Conditions were cold, windy, and clear. The wind was northwest at 20-25 mph but again the swell was only 3 ft, so the conditions were good. There were 4 black oystercatchers and 1 hybrid oystercatcher with mottled white on the belly at Fraser Cove. Three black oystercatchers were at the Forney's and there was a large group of gulls further out on the point. We were on site from 0615-1130 hrs, with us moving over to the Forney's area about 0915.

There was abundant tar at the site, but fresh tar was uncommon and the plots seemed to have declining tar cover. Most were below 50% cover.

Jacob did a 30-minute search for seastars and abalone finding 329 *Pisaster ochraceus* and 2 *Haliotis cracherodii*.

Surfgrass cover in the transects was quite low with much of the grass being abraded and bleached. Surfgrass in the lower zones however looked much better. Cover was only 20-73% *Phyllospadix* with only transect 3 having more than 40% cover. Epiphytes were rare. Some young *Phyllospadix* flowers were beginning to form.

Having finished three zones yesterday afternoon made the day much less stressful and we easily completed all plots. *Mytilus* cover was over 50% in all *Mytilus* and *Pollicipes* zone plots except one that is often dominated by *Phragmatopoma californica*. Bare rock was dominant in that plot this time, however. Rockweed cover was not very high and *Hesperophycus* cover surpassed *Silvetia* in six of the ten plots. Though spotty in distribution *Silvetia* draped luxuriantly over some rocks. No reproductive material was present on the *Silvetia*. A few juvenile plants of *Hesperophycus* were seen at Fraser above plot *Endocladia* plot 3. *Porphyra perforata* was abundant at both areas but it did not cover the majority of the reef as it does at times. *Chthamalus* were very abundant at both areas. *Endocladia* was spotty at Fraser and was much more common at Forney's.

29 April Willows Anchorage. Low tide -0.6 ft at 0816. Conditions were excellent with clear sky, little wind and light surge. There were five black oystercatchers in the area mostly at the islets. One harbor seal was in the cove in the morning. Western gulls were common at the islets. About 50-60 common ravens were flying together high above the cliffs, landed, and appeared to be feeding in the intertidal zone on the small islet at one point. We were on site from 0645-1400 hrs.

I spent about three hours measuring black abalone, finding 175 before the tide got too high minimizing my search at the west end of the site. Most were juveniles between 30 and 60 mm. I

only found 7 tagged animals and one tag (on the largest abalone I found all day) was not working.

Jacob counted 631 *Pisaster ochraceus* in the 30-minute search. The majority were small, with many under 40mm.

All the plots were field-scored. We took advantage of the conditions to have Stephen practice scoring plots. He found mostly low numbers of snails in the motile invertebrate counts, probably due to the low cover of most target species. *Chthamalus* were abundant on the upper reef and *Tetraclita* were very common over most of the outer reef area. *Hesperophycus* was uncommon overall though there was a little recruitment along the base of the cliff. *Silvetia* was not common and the area around *Silvetia* zone plots 3 and 4 was mostly void of plants. *Mytilus* was abundant and recruitment was fairly high. There were patches of large mussels on the lower reef that were surrounded by *P. ochraceus*.

30 April Prisoners Harbor. Low tide -0.4 ft at 0916. Conditions were excellent with clear sky, light northwest wind and no surge. Two black oystercatchers were seen right at the end of the day. We returned to Ventura on the afternoon Island Packer boat. We were on site from 0830-1300 hrs.

Stephen counted motile invertebrates and I scored all the photoplots. Jacob counted seastars finding 110 *Pisaster ochraceus* and one *P. giganteus* in the 30-minute search. He found one *Haliotis cracherodii* (102 mm).

All the plots were scored in the field. Mussels were rare in the plots and generally over the reef. The front portion of the reef between the *Endocladia* and *Hesperophycus* plots had no mussels. The zone was dominated by *Porphyra perforata*. Juvenile *Chthamalus* were extremely abundant and nearly formed a pavement over patches on the back reef especially in the mussel plots. There were dense patches of dead *Balanus* in some of the plots higher on the reef. *Tetraclita* were common and large. *Silvetia* was rare and *Hesperophycus* was only slightly more common. There was fair *Hesperophycus* recruitment judging by the small plants. *Endocladia* was also sparse and covered 20% or less of the photoplots. There were some bleached *Endocladia*.

Haliotis cracherodii (black abalone) counts at Santa Cruz Island, spring 2009.

Site Code	Timed count	Mean Size	St Dev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
SCFC	2	159.00	38.18	132	186	-	-	50.00	50.00
SCOC	14	73.00	11.40	54	85	-	100.00	-	-
SCPH	1	102.00	-	102	102	-	100.00	-	-
SCTR	14	92.64	32.42	60	155	-	78.57	14.29	7.14
SCWA	177	56.86	19.66	24	140	31.64	67.23	1.13	-

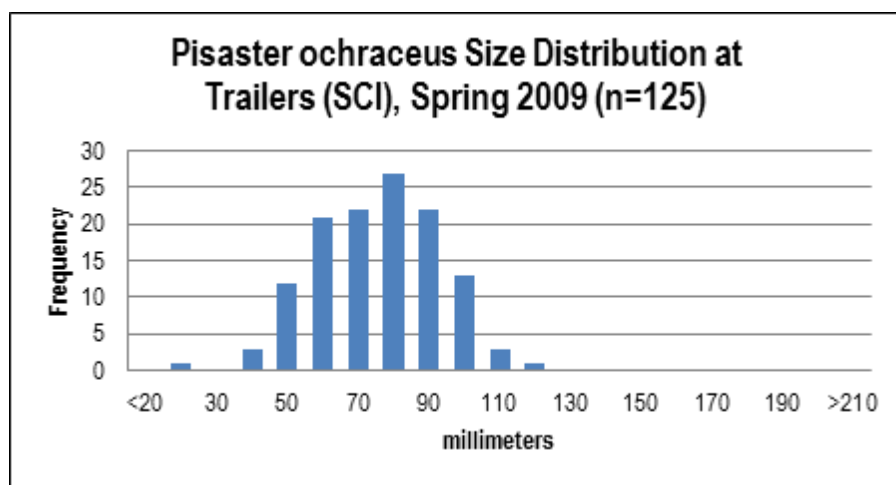
Surfgrass transects at Fraser Cove, Santa Cruz Island, spring 2009 (additional taxa with no values deleted from table).

Location: Fraser Cove Date: 4/28/2009		Site Code: SCFC Recorders: Dan Richards		
Surf Grass Taxa		Transect 1	Transect 2	Transect 3
<i>Phyllospadix</i> spp. overstory		19	35	72
<i>Phyllospadix</i> spp. understory		1	5	1

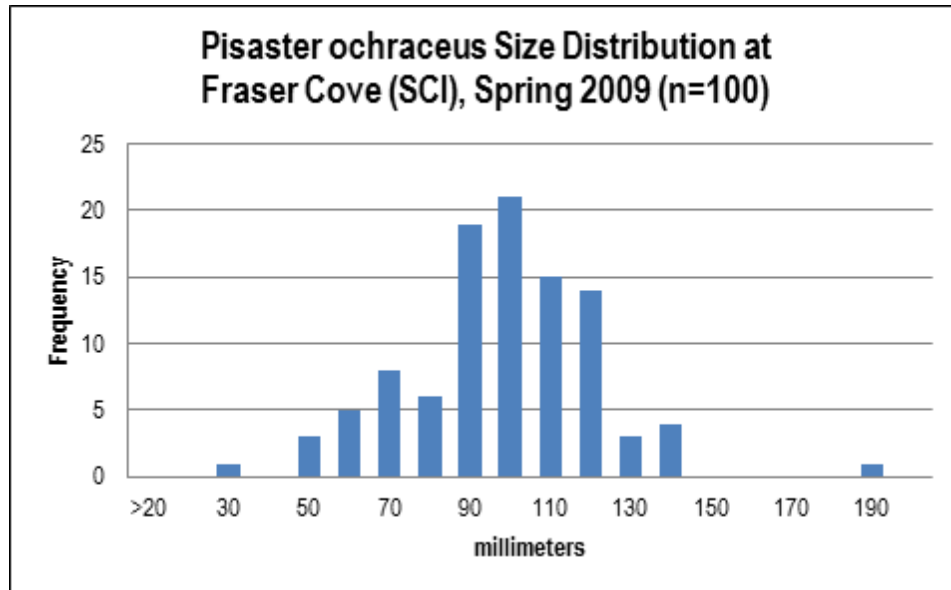
<i>Egregia menziesii</i>	1	11	-
Erect coralline	20	5	1
other red algae	44	46	23
Other green algae	3	-	3
<i>Anthopleura</i> spp.	2	1	-
<i>Mytilus californianus</i>	1	-	-
Rock	9	1	-
Sand	-	1	-
total	100	105	100

Surfgrass transects at Trailer, Santa Cruz Island, spring 2009 (additional taxa with no values deleted from table).

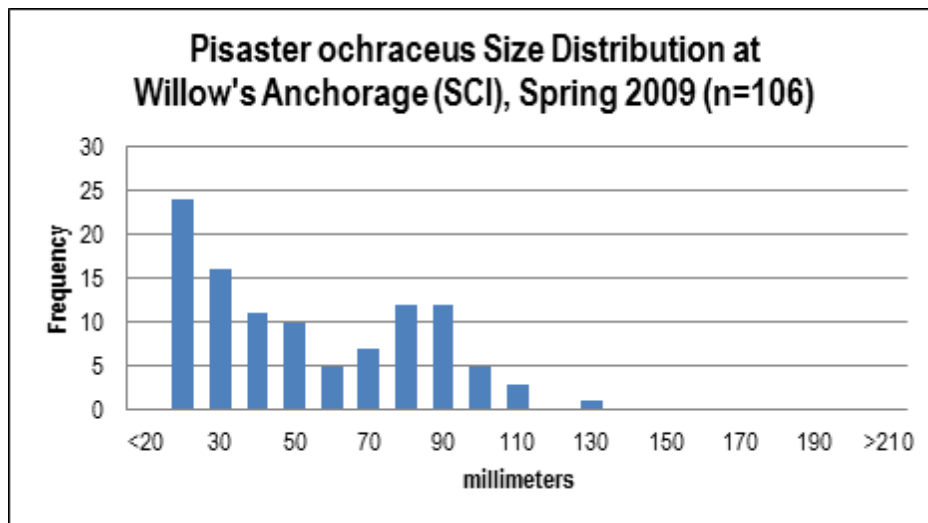
Location: Trailer Site Code: SCTR				
Date: 4/27/2009 Recorders: Dan Richards				
<u>Surf Grass Taxa</u>	<u>Transect 1</u>	<u>Transect 2</u>	<u>Transect 3</u>	
<i>Phyllospadix</i> spp. overstory	64	53	49	
<i>Phyllospadix</i> spp. understory	2	3	2	
<i>Egregia menziesii</i>	4	4	-	
<i>Cystoseira/Halidrys</i>	-	-	1	
articulated corallines	3	3	4	
other red algae	27	35	38	
other green algae	2	2	1	
<i>Phragmatopoma californica</i>	-	1	1	
barnacles	-	1	4	
Rock	-	1	2	
total	102	103	102	



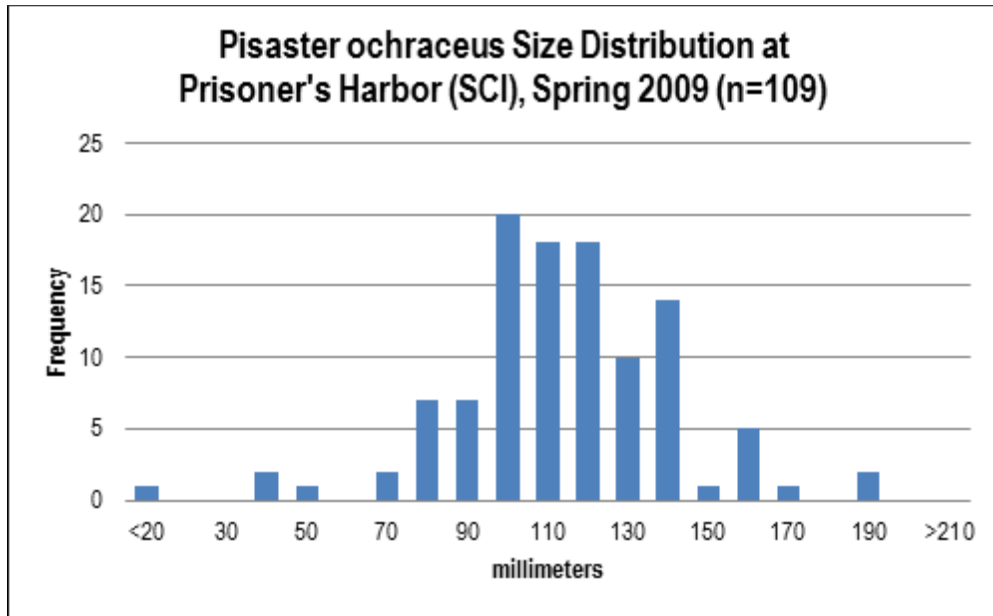
SCTR Pisaster Totals	
count	125
min size	42
max size	150
mean size	75.44
StDev	17.71



SCFC Pisaster Totals	
Count	100
min size	30
max size	190
mean size	98
StDev	23.74



SCWA Pisaster Totals	
count	106
min size	20
max size	130
mean size	53.68
StDev	29.38



SCPH Pisaster Totals	
count	109
min size	19
max size	190
mean size	113.57
StDev	27.80

Photoplot summary – mean percent cover by zone at Fraser and Forney's Cove, Santa Cruz Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracita	Endocladia	Hesperophycus	Silvetia	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	51.0	35.4	0.0	0.0	0.0	0.0	1.2	0.0	0.0	10.4	0.4	1.6	0.0
<i>Endocladia</i>	55.6	10.0	0.0	28.8	0.0	0.0	3.4	0.0	0.0	1.4	0.8	0.0	0.0
<i>Silvetia</i>	44.2	6.6	0.0	8.8	10.4	15.6	0.0	1.8	0.0	9.4	2.6	0.0	0.6
Mussels	21.6	0.2	0.2	0.0	0.0	0.0	66.0	0.0	0.2	1.2	10.6	0.0	0.0
<i>Pollicipes</i>	30.0	3.0	2.2	1.2	0.0	0.0	44.0	0.0	5.6	4.2	9.8	0.0	0.0
Tar	48.8	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.8	0.0
<i>Hesperophycus</i>	54.6	8.0	0.0	20.8	8.4	3.4	0.2	1.2	0.0	3.4	0.0	0.0	0.0

Photoplot summary – mean percent cover by zone at Prisoner’s Harbor, Santa Cruz Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hesperophycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	60.6	16.0	0.4	11.6	0.6	0.0	0.0	0.6	0.0	2.6	7.6	0.0	0.0
<i>Endocladia</i>	73.0	6.8	0.2	11.0	1.8	0.0	0.2	0.0	0.0	4.8	2.2	0.0	0.0
<i>Silvetia</i>	35.2	19.0	4.0	6.6	0.2	8.6	0.0	1.4	0.0	23.4	1.6	0.0	0.0
Mussels	25.8	22.0	5.8	0.0	0.0	0.0	0.6	2.2	0.0	20.2	22.8	0.0	0.6
<i>Hesperophycus</i>	53.0	4.8	0.0	6.0	2.8	0.2	0.0	0.0	0.0	32.2	1.0	0.0	0.0

Photoplot summary – mean percent cover by zone at Trailer, Santa Cruz Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hesperophycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Chthamalus/Balanus</i>	53.4	42.4	0.0	3.0	0.0	0.0	0.4	0.0	0.0	0.0	0.8	0.0	0.0
<i>Silvetia</i>	26.2	3.2	0.0	3.2	0.0	57.6	0.0	0.0	0.0	9.8	0.0	0.0	0.0
Mussels	8.8	1.2	1.0	0.0	0.0	0.0	47.8	1.4	0.0	29.8	10.0	0.0	0.0
<i>Hesperophycus</i>	40.8	11.8	0.0	13.5	5.5	26.5	0.0	0.0	0.0	1.8	0.0	0.0	0.0

Photoplot summary – mean percent cover by zone at Willow’s Anchorage, Santa Cruz Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hesperophycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
<i>Endocladia</i>	52.0	0.2	1.8	40.8	0.0	0.0	0.0	0.0	0.0	3.6	1.6	0.0	0.0
<i>Silvetia</i>	60.6	1.6	0.0	10.0	0.0	3.2	0.0	0.0	0.0	18.8	5.8	0.0	0.0
Mussels	17.8	0.0	7.0	0.0	0.0	0.0	49.2	5.4	0.2	18.4	2.0	0.0	0.0
<i>Hesperophycus</i>	58.8	5.4	0.0	16.8	0.6	0.8	0.0	0.0	0.0	17.4	0.2	0.0	0.0

Santa Rosa Island May 22-31, 2009

(Database event #2009-D))

Purpose: To count Snowy Plovers and monitor rocky intertidal sites at Santa Rosa Island.

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biotech, Channel Islands National Park
Jacob Elliott, S.C.A. Intern, Channel Islands National Park
Ken Niessen, volunteer
Lisa Drake, fox tech, Channel Islands National Park

Procedure and General Observations

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 5050-Z digital camera. Motile invertebrates were counted in the photoplots. Seastars and black abalone were counted and measured at all sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers were downloaded from Johnson's Lee, Northwest Talcott, and Fossil Reef. All were in housings placed in black abalone habitat. I concentrated on Snowy Plover counts the first few days with assistance from Lisa Drake for both counts and vehicle shuttles. Stephen, Jacob and Ken came out on Island Packers on 5/25. Summary tables of data are presented at the end.

Results (Daily and Site Description)

22 May, travel to Santa Rosa on Island Packers with Michele Berman, Krista Faye and an intern from the Santa Barbara Museum of Natural History and Sarah from NOAA to examine several northern right whale dolphins (*Lissodelphis borealis*) at Bechers Bay. Five animals were found on 21 May in the surf by the pier. At least two were alive at the time. We found three dead just outside the surf line and one on the beach north of the pier. All were adult males. Island Packers crew were very helpful in skiffing us to the site and pulling the dolphins ashore. Michele did a necropsy on the one north of the pier and the other three were taken back to Ventura on the IPCO boat for MRI scans and lab necropsy. During the necropsy, tissue samples were taken from all of the major organs. The only obvious sign of injury was some bruising and a broken rib and punctured lung, which may have occurred during the stranding. The fifth animal was never found.

23 May, Skunk Point beaches. High tide at 1025. Lisa Drake helped with vehicle shuttle and the count. We walked from Southeast Anchorage to the East Point beaches from 0805-1230 hrs. Nine western snowy plovers were seen (five females and four males). Six were on the main Skunk Point beach in three pairs. One pair was near the Old Ranch Lagoon and one female was on the rocky point south of the Old Ranch Lagoon. One male had bands but was not seen well enough to read them.

Five surfers were seen onshore walking along the beach between their anchorage and the surf spot. There were tracks from someone walking inshore to look at something up the beach and returning to shore.

The only other shorebirds seen were black oystercatchers. There were 12 on the rocks between Southeast Anchorage and Skunk, six on Skunk Pt., and three on the east beaches. There were about 300 western gulls on Skunk Point, at least three glaucus-winged gulls, about 85 brown pelicans and 8 royal terns. Five mallards were seen at various bodies of water on the east side and six brant geese were on the intertidal rocks by Old Ranch Canyon. Surf scoters and loons were seen offshore. One bald eagle adult was seen flying over Southeast Anchorage at 0817 and it had blue wing tags. One common raven was observed at Skunk Point. There was a high amount of weathered tar pancakes on the beach. Plastic debris was typical for the beach.

Returning to the vehicle, we encountered one of the campers on the beach by Old Ranch Lagoon. Upon informing him of the beach closure, he said he had seen two other people on the beach (probably us) and had followed us around Skunk Point.

A total of 11 carcasses were found including 7 California sea lions, one elephant seal, one western gull that had been preyed upon, a mola (with no fins) and a thornback ray.

In the afternoon, I walked the beach at the base of Soledad Canyon. No plovers were found. There were 12 black oystercatchers and one black/American hybrid oystercatcher on the beach. At least 100 western gulls, about 20 glaucus-winged gulls, two whimbrels, and two common ravens were seen.

There was a moderate fresh tar on the beach and a moderate amount of fresh wrack. The sand level was high. Five carcasses were found, including one common Raven, one rhinoceros auklet, two California sea lions and one large male elephant seal (at the mouth of Dry Canyon). Also found was a piece of trawl net and a monofilament gill net.

24 May, China Camp and Mud Tank Beaches. Lisa helped with the shuttle then went off to look for foxes. No plovers were found. There were about 200 elephant seals on the beach east of China Camp. China Camp had at least 500 elephant seals on the beach. They were also numerous at Cluster Point and at the mouth of the “no name” canyon. Only about 50 or 60 total were seen on the Bee Rock Beaches. One immature bald eagle with orange wing tags was seen at the main China Camp beach. A peregrine falcon seemed hostile as approached near the Whetstone Canyon bluffs. Five common ravens were seen. A total of 14 black oystercatchers were seen (nine were at Whetstone Beach). Western gulls were common and glaucus-winged gulls were present. There were about 100 Brandt’s cormorants and at least 45 nests near the mouth of Bee Canyon on the shore bluffs.

There were gull tracks on all the dunes. Skunk tracks were seen at Cluster Point and the no name canyon. 10 mule deer were in the dunes at Bee West. Deer tracks were observed at most of the beaches.

There were at least 17 elephant seal carcasses on the beaches, all were mummified too some degree and all were pups or immature animals. Other carcasses included two California sea lion adult females, two harbor seals (adult and pup) both mummified, a western gull, western grebe, rhinoceros auklet, and two immature glaucus-winged gulls that were apparently killed by a peregrine falcon.

25 May, Water Canyon. Water Canyon was hiked in the morning and no shorebirds or carcasses were seen. The bluff at the ranch dump continues to erode and there are many metal pieces from old vehicles in the intertidal zone. One great egret was on the rocks near the pier.

The rest of the crew arrived on Island Packers today. After lunch, we went out to the northwest beaches.

Tecalote Canyon Beach. There were two killdeer, three western gulls, one common raven and two mallards on the beach. No plovers were seen. The lagoon at the mouth was nearly dry and the stream was barely running. There were large piles of surfgrass wrack and much debris, mostly trap floats. Only two carcasses were found, a California sea lion pup and an immature western gull that had been predated. Both were old and dried. The amount of tar was low

Arlington Canyon Beach. The lagoon was small but there were 17 mallards present. No other birds were on the beach. Five western gulls and one double crested cormorant had been predated, more than likely by a peregrine falcon. One dried northern fulmar carcass may have been scavenged or predated. Three pinniped carcasses were on the beach, including an adult female California sea lion, a bull elephant seal and an immature elephant seal. Tar pancakes were abundant, especially at the east end of the beach. *Phyllospadix* wrack was abundant though not as thick as some years. Inside the wrack piles were hoards of beach hoppers. The mooring buoy, which has been high on the beach for two decades, was in the middle of the beach, the first time it has moved in many years.

Driving back through Verde Canyon, a loggerhead shrike was spotted just east of the creek crossing, flying upstream and landing in a *Baccharis* bush.

26 May, Johnson's Lee, low tide -1.5 at 0621 hrs. Conditions were excellent with light southwest swell, no wind, and heavy overcast. There were 4 black oystercatchers, 2 wandering tattlers and one song sparrow on the site. Eight elephant seals were in the area, either in the surge channel, pools, or floating in the surf zone. We were on site from 0715- 1050 hrs.

A commercial fisherman came by, just walking the shoreline. He had been surfing at Jolla and he spoke about the sailboat that wrecked just east of the monitoring site last winter. We checked it later, found most of the hull gone but the decking was still present, and the mast and some gear was on the rocks. I brought back a gallon can of what looked like bottom paint. One battery was present but was already broken and full of sand.

The temperature logger was downloaded at 0850 and replaced it back into the housing. All seemed fine. Overall, the site looked normal. There had been barnacle recruitment of both *Balanus glandula* and *Chthamalus* sp. *Endocladia* was dense in patches but not dense overall on most of the reef. Some *Endocladia* was lightly bleached. *Mytilus californianus* was common and there were numerous recruits including some in the *Phragmatopoma californica* on the lower shelf. *Pollicipes polymerus* were common among the mussels. In the low intertidal zones, red algae were abundant and diverse. *Phyllospadix* spp. was abundant. Sponges and tunicates were common.

Lottia gigantea were common and large. We did not have time to monitor the plots, but *Lottia* were numerous in plots 598 and 599. Plot 597 had no *Lottia*, 595 had one, and 596 only had a few. *Anthopleura elegantissima* were filling the bottom right quadrant of plot 595. Jacob found three *Haliotis cracherodii* including the large one still present in the same crevice at the end of the reef. Jacob counted 586 *Pisaster ochraceus*, one *P. gigantea* and one *Pycnopodia helianthoides* in a thirty-minute search of the reef. There were many juveniles among them. Sizes ranged from under 40mm to 100mm radius. In the 10x2m transect 42 *P. ochraceus* were found, most were small.

We checked Officers Beach for shorebirds finding none.

27 May, Ford Point. Low tide -1.3 ft at 0000 hrs. Conditions were excellent with moderate southwest swell, light wind, and heavy overcast. There were 3 black oystercatchers at the site. Stephen noticed a songbird nest on the cliff above the site- probably a house finch. Eight elephant seals were in the area floating in the surf zone. We were on site from 0720- 1120 hrs.

Chthamalus sp. recruits were abundant and overall barnacles were very common but not as dense as we sometimes see them and cove in the plots was relatively low. *Endocladia* was doing well in several plots but overall it seemed sparse though in good condition. *Mytilus* seemed typical for the last decade at this site but overall abundance was not high as lower shelf is dominated by *Pisaster ochraceus* and *Phragmatopoma californica*. *Phragmatopoma* was dominant in two of the mussel plots. Red algae were diverse and abundant in the lower zones and *Phyllospadix* was abundant though heavily epiphytized by *Smithora naiadum* and *Melobesia mediocris*. *Anthopleura elegantissima* were forming large clones including one below plot 534. I have not noticed these anemones being abundant here in recent years.

Jacob counted 529 *P. ochraceus* on the site. As we found at Johnson's Lee, juveniles dominated with the <40 mm size category being the largest. Because of the small animals, they did not appear as numerous as they were. Sizes ranged from under 40 mm to 110 mm. I found 18 *Haliotis cracherodii* with sizes ranging from about 40 mm to 165 mm. this was the same number found in January 2009.

I measured *Lottia gigantea* in the plots since we had time. I found 24 in the five plots ranging from 9 to 64mm in length. This number is half of what we found in January 2009. On plot 5, there was a shell (32 mm) of a *L. gigantea* with just a bit of muscle still attached. The plots were filled with hundreds of small *Lottia digitalis* and *L. scabra*. Few *L. limatula* were seen. *Lepidochitona hartwegii* were common among the mussels within the plots. Large *Nuttalina californica* were common also.

I scanned Ford Point beach from the bluff and did not see any shorebirds. There were about 100 elephant seals, 8 harbor seals and about 20 California sea lions on the beach.

28 May East Point. Low tide -1.0 ft at 0808. It was a beautiful day with overcast burning off in the late morning, no wind and very light swell. There were 6 black oystercatchers in the area. Two common ravens on the adjacent reef were only noticed when a peregrine falcon stooped on

them. There were eight bird carcasses on the bluffs, 3 gulls and 5 cormorants. All were apparently killed by a peregrine. No pinnipeds were in the area and Abalone Rocks only had 20-30 harbor seals as we drove by. We were on site from 0710 to 1145 hrs.

Chthamalus sp. were abundant and seemed to have had good recruitment recently. *Mytilus californianus* had very little recruitment. *Pisaster ochraceus* predation was present along the lower margins of the bed. The upper reef has patchy with plenty of openings among the mussel groups. Dense aggregations of *P. ochraceus* were in several spots along the reef feeding on mussels and leaving a meter wide band of bare rock, byssal threads, and *Ulva californica* below them. There were patches of *Endocladia muricata* that looked terrible on the upper reef. Plants were very ragged and bleached. Some of the *Silvetia compressa* looked ragged and plants were very sparse in most areas. There was some new growth happening though and some plants looked healthy. It seems that a few of the plants have the “black tip” fungus seen previously on the west end of the island. *Hesperophycus* also showed symptoms of the fungus and were sparse overall. There was new growth though. The full sized plants have very wide thalli, which are in stark contrast to the plants we see on San Miguel Island.

Motile invertebrates were fairly abundant in many of the plots. The *Endocladia* zone was the most depauperate followed by the barnacle plots save one that had micro-topography favorable to snails. Cover of *Endocladia* did not seem to have any bearing on the number of motile invertebrates

We found 10 *Haliotis cracherodii*. Most were out of reach in deep crevices so the size estimates were rough but only one was less than 90 mm. One was within the abalone transect between plots 591 and 593. Jacob counted 983 *Pisaster ochraceus* in a 30-minute search. There were a few less than 40 mm but most were mid-sized around 100 mm radius and the largest he measured were 130 mm.

Phyllospadix spp. cover was very high and the plants were healthy with almost no bleaching or broken leaves. *Smithora naiadum* cover was very high as well. Some of the *P. scouleri* was flowering.

The temperature logger and housing were missing. Apparently, the epoxy was not set well before the waves came in when we installed it in January. A replacement was not installed. We did not make any repairs but only a couple of corners were missing.

29 May Northwest-Talcott. Low tide -0.6 ft at 0905 hrs. Excellent calm and overcast conditions again. There were two western gulls and three black oystercatchers on the reef area. A pair of oystercatchers were acting as if they had a nest in the area but we did not see anything. There was a cracked egg on the reef but it looked like a western gull. There was at least one western gull nest on the bluff at the access point. We were on site from 0830 to 1230 hrs.

Silvetia looked great here. The plants here appear to be the *S. deliquescens* species (long and slender). *Silvetia* was present in several of the *Endocladia* and barnacle zone plots as well. There were a couple of wide *Hesperophycus californica* plants near plot 560, a species not usually seen at this site. *Ulva* spp. covered most of the middle reef including much of the

surfgrass. *Porphyra perforata* was common but patchy in distribution. *Mytilus californianus* was restricted to the outer reef only and there were many gaps in the cover (usually filled by coralline algae).

Surfgrass transects 1 and 2 had high cover but transect 3 was covered by *Ulva* spp. and most of the *Phyllospadix* there was pale and broken.

No *P. ochraceus* were found and only one *P. giganteus* and one *Patiria miniata* were seen. No *Haliotis cracherodii* were found. We saw the usual high diversity of algae and fish at the site.

The temperature logger was downloaded at about 0900.

30 May Fossil Reef. Low tide -0.1 ft at 1002 hrs. Conditions were overcast, calm, and a little cooler but still excellent for working. There were 5 black oystercatchers and 10 western gulls. One harbor seal was on the reef by the temperature logger. There were 6 elephant seals in the water at the site. Numerous elephant seals and harbor seals were on the reefs and beaches to the west of the site. We were on site from 0820-1345 hrs.

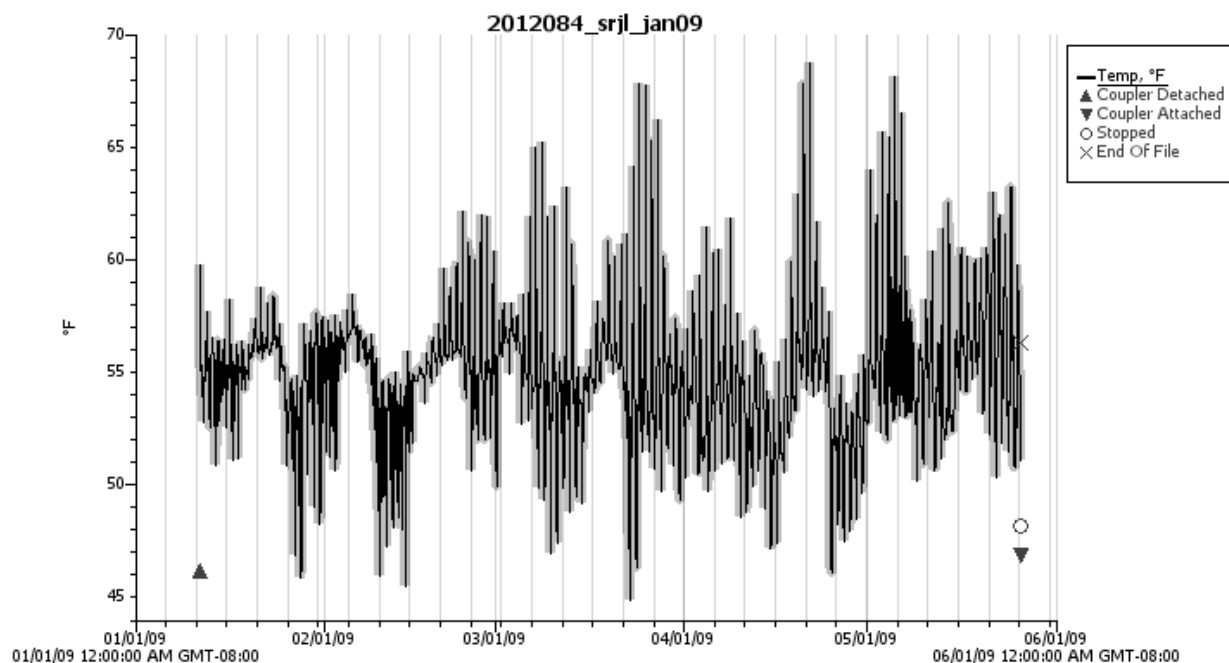
Silvetia was growing well in the middle reef with fairly high recruitment. This *Silvetia* looks quite different from plants at Northwest-Talcott. Anatomically, the algae would closer fit the *S. compressa* taxonomy. There were patches of bleached and abraded *Endocladia*. *Mytilus* was confined to the higher reaches of the reef, corralled by the numerous *Pisaster ochraceus*.

Jacob counted 327 *P. ochraceus* and there were two *P. giganteus*, 2 *Pycnopodia helianthoides*, and one *Patiria miniata*. *Pisaster* sizes ranged from under 40 mm to 150 mm radius. There were 99 *P. ochraceus* in the 30x6 m transect on the outer reef.

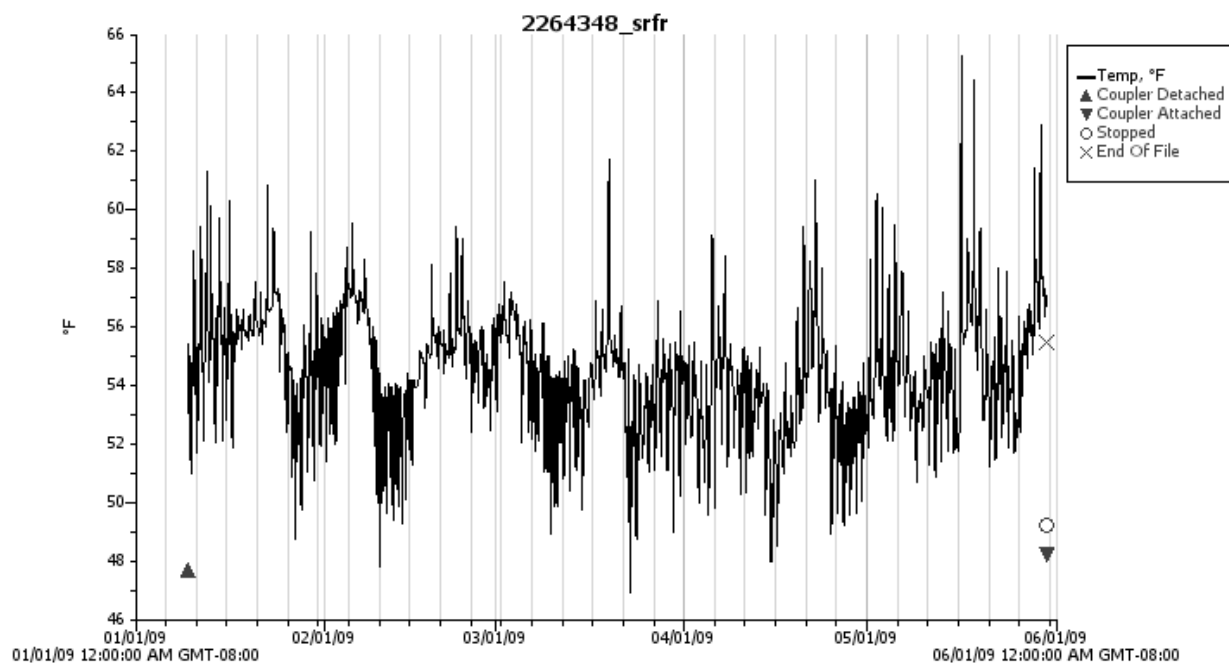
I only found 6 *Haliotis cracherodii*, and all were adults ranging from 86-169 mm. Two red abalone were found in the intertidal (137 and 191 mm). One fresh black abalone shell (66 mm) was found. A total of 33 black abalone were on the reef to the west of the site. All were large but no actual measurements were taken.

I measured *Lottia gigantea* in the plots finding 217 total. Sizes ranged from 18 to 91 mm.

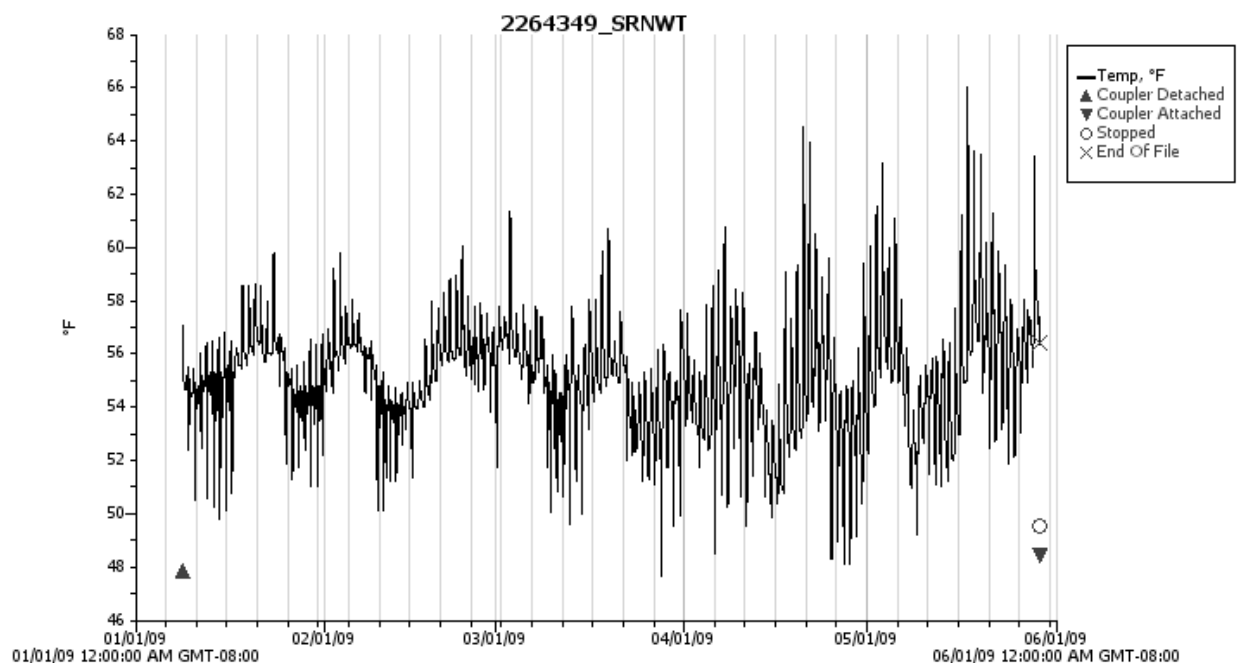
Mastocarpus papillatus was unusually abundant on the reef for this area. Flowering *Phyllospadix torreyi* was found. I have seen flowering *P. scouleri* this trip, but had not found *P. torreyi* flowers before. Neither surfgrass species was very common. *Tegula funebris* were very abundant in areas, especially on the west side of the site. An unusual species found was *Colpomenia bullosa*, which has been documented here before. *Stongylocentrotus purpuratus* was very abundant in the lower zones. *Sargassum muticum* was fairly common in the surge channels.



Temperature logger from Santa Rosa Island, Johnson's Lee (data downloaded Jan. 2009).



Temperature logger from Santa Rosa Island, Fossil Reef (data downloaded Jan. 2009).



Temperature logger from Santa Rosa Island, Northwest Talcott (data downloaded Jan. 2009).

Haliotis cracherodii (black abalone) counts at Santa Rosa Island, spring 2009.

Site Code	Timed count	Number in plots	Mean Size	St Dev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
SREP	11	0	114.73	31.37	60	157	-	63.64	9.09	27.27
SRFP	15	3	99.33	43.44	30	180	16.67	55.56	5.56	22.22
SRFR	6	0	121.67	37.09	86	169	-	50.00	16.67	33.33
SRJL	3	0	143.00	40.58	104	185	-	33.33	33.33	33.33
SRNWT	0	0	-	-	-	-	-	-	-	-

Lottia gigantea counts in plots at Santa Rosa Island, spring 2009.

Site Code	Plot	Number in plot	Density	Mean Size	St Dev	Min Size	Max Size
SRFP	600	2	.637	58.00	5.66	54	62
SRFP	601	0	-	-	-	-	-
SRFP	602	8	2.547	58.63	20.74	19	82
SRFP	603	4	1.273	27.75	24.20	14	64
SRFP	604	9	2.865	27.44	15.18	9	54
SRFR	1	2	.637	59.00	1.41	58	60
SRFR	2	3	.955	57.00	5.57	51	62
SRFR	3	44	14.008	61.23	16.14	23	91
SRFR	4	75	23.878	48.09	9.94	23	66
SRFR	5	93	29.608	44.35	13.75	18	77
SRNWT	701	17	5.412	84.94	19.79	37	104
SRNWT	702	15	4.776	80.33	7.11	70	89
SRNWT	703	15	4.776	69.27	14.69	37	87
SRNWT	704	9	2.865	70.56	16.89	42	96
SRNWT	705	9	2.865	69.22	12.07	43	83

Lottia gigantea size distribution in plots at Santa Rosa Island, spring 2009.

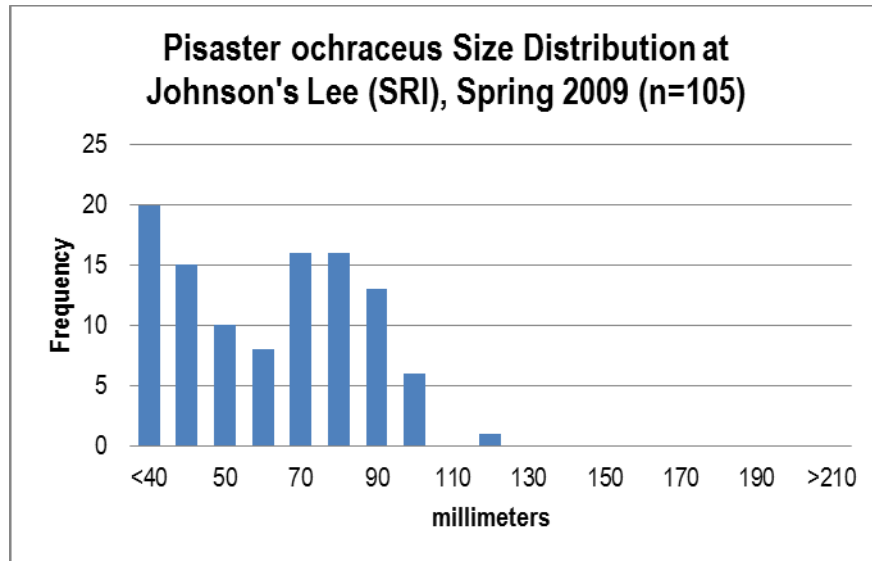
Site Code	Plot	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm	%70-79 mm	%80-89 mm	%90-99 mm	%≥100 mm
SRFP	600	0.00	0.00	0.00	0.00	50.00	50.00	0.00	0.00	0.00	0.00
SRFP	601										
SRFP	602	12.50	0.00	0.00	12.50	25.00	12.50	25.00	12.50	0.00	0.00
SRFP	603	75.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
SRFP	604	33.33	44.44	0.00	11.11	11.11	0.00	0.00	0.00	0.00	0.00
SRFR	1	0.00	0.00	0.00	0.00	50.00	50.00	0.00	0.00	0.00	0.00
SRFR	2	0.00	0.00	0.00	0.00	66.67	33.33	0.00	0.00	0.00	0.00
SRFR	3	0.00	6.82	2.27	15.91	13.64	22.73	31.82	4.55	2.27	0.00
SRFR	4	0.00	6.67	13.33	26.67	45.33	8.00	0.00	0.00	0.00	0.00
SRFR	5	2.15	13.98	23.66	19.35	24.73	12.90	3.23	0.00	0.00	0.00
SRNWT	701	0.00	0.00	5.88	5.88	5.88	0.00	5.88	17.65	41.18	17.65
SRNWT	702	0.00	0.00	0.00	0.00	0.00	0.00	40.00	60.00	0.00	0.00
SRNWT	703	0.00	0.00	13.33	0.00	0.00	26.67	40.00	20.00	0.00	0.00
SRNWT	704	0.00	0.00	0.00	11.11	11.11	33.33	22.22	0.00	22.22	0.00
SRNWT	705	0.00	0.00	0.00	11.11	0.00	44.44	22.22	22.22	0.00	0.00

Surfgrass transects at East Point, Santa Rosa Island, spring 2009 (Additional taxa with no values deleted from table).

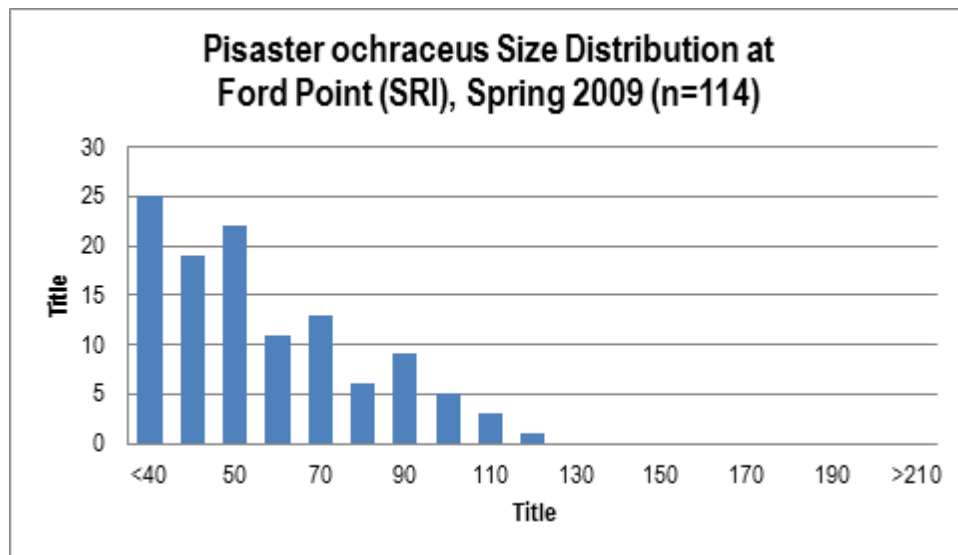
Location: East Point		Site Code: SREP		
Date: 28-May-09		Recorders: Dan Richards		
Surf Grass Taxa		Transect 1	Transect 2	Transect 3
<i>Phyllospadix</i> sp. overstory		97	95	90
<i>Phyllospadix</i> sp. understory		3		
<i>Egria menziesii</i>		2		
other red algae		1	4	5
other green algae				3
Sand			1	2
total		103	100	100

Surfgrass transects at Northwest Talcott, Santa Rosa Island, spring 2009 (Additional taxa with no values deleted from table).

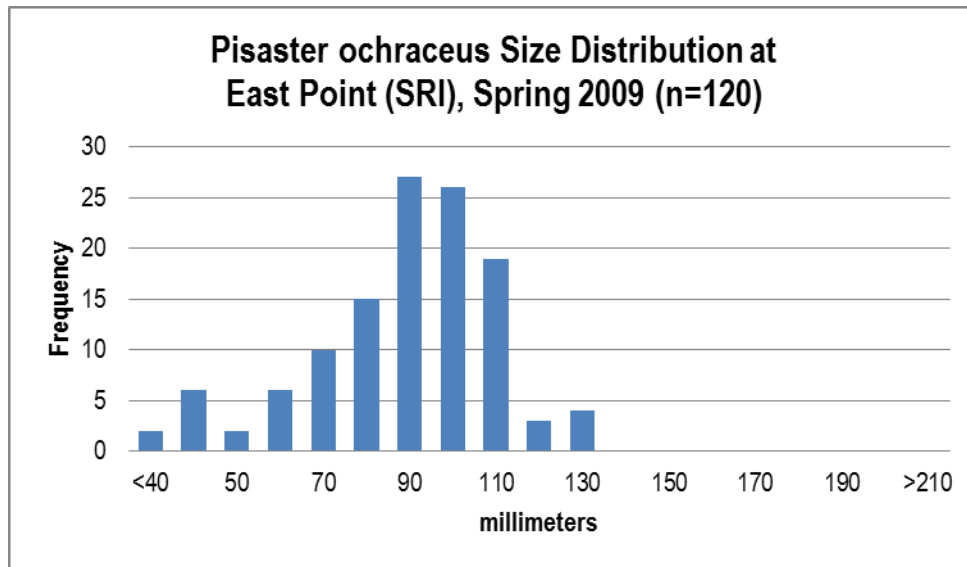
Location: Northwest-Talcott		Site Code: SRNWT		
Date: 29-May-09		Recorders: Dan Richards		
Surf Grass Taxa		Transect 1	Transect 2	Transect 3
<i>Phyllospadix</i> sp. overstory		83	96	17
<i>Phyllospadix</i> sp. understory				14
Encrusting coralline				1
Non-coralline crust				1
Erect coralline			2	2
other red algae			1	2
other brown algae		1		2
other green algae		12		77
Rock		3		
Sand		1	1	
total		100	100	116



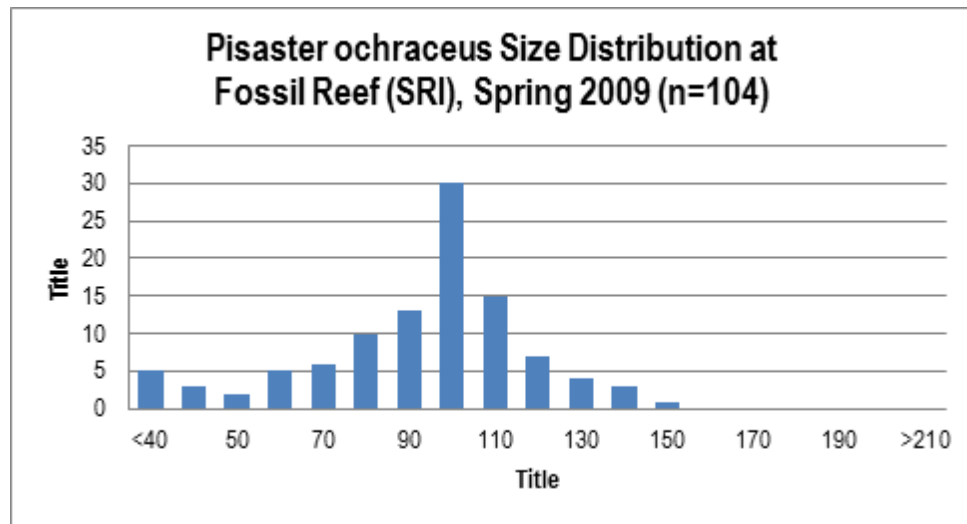
SRJL Pisaster Totals	
count	105
min size	39
max size	120
mean size	63.33
StDev	21.38



SRFP Pisaster Totals	
count	114
min size	39
max size	120
mean size	58.29
StDev	21.33



SREP Pisaster Totals	
count	120
min size	39
max size	130
mean size	88.98
StDev	21.20



SRFR Pisaster Totals	
count	104
min size	39
max size	150
mean size	93.13
StDev	24.81

Photoplot summary – mean percent cover by zone at East Point, Santa Rosa Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hespero-phycus	Silvetia	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	tar
<i>Chthamalus/Balanus</i>	43.4	39.2	0.0	10.4	5.8	0.4	0.0	0.0	0.0	0.2	0.4	0.2
<i>Endocladia</i>	59.0	0.4	0.0	38.8	1.4	0.0	0.0	0.0	0.0	0.0	0.4	0.0
<i>Silvetia</i>	64.6	0.0	0.0	14.0	0.8	15.8	0.2	0.0	0.0	3.0	1.6	0.0
Mussels	12.2	1.4	0.0	0.0	0.0	0.0	44.2	8.6	0.0	25.4	8.2	0.0
<i>Hespero-phycus</i>	24.8	2.4	0.0	53.2	18.6	0.4	0.0	0.0	0.0	0.4	0.2	0.0

Photoplot summary – mean percent cover by zone at Ford Point, Santa Rosa Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hespero-phycus	Silvetia	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	tar
<i>Chthamalus/Balanus</i>	61.8	25.2	0.0	9.6	0.0	0.0	0.2	0.0	0.0	0.2	3.0	0.0
<i>Endocladia</i>	41.2	4.6	0.2	45.0	0.0	0.0	3.2	0.0	0.0	3.4	2.4	0.0
Mussels	24.2	2.2	0.0	0.0	0.0	0.0	34.4	8.0	0.2	13.8	17.2	0.0

Photoplot summary – mean percent cover by zone at Fossil Reef, Santa Rosa Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hespero-phycus	Silvetia	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	tar
<i>Chthamalus/Balanus</i>	65.8	31.4	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8
<i>Endocladia</i>	39.4	13.8	0.0	38.2	0.0	7.0	0.0	0.0	0.0	1.0	0.6	0.0
<i>Silvetia</i>	27.0	4.4	0.0	21.0	0.0	46.0	0.0	0.0	0.0	0.6	1.0	0.0
Mussels	32.6	0.0	4.6	0.4	0.0	0.0	5.6	4.2	0.2	45.2	7.2	0.0

Photoplot summary – mean percent cover by zone at Johnson's Lee, Santa Rosa Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	Tetracrita	Endocladia	Hespero-phycus	Silvetia	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal
<i>Chthamalus/Balanus</i>	48.6	44.8	0.2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
<i>Endocladia</i>	48.4	5.0	0.4	33.8	0.0	0.0	9.4	0.0	0.6	0.0	2.4
Mussels	16.2	0.4	0.4	0.0	0.0	0.0	39.3	3.1	1.7	4.2	34.6

Photoplot summary – mean percent cover by zone at Northwest Talcott, Santa Rosa Island, spring 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetraclitia</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	tar
<i>Chthamalus/Balanus</i>	43.6	34.2	0.0	2.0	0.0	18.6	0.0	0.0	0.0	0.8	0.6	0.2
<i>Endocladia</i>	61.2	1.6	0.2	16.8	0.0	13.8	0.0	0.0	0.0	4.8	1.6	0.0
<i>Silvetia</i>	39.6	0.2	0.0	3.4	0.0	55.0	0.0	0.0	0.0	1.4	0.2	0.2
Mussels	36.2	0.0	0.4	0.0	0.0	0.0	28.2	1.4	3.2	25.6	5.0	0.0

Fall 2009 Rocky Intertidal Trip Reports

Santa Barbara Island October 14-18, 2009

(Database event #2009E)

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
 Stephen Whitaker, Biological Technician, Channel Islands National Park
 Christy Hand, Biological Technician, Channel Islands National Park
 Nick Griese, Biological Technician, Channel Islands National Park
 Kevin Barnes, volunteer

Procedure and General Observations

Standard procedures were followed to photograph, field score and count motile invertebrates in fixed plots. All plots and site overviews were photographed with an Olympus 5050 digital camera mounted on a PVC quadrapod. Scoring was performed in the field for all plots. Sub-sampling of motile invertebrates was performed for littorines and small limpets, using three 20x20 cm, or 10x10 cm, subplots as noted. Sea stars and abalone were counted and measured at both sites using a 30-minute timed-search. The maximum number of shorebirds and pinnipeds seen at any one time was recorded. We used the Ocean Ranger to go out on 10/14, but were the swell and rain prevented us from doing any intertidal work that day. We returned to Ventura on the Island Packers boat 10/18.

Results (Daily and Site Description)

October 15, Landing Cove. Low tide 0.5 ft at 1412 hrs. It rained about .25 inches over the previous 48 hrs, but today was sunny after morning fog. The wind was calm but there was a large swell (about 4ft), limiting our ability to work. There were 20 young California sea lions in the cove. Two black turnstone, one wandering tattler, and two black oystercatchers were present in the cove. Western gulls and royal terns were flying in the area.

We only had a short time to work safely around the large swell. We shot photos of the barnacle and mussel zone plots. I scored four of the barnacle plots that probably would have been impossible to score accurately from the photos because of the dark wet rock and small red algae. It was too risky to try to score the other plots. We did not go to the north side plots since the crossing is still a little sketchy and the turf plots were never exposed.

October 16, Sea Lion Rookery. Low tide 0.0 ft at 1455 hrs. The morning started off breezy (10-15 mph), but by approximately 1000 there was very little wind and clear sky. Most of Catalina and part of San Clemente Island were visible with only a slight amount of haze on the waterline. Dan and Stephen Whitaker left housing around 1100 to hike over to SLR. The temperature felt warm perhaps in the mid to upper 80's. Swell remained moderate-sized (approx. 3-4ft) and continued to come out of the northwest. Though SLR faces the opposite direction of the swell, the sets wrap around the island and impact the site.

There were approximately 50 sea lions on the bluff above the site. We slowly made our way down the bluff to avoid causing any harm to the sea lions and waited 15-20 minutes for the tide

to recede before monitoring. There may have been at least 300 sea lions (mostly juveniles and mature females) in the water immediately surrounding the site.

The maximum number of shorebirds seen was 6 western gulls, 3 black oystercatchers, 6 black turnstones and 8 royal terns occupying the site.

I counted motile invertebrates while Dan scored photo plots. We both managed to complete three zones (barnacle, Endocladia, and rockweed), but were unable to safely and accurately sample the 5 *Mytilus* plots due to the moderate-sized waves that continuously washed over the outer reef. Afterwards, we both worked together to photograph all plots and shoot the panoramic photos. At the low tide, Dan counted sea stars and abalone while I measured both sea stars (100) and 60 *Lottia gigantea*. In a 30-minute count covering the entire site, 1024 *Pisaster ochraceus* were found. The ratio of orange to purple/other color was 230:794. Sizes ranged from 60-170 mm. No abalone were found. The abalone plots were primarily dominated by *Tetraclita*, *Mytilus* and various algae.

Within the barnacle plots, I observed very few invertebrates. Limpets and littorine snails were uncommon. Only a few *Tegula funebris* and *Ocenebra circumtexta* were present throughout all five plots. The Endocladia plots had similar abundances of motile invertebrates though chitons (both *Nuttalina* and *Lepidochitona*) were slightly more common. The rockweed plots had low numbers of small to medium limpets and littorine snails. Larger (>15mm) limpets were fairly common averaging approximately 10 per plot and the gastropod *Ocenebra* was the second most abundant organism. Throughout the three zones sampled, *Nucella* were absent and only one *Tegula gallina* and two *Acanthina* were observed in plots. *Tegula gallina* were present in slightly higher numbers on the upper reef above plot 347.

Much of the intertidal zone was covered by a low-lying layer of *Ulva* sp. indicating an influx of nutrients perhaps from wastes emitted from the pinnipeds. Mussel recruitment was low. Large open patches were common throughout the mussel bed where dense fronts of *Pisaster ochraceus* were feeding. *Tetraclita rubescens* and *Anthopleura elegantissima* were the dominant organisms in the wake of *Pisaster ochraceus*.

October 17, Landing Cove. Low tide -0.3 ft at 1537 hrs. Conditions were pleasant with a high around 75°F and little wind out of the northwest. There was residual swell from the previous few days but it was slightly smaller with sets averaging 2-3ft occasionally peaking at 4ft. We had a lower tide than previous days, which helped to significantly improve working conditions.

On the western reef, there were two black oystercatchers and eight sea lions. One elephant seal was observed swimming in Landing Cove during the morning around 0900 and again around 1300.

Dan and I started monitoring the eastern reef at 1300. The tide was not quite low enough to access most of the plots so Dan recorded while I counted motile invertebrates in the barnacle plots. We scored 4 out of 5 plots and decided to relocate to the western reef to work while the tide continued to recede. Kevin Barnes joined us as to aid in note taking. Crossing the chasm

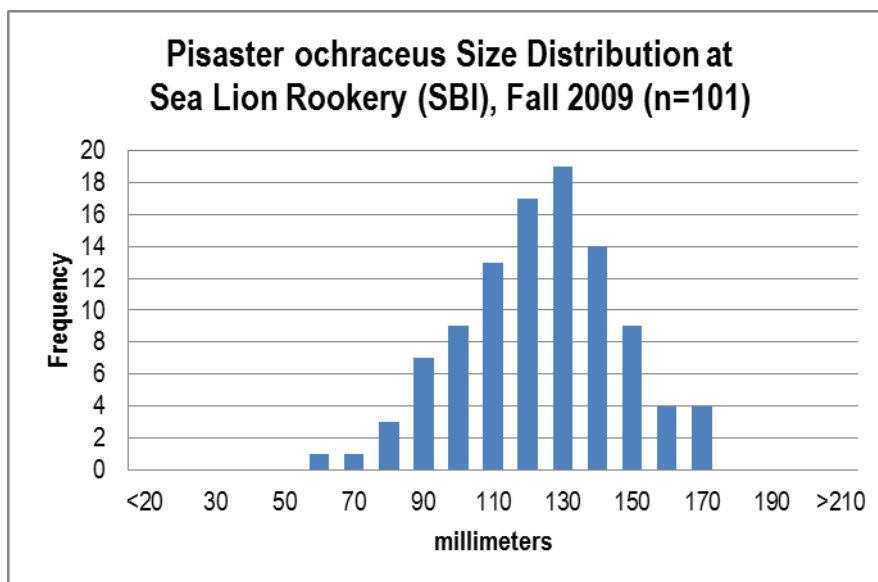
above the surge channel was dicey. Dan and Kevin crossed first successfully, but the foothold began to crumble as I moved across.

With Kevin recording, I counted motile invertebrates in the rockweed plots while Dan scored both the rockweed and the red turf zones. Afterwards, all three of us worked to photograph the 10 plots. As in previous years, we did not count motile invertebrates in the red turf plots. We decided to climb up the draw above the surge channel to get back across to the pier rather than cross the way we came over.

Back at the eastern reef, we all worked to shoot the plot and panoramic photos. Kevin recorded for me as I counted motile invertebrates in the mussel zone and the remaining barnacle plot. Dan scored plot 329 but not the other mussel zone plots. Dan counted seastars finding 381 *P. ochraceus* in a 30-minute search of the reef, including 35 *P. ochraceus* in the 15x2 m transect between plots 327 and 329.

Overall, there were more motile invertebrates to count in the plots at Landing Cove than at Sea Lion Rookery. In 3 out of 5 barnacle plots as well as in all mussel and rockweed plots, there were low numbers of littorine snails. Plots 318 and 319 had an average of 15 littorine snails (most were large) in the 20x20 cm sampling areas. *Ocenebra* were common in two of the barnacle plots as well as all five of both the *Mytilus* and rockweed plots though all measured snails were noticeably small. Only two *Tegula funebris* were located in all three zones. Both were recorded in the rockweed plot #314. The only other gastropods found in the plots were three *Amphissa versicolor* and one *Acanthina*. The chitons *Lepidochitona* spp. and *Nuttalina* spp. were present in all three zones but most individuals were small. Three of the mussel plots had several small purple urchins.

General bird list for the week: Brown Pelican, Western Gull, Brandt's Cormorant, Royal Tern, Black Oystercatcher, Black Turnstone, Wandering Tattler, Northern Harrier, Peregrine falcon, American Kestrel, Burrowing Owl, Horned Lark, Western Meadowlark, Rock Wren, Say's Phoebe, Black Phoebe, White-crowned Sparrow, Yellow-rumped warbler, Ruby-crowned kinglet, Vaux's swift, Spotted Towhee, Green heron.



SBSLR Pisaster Totals	
count	101
min size	37
max size	176
mean size	123.47
StDev	22.99

Lottia gigantea counts in plots at Sea Lion Rookery, Santa Barbara Island, fall 2009.

Site Code	Plot	Count	Mean Size	StDev	Min Size	Max Size
SLR	6	60	45.90	8.83	17	70

Lottia gigantea size distribution in plots at Sea Lion Rookery, Santa Barbara Island, fall 2009.

Site Code	Plot	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm	%70-79 mm
SLR	6	1.67	0.00	20.00	38.33	36.67	1.67	1.67

Photoplot summary – mean percent cover by zone at Landing Cove, Santa Barbara Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hesperophycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	<i>Silvetia</i>	<i>Tetraclitia</i>	Turf-weed
<i>Chthamalus/Balanus</i>	43.0	0.2	4.2	0.0	0.0	30.0	1.0	9.0	0.0	12.0	0.6
<i>Silvetia</i>	54.6	0.6	0.0	0.0	0.0	37.2	0.6	0.6	0.6	0.0	5.8
Mussels	4.4	0.0	0.0	0.0	0.2	11.0	1.0	71.2	0.0	9.6	2.6
Red Algal Turf	2.2	0.0	0.0	0.0	0.0	34.8	1.4	15.8	0.0	0.0	35.6

Photoplot summary – mean percent cover by zone at Sea Lion Rookery, Santa Barbara Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hesperophycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	<i>Silvetia</i>	<i>Tetraclitia</i>	Turf-weed
<i>Chthamalus/Balanus</i>	38.8	3.6	0.6	0.0	0.0	55.4	0.0	1.4	0.0	0.2	0.0
<i>Endocladia</i>	21.2	0.4	7.2	0.0	1.0	64.2	0.2	2.6	0.0	2.8	0.4
<i>Silvetia</i>	21.8	0.0	1.0	0.0	0.0	42.2	1.4	6.4	12.8	0.8	13.6
Mussels	2.0	0.0	0.0	0.0	0.0	88.8	3.4	0.0	0.0	3.8	2.0

Santa Cruz Island November 1-6, 2009

(Database event #2009-F))

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
 Stephen Whitaker, Biotech, Channel Islands National Park
 Rachel Clausing, UCLA Graduate Student
 Jessie Altstatt, Santa Barbara Channel Keepers

Procedure and General Observations

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 5050-Z digital camera. Motile invertebrates were counted in the photoplots. All photoplots were field scored at all four sites. Seastars and black abalone were counted at all sites. We did not measure sea stars. *Lottia gigantea* were counted and measured in one-meter radius circular plots. The maximum number of shorebirds and pinnipeds observed at each site was recorded. The Hobotemp Tidbit temperature logger was downloaded from Willows Anchorage. We used Island Packers for transportation both ways. We camped at the west end lean-to two nights and used the UC Reserve research station and vehicles.

Results (Daily and Site Description)

November 1, Prisoners Harbor, Low tide -0.2 ft at 1445 hrs. Conditions were excellent with clear sky and calm sea and wind. We came out on Island Packers today, arriving about 1100 hrs. There was a wandering tattler and a western sandpiper on the reef. A western gull and two royal terns were feeding on the baitfish nearby. One Harbor seal watched us from the water. There were several piles of fox scat on the upper rocks of the site. We were on site from 1200-1530 hrs.

The sampling went well. Steve and I shared the plot scoring. *Mytilus californianus* were missing from all plots and were in very low densities on the reef. Only a few were found near the Endocladia plots or in small crevices. *Septifer* were only a little more common up in the upper zones. Diatoms or small ceramiales type red algae and *Corallina* spp. were the dominant occupants in the mussel zone plots. *Balanus/Chthamalus* were abundant in areas with high densities of young recruits in some of the *Hesperophycus* zone plots. *Endocladia* was present but not very abundant in the plots. *Hesperophycus* plants did not look very vigorous and were sparse along the reef. There was moderate recruitment though. *Silvetia* were not very common but the plants looked healthy and were growing. *Nemalion helminthoides* seemed to be everywhere on the mussel reef. *Scytosiphon dotyi* and *Endarachne* sp. were very common. *Tetraclita rubescens* were abundant with heavy new recruits common. *Serpulorbis squamigerous* was very common in the low zones with *Chondracanthus canaliculatus*. I did not search through the algae for *Psuedochama exigeros*, but numerous empty shells were seen on the outer reef.

One *Haliotis cracherodii* and 62 *Pisaster ochraceus* were found in a 30-minute search of the reef.

November 2, Willows Anchorage. Low tide -0.5 ft at 1523 hrs. We had excellent conditions with calm seas and wind. There was fog right on the coastline all day. Rachel Clausing helped us with recording and the seastar count. She wants to set up an experiment at the site to look at

effects of nutrient influx. There was one western gull and one black oystercatcher at the site. We were on site from 1200-1700 hrs.

Silvetia compressa was in better shape than it was last spring, though abundance was still pretty low overall. *Hesperophycus* abundance was low and overall condition was fairly poor. Both rockweeds were non-reproductive. *Mazzaella affinis* and *Endocladia muricata* were very abundant. *Balanus/Chthamalus* were abundant above the *Endocladia* zone. *Chondracanthus canaliculatus* and *C. leptorhyncus* were both abundant. *Mytilus californianus* were common but there are still large open patches on the reef where sea stars have taken a toll. Moderate recruitment of mussels was seen.

Lottia gigantea numbers were about the same as last year, and we found more than it appeared there would be in the plots. Most of the plots had about 50% mussel cover. Plot 5 did not have any limpets and was mostly covered by *Corallina* spp. I found 114 *H. cracherodii* in about 90 minutes including measuring most of them. I did not go past the crevice and pool next to the *Endocladia* plots. The majority were in groups of two or more. Sizes ranged from 34-134 mm. I also found nine fresh *H. cracherodii* shells and one *H. rufescens* shell (32-77 mm). Rachel counted 294 *Pisaster ochraceus*. We did not measure sizes but there were numerous small individuals present.

Aplysia californica juveniles were quite common scattered around the reef. *Phragmatopoma californica* was abundant, especially on the inner reefs. There was fairly high sand between the innermost reefs. *Egregia menziesii* was common as was *Endarachne* sp. *Sargassum muticum* was quite common in the inner reef area. *Strongylocentrotus purpuratus* were common inside the cove.

November 3, Fraser Cove. Low tide -0.6 ft at 1604 hrs. The weather was foggy and breezy with a moderate swell but conditions were still good for us. Ten black oystercatchers were the only shorebirds seen. At Forney's Cove there were numerous gulls, 13 royal terns, one black oystercatcher and one long-billed curlew. Jessie Altstatt was on the island to help Carol and joined us for the two days at the west end. We camped at the trailer site both nights because of the late tides.

Steve and Dan shared scoring the photoplots. Dan counted 263 *Pisaster ochraceus* in a 30-minute search. No abalone or other species of stars were found. Many of the stars were in crevices under *Egregia*. There were a few small *P. ochraceus*, but most were in the 100-150 mm range. No measurements were made, however. *Phyllospadix* spp. looked very healthy, and cover was good, ranging from 45-81% cover in the transects. Epiphytes were only light in abundance. *Lottia gigantea* density was fairly low with only 48 total found in the five plots.

Balanus/Chthamalus cover was high with lots of recruitment. There were some empty tests but nothing unusual. *Endocladia* was very dense and a nice dark healthy color. *Pollicipes polymerus* were common and *Mytilus* were abundant. *Phragmatopoma* was abundant.

November 4, Trailer, Low tide -0.6 ft at 1651 hrs. We had clear and calm weather again today, making for excellent conditions to do the monitoring. There were three black oystercatchers 2 black turnstones, one blue heron, two western gulls, a snowy egret on the kelp bed offshore and a royal tern flying over were seen today.

Balanus/Chthamalus cover was high. There was good barnacle recruitment and about 10% of the tests were empty. Both rockweeds were doing abundant on the first reef and the plants were all healthy looking. Both *Silvetia* and *Hesperophycus* were reproductive. *Mytilus californianus* cover was low in the plots and there were many open areas throughout the bed. *Phragmatopoma californica* was abundant and there were many young colonies. *Tegula funebris* were abundant and only a few *T. gallina* were found.

Steve counted 217 *Pisaster ochraceus*, which is a considerable decline from past years. There were still some dense clusters of seastars within the mussel bed. Jessie counted 14 *Haliotis cracherodii* in 30 minutes over the site. In an additional search of about 45 minutes, we found another 45. *Lottia gigantea* looked good, however only one was found in plot 3 and none were found in plot 5. Plot 5 was barren of mussels and had high cover of barnacles. Because there were so many large *Lottia limatula* in plot 4, we measured them for possible future comparisons. *Phyllospadix* was in good condition and fair cover (44-72% cover) in the transects. One repair was made to install new upper bolts to plot M4 (924).

Surfgrass transects at Fraser Cove, Santa Cruz Island, fall 2009 (additional taxa with no values deleted from table).

Location: Fraser Cove		Site Code: SCFC	
Date: 3 Nov. 2009		Recorder: Dan Richards	
<u>Taxa</u>	<u>Transect 1</u>	<u>Transect 2</u>	<u>Transect 3</u>
<i>Phyllospadix</i> overstory	45	55	81
<i>Phyllospadix</i> understory	6	0	1
<i>Egregia menziesii</i>	12	0	0
<i>Anthopleura</i>	3	0	0
Articulated coralline algae	2	1	4
Other red algae	25	35	10
Other green algae	0	2	1
Barnacles	1	0	0
Rock	3	1	2
Sand	2	0	1
<i>Phragmatopoma californica</i>	1	6	1
total	106	100	101

Surfgrass transects at Trailer, Santa Cruz Island, fall 2009 (additional taxa with no values deleted from table).

Location: Trailer	Site Code: SCTR		
Date: 4 Nov. 2009	Recorder: Dan Richards		
Taxa	Transect 1	Transect 2	Transect 3
<i>Phyllospadix</i> overstory	72	61	44
<i>Phyllospadix</i> understory	3	2	2
<i>Egria menziesii</i>	0	0	2
<i>Eisenia arborea</i>	0	0	1
<i>Halidrys</i>	0	0	3
Articulated coralline algae	3	4	9
Other red algae	23	30	36
Other green algae	0	0	2
Barnacles	1	3	0
Rock	1	2	4
total	103	102	102

Temperature logger at Santa Cruz Island, Willow's Anchorage, fall 2009.

Haliotis cracherodii (black abalone) counts at Willows Anchorage, Santa Cruz Island, fall 2009.

Timed count	Mean Size	StDev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
54	62.22	21.36	30	134	20.37	77.78	1.85	-

Lottia gigantea counts in plots at Willows Anchorage, Santa Cruz Island, fall 2009.

Plot	Number in Plot	Density	Count Sized	Mean Size	StDev	Min Size	Max Size
1	44	14.008	44	31.50	12.10	15	66
2	22	7.004	22	33.18	10.93	15	57
3	45	14.327	45	26.42	9.46	14	52
4	7	2.229	7	30.14	17.37	14	57
5	0	.000	0	-	-	-	-

Lottia gigantea size distribution in plots at Willows Anchorage, Santa Cruz Island, fall 2009.

Plot	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm
1	15.91%	43.18%	9.09%	22.73%	6.82%	2.27%
2	13.64%	18.18%	40.91%	13.64%	13.64%	0.00%
3	26.67%	40.00%	22.22%	6.67%	4.44%	0.00%
4	42.86%	28.57%	0.00%	0.00%	28.57%	0.00%
5	-	-	-	-	-	-

Lottia gigantea counts in plots at Trailer, Santa Cruz Island, fall 2009.

Plot	Count Density	Area	Density	Count Sized	Mean Size	StDev	Min Size	Max Size
1	18	3.14	5.731	18	64.94	27.90	15	97
2	23	3.14	7.323	23	57.26	24.05	19	93
3	1	3.14	.318	1	42.00		42	42
4	23	3.14	7.323	23	37.48	27.88	14	82
5	0	-	.000	0	-	-	-	-

Lottia gigantea size distribution in plots at Trailer, Santa Cruz Island, fall 2009.

Plot	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm	%70-79 mm	%80-89 mm	%90-99 mm
1	11.11	5.56	11.11	0.00	0.00	11.11	22.22	22.22	16.67
2	4.35	13.04	4.35	26.09	4.35	4.35	17.39	21.74	4.35
3	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
4	52.17	4.35	0.00	4.35	8.70	4.35	21.74	4.35	0.00
5	-	-	-	-	-	-	-	-	-

Lottia gigantea counts in plots at Frasier Cove, Santa Cruz Island, fall 2009.

Plot	Count Random	Count Density	Area	Density	Count Sized	Mean Size	StDev	Min Size	Max Size
1	0	14	3.14	4.457	14	46.21	14.27	18	70
2	0	3	3.14	.955	3	58.67	13.43	49	74
3	0	13	3.14	4.139	13	45.54	14.00	27	68
4	0	7	3.14	2.229	7	32.71	6.02	23	41
5	0	11	3.14	3.502	11	47.82	15.20	22	71

Lottia gigantea size distribution in plots at Frasier Cove, Santa Cruz Island, fall 2009.

Plot	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm	%70-79 mm
1	7.14	7.14	14.29	28.57	21.43	14.29	7.14
2	0.00	0.00	0.00	33.33	33.33	0.00	33.33
3	0.00	7.69	30.77	30.77	0.00	30.77	0.00
4	0.00	28.57	57.14	14.29	0.00	0.00	0.00
5	0.00	9.09	18.18	27.27	27.27	0.00	18.18

Photoplot summary – mean percent cover by zone at Willows Anchorage, Santa Cruz Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hesperophycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Silvetia</i>	Tar	<i>Tetracita</i>
<i>Endocladia</i>	28.2	0.0	60.8	0.0	0.0	8.8	1.2	0.0	0.0	0.0	0.0	1.0
<i>Silvetia</i>	45.6	0.2	13.0	0.0	0.0	27.8	9.8	0.0	0.0	3.6	0.0	0.0
Mussels	4.0	0.0	0.0	0.0	0.2	35.0	2.6	50.6	0.0	0.0	0.0	2.6
<i>Hesperophycus</i>	58.8	1.8	14.0	3.0	0.0	21.4	0.2	0.0	0.0	0.8	0.0	0.0

Photoplot summary – mean percent cover by zone at Trailers, Santa Cruz Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hesperophycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Silvetia</i>	Tar	<i>Tetracita</i>
<i>Chthamalus/Balanus</i>	57.6	37.6	3.4	0.0	0.0	0.0	1.0	0.4	0.0	0.0	0.0	0.0
<i>Silvetia</i>	25.0	0.8	2.6	0.6	0.0	7.4	0.0	0.0	0.0	63.4	0.0	0.0
Mussels	8.0	1.6	0.0	0.0	0.0	38.6	27.4	19.6	1.8	0.0	0.0	0.0
<i>Hesperophycus</i>	41.7	6.5	10.5	9.2	0.0	0.5	0.2	0.0	0.0	31.2	0.3	0.0

Photoplot summary – mean percent cover by zone at Fraser and Forney's Cove, Santa Cruz Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endo-cladia</i>	<i>Hespero-phycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Sil-vetia</i>	Tar	<i>Tetra-clita</i>	Turf weed
<i>Chthamalus/Balanus</i>	53.0	40.2	2.0	0.0	0.0	1.0	0.0	1.4	0.0	0.0	2.4	0.0	0.0
<i>Endocladia</i>	40.2	10.2	33.2	0.0	0.0	6.4	0.6	3.8	0.0	0.0	0.0	5.6	0.0
<i>Silvetia</i>	37.4	4.0	5.6	11.0	0.0	13.4	0.2	0.0	0.2	24.6	0.0	0.0	3.6
Mussels	11.2	2.4	0.0	0.0	0.8	7.8	11.6	65.6	0.0	0.0	0.0	0.6	0.0
<i>Pollicipes</i>	13.8	10.2	2.2	0.0	6.2	9.8	8.6	46.2	0.0	0.0	0.0	2.4	0.6
Tar	46.0	7.8	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	46.	0.0	0.0
<i>Hespero-phycus</i>	49.2	2.6	19.6	19.0	0.0	5.0	0.0	0.0	0.0	3.8	0.0	0.0	0.8

Photoplot summary – mean percent cover by zone at Prisoner's Harbor, Santa Cruz Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endo-cladia</i>	<i>Hespero-phycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Sil-vetia</i>	Tar	<i>Tetra-clita</i>	Turf weed
<i>Chthamalus/Balanus</i>	55.0	16.0	10.8	1.2	0.0	13.4	2.2	0.0	0.0	0.0	0.0	0.2	1.2
<i>Endocladia</i>	76.2	9.6	8.8	0.8	0.0	3.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0
<i>Silvetia</i>	40.8	4.0	5.4	1.0	0.0	36.0	0.2	0.0	0.2	10.4	0.0	2.0	0.0
Mussels	16.8	0.4	0.0	0.0	0.0	41.0	4.8	0.0	26.4	0.0	0.0	7.4	3.2
<i>Hespero-phycus</i>	76.4	14.2	3.2	4.6	0.0	0.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0

San Miguel Island November 13-18, 2009

(Database event #2009-G)

Purpose: To monitor rocky intertidal sites at San Miguel Island.

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
 Stephen Whitaker, Biotech, Channel Islands National Park

Procedure and General Observations

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 5050-Z digital camera. All photoplots were scored in the field. Sea stars and black abalone were counted at all sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers were downloaded from Crook Point, and Otter Harbor in black abalone habitat.

Results (Daily and Site Description)

13 November 2009 Otter Harbor. Low tide 0.0 ft at 1341 hrs. Conditions were clear and very windy. Winds were WNW at 25 mph. High swell/surge combined with a moderately low tide made for difficult sampling conditions. There were 5 black oystercatchers, one hybrid American/black oystercatcher and 23 harbor seals, and on the reef or near by there were 4 western gulls, 1 cormorant, and 2 common ravens. We got a lift from the plane to get on site by 1200 and departed the site at 1600 hrs. We both scored plots, photographed plots and measured *Lottia gigantea*. Because of the marginal tide and wind waves, we did not have time to count abalone or sea stars.

With the exception of plot 374, the barnacle plots were dominated by bare rock. Mean barnacle cover for 4/5 plots was 34%. The odd placement of plot 374 resulted in 54% *Mazzaella affinis* and 22% *Chondracanthus canaliculatus*.

Endocladia plots had moderate *Endocladia* cover (mean = 45%). One plot had between 6-10% each of *Chthamalus/Balanus*, *Tetraclita*, *Silvetia*, and *Mytilus*.

There was a conspicuous absence of rockweed in the rockweed plots. Both *Silvetia* and *Hesperophycus* measured < 1% across all 5 plots. Mean *Endocladia* cover was 19%. Mean barnacle cover (23%).

Mytilus plots were relatively diverse. The higher-ranking organisms in terms of abundance were *Mytilus* (40%), *Pollicipes* (7%), coralline crusts (6%), non-coralline crusts (6%), and *Mastocarpus papillatus* (5%).

Limpet plots were well populated. Total counts for the 5 plots ranged from 13-32 with mean of 21.4mm. Sizes ranged (15-74 mm). Most *Lottia gigantea* measured ranged 20-40 mm.

14 November 2009, Crook Point. Low tide -0.4 ft at 1323 hrs. Conditions were clear and windy but waves were calm. There were 3 black oystercatchers, 20 cormorants, 2 gulls, and 2 black

turnstones. Four elephant seals were swimming in the surge channel most of the day while we were on site (1020 to 1630).

We both scored 10 plots apiece and proceeded to photograph plots and panoramic points. The lack of surf allowed us to search the front reef well for abalone and sea stars. Dan located 52 abalone (45 were measured) during a 50 minute search of the entire reef and Steve counted 154 *Pisaster ochraceus* (95 were measured) throughout the site during a 30 minute search effort. Seastars ranged in size from 30-140 mm (mode = 100). Dan compiled a species list for the reef.

As observed during several past visits, the inner reef was dominated by *Mytilus*, which in turn, were densely covered by *Ulva californica*. Mean *Mytilus* cover was 78% in the mussel plots. Overall, *Balanus* densities were high though mean barnacle cover (13%) was low in the barnacle plots. *Endocladia* appeared healthy even though cover (mean = 24%) was not particularly high in the plots. As for rockweeds, *Hesperophycus* plants were sparse and *Silvetia* individuals were rare. Specifically in the rockweed plots, *Silvetia* was absent and mean *Hesperophycus* cover was < 1%. *Endocladia* and *Mytilus* were common in the rockweed zone (mean % cover = 20 and 25%, respectively).

15 November 2009 Harris Point. Low tide -0.7 ft at 1503 hrs. Conditions were excellent with clear sky and no wind, though remaining wind waves were impacting the site every several minutes. There were 2 black oystercatchers, 4 common ravens and 5 harbor seals occupying the site when we arrived. We arrived at 1130 and left at 1700.

Dan scored the rockweed, *Tetraclita*, and *Mytilus* plots, and Steve scored *Balanus* and *Endocladia*. We worked together to shoot the site photos then Dan searched for and measured abalone finding 14 outside of plots and 1 in plot #3. Steve observed 19 *Pisaster ochraceus* during a 30-minute site-wide search as well as 2 *Pisaster giganteus*, 4 *Leptasterias*, 3 *Pycnopodia*, and 10 *Patiria*. Dan measured *Lottia gigantea* while Steve recorded. Overall, there were fewer individuals this season compared with past, yet numbers remained fairly high (n = 12, 31, 54, 24 for plots 2, 3, 4, and 5) with the exception of plot 1 (n = 3). There were numerous small *Lottia gigantea*, particularly in plots 3 and 4. Additionally, we measured *Lottia limatula* in 4 out of 5 plots since they were nearly as dominant and big as some *L. gigantea*.

There was moderate recruitment of *Mytilus* comparable to our last visit with some large individuals seen among the boulders. Mean cover of *Mytilus* was 18% in the mussel plots and 14% in the *Tetraclita* zone. *Hildenbrandia/Peyssonellia* was dominant throughout much of the site as somewhat indicated by the relatively high percent coverage of non-coralline crust in the *Endocladia*, *Tetraclita*, and *Mytilus* plots (mean = 17, 16, 6%, respectively). Both *Endocladia* (mean = 6%) and *Hesperophycus* (mean = 22%) were rare in representative zones and plots indicating some form of recent mechanical disturbance.

Note that one dead abalone was found near the *Lottia* plots that was partially eaten and appeared withered. In addition, fresh blobs of tar had settled on rocks throughout the site.

16 November 2009 Cuyler Harbor. Low tide -0.8 ft at 1542 hrs. Conditions were excellent with clear sky and only light breeze. One western gull, 1 black oystercatcher, 2 black turnstones,

and 1 black phoebe were on site. There were also 4 common ravens and 8 whimbrels on the beach, but no seals were present at the east end of the beach. At the west end of the beach, we found 37 elephant seals, 3 black oystercatchers, 5 black turnstones. There were an estimated 300 surf scoters in the bay. We were on site from 1315 to 1645.

Steve scored *Mytilus* and *Silvetia* plots while Dan scored barnacle and *Endocladia*. High diversity and the layered composition of species in the *Mytilus* plots slowed the scoring process significantly. *Mytilus* were abundant and uncommonly large. Mean cover of mussels in *Mytilus* plots was 34%. *Mazzaella affinis* ranked second in abundance (mean = 12%).

Phragmatopoma were common but large expansive colonies were rare. Most algae had a healthy appearance with the exception of *Silvetia* plants in the upper zone. *Endocladia* was thick and moderately abundant (mean = 29%) in representative plots. *Balanus/Chthamalus* were abundant in areas throughout the reef (mean cover in barnacle plots = 30%). Several *Cancer antennarius* and *Pugetia producta* were present. 141 *Pisaster ochraceus* (105 measured, range = 50-190, mode = 120) and 2 *Patiria* were observed by Dan during a 30 minute survey of the reef. No abalone were found. A species list was compiled by both Steve and Dan.

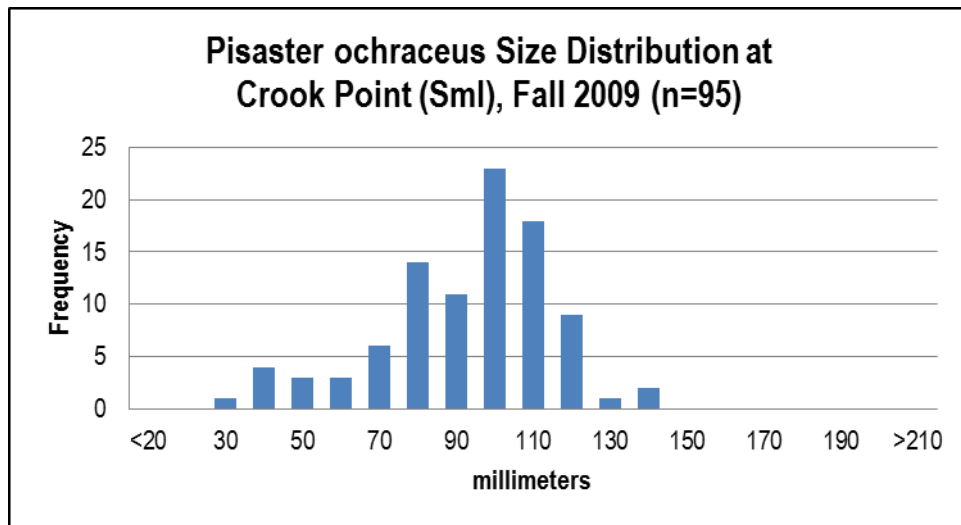
17 November 2009 Otter Harbor. Low tide -0.4 ft at 13xx hrs. Conditions were clear and windy. There was one hybrid American/black oystercatcher, 4 black oystercatchers, 5 western gulls, 1 Brandt's cormorant, and 33 harbor seals. We were on site from 1300 to 1645 hrs.

We hiked Simonton Cove beach in the morning to do a beach-walk survey. There were 14 black oystercatchers and one full American oystercatcher. Five more black oystercatchers were on Range Pole Beach. There were also small numbers of common ravens, western and herring gulls. There was a large amount of marine debris including light bulbs (both incandescent and fluorescent tubes), many fishing trawl and trap floats, glass and plastic bottles, toys, balloons, buckets, and bait containers. Fox tracks were numerous. No plover tracks were seen. Carcasses were uncommon with only three sea lions and two ocean sunfish (*Mola mola*) on Simonton. Range Pole Beach had three sea lion pup carcasses. Rat tracks were seen in the east end cave there.

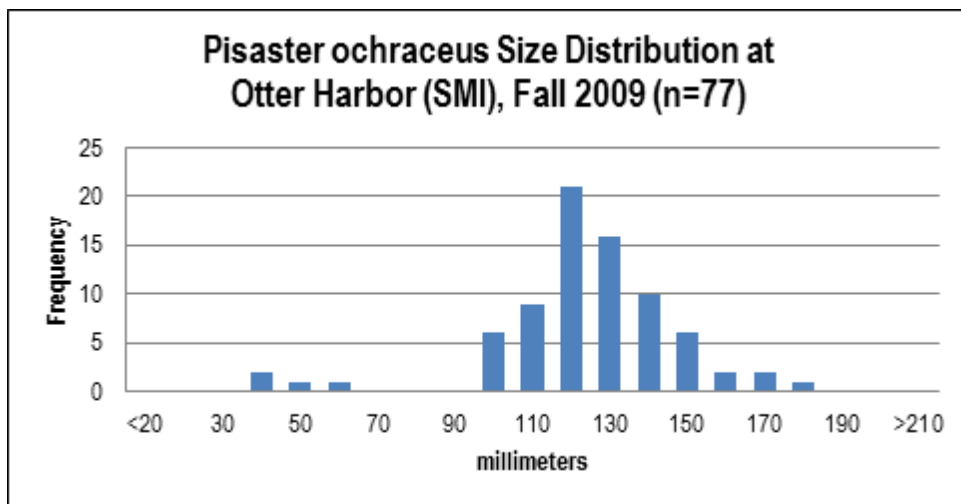
At the site we made plot repairs to missing corners, then counted black abalone, and seastars, and surveyed for a species list. Dan found 180 black abalone. Because of time, Dan did not measure all of them and did not read the pit tags though he found 18 with tags. Two old and 2 new black abalone shells were found during a search of the site. Steve found 130 *Pisaster ochraceus*, 16 *P. giganteus*, and 3 *Patiria miniata* in a 30 minute search. 77 *P. ochraceus* were measured (size range = 40-180 mm). Most stars were large (mode = 120 mm). A total of 107 *Lottia* in the five plots is lower than past counts.

Birds observed on San Miguel Island during the week:

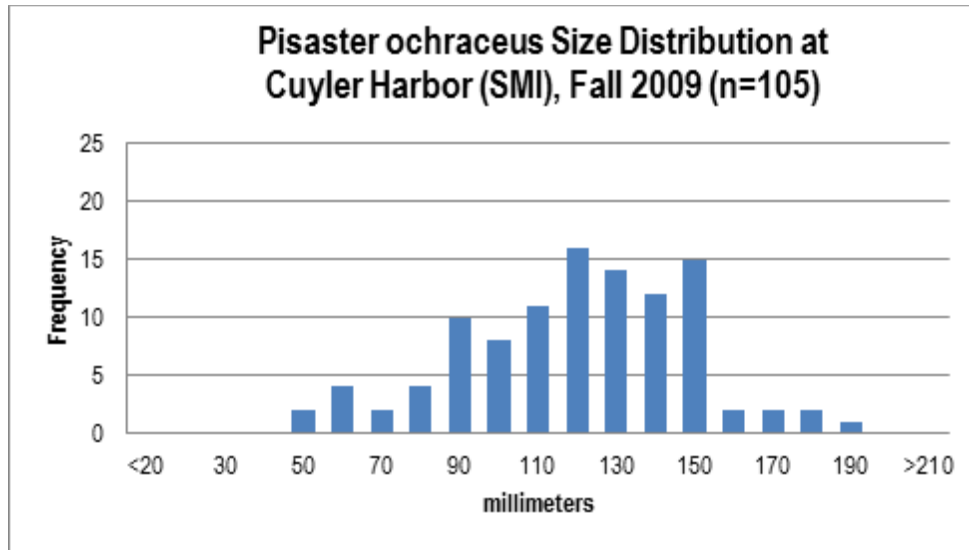
surf scoter, great blue heron, western gull, herring gull, whimbrel, black oystercatcher, American oystercatcher, black turnstone, royal tern, brown pelican, Brandt's cormorant, American Kestrel, northern harrier, Allen's hummingbird, Brewer's blackbird, common raven, Say's phoebe, black phoebe, house finch, yellow-rumped warbler, orange crowned warbler, song sparrow, Oregon junco, western meadow lark, American pipit, mountain bluebird.



SMCP Pisaster Totals	
count	95
min size	40
max size	140
mean size	92.79
StDev	22.81



SMOH Pisaster Totals	
count	77
min size	40
max size	160
mean size	123.64
StDev	24.70



SMCH Pisaster Totals	
count	105
min size	50
max size	220
mean size	119.91
StDev	29.24

Haliotis cracherodii (black abalone) counts at Otter Harbor, San Miguel Island, fall 2009.

Site Code	Count Sized	Mean Size	StDev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
CP	45	111.60	23.46	52	148	-	62.22	35.56	2.22
HP	15	116.67	25.46	65	150	-	73.33	13.33	13.33
CH	0	-	-	-	-	-	-	-	-
OH	41	96.73	28.51	40	151	2.44	82.93	9.76	4.88

Lottia gigantea counts in plots at San Miguel Island, fall 2009.

Site Code	Count Sized	Mean Size	StDev	Min Size	Max Size	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm	%60-69 mm	%70-79 mm
OH	107	32.66	12.11	15	74	9.35	38.32	30.84	11.21	5.61	3.74	0.93
HP	124	37.73	14.99	14	79	13.71	16.94	28.23	20.97	10.48	7.26	2.42

Photoplot summary – mean percent cover by zone at Cuyler Harbor, San Miguel Island, fall 2009 (5 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
Barnacle	44.0	27.4	0.0	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
<i>Endocladia</i>	42.4	4.8	0.2	35.8	0.0	4.4	8.0	0.8	0.0	3.6	0.0	0.0
<i>Silvetia</i>	45.4	0.0	2.2	3.6	0.0	31.2	0.4	0.0	0.0	9.8	7.4	0.0
Mussels	23.0	1.8	7.4	0.0	0.0	0.0	47.8	1.6	2.6	2.2	13.6	0.0

Photoplot summary – mean percent cover by zone at Crook Point, San Miguel Island, fall 2009 (5 plots/zone).

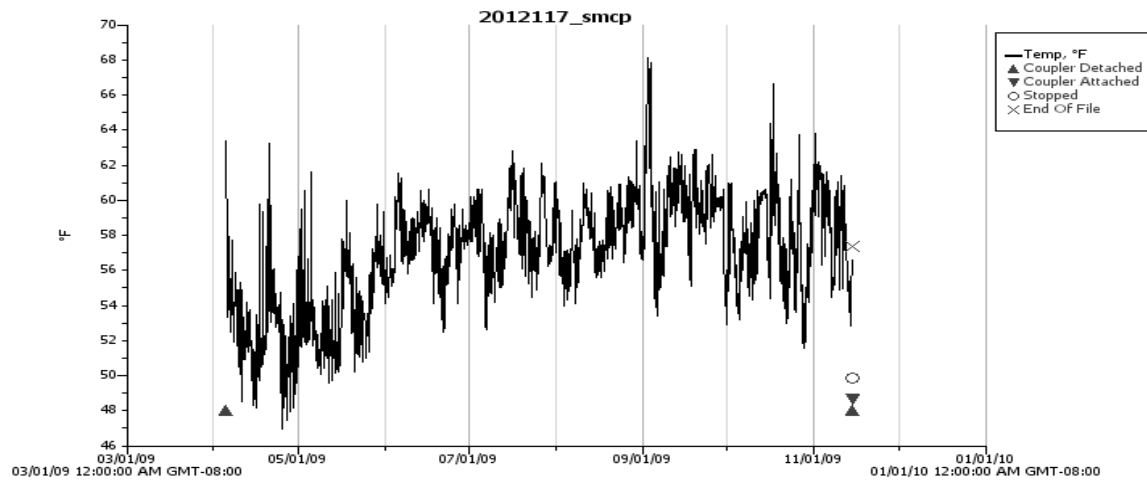
Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
Barnacle	75.0	21.2	0.0	3.4	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0
<i>Endocladia</i>	56.6	4.0	0.2	21.2	1.0	0.0	9.2	0.0	1.0	6.2	0.6	0.0
<i>Silvetia</i>	44.6	2.0	0.0	17.2	1.4	0.0	23.8	1.2	0.6	9.0	0.2	0.0
Mussels	18.0	0.2	0.4	0.0	0.0	0.0	75.8	0.0	1.0	4.4	0.2	0.0

Photoplot summary – mean percent cover by zone at Harris Point, San Miguel Island, fall 2009 (5 plots/zone).

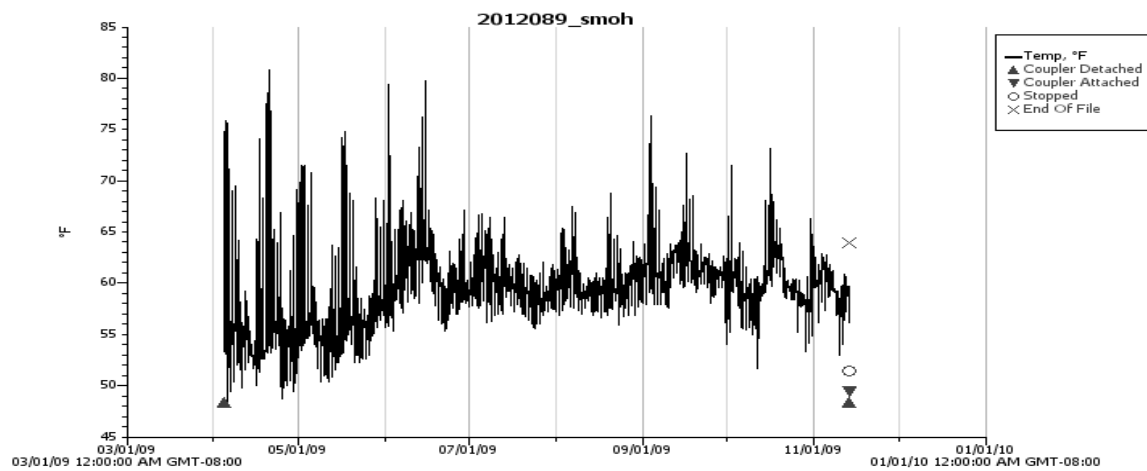
Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
Barnacle	39.0	56.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.8
<i>Endocladia</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mussels	41.6	3.6	0.6	5.8	2.4	0.0	29.4	0.4	0.8	14.4	0.8	0.0
<i>Tetraclita</i>	43.2	3.6	7.0	2.0	0.0	0.0	18.0	5.0	0.0	20.6	0.6	0.0
<i>Hesperophycus</i>	42.0	0.2	0.0	29.6	27.2	0.0	0.0	0.0	0.0	0.8	0.2	0.0

Photoplot summary – mean percent cover by zone at Otter Harbor, San Miguel Island, fall 2009 (5 plots/zone).

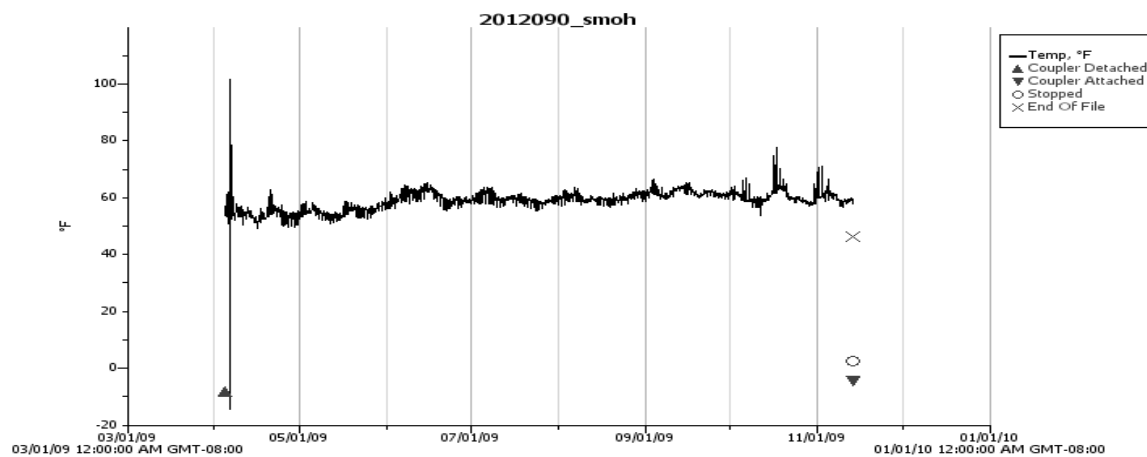
Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
Barnacle	49.2	29.6	0.0	0.0	0.0	0.0	0.0	5.2	0.0	14.8	0.4	0.8
<i>Endocladia</i>	35.0	6.8	0.6	48.8	0.0	2.6	0.4	0.0	0.2	5.4	0.0	0.2
<i>Silvetia</i>	33.4	25.0	0.4	33.2	0.0	3.8	0.0	0.0	0.0	3.4	0.4	0.4
Mussels	36.8	2.8	0.2	0.8	0.0	0.0	48.2	0.2	4.0	6.8	0.2	0.0



Temperature readout from Onset TidBit v2 temperature logger at SMCP.



Temperature readout from Onset TidBit v2 temperature logger #201289 at SMOH from plot 366 (full sun).



Temperature readout from Onset TidBit v2 temperature logger #201290 at SMOH from crevice 4 (shaded).

Anacapa/Santa Cruz Island November 30 – December 2, 2009

(Database event #2009-H)

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
 Stephen Whitaker, Biotech, Channel Islands National Park
 Benjamin Pister, Marine Biologist, Cabrillo National Monument
 Danielle Lipski, Channel Islands National Marine Sanctuary
 Terrance Shinn, Channel Islands National Marine Sanctuary
 Leslie, Channel Islands National Marine Sanctuary

Procedure and General Notes

The R/V Shearwater was provided by the Channel Islands National Marine Sanctuary for transportation for the monitoring. We did day trips from Ventura to Cat Rock and South Frenchy's Cove sites at Anacapa Island and Scorpion Rock at Santa Cruz Island. Cassin's auklets were numerous in the channel crossing to the island. Common dolphins were also seen. Standard procedures were followed for photographing and counting motile invertebrates in fixed plots. Percent cover of photo plots was determined in the field except at Cat Rock which, with the exception of the *Mytilus* plots, will be scored from digital images. Stephen and Ben did the motile invertebrate counts and Dan scored plots. Black abalone, *Haliotis cracherodii*, and seastars were counted in 30-minute searches. Seastars were measured for size distribution at Scorpion Rock. Black abalone were only measured at Cat Rock. Owl limpets, *Lottia gigantea*, were measured in three fixed one-meter radius plots at Cat Rock and South Frenchy's Cove. The highest number of shorebirds and pinnipeds seen was recorded at each site.

Results (Daily and Site Description)

November 30, 2009, Cat Rock, Anacapa Island. Low tide -0.6 ft at 1435 hrs.

Clear sky, light wind and swell, excellent conditions. Two black oystercatchers, two western gulls, and one rock wren were seen in the area. There were 4 harbor seals in the cove. We worked the site from 1130-1620 hrs.

There were no problems finding plots, but missing tags were replaced for plots 2 and 3 along with corners for several other plots. Survey team consisted of Dan, Stephen, Ben, and Dani. Dan and Dani photographed the plots and panoramas while Stephen and Ben counted motile invertebrates. Dan then scored *Mytilus* plots, searched for *Haliotis cracherodii* (0 found in plots, 3 in usual crevices), counted *Lottia gigantea* in limpet plots, and made plot repairs. Dani helped by conducting a 30-minute search of the site for seastars (7, all large) and recording motile data.

Barnacle plots had high percentages of bare rock with most measuring >60% and one scored as 94% rock. Several of the barnacle plots had 2-6 *Acanthina* spp. and 1-4 large limpets present. *Pachygrapsus*, *Lepidochitona* spp., and small and medium sized limpets were rarely present. Littorine snails were moderately abundant. Note that plot # 35 was accidentally skipped from the motile counting protocol.

Endocladia plots were diverse with measurable abundances of barnacles, mussels, prostrate and erect corallines, *Mazzaella*, and non-coralline crusts. Mean percent cover for *Endocladia* across the 9 plots was 28%. Nearly all of the 9 plots had between 1 and 10 each of *Lepidochitona*,

Nuttalina, *Fissurella*, *Pachygrapsus*, *Ocenebra*, *Lottia gigantea* and other large limpet species present. Small and medium-sized limpets along with littorine snails occurred in low abundances.

Silvetia thalli were pale and somewhat tattered throughout much of the reef. Only 4 out of 9 rockweed plots had measurable abundances of *Silvetia* (mean = 3%). *Hesperophycus* was present in 6/9 plots (mean = 4%) and most plants were small. Mean percent cover of *Endocladia* in the rockweed plots was 13%. *Lepidochitona*, *Nuttalina*, *Ocenebra*, *Acanthina*, *Pachygrapsus*, and large limpet species all occurred in abundances <5 per plot. Small and medium-sized limpets along with littorine snails occurred in low abundances.

Mytilus were < 100 mm throughout most of the site. Many were overgrown with barnacles and/or coralline algae. Mean cover of mussels in *Mytilus* plots was 37%. *Nuttalina* spp. were the most abundant motile organisms. More than 20 were sampled in several of the mussel plots. *Ocenebra*, *Lottia gigantea*, *Lepidochitona*, and *Fissurella* were present in moderate numbers typically less than 5 but sometimes totaling more than 10 per plot. A couple of purple urchins were located in 2 plots. Small limpets and littorine snails were rare. Medium-sized limpets were moderately common.

Two out of three limpet plots were well populated. Plots 1 and 2 had n=30 and n=22 *Lottia gigantea*, respectively (sizes ranged from 17-60mm). Plot 3 only had 4 *L. gigantea* within the sampled one-meter radius. There were numerous *Lottia limatula* within plot 2 and inshore of plot 3.

December 1, Scorpion Rock, Santa Cruz Island. Low tide -1.0 ft at 1516 hrs. Clear sky, light wind and seas, cool but pleasant conditions. One harbor seal was seen watching us from just offshore and there were 4 black oystercatchers and 1 western gull on the reef. Just prior to leaving the main reef, a large male sea lion swam nearby barking loudly. We were on site from 1125-1545 hrs.

After departing Ventura on the Shearwater at 0900, we waited for an hour upon arrival at Scorpion to allow the tide to recede enough to access the main reef. Dan scored all plots including the rockweed zone at the offshore reef. Stephen and Ben split up the task of counting motile invertebrates in the plots on the main reef. Ben and Dan worked together to photograph the site and proceeded to measure seastars (n=65). Stephen counted seastars (n=133 *Pisaster ochraceus*, 1 *P. giganteus*) during a 30 minute search of the small reef. One *Haliotis cracherodii* was seen clinging to the western vertical ledge of the reef above the arch. At approximately 1445 we radioed Terrence to skiff us over to the rockweed reef. Dan and Ben photographed the 5 *Silvetia* plots and then Ben recorded for Stephen while he counted motiles and Dan scored. At the rockweed reef, one black abalone was observed in an exposed portion of the boulder field south of the plots. Seven other black abalone were located in close proximity to each other tucked into a crevice prior to boarding the skiff for departure.

Mytilus californianus was conspicuously absent from the main reef. Though *Tetraclita* were generally abundant throughout most of the lower reef, cover was lower in the *Tetraclita* plots (mean = 11%) than the *Mytilus* plots (mean = 30%). Mussel plots had low abundances of *Mazzaella* (mean = 8%) and low to moderate levels of articulated coralline cover (mean = 28%).

Two of the mussel plots had 1- 2 *Pisaster ochraceus* present. *Ocenebra* was the most abundant motile organism in both the mussel (range = 7-22) and *Tetraclita* (range = 0-5) plots. Low to moderate numbers of *Fissurella*, *Pachygrapsus*, *Nuttalina* and *Strongylocentrotus purpuratus* species were found in each of the mussel plots. *Tetraclita* plots had similar abundances of aforementioned organisms with exception of purple urchins. Small to medium-sized limpets were both moderately abundant in the mussel and *Tetraclita* plots. Littorine snails were scarce in the *Tetraclita* zone. Non-coralline crust composed primarily of *Petrospongium rugosum* and *Pseudolithoderma nigra* was common throughout much of the reef.

Barnacle plots had high percent cover of bare rock (mean = 71%) and low levels of *Endocladia* (mean = 20%). *Pachygrapsus* were present in low numbers along with a few *Lepidochitona*, *Acanthina* spp. and a handful of *Nucella emarginata*. Small and medium-sized limpets were present in low abundances. Littorine snails were moderately common. Note that high levels of recruitment were detected for littorines in all the barnacle plots but were excluded from total counts.

Endocladia plots were moderately covered with *Endocladia* (mean percent cover = 51%). Mean *Mazzaella* cover approximately 5%. Few motile invertebrates located in plots. Small and medium-sized limpets were present in low abundances. Littorine snails were moderately common.

Hesperophycus plots had moderate amounts of bare rock (mean = 43%) and low percentages of the rockweeds *Hesperophycus* (mean = 18%) and *Silvetia* (mean = 13%). Similar to the *Endocladia* zone, motile invertebrates were rare as were small and medium-sized limpets. Littorine snails were only moderately common.

December 2, South Frenchy's Cove. Low tide -1.2 ft at 1600 hrs. We had partly cloudy conditions with moderate NW wind and light surf but it was calm at the site and working conditions were excellent. At the site there were 2 black oystercatchers. No pinnipeds were observed. We were on site from 1150-1540 hrs.

The sand level was very high between the reefs which made it a little easier for us to get around. A thin cover of sand was present in most of the barnacle, *Endocladia*, and *Silvetia* plots which may have hindered our ability to accurately count some of the motile organisms. *Jania crassa* was abundantly present in many of the tidepools throughout the upper reef. Two large *Cancer antennarius* were seen in the pool on the outer reef.

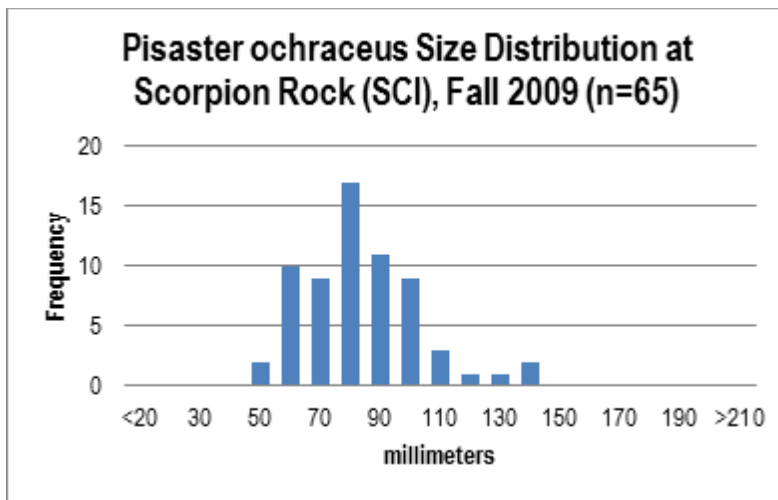
Dan scored all plots while Stephen and Ben shared the task of counting motile invertebrates with Dani recording. Dani and Stephen then worked together to photograph the site while Ben conducted a 30 minute search for seastars (n = 34 *Pisaster ochraceus*) and black abalone (0 found). No measurements were taken. Stephen and Dani counted and measured *Lottia gigantea* in the limpet plots. Plots 1, 2, 3 had (n = 4, 12, 6), respectively. Sizes ranged from 25-56 mm. Dan and Ben made repairs to several of the plots and Stephen downloaded the temperature logger.

Barnacle plots had low to moderate cover of barnacles (mean = 29%) and *Endocladia* (mean = 26%). Motile invertebrates were uncommon including both small and medium-sized limpets. Littorine snails were present in medium abundances.

Endocladia plots had relatively high cover of *Endocladia* (mean = 77%) though most was bleached and partially buried by sand. Motile organisms were rarely present. Only one littorine snail was observed in all 5 plots.

Silvetia plots had low to moderate cover of *Silvetia* (mean = 27%) and most of the rockweeds were in good condition with some recruitment occurring. *Mazzaella* and other red algae cover = 3% and 13%, respectively. Diversity was high for motile invertebrates though abundances were low for each species. Small and medium limpets along with littorine snails were rare.

Mytilus plots had moderate cover of mussels (mean = 46%) with some newly recruited individuals. Other notable organisms in the plots included *Chondracanthus canaliculatus* (mean = 13.6%), other red algae (mean = 8%), articulated corallines (mean = 7%), *Mazzaella* (mean = 4%), and *Gelidium* (mean = 4%). *Nucella emarginata* were somewhat common ranging from 1-12 in each of the plots. *Pachygrapsus*, *Acanthina*, and *Nuttalina* were also present though in lower abundances. Medium-sized limpets were slightly more common than the smaller limpets.



SCSR Pisaster Totals	
count	65
min size	19
max size	190
mean size	83.91
StDev	19.64

Haliotis cracherodii (black abalone) counts at Cat Rock, Anacapa Island, fall 2009.

Timed count	Mean Size	StDev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
30	101.7	35.3	63	132	-	67.67%	33.33%	-

Lottia gigantea counts in plots at S. Frenchy's Cove, Anacapa Island, fall 2009.

Site Code	Density	Count	Sized	Mean Size	StDev	Min Size	Max Size
SFC	2.441	23		40.70	8.60	25	56

Lottia gigantea size distribution in plots at S. Frenchy's Cove, Anacapa Island, fall 2009.

Site Code	%<20 mm	%20-29 mm	%30-39 mm	%40-49 mm	%50-59 mm
SFC	0.00%	8.70%	39.13%	30.43%	21.74%

Photoplot summary – mean percent cover by zone at Cat Rock, Anacapa Island, fall 2009 (9 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hespero-phycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Silvetia</i>	Tar	<i>Tetracita</i>	Turf weed
<i>Chthamalus Balanus</i>	69.1	24.6	0.0	4.4	0.2	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.1
<i>Endocladia</i>	32.4	2.8	4.1	27.6	0.0	0.2	7.8	2.0	0.0	22.8	0.3	0.0	0.0
<i>Silvetia</i>	58.8	12.6	0.7	13.3	4.1	2.9	0.4	0.0	0.0	6.6	0.7	0.0	0.0
Mussels	19.3	0.3	10.6	1.7	0.0	0.0	36.9	1.7	0.0	26.7	2.9	0.0	0.0
<i>Hespero-phycus</i>	69.1	24.6	0.0	4.4	0.2	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.1

Photoplot summary – mean percent cover by zone at S. Frenchy's Cove, Anacapa Island, fall 2009 (9 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hespero-phycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Silvetia</i>	Tar	<i>Tetracita</i>	Turf weed
<i>Chthamalus Balanus</i>	41.6	29.4	0.0	25.8	0.2	0.0	0.0	0.0	0.0	2.0	0.6	0.4	0.0
<i>Endocladia</i>	9.4	0.0	0.0	76.6	0.2	9.2	0.0	0.2	0.0	4.4	0.0	0.0	0.0
<i>Silvetia</i>	31.2	3.8	0.0	7.0	0.0	26.6	0.0	0.0	0.0	30.8	0.6	0.0	0.0
Mussels	6.6	0.0	0.0	0.0	0.0	0.0	46.0	17.8	0.0	27.6	2.0	0.0	0.0
<i>Hespero-phycus</i>	41.6	29.4	0.0	25.8	0.2	0.0	0.0	0.0	0.0	2.0	0.6	0.4	0.0

Photoplot summary – mean percent cover by zone at Scorpion Rock, Santa Cruz Island, fall 2009 (9 plots/zone).

Zone Name	Bare Rock	Barnacle	<i>Endocladia</i>	<i>Hespero-phycus</i>	Leaf Barnacle	Misc Algae	Misc Animal	Mussels	Other	<i>Silvetia</i>	Tar	<i>Tetracita</i>	Turf weed
<i>Chthamalus Balanus</i>	70.8	8.6	0.0	19.8	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.0
<i>Endocladia</i>	32.8	0.8	0.2	51.2	0.0	0.0	0.6	0.0	0.2	13.8	0.4	0.0	0.0
<i>Silvetia</i>	22.4	0.0	30.0	0.2	0.0	0.0	0.0	2.6	0.0	40.8	4.0	0.0	0.0
Mussels	63.0	0.0	11.0	3.0	0.0	0.0	0.0	0.0	0.0	20.0	3.0	0.0	0.0
<i>Hespero-phycus</i>	43.2	0.0	0.2	22.4	17.8	12.6	0.8	0.0	0.0	2.8	0.2	0.0	0.0

Anacapa/Santa Cruz Island December 14-15, 2009

(Database event #2009-I)

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
 Stephen Whitaker, Biotech, Channel Islands National Park
 Danielle Lipski, Channel Islands National Marine Sanctuary
 Connie Jenkins, Volunteer
 Charlie Lara, Channel Islands National Marine Sanctuary
 Reg Greenwood, Channel Islands National Marine Sanctuary

Procedure and General Notes

The R/V Shearwater was provided by the Channel Islands National Marine Sanctuary for transportation to do the monitoring. We did day trips from Ventura. Middle West and Middle East sites at Anacapa Island and Orizaba Cove at Santa Cruz Island were monitored. Standard procedures were followed for photographing and counting motile invertebrates in fixed plots. Percent cover of photo plots was determined in the field except for two plots at Middle East which will be scored from digital images. At Orizaba Cove, Stephen did the motile invertebrate counts and Dan scored plots. At Middle West/East, both Stephen and Dan scored plots. Black abalone, *Haliotis cracherodii*, and seastars were counted in 30-minute searches and measured for size distribution. Owl limpets, *Lottia gigantea*, were measured in fixed one-meter radius plots at Middle West. The highest number of shorebirds and pinnipeds seen was recorded. The temperature logger was downloaded at Middle West.

Results (Daily and Site Description)

December 14, 2009, Orizaba Cove, Santa Cruz Island. Low tide -0.8 ft at 1451 hrs.

Clear sky, light wind and swell, excellent conditions. Three low-pressure systems passed through the southern California bight the week prior to this trip resulting in several inches of rain and high winds. Two black oystercatchers and 4 black turnstones were seen at the site prior to landing. Seven harbor seals were observed swimming in the cove and several others were seen on the rocks across from the site. Additionally, 16 black oystercatchers were counted on Orizaba Rock. We worked the site from 1110-1530 hrs.

There were no problems finding plots, and all bolts were in good shape. Monitoring team for the two days consisted of Dan, Steve, Dani, and Connie. Steve counted motile invertebrates (note: 2 *Hesperophycus* plots were not completed due to insufficient sampling time) with Dani recording while Dan scored plots with Connie recording. Dani then counted (n = 517 *Pisaster ochraceus*, 1 *Patiria miniata*, 1 *Pycnopodia helianthoides*) and measured (n = 64) sea stars (range = 60-110, mode = 19). Dan found 8 *Haliotis cracherodii* (all single) and 5 *Megathura crenulata* during a 30-minute site-wide search.

Balanus glandula were large, common, and alive, in contrast to last season when approximately 50% of the tests were empty. The barnacle plots had 40% mean barnacle cover. *Tetraclita rubescens* were also fairly common throughout the site with many large individuals and moderately- high recruitment. However, representation was relatively low in the *Tetraclita* (mean = 22%) and *Mytilus* (mean = 11%) plots compared with some previous seasons. *Endocladia muricata* was common and dense in areas. Yet, it only comprised 25% and 9% of the

mean cover in the *Hesperophycus* and *Silvetia* plots, respectively. *Mazzaella affinis* was conspicuously abundant throughout most of the site. Mean cover in the *Mytilus* (27%), *Tetracilita* (9%), *Silvetia* (6%), and *Hesperophycus* (4%) zones was moderate to low. Young *Hesperophycus californicus* and *Silvetia compressa* were common in the rockweed zone plots. Mean cover of rockweeds, *Hesperophycus* (22%) and *Silvetia* (23%), was relatively low in their representative plots. *Mytilus californianus* were infrequent to rare throughout the entire site and completely absent in the mussel plots. The most abundant patch of *Mytilus* actually occurred in plot #1 of the *Hesperophycus* zone. Still, *Mytilus* only comprised 3% of the total plot cover. Articulated corallines (32% mean cover) were the most dominant species sampled in the mussel plots. Other red algae (Ceramiales) were also fairly common (10%) in the mussel zone.

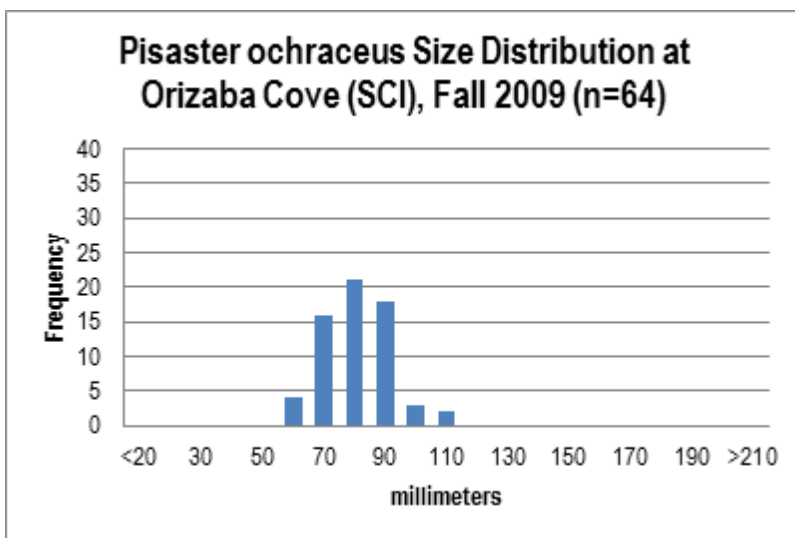
A diverse composition of motile invertebrates was observed in many of the plots particularly in the *Silvetia* zone. Three spp. of chitons were counted in at least 1:5 *Silvetia* plots along with *Tegula funebris*, *T. galena*, *Pachygrapsus crassipes*, *Pagurus* spp., *Nucella emarginata*, *Acanthina* spp., *Ocenebra circumtexta*, and *Strongylocentrotus purpuratus*. Species abundance was uniformly low in all plots with the exception of *N. emarginata* in a couple *Tetracilita* plots (range = 8-19 individuals per plot), *O. circumtexta* in one *Tetracilita* plot (n = 16), and *S. purpuratus* in most *Mytilus* plots (range = 7-54/plot). Interestingly, several juvenile nudibranchs (3 *Hermisenda crassicornis* and 2 *Triopha catalinae*) were located in three of the *Mytilus* plots. Small and medium-sized limpets were common in all 5 sampled zones. With the exception of mussel plots, littorine snails were observed in moderate numbers and were especially abundant in the barnacle zone.

December 15, Middle Anacapa Island. Low tide -0.8 ft at 1527 hrs. Partly cloudy sky, calm wind and seas, pleasant conditions. In contrast to last season, no nesting pelicans or any other animals were on the site when we arrived. Six harbor seals were observed on the reef at Harbor Seal Arch. We were on site from 1030-1530 hrs.

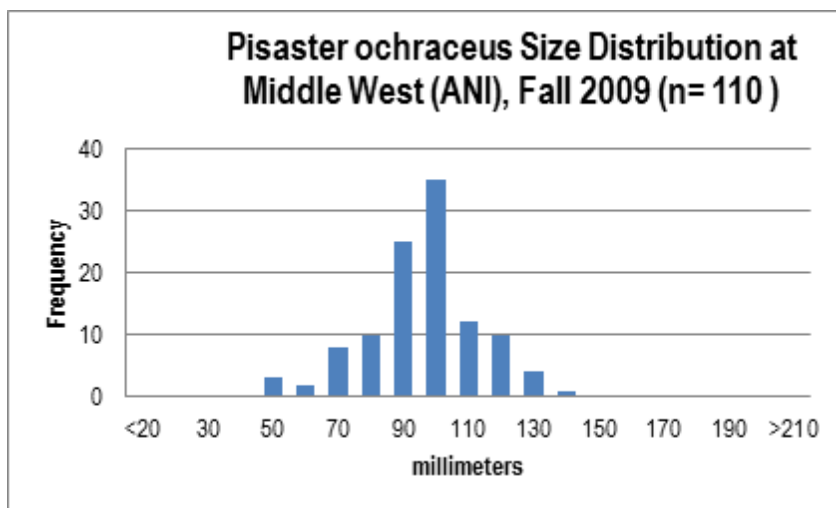
We arrived too early to start work immediately and decided to eat lunch while the tide receded. Steve scored the barnacle plots with help from Dani recording and Dan Scored the *Endocladia* and *Silvetia* zones. Connie recorded for Dan. Steve and Dani then measured *Lottia gigantea* (n = 74, size range = 15-56 mm) while Dan and Connie photographed the site. Dan and Steve used the skiff to get over to Middle East whereby Dan photographed and made plot repairs and Steve scored all but 2 plots. Meanwhile, Dani and Connie searched the Middle West reef for sea stars and abalone finding 110 *Pisaster ochraceus* (sizes ranging 50-140 mm, mode = 100 mm) and 10 (17 found last season, 37 found in Fall 2008) *Haliotis cracherodii* (sizes ranging 21-180) in 30 minutes. Prior to leaving, Dan and Dani worked together to score the *Mytilus* plots at Middle West. We did not have time to visit Harbor Seal Arch area so no abalone count was done there.

Similar to last season, *Mytilus californianus* was mostly absent from the plots and the reefs at both Middle West and Middle East. Most mussels were relatively small though there were a few large individuals scattered about. *Silvetia compressa* also occurred in extremely low abundance at both reefs. The few individuals present appeared to be in poor condition. The invasive algae *Caulacanthus ustulatus* was fairly common and may have expanded in distribution at Middle West but remained stable at Middle East. A few *Sargassum muticum* plants were scattered at the Middle East reef. *Psuedochama exogyra* were common at Middle West.

All plots at Middle West had relatively high species diversity. As a result, few species occurred in significant abundance. Exceptions were attributed to articulated corallines (mean cover = 22%), *Mazzaella affinis* (mean cover = 24%), and *Tetraclita rubescens* (16%) in the mussel plots; *Endocladia* (mean cover = 16%) in representative zone; *M. affinis* in *Endocladia* plots (mean cover = 8%) and *Silvetia* plots (mean cover = 12%); and *Balanus/Chthamalus* (mean cover = 13 %) in barnacle plots.



SCOC Pisaster Totals	
count	64
min size	60
max size	110
mean size	80.94
StDev	11.23



ANMW Pisaster Totals	
count	110
min size	50
max size	140
mean size	96.25
StDev	17.30

Haliotis cracherodii (black abalone) counts at Orizaba Cove, Santa Cruz Island, fall 2009.

Timed count	Mean Size	StDev	Min Size	Max Size	%<45 mm	%45-126 mm	%127-145 mm	%>145 mm
8	77.25	20.47	60	122	-	100.00	-	-

Haliotis cracherodii (black abalone) counts at Middle West, Anacapa Island, fall 2009.

Timed count	Mean Size	StDev	MinSize	MaxSize	%<45mm	%45-126mm	%127-145mm	%>145mm
10	88.10	48.16	21	180	10.00	70.00	10.00	10.00

Lottia gigantea counts in plots at Middle West, Anacapa Island, fall 2009.

Plot	Number In plot	Density	CountSized	MeanSize	StDev	MinSize	MaxSize
1	41	36.54	11.32	15	55	41	36.54
2	13	32.15	3.56	25	37	13	32.15
3	20	36.45	8.99	19	56	20	36.45

Lottia gigantea size distribution in plots at Anacapa Island, fall 2009.

Plot	%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm
1	14.63	9.76	31.71	34.15	9.76
2	0.00	23.08	76.92	0.00	0.00
3	5.00	10.00	45.00	35.00	5.00

Photoplot summary – mean percent cover by zone at Middle East, Anacapa, fall 2009.

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
Barnacle	77.0	3.3	11.0	2.7	0.0	0.0	2.0	0.0	0.0	4.0	0.0	0.0
<i>Endocladia</i>	77.3	2.0	6.3	7.7	0.0	0.0	2.7	0.0	0.0	4.0	0.0	0.0
<i>Silvetia</i>	64.0	1.0	5.7	5.0	0.0	7.0	5.0	0.0	0.0	11.3	1.0	0.0
Mussels	31.7	1.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	57.0	0.7	0.0

Photoplot summary – mean percent cover by zone at Middle West, Anacapa, fall 2009.

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	tar
Barnacle	62.4	17.8	0.4	5.8	0.0	0.0	0.2	0.2	0.0	13.2	0.0	0.0
<i>Endocladia</i>	60.4	8.0	0.6	14.0	0.0	0.0	0.2	0.8	0.0	15.2	0.8	0.0
<i>Silvetia</i>	59.4	2.8	1.0	4.2	0.0	4.2	0.0	0.6	0.0	26.4	1.4	0.0
Mussels	33.4	0.2	6.4	0.0	0.0	0.0	10.4	2.6	0.0	45.4	1.6	0.0

Photoplot summary – mean percent cover by zone at Orizaba Cove, Santa Cruz Island, fall 2009.

Zone Name	Bare Rock	Barnacle	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hespero-phycus</i>	<i>Silvetia</i>	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	tar
Barnacle	57.6	37.6	2.0	0.0	0.0	0.0	0.2	0.0	0.0	2.4	0.2	0.0
<i>Silvetia</i>	38.6	0.2	5.6	5.0	0.6	16.8	4.0	0.0	0.0	29.2	0.0	0.0
Mussels	16.4	0.0	2.0	0.0	0.0	0.0	0.0	0.4	0.0	80.0	1.2	0.0
<i>Tetraclita</i>	65.2	0.4	20.2	0.0	0.0	0.0	0.0	0.0	0.0	13.2	1.0	0.0
<i>Hespero-phycus</i>	39.8	2.2	1.2	32.2	9.4	1.8	1.4	0.0	0.0	11.8	0.2	0.0

Santa Rosa Island January 11-19, 2010

(Database event #2009-J))

Purpose: To monitor rocky intertidal sites at Santa Rosa Island, and count snowy plovers during the winter survey window.

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biotech, Channel Islands National Park
Connie Jenkins, volunteer

Procedure and General Observations

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 1030 or 5050-Z digital camera. Owl limpets were measured within 1m radius circular plots. Surfgrass transects were sampled at East Point and Northwest-Talcott. Seastars and black abalone were counted and measured at all sites except Fossil Reef. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers were installed inside PVC housings at East Point, Johnson's Lee, Northwest-Talcott and Fossil Reef in black abalone habitat. Motile invertebrates were counted in photoplots at all sites. Counts of snowy plovers were conducted on the beaches around the island.

Results (Daily and Site Description)

11 January, Johnson's Lee. Low tide -0.5 ft at 1421 hrs. Conditions were excellent. There were a few high clouds and the temperature was pleasant. Winds and seas were calm. The surf was 2-3 ft onto the shore but surge was minimal. There were 5 black oystercatchers, 9 black turnstones, 5 western gulls and 4 common ravens at the site. Four northern elephant seals were on the sand behind the reef and one was in the surf in front of the site. We were on site from 1130-1645 hrs.

We added bolts to the lower right corner of plot 516 and upper left of 509 to make them easier to find. The temperature logger was successfully downloaded at 1248 hrs.

Continuing to take advantage of the good conditions, Stephen counted motile invertebrates in the photoplots since the tides may not allow us to do them this spring. *Tegula funebris* were fairly common and Stephen found one *T. gallina*. *Nucella emarginata* were fairly abundant with high numbers in some of the new *Mytilus* plots. *Pisaster* were numerous in plot 510. Purple sea urchins were common in several plots including 514 which was not sampled. No counts were done in plots 513 and 514 as the tide and swell kept them fairly wet. We often do not count in those plots. Dan shot the photos and scored all the plots.

Stephen counted seastars for 30-minutes, finding 396 *Pisaster ochraceus*. Most were small and brown. He measured 100 and the majority of them were under 100 mm radius with a mode at 70 mm. In the transect on the offshore rock, there were 24 *P. ochraceus*. Only three *Haliotis cracherodii* were found in 30-minutes, none were in plots. Sizes ranged from 120-186 mm and all were at the east end of the site. *Lottia gigantea* were measured by Dan. All plots had several

L. gigantea and overall a total of 96 were found; slightly fewer than last year but more evenly distributed among plots.

Phragmatopoma californica and *Anthopleura* sp. still dominate the lowest shelf. There was plenty of fresh growth on the *P. californica*. *Mytilus californianus* dominate the second shelf and a wide range of sizes was present. There were many large shells in the central part of the reef. Juveniles seemed common. Leaf barnacles, *Pollicipes polymerus*, were common. A few juvenile *Pisaster ochraceus* were present on the second shelf possibly indicating that seastars are moving up the reef. Tiny acorn barnacles, probably *Balanus glandula* were abundant on rocks as were adults. *Endocladia muricata* was common and looked healthy.

12 January, Ford Point. Low tide -0.7 ft at 1456 hrs. Conditions were very good with calm wind and seas, partly cloudy sky but moderate swell of 3-6 ft at times. We had 6 black oystercatchers fly by and there were 2 western gulls and 1 song sparrow on the reef. A single bull elephant seal was in the surf zone just off shore. We were on site from 1100-1700 hrs but could not start working until almost noon. There were about 87 elephant seals on the beach at Ford Point with at least 36 pups.

Stephen counted motile invertebrates and Dan scored the plots. There was a wide variety of motile invertebrates with *Nucella emarginata* being common in many plots. A few plots had 6-8 *Tegula funebris* present. Low numbers of chitons, *Pachygrapsus*, and hermit crabs were present. Littorine snails and limpets were common in most plots. Barnacle cover ranged from 10-47% with one barnacle zone plot being dominated by *Endocladia*. *Endocladia* zone plots all had moderate to high cover of *Endocladia muricata* at 44-71% cover. *Mytilus californianus* cover ranged 32-88% in three of the plots and 0% in the other two plots which were dominated by *Phragmatopoma californica*.

Lottia gigantea numbers continue to decline with only n=27 found in the five combined plots. A fair number of small *L. gigantea* were found. Dan and Steve together found 11 *Haliotis cracherodii*, 70-170 mm. Most were very large. All but two were spread far apart and all were in crevices. One was inside plot 1. All the abalone plots were dominated by *Phragmatopoma*. Stephen counted 304 *Pisaster ochraceus* in 30 minutes over most of the reef and measured 100 ranging from 30-130 mm with a mode at 100 mm.

We made repairs to the six plots that were each missing two corners. We added a bolt to the lower right corner of plot 533 as it is difficult to find sometimes and drilled a shallow hole in the other corners to anchor the epoxy. The *Lottia* plot bolts are in better condition than at Johnson's Lee but we should consider replacing them with stainless steel bolts soon also.

13 January, East Point. Low tide -0.8 ft at 1527 hrs. The sky was mostly clear and winds were light through most of the day. A heavy swell with sets at 6-8 feet kept the lower zones under water all day. There were 6 black oystercatchers, 2 western sandpipers, about 60 Brandt's cormorants and 4 brown pelicans when we arrived at the point. There were two royal terns feeding in the surf zone and a single bull elephant seal was in the surf zone just off shore. We were on site from 1140-1630 hrs.

Stephen counted motile invertebrates while Connie and Dan scored the plots. Motile invertebrates were numerous with *Nucella emarginata*, *Acanthina* sp. and *Tegula funebris* in most of the plots. Littorina were abundant. A few *Ocenebra circumtexta* were found in plots. *Lepidochitona* were common as were *Pachygrapsus* and *Pagurus*. *Chthamalus* cover ranged 29-66% in the barnacle zone plots. There were numerous tiny barnacles on the rocks and dense patches of barnacles could be found throughout the reef area. *Endocladia* zone plots all had moderate to high cover of *Endocladia muricata* at 53-78% cover. *Silvetia compressa* cover ranged 0-66%. *Silvetia* was common but somewhat patchy and not very dense. There was good recruitment though. There were many new *Hesperophycus californicus* plants but also some older abraded plants. Cover in the *Hesperophycus* zone ranged 15-64%. *Mytilus californianus* was absent in three of the mussel zone plots but *Mytilus* cover was 77% and 92% cover in the other two plots. *Phragmatopoma californica* and various algae, especially *Ulva californica*, dominated the three plots on the inside reef.

Dan found 652 *P. ochraceus* and 3 *Patiria miniata* in the 30-minute search and found 11 *H. cracherodii*. Most of the abalone were in the large central surge channel/crevice under boulders. Two were in the crack between plots 591 and 592. *Phyllospadix* was dense over the lower reef but because of the swell we were unable to score transects 1 and 2. Their cover was estimated at 100% because the grass grew up to and around the upper bolts and only a few minor patches of sand were within that part of the reef. Transect 3 was scored, and it too had high cover of surfgrass.

All the plots were in good shape and no repairs were needed.

14 January, Northwest-Talcott. Low tide -0.7 ft at 1556 hrs. Today the skies were mostly clear with light wind out of the northwest. Swell remained large with sets averaging 8' consistently rolling over the outer reefs. Dan commented that he had not seen the swell so large at this site and was surprised to see that there were no surfers out. We descended the cliff approximately 100 yards to the west of the usual access point to avoid the water that was still washing over the reef when we arrived. There was a freshly dead cabezon on the rocks at the base of the cliff. As the tide receded, many of the cobblestones appeared to have been tumbled recently in the large wave energy and the beach was clean. Only a small amount of kelp wrack was on the beach and no piles of surf grass. One large adult male elephant seal was observed on the rocks 100 meters east of the site. Two western gulls and 5 black oystercatchers were the only birds at the site. We were on site from 1300-1730 hrs.

Dan scored all plots while Stephen counted motile invertebrates in all zones with Connie recording. Motile invertebrates were relatively easy and quick to count compared to most other sites since abundances were low to moderate for all species and the smooth siltstone made for easy observations. The barnacle plots had low numbers of invertebrates with the exceptions of one plot which had 15 *Acanthina* spp. and another with 10 *Lepidochitona* spp. One other barnacle plot had 6 *Tegula funebris*. Three of the barnacle plots had moderate cover of *Silvetia* (31-66%). Barnacle cover was also moderately high (29-48%) in three barnacle plots.

The *Endocladia* plots had similar abundances of motiles. One plot had 8 *Ocenebra circumtexta* and another had 7 large limpets (*Lottia scabra*). Otherwise, counts were uniformly low across the

entire zone. *Endocladia* cover ranged from 7-41% (mean=24%). *Silvetia* ranged 0-27% (mean=16%). One plot had 37% non-coralline crust.

All *Silvetia* plots had *Tegula funebris*, but abundances were low in all but one plot which had 9 individuals. Other motile spp. were scarcely present. *Silvetia* cover was moderate to high (mean=69%) in 4 of the 5 plots. The one plot with low rockweed cover had 17% *Endocladia*. Throughout the site, recruitment of *Silvetia* was above average. Numerous small plants were visible in addition to a high abundance of large, healthy mature individuals.

The *Mytilus* plots had a relatively diverse combination of invertebrates, though abundances were generally low for all species with the exception of *Nuttalina* spp. which ranged 3-18 individuals/plot. A couple of the plots had 6-7 *Lottia gigantea* ranging in size from 20-93 mm (mean=47mm). Algal and sedentary invertebrate spp. were also diverse within all 5 mussel plots. The most dominant spp. were *Mytilus* (mean=29%), articulated corallines (mean=18%), coralline crusts (mean=8%), and non-coralline crust (mean=7%).

Due to the late afternoon low-tide, search time was reduced to 20 minutes for abalone and sea stars. No abalone were found in any plots or anywhere else throughout the site. Only one *Pisaster ochraceus* (approx. 140 mm), 2 *Pisaster giganteus* (approx. 70, 100 mm), and 3 *Patiria miniata* were seen site-wide. Additionally, Stephen found 1 *Leptasterias* in 2 plots.

Stephen and Connie sampled the *Lottia* plots. Total counts for plots 1-5 were n=26, 8, 15, 7, and 6, respectively. Most were large with sizes ranging 43-104 mm (mode=87 mm).

The surfgrass transects were sampled by Dan. Transect 1 had 72% *Phyllospadix*, 16% rock, and 12% other green algae cover. Transect 2 had 99% *Phyllospadix*, and transect 3 was quite diverse with only 39% surfgrass cover, 24% other red algae, 19% other green algae as well as low quantities of *Sargassum muticum*, articulated corallines and rock. Epiphytic cover on blades varied considerably depending on species. *Smithora naiadum* was present in low abundance yet cover of *Melobesia mediocris* on blades was estimably high.

No repairs were made to plots even though a few corners were missing. Overall, we had no trouble locating any of the plots.

15 January, Fossil Reef. Low tide -0.7 ft at 1556 hrs. The weather shifted today from being mostly clear and sunny to overcast, but the wind remained light out of the southwest. The temperature was comfortable when we arrived around 1330 and later became brisk requiring layered clothing. Once again, a large swell (6-8') continued to impact the site with sets washing completely over the mussel plots occasionally. There were some broken rocks along the reef near the *Lottia* plots. A mix of cormorants (15), 40 western gulls, and 8 black oystercatchers were seen on the reef. We were on site from 1320 to 1730 hrs.

Dan scored plots and photographed plots. Stephen and Connie counted motile invertebrates. Two barnacle plots had moderate numbers of *Tegula funebris* (n=10 and n=13). One plot had 6 *Acanthina* spp. *Littorina* spp. were moderately-abundant. All plots were predominantly rock. Barnacle cover ranged from 18-45% (mean=26%).

Endocladia plots had unprecedented numbers of *Tegula funebris*. Abundances ranged 19-105 throughout the five plots (mean=55/plot). *Acanthina* spp. were also relatively numerous. Four plots ranged 9-14 individuals/plot. Littorines were moderately-abundant. *Endocladia* cover ranged 13-75% (mean=49%). One plot had 56% *Silvetia* cover and another had 27% barnacle cover.

The *Silvetia* zone was highly-populated with *Tegula funebris*. In the 5 plots, abundances ranged 15-379 (mean=159/plot). *Acanthina* spp. ranged 3-17 individuals/plot. *Pagurus* spp. (primarily *Pagurus samuelis*) were extremely abundant in one plot (n=73). One plot had 12 *Lepidochitona* spp. Cover of *Silvetia* and *Endocladia* ranged 33-97% (mean=68%) and 2-22% (mean=10%), respectively. *Silvetia* recruits were abundant throughout the site and mature plants appeared large and healthy.

Mussel plots had high numbers of *Nuttallina* spp. in three plots (n=27, 33, 60) and *Strongylocentrotus purpuratus* in 4 plots (range=14-53, mean=37/plot). Ten *Lottia gigantea* were observed in one plot. Sizes ranged 15-40mm. Diversity of sedentary spp. was high across all plots though abundances were quite low. Most spp. were present in trace quantities, others such as *Ulva* (mean=20%), articulated corallines (mean=15%), and coralline crusts (mean=14%) were low to moderately abundant. *Phragmatopoma* dominated much of the *Mytilus* zone whereby it comprised 57% of one plot. *Mytilus* are still restricted to the highest part of the outer reef. *Pisaster* continue to advance up the reef in search of their prey, mussels.

Dan and Connie counted limpets in the *Lottia* plots. Plots 1-5 had n=1, 2, 46, 55, and 71, respectively. Sizes ranged 17-87 mm. The majority of limpets measured 35-50 mm. The late afternoon low tide coupled with the high surge precluded any search for black abalone and site-wide sea star survey. Dan was able to sample the inshore 15x6 meter transect for sea stars in which he found 22 and 32 on either side of the transect.

No repairs were made during this visit even though 9 plots are in need of some repair. However, we had no trouble locating any of the plots.

15 January Skunk Point-snowy plover counts. We walked the Skunk Point beaches between 0800 and 1030 hrs. Conditions were excellent with some high clouds but mostly clear sky and no wind. The tide was high and the overwash lake on the point was very large. On Southeast Anchorage there were only five black oystercatchers. There were no ducks or loons in the anchorage.

On Skunk Point there were 345 sanderling, 320 black-bellied plover, 50 royal tern, 30 Herrmann's gull, 10 California gull, 1 willet, 2 common raven, 1 long-billed curlew, 4 marbled godwit, 2 western sandpiper, and 71 snowy plovers. The snowy plovers were flying across the lake and I did not feel that we got a very good count of them. We did not see any more snowy plovers on the east side beaches. There were some surf scoters offshore at the point. Fox tracks were present on the beach.

Oat Point Lagoon was about three-quarters full but no birds were in the vicinity.

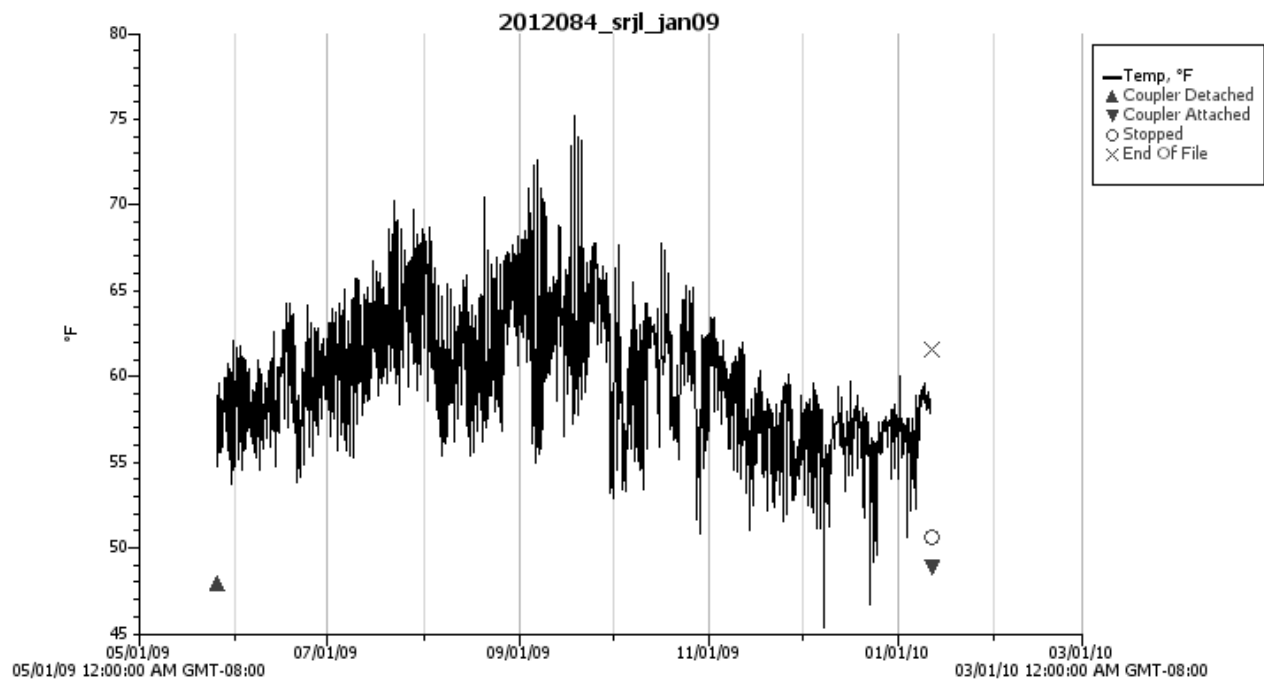
At Old Ranch Canyon there was one bull elephant seal on the beach and at the lagoon there was 1 great blue heron, 2 mallard ducks, 2 northern pintail, 2 American wigeon, 1 eared grebe, and 1 merlin. At Abalone Rocks, there was one common raven and 2 mallard ducks on the lagoon.

16 January, China Camp to Mud Tank, snowy plover count. Low tide -0.7 ft at 1556 hrs. Conditions were excellent with no wind and a few high clouds. The tide was high through most of the walk and there was high surf but it did not impact our survey. Elephant seals with pups were abundant on all the beaches. No carcasses were observed except a few dead elephant seal pups. With the high tides and surf most of the beaches were pretty clean. There was moderate kelp wrack in a few areas. Donovan assisted us with a shuttle near mud tank and dropped us off at China camp about 0900 hrs.

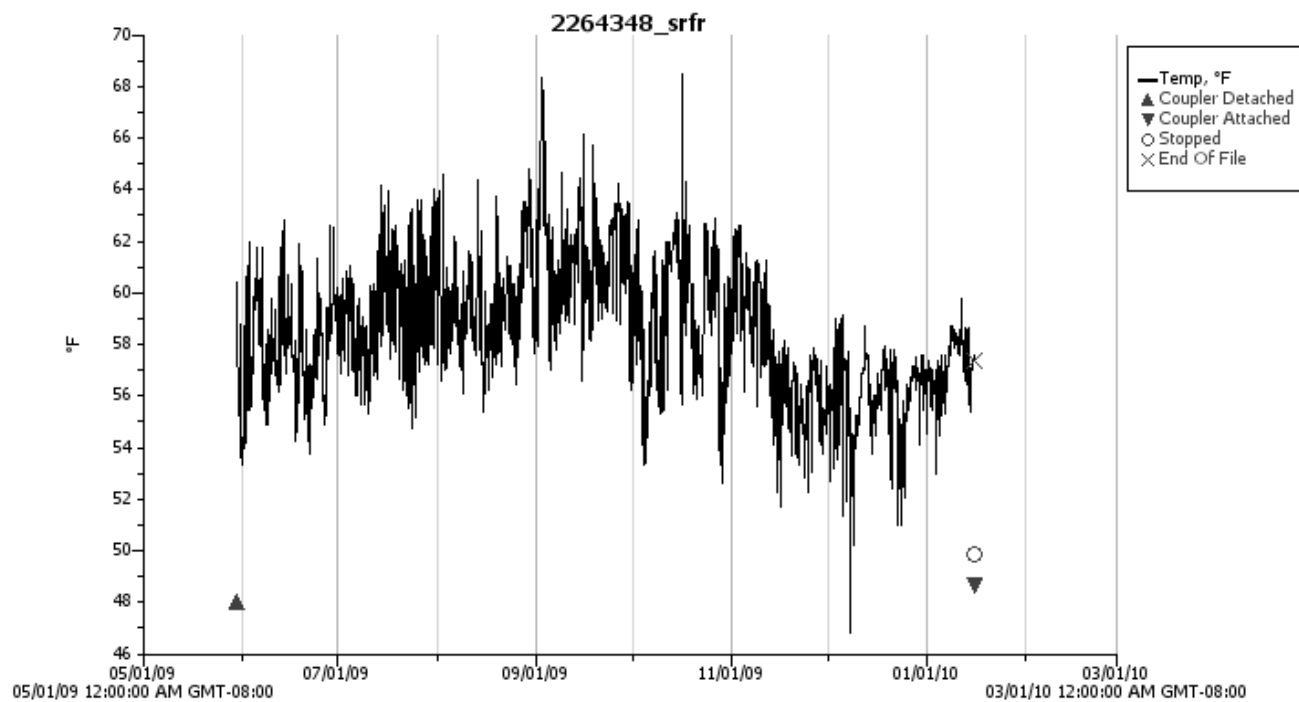
At China Camp there were 6 black oystercatchers on the reef, 34 common raven (walking among the elephant seals), 11 whimbrel, and 60 western gulls. On Cluster Point there were aggregations of brown pelicans, royal terns, western gulls, Brandt's cormorants, double-crested cormorants and 1 rock wren. Between Cluster Point and Bee Canyon were 1 American pipit, 1 bald eagle adult with blue wing tags and a transmitter, and 2 common raven. Pelagic cormorants with breeding plumage were observed and there was a large number of cormorants on the point east of Bee Rock Beaches. On the Bee Rock Beaches there were 1 long-billed curlew, 3 least sandpiper, 1 common raven, about 50 western gull, and 29 snowy plover on the foredune hiding in elephant seal tracks. We checked Mud Tank Beach and found 8 snowy plover on a rocky reef. Many elephant seals were at Mud Tank Beach.

17 January, Skunk Point, snowy plover count. Because of the rain forecasted, we modified our trip and arranged a flight for the morning. Connie and Dan went down to Skunk Point while Stephen cleaned the bunkhouse and vehicles. We were able to get a good count on the snowy plovers finding 205 on the main beach. We did not count other shorebirds but there were probably fewer sanderling and black-bellied plovers than on the 15th. Gulls and terns were not present either. More surf scoters and loons were present offshore. A bull elephant seal, possibly the same one we saw at Old Ranch on 1/15, was on the Skunk Point Beach. We found carcasses of an immature western gull and a western grebe on the beach. The gull looked like a peregrine kill. The total for snowy plovers was 242 using counts from 1/16-17, which is the highest winter count since before 2000.

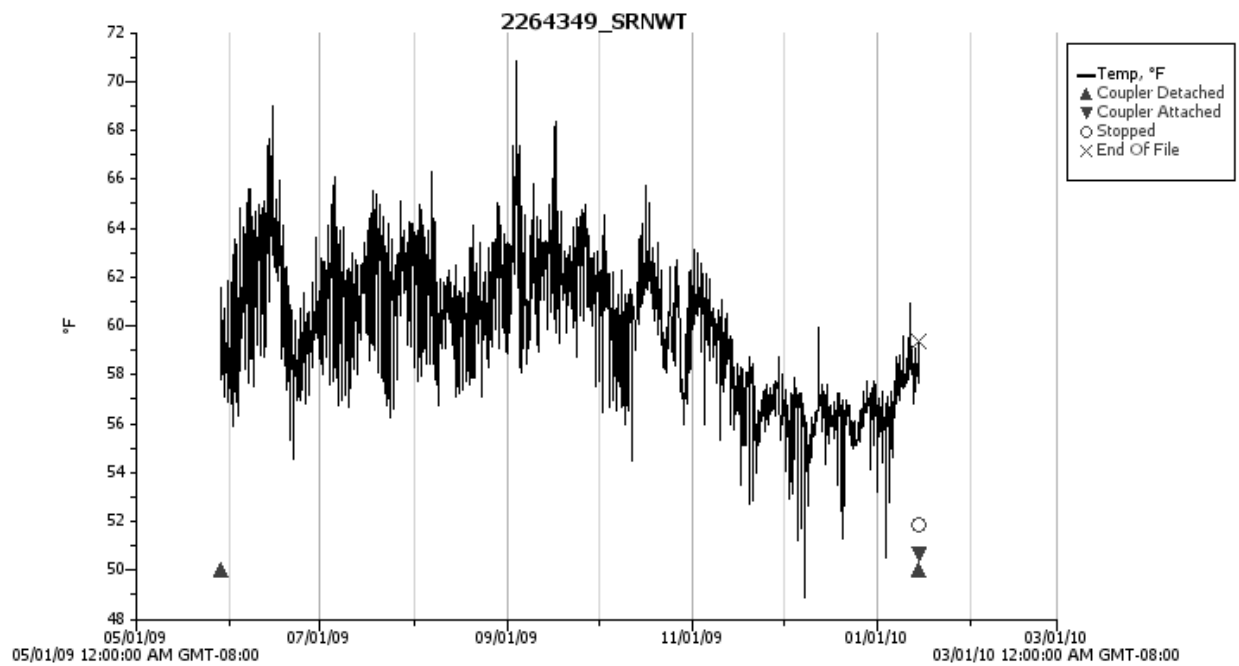
Bird list for the week: Pacific loon, eared grebe, western grebe, double-crested cormorant, Brandt's cormorant, pelagic cormorant, mallard, northern pintail, American wigeon, surf scoter, western brown pelican, Western gull, herring gull, California gull, Herrmann's gull, royal tern, great blue heron, black oystercatcher, black-bellied plover, snowy plover, marbled godwit, long-billed curlew, whimbrel, willet, sanderling, western sandpiper, least sandpiper, black turnstones, sharp-shinned hawk, red-tailed hawk, bald eagle, American kestrel, merlin, burrowing owl, unidentified hummingbird, black phoebe, Say's phoebe, horned lark, American pipit, common raven, rock wren, yellow-rumped warbler, western meadowlark, spotted towhee.



Temperature logger from Johnson's Lee, Santa Rosa Island, fall 2009.



Temperature logger from Fossil Reef, Santa Rosa Island, fall 2009.



Temperature logger from Northwest Talcott, Santa Rosa Island, fall 2009.

Appendix D. Motile Invertebrate Data Tables and Figures

Motile invertebrate species sampled in fixed photoquadrats are listed in Table D-1. Included are species and group codes along with corresponding species and group names. Site identification codes and corresponding site names are also included.

Mean and standard error values are presented in Table D-2 for select motile invertebrate species in each sampling zone at all sites and both sampling seasons (spring and fall). All species were sampled within the entire area (50 x 75 cm) of photoquadrats except for LSMALL, LMDALL and *Littorina* spp. which were subsampled in three locations within photoquadrats each measuring either 10 x 10 cm or 20 x 20 cm (subsamped count data are extrapolated to the full 50 x 75 cm photoplot area). The three limpet categories (LIMPLG, LMDALL, and LSMALL) included all species of limpets.

Figures D-1 through D-5 represent size distributions for dominant motile invertebrate species. Maximum of 10 individuals from each genera were collected for sizing. Refer to Table D-1 for site codenames. Figure D-6 includes graphs of species mean abundances for 2009 at each site along with the overall, maximum, and minimum means of combined previous years.

Table D1. Site, Species, and Group Codes with Definitions

Site ID	Island	Site	Species/ Group Code	Scientific Name/ Description
SMOH	San Miguel	Otter Harbor	LEPSPP	<i>Lepidochitona</i> spp.
SMCH	San Miguel	Cuyler Harbor	NUTSPP	<i>Nuttalina</i> spp.
SMCP	San Miguel	Crook Point	FISVOL	<i>Fissurella volcano</i>
SRFR	Santa Rosa	Fossil Reef	PACCRA	<i>Pachygrapsus crassipes</i>
SRNWT	Santa Rosa	NW-Talcott	PAGSPP	<i>Pagurus</i> spp
SREP	Santa Rosa	East Point	OCESPP	<i>Ocenebra</i> spp
SRFP	Santa Rosa	Ford Point	LIMPLG	limpets over 15 mm in size on any substrate/organism
SRJL	Santa Rosa	Johnson's Lee	NUCEMA	<i>Nucella emarginata/ostrina</i>
SCTR	Santa Cruz	Trailer	TEGFUN	<i>Tegula funebris</i> (<i>Chlorostoma funebris</i>)
SCFC	Santa Cruz	Fraser Cove	TEGGAL	<i>Tegula gallina</i> (<i>Chlorostoma gallina</i>)
SCOC	Santa Cruz	Orizaba Cove	LOTGIG	<i>Lottia gigantea</i>
SCPH	Santa Cruz	Prisoner's Harbor	LSMALL	limpets under 5 mm in size on all substrate
SCSR	Santa Cruz	Scorpion Rock	LMDALL	limpets 5-15 mm in size on all substrate
SCWA	Santa Cruz	Willows Anchorage	LITSPP	<i>Littorina</i> spp
ANCR	Anacapa	Cat Rock	PISOCH	<i>Pisaster ochraceus</i>
ANMW	Anacapa	Middle-West	STRPUR	<i>Strongylocentrotus purpuratus</i>
ANME	Anacapa	Middle-East		
ANSFC	Anacapa	S Frenchy's Cove		
SBLC	Santa Barbara	Landing Cove		
SBSLR	Santa Barbara	Sea Lion Rookery		

Table D2. Mean and Standard Error Values for Select Motile Invertebrate Species and Groups

	Site ID	Sampling Season Code	Target Zone	# Plots	LEPSPP	NUTSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
D-3	SMOH	SP09	<i>Silvetia</i>	5	0.2	0.0	0.0	0.0	0.0	0.0	1.4	0.2	0.0	0.2	0.0	0.0	11.3	162.5	554.4	0.0	0.0
	SMOH	SP09	<i>Mytilus</i>	5	0.4	5.4	0.0	0.2	0.2	0.2	0.6	13.8	0.0	2.2	0.0	1.2	24.4	258.1	1.9	0.0	0.0
	SMOH	SP09	<i>Endocladia</i>	5	0.0	1.4	0.0	0.4	0.0	0.0	1.4	1.6	0.4	1.2	0.0	0.0	17.5	206.3	211.3	0.0	0.0
	SMOH	SP09	<i>Chthamalus /Balanus</i>	5	0.0	0.0	0.0	0.0	0.4	0.0	1.2	0.0	0.0	16.4	0.0	0.0	2.5	29.4	843.1	0.0	0.0
	SE				0.0	0.6	0.0	0.0	0.0	0.0	0.1	1.5	0.0	1.7	0.0	0.1	2.1	21.9	83.1	0.0	0.0
	AVE				0.2	1.7	0.0	0.2	0.2	0.1	1.2	3.9	0.1	5.0	0.0	0.3	13.9	164.1	402.7	0.0	0.0
	SMHP	SP09	<i>Tetraclita</i>	2	0.0	4.5	0.0	0.5	0.5	1.0	1.5	4.5	0.0	0.0	0.0	0.0	25.0	198.4	118.8	0.0	0.0
	SMHP	SP09	<i>Mytilus</i>	3	0.0	0.7	0.0	1.0	0.3	0.0	4.3	1.3	0.0	0.0	0.0	0.0	18.8	159.4	243.8	0.0	1.3
	SMHP	SP09	<i>Hespero-phycus</i>	5	0.2	0.0	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	3.8	55.0	263.1	0.0	0.0
	SMHP	SP09	<i>Endocladia</i>	5	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.6	0.0	0.0	0.0	0.0	13.8	115.6	178.8	0.0	0.0
	SMHP	SP09	<i>Chthamalus /Balanus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.5	1112.5	0.0	0.0
	SE				0.0	0.4	0.0	0.1	0.1	0.1	0.4	0.4	0.0	0.0	0.0	0.0	2.3	15.2	92.0	0.0	0.1
	AVE				0.0	1.1	0.0	0.4	0.2	0.2	1.2	1.3	0.0	0.0	0.0	0.0	12.3	113.2	383.4	0.0	0.3
	SMCH	SP09	<i>Silvetia</i>	5	0.2	1.6	0.0	2.0	1.2	0.8	2.0	2.0	0.8	15.6	0.0	0.6	4.4	101.3	95.6	0.0	0.0
	SMCH	SP09	<i>Mytilus</i>	5	0.0	6.4	0.2	1.0	0.0	0.2	0.8	16.8	0.0	0.0	0.0	2.0	28.1	193.1	0.0	0.0	0.6
	SMCH	SP09	<i>Endocladia</i>	5	0.0	0.8	0.0	1.0	0.0	0.6	1.2	2.0	1.4	6.6	0.0	0.8	5.0	61.3	162.5	0.0	0.0
	SMCH	SP09	<i>Chthamalus /Balanus</i>	5	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.6	0.0	0.0	0.0	25.6	1072.5	0.0	0.0
	SE				0.0	0.6	0.0	0.2	0.1	0.1	0.2	1.7	0.1	1.6	0.0	0.2	2.8	16.1	111.3	0.0	0.1
	AVE				0.1	2.2	0.1	1.1	0.3	0.4	1.0	5.2	0.6	5.7	0.0	0.9	9.4	95.3	332.7	0.0	0.2

Site ID	Sampling Season Code	Target Zone	# Plots	LESP	NUTSP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMRDALL	LITSP	PISOCH	STRPUR
SMCP	SP09	<i>Silvetia</i>	5	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	45.0	239.4	90.0	0.0	0.2
SMCP	SP09	<i>Mytilus</i>	5	0.2	1.8	0.0	0.6	0.0	0.0	0.2	0.0	0.0	4.8	0.0	0.8	18.1	123.1	21.9	0.0	0.6
SMCP	SP09	<i>Endocladia Chthamalus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	36.9	388.8	363.8	0.0	0.0
SMCP	SP09	<i>/Balanus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	36.9	1322.5	0.0	0.0
SE				0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.1	4.4	34.1	134.3	0.0	0.1
AVE				0.1	0.5	0.0	0.2	0.0	0.0	0.1	0.3	0.0	1.2	0.0	0.2	25.3	197.0	449.5	0.0	0.2
SRFR	SP09	<i>Silvetia</i>	5	5.6	0.0	0.0	4.2	3.0	0.4	3.0	0.0	6.6	69.2	0.4	0.0	22.5	45.0	370.0	0.0	0.2
SRFR	SP09	<i>Mytilus</i>	5	1.8	33.6	1.2	4.6	5.4	1.2	5.6	1.6	0.0	0.0	0.0	4.2	240.0	168.1	2.5	0.0	8.6
SRFR	SP09	<i>Endocladia Chthamalus</i>	5	0.8	0.0	0.0	3.0	1.5	0.0	2.3	0.0	12.3	18.0	0.0	0.0	38.3	65.6	300.0	0.0	0.0
SRFR	SP09	<i>/Balanus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	5.6	37.5	1097.5	0.0	0.0
SE				0.6	3.8	0.1	0.5	0.5	0.1	0.5	0.2	1.3	7.3	0.0	0.5	24.5	13.5	103.9	0.0	1.0
AVE				2.0	8.4	0.3	3.0	2.5	0.4	2.7	0.4	4.8	21.8	0.1	1.1	76.6	79.1	442.5	0.0	2.2
SRNWT	SP09	<i>Silvetia</i>	5	2.2	0.6	0.0	2.0	0.0	0.0	0.6	0.0	0.0	1.2	0.0	0.0	25.0	32.5	84.4	0.0	0.0
SRNWT	SP09	<i>Mytilus</i>	5	0.8	14.6	3.6	3.4	0.0	1.0	4.0	0.2	0.0	0.0	0.0	3.2	70.6	92.5	0.0	0.0	0.0
SRNWT	SP09	<i>Endocladia Chthamalus</i>	5	0.8	1.4	0.0	0.8	0.0	0.4	5.0	0.2	0.6	0.2	0.0	0.4	56.3	89.4	8.8	0.0	0.0
SRNWT	SP09	<i>/Balanus</i>	5	1.4	0.4	0.0	0.4	0.0	0.2	0.2	0.0	0.2	8.0	0.0	0.0	58.8	56.3	486.3	0.0	0.0
SE				0.1	1.5	0.4	0.3	0.0	0.1	0.5	0.0	0.1	0.9	0.0	0.3	4.4	6.4	51.6	0.0	0.0
AVE				1.3	4.3	0.9	1.7	0.0	0.4	2.5	0.1	0.2	2.4	0.0	0.9	52.7	67.7	144.8	0.0	0.0
SREP	SP09	<i>Silvetia</i>	5	6.6	0.4	0.0	4.2	0.4	0.2	1.0	0.2	7.2	14.2	0.0	0.0	251.3	101.9	376.9	0.0	0.0
SREP	SP09	<i>Mytilus</i>	5	1.8	6.6	5.2	7.2	0.4	1.8	0.8	10.0	0.0	1.2	0.0	0.0	486.3	146.3	53.1	0.6	0.0
SREP	SP09	<i>Hespero- phycus</i>	5	1.2	0.0	0.0	2.6	0.0	0.2	0.0	0.0	0.8	2.8	0.2	0.0	20.0	8.1	740.0	0.0	0.0
SREP	SP09	<i>Endocladia Chthamalus</i>	5	0.4	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	31.9	5.6	1505.0	0.0	0.0
SREP	SP09	<i>/Balanus</i>	5	1.4	0.2	0.0	0.6	0.2	0.2	0.2	0.0	1.4	9.4	0.0	0.0	21.9	27.5	1203.8	0.0	0.0
SE				0.5	0.6	0.5	0.6	0.0	0.1	0.1	0.9	0.6	1.2	0.0	0.0	41.2	12.6	118.2	0.1	0.0
AVE				2.3	1.4	1.0	3.0	0.2	0.5	0.4	2.0	1.9	5.6	0.0	0.0	162.3	57.9	775.8	0.1	0.0

Site ID	Sampling Season Code	Target Zone	# Plots Sampled	LESPPP	NUTSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMIDALL	LITSPP	PISOCH	STRPUR
SRFP	SP09	<i>Mytilus</i>	5	3.2	4.8	2.0	4.2	0.0	0.2	0.6	3.8	0.2	0.6	0.0	0.4	375.0	222.5	102.5	0.6	12.2
SRFP	SP09	<i>Endocladia</i>	5	2.6	3.2	0.2	1.8	0.8	0.0	0.4	3.2	0.0	5.8	0.0	0.2	484.4	231.3	308.8	0.0	1.4
SRFP	SP09	<i>Chthamalus /Balanus</i>	5	1.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.4	0.2	0.0	79.4	196.9	1393.8	0.0	0.0
SE				0.3	0.6	0.3	0.5	0.1	0.0	0.1	0.5	0.0	0.7	0.0	0.1	54.1	4.6	179.1	0.1	1.7
AVE				2.3	2.7	0.7	2.0	0.3	0.1	0.3	2.3	0.1	2.6	0.1	0.2	312.9	216.9	601.7	0.2	4.5
SRJL	SP09	<i>Mytilus</i>	9	2.9	3.1	0.1	5.0	1.9	0.2	0.1	6.3	0.8	6.6	0.1	0.9	149.3	154.2	66.3	0.6	22.1
SRJL	SP09	<i>Endocladia</i>	5	0.6	0.8	0.0	0.4	0.0	0.0	0.2	2.8	0.0	0.2	0.0	0.6	149.4	236.9	305.6	0.0	0.0
SRJL	SP09	<i>Chthamalus /Balanus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	130.5	100.8	1859.4	0.0	0.0
SE				0.3	0.4	0.0	0.6	0.3	0.0	0.0	0.7	0.1	0.8	0.0	0.1	2.5	15.7	223.3	0.1	2.9
AVE				1.2	1.3	0.0	1.8	0.6	0.1	0.1	3.0	0.3	2.3	0.0	0.5	143.0	163.9	743.8	0.2	7.4
SCTR	SP09	<i>Silvetia</i>	5	3.0	0.0	0.0	0.2	2.2	0.0	1.2	0.0	4.8	61.0	1.0	0.0	13.8	91.3	42.5	0.0	0.0
SCTR	SP09	<i>Mytilus</i>	5	0.2	5.6	0.0	0.4	0.0	0.4	0.6	3.6	0.0	0.0	0.0	0.0	101.3	130.6	20.0	0.0	0.6
SCTR	SP09	<i>Hespero-phycus</i>	5	1.7	0.0	0.0	0.7	0.0	1.2	0.0	0.0	1.7	9.2	0.7	0.0	7.3	47.4	410.4	0.0	0.0
SCTR	SP09	<i>Chthamalus /Balanus</i>	5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.5	105.0	962.5	0.0	0.0
SE				0.3	0.6	0.0	0.1	0.2	0.1	0.1	0.4	0.5	6.6	0.1	0.0	9.6	7.8	98.5	0.0	0.1
AVE				1.4	1.4	0.0	0.3	0.6	0.4	0.5	0.9	1.6	17.5	0.4	0.0	38.7	93.6	358.9	0.0	0.2
SCFC	SP09	<i>Tar</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	555.0	0.0	0.0
SCFC	SP09	<i>Silvetia</i>	5	2.4	0.4	0.0	0.2	0.2	0.2	0.2	0.0	5.6	21.6	0.0	0.0	18.1	126.9	75.0	0.0	0.0
SCFC	SP09	<i>Pollicipes</i>	5	0.8	2.8	0.0	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0	295.0	845.0	122.5	0.0	0.0
SCFC	SP09	<i>Mytilus</i>	5	0.2	0.6	0.0	0.4	0.0	0.0	0.2	9.4	0.0	1.6	0.0	0.6	28.1	118.8	5.6	0.0	0.2
SCFC	SP09	<i>Hespero-phycus</i>	5	0.8	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.2	6.2	0.0	0.0	10.0	56.3	372.5	0.0	0.0
SCFC	SP09	<i>Endocladia</i>	5	0.2	0.4	0.0	0.0	0.0	0.0	0.2	0.4	0.6	0.0	0.0	0.0	27.5	122.5	812.5	0.0	0.0
SCFC	SP09	<i>Chthamalus /Balanus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	3.1	1031.3	0.0	0.0
SE				0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.7	0.3	1.4	0.0	0.0	18.1	50.3	66.4	0.0	0.0
AVE				0.6	0.6	0.0	0.1	0.0	0.0	0.1	2.7	1.1	4.2	0.0	0.1	54.1	181.8	424.9	0.0	0.0

Site ID	Sampling Season Code	Target Zone	# Plots Sampled	LEPSP	NUTSP	FISVOL	PACCRA	PAGSP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSP	PISOCH	STRPUR
SCOC	SP09	<i>Tetraclita</i>	5	0.0	2.8	0.0	0.2	0.0	3.8	2.0	4.8	0.0	0.0	0.0	0.0	69.4	114.4	21.3	0.0	0.0
SCOC	SP09	<i>Silvetia</i>	5	0.0	1.2	0.0	1.2	2.4	2.0	0.0	1.0	1.4	2.4	0.0	0.2	45.0	53.8	80.0	0.0	0.0
SCOC	SP09	<i>Mytilus</i>	5	0.0	0.4	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.8	15.6	1.9	1.8	2.2
SCOC	SP09	<i>Hesperophycus</i>	5	2.0	0.0	0.0	1.6	0.4	4.6	5.2	6.0	0.0	4.6	0.0	0.0	43.1	45.0	785.0	0.0	0.0
SCOC	SP09	<i>Chthamalus/Balanus</i>	5	0.0	0.6	0.0	0.6	0.0	0.2	0.4	2.8	0.0	0.0	0.0	0.0	29.4	25.6	880.0	0.0	0.0
SE				0.2	0.2	0.0	0.1	0.2	0.4	0.4	0.5	0.1	0.4	0.0	0.0	2.9	7.7	87.9	0.2	0.2
AVE				0.4	1.0	0.1	0.8	0.6	2.1	1.5	2.9	0.3	1.4	0.0	0.0	46.1	50.9	353.6	0.4	0.4
SCPH	SP09	<i>Silvetia</i>	5	1.4	0.0	0.0	1.2	0.0	1.2	0.2	1.0	0.6	0.0	0.0	0.0	120.6	67.5	657.5	0.0	0.0
SCPH	SP09	<i>Mytilus</i>	5	1.8	12.2	6.0	0.6	0.8	8.8	0.0	0.0	1.8	0.0	0.0	0.0	226.3	212.5	4.4	0.0	0.0
SCPH	SP09	<i>Hesperophycus</i>	5	0.6	0.4	0.0	1.4	0.0	0.0	0.0	0.8	1.0	0.4	0.0	0.0	31.3	25.6	1460.0	0.0	0.0
SCPH	SP09	<i>Endocladia</i>	5	0.0	0.0	0.0	0.6	0.2	0.0	0.0	1.0	2.8	1.6	0.4	0.0	22.5	29.4	767.5	0.0	0.0
SCPH	SP09	<i>Chthamalus/Balanus</i>	5	0.6	0.0	0.0	0.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	142.5	93.1	1130.0	0.0	0.0
SE				0.1	1.1	0.5	0.1	0.1	0.8	0.0	0.1	0.2	0.1	0.0	0.0	16.9	15.2	109.5	0.0	0.0
AVE				0.9	2.5	1.2	0.8	0.2	2.0	0.1	0.6	1.2	0.4	0.1	0.0	108.6	85.6	803.9	0.0	0.0
SCWA	SP09	<i>Silvetia</i>	5	1.8	1.0	0.0	0.4	1.2	0.0	0.4	0.2	1.2	0.0	0.0	0.0	310.6	155.0	46.9	0.0	0.0
SCWA	SP09	<i>Mytilus</i>	5	0.2	3.8	2.6	2.0	0.0	0.0	3.8	3.6	0.0	0.0	0.0	0.8	150.0	115.0	2.5	0.2	3.0
SCWA	SP09	<i>Hesperophycus</i>	5	3.4	0.2	0.0	0.0	0.4	0.2	1.0	0.0	0.6	0.2	0.2	0.0	92.5	75.0	922.5	0.0	0.0
SCWA	SP09	<i>Endocladia</i>	5	0.2	0.2	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	16.3	50.6	887.5	0.0	0.0
SE				0.3	0.4	0.3	0.2	0.1	0.0	0.4	0.4	0.1	0.0	0.0	0.1	27.9	10.3	113.8	0.0	0.3
AVE				1.4	1.3	0.7	0.7	0.4	0.1	1.4	1.0	0.5	0.1	0.1	0.2	142.3	98.9	464.8	0.1	0.8
ANMW	SP09	<i>Silvetia</i>	5	1.0	7.8	1.0	5.6	0.2	0.6	0.8	1.0	0.0	0.0	0.0	1.0	13.1	99.4	7.5	0.0	4.2
ANMW	SP09	<i>Mytilus</i>	5	0.7	16.0	2.4	0.3	0.3	2.0	0.1	2.7	0.4	0.0	0.0	0.9	17.9	106.3	0.9	0.0	0.6
ANMW	SP09	<i>Endocladia</i>	5	3.0	6.6	0.2	4.0	1.4	1.6	5.6	0.6	1.2	0.0	0.0	0.0	7.5	74.4	99.4	0.0	0.0
ANMW	SP09	<i>Chthamalus/Balanus</i>	5	1.4	1.8	0.0	2.2	0.6	0.2	0.8	0.6	0.8	0.0	0.0	0.0	18.1	81.9	92.5	0.0	1.4
SE				0.2	1.3	0.2	0.5	0.1	0.2	0.6	0.2	0.1	0.0	0.0	0.1	1.1	3.3	11.9	0.0	0.4
AVE				1.5	8.1	0.9	3.0	0.6	1.1	1.8	1.2	0.6	0.0	0.0	0.5	14.2	90.5	50.1	0.0	1.5

Site ID	Sampling Season Code	Target Zone	# Plots Sampled	LESPPP	NUTSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
ANSFC	SP09	<i>Silvetia</i>	5	0.2	0.2	0.0	1.4	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.9	21.9	35.6	0.0	0.0
ANSFC	SP09	<i>Mytilus</i>	5	0.0	1.3	0.0	1.7	0.0	0.7	0.0	4.7	0.0	0.0	0.0	0.0	12.5	50.0	0.0	0.0	0.0
ANSFC	SP09	<i>Endocladia</i>	5	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	5.0	92.5	0.0	0.0
ANSFC	SP09	<i>Chthamalus</i> <i>/Balanus</i>	5	0.4	0.0	0.0	0.4	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	3.1	8.1	615.0	0.0	0.0
SE				0.0	0.1	0.0	0.2	0.0	0.1	0.1	0.5	0.0	0.0	0.0	0.0	1.1	4.6	64.5	0.0	0.0
AVE				0.2	0.4	0.0	0.9	0.0	0.2	0.3	1.2	0.0	0.0	0.0	0.0	4.8	21.3	185.8	0.0	0.0
SCOC	FA09	<i>Tetraclita</i>	5	0.6	1.2	0.0	1.0	0.0	4.2	0.0	5.8	0.2	0.0	0.0	0.0	766.3	361.9	195.0	0.0	0.0
SCOC	FA09	<i>Silvetia</i>	5	1.2	0.8	0.0	1.0	0.6	0.6	0.8	1.4	1.8	0.8	0.2	0.0	201.9	107.5	303.1	0.0	0.2
SCOC	FA09	<i>Mytilus</i>	5	0.6	2.6	4.4	0.8	0.0	2.8	0.0	0.2	0.0	0.0	0.0	0.0	153.8	55.6	0.6	1.8	21.8
SCOC	FA09	<i>Hespero-</i> <i>phycus</i>	3	1.0	0.0	0.0	0.0	0.0	0.3	1.0	0.0	0.0	0.7	0.0	0.0	161.5	115.6	183.3	0.0	0.0
SCOC	FA09	<i>Chthamalus</i> <i>/Balanus</i>	5	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.0	0.4	0.0	0.0	59.4	107.5	1755.0	0.0	0.0
SE				0.1	0.2	0.5	0.1	0.1	0.4	0.1	0.6	0.2	0.1	0.0	0.0	62.1	28.6	26.2	0.2	2.3
AVE				0.7	0.9	0.9	0.6	0.1	1.6	0.4	1.6	0.4	0.4	0.0	0.0	268.5	149.6	487.4	0.4	4.4
SCSR	FA09	<i>Tetraclita</i>	5	1.0	1.2	0.2	0.4	0.4	3.2	5.4	0.2	0.0	0.0	0.0	0.0	36.9	280.6	64.4	0.0	0.0
SCSR	FA09	<i>Mytilus</i>	5	0.2	1.8	3.4	3.2	0.0	13.4	0.0	0.0	0.0	0.0	0.0	0.0	102.5	142.5	0.0	0.6	5.8
SCSR	FA09	<i>Hespero-</i> <i>phycus</i>	5	1.2	0.6	0.4	0.6	0.0	0.4	1.2	0.0	1.6	0.6	0.2	0.0	29.4	67.5	106.9	0.0	0.0
SCSR	FA09	<i>Endocladia</i>	5	0.4	0.8	0.0	0.2	0.0	0.6	3.4	1.4	0.0	0.0	0.0	0.0	16.3	35.6	472.5	0.0	0.0
SCSR	FA09	<i>Chthamalus</i> <i>/Balanus</i>	5	1.0	0.0	0.0	1.4	0.0	0.0	0.2	1.0	0.6	0.0	0.0	0.0	21.9	47.5	676.3	0.0	0.0
SE				0.1	0.1	0.3	0.2	0.0	1.1	0.5	0.1	0.1	0.1	0.0	0.0	7.0	20.3	59.0	0.1	0.5
AVE				0.8	0.9	0.8	1.2	0.1	3.5	2.0	0.5	0.4	0.1	0.0	0.0	41.4	114.8	264.0	0.1	1.2
SBLC	FA09	<i>Silvetia</i>	5	1.0	0.8	0.0	0.0	1.6	2.6	1.2	0.0	0.0	0.4	0.0	0.0	1.9	108.8	6.9	0.0	0.2
SBLC	FA09	<i>Mytilus</i>	5	1.6	3.6	0.4	0.4	0.0	11.8	0.0	0.0	0.0	0.0	0.0	0.0	18.8	93.8	0.0	0.0	3.4
SBLC	FA09	<i>Chthamalus</i> <i>/Balanus</i>	5	1.0	1.2	0.0	0.0	0.0	4.4	0.0	0.0	0.2	0.0	0.0	0.0	5.6	40.0	77.5	0.0	0.0
SE				0.1	0.4	0.1	0.1	0.2	1.3	0.2	0.0	0.0	0.1	0.0	0.0	2.3	9.3	11.1	0.0	0.5
AVE				1.2	1.9	0.1	0.1	0.5	6.3	0.4	0.0	0.1	0.1	0.0	0.0	8.8	80.8	28.1	0.0	1.2

	Sampling Season Code	Target Zone	# Plots Sampled	LEPSPP	NUTSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR	
SBSLR	FA09	<i>Silvetia</i>	5	1.4	0.2	0.6	0.4	1.8	2.2	11.4	0.0	0.4	0.0	0.0	2.6	1.9	25.0	1.3	0.0	0.0	
SBSLR	FA09	<i>Mytilus</i>	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
SBSLR	FA09	<i>Endocladia Chthamalus /Balanus</i>	5	0.4	1.2	0.0	0.0	0.0	0.6	1.6	0.0	0.0	0.0	0.2	0.0	2.5	8.8	3.1	0.0	0.0	
SBSLR	FA09		5	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.4	0.0	0.2	0.0	3.1	57.5	0.0	0.0	
SE					0.2	0.2	0.1	0.1	0.3	0.3	1.6	0.0	0.1	0.1	0.0	0.4	0.3	2.9	8.2	0.0	0.0
AVE					0.7	0.5	0.2	0.1	0.6	1.0	4.4	0.0	0.1	0.1	0.1	0.9	1.5	12.3	20.6	0.0	0.0
ANCR	FA09	<i>Silvetia</i>	9	1.7	2.2	0.0	1.9	0.0	0.6	4.7	0.0	1.1	0.0	0.0	0.0	10.1	28.8	453.8	0.0	0.0	
ANCR	FA09	<i>Mytilus</i>	9	3.7	11.8	3.3	0.7	0.0	2.0	1.6	0.0	0.1	0.0	0.0	5.4	11.8	74.3	29.5	0.0	0.2	
ANCR	FA09	<i>Endocladia Chthamalus /Balanus</i>	9	3.3	7.9	5.1	2.3	0.0	2.0	3.9	0.0	0.9	0.0	0.0	0.9	4.9	45.5	16.0	0.0	0.0	
ANCR	FA09		8	0.9	0.0	0.0	0.9	0.1	0.3	1.9	0.0	2.0	0.0	0.1	0.0	5.1	15.6	638.7	0.0	0.0	
SE					0.2	0.9	0.4	0.1	0.0	0.2	0.3	0.0	0.1	0.0	0.0	0.4	0.6	4.3	52.7	0.0	0.0
AVE					2.4	5.5	2.1	1.4	0.0	1.2	3.0	0.0	1.0	0.0	0.0	1.6	8.0	41.1	284.5	0.0	0.1
ANSFC	FA09	<i>Silvetia</i>	5	0.2	0.0	0.2	1.8	0.0	0.0	0.6	0.2	0.8	0.2	0.0	0.2	9.2	23.5	6.9	0.0	0.0	
ANSFC	FA09	<i>Mytilus</i>	5	1.4	1.0	0.2	3.0	0.0	0.2	0.0	5.6	2.4	0.0	0.0	0.2	6.9	63.8	0.6	0.0	0.0	
ANSFC	FA09	<i>Endocladia Chthamalus /Balanus</i>	5	0.2	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.8	5.3	0.2	0.0	0.0	
ANSFC	FA09		5	0.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	6.3	10.0	106.3	0.0	0.0	
SE					0.1	0.1	0.0	0.3	0.0	0.0	0.1	0.6	0.2	0.0	0.0	0.0	0.8	5.9	11.6	0.0	0.0
AVE					0.5	0.3	0.1	1.5	0.0	0.1	0.2	1.5	1.0	0.1	0.0	0.1	5.8	25.6	28.5	0.0	0.0
SRFR	FA09	<i>Silvetia</i>	5	5.2	0.0	0.0	0.6	16.2	0.4	2.2	0.0	8.8	159. 2	0.0	0.0	10.6	43.1	21.9	0.0	0.8	
SRFR	FA09	<i>Mytilus</i>	5	3.6	25.4	0.6	0.4	0.0	0.8	0.4	1.6	0.0	0.0	0.0	2.6	60.0	142.5	2.5	0.0	30.4	
SRFR	FA09	<i>Endocladia Chthamalus /Balanus</i>	5	1.2	0.0	0.0	2.2	2.4	0.0	1.8	0.0	8.4	39.4	0.0	0.0	47.5	121.3	155.0	0.0	0.2	
SRFR	FA09		5	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	2.0	5.0	0.0	0.0	6.9	45.8	1225.0	0.0	0.0	
SE					0.5	2.8	0.1	0.2	1.7	0.1	0.2	0.2	1.0	16.6	0.0	0.3	5.9	11.5	131.2	0.0	3.4
AVE					2.5	6.4	0.2	0.8	4.7	0.3	1.2	0.4	4.8	50.9	0.0	0.7	31.3	88.2	351.1	0.0	7.9

Site ID	Sampling Season Code	Target Zone	# Plots Sampled	LEPSPP	NUTSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
SRNWT	FA09	<i>Silvetia</i>	5	2.8	0.2	0.0	0.2	0.2	0.0	2.8	0.0	0.2	3.8	0.0	0.0	0.6	22.4	1.7	0.0	0.0
SRNWT	FA09	<i>Mytilus</i>	5	0.4	9.2	2.0	0.6	0.2	0.6	2.0	0.4	0.0	0.0	0.0	3.8	0.6	70.6	0.0	0.0	0.2
SRNWT	FA09	<i>Endocladia Chthamalus</i>	5	1.4	0.2	0.0	1.2	0.0	1.6	1.6	0.0	0.6	0.2	0.0	0.4	16.3	66.9	0.6	0.0	0.0
SRNWT	FA09	<i>/Balanus</i>	5	3.0	0.0	0.0	0.6	0.0	0.2	1.2	0.0	3.2	2.0	0.0	0.0	24.4	43.8	182.5	0.0	0.0
SE				0.3	1.0	0.2	0.1	0.0	0.2	0.2	0.0	0.3	0.4	0.0	0.4	2.6	5.0	20.3	0.0	0.0
AVE				1.9	2.4	0.5	0.7	0.1	0.6	1.9	0.1	1.0	1.5	0.0	1.1	10.5	50.9	46.2	0.0	0.1
SREP	FA09	<i>Silvetia</i>	5	7.4	0.0	0.0	2.6	2.0	0.0	0.0	2.8	8.4	24.8	0.0	0.0	166.3	63.1	285.6	0.0	0.0
SREP	FA09	<i>Mytilus</i>	5	0.6	1.6	0.6	0.4	0.2	0.8	0.2	5.4	0.0	0.0	0.0	0.4	67.5	66.9	1.3	0.0	0.6
SREP	FA09	<i>Hespero-phycus</i>	5	1.2	0.0	0.0	1.4	1.4	0.2	0.0	1.4	4.0	6.6	0.0	0.0	57.5	13.1	223.1	0.0	0.0
SREP	FA09	<i>Endocladia Chthamalus</i>	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	3.6	2.8	0.0	0.0	136.3	36.3	1204.4	0.0	0.0
SREP	FA09	<i>/Balanus</i>	5	1.2	1.2	0.0	0.0	4.2	0.0	0.0	1.4	0.4	12.8	0.0	0.0	56.3	60.6	310.6	0.0	0.0
SE				0.6	0.2	0.1	0.2	0.3	0.1	0.0	0.3	0.7	2.0	0.0	0.0	10.2	4.6	92.6	0.0	0.1
AVE				2.1	0.6	0.1	0.9	1.6	0.2	0.0	2.6	3.3	9.4	0.0	0.1	96.8	48.0	405.0	0.0	0.1
SRFP	FA09	<i>Mytilus</i>	5	1.0	1.6	0.4	2.4	0.0	0.0	0.2	4.8	0.0	1.6	0.0	1.0	29.6	83.7	36.9	0.4	14.2
SRFP	FA09	<i>Endocladia Chthamalus</i>	5	0.2	1.0	0.2	1.4	0.4	0.2	0.0	1.6	0.6	1.6	0.0	0.2	107.5	78.1	160.0	0.2	1.0
SRFP	FA09	<i>/Balanus</i>	5	1.4	0.0	0.0	0.8	0.0	0.4	0.0	0.0	0.0	1.6	0.0	0.0	68.1	208.8	1011.9	0.0	0.0
SE				0.2	0.2	0.1	0.2	0.1	0.1	0.0	0.6	0.1	0.0	0.0	0.1	10.1	19.1	137.1	0.1	2.0
AVE				0.9	0.9	0.2	1.5	0.1	0.2	0.1	2.1	0.2	1.6	0.0	0.4	68.4	123.5	402.9	0.2	5.1
SRJL	FA09	<i>Mytilus</i>	3	2.7	0.4	0.0	2.3	4.1	0.0	0.6	8.9	0.1	9.1	0.1	0.7	26.8	117.0	23.2	2.3	1.0
SRJL	FA09	<i>Endocladia Chthamalus</i>	5	0.0	0.6	0.0	0.8	0.0	0.0	0.0	3.4	0.0	1.2	0.0	0.8	330.0	455.0	247.5	0.0	0.0
SRJL	FA09	<i>/Balanus</i>	5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.6	0.0	0.2	418.8	210.6	1540.0	0.0	0.0
SE				0.4	0.1	0.0	0.3	0.6	0.0	0.1	1.1	0.0	1.2	0.0	0.1	53.1	45.1	211.4	0.3	0.1
AVE				1.0	0.3	0.0	1.0	1.4	0.0	0.2	4.2	0.0	3.6	0.0	0.6	258.5	260.9	603.6	0.8	0.3

* Refer to Table D1 for definitions of site, species and group codes. SP=spring, FA=fall.

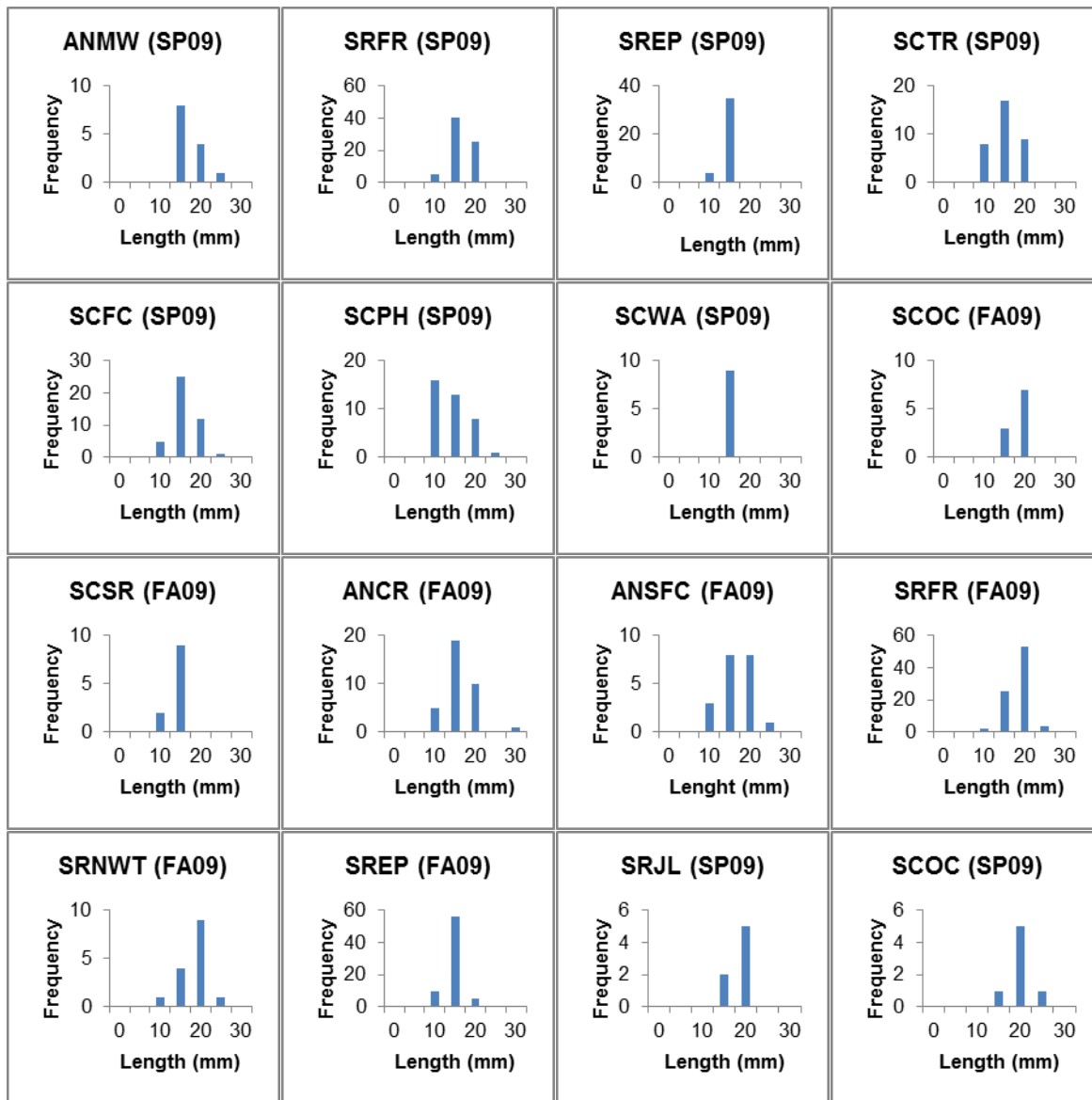


Figure D-1. *Acanthina* spp. size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Acanthina*.

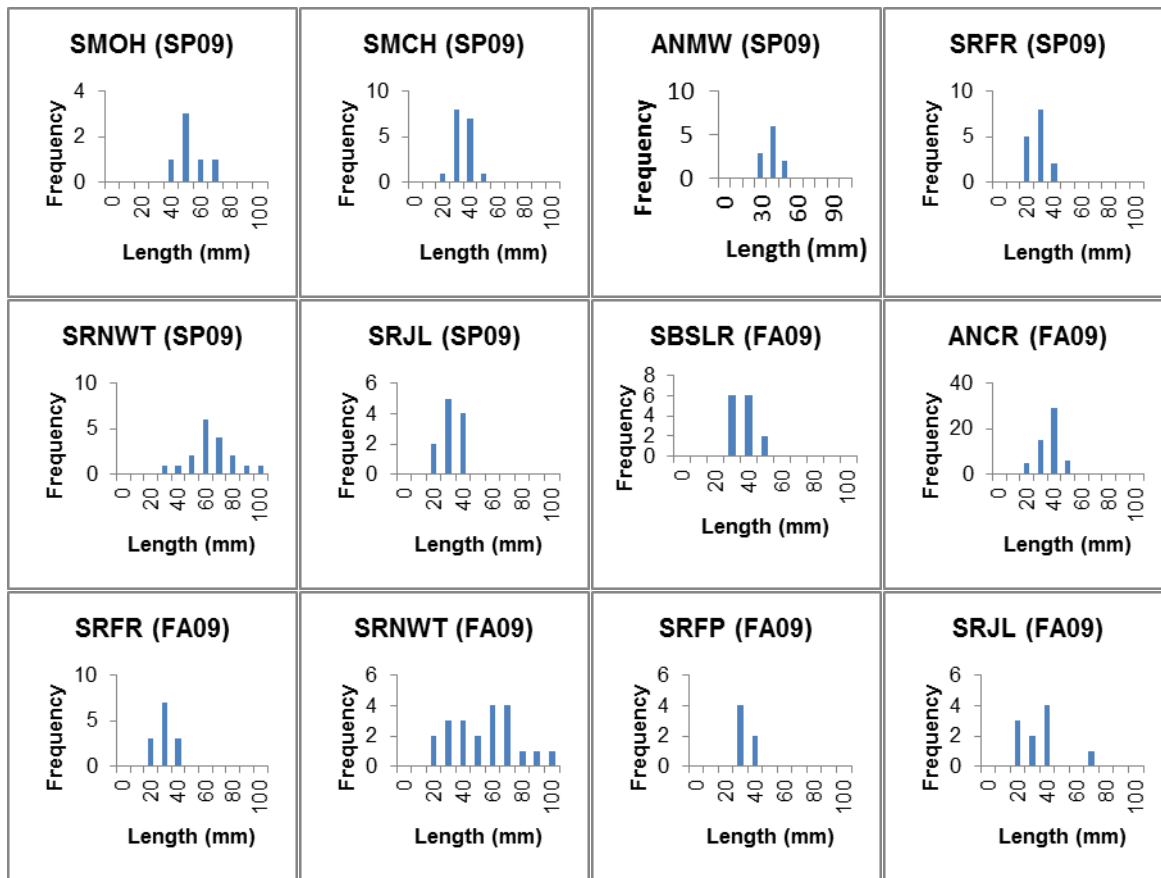


Figure D-2. *Lottia gigantea* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Lottia gigantea*.

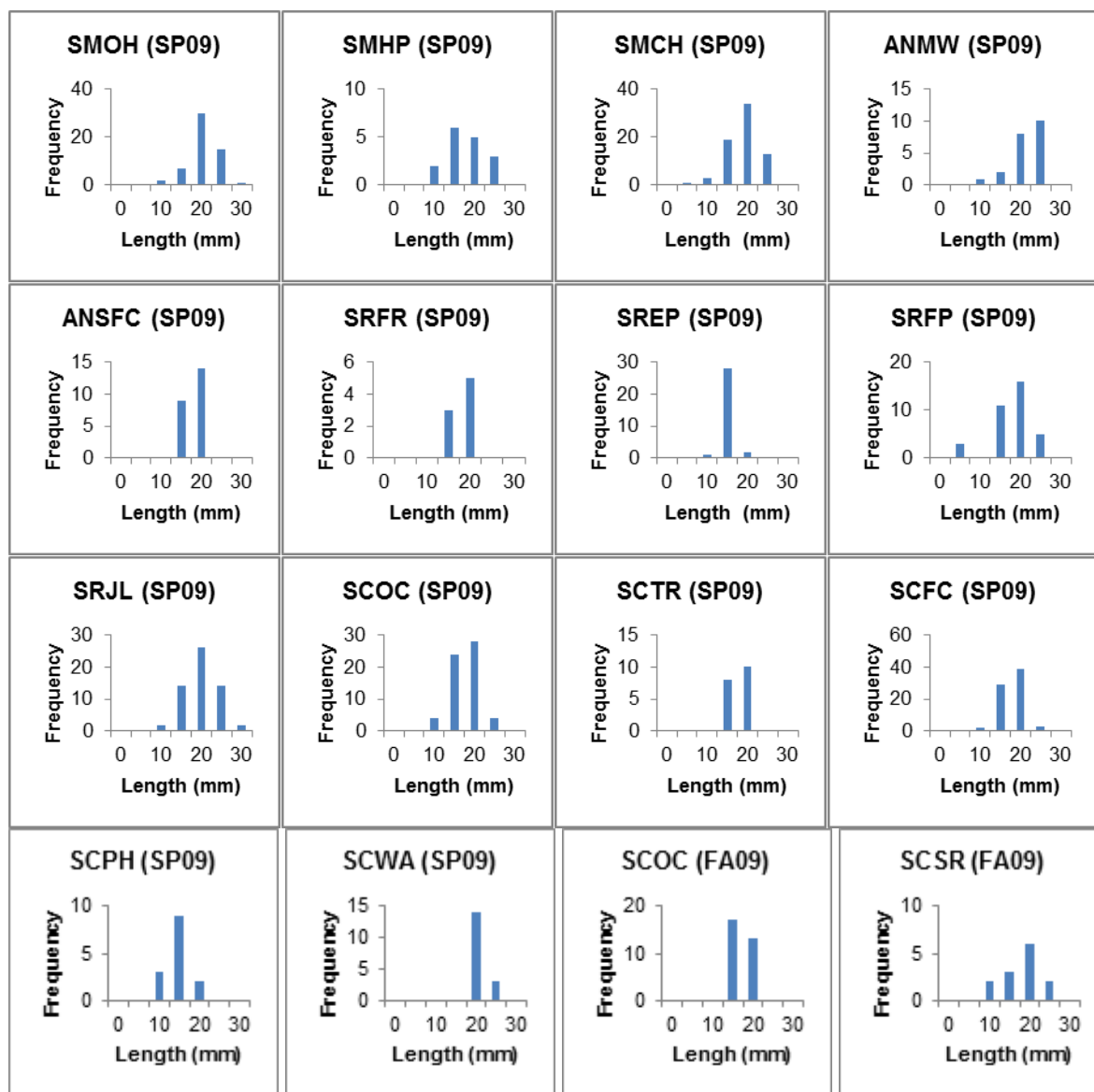


Figure D-3. *Nucella emarginata/ostrina* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Nucella*.

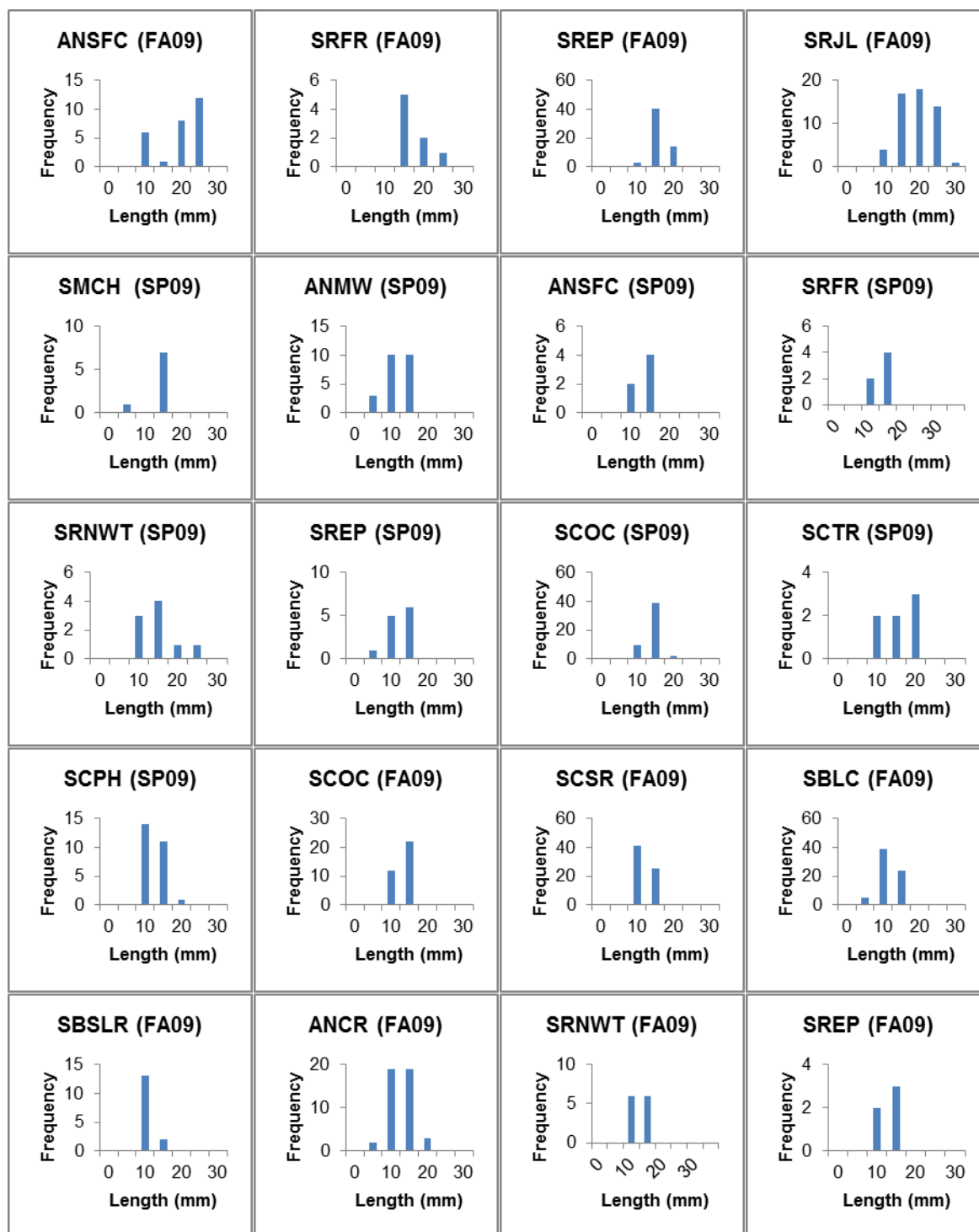


Figure D-4. *Ocenebra circumtexta* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Ocenebra*.

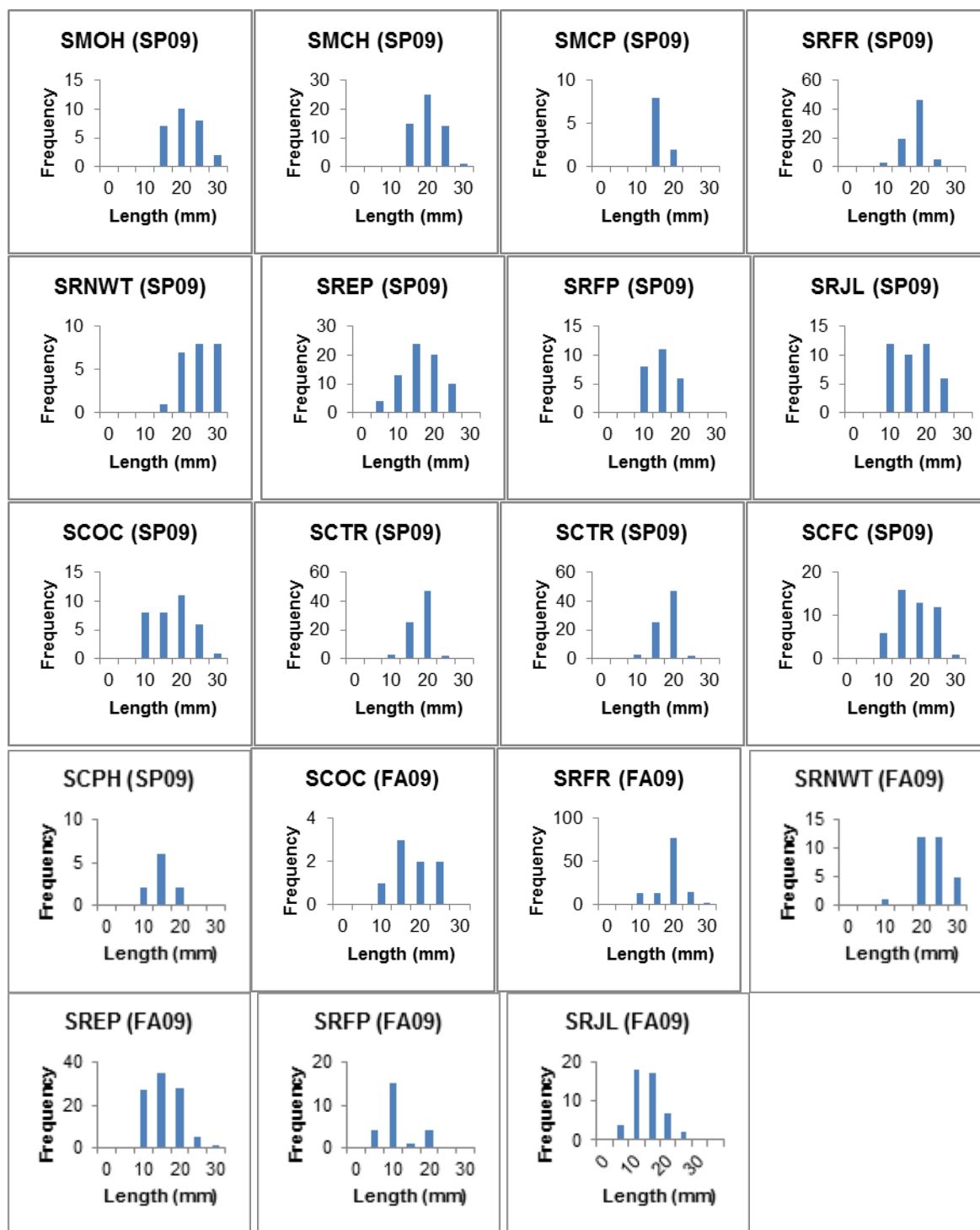


Figure D-5. *Chlorostoma funebris* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *C. funebris*.