



Rocky Intertidal Community Monitoring at Channel Islands National Park

2010 Annual Report

Natural Resource Data Series NPS/CHIS/NRDS—2012/371



ON THE COVER

Access to the rocky intertidal zone at Fossil Reef, Santa Rosa Island. Actual site is located further to the left (when facing the ocean) out of the picture. Black abalone shells in foreground are from historic Chinese fishing camp.

Photograph by Jacob Elliott

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Executive Summary

Channel Islands National Park includes the five northern islands off the coast of southern California and the surrounding waters out one nautical mile. There is approximately 176 miles of coastline around the islands; about 80% of which is composed of rock. The diversity 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. Site selection considered visitation, accessibility, presence of representative organisms, wildlife disturbance, and safety. This report summarizes the 2010 sampling year efforts (from March 2010 to December 2010) and findings of the Channel Islands National Park (CINP) Rocky Intertidal Monitoring Program.

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 were met by monitoring percent cover of core species in target intertidal zones using photo-plots and transects, monitoring species composition and abundance of motile invertebrates using photo-plots, and measuring size frequency and abundance of black abalone, owl limpets, and sea stars using fixed plots or timed searches.

Thirteen key species or assemblages have been monitored twice per year at 21 sites on the five park islands (Figure 1) as part of the Rocky Intertidal Monitoring Program. Fixed photo-plots 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 were used to determine the percent cover of surfgrass (*Phyllospadix* spp.). Information about size distribution (i.e. “size-frequency” data) was collected for owl limpets (*Lottia gigantea*) in circular plots. Size distribution and relative abundance of black abalone (*Haliotis cracherodii*) and ochre sea stars (*Pisaster ochraceus*) were determined using timed searches. The maximum number of shorebirds and pinnipeds seen at one time were counted at each site. The number of concession boat visitors to the Anacapa tidepools was collected and reported.

The majority of study sites were sampled in both spring and fall except the two sites at Santa Barbara Island which were monitored only in fall to avoid disturbing nesting California brown pelicans and the five sites at Santa Rosa Island because of logistical difficulties. Weather conditions were satisfactory during most monitoring sessions, but high wind coupled with strong swell and surge limited some of the abalone and sea star searches.

Most key species or assemblages targeted in the photo-plots were highly variable among sites but remained fairly comparable between sampling seasons in 2010. Mussels, *Mytilus californianus*, and both rockweeds, *Silvetia compressa* and *Hesperophycus californicus*, occurred in low abundances again this year compared to combined averages for previous years. All three species have decreased markedly during the last several years at most sites. Barnacle, *Chthamalus/Balanus* spp., abundances in both spring and fall were comparable to long term

averages at approximately half the sites sampled. *Endocladia muricata* cover declined more than one standard error at approximately one-quarter of sites, but increased at nearly half the sites during both monitoring seasons compared to long term means.

Motile invertebrate densities within sites often vary substantially from year to year. In 2010, taxa commonly associated with barnacle and *Endocladia* plots (*Littorina* spp. and small [< 5 mm] and medium-sized [5-15 mm] limpets) reached all-time high abundances at many sites. The same organisms also reached record-high densities within the *Silvetia* plots at several sites. Record-low abundances only occurred for *Littorina* spp. and small-sized limpets at one site. *Silvetia* plots at three sites also had the lowest recorded numbers of *Lepidochitona* spp. this year. *Mytilus* plots supported more *Nuttallina* spp. than previous years at two sites, and had the lowest recorded abundances of both *Nuttallina* spp. and *Nucella emarginata* at two and three sites, respectively.

Black abalone, *Haliotis cracherodii*, abundances at the islands are still less than one percent of 1985 population levels. Only one individual was seen in a plot during both monitoring seasons. Zero abalone were found at Cuyler Harbor, Fraser Cove, Sea Lion Rookery and South Frenchy's Cove. Three sites supported greater than 30 black abalone. With few exceptions, counts at all sites were consistent with the range of counts seen in recent years. Anacapa and Santa Cruz Island size frequencies for black abalone indicate the effects of recruitment in recent years since the populations are skewed towards smaller (< 50 mm) animals. The opposite is true at San Miguel Island where we continue to find very few juvenile abalone; instead, the population is dominated by older individuals.

Ochre sea stars, *Pisaster ochraceus*, were moderately-abundant in 2010 at most sites around the islands. More than 500 *P. ochraceus* were counted during 30-minute searches at three sites in fall (note that the five sites at Santa Rosa Island were not monitored in 2010), and more than 100 sea stars were counted at two-thirds of all sites monitored during one or both seasons. *P. ochraceus* populations at most sites followed normal size frequency distributions with modes typically between 80 mm and 100 mm. Exceptions were at Fraser Cove, Harris Point, Prisoners Harbor, and Sealion Rookery where the majority of seastars were larger (110-130 mm) during one or both sampling seasons. Additionally, the Willows Anchorage population was oddly distributed during both seasons whereby two modes occurred in spring (one at 40 mm and another larger mode at 80 mm) and a high degree of positive skew appeared in fall.

Giant owl limpet, *Lottia gigantea*, densities varied minimally, if at all in 2010, from past years according to five-sample moving trends. In contrast, the mean sizes of *L. gigantea* in 2010 varied spatially among sites and islands and temporally within most sites. The smallest limpets were measured at Willows Anchorage and Otter Harbor; Trailer had the largest individuals.

Surfgrasses, *Phyllospadix* spp., are typically monitored at two sites each on Santa Cruz and Santa Rosa Islands. This year only Fraser Cove and Trailer on Santa Cruz were sampled. Five-sample trends indicate that *Phyllospadix* spp. cover on the three transects at Fraser has been increasing during the last two years. At Trailer, five-sample trends indicate that abundances on Transects-1 and-3 have been slowly decreasing since spring 2008 and spring 2010, respectively. Both transects reached their all-time lowest recorded abundances for surfgrass in spring 2010. Surfgrass cover on Transect-2 at Trailer has remained relatively stable during the past couple years.

Black oystercatchers were the most ubiquitous shorebird seen at all sites; seasonal abundances were relatively comparable to those observed in recent years. American oystercatchers were present at three sites, and black turnstones were observed at seven sites throughout 2010. Other notable observations include 25 western gulls counted at Otter Harbor in spring and 20 cormorants seen at Crook Point in fall.

Harbor seals, *Phoca vitulina*, were seen at six sites in 2010. As in past years, *P. vitulina* were most abundant at Otter Harbor in fall. Elephant seals, *Mirounga angustirostris*, were seen at four sites during the year. California sea lions, *Zalophus californianus*, were observed at Sea Lion Rookery, Santa Barbara Island and Forney Cove (considered part of the monitoring site, Fraser Cove), Santa Cruz Island. Approximate numbers of sea lions at the two sites ranged 200-500. Additionally, two sea lions were seen nearby Scorpion Rock in spring.

Visitation to all but two intertidal sites, South Frenchy's Cove on Anacapa and Prisoner's Harbor at Santa Cruz, is low or nonexistent. However, Frenchy's Cove particularly receives moderate usage due to its close proximity to the mainland and relative ease of access. In 2010, Island Packers Company conducted 24 trips to Frenchy's Cove to allow visitors access to the tidepools. Total visitation was 1,704 passengers. Most visitation (67%) occurred during February through April with March being the busiest month (527 visitors).

Acknowledgments

The National Park Service, Channel Islands National Park (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 (two days in spring and five in fall) was provided by CINMS. Temperature loggers and temperature data management were provided by the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) Marine Science Institute, University of California, Santa Barbara (UCSB).

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 2010 we received funding from the National Marine Fisheries Service Endangered Species Program to hire a biological technician (Jacob Elliott) and conduct additional sampling for black abalone. Jacob’s assistance in the field along with digital file management and GIS map work was greatly appreciated.

Special thanks to the Channel Islands National Marine Sanctuary (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.

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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, un-sampled 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 2010 sampling year efforts (from March 2010 to December 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 throughout 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.

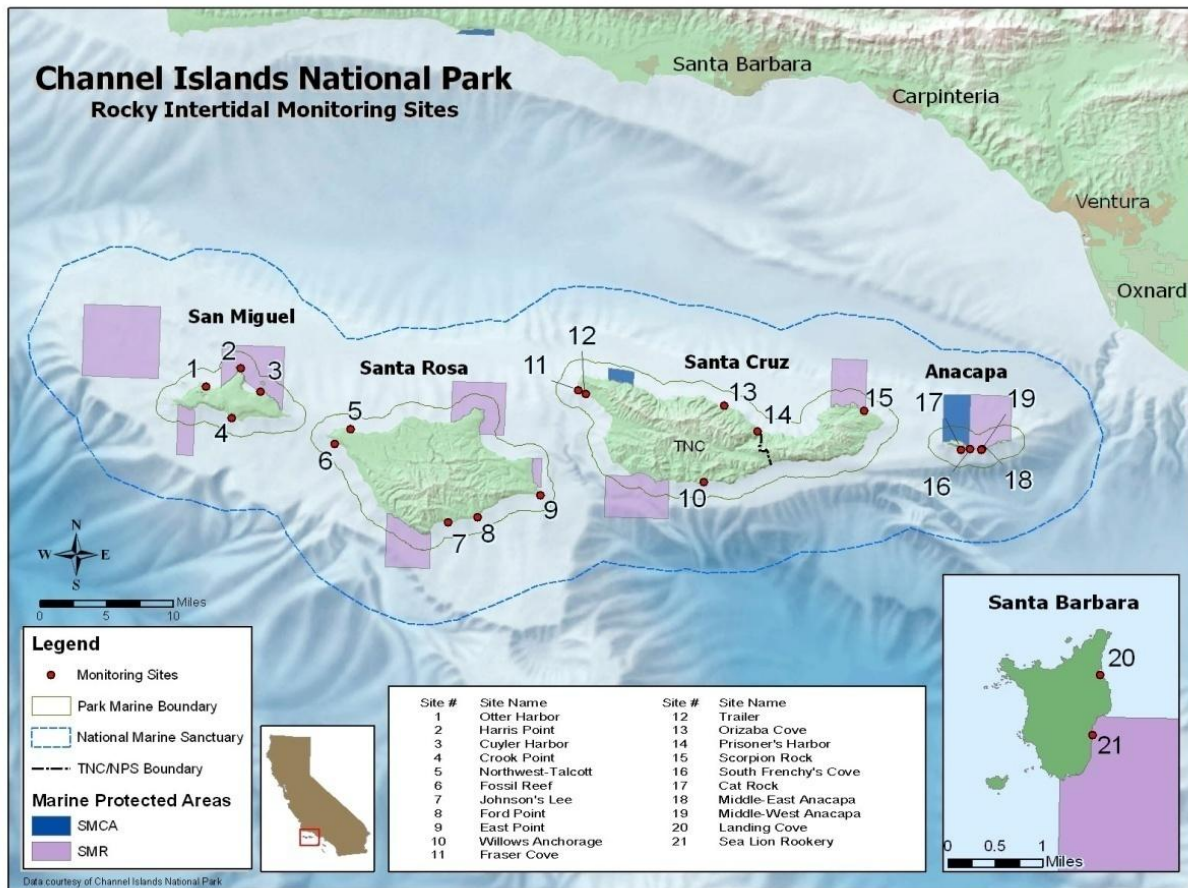


Figure 1. Rocky Intertidal Community Monitoring Site Locations in Channel Islands National Park. Note: TNC= The Nature Conservancy, SMCA= State Marine Conservation Area, SMR= State Marine Reserve, Sites 18 and 19 are on adjacent reefs.

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 2010, monitoring occurred at 13 sites in spring (March-May) and 16 sites in fall (October - December 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 2010 program.

Data are maintained in Microsoft Access databases and Excel files in the Channel Islands National Park network and MARINE. The 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 that were 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 2011 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 2010.

(Target species are shown in bold.)	Photo plots	Surfgrass Transects	Circular Plots	Abalone/ Sea star	Motile Inverts
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 capillacea</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 (continued). 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 2010.

(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>Nuttallina</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 2010, all photoplots were photographed with a digital camera (Olympus Camedia Z-5050). The percent cover of core organisms was determined using the MARINe protocol (Engle 2008). In the field, a grid (50 x 75 cm) of one hundred evenly-spaced points (10 x 10) was laid over the plot (Figure 2). In rare cases when conditions were unfavorable or insufficient time was available, plots were scored in the office from digital images whereby 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 100% reviewed for errors.



Figure 2. Stephen Whitaker scoring photoplots at Crook Point, San Miguel Island. Note foot carefully placed on quadrat to protect from wave activity.

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 (time and weather permitting), 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 (2m x ~8m) were used as a rough measure of density within that area. Transects are parallel to the reef through the zone of highest seastar concentration.

Smaller motile invertebrates (Table 1) were counted by carefully searching each photoplot. 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-invertebrates are sampled annually (usually in spring). Note that analysis indicated that motile invertebrates exhibited minimal seasonal differences in abundance.

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 during dark hours. 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 regarding 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 of //ucjeps.berkeley.edu/california seaweeds.html](http://ucjeps.berkeley.edu/california_seaweeds.html). Note that in this report, we have adopted the taxonomy of Carlton (2007) with the genus name change from *Tegula* to *Chlorostoma* for turban snails.

Data Analysis

The purpose of this report is to present data collected in 2010. 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 taxa 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, are not randomly placed, 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 and Discussion

Photoplots

Photoplot data are summarized in Figures 3-5 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 cover averaged across all previous 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). As in most years, the mean percent cover of nearly all targeted species in 2010 was highly variable among sites but remained fairly comparable between spring and fall sampling seasons (Figures 3-5).

Mussel, *Mytilus californianus*, mean percent cover fell more than one standard error below the combined means for previous years at 9 of 13 sites sampled in spring and 12 of 16 sites in fall (Figures 3-4). Mean abundances in 2010 remained comparable to long-term means at 4 of 13 sites in spring and 3 of 16 sites in fall. Only one site, Crook Point, had markedly higher (greater than one standard error) mussel cover in 2010 (measured in fall) compared with the mean value for cumulative past years at that site, and had a positive moving trend averaged over five samples. Five sites (Anacapa Middle East and Middle West, Orizaba Cove, Prisoners Harbor and Scorpion Rock) had zero percent cover of *M. californianus* in the mussel plots, thereby reaching the lowest recorded abundances for each site since monitoring began. Anacapa Middle East and Middle West sites both experienced recruitment events for *M. californianus* in fall increasing mussel cover in the plots to approximately 10 percent.

Rockweed, *Silvetia compressa*, abundances were very low in 2010 compared to previous years. *S. compressa* cover averaged across representative plots at each site was more than one standard error below long-term averages at all sites sampled in spring (11) and fall (14) (Figures 3-4). Nine sites had less than 10% *S. compressa* cover measured in spring, fall or both seasons. South Frenchy's Cove experienced an increase in rockweed cover from 23% mean cover in spring to 48.2% in fall, but was still nearly 30% below the long term average cover for *S. compressa* at the site.

The other rockweed, *Hesperophycus californicus*, declined below long-term means at 4 of 6 sites in spring and 3 of 7 sites in fall (Figures 3-4). Record low quantities (approximately 10%) of *H. californicus* were measured at Scorpion Rock in spring. Above average abundances of *H. californicus* were measured at Harris Point during both seasons and Orizaba Cove in fall. Abundances remained comparable to grand averages at Fraser Cove during both seasons and Willows Anchorage in fall. Five-sample moving trends for all sites except Harris Point were stable but low compared with earlier monitoring years. Harris Point displayed a negative trend following nearly eight years of moderately high abundances of *H. californicus* for the site.

Endocladia muricata declined more than one standard error at 3 sites, remained the same at 3 sites, and increased at 6 of 12 sites in spring compared to long term means calculated for each site (Figures 3-4). During the fall sampling, the same three sites, Anacapa Middle East, Prisoners Harbor and Harris Point, had below average *E. muricata* cover. Compared with spring, more sites (7 of 13) had comparable amounts of *E. muricata* to long term means and fewer sites (3 of 13) measured greater than one standard error above grand averages. Five-sample moving averages indicate negative trends for Harris Point, Prisoners Harbor, Scorpion Rock and Willows

Anchorage. Five sites (Anacapa Middle East and Middle West, Crook Point, Otter Harbor, Sea Lion Rookery) exhibited stable trends and four sites (Cat Rock, Fraser Cove, Otter Harbor, South Frenchy's Cove) displayed slightly positive trends for *E. muricata* in 2010.

Barnacle, *Chthamalus/Balanus* spp., abundances were very similar in spring and fall 2010 (Figures 3-4). Nearly as many sites (approximately 20-30%) declined more than one standard error below grand averages for each site as the number of sites that increased above the long term means. Approximately half the sites sampled in spring (6 of 12) and fall (7 of 15) had comparable percentages of *Chthamalus/Balanus* spp. to long term averages. Mean barnacle abundances (approximately 20%) at South Frenchy's Cove departed further from the grand mean (approximately 40%) than any other site. Five-sample moving averages indicate that five sites (Cat Rock, Cuyler Harbor, Orizaba Cove, South Frenchy's Cove and to a lesser degree, Landing Cove) followed a negative trend in 2010. Six sites (Anacapa Middle East and Middle West, Sea Lion Rookery, Scorpion Rock, Trailer, Crook Point) exhibited stable trends and three sites (Fraser Cove, Harris Point, Prisoners Harbor) displayed positive trends for *Chthamalus/Balanus* spp. in 2010.

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 2010, red algal turf abundance fell markedly below the long-term mean, and was replaced primarily by articulated corallines and *Egregia menziesii* (Figure 5, Appendix B). Conversely, surfgrass cover in the plots increased more than one standard error above the mean of combined previous years.

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 2010 (Figure 5).

Tetraclita rubescens is monitored at three sites (Harris Point, Orizaba Cove, Scorpion Rock) (Figure 5). At Harris Point, *T. rubescens* cover was more than one standard error above the long-term mean in spring and fall. Below average cover was measured at Orizaba Cove in fall. Scorpion Rock showed no change from previous years in spring, but increased markedly in fall.

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 (approximately 10%) in tar cover during both seasons from the long-term mean (50%) (Figure 5).

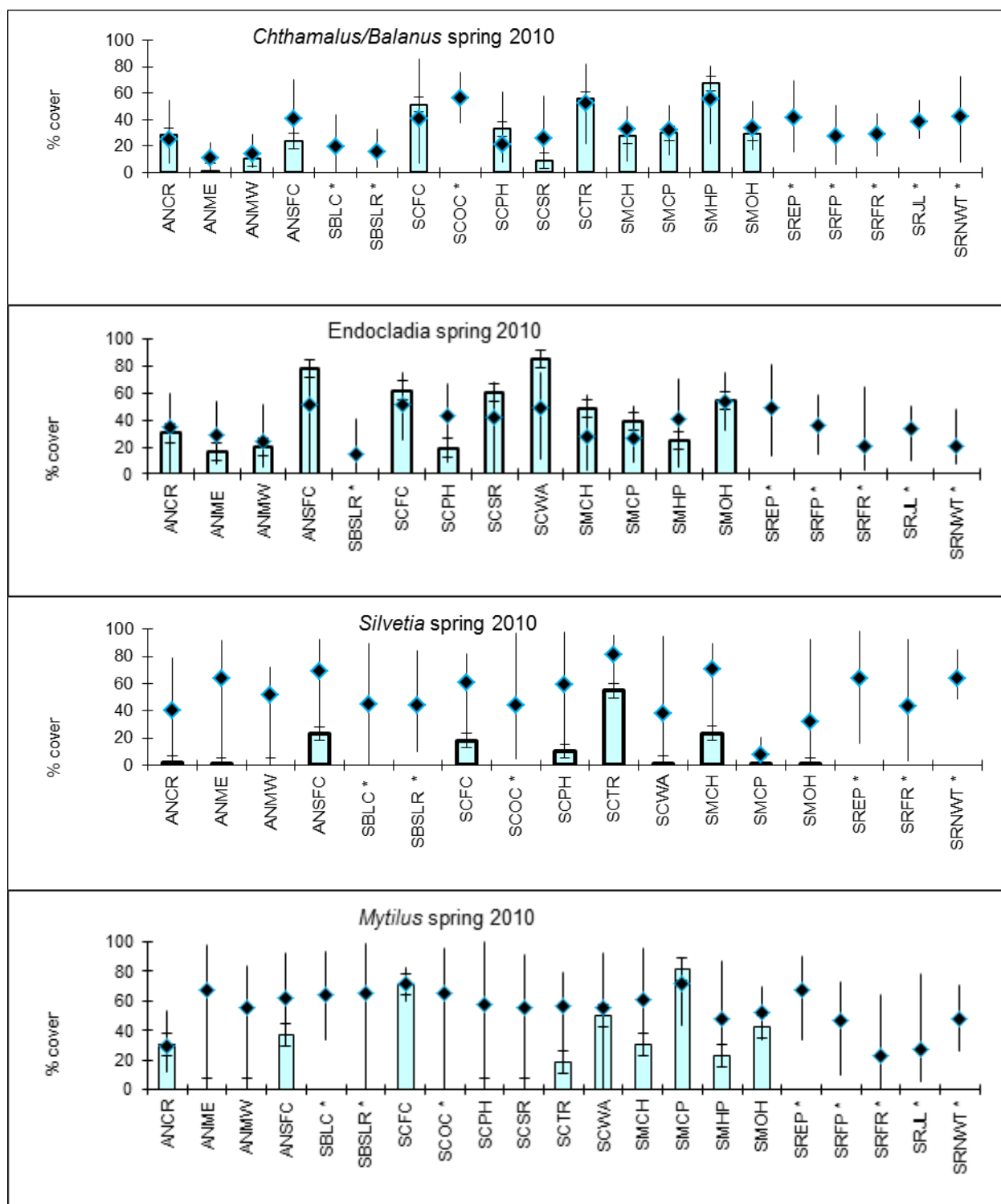


Figure 3. Percent cover of target species (*Chthamalus/Balanus*, *Endocladia muricata*, *Silvetia compressa*, and *Mytilus californianus*) in fixed plots by zone in spring 2010. Bars represent the seasonal mean percent cover from five plots within that zone; error bars represent ± 1 standard error of 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 10 for site codes. (* denotes no sample in 2010).

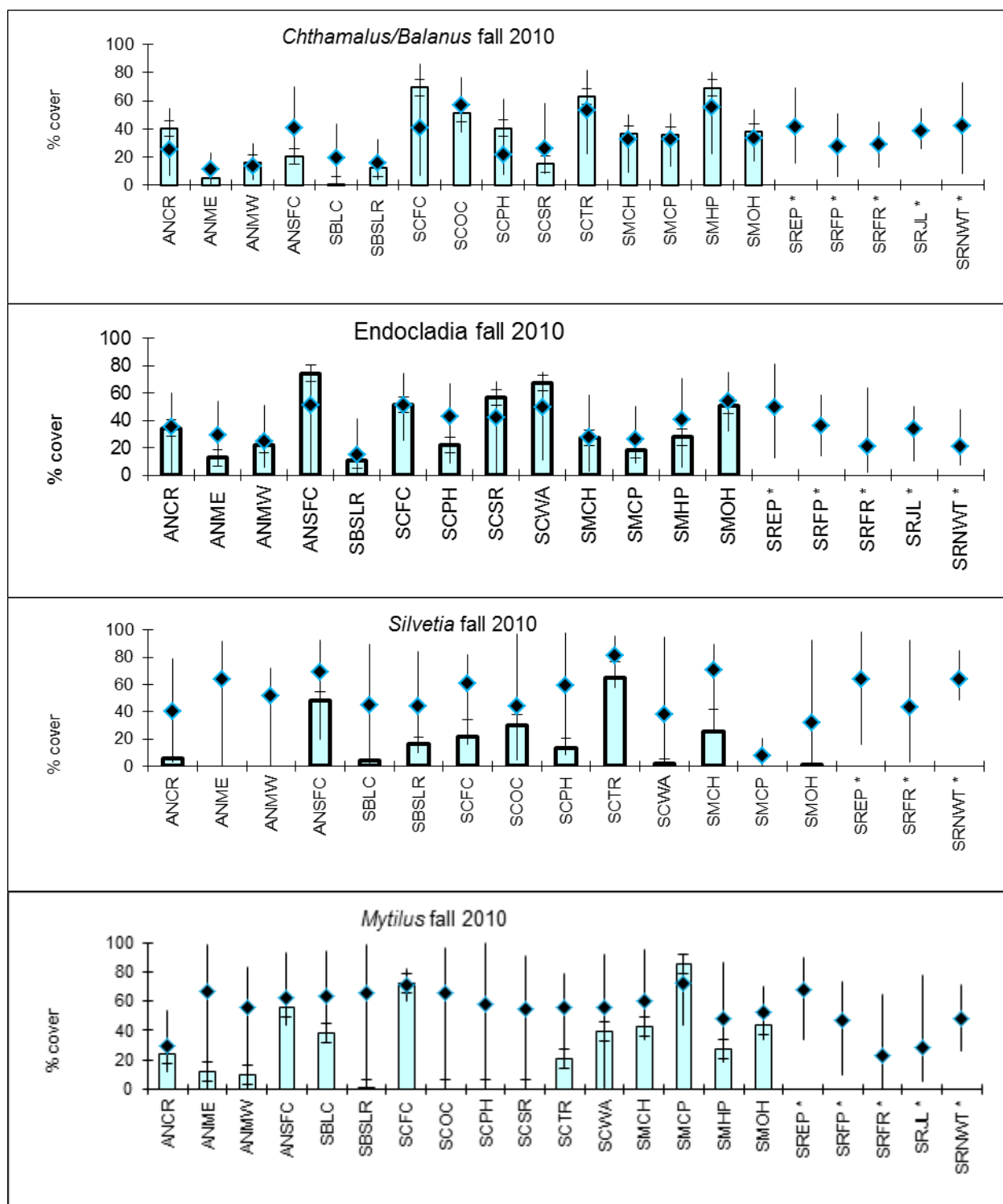


Figure 4. Percent cover of target species (*Chthamalus/Balanus*, *Endocladia muricata*, *Silvetia compressa*, and *Mytilus californianus*) in fixed plots by zone in fall 2010. Bars represent the seasonal mean percent cover from five plots within that zone; error bars represent ± 1 standard error of the 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 10 for site codes. (* denotes no sample in 2010).

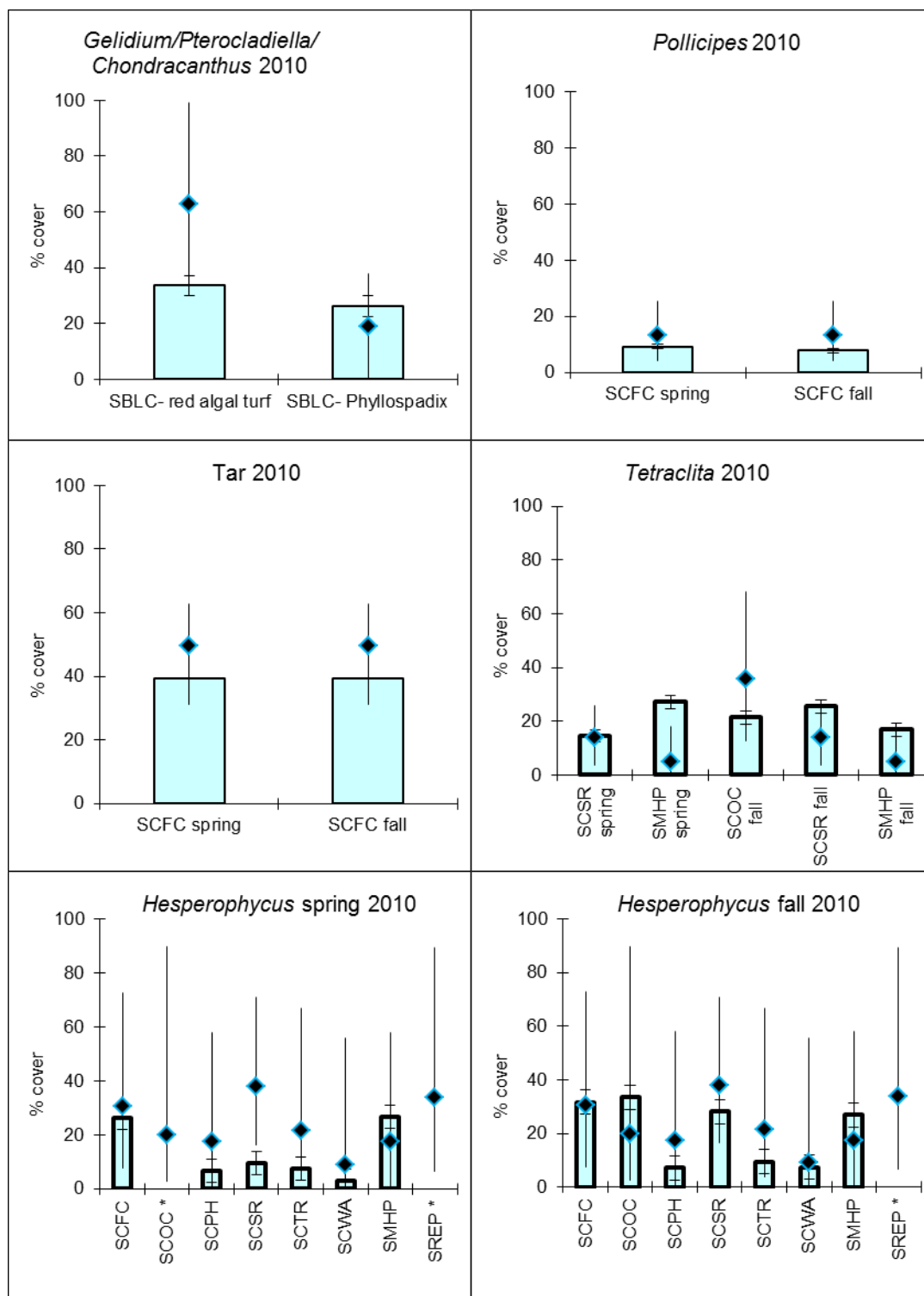


Figure 5. Percent cover of target taxa (Red algal turf, Tar, *Tetraclita rubescens*, *Pollicipes polymerus*, and *Hesperophycus californicus*) in fixed plots by zone in 2010. Bars represent the seasonal mean percent cover from five plots within that zone; error bars represent ± 1 standard error of the 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 10 for site codes. (* denotes no sample in 2010).

Motile Invertebrates

Select motile invertebrate species have been counted, and a subset of species, have been measured within photoplots at nearly all sites (excluding Middle Anacapa East) annually since 2000. Figures 6-9 display abundances for two to four of the most commonly encountered species in the barnacle, *Endocladia*, *Silvetia* and mussel zones at each site. Counts and measurements were also conducted for motile invertebrate species occurring in photoplots established within other zones (e.g. *Tetraclita*, *Pollicipes*, *Hesperophycus*, Tar), but are not presented in this report.

The most common motile invertebrates counted within the barnacle plots are *Littorina* spp. and small (< 5 mm) and medium-sized (5-15 mm) limpets. Counts for each of these groups have fluctuated markedly at most sites over the years. In 2010, abundances for all three groups (particularly medium-sized limpets) reached all-time highs at many sites (Figure 6). *Littorina* spp. were more abundant in 2010 than any previous year at Cat Rock, Fraser Cove, Harris Point and Trailer. The same occurred for small-sized limpets at Cuyler Harbor, Johnson's Lee (measured in 2009), Orizaba Cove and Scorpion Rock and medium-sized limpets at Fraser Cove, Orizaba Cove, Prisoner's Harbor, Scorpion Rock, Sea Lion Rookery and South Frenchy's Cove. Record-low densities only occurred for *Littorina* spp. at East Point and small limpets at Crook Point. Note that both mentioned sites however were not sampled in 2010 and counts reflect abundances from the prior year. Record-low abundances of medium-sized limpets were not seen at any site during the past two years.

Endocladia plots are typically within close spatial proximity to barnacle plots and usually have high numbers of *Littorina* spp. and small (< 5 mm) and medium-sized (5-15 mm) limpets. Record-high abundances of limpets and littorine snails were measured at several sites in 2010 though most were only marginally higher than previous years (Figure 7). *Littorina* spp. were most abundant this year at Harris Point and Scorpion Rock compared to past abundances and small limpets were most common at Cuyler Harbor, East Point, Harris Point, Prisoner's Harbor and Willows Anchorage. Medium-sized limpet densities were greater at six sites (Cat Rock, Crook Point [measured in 2009], Cuyler Harbor, Prisoners Harbor, Scorpion Rock and Sea Lion Rookery) than before. Record-low abundances were not measured for limpets or littorine snails at any site in 2010. However, all the Santa Rosa Island sites along with Crook Point at San Miguel were not sampled for motile invertebrates this year. Record-low abundances occurred in 2009 for *Littorina* spp. at Fossil Reef and Northwest-Talcott and small-sized limpets at Crook Point.

Silvetia plots commonly have high numbers of chitons (*Lepidochitona* spp.), turban snails (*Chlorostoma funebris*), and small- (< 5 mm) and medium-sized (5-15 mm) limpets among other taxa. In 2010, *Lepidochitona* spp. were slightly more abundant than previous years at Landing Cove and decreased to record-low densities at Fraser Cove, Trailer and Willows Anchorage (Figure 8). *C. funebris* was marginally more common at Otter Harbor this year and at Fossil Reef in 2009 (site was not sampled in 2010) than earlier years. In 2010, small-sized limpets were slightly more abundant at Cat Rock, Cuyler Harbor, Landing Cove and Prisoner's Harbor and markedly more common at Orizaba Cove and Willows Anchorage compared to earlier surveys. Record-low abundances for small limpets were seen at Sea Lion Rookery and to a lesser degree at Crook Point (measured in 2009). Vastly more medium-sized limpets were counted this year at Orizaba Cove, Prisoner's Harbor, Sea Lion Rookery and slightly more were seen at South Frenchy's Cove and Landing Cove than previous years.

Mytilus plots can support a diverse assemblage of motile invertebrates, but typically have consistent numbers of chitons (*Nuttallina* spp.) and dogwinkle snails (*Nucella emarginata*). Compared with past seasons, more *Nuttallina* spp. were counted at Cuyler Harbor and Landing Cove (Figure 9). Record-low abundances occurred for *Nuttallina* spp. at Cat Rock, East Point (measured in 2009) and Trailer, and for *N. emarginata* at Anacapa Middle West, Crook Point (measured in 2009), Cuyler Harbor and Trailer.

Size frequencies are presented in Figures 10-13 for select motile invertebrate taxa. Measurements may represent individuals sampled from various zones/assemblages (e.g. mussels, rockweeds, barnacles, etc.).

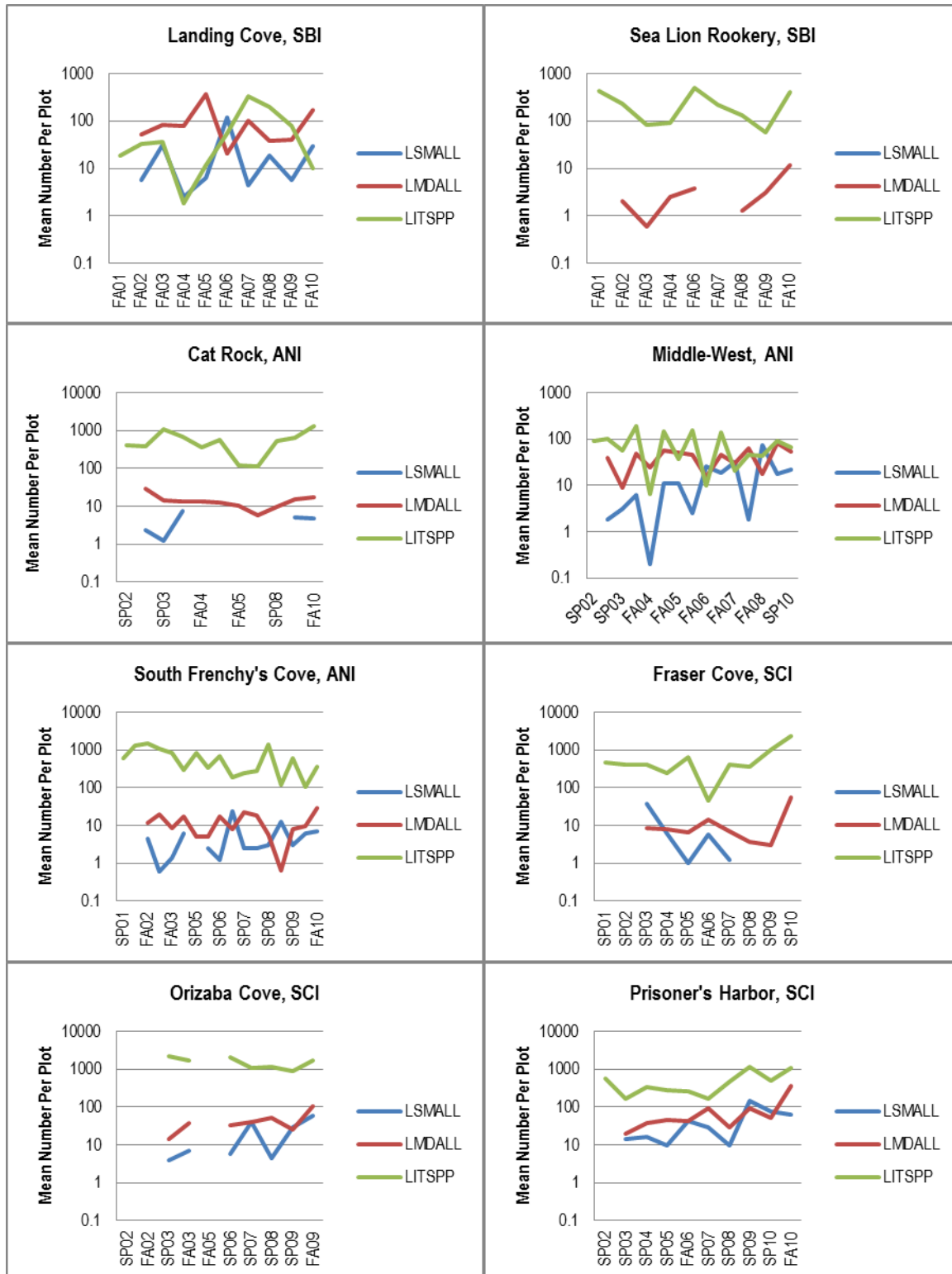


Figure 6. Common motile invertebrates in barnacle plots. Note log scale and variation in scale among plots. (LSMALL= small-sized limpets, LMDALL= medium-sized limpets, LITSPP= *Littorina* spp.).

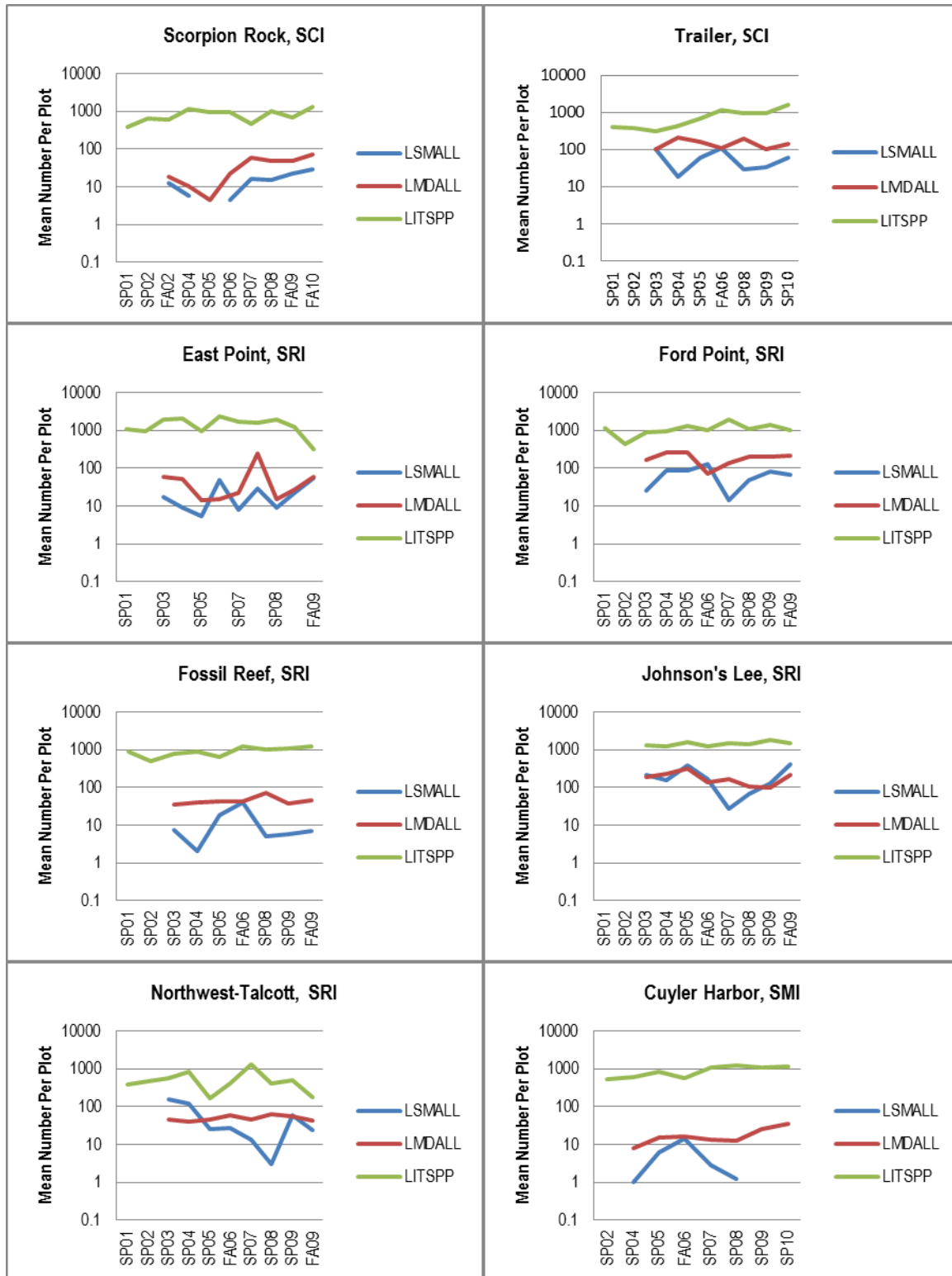


Figure 6 (continued). Common motile invertebrates in barnacle plots. Note log scale and variation in scale among plots. (LSMALL= small-sized limpets, LMDALL= medium-sized limpets, LITSPP= *Littorina* spp.).

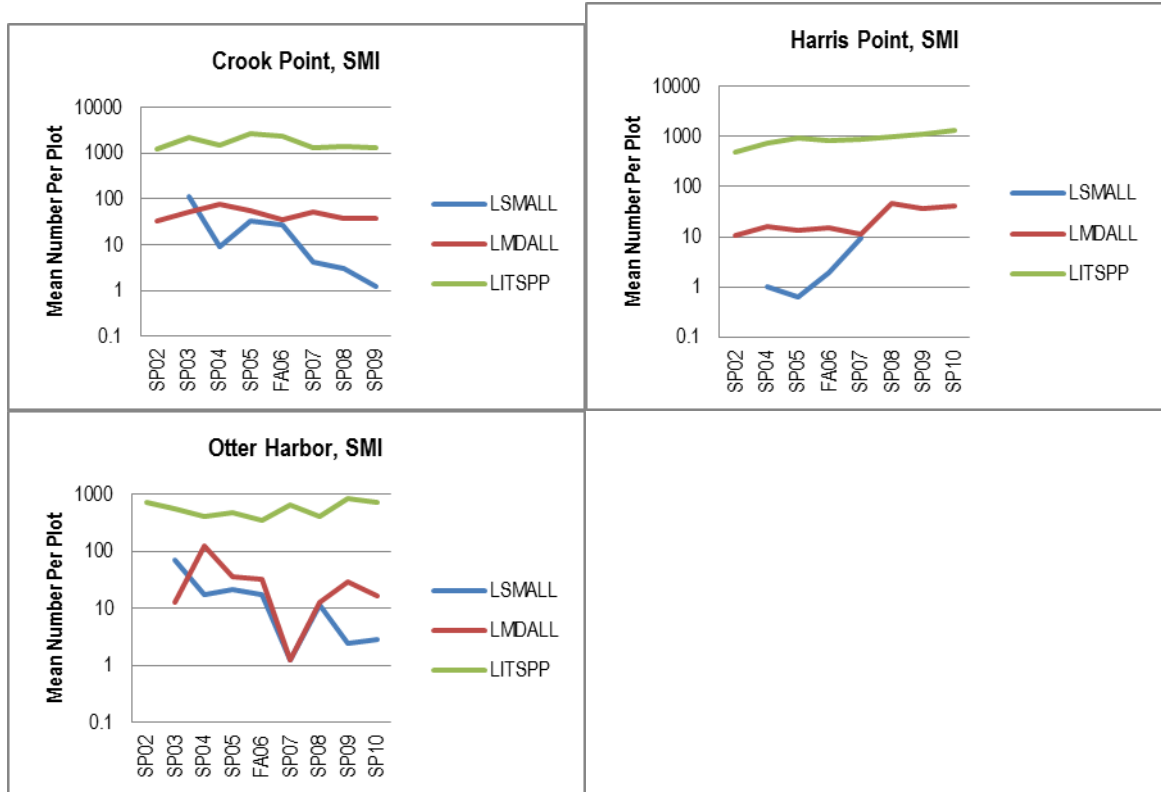


Figure 6 (continued). Common motile invertebrates in barnacle plots. Note log scale and variation in scale among plots. (LSMALL= small-sized limpets, LMDALL= medium-sized limpets, LITSP= *Littorina* spp.).

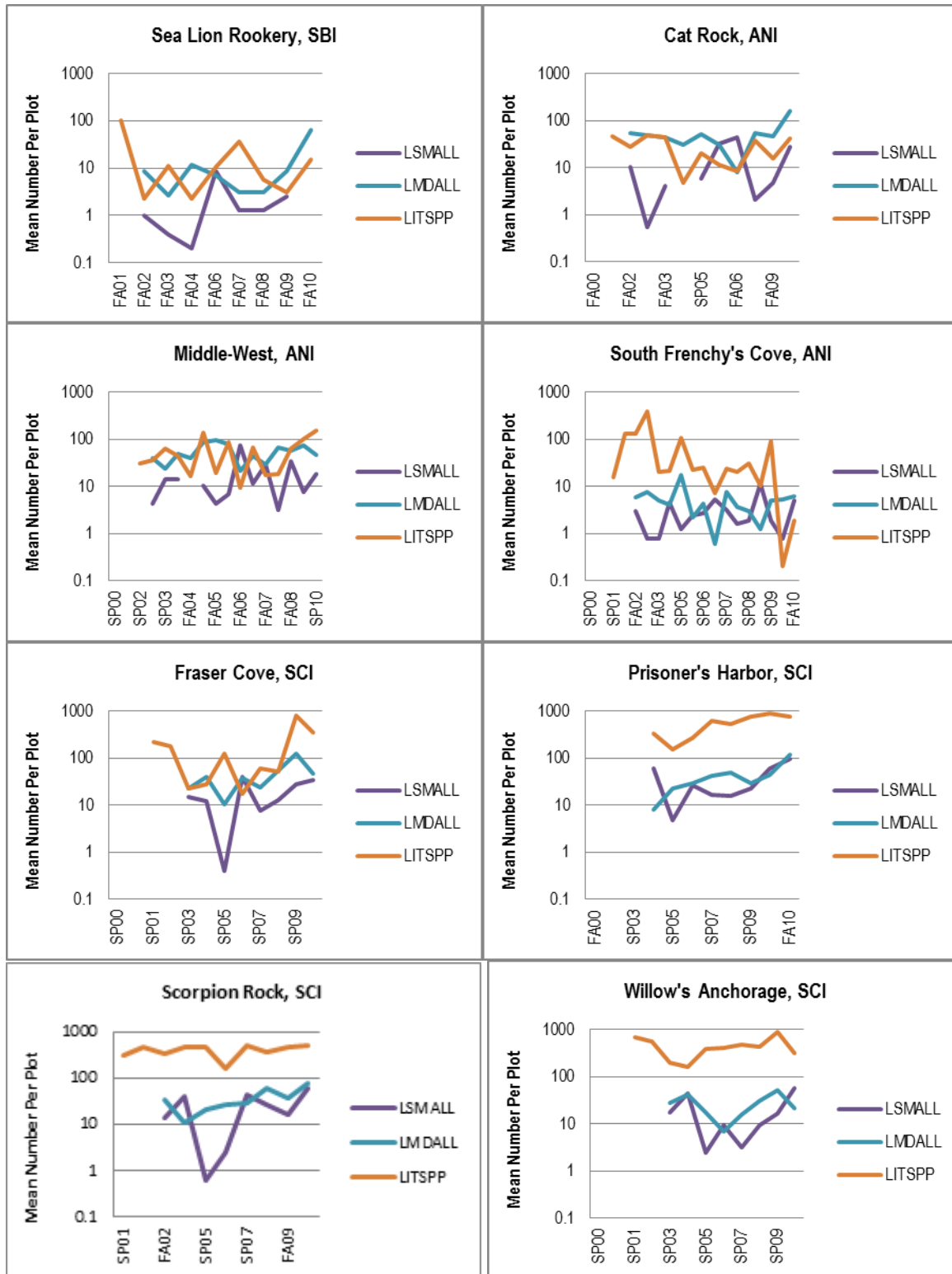


Figure 7. Common motile invertebrates in *Endocladia* plots. Note log scale and variation in scale among plots. (LSMALL= small-sized limpets, LMDALL= medium-sized limpets, LITSPP= *Littorina* spp.).

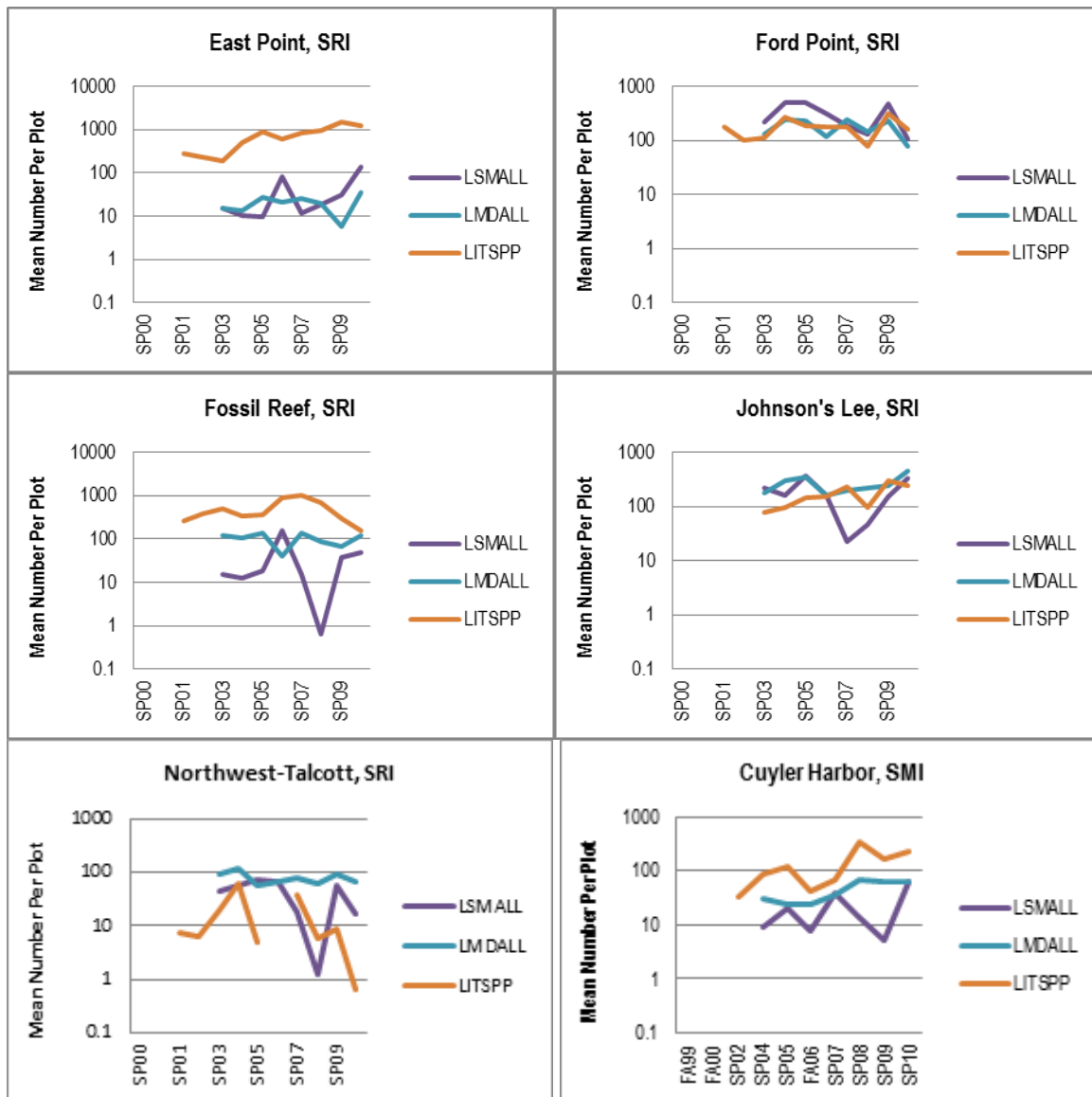


Figure 7 (continued). Common motile invertebrates in *Endocladia* plots. Note log scale and variation in scale among plots. (LSMALL= small-sized limpets, LMDALL= medium-sized limpets, LITSPP= *Littorina* spp.).

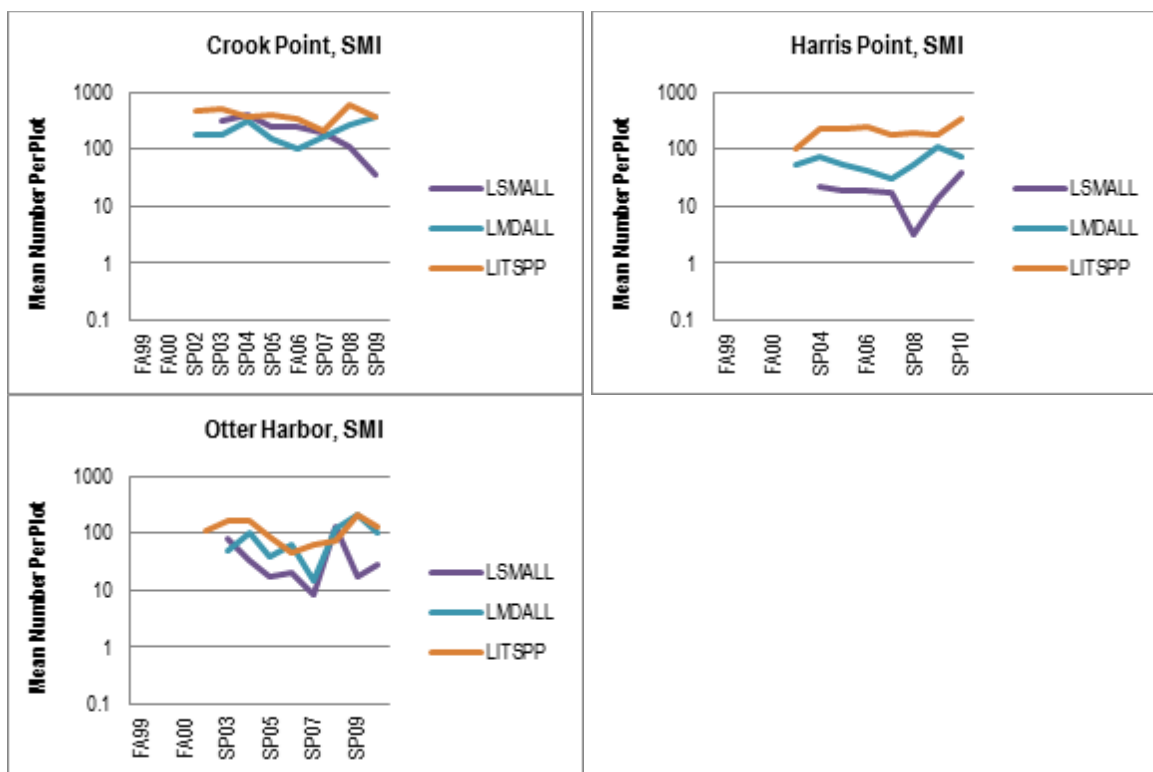


Figure 7 (continued). Common motile invertebrates in *Endocladia* plots. Note log scale and variation in scale among plots. (LSMALL= small-sized limpets, LMDALL= medium-sized limpets, LITSPP= *Littorina* spp.).

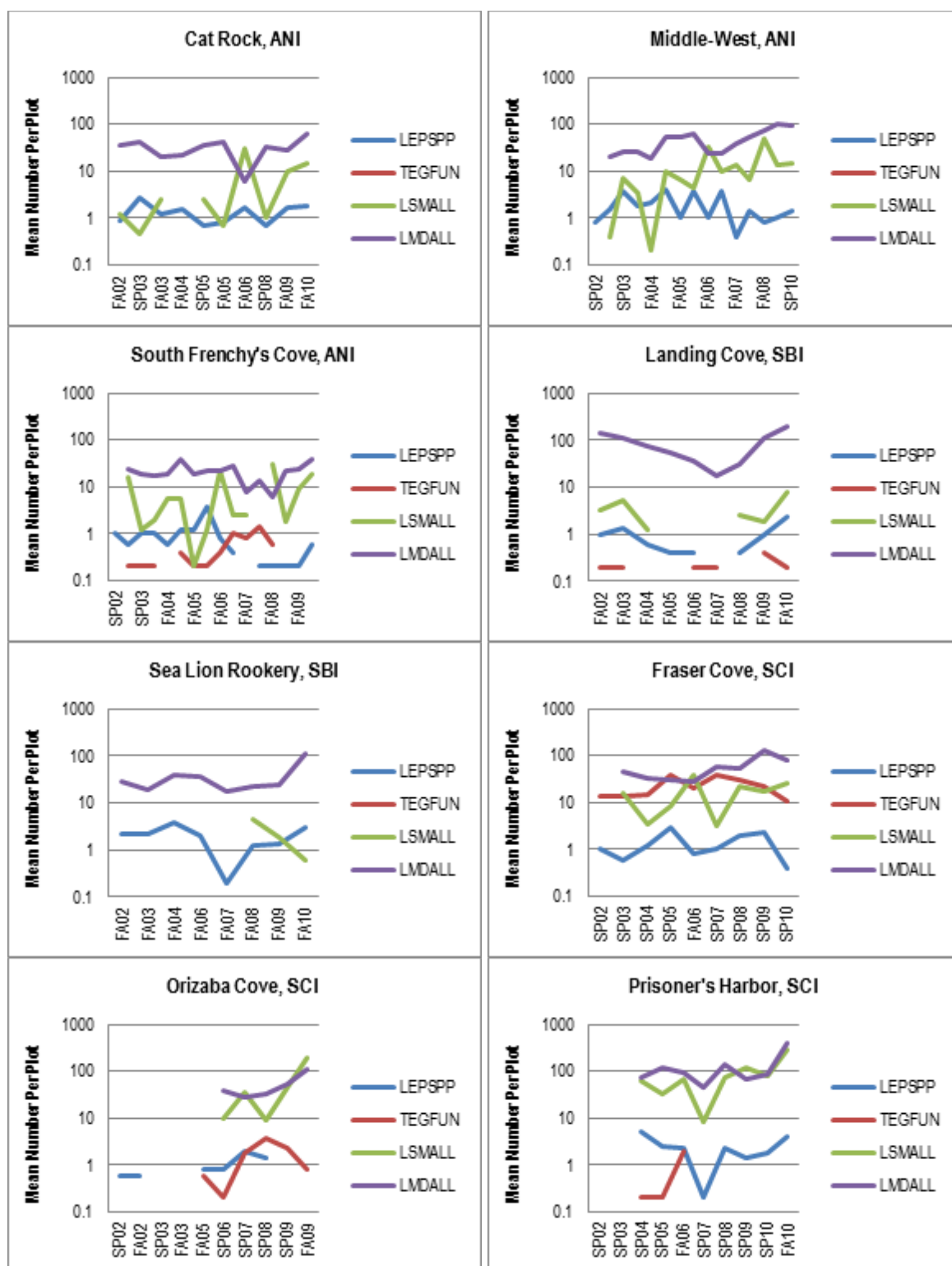


Figure 8. Common motile invertebrates in *Silvetia* plots. Note log scale and variation in scale among plots. (LEPSPP= *Lepidochitona* spp., TEGFUN= *Chlorostoma funebris*, LSMALL= small-sized limpets, LMDALL= medium-sized limpets).

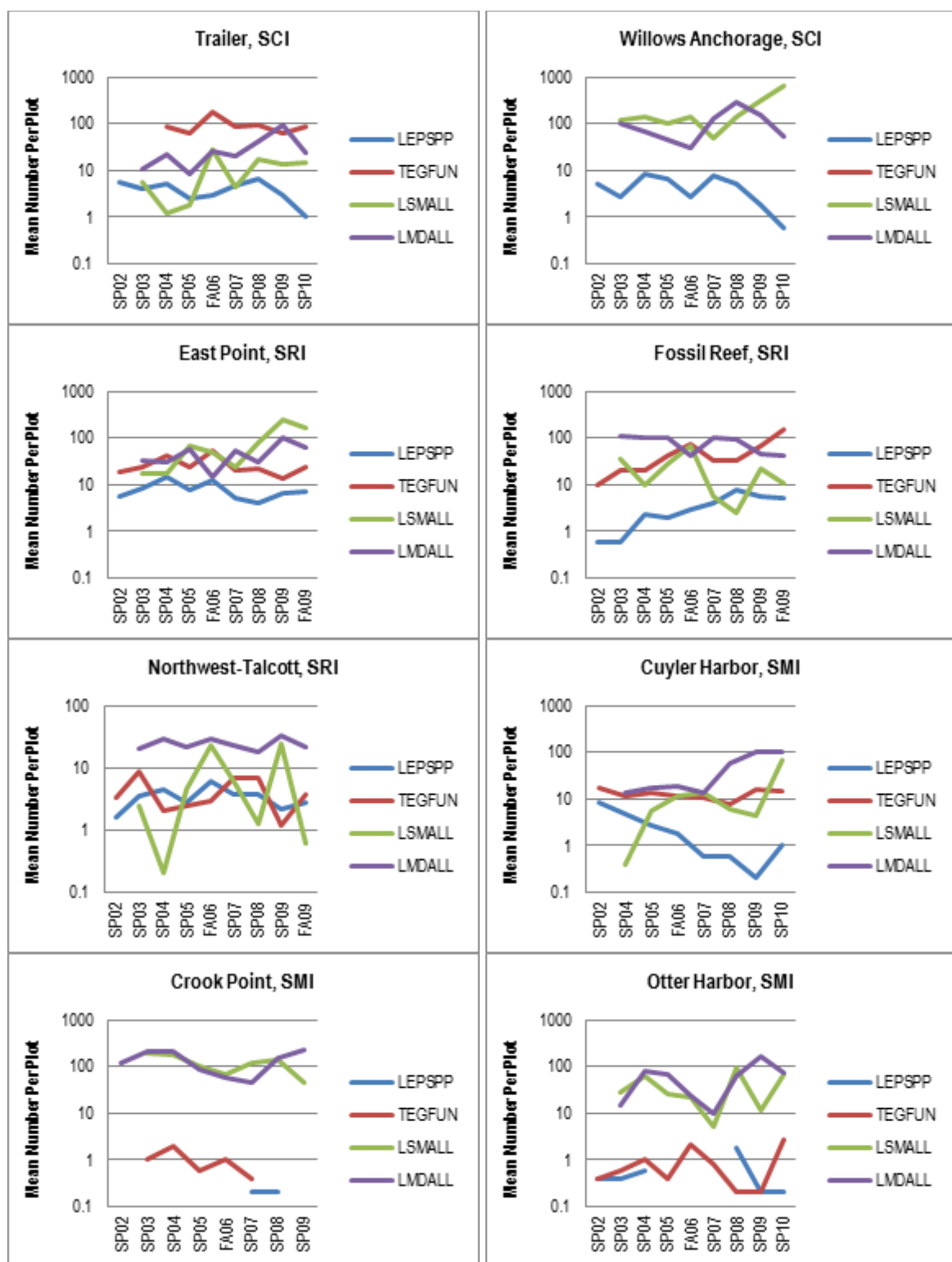


Figure 8 (continued). Common motile invertebrates in *Silvetia* plots. Note log scale and variation in scale among plots. (LEPSPP= *Lepidochitona* spp., TEGFUN= *Chlorostoma funebris*, LSMALL= small-sized limpets, LMDALL= medium-sized limpets).

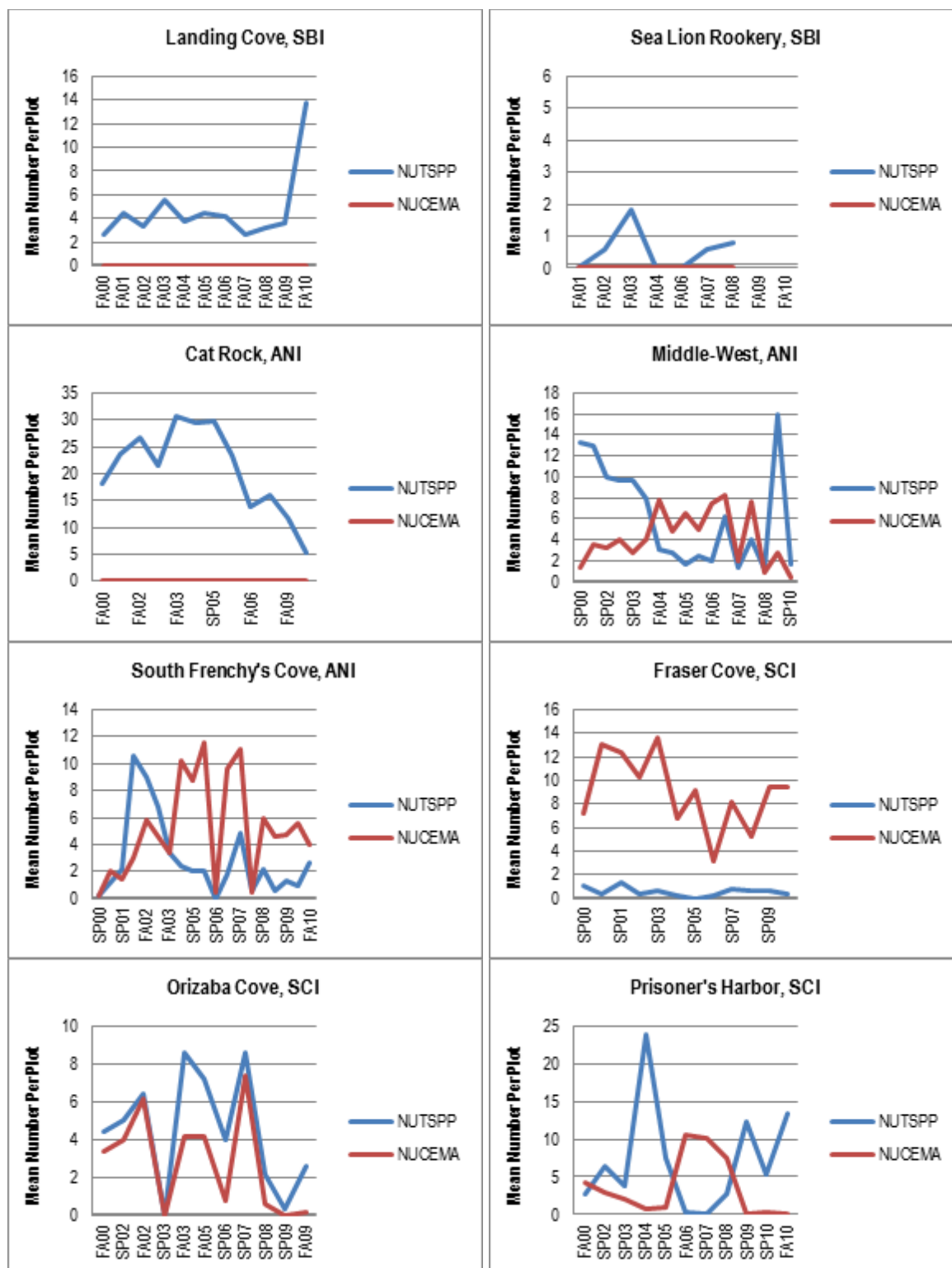


Figure 9. Common motile invertebrates in *Mytilus* plots. Note variation in scale among plots. (NUTSPP= *Nuttallina* spp., NUCEMA= *Nucella emarginata*).

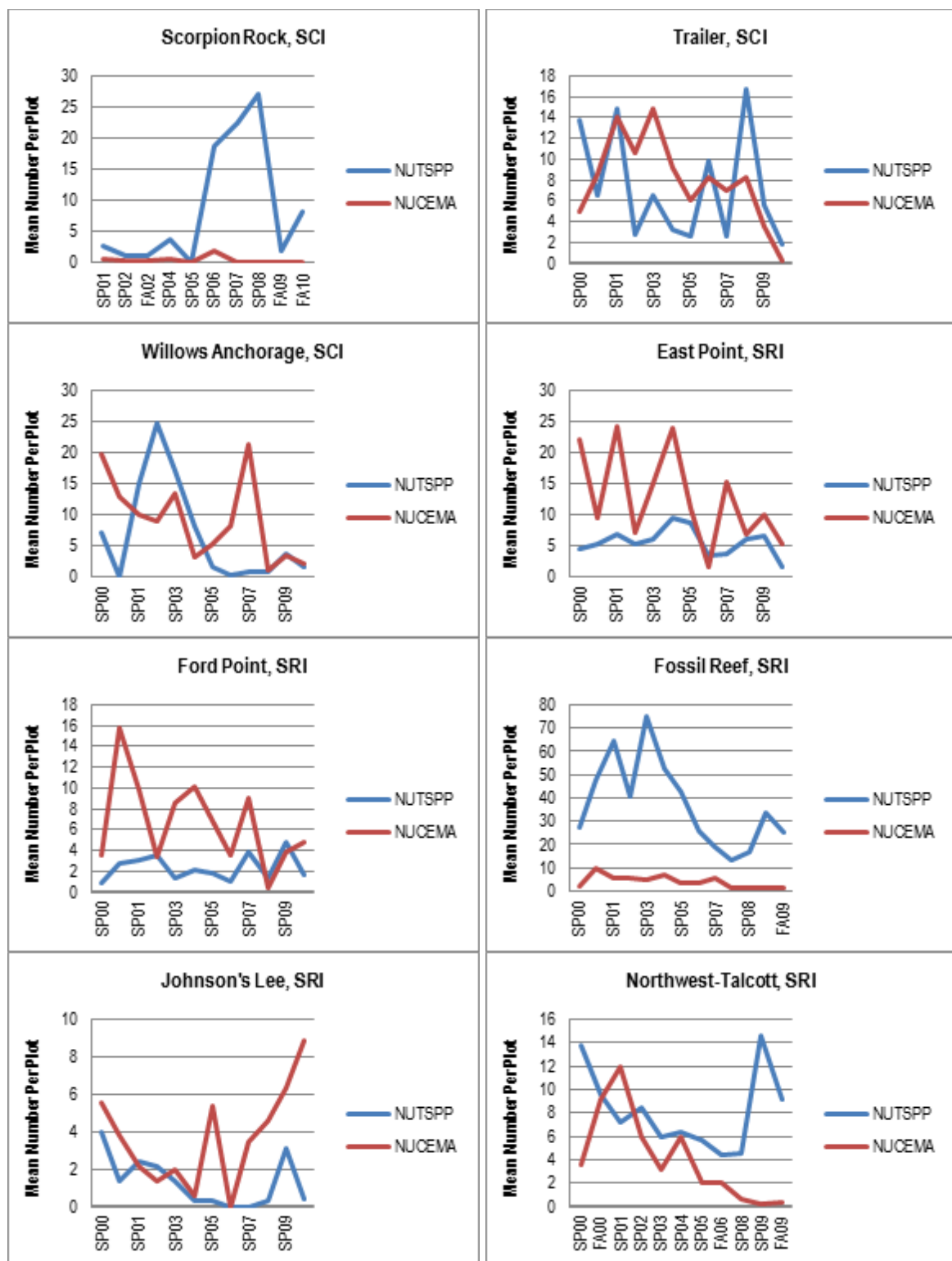


Figure 9 (continued). Common motile invertebrates in *Mytilus* plots. Note variation in scale among plots. (NUTSPP= *Nuttallina* spp., NUCEMA= *Nucella emarginata*).

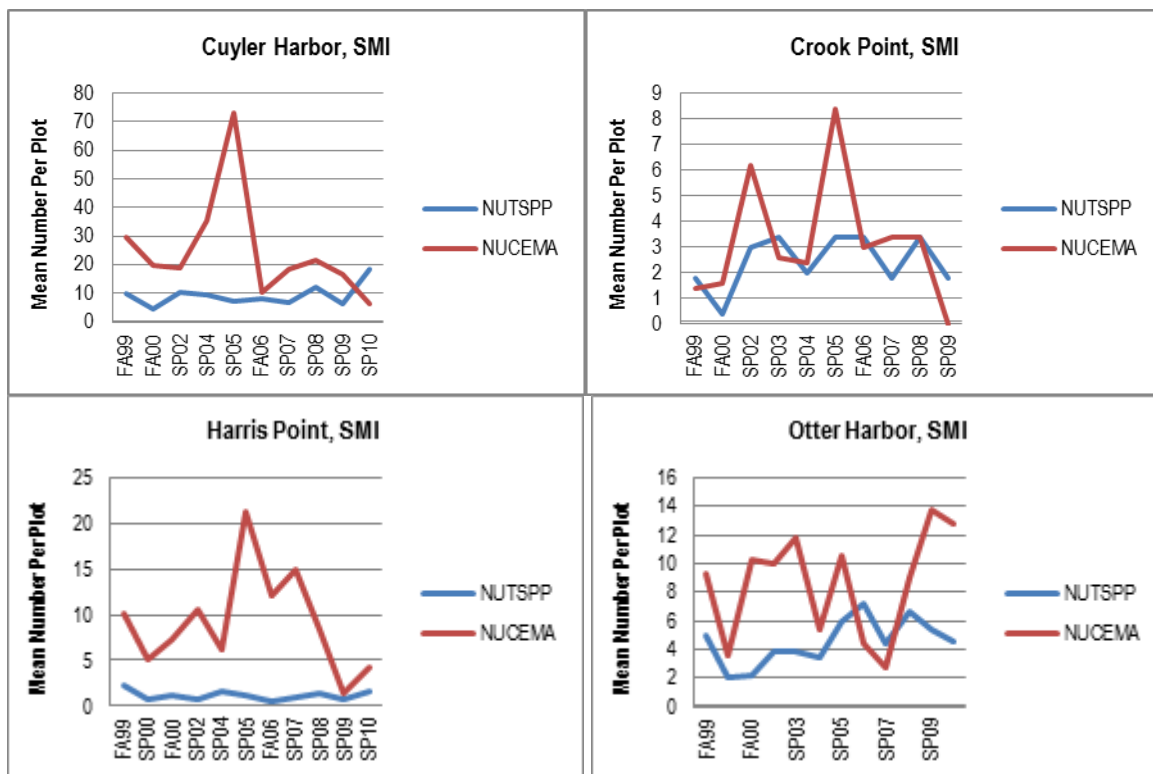


Figure 9 (continued). Common motile invertebrates in *Mytilus* plots. Note variation in scale among plots. (NUTSPP= *Nuttallina* spp., NUCEMA= *Nucella emarginata*).

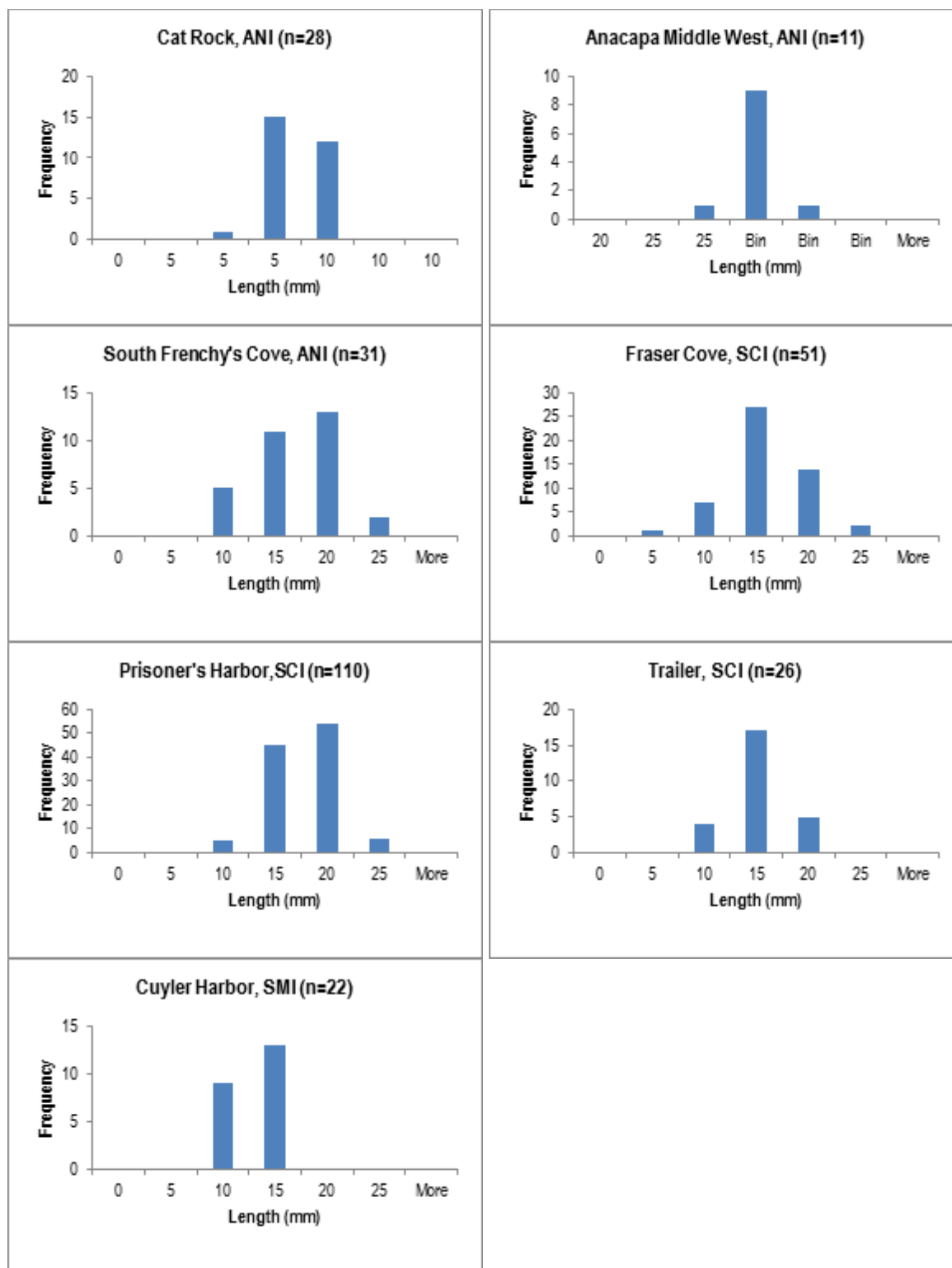


Figure 10. *Acanthina* spp. size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Acanthina*.

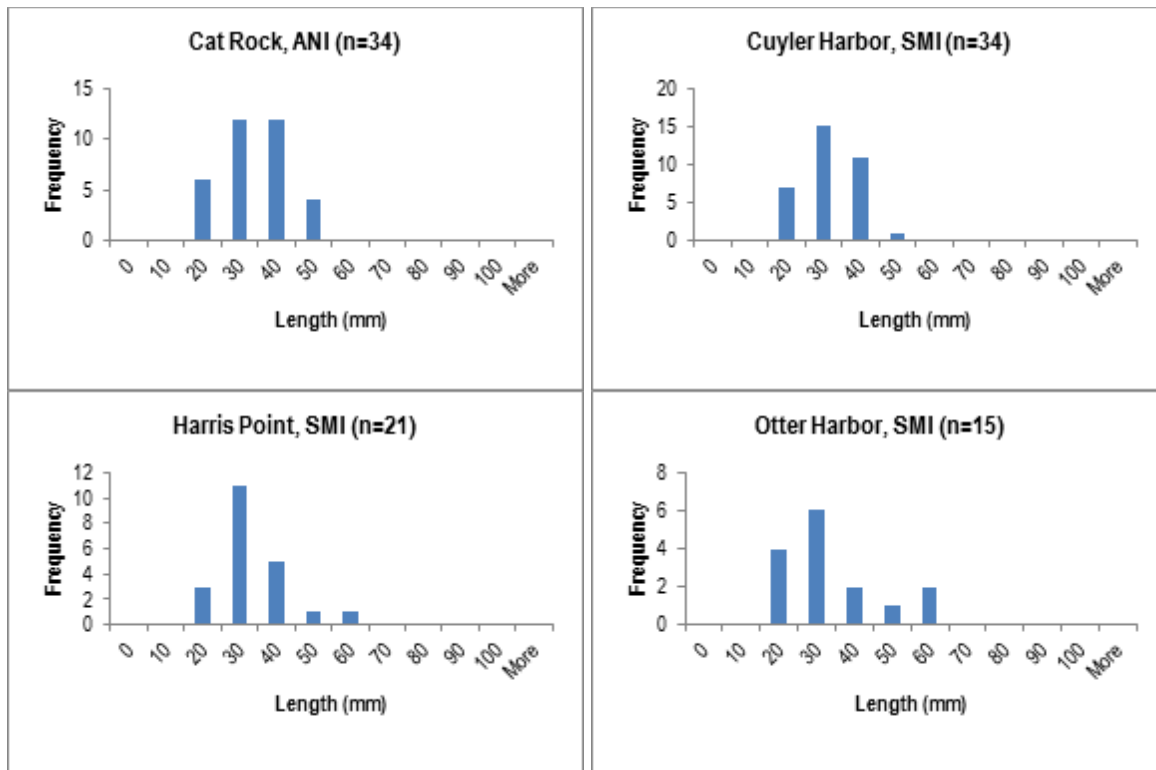


Figure 11. *Lottia gigantea* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Lottia gigantea*.

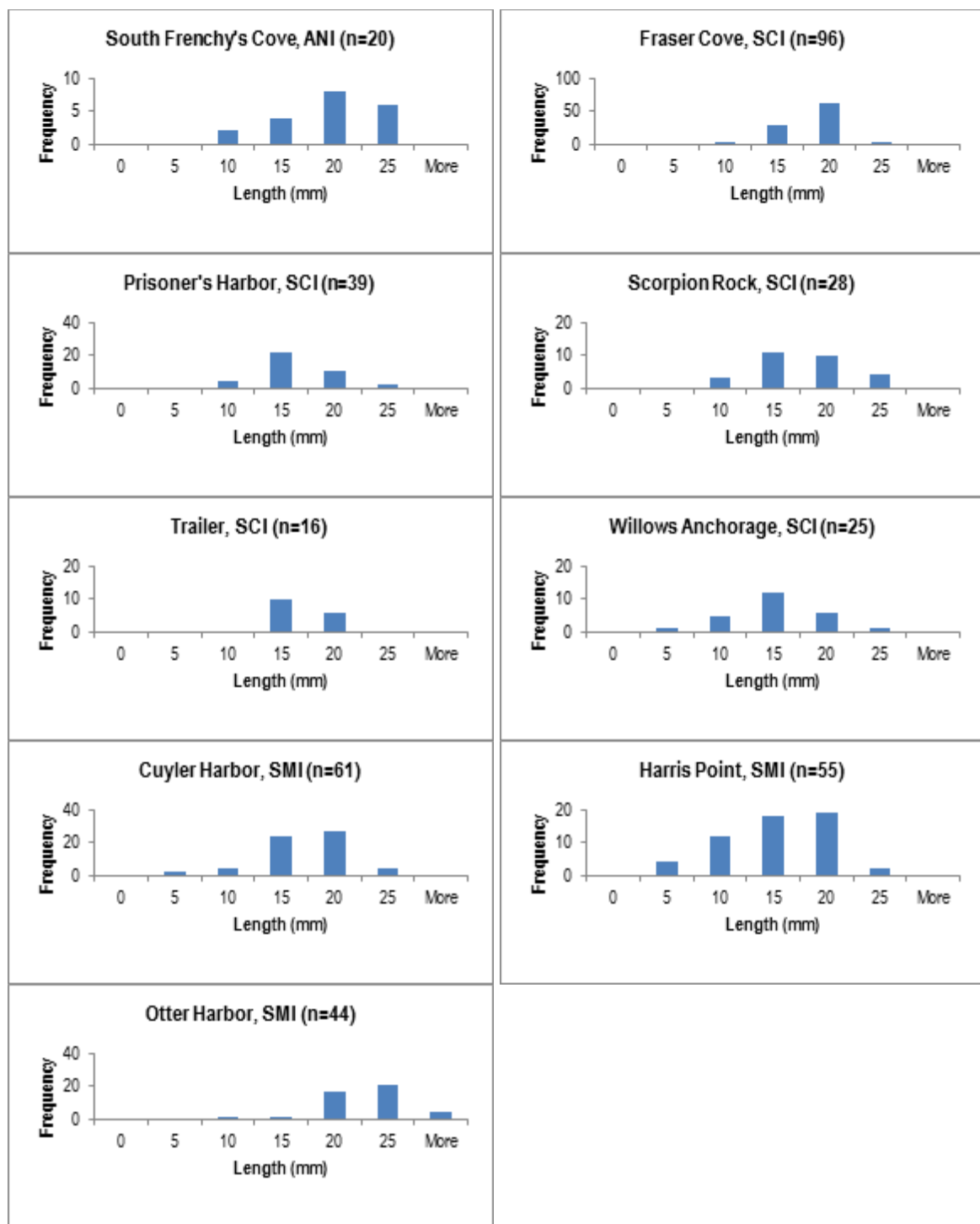


Figure 12. *Nucella emarginata/ostrina* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Nucella*.

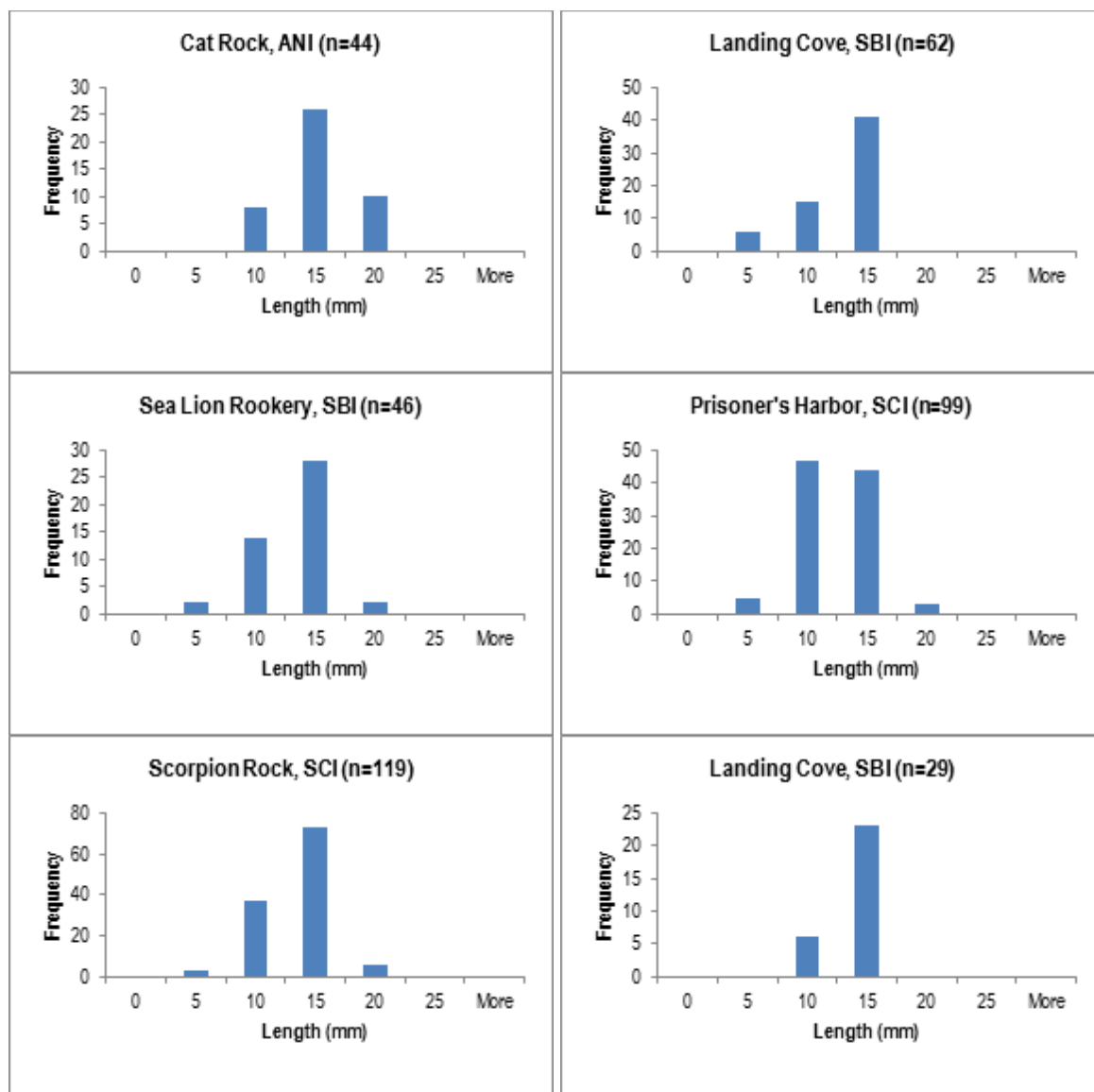


Figure 13. *Ocenebra circumtexta* size distributions in all plots. Figures show proportion of total (note that y-axes vary by graph) and do not reflect overall abundance. Some sites are not shown due to insufficient abundances of *Ocenebra*.

Haliotis cracherodii

Count and size distribution data collected in 2010 for *H. cracherodii* pooled across sites and islands are displayed in Tables 2-3 and Figures 14-19. Extended counts were made at Otter Harbor and Willows Anchorage. The count at Scorpion Rock includes both areas. At Middle Anacapa West we found an additional five abalone after the 30-minute search. Only one *H. cracherodii* was found inside a fixed plot in spring 2010. For reference, density estimates from 1985-1999 and count data pooled for each island from 2000-2010 are provided in Figures 17-18.

Anacapa and Santa Cruz Island size frequencies indicate the effects of recruitment in recent years with the populations skewed towards smaller animals. The opposite is true at San Miguel Island where we continue to find very few juvenile abalone; the population is dominated by older individuals.

During routine monitoring, no abalone were found at Cuyler Harbor, Fraser Cove or South Frenchy's Cove. With few exceptions, counts at all sites were consistent with the range of counts seen in recent years. At Middle Anacapa Island, a total of 23 *H. cracherodii* were seen; an increased number of individuals compared to surveys conducted in 2009, but fewer than the total number of individuals located in 2008. Scorpion Rock experienced an apparent increase in abalone in 2010. In recent years, only one individual has been located in the vicinity of Area A and typically no abalone are observed at Area B, but this year eight *H. cracherodii* were found at Area A and 11 individuals were located in Area B. Rocky intertidal monitoring was not conducted in spring at Santa Barbara Island, Santa Rosa Island or Orizaba Cove on Santa Cruz Island.

We spent two days at Otter Harbor in February (winter season) and three days at Willows Anchorage in June (summer season) focused on black abalone. Site-wide counts of black abalone were conducted and new tags were deployed at both locations. Ledges and crevices were mapped at both sites to facilitate the description of movement patterns of tagged abalone.

At Otter Harbor, 17 *H. cracherodii* were tagged with Passive integrated Transponder (PIT) tags attached to the outer shell with marine epoxy in February (Richards and Whitaker 2012). Two of these new tags were placed on abalone that had been previously tagged but were no longer identifiable. Twenty-three formerly tagged *H. cracherodii* were located, though only 13 animals could be identified by their tags. One shell had remnants of epoxy indicating a lost tag and the other tags could not be read due to malfunction or breakage. We measured 151 *H. cracherodii* but were unable to reach all areas due to the incoming tide. Two empty (and un-tagged) shells were found; one fresh shell (148 mm) with a small amount of muscle tissue remaining, and one older shell (96 mm) with the appearance of dullness or growth on the inner part of the shell. During the regular monitoring in April at Otter Harbor we found 20 tagged abalone and measured 125 individuals. That total is lower than recent counts; however, sampling was hampered by a large swell.

At Willows Anchorage on Santa Cruz Island, we tagged 13 *H. cracherodii* (43-97 mm) with double tags (PIT and vinyl fish tag) in June (Figure 20). Searches yielded 259 *H. cracherodii* (Figure 16) and 11 juvenile *H. rufescens* in the main monitoring area. A strong effort was put into searching for abalone on the western half of the reef where we often do not have time to monitor, resulting in an additional 142 *H. cracherodii* counted. Four empty juvenile abalone

shells (2 red and 2 black) were found and measured. Many of the abalone tagged on the first day disappeared by the second or third day of monitoring, and presumably went into crevices or under boulders. Forty-eight hours after tagging, one *H. cracherodii* was found 4.7 meters from the location it was originally tagged. Three other tagged *H. cracherodii* crossed a small sand channel located approximately two meters from their original tagging location.

Valley Anchorage on Santa Cruz Island was sampled in the fall. We measured 217 *H. cracherodii*. Sizes ranged from 20 to 150mm. Valley is not one of our regular monitoring sites, but it is a PISCO site and we check on the abalone there when we can. That population began increasing when the Willows Anchorage population increases occurred. The two sites are only a few miles apart and both have southern exposure. Valley data are included in the size frequency data (Figure 15) but are left out of the abundance (Figure 18) for consistency with past data.

Extra surveys were conducted for black abalone presence at various locations on Santa Cruz Island in February. Those data are presented in Figure 19. Additionally, a small but highly rugose area on the northeast side of San Miguel Island (Willow Canyon) was searched in spring (50-minute timed search) yielding 16 *H. cracherodii*. Willow Canyon has harbored moderate numbers of *H. cracherodii* in past years. Though we do not monitor that area regularly, we occasionally conduct surveys. Access to Willow Canyon has become difficult due to increased use by pinnipeds.

We found one withered *H. cracherodii* in February at Otter Harbor and one shell with muscle tissue remaining which is not typical of predated abalone. Another *H. cracherodii* was found that was weak, though not especially withered. It was not holding onto the rock when first found and did not react to touch. It was still alive the next day however, and was firmly gripping the rock at that time. A withered *H. cracherodii* was also found there in April. Conditions have generally been cold during the last year so it was surprising to see these symptoms which are typically more prevalent during warm water conditions.

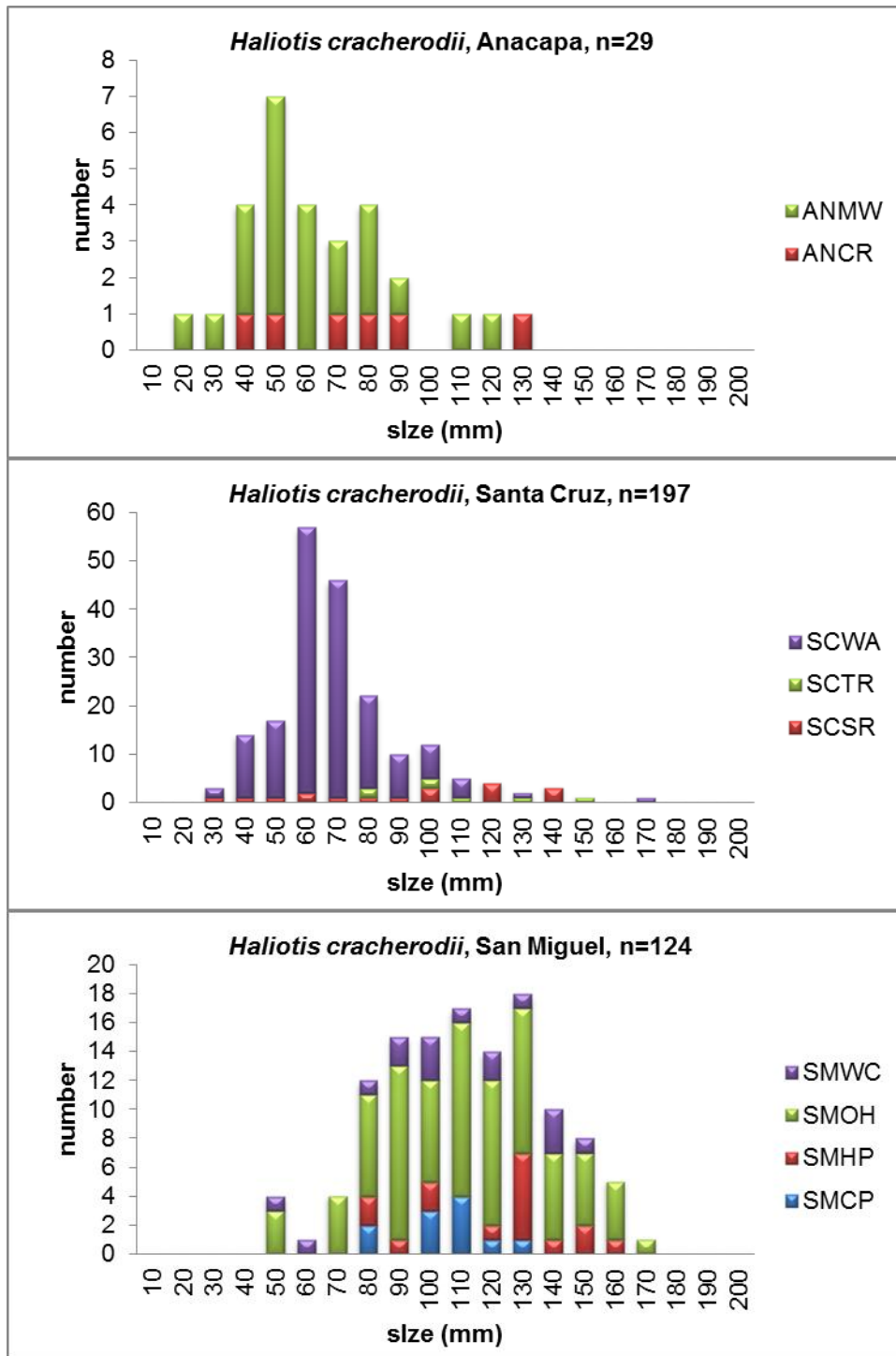


Figure 14. *Haliotis cracherodii* size distributions in spring 2010. All sampled sites were combined by island in each histogram. Note differences in scale of y-axes.

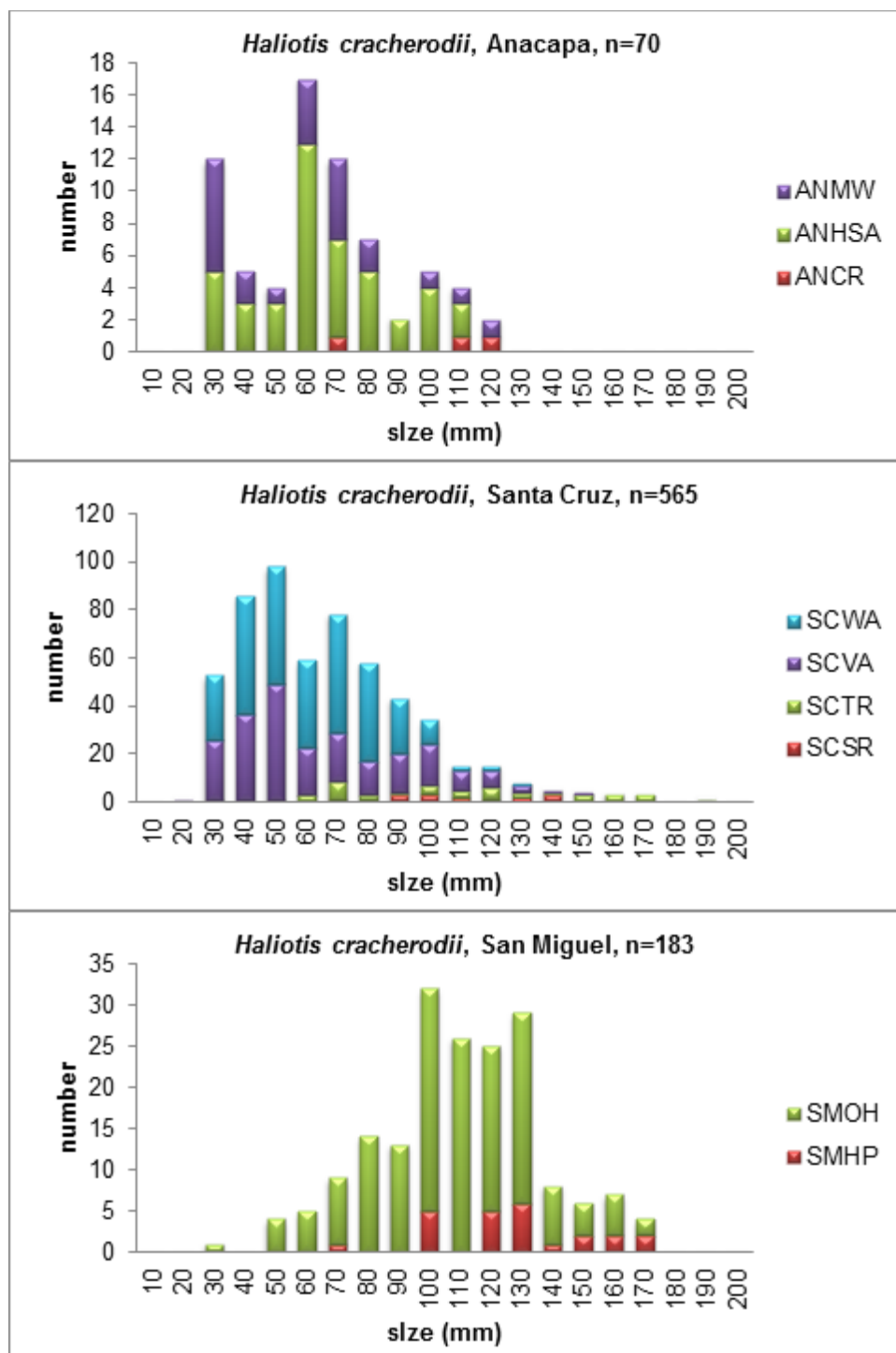


Figure 15. *Haliotis cracherodii* size distributions in fall 2010. All sampled sites were combined by island in each histogram. Note differences of scale of y-axes.

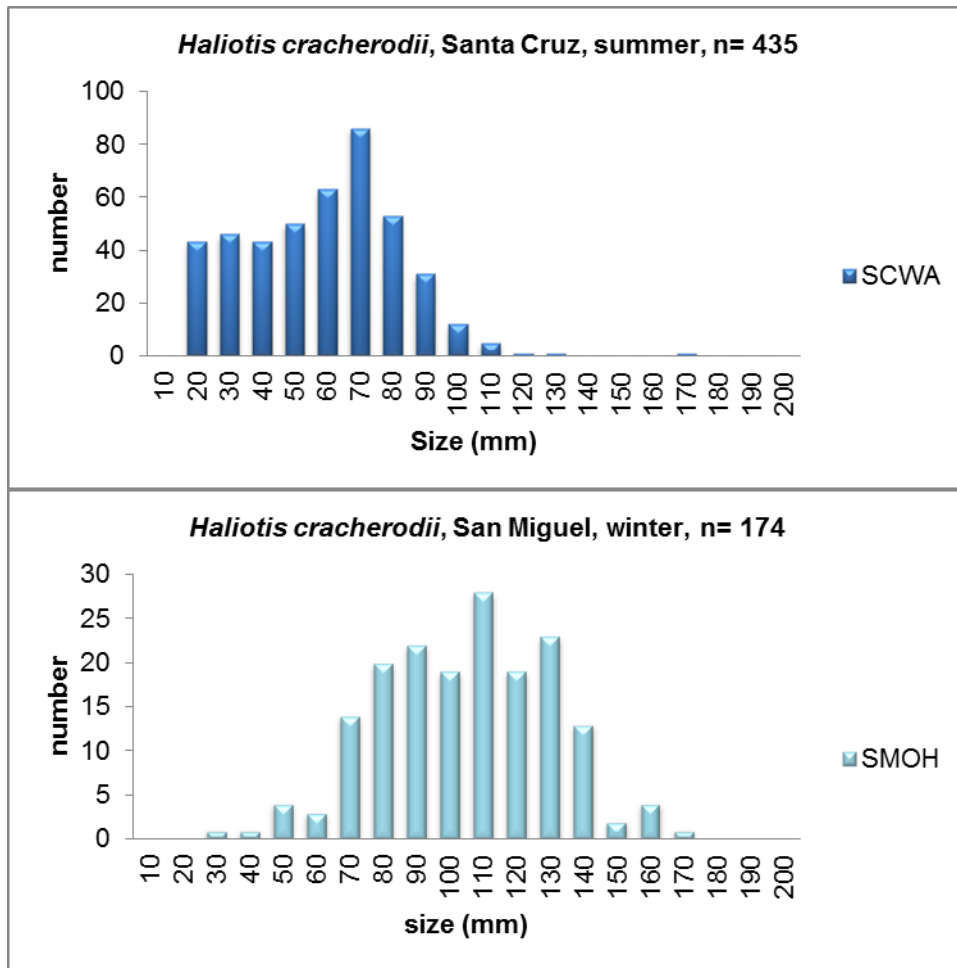


Figure 16. *Haliotis cracherodii* size distributions in summer and winter 2010. Note differences in scale of y-axes.

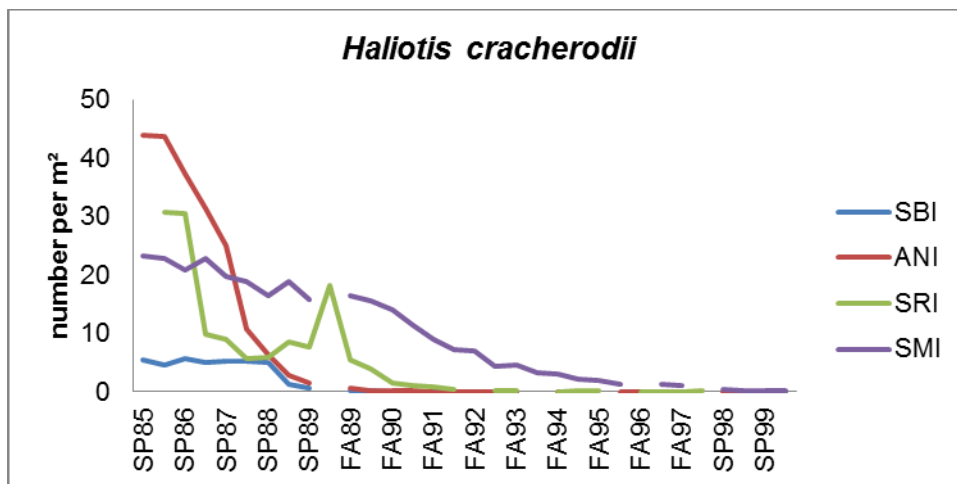


Figure 17. Black abalone density estimates at all islands except Santa Cruz from 1985-1999. Note that Santa Cruz Island was not sampled for black abalone until 1998. SBI=Santa Barbara Island, ANI=Anacapa Island, SRI=Santa Rosa Island, SMI=San Miguel Island. SP=spring, FA=fall.

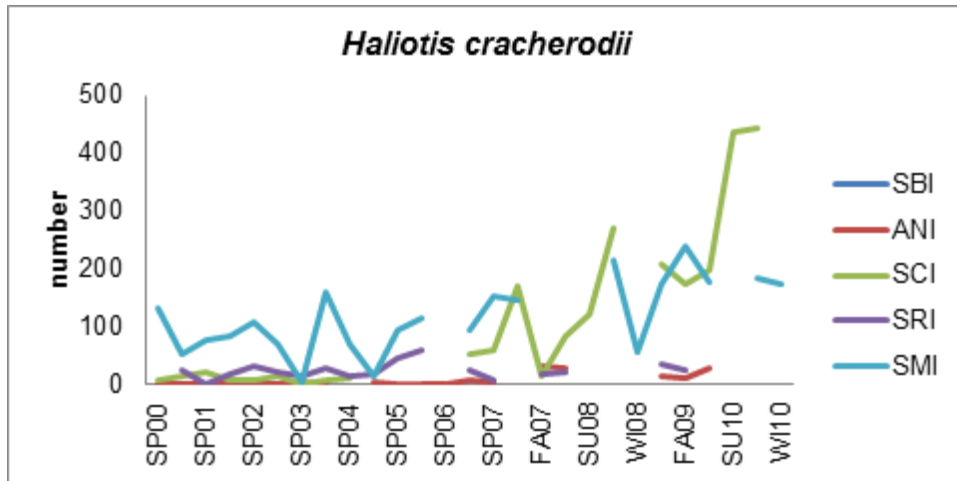


Figure 18. Black abalone counts at all islands from 2000-2010. Count data are generally derived from site-wide searches. SBI=Santa Barbara Island, ANI=Anacapa Island, SCI=Santa Cruz Island, SRI=Santa Rosa Island, SMI=San Miguel Island. SP=spring, FA=fall.

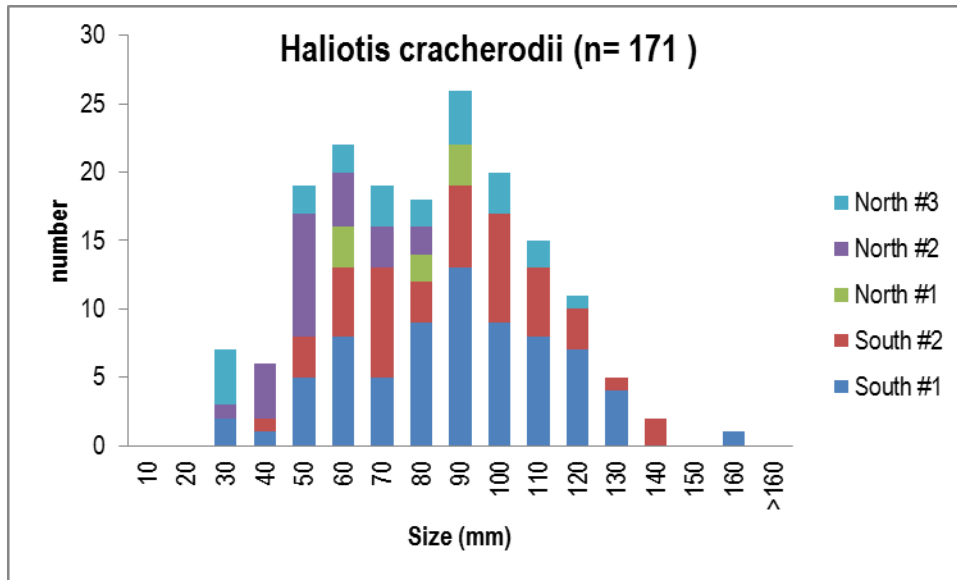


Figure 19. *Haliotis cracherodii* size distributions at five ad hoc sites on Santa Cruz Island, February 2010. Three north sites are near Orizaba Cove and two south sites are west of Willows Anchorage.

Table 2. Black abalone searches in spring 2010.

Site	Sampling Date	Abalone in plots	Abalone search
Cuyler Harbor, SMI	4/18	x	0 (15min)
Crook Point, SMI	4/20	0	17 (30min)
Otter Harbor, SMI	2/24, 4/21	0	125 (>60min)
Harris Point, SMI	4/19	0	19 (48min)
Fossil Reef, SRI	nc	nc	nc
Johnson's Lee, SRI	nc	nc	nc
Ford Point, SRI	nc	nc	nc
Northwest-Talcott, SRI	nc	nc	nc
East Point, SRI	nc	nc	nc
Fraser Cove, SCI	3/24	x	0 (30min)
Trailer, SCI	3/26	x	7 (30min)
Willows Anchorage, SCI	3/25	x	172 (200min)
Scorpion Rock, SCI	3/28	x	8 (site A), 11 (site B)
Prisoner's Harbor, SCI	3/23	x	1 (30min)
Orizaba Cove, SCI	nc	nc	nc
Cat Rock, ANI	3/11	0	6 (30min)
South Frenchy's Cove, ANI	3/11	x	0 (30min)
Middle Anacapa-West	3/12	0	23 (45min)

Nc= no counts, Santa Rosa Island was not sampled in spring 2010. *30-minute timed search except at Otter harbor and Willows Anchorage (see text). (x indicates no plot or transect, nc indicates no count performed,).

Table 3. Black abalone searches in fall 2010.

Site	Sampling Date	Abalone in plots	Abalone search
Cuyler Harbor, SMI	12/7	x	0
Crook Point, SMI	12/6	nc	nc
Otter Harbor, SMI	12/4	0	159 (120min)
Harris Point, SMI	12/5	1	24 (45min)
Fossil Reef, SRI	nc	nc	nc
Johnson's Lee, SRI	nc	nc	nc
Ford Point, SRI	nc	nc	nc
Northwest-Talcott, SRI	nc	nc	nc
East Point, SRI	nc	nc	nc
Fraser Cove, SCI	11/19	x	0 (30min)
Trailer, SCI	11/18	x	30 (30min)
Willows Anchorage, SCI	11/21	x	180 (70min)
Scorpion Rock, SCI	12/3	x	4 (site A), 12 (site B)
Prisoner's Harbor, SCI	11/17	x	1 (30min)
Orizaba Cove, SCI	11/3	x	5 (incomplete survey)
Cat Rock, ANI	11/4	0	3 (30min)
South Frenchy's Cove, ANI	11/5	x	0 (30min)
Middle Anacapa-West	12/2	0	24 (site) 43 (HSA)
Sea Lion Rookery, SBI	10/7	0	0 (30min)
Landing Cove, SBI	10/6	x	2 (30min)

Nc= no counts, Santa Rosa Island was not sampled in spring 2010. *30-minute timed search except at Otter harbor and Willows Anchorage (see text). (x indicates no plot or transect, nc indicates no count performed)



Figure 20. Black abalone double tagged with vinyl number tag and PIT tag.

Lottia gigantea

Owl limpets, *Lottia gigantea*, are typically sampled in fall, alternating with motile invertebrate counts in spring. However *L. gigantea* were sampled at three Anacapa Island sites (Cat Rock, Middle West and South Frenchy's Cove) in both spring and fall. Five-sample moving trends indicate minimal, if any, changes in mean densities for each site sampled in 2010 compared with previous years (Figures 21-24). South Frenchy's Cove had the lowest density (2.7 m^{-2}) of owl limpets measured in spring and fall followed by Anacapa Middle West and Fraser Cove (approx. 3.4 m^{-2}). Trailer had slightly higher (4.9 m^{-2}) densities of *L. gigantea*. All other sites (Cat Rock, Harris Point, Otter Harbor and Willows Anchorage) had densities ranging $7.0\text{-}8.9 \text{ m}^{-2}$. Data are presented for individual plots in the trip reports (Appendix C). Santa Rosa sites were not sampled in 2010 due to inclement weather and logistical difficulties. 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 (Table 4, Figure 26).

The mean sizes of *L. gigantea* in 2010 varied spatially among sites and islands and temporally within most sites according to five-sample moving trends (Figures 21-24, Table 4). Willows Anchorage and Otter Harbor had the smallest (mean~ 30 mm) owl limpets in 2010. Cat Rock, Fraser Cove and Harris Point had similar-sized (mean~ 35 mm) *L. gigantea*. Anacapa Middle West and South Frenchy's Cove had slightly larger (mean~ 40-42 mm) limpets and Trailer had the largest (mean~ 54 mm) individuals.

Compared with previous years, Fraser Cove, Otter Harbor, Trailer, Willows Anchorage, and to a lesser degree, Harris Point, had smaller *L. gigantea* in 2010 (Figures 21-24). Owl limpets at Cat Rock and Anacapa Middle West appeared somewhat larger this year according to five-sample moving trends, but remained comparable at South Frenchy's Cove.

L. gigantea size distributions pooled by sites and islands are displayed in Figures 25-26. Distributions at Anacapa Island during spring and fall and at Santa Barbara Island in fall appear symmetric with similar mean and median values for each island population (Table 4). Santa Cruz and San Miguel Island distributions for owl limpets are skewed right whereby mean values for both populations are higher than the median sizes.

Table 4. *Lottia gigantea* plot count and size information for 2010. All sites pooled by island.

Island Code	Season	Count Random	Count Density	Area	Density	Median Size	Mean Size	StDev	Min Size	Max Size
AN	spring	0	126	28.27	4.458	37.00	37.71	9.93	7	59
AN	fall	0	122	28.27	4.316	38.50	38.60	11.37	15	65
SB	fall	106				43.00	43.56	10.19	26	65
SC	fall	0	253	43.97	5.753	33.00	36.87	21.55	14	102
SM	fall	0	274	31.41	8.723	30.00	32.19	13.77	12	79

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.

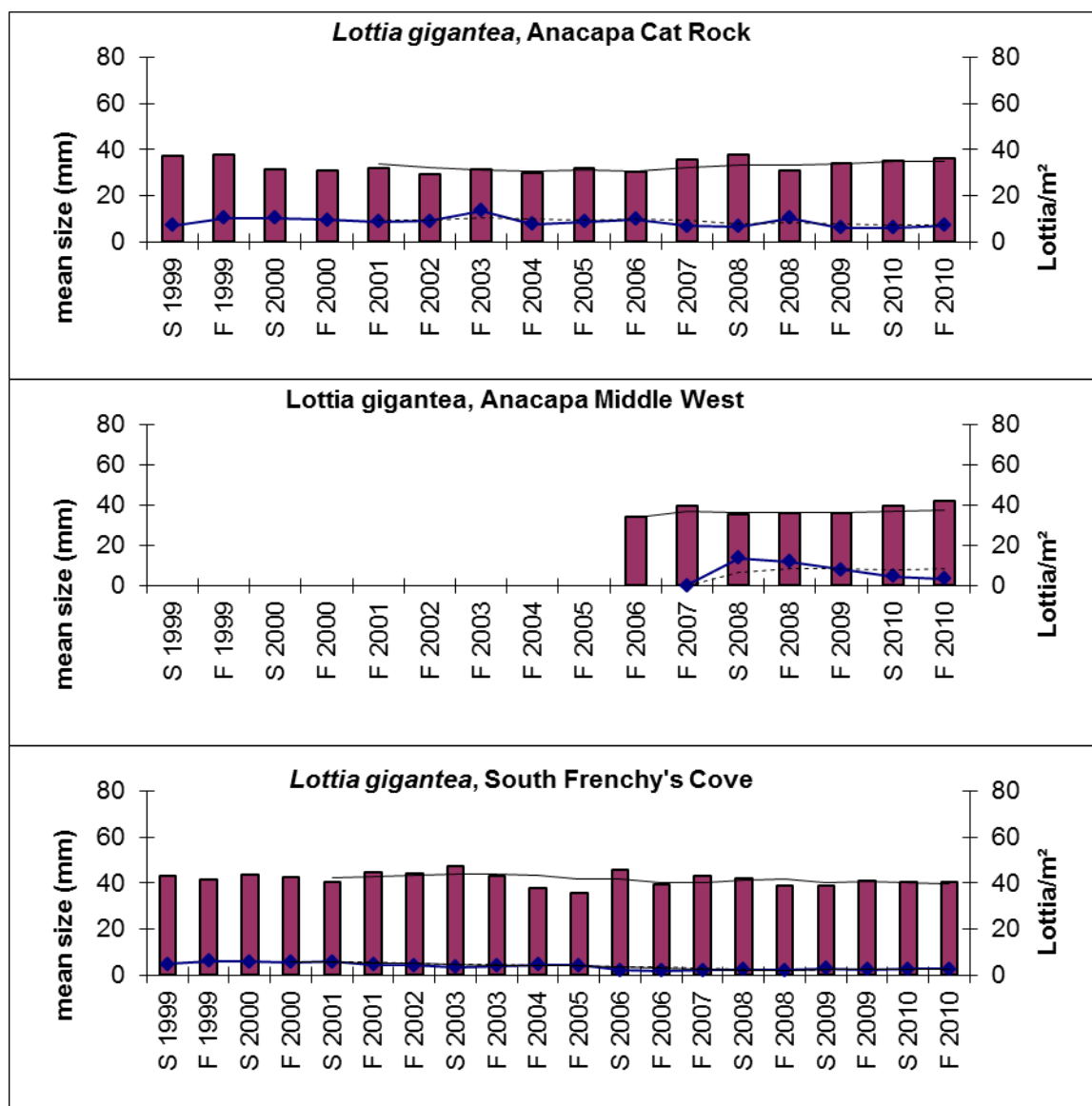


Figure 21. *Lottia gigantea* at Anacapa Island 1999-2010. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from three fixed plots, black lines indicate five-sample moving trends for mean size and dashed lines indicate five-sample moving trends for mean density. S=spring samples, F=fall samples.

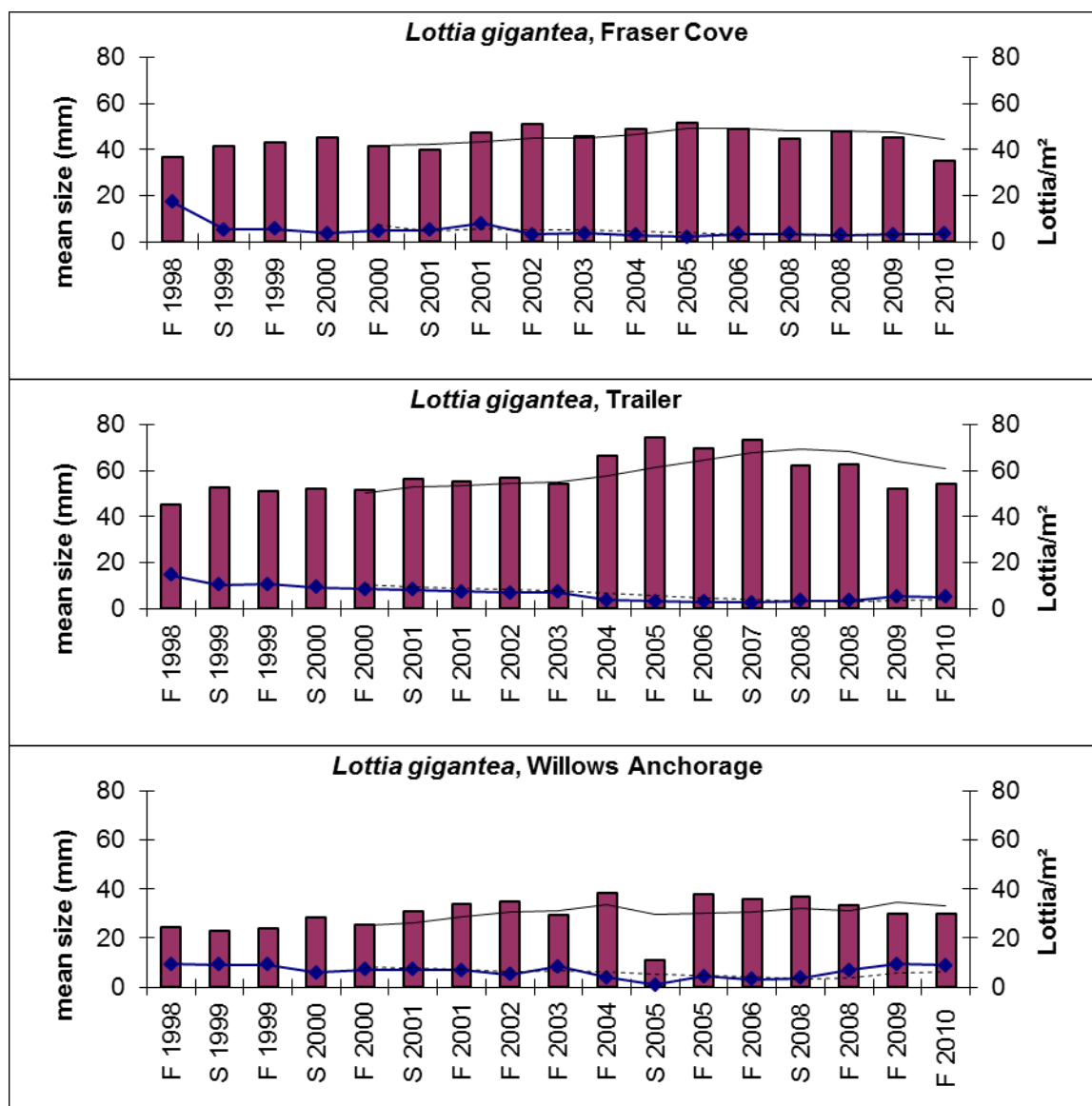


Figure 22. *Lottia gigantea* at Santa Cruz Island 1998-2010. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from five fixed plots, black lines indicate five-sample moving trends for mean size and dashed lines indicate five-sample moving trends for mean density. S=spring samples, F=fall samples.

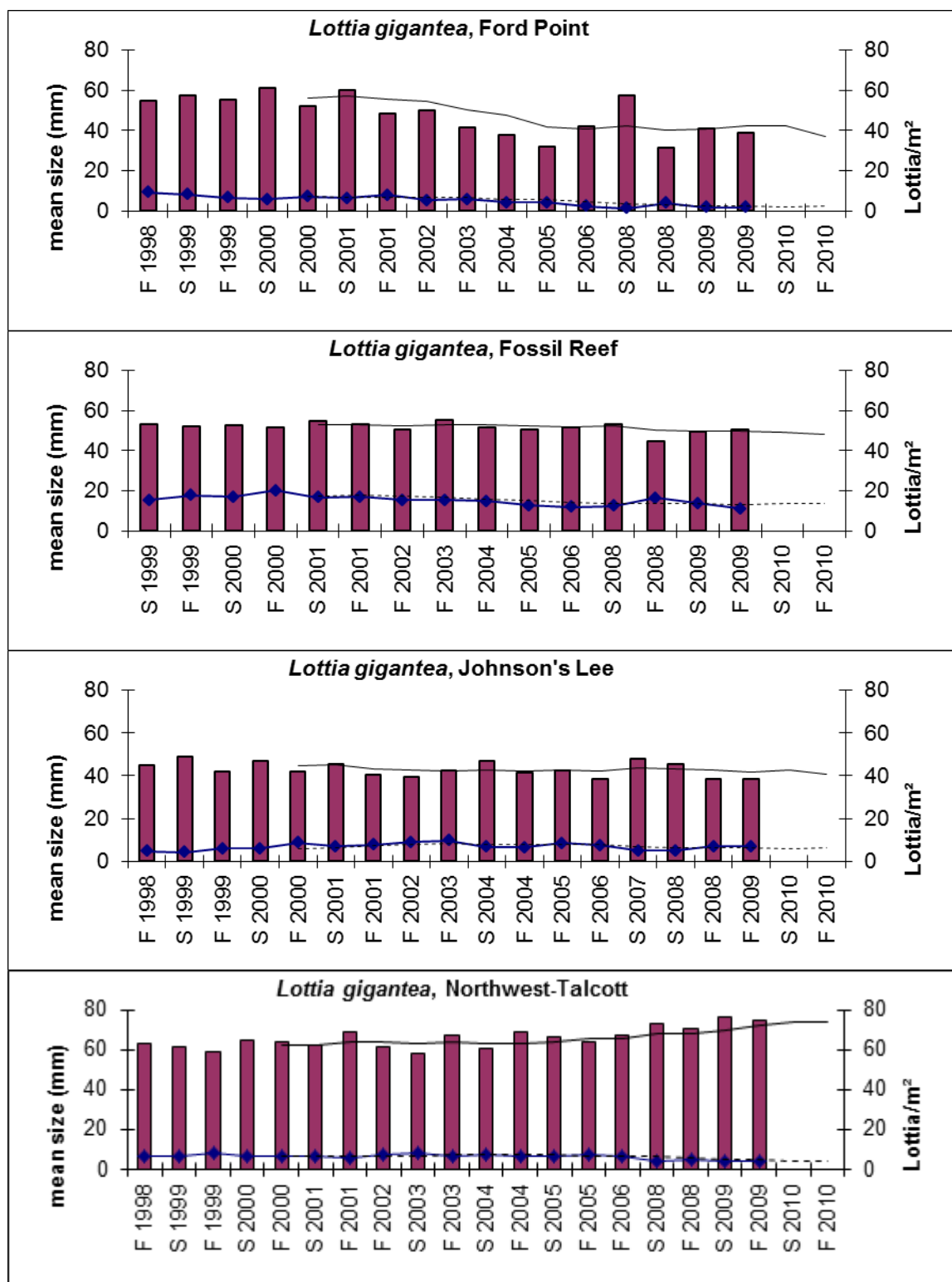


Figure 23. *Lottia gigantea* at Santa Rosa Island 1998-2009. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from five fixed plots, black lines indicate five-sample moving trends for mean size and dashed lines indicate five-sample moving trends for mean density. S=spring samples, F=fall samples. Note that Santa Rosa Island sites were not monitored in 2010 due to logistical difficulties.

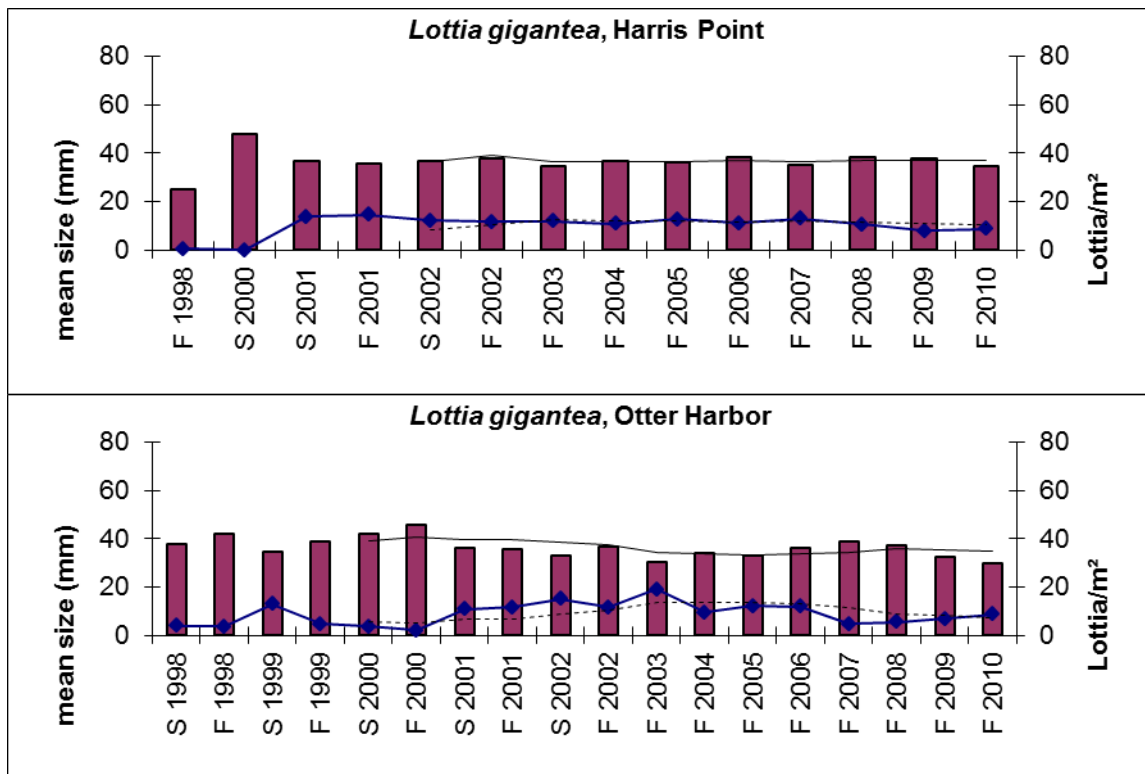


Figure 24. *Lottia gigantea* at San Miguel Island 1988-2010. Bars represent mean size (mm), blue diamonds and corresponding lines represent mean density from five fixed plots, black lines indicate five-sample moving trends for mean size and dashed lines indicate five-sample moving trends for mean density. S=spring samples, F=fall samples.

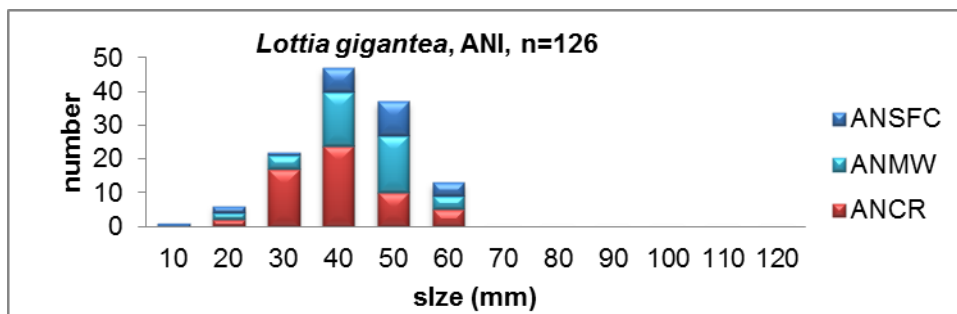


Figure 25. *Lottia gigantea* size distributions in spring 2010 at Anacapa Island.

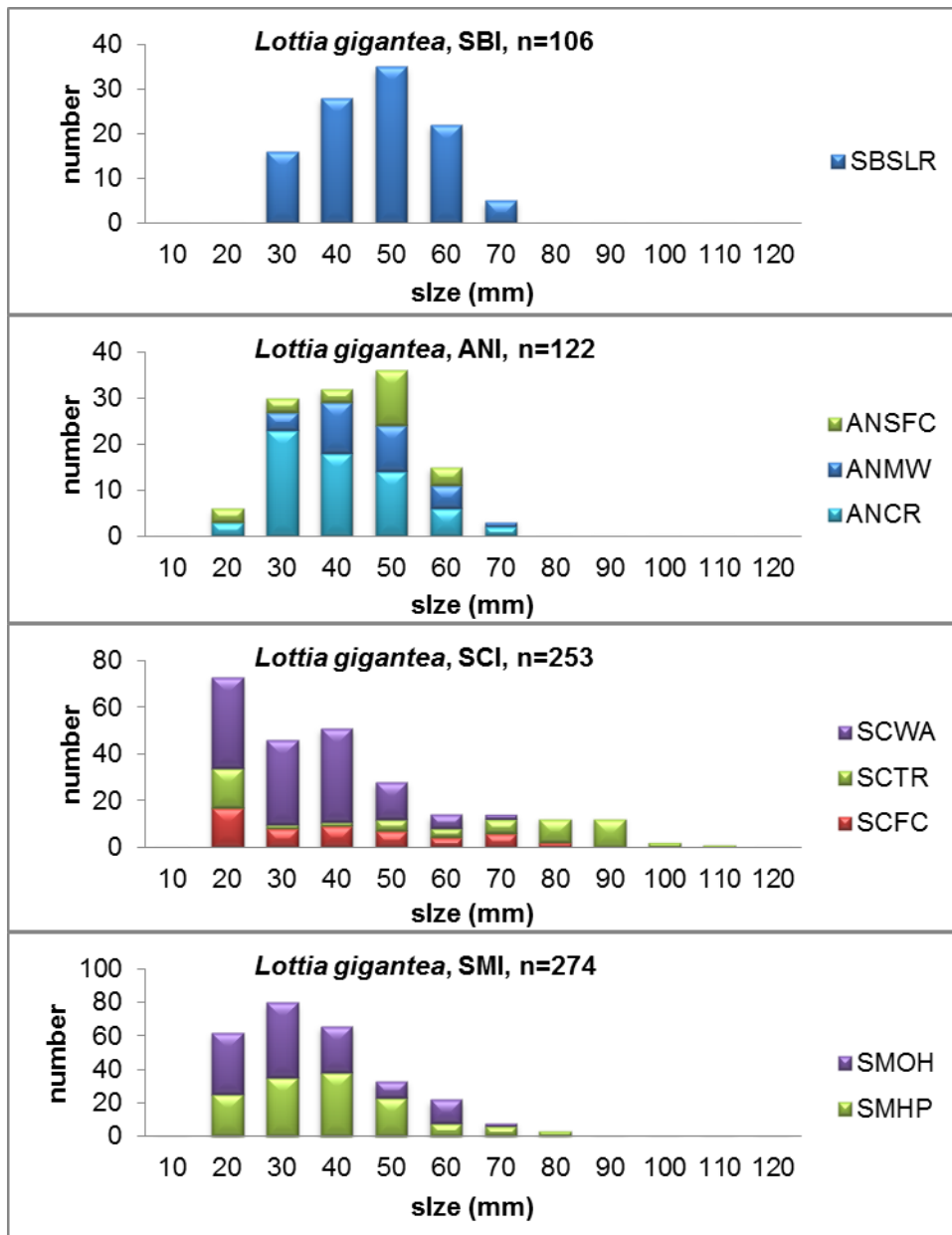


Figure 26. *Lottia gigantea* size distributions in fall 2010 at each island. Note differences in scale of y-axes.

Pisaster ochraceus

Temporally, 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. Compared with previous years, seastars were moderately abundant at most sites in 2010 (Tables 5-6 and Figure 27). Note that all the Santa Rosa Island sites were not sampled in 2010 due to logistical difficulties. Extremely high abundances occurred in 2009 with five sites having more than 500 *P. ochraceus* observed in 30-minute intervals. In 2010, only three sites (Anacapa Middle West, Sealion Rookery, Willows Anchorage) had nearly 500 *P. ochraceus*. Still, more than 100 seastars were counted at 10 of 15 sites during one or both seasons. Very low numbers were again observed at Harris Point, Cat Rock, and South Frenchy's Cove; all of which have had low abundances of *P. ochraceus* since monitoring began.

Size frequency measurements were collected whenever possible (Figures 28-30). *P. ochraceus* populations at most sites followed normal size frequency distributions with modes typically between 80 mm and 100 mm. Exceptions were at Fraser Cove, Harris Point, Prisoners Harbor, and Sealion Rookery where the majority of seastars were larger (110-130 mm) during one or both sampling seasons. Additionally, the Willows Anchorage population was oddly distributed during both seasons whereby two modes occurred in spring (one at 40 mm and another larger mode at 80 mm) and a high degree of positive skew appeared in fall. As in recent years, the largest *P. ochraceus* were measured at Harris Point and the smallest were seen at Willows Anchorage.

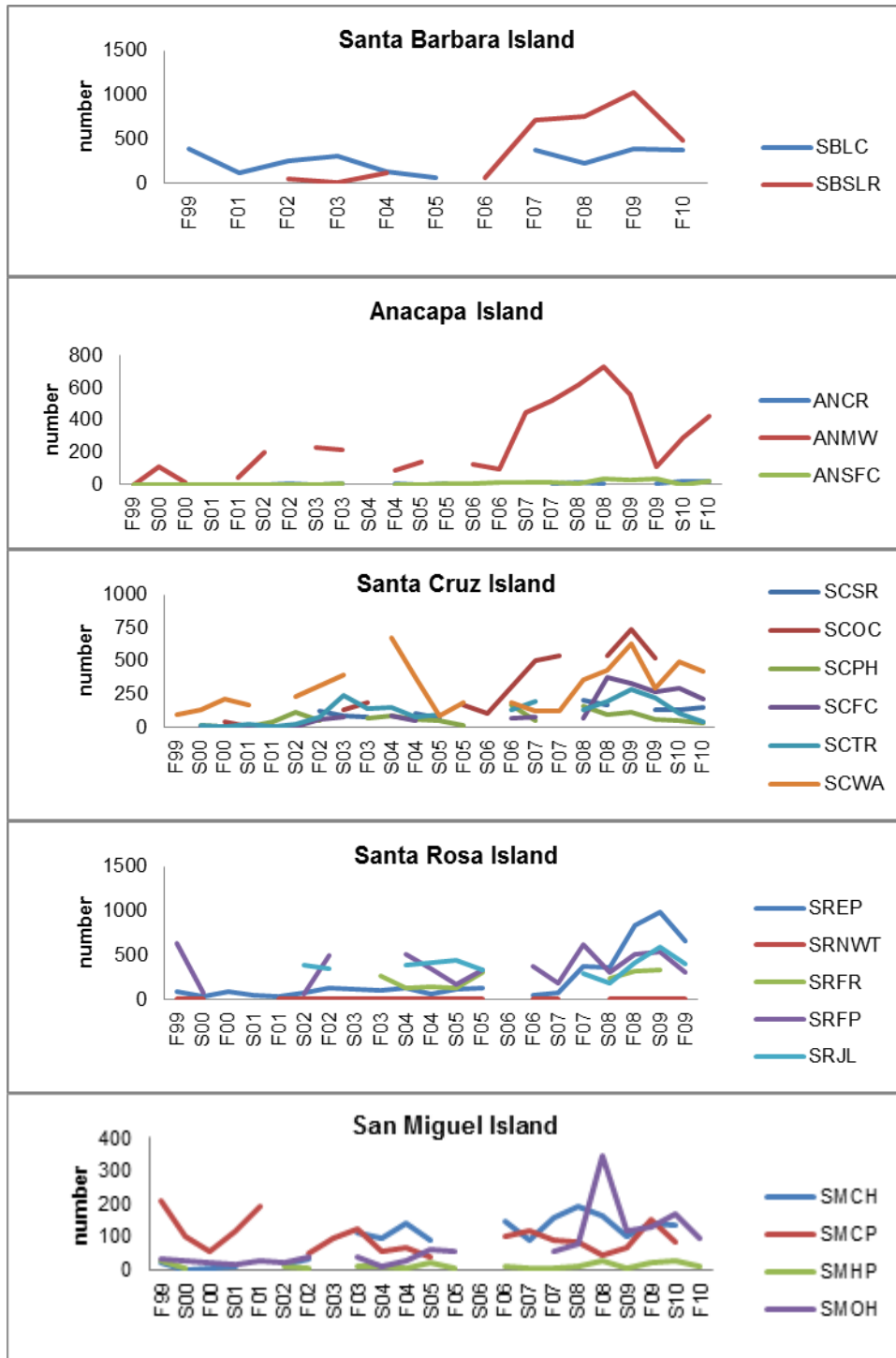


Figure 27. *Pisaster ochraceus* counts at each site from 1999-2010. Count data were attained from timed-(30 minute) searches. Note that y-axes vary by graph.

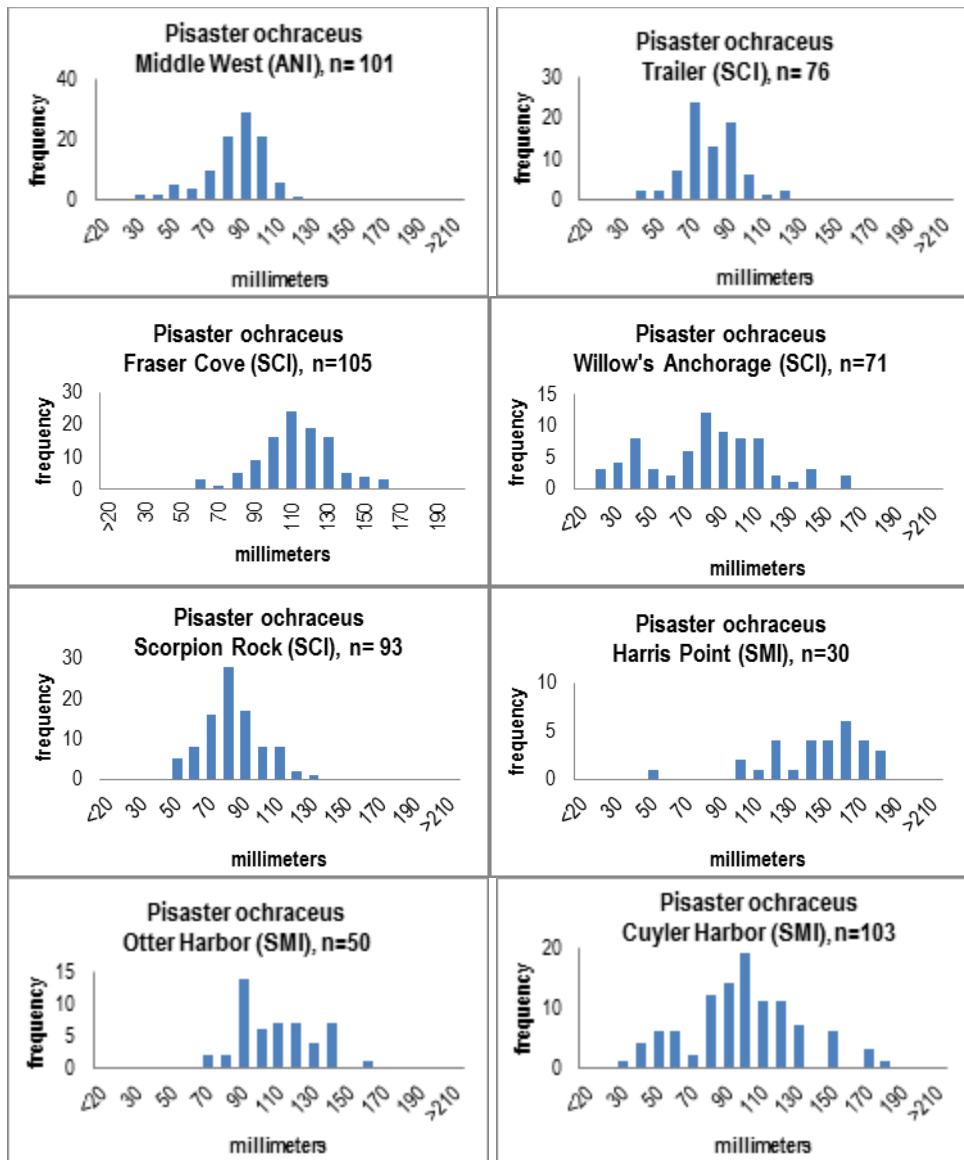


Figure 28. *Pisaster ochraceus* size distributions in spring 2010 at each site. Note differences in scale of y-axes. Some sites are excluded due to insufficient numbers of *P. ochraceus* or lack of sampling.

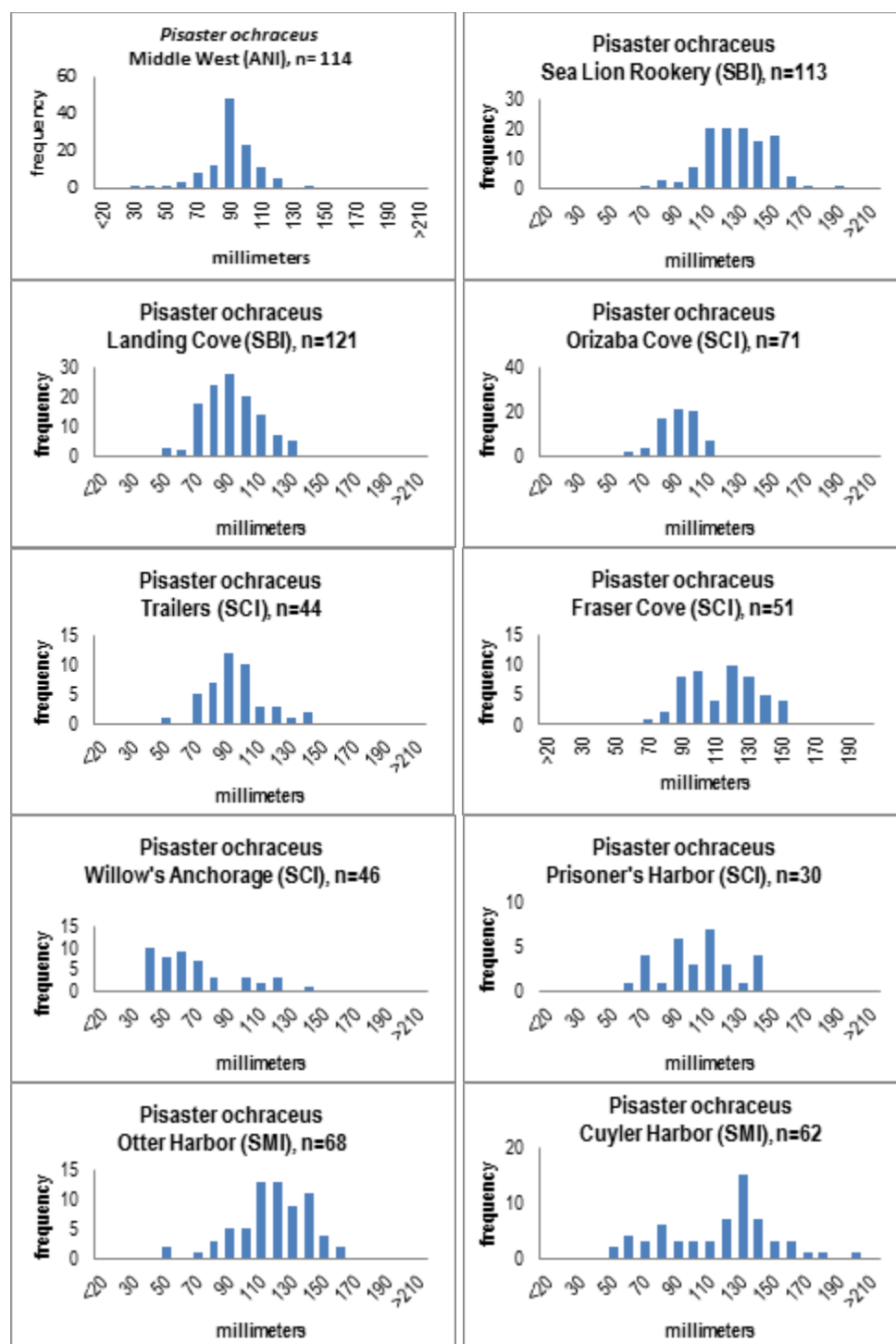


Figure 29. *Pisaster ochraceus* size distributions in fall 2010 at each site. Note differences in scale of y-axes. Some sites are excluded due to insufficient numbers of *P. ochraceus* or lack of sampling.

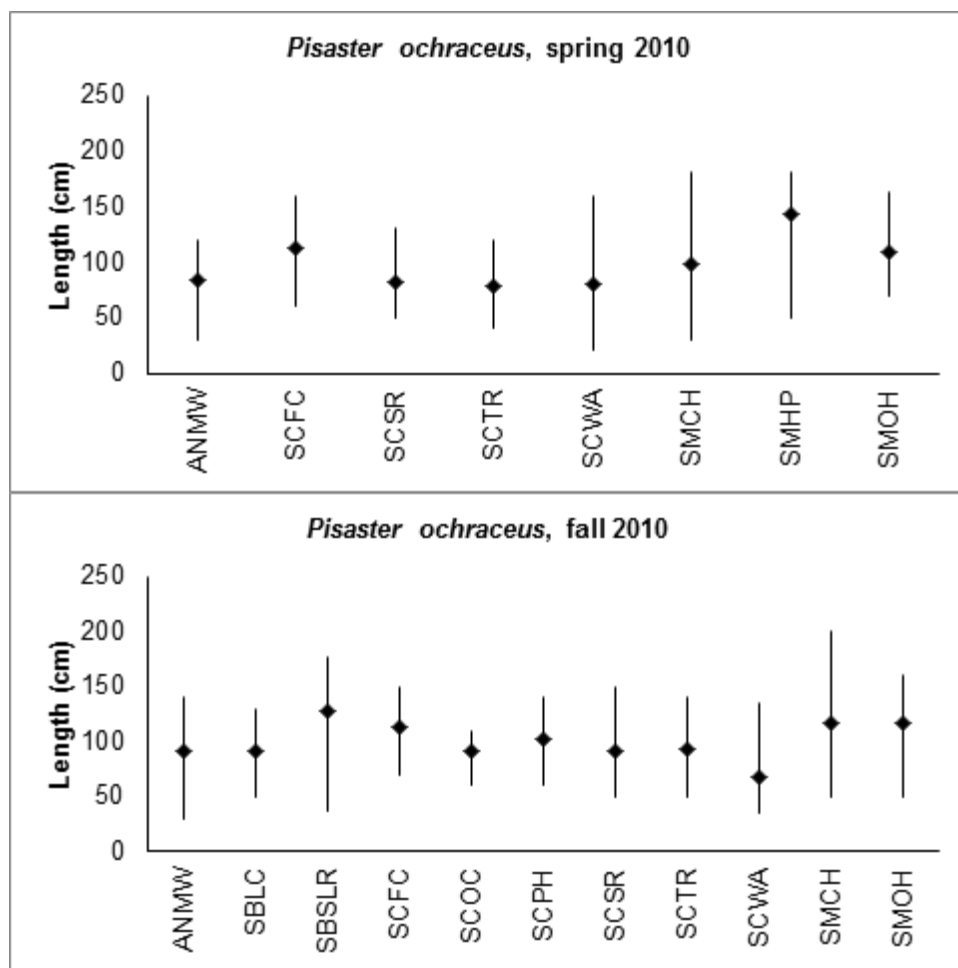


Figure 30. *Pisaster ochraceus* sampled in 2010. Diamonds represent the mean length (measured as longest ray), and vertical lines represent the range of lengths measured at each site. $N \geq 30$ *P. ochraceus* were measured at each site. See table 2 for site codes. Note that some sites are not presented either because they were not sampled or insufficient numbers of *P. ochraceus* were seen.

Table 5. Sea star searches in spring 2010.

Site	Sampling Date	Seastars in 30 min	Seastars in transects
Cuyler Harbor, SMI	4/18	137 (15min)	x
Crook Point, SMI	4/20	83	x
Otter Harbor, SMI	2/24, 4/21	167 P.o., 6 P.g., 1 P.m.	x
Harris Point, SMI	4/19	30 (45min)	x
Fossil Reef, SRI	nc	nc	nc
Johnson's Lee, SRI	nc	nc	nc
Ford Point, SRI	nc	nc	x
Northwest-Talcott, SRI	nc	nc	x
East Point, SRI	nc	nc	x
Fraser Cove, SCI	3/24	297	x
Trailer, SCI	3/26	105 P.o., 1 P.m.	x
Willows Anchorage, SCI	3/25	497 P.o., 1 P.g., 1 P.m.	x
Scorpion Rock, SCI	3/28	128	x
Prisoner's Harbor, SCI	3/23	49	x
Orizaba Cove, SCI	nc	nc	x
Cat Rock, ANI	3/11	20	x
South Frenchy's Cove, ANI	3/11	0	x
Middle Anacapa-West	3/12	286	x

(x indicates no plot or transect, nc indicate no count performed, P.o. = *Pisaster ochraceus*, P.g. = *P. giganteus*, P.b. = *Pisaster brevispinous*, P.h. = *Pycnopodia helianthoides*, P.m. = *Patiria miniata*)

Table 6. Sea star searches in fall 2010.

Site	Sampling Date	Seastars in 30 min	Seastars in transects
Cuyler Harbor, SMI			x
Crook Point, SMI	12/6	nc	x
Otter Harbor, SMI	12/4	98	x
Harris Point, SMI	12/5	9 P.o., 2 P.h., 18 P.m., 2 P.g.	nc
Fossil Reef, SRI	nc	nc	nc
Johnson's Lee, SRI	nc	nc	nc
Ford Point, SRI	nc	nc	nc
Northwest-Talcott, SRI	nc	nc	nc
East Point, SRI	nc	nc	nc
Fraser Cove, SCI	11/19	212	x
Trailer, SCI	11/18	44 (underestimate)	x
Willows Anchorage, SCI	11/21	421	x
Scorpion Rock, SCI	12/3	145	x
Prisoner's Harbor, SCI	11/17	30	x
Orizaba Cove, SCI	11/3	283	x
Cat Rock, ANI	11/4	21	x
South Frenchy's Cove, ANI	11/5	18	x
Middle Anacapa-West	12/2	423 (45min)	x
Sea Lion Rookery, SBI	10/7	487	x
Landing Cove, SBI	10/6	375	86

(x indicates no plot or transect, nc indicate no count performed, P.o. = *Pisaster ochraceus*, P.g. = *P. giganteus*, P.b. = *Pisaster brevispinous*, P.h. = *Pycnopodia helianthoides*, P.m. = *Patiria miniata*)

***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 (Figures 31-32 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 the two Santa Cruz Island sites, Fraser Cove and Trailer, whereby surfgrass overstory cover has routinely declined in spring and increased in fall. In 2010, the same trends were observed on all three transects at Fraser Cove and Transect-1 at Trailer, but were not as distinct on the two other transects at Trailer. Five-sample trends indicate that *Phyllospadix* spp. cover on the three transects at Fraser has been increasing during the last two years. At Trailer, five-sample trends indicate that abundances on Transects-1 and-3 have been slowly decreasing since spring 2008 and spring 2010, respectively. Both transects reached their all-time lowest recorded abundances for surfgrass in spring 2010. Surfgrass cover on Transect-2 at Trailer has remained relatively stable during the past couple years. Over time, *Phyllospadix* spp. cover at Fraser Cove has ranged approximately 20-80 % among the three transects and approximately 40-90 % among the three transects at Trailer.

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 cover on two transects 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. Unfortunately, neither East Point nor Northwest-Talcott was sampled in 2010 due to logistical challenges. However, 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.

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 2010. Red algae abundances at the two sites ranged 19% to 35% in spring and 10% to 36% in fall. The ephemeral green algae, *Ulva* spp., dominated Transect-3 at Northwest-Talcott comprising 77% of the total cover in fall 2009. Articulated corallines and feather boa kelp, *Egregia menziesii*, were commonly observed in low abundances on most transects at all four sites.

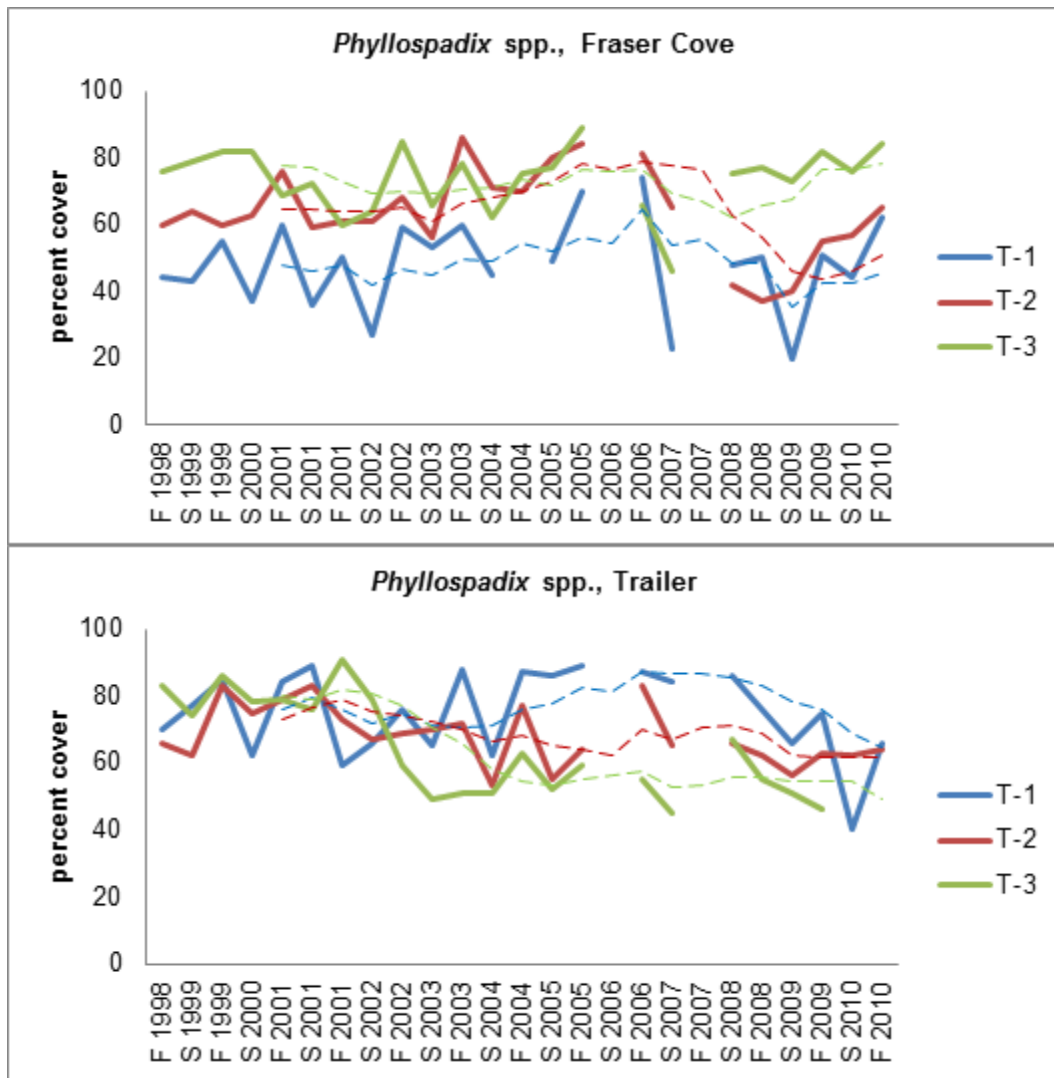


Figure 31. *Phyllospadix* spp. cover trends on 10m point-intercept transects at Fraser Cove and Trailer, Santa Cruz Island. S=spring samples, F=fall samples. Dashed lines indicate five-sample moving trends for percent cover of *Phyllospadix* spp. cover on each transect.

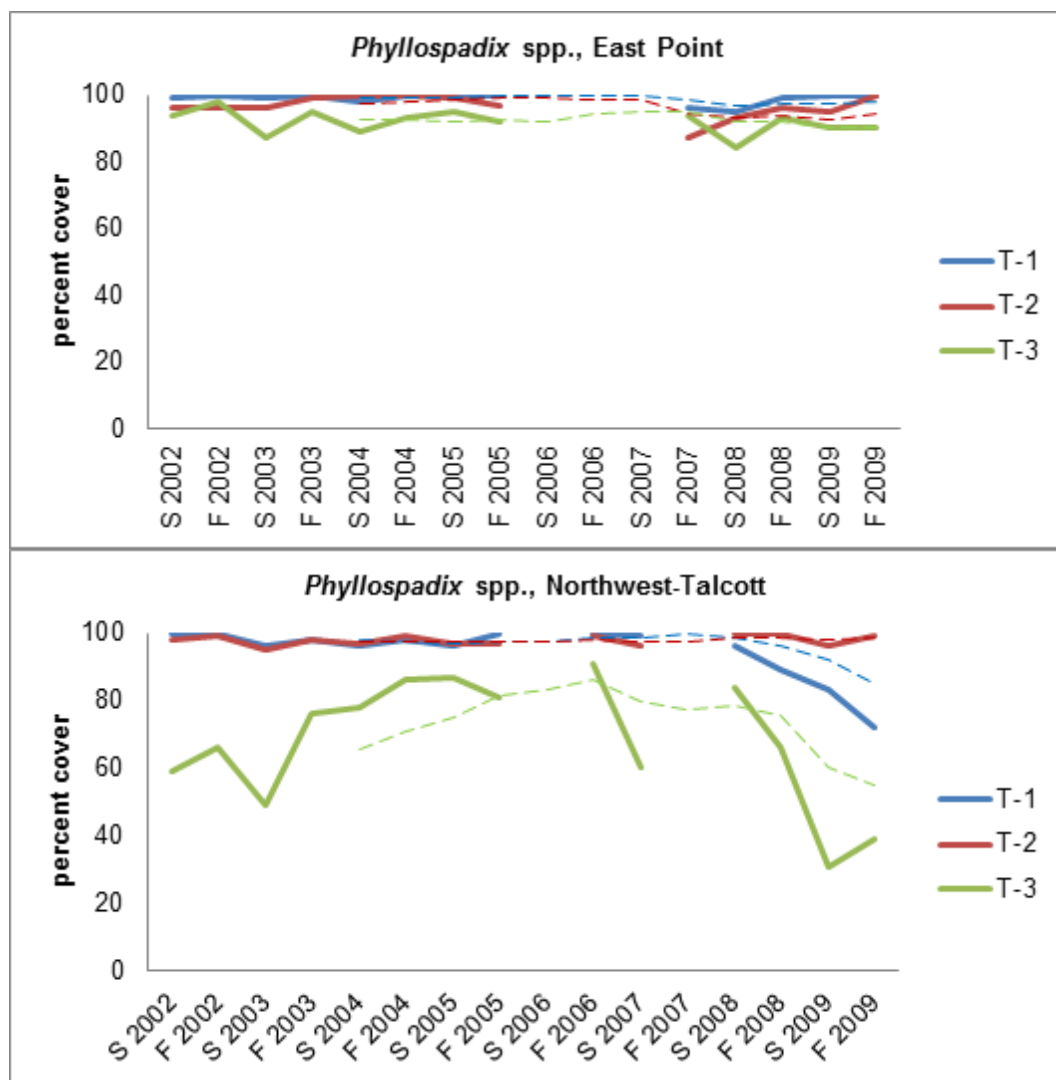


Figure 32. Surfgrass, *Phyllospadix* spp., cover trends on 10m point-intercept transects at East Point and Northwest-Talcott, Santa Rosa Island. S=spring samples, F=fall samples. Dashed lines indicate five-sample moving trends for percent cover of *Phyllospadix* spp. cover on each transect. Note that Santa Rosa Island sites were not monitored in 2010 due to logistical difficulties.

Shorebirds and Pinnipeds

The maximum number of shorebirds and pinnipeds observed at any one time during a visit to the sites in 2010 is summarized in Tables 7 and 8. One American oystercatcher was sighted at Fraser Cove in spring and two were seen at Willows Anchorage in spring. In fall, two American oystercatchers were seen at Cat Rock; the birds were not seen at other sites. As in previous years, black oystercatchers were the most common shorebird at each site in 2010 and seasonal abundances were relatively comparable to those observed in recent years. Nearly all sites had at least one black oystercatcher present during both spring and fall, and as many as seven individuals were seen in spring at one site (Crook Point). A flock of 15 black oystercatchers were observed at Orizaba Cove in fall.

Black turnstones were present in spring at three sites (Crook Point, Cuyler Harbor and Trailer). Abundances ranged 2-9 individuals. In fall, 2-5 turnstones were seen at five sites (Crook Point, Fraser Cove, Landing Cove, Orizaba Cove and Sea Lion Rookery). Less common shorebirds such as wandering tattlers, and ruddy turnstone are occasionally seen on the reefs while black-bellied plovers and snowy plovers usually stick to adjacent beaches. Seabirds such as cormorants, gulls, pelicans and occasionally pigeon guillemots may be resting on the reef or hunting in the nearshore zone. Belted kingfishers, great blue herons, osprey, and snowy egrets tend to use the island shores as freshwater venues are less common. While not generally considered shorebirds, black phoebes and song sparrows are commonly seen catching flies on the shore while common ravens are primarily scavenging for dead animals washed ashore. Ravens and gulls have both been observed foraging in the mussel beds and other intertidal areas for invertebrates.

Harbor seals, *Phoca vitulina*, were observed within the immediate vicinity of six sites (Cat Rock, Anacapa Middle West, Fraser Cove, Trailer, Scorpion Rock and Otter Harbor) in spring 2010. In fall, many of the same sites (Fraser Cove, Trailer, Scorpion Rock and Otter Harbor) also supported low numbers of seals excluding Otter Harbor whereby 18 individuals were counted. Additionally, 1-7 harbor seals were seen at Sea Lion Rookery, Orizaba Cove and Harris Point in fall.

Northern elephant seals, *Mirounga angustirostris*, usually prefer sandy beaches over rocky shelves to haul out. They are common sights on beaches near Cuyler Harbor, Crook Point, and Fossil Reef in spring where we find weaned pups that have not yet gone to sea or adults coming ashore to molt. In 2010, elephant seals were seen near Cuyler Harbor, Crook Point and Otter Harbor during both seasonal visits and Harris Point only during spring.

California sealions, *Zalophus californianus*, were abundant at the aptly named, Sea Lion Rookery on Santa Barbara Island as well as Forney Cove (considered part of the site, Fraser Cove) on Santa Cruz Island in fall. Approximate numbers of sea lions at both sites ranged 200-500. Two sea lions were seen nearby Scorpion Rock during the visit in spring.

Table 7. Shorebirds and pinnipeds at monitoring sites in spring 2010 (maximum seen at any one time) (ns=not sampled, *= nearby but not on reef, ¹=Forney's Cove, Santa Cruz Island).

Spring 2010						
Site	Black Oystercatcher/ (American)	Black Turnstone	Other birds	<i>Phoca vitulina</i>	<i>Mirounga Angustirostris</i>	<i>Zalophus californianus</i>
ANCR	5	0	1 western gull, 1 wandering tattler	16, 10*	0	0
ANMW	6	0	0	2	0	0
ANSFC	5	0	2 western gulls	0	0	0
SCFC (Fraser)	4(1), 2 ¹	0	1 cormorant	2	0	0
SCTR	0	3	0	2	0	0
SCWA	2*(2)	0	0	0	0	0
SCSR	0	0	1 cormorant, 3 gulls*, 3 pigeon guillemots*	2	0	2*
SCPH	2	0	1 osprey	0	0	0
SCOC	ns	ns	ns	ns	ns	ns
SREP	ns	ns	ns	ns	ns	ns
SRFP	ns	ns	ns	ns	ns	ns
SRFR	ns	ns	ns	ns	ns	ns
SRJL	ns	ns	ns	ns	ns	ns
SRNWT	ns	ns	ns	ns	ns	ns
SMCH	2*	2	0	0	6, 1*	0
SMCP	7	9	1 cormorant, 2 gulls, 1 ruddy turnstone	0	3	0
SMHP	3	0	0	0	2*	0
SMOH	6	0	25 gulls	12	12	0

Table 8. Shorebirds and pinnipeds at monitoring sites in fall 2010 (maximum seen at any one time) (ns=not sampled, *= nearby but not on reef, ¹=Forney's Cove, Santa Cruz Island).

Site	Fall 2010					
	Black Oystercatcher/ (American)	Black Turnstone	other birds	<i>Phoca vitulina</i>	<i>Mirounga Angustirostris</i>	<i>Zalophus californianus</i>
SBLC	2	2	1 wandering tattler	0	0	0
SBSLR	2	5	3 western gulls	7	0	approx. 200
ANCR	11(2)	0	0	0	0	0
ANSFC	2	0	2 wandering tattlers*	0	0	0
Middle – all	2	0	1 black phoebe, 2 wandering tattlers, 1 song sparrow	0	0	0
SCFC	3	2	numerous gulls, brown pelicans, cormorants ¹	2	0	approx. 500 ¹
SCTR	3	0	1 great blue heron, western gulls and California gulls*	2	0	0
SCPH	0	0	2 belted kingfishers, 1 common raven*, 1 great blue heron*	0	0	0
SCWA	2	0	0	0	0	0
SCSR	4	0	2 western gulls, 1 snowy egret, 1 common raven, 1 black phoebe	1	0	0
SCOC	15	5	0	1	0	0
SREP	ns	ns	ns	ns	ns	ns
SRFP	ns	ns	ns	ns	ns	ns
SRFR	ns	ns	ns	ns	ns	ns
SRJL	ns	ns	ns	ns	ns	ns
SRNWT	ns	ns	ns	ns	ns	ns
SMCH	2	0	1 black-bellied plover, 4 snowy plovers*, 2 common ravens	0	3*	0
SMCP	7	2	20 cormorants	0	1*	0
SMHP	2	0	0	2	0	0
SMOH	4	0	1 brown pelican, 5 western gulls, 2 common ravens	18	6, 4*	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 33). 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 2010 was 1704 passengers in 24 trips (Table 9) which was greater than the 1519 passengers in 2009, but slightly less than the number of passengers in 2007 (Figure 34). March was once again the top month for visitation with 527 passengers on six trips. Sixty-seven 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 or October.

Table 9. Visitors to South Frenchy's Cove, Anacapa Island in 2010 (visitation with Island Packers)

YEAR	MONTH	#Passengers	#TRIPS
2010	January	67	1
2010	February	499	6
2010	March	527	6
2010	April	117	1
2010	May	0	0
2010	June	102	2
2010	July	72	2
2010	August	24	1
2010	September	20	1
2010	October	0	0
2010	November	158	2
<u>2010</u>	<u>December</u>	<u>118</u>	<u>2</u>
2010	total	1704	24

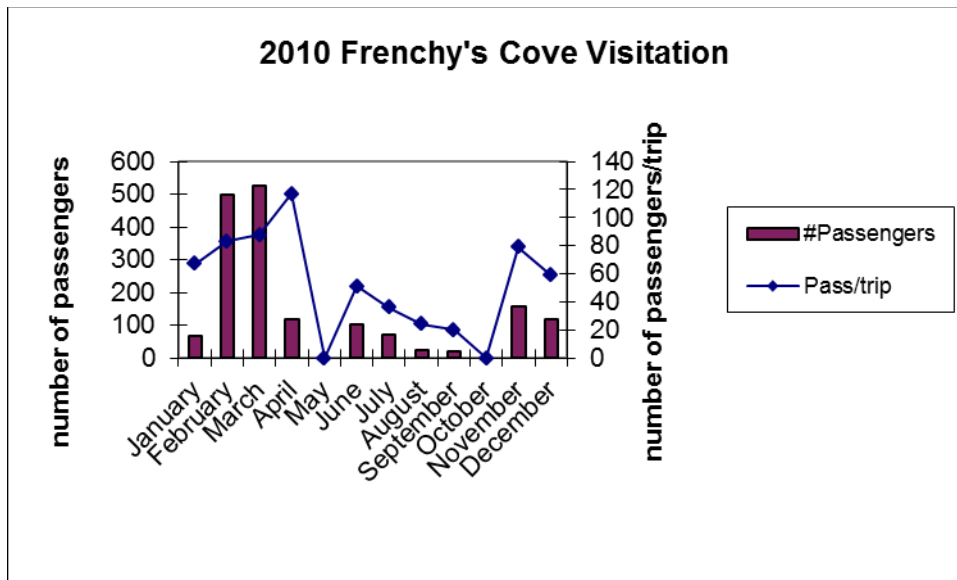


Figure 33. Monthly visitation at Frenchy's Cove, Anacapa (Island Packers visitors).

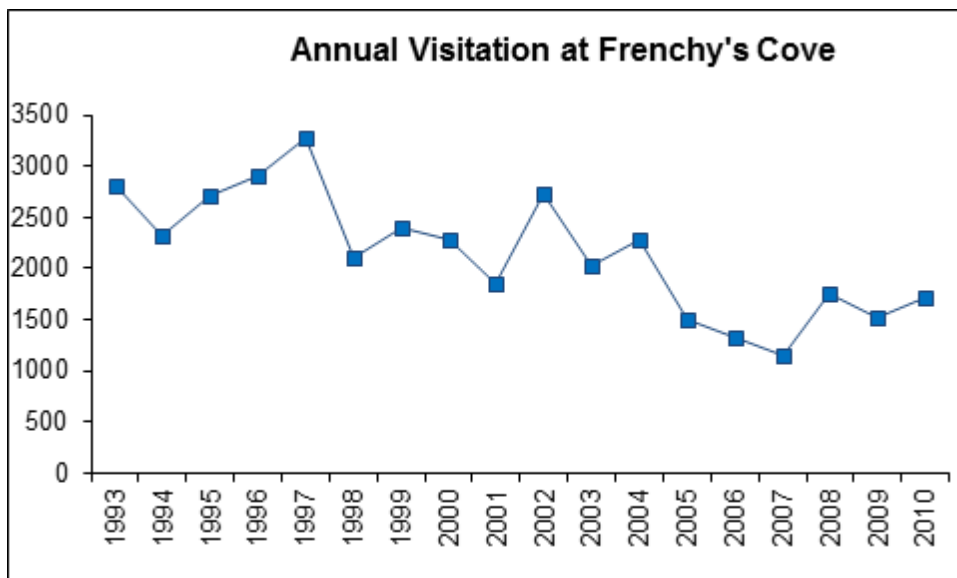


Figure 34. Annual Commercial Visitation at Frenchy's Cove, Anacapa (Island Packers visitors) 1993-2010.

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Appendix A: Program Notes

2010 Sampling Events

Thirteen sites were sampled in spring and 16 were visited in fall (Table 10). The two sites at Santa Barbara Island were not sampled in spring because of difficulties with access due to nesting California brown pelicans. Orizaba Cove on Santa Cruz Island also was not sampled in spring because a large swell event coincided with our scheduled visit to the site. The five sites at Santa Rosa Island were not sampled in spring or fall due to logistical difficulties resulting from winter storm damage to the roads.

Two days of boat time on the CINMS R/V Shearwater were lost in spring due to inclement weather conditions, but we were able to make up the monitoring at two sites (South Frenchy's Cove and Cat Rock) by combining the work into one low tide visit. Additionally, Scorpion Rock was visited on a later date following our week-long trip to the west Santa Cruz Island sites. Significant-sized swell and heavy surge from south and westerly swells impeded some sampling protocols at Crook Point during both sampling seasons and Orizaba Cove in fall.

Funding provided by the NMFS Endangered Species Program for black abalone monitoring allowed for the temporary hire of a biological technician (Jacob Elliott) from February to August. Additionally, the funds enabled us to conduct an abalone tagging trip to Otter Harbor, San Miguel Island in February. The focus of the trip was not only to measure abalone at the site, but to map the crevices utilized by black abalone with GIS to allow better tracking of the movement of tagged individuals. The same procedures were conducted at Willows Anchorage, Santa Cruz Island in June. Over 400 black abalone and 11 juvenile red abalone were found during the sampling trip.

California mussels were collected from Otter Harbor in February for the NOAA Mussel Watch program. Attempts were made to collect mussels from Anacapa Middle West, a location utilized in the past, but no mussels were present. Lyndal Laughrin, the Coordinator for the UC Natural Reserve on Santa Cruz Island, collected mussels from Fraser Point for the program in March.

Ann Vileisis, an author researching abalone for a new book, volunteered during the spring intertidal monitoring trip to San Miguel Island to see black abalone in their natural habitat. We experienced inclement weather during part of the trip which inhibited access to some crevices normally inhabited by black abalone, but we still managed to find 125 individuals at Otter Harbor.

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

In May, Dan was called to Gulf Islands National Seashore to assist with the Deepwater Horizon oil spill. The Mississippi Canyon incident was the result of the British Petroleum Deepwater Horizon drilling platform explosion on April 20, 2010. Dan was at GUIS May 3-23 as a resource advisor. Oil was primarily staying offshore and few tar balls or oiled birds were

encountered at that point. Stephen and Jacob were resource advisors at Dry Tortugas National Park for 21 day details during the months June and July. At the time, there were concerns that spilled oil would become entrained within the Loop Current and taken to south Florida, which fortunately did not occur.

Table 10. 2010 Sampling dates for Rocky Intertidal Monitoring sites

Site	Site Codes	Spring	Fall
Cuyler Harbor, SMI	SMCH	4/18/10	12/7/10
Crook Point, SMI	SMCP	4/20/10	12/6/10
Otter Harbor, SMI	SMOH	4/21/10	12/4/10
Harris Point, SMI	SMHP	4/19/10	12/5/10
Fossil Reef, SRI	SRFR	*	*
Johnson's Lee, SRI	SRJL	*	*
Ford Point, SRI	SRFP	*	*
Northwest-Talcott, SRI	SRNWT	*	*
East Point, SRI	SREP	*	*
Fraser Cove/Forney Cove, SCI	SCFC	3/24/10	11/19/10
Trailer, SCI	SCTR	3/26/10	11/18/10
Willows Anchorage, SCI	SCWA	3/25/10	11/21-22/10
Scorpion Rock, SCI	SCSR	3/30/10	12/3/10
Prisoner's Harbor, SCI	SCPH	3/23/10	11/17/10
Orizaba Cove, SCI	SCOC	*	11/3/10
Cat Rock, ANI	ANCR	3/11/10	11/4/10
South Frenchy's Cove, ANI	ANSFC	3/11/10	11/5/10
Middle Anacapa-West	ANMW	3/12/10	12/2/10
Middle Anacapa-East	ANME	3/12/10	12/2/10
Landing Cove, SBI	SBLC	--	10/6/10, 10/8/10
Sealion Rookery, SBI	SBSLR	--	10/7/10

--no spring sample because of nesting pelicans

* no sampling due to logistical problems

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 *Pterocliadiella capillacea*. The mussel taxa are *Mytilus* spp. with *Mytilus californianus* dominating at all sites. In 2004, horse mussels, *Septifer bifurcates* or *Brachydontes 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

Cat Rock, Anacapa Island - Spring 2010 (3/11/10)

Silvetia 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	47	42	9	0	0	0	0	0	0	2	0	0	0	100
	32	49	37	0	14	0	0	0	0	0	0	0	0	0	100
	33	59	25	0	9	0	0	0	0	0	7	0	0	0	100
	35	64	27	0	9	0	0	0	0	0	0	0	0	0	100
	36	71	22	0	6	1	0	0	0	0	0	0	0	0	100
	37	59	22	0	13	0	0	0	0	0	6	0	0	0	100
	38	95	3	0	2	0	0	0	0	0	0	0	0	0	100
	39	60	36	0	1	0	0	0	0	0	3	0	0	0	100
	135	49	41	0	0	0	0	0	1	0	9	0	0	0	100
	Mean	61.44	28.33	1.00	6.00	.11	.00	.00	.11	.00	3.00	.00	.00	.00	100.00
	StDev	14.82	12.33	3.00	5.52	.33	.00	.00	.33	.00	3.50	.00	.00	.00	.00
Endocladia	13	32	2	6	46	0	0	4	0	0	9	1	0	0	100
	14	26	0	38	14	0	0	7	0	0	10	5	0	0	100
	19	50	3	0	40	0	1	0	0	0	6	0	0	0	100
	51	16	0	5	8	0	0	0	8	0	56	7	0	0	100
	52	15	0	7	21	0	0	19	9	0	26	3	0	0	100
	54	12	0	23	33	0	0	3	4	0	23	2	0	0	100
	212	28	3	2	52	0	0	3	0	0	3	9	0	0	100
	467	25	0	12	25	0	0	35	0	0	3	0	0	0	100
	492	25	4	15	33	0	1	2	2	0	17	1	0	0	100
	Mean	25.44	1.33	12.00	30.22	.00	.22	8.11	2.56	.00	17.00	3.11	.00	.00	100.00
	StDev	11.36	1.66	12.04	14.59	.00	.44	11.62	3.64	.00	16.82	3.22	.00	.00	.00
Silvetia (Rockweed)	2	27	10	1	40	19	0	0	0	0	3	0	0	0	100
	3	42	28	1	23	0	1	1	1	0	3	0	0	0	100
	4	47	24	0	20	4	0	0	0	0	5	0	0	0	100
	5	25	4	15	33	0	1	2	2	0	17	1	0	0	100
	6	39	9	0	14	13	6	0	0	0	17	2	0	0	100
	8	55	26	0	2	0	2	0	0	0	13	2	0	0	100
	9	40	8	3	6	2	8	0	0	0	27	6	0	0	100
	10	68	17	0	8	0	0	0	0	0	3	4	0	0	100
	55	32	19	6	22	1	0	3	2	0	15	0	0	0	100
	Mean	41.67	16.11	2.89	18.67	4.33	2.00	.67	.56	.00	11.44	1.67	.00	.00	100.00
	StDev	13.67	8.74	4.96	12.58	6.91	2.96	1.12	.88	.00	8.47	2.12	.00	.00	.00

B-2

Percent Cover of Index Species

Cat Rock, Anacapa Island - Spring 2010 (3/11/10) (continued)

Silvetia 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	26	0	0	0	31	0	0	30	5	0	0	100
	164	19	2	22	1	0	0	24	0	0	32	0	0	0	100
	203	24	0	16	1	0	0	21	0	0	38	0	0	0	100
	204	13	1	13	0	0	0	49	0	0	19	5	0	0	100
	468	13	0	20	0	0	0	21	3	0	42	1	0	0	100
	470	43	0	16	6	0	0	17	2	0	16	0	0	0	100
	471	24	0	10	7	0	0	32	3	0	21	3	0	0	100
	472	16	0	12	0	0	0	58	0	0	12	2	0	0	100
	473	33	0	17	2	0	0	22	6	0	19	1	0	0	100
	Mean	21.44	.33	16.89	1.89	.00	.00	30.56	1.56	.00	25.44	1.89	.00	.00	100.00
	StDev	11.01	.71	5.09	2.71	.00	.00	14.05	2.13	.00	10.42	2.03	.00	.00	.00

Percent Cover of Index Species Middle-East, Anacapa Island - Spring 2010 (3/12/10)

Silvetia 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	41	2	17	1	0	0	0	0	0	39	0	0	0	100
	244	72	1	1	14	0	0	0	0	0	12	0	0	0	100
	245	72	1	6	4	0	0	0	0	0	16	1	0	0	100
	Mean	61.67	1.33	8.00	6.33	.00	.00	.00	.00	.00	22.33	.33	.00	.00	100.00
	StDev	17.90	.58	8.19	6.81	.00	.00	.00	.00	.00	14.57	.58	.00	.00	.00
Endocladia	240	37	0	1	14	0	0	0	0	0	48	0	0	0	100
	241	28	0	9	14	0	0	0	0	0	48	0	0	1	100
	242	55	2	1	21	0	0	0	0	0	21	0	0	0	100
	Mean	40.00	.67	3.67	16.33	.00	.00	.00	.00	.00	39.00	.00	.00	.33	100.00
	StDev	13.75	1.15	4.62	4.04	.00	.00	.00	.00	.00	15.59	.00	.00	.58	.00
Silvetia (Rockweed)	53	49	1	5	4	0	0	0	6	0	35	0	0	0	100
	237	36	1	0	3	0	1	0	1	0	54	0	0	4	100
	469	53	1	4	1	0	0	0	0	0	40	0	0	1	100
	Mean	46.00	1.00	3.00	2.67	.00	.33	.00	2.33	.00	43.00	.00	.00	1.67	100.00
	StDev	8.89	.00	2.65	1.53	.00	.58	.00	3.21	.00	9.85	.00	.00	2.08	.00
Mussels	476	10	0	6	0	0	0	0	5	0	79	0	0	0	100
	477	6	0	5	0	0	0	0	7	0	82	0	0	0	100
	478	9	0	4	0	0	0	0	3	0	81	1	0	2	100
	Mean	8.33	.00	5.00	.00	.00	.00	.00	5.00	.00	80.67	.33	.00	.67	100.00
	StDev	2.08	.00	1.00	.00	.00	.00	.00	2.00	.00	1.53	.58	.00	1.15	.00

Percent Cover of Index Species

Middle-West, Anacapa Island - Spring 2010 (3/12/10)

Silvetia 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	54	44	0	0	0	0	0	0	0	2	0	0	0	100
	448	64	0	0	11	0	0	0	0	0	25	0	0	0	100
	449	61	3	0	0	0	0	0	0	0	36	0	0	0	100
	450	47	5	0	4	0	0	0	0	0	44	0	0	0	100
	451	60	0	0	34	0	0	0	0	0	6	0	0	0	100
	Mean	57.20	10.40	.00	9.80	.00	.00	.00	.00	.00	22.60	.00	.00	.00	100.00
	StDev	6.76	18.90	.00	14.25	.00	.00	.00	.00	.00	18.32	.00	.00	.00	.00
Endocladia	457	11	0	0	39	0	0	0	6	0	44	0	0	0	100
	458	29	1	2	37	0	0	0	0	0	31	0	0	0	100
	459	78	0	0	6	0	0	0	0	0	16	0	0	0	100
	460	65	9	0	17	0	0	0	0	0	9	0	0	0	100
	461	83	4	0	0	0	0	0	0	0	13	0	0	0	100
	Mean	53.20	2.80	.40	19.80	.00	.00	.00	1.20	.00	22.60	.00	.00	.00	100.00
	StDev	31.66	3.83	.89	17.71	.00	.00	.00	2.68	.00	14.57	.00	.00	.00	.00
Silvetia (Rockweed)	452	71	11	4	0	0	0	0	0	0	14	0	0	0	100
	453	74	5	3	0	0	0	0	0	0	14	4	0	0	100
	454	13	0	2	13	0	0	0	14	0	58	0	0	0	100
	455	37	0	8	15	0	0	0	7	0	31	2	0	0	100
	456	43	0	5	3	0	0	0	0	0	49	0	0	0	100
	Mean	47.60	3.20	4.40	6.20	.00	.00	.00	4.20	.00	33.20	1.20	.00	.00	100.00
	StDev	25.37	4.87	2.30	7.26	.00	.00	.00	6.26	.00	20.04	1.79	.00	.00	.00
Mussels	462	24	0	11	2	0	0	0	5	0	56	1	0	1	100
	463	19	0	21	3	0	0	0	4	0	52	1	0	0	100
	464	9	0	19	0	0	0	0	17	0	54	0	0	1	100
	465	2	0	17	1	0	0	0	28	0	52	0	0	0	100
	466	5	0	2	0	0	0	0	4	0	88	1	0	0	100
	Mean	11.80	.00	14.00	1.20	.00	.00	.00	11.60	.00	60.40	.60	.00	.40	100.00
	StDev	9.36	.00	7.68	1.30	.00	.00	.00	10.69	.00	15.52	.55	.00	.55	.00

B-5

Percent Cover of Index Species

S Frenchy's Cove, Anacapa Island - Spring 2010 (3/12/10)

Silvetia 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	29	14	0	42	0	0	0	0	0	15	0	0	0	100
	250	25	27	0	41	0	0	0	0	0	7	0	0	0	100
	251	60	26	0	13	0	0	0	0	0	1	0	0	0	100
	252	48	30	0	19	0	0	0	0	0	2	0	1	0	100
	253	22	23	0	52	0	0	0	0	0	3	0	0	0	100
	Mean	36.80	24.00	.00	33.40	.00	.00	.00	.00	.00	5.60	.00	.20	.00	100.00
	StDev	16.45	6.12	.00	16.59	.00	.00	.00	.00	.00	5.73	.00	.45	.00	.00
Endocladia	154	3	0	0	95	1	0	0	0	0	1	0	0	0	100
	155	15	0	0	76	0	8	0	0	0	1	0	0	0	100
	256	11	0	0	69	0	9	0	1	0	10	0	0	0	100
	257	11	0	0	88	0	0	0	0	0	1	0	0	0	100
	258	12	1	0	64	0	22	0	0	0	1	0	0	0	100
	Mean	10.40	.20	.00	78.40	.20	7.80	.00	.20	.00	2.80	.00	.00	.00	100.00
	StDev	4.45	.45	.00	12.93	.45	9.01	.00	.45	.00	4.02	.00	.00	.00	.00
Silvetia (Rockweed)	259	25	2	0	5	0	12	0	0	0	56	0	0	0	100
	260	20	4	0	15	0	37	0	0	0	24	0	0	0	100
	261	10	2	0	0	0	22	0	0	0	66	0	0	0	100
	262	37	2	0	37	0	3	0	2	0	19	0	0	0	100
	263	42	1	0	4	0	41	0	0	0	12	0	0	0	100
	Mean	26.80	2.20	.00	12.20	.00	23.00	.00	.40	.00	35.40	.00	.00	.00	100.00
	StDev	12.91	1.10	.00	14.92	.00	16.14	.00	.89	.00	24.02	.00	.00	.00	.00
Mussels	201	12	0	0	0	0	0	35	38	0	15	0	0	0	100
	202	13	0	0	0	0	0	33	34	0	20	0	0	0	100
	264	10	0	0	0	0	0	30	40	0	20	0	0	0	100
	265	9	0	0	0	0	0	63	18	0	10	0	0	0	100
	266	6	0	0	0	0	0	25	17	0	52	0	0	0	100
	Mean	10.00	.00	.00	.00	.00	.00	37.20	29.40	.00	23.40	.00	.00	.00	100.00
	StDev	2.74	.00	.00	.00	.00	.00	14.91	11.08	.00	16.52	.00	.00	.00	.00

B-6

Percent Cover of Index Species

Crook Point, San Miguel Island - Spring 2010 (4/20/10)

Silvetia 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	81	19	0	0	0	0	0	0	0	0	0	0	0	100
	147	65	35	0	0	0	0	0	0	0	0	0	0	0	100
	148	60	40	0	0	0	0	0	0	0	0	0	0	0	100
	149	64	10	0	21	0	0	3	0	0	2	0	0	0	100
	495	48	45	0	7	0	0	0	0	0	0	0	0	0	100
	Mean	63.60	29.80	.00	5.60	.00	.00	.60	.00	.00	.40	.00	.00	.00	100.00
	StDev	11.84	14.75	.00	9.13	.00	.00	1.34	.00	.00	.89	.00	.00	.00	.00
Endocladia	386	40	7	0	50	0	0	2	0	0	1	0	0	0	100
	387	8	5	0	55	0	0	0	0	0	31	1	0	0	100
	388	40	14	0	29	0	0	0	0	0	17	0	0	0	100
	389	4	0	0	39	14	0	41	0	0	2	0	0	0	100
	390	41	7	0	23	0	0	9	0	1	19	0	0	0	100
	Mean	26.60	6.60	.00	39.20	2.80	.00	10.40	.00	.20	14.00	.20	.00	.00	100.00
	StDev	18.86	5.03	.00	13.54	6.26	.00	17.50	.00	.45	12.61	.45	.00	.00	.00
Silvetia (Rockweed)	396	28	4	0	42	0	1	13	0	0	11	1	0	0	100
	397	0	0	0	0	0	0	96	0	0	4	0	0	0	100
	398	12	2	0	12	0	0	28	0	2	44	0	0	0	100
	399	36	4	0	0	0	0	0	10	0	47	3	0	0	100
	400	16	0	0	73	7	0	3	0	1	0	0	0	0	100
	Mean	18.40	2.00	.00	25.40	1.40	.20	28.00	2.00	.60	21.20	.80	.00	.00	100.00
	StDev	14.03	2.00	.00	31.67	3.13	.45	39.55	4.47	.89	22.55	1.30	.00	.00	.00
Mussels	381	16	6	1	1	0	0	66	0	4	6	0	0	0	100
	382	0	0	0	0	0	0	94	0	0	6	0	0	0	100
	383	6	0	0	0	0	0	91	0	0	3	0	0	0	100
	384	4	4	1	0	0	0	82	0	0	8	1	0	0	100
	385	10	3	2	0	0	0	74	0	2	9	0	0	0	100
	Mean	7.20	2.60	.80	.20	.00	.00	81.40	.00	1.20	6.40	.20	.00	.00	100.00
	StDev	6.10	2.61	.84	.45	.00	.00	11.65	.00	1.79	2.30	.45	.00	.00	.00

Percent Cover of Index Species

Cuyler Harbor, San Miguel Island - Spring 2010 (4/18/10)

Silvetia 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	44	56	0	0	0	0	0	0	0	0	0	0	0	100
	417	53	13	0	34	0	0	0	0	0	0	0	0	0	100
	418	39	53	0	7	0	0	1	0	0	0	0	0	0	100
	419	60	8	0	31	0	0	0	0	0	1	0	0	0	100
	420	28	7	0	63	0	0	0	0	0	2	0	0	0	100
	Mean	44.80	27.40	.00	27.00	.00	.00	.20	.00	.00	.60	.00	.00	.00	100.00
	StDev	12.40	24.87	.00	24.95	.00	.00	.45	.00	.00	.89	.00	.00	.00	.00
Endocladia	411	42	2	6	23	0	0	17	1	1	3	5	0	0	100
	412	10	19	0	48	0	0	15	0	1	7	0	0	0	100
	413	29	0	0	30	0	23	0	0	0	18	0	0	0	100
	414	31	1	0	64	0	0	0	1	0	3	0	0	0	100
	415	8	0	0	77	0	0	0	0	0	14	1	0	0	100
	Mean	24.00	4.40	1.20	48.40	.00	4.60	6.40	.40	.40	9.00	1.20	.00	.00	100.00
	StDev	14.58	8.20	2.68	22.61	.00	10.29	8.79	.55	.55	6.75	2.17	.00	.00	.00
Silvetia (Rockweed)	406	16	0	0	14	0	38	0	0	0	8	24	0	0	100
	407	13	0	0	0	0	75	0	0	0	10	2	0	0	100
	408	58	7	7	11	0	4	0	1	0	9	3	0	0	100
	409	57	9	2	8	0	0	1	0	0	11	12	0	0	100
	410	73	2	9	1	0	0	0	0	0	8	7	0	0	100
	Mean	43.40	3.60	3.60	6.80	.00	23.40	.20	.20	.00	9.20	9.60	.00	.00	100.00
	StDev	27.15	4.16	4.16	6.14	.00	32.97	.45	.45	.00	1.30	8.96	.00	.00	.00
Mussels	401	17	4	21	0	0	0	1	1	3	19	34	0	0	100
	402	4	1	3	0	0	0	44	5	0	26	17	0	0	100
	403	4	0	7	0	0	0	51	7	0	14	17	0	0	100
	404	17	1	21	0	0	0	12	6	2	17	24	0	0	100
	405	33	0	7	0	0	0	43	0	8	1	8	0	0	100
	Mean	15.00	1.20	11.80	.00	.00	.00	30.20	3.80	2.60	15.40	20.00	.00	.00	100.00
	StDev	11.98	1.64	8.56	.00	.00	.00	22.20	3.11	3.29	9.18	9.67	.00	.00	.00

B-8

Percent Cover of Index Species

Harris Point, San Miguel Island - Spring 2010 (4/19/10)

Silvetia Zone	Plot	Bare Rock	Acorn Barnacle	Tetraclita	Endocladia	Hesperophycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	440	23	77	0	0	0	0	0	0	0	0	0	0	0	100
	441	20	78	0	2	0	0	0	0	0	0	0	0	0	100
	442	14	83	0	3	0	0	0	0	0	0	0	0	0	100
	443	51	39	0	0	0	0	0	0	0	0	0	10	0	100
	444	39	60	0	0	0	0	1	0	0	0	0	0	0	100
	Mean	29.40	67.40	.00	1.00	.00	.00	.20	.00	.00	.00	.00	2.00	.00	100.00
	StDev	15.21	18.09	.00	1.41	.00	.00	.45	.00	.00	.00	.00	4.47	.00	.00
Endocladia	431	12	41	1	35	1	0	4	1	0	5	0	0	0	100
	432	37	25	4	30	0	0	0	0	0	4	0	0	0	100
	433	35	35	0	26	0	0	0	0	0	4	0	0	0	100
	434	60	9	0	22	0	0	0	0	0	9	0	0	0	100
	435	6	2	0	11	68	0	0	0	0	13	0	0	0	100
	Mean	30.00	22.40	1.00	24.80	13.80	.00	.80	.20	.00	7.00	.00	.00	.00	100.00
	StDev	21.64	16.64	1.73	9.09	30.30	.00	1.79	.45	.00	3.94	.00	.00	.00	.00
Mussels	426	15	2	10	4	0	0	54	0	5	8	2	0	0	100
	427	16	29	10	13	2	0	3	0	0	22	5	0	0	100
	428	31	42	5	1	1	0	0	0	0	16	4	0	0	100
	429	16	49	1	4	0	0	1	7	0	22	0	0	0	100
	430	12	0	7	0	0	0	56	0	0	25	0	0	0	100
	Mean	18.00	24.40	6.60	4.40	.60	.00	22.80	1.40	1.00	18.60	2.20	.00	.00	100.00
	StDev	7.45	22.55	3.78	5.13	.89	.00	29.42	3.13	2.24	6.77	2.28	.00	.00	.00
Tetraclita	436	13	10	32	0	0	0	27	0	0	15	3	0	0	100
	437	4	7	39	0	0	0	16	1	1	31	1	0	0	100
	438	17	2	0	10	0	0	0	15	0	54	2	0	0	100
	439	8	18	38	4	0	0	20	0	0	8	4	0	0	100
	445	34	9	27	0	0	0	15	0	0	11	4	0	0	100
	Mean	15.20	9.20	27.20	2.80	.00	.00	15.60	3.20	.20	23.80	2.80	.00	.00	100.00
	StDev	11.61	5.81	15.96	4.38	.00	.00	9.91	6.61	.45	19.07	1.30	.00	.00	.00
Hesperophycus	421	20	1	0	27	52	0	0	0	0	0	0	0	0	100
	422	36	8	0	30	8	0	0	1	0	16	1	0	0	100
	423	36	4	0	36	18	0	0	0	0	6	0	0	0	100
	424	68	15	0	15	0	0	0	0	0	0	0	2	0	100
	425	41	3	0	0	55	0	0	0	0	1	0	0	0	100
	Mean	40.20	6.20	.00	21.60	26.60	.00	.00	.20	.00	4.60	.20	.40	.00	100.00
	StDev	17.44	5.54	.00	14.29	25.39	.00	.00	.45	.00	6.84	.45	.89	.00	.00

B-9

Percent Cover of Index Species

Otter Harbor, San Miguel Island - Spring 2010 (4/21/10)

Silvetia 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	84	6	0	0	0	0	0	0	0	2	0	8	0	100
	371	11	40	0	0	0	0	0	0	0	33	0	16	0	100
	372	53	44	0	0	0	0	0	0	0	0	3	0	0	100
	373	36	58	0	0	0	0	0	0	0	6	0	0	0	100
	374	1	0	0	0	0	0	0	38	0	61	0	0	0	100
	Mean	37.00	29.60	.00	.00	.00	.00	.00	7.60	.00	20.40	.60	4.80	.00	100.00
	StDev	33.31	25.27	.00	.00	.00	.00	.00	16.99	.00	26.31	1.34	7.16	.00	.00
Endocladia	360	36	8	2	40	0	5	2	0	1	4	2	0	0	100
	361	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	362	5	0	0	93	0	0	0	0	0	2	0	0	0	100
	363	22	1	0	67	0	0	0	0	0	10	0	0	0	100
	364	21	0	0	74	0	1	0	0	0	4	0	0	0	100
	Mean	16.80	1.80	.40	54.80	.00	1.20	.40	.00	.20	4.00	.40	.00	.00	80.00
	StDev	14.45	3.49	.89	36.05	.00	2.17	.89	.00	.45	3.74	.89	.00	.00	44.72
Silvetia (Rockweed)	355	35	20	0	0	0	0	0	0	0	42	3	0	0	100
	356	28	0	1	44	0	1	0	0	0	26	0	0	0	100
	357	21	0	0	63	0	0	0	0	0	16	0	0	0	100
	358	40	32	0	23	0	0	0	0	0	5	0	0	0	100
	359	36	52	0	5	0	0	0	0	0	5	1	1	0	100
	Mean	32.00	20.80	.20	27.00	.00	.20	.00	.00	.00	18.80	.80	.20	.00	100.00
	StDev	7.52	22.16	.45	26.52	.00	.45	.00	.00	.00	15.64	1.30	.45	.00	.00
Mussels	375	8	0	0	1	0	0	51	0	4	36	0	0	0	100
	376	18	0	0	1	0	0	41	1	0	39	0	0	0	100
	378	2	0	1	2	0	0	42	6	7	40	0	0	0	100
	379	7	0	1	10	0	0	19	0	2	61	0	0	0	100
	380	1	0	0	0	0	0	60	0	7	31	1	0	0	100
	Mean	7.20	.00	.40	2.80	.00	.00	42.60	1.40	4.00	41.40	.20	.00	.00	100.00
	StDev	6.76	.00	.55	4.09	.00	.00	15.27	2.61	3.08	11.50	.45	.00	.00	.00

B-10

Percent Cover of Index Species

Fraser Cove, Santa Cruz Island - Spring 2010 (3/24/10)

Silvetia 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	18	61	0	9	0	0	3	0	0	8	0	1	0	100
	877	28	49	0	7	0	0	3	1	0	11	1	0	0	100
	878	43	47	0	6	0	0	0	0	0	0	0	4	0	100
	879	36	53	0	9	0	0	0	0	0	0	0	2	0	100
	880	50	47	0	1	0	0	0	0	0	0	0	2	0	100
	Mean	35.00	51.40	.00	6.40	.00	.00	1.20	.20	.00	3.80	.20	1.80	.00	100.00
	StDev	12.53	5.90	.00	3.29	.00	.00	1.64	.45	.00	5.31	.45	1.48	.00	.00
Endocladia	881	25	10	0	44	0	0	12	0	0	9	0	0	0	100
	882	40	6	0	44	0	0	2	0	0	8	0	0	0	100
	883	40	5	0	53	0	0	0	0	0	1	1	0	0	100
	884	4	0	0	96	0	0	0	0	0	0	0	0	0	100
	885	6	15	0	73	0	0	0	0	0	6	0	0	0	100
	Mean	23.00	7.20	.00	62.00	.00	.00	2.80	.00	.00	4.80	.20	.00	.00	100.00
	StDev	17.55	5.63	.00	22.39	.00	.00	5.22	.00	.00	4.09	.45	.00	.00	.00
Silvetia (Rockweed)	896	57	2	0	23	5	0	0	0	0	13	0	0	0	100
	897	24	1	0	16	14	14	0	10	0	17	1	0	3	100
	898	27	0	0	7	5	38	0	3	0	18	2	0	0	100
	899	44	5	0	22	4	5	0	0	0	20	0	0	0	100
	900	23	3	0	4	37	33	0	0	0	0	0	0	0	100
	Mean	35.00	2.20	.00	14.40	13.00	18.00	.00	2.60	.00	13.60	.60	.00	.60	100.00
	StDev	14.95	1.92	.00	8.62	14.02	16.84	.00	4.34	.00	8.02	.89	.00	1.34	.00
Mussels	891	2	1	0	0	0	0	73	0	0	9	15	0	0	100
	892	12	2	0	0	0	0	69	0	0	6	11	0	0	100
	893	5	1	0	0	0	0	82	0	0	1	11	0	0	100
	894	7	6	1	0	0	0	72	0	1	1	10	0	2	100
	895	6	7	1	0	0	0	60	2	0	13	11	0	0	100
	Mean	6.40	3.40	.40	.00	.00	.00	71.20	.40	.20	6.00	11.60	.00	.40	100.00
	StDev	3.65	2.88	.55	.00	.00	.00	7.92	.89	.45	5.20	1.95	.00	.89	.00
Pollicipes	901	18	15	1	0	0	0	58	0	6	1	1	0	0	100
	902	16	18	7	13	0	0	0	5	0	20	21	0	0	100
	903	4	0	0	0	0	0	54	0	11	16	15	0	0	100
	904	13	3	1	0	0	0	53	0	13	6	11	0	0	100
	905	7	2	1	0	0	0	60	0	16	3	11	0	0	100
	Mean	11.60	7.60	2.00	2.60	.00	.00	45.00	1.00	9.20	9.20	11.80	.00	.00	100.00
	StDev	5.94	8.26	2.83	5.81	.00	.00	25.32	2.24	6.30	8.35	7.29	.00	.00	.00

B-11

Percent Cover of Index Species

Fraser Cove, Santa Cruz Island - Spring 2010 (3/24/10) (continued)

Silvetia 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	30	22	0	0	0	0	0	0	0	11	0	37	0	100
	907	40	18	0	0	0	0	0	0	0	12	0	30	0	100
	908	40	13	0	0	0	0	0	0	0	0	0	47	0	100
	909	63	12	0	0	0	0	0	0	0	0	0	25	0	100
	910	36	7	0	0	0	0	0	0	0	0	0	57	0	100
	Mean	41.80	14.40	.00	.00	.00	.00	.00	.00	.00	4.60	.00	39.20	.00	100.00
	StDev	12.54	5.77	.00	.00	.00	.00	.00	.00	.00	6.31	.00	12.93	.00	.00
Hesperophycus	886	37	0	0	22	40	0	0	0	0	1	0	0	0	100
	887	59	3	0	17	15	0	0	0	0	6	0	0	0	100
	888	22	3	0	46	29	0	0	0	0	0	0	0	0	100
	889	58	3	0	17	20	2	0	0	0	0	0	0	0	100
	890	32	3	0	32	27	6	0	0	0	0	0	0	0	100
	Mean	41.60	2.40	.00	26.80	26.20	1.60	.00	.00	.00	1.40	.00	.00	.00	100.00
	StDev	16.35	1.34	.00	12.36	9.52	2.61	.00	.00	.00	2.61	.00	.00	.00	.00

Percent Cover of Index Species

Prisoner's Harbor, Santa Cruz Island - Spring 2010 (3/23/10)

Silvetia 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	11	31	0	0	0	0	0	0	0	58	0	0	0	100
	827	11	16	0	5	1	0	0	0	0	66	1	0	0	100
	828	1	50	0	18	0	0	0	6	0	25	0	0	0	100
	829	13	46	0	10	0	0	0	8	0	19	4	0	0	100
	830	17	22	0	46	5	0	0	2	0	7	1	0	0	100
	Mean	10.60	33.00	.00	15.80	1.20	.00	.00	3.20	.00	35.00	1.20	.00	.00	100.00
	StDev	5.90	14.76	.00	18.14	2.17	.00	.00	3.63	.00	25.64	1.64	.00	.00	.00
Endocladia	831	28	24	0	38	0	0	0	0	0	8	2	0	0	100
	832	10	46	0	16	1	0	0	0	0	27	0	0	0	100
	833	31	53	0	10	0	0	0	0	0	6	0	0	0	100
	834	43	27	0	16	1	0	0	0	0	11	2	0	0	100
	835	30	33	0	17	3	0	0	0	0	17	0	0	0	100
	Mean	28.40	36.60	.00	19.40	1.00	.00	.00	.00	.00	13.80	.80	.00	.00	100.00
	StDev	11.84	12.46	.00	10.76	1.22	.00	.00	.00	.00	8.47	1.10	.00	.00	.00
Silvetia (Rockweed)	846	9	25	0	36	3	1	0	0	0	26	0	0	0	100
	847	19	10	0	8	0	0	0	2	0	61	0	0	0	100
	848	13	12	0	4	0	0	0	4	0	67	0	0	0	100
	849	12	1	1	8	0	29	0	0	0	49	0	0	0	100
	850	20	3	0	0	0	21	0	1	0	55	0	0	0	100
	Mean	14.60	10.20	.20	11.20	.60	10.20	.00	1.40	.00	51.60	.00	.00	.00	100.00
	StDev	4.72	9.47	.45	14.25	1.34	13.81	.00	1.67	.00	15.81	.00	.00	.00	.00
Mussels	841	2	0	0	0	0	0	0	4	0	94	0	0	0	100
	842	2	5	7	0	0	0	0	3	0	81	2	0	0	100
	843	1	0	6	0	0	0	0	3	0	76	14	0	0	100
	844	2	1	0	0	0	0	0	14	0	83	0	0	0	100
	845	3	3	23	0	0	0	0	9	0	54	8	0	0	100
	Mean	2.00	1.80	7.20	.00	.00	.00	.00	6.60	.00	77.60	4.80	.00	.00	100.00
	StDev	.71	2.17	9.42	.00	.00	.00	.00	4.83	.00	14.74	6.10	.00	.00	.00
Hesperophycus	836	50	26	0	16	0	0	0	0	0	8	0	0	0	100
	837	30	32	0	3	1	0	0	0	0	34	0	0	0	100
	838	44	18	0	2	19	0	0	0	0	17	0	0	0	100
	839	12	76	0	5	5	0	0	0	0	2	0	0	0	100
	840	31	36	0	5	8	0	0	0	0	20	0	0	0	100
	Mean	33.40	37.60	.00	6.20	6.60	.00	.00	.00	.00	16.20	.00	.00	.00	100.00
	StDev	14.69	22.51	.00	5.63	7.64	.00	.00	.00	.00	12.26	.00	.00	.00	.00

B-13

Percent Cover of Index Species

Scorpion Rock, Santa Cruz Island - Spring 2010 (3/28/10)

Silvetia 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
B-14	Chthamalus/Balanus	801	28	7	0	65	0	0	0	0	0	0	0	0	100
		802	51	5	0	43	0	0	0	0	1	0	0	0	100
		803	78	3	0	18	0	0	0	0	1	0	0	0	100
		804	51	4	0	43	0	0	0	0	2	0	0	0	100
		805	74	25	0	1	0	0	0	0	0	0	0	0	100
		Mean	56.40	8.80	.00	34.00	.00	.00	.00	.00	.80	.00	.00	.00	100.00
		StDev	20.26	9.18	.00	24.84	.00	.00	.00	.00	.84	.00	.00	.00	.00
	Endocladia	806	9	0	1	82	0	1	0	0	7	0	0	0	100
		807	6	0	0	72	0	0	0	0	22	0	0	0	100
		808	26	0	1	46	0	0	0	0	27	0	0	0	100
		809	47	3	0	46	0	0	0	0	4	0	0	0	100
		810	28	1	0	57	0	0	0	0	14	0	0	0	100
		Mean	23.20	.80	.40	60.60	.00	.20	.00	.00	14.80	.00	.00	.00	100.00
		StDev	16.54	1.30	.55	16.02	.00	.45	.00	.00	9.73	.00	.00	.00	.00
	Mussels	816	11	0	16	1	0	0	13	0	58	1	0	0	100
B-14		817	13	0	22	0	0	0	30	0	34	1	0	0	100
		818	11	0	27	0	0	0	13	0	49	0	0	0	100
		819	18	0	11	3	0	0	16	0	51	1	0	0	100
		820	8	0	28	0	0	0	10	0	51	3	0	0	100
		Mean	12.20	.00	20.80	.80	.00	.00	16.40	.00	48.60	1.20	.00	.00	100.00
		StDev	3.70	.00	7.26	1.30	.00	.00	7.89	.00	8.85	1.10	.00	.00	.00
	Tetraclita	821	34	0	16	22	0	0	1	0	24	3	0	0	100
		822	52	0	9	8	0	0	1	0	29	1	0	0	100
		823	60	3	20	2	0	0	1	0	9	5	0	0	100
		824	72	0	14	1	0	0	0	0	11	2	0	0	100
		825	47	0	14	3	0	0	0	0	35	1	0	0	100
		Mean	53.00	.60	14.60	7.20	.00	.00	.60	.00	21.60	2.40	.00	.00	100.00
		StDev	14.21	1.34	3.97	8.70	.00	.00	.55	.00	11.30	1.67	.00	.00	.00
	Hesperophycus	811	43	0	1	23	29	1	0	0	3	0	0	0	100
B-14		812	26	1	0	57	13	1	1	0	1	0	0	0	100
		813	28	0	0	49	1	17	0	0	5	0	0	0	100
		814	74	0	0	25	0	1	0	0	0	0	0	0	100
		815	29	0	0	41	4	22	0	0	4	0	0	0	100
		Mean	40.00	.20	.20	39.00	9.40	8.40	.20	.00	2.60	.00	.00	.00	100.00
		StDev	20.16	.45	.45	14.83	12.10	10.29	.45	.00	2.07	.00	.00	.00	.00

Percent Cover of Index Species

Trailer, Santa Cruz Island - Spring 2010 (3/26/10)

Silvetia 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	54	20	0	22	0	0	0	0	0	3	1	0	0	100
	912	23	76	0	1	0	0	0	0	0	0	0	0	0	100
	913	31	35	0	30	0	0	2	0	0	2	0	0	0	100
	914	10	90	0	0	0	0	0	0	0	0	0	0	0	100
	915	41	57	1	0	0	0	0	0	0	0	1	0	0	100
	Mean	31.80	55.60	.20	10.60	.00	.00	.40	.00	.00	1.00	.40	.00	.00	100.00
	StDev	16.81	28.69	.45	14.35	.00	.00	.89	.00	.00	1.41	.55	.00	.00	.00
Silvetia (Rockweed)	926	11	0	0	2	0	83	0	0	0	4	0	0	0	100
	927	55	5	0	1	0	31	0	0	0	8	0	0	0	100
	928	24	2	0	7	1	61	0	0	0	5	0	0	0	100
	929	19	3	0	0	0	53	1	0	0	24	0	0	0	100
	930	22	2	0	0	0	46	0	0	0	23	7	0	0	100
	Mean	26.20	2.40	.00	2.00	.20	54.80	.20	.00	.00	12.80	1.40	.00	.00	100.00
	StDev	16.84	1.82	.00	2.92	.45	19.24	.45	.00	.00	9.88	3.13	.00	.00	.00
Mussels	921	4	0	5	0	0	0	0	8	0	56	27	0	0	100
	922	3	0	1	0	0	0	4	2	0	36	54	0	0	100
	923	0	0	0	0	0	0	0	4	0	81	15	0	0	100
	924	3	4	0	0	0	0	1	1	0	57	34	0	0	100
	925	11	1	0	0	0	0	87	0	0	0	1	0	0	100
	Mean	4.20	1.00	1.20	.00	.00	.00	18.40	3.00	.00	46.00	26.20	.00	.00	100.00
	StDev	4.09	1.73	2.17	.00	.00	.00	38.38	3.16	.00	30.26	19.97	.00	.00	.00
Hesperophycus	916	28	1	0	6	12	53	0	0	0	0	0	0	0	100
	917	31	6	0	29	8	25	0	0	0	1	0	0	0	100
	918	17	1	0	3	10	59	0	0	0	10	0	0	0	100
	919	68	17	0	15	0	0	0	0	0	0	0	0	0	100
	920	31	5	0	19	15	23	0	0	0	7	0	0	0	100
	951	88	3	0	9	0	0	0	0	0	0	0	0	0	100
	Mean	43.83	5.50	.00	13.50	7.50	26.67	.00	.00	.00	3.00	.00	.00	.00	100.00
	StDev	27.69	5.99	.00	9.59	6.25	25.21	.00	.00	.00	4.38	.00	.00	.00	.00

B-15

Percent Cover of Index Species

Willows Anchorage, Santa Cruz Island - Spring 2010 (3/25/10)

Silvetia 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
B-16	Endocladia	931	5	0	0	95	0	0	0	0	0	0	0	0	100
		932	24	0	0	75	0	0	0	0	1	0	0	0	100
		933	18	0	0	82	0	0	0	0	0	0	0	0	100
		934	4	0	0	94	0	0	0	0	2	0	0	0	100
		935	10	0	4	80	0	0	0	0	6	0	0	0	100
	Mean	12.20	.00	.80	85.20	.00	.00	.00	.00	.00	1.80	.00	.00	.00	100.00
	StDev	8.61	.00	1.79	8.87	.00	.00	.00	.00	.00	2.49	.00	.00	.00	.00
	Silvetia (Rockweed)	946	23	0	0	35	0	0	0	0	25	17	0	0	100
		947	11	0	0	36	0	0	0	0	30	23	0	0	100
		948	59	8	0	4	0	0	0	0	23	6	0	0	100
B-16		949	53	0	0	0	7	0	0	0	33	7	0	0	100
		950	25	1	0	9	0	0	0	0	25	40	0	0	100
	Mean	34.20	1.80	.00	16.80	.00	1.40	.00	.00	.00	27.20	18.60	.00	.00	100.00
	StDev	20.72	3.49	.00	17.37	.00	3.13	.00	.00	.00	4.15	13.90	.00	.00	.00
	Mussels	941	4	0	17	0	0	69	0	2	7	1	0	0	100
		942	6	0	7	0	0	0	19	0	66	2	0	0	100
		943	11	0	2	0	0	28	11	1	47	0	0	0	100
		944	8	0	3	0	0	61	9	0	19	0	0	0	100
		945	0	0	3	0	0	94	0	0	3	0	0	0	100
	Mean	5.80	.00	6.40	.00	.00	.00	50.40	7.80	.60	28.40	.60	.00	.00	100.00
B-16		StDev	4.15	.00	6.23	.00	.00	36.75	8.04	.89	27.16	.89	.00	.00	.00
	Hesperophycus	936	28	0	0	61	0	0	0	0	11	0	0	0	100
		937	67	2	0	0	0	0	0	0	31	0	0	0	100
		938	70	0	0	4	0	0	0	0	26	0	0	0	100
		939	59	4	0	0	0	0	0	0	37	0	0	0	100
		940	47	0	0	8	15	0	0	0	30	0	0	0	100
	Mean	54.20	1.20	.00	14.60	3.00	.00	.00	.00	.00	27.00	.00	.00	.00	100.00
	StDev	17.14	1.79	.00	26.15	6.71	.00	.00	.00	.00	9.77	.00	.00	.00	.00

Percent Cover of Index Species

Cat Rock, Anacapa Island - Fall 2010 (11/4/10)

Silvetia 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	40	45	0	15	0	0	0	0	0	0	0	0	0	100
	32	44	31	0	23	2	0	0	0	0	0	0	0	0	100
	33	36	43	0	20	0	0	0	1	0	0	0	0	0	100
	35	39	44	0	16	0	0	0	0	0	1	0	0	0	100
	36	35	49	0	15	0	0	0	0	0	1	0	0	0	100
	37	34	30	0	23	0	0	0	0	0	13	0	0	0	100
	38	83	16	0	0	0	0	0	0	0	1	0	0	0	100
	39	44	50	0	6	0	0	0	0	0	0	0	0	0	100
	135	38	54	0	5	0	0	0	1	0	1	0	1	0	100
	Mean	43.67	40.22	.00	13.67	.22	.00	.00	.22	.00	1.89	.00	.11	.00	100.00
	StDev	15.17	12.16	.00	8.25	.67	.00	.00	.44	.00	4.20	.00	.33	.00	.00
Endocladia	13	19	6	12	53	0	0	3	0	0	6	1	0	0	100
	14	14	7	36	16	0	0	5	6	0	14	2	0	0	100
	19	53	3	0	33	3	0	0	0	0	8	0	0	0	100
	51	6	0	2	8	0	0	0	32	0	40	12	0	0	100
	52	6	0	6	29	0	0	20	4	0	34	1	0	0	100
	54	12	0	12	28	0	0	4	14	0	27	3	0	0	100
	212	15	5	6	61	0	0	1	0	0	7	4	0	1	100
	467	19	0	11	36	0	0	25	0	0	7	2	0	0	100
	492	21	2	4	46	0	0	1	1	0	22	3	0	0	100
	Mean	18.33	2.56	9.89	34.44	.33	.00	6.56	6.33	.00	18.33	3.11	.00	.11	100.00
	StDev	14.07	2.83	10.71	16.95	1.00	.00	9.29	10.68	.00	12.93	3.55	.00	.33	.00
Silvetia (Rockweed)	2	14	8	0	36	36	0	0	0	0	5	1	0	0	100
	3	26	26	0	39	7	0	0	0	0	2	0	0	0	100
	4	26	13	2	44	11	0	0	0	0	4	0	0	0	100
	5	14	6	8	55	0	3	1	2	0	11	0	0	0	100
	6	41	1	0	16	17	19	0	0	0	6	0	0	0	100
	8	55	19	0	14	0	9	0	0	0	3	0	0	0	100
	9	55	5	0	6	8	19	0	0	0	7	0	0	0	100
	10	65	20	0	13	1	0	0	0	0	0	1	0	0	100
	55	16	13	9	25	6	0	2	7	0	22	0	0	0	100
	Mean	34.67	12.33	2.11	27.56	9.56	5.56	.33	1.00	.00	6.67	.22	.00	.00	100.00
	StDev	19.81	8.15	3.69	16.68	11.37	8.17	.71	2.35	.00	6.56	.44	.00	.00	.00

B-17

Percent Cover of Index Species

Cat Rock, Anacapa Island - Fall 2010 (11/4/10) (continued)

Silvetia 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	11	0	11	0	0	0	18	16	0	41	3	0	0	100
	164	13	0	25	2	0	0	22	3	0	32	3	0	0	100
	203	11	2	21	3	0	0	18	9	0	35	1	0	0	100
	204	4	1	15	0	0	0	34	5	1	38	2	0	0	100
	468	5	0	14	0	0	0	12	15	0	53	1	0	0	100
	470	27	0	8	8	0	0	29	9	0	19	0	0	0	100
	471	17	0	9	17	0	0	18	10	0	29	0	0	0	100
	472	6	0	12	0	0	0	50	7	0	22	3	0	0	100
	473	26	0	14	1	0	0	15	24	0	20	0	0	0	100
	Mean	13.33	.33	14.33	3.44	.00	.00	24.00	10.89	.11	32.11	1.44	.00	.00	100.00
	StDev	8.53	.71	5.52	5.70	.00	.00	11.93	6.47	.33	11.12	1.33	.00	.00	.00

Percent Cover of Index Species

Middle-East, Anacapa Island - Fall 2010 (12/2/10)

Silvetia 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	56	1	22	0	0	0	0	0	0	21	0	0	0	100
	244	56	10	10	18	0	0	1	0	0	4	1	0	0	100
	245	71	3	9	7	0	0	0	0	0	6	4	0	0	100
	Mean	61.00	4.67	13.67	8.33	.00	.00	.33	.00	.00	10.33	1.67	.00	.00	100.00
	StDev	8.66	4.73	7.23	9.07	.00	.00	.58	.00	.00	9.29	2.08	.00	.00	.00
Endocladia	240	49	4	4	12	0	0	0	0	0	30	1	0	0	100
	241	41	0	18	9	0	0	0	0	0	32	0	0	0	100
	242	58	5	10	17	0	0	0	0	0	10	0	0	0	100
	Mean	49.33	3.00	10.67	12.67	.00	.00	.00	.00	.00	24.00	.33	.00	.00	100.00
	StDev	8.50	2.65	7.02	4.04	.00	.00	.00	.00	.00	12.17	.58	.00	.00	.00
Silvetia (Rockweed)	53	32	0	13	2	0	0	0	3	0	41	9	0	0	100
	237	27	2	1	2	0	0	0	2	0	66	0	0	0	100
	469	48	0	8	0	0	0	0	0	0	40	4	0	0	100
	Mean	35.67	.67	7.33	1.33	.00	.00	.00	1.67	.00	49.00	4.33	.00	.00	100.00
	StDev	10.97	1.15	6.03	1.15	.00	.00	.00	1.53	.00	14.73	4.51	.00	.00	.00
Mussels	476	2	0	17	0	0	0	35	7	0	23	16	0	0	100
	477	1	0	10	0	0	0	1	21	0	62	5	0	0	100
	478	3	0	7	0	0	0	0	8	0	41	41	0	0	100
	Mean	2.00	.00	11.33	.00	.00	.00	12.00	12.00	.00	42.00	20.67	.00	.00	100.00
	StDev	1.00	.00	5.13	.00	.00	.00	19.92	7.81	.00	19.52	18.45	.00	.00	.00

Percent Cover of Index Species

Middle-West, Anacapa Island - Fall 2010 (12/2/10)

Silvetia 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	52	36	1	0	0	0	0	0	0	9	2	0	0	100
	448	35	5	4	14	0	0	5	3	0	32	2	0	0	100
	449	48	9	1	0	0	0	0	1	0	41	0	0	0	100
	450	40	17	0	6	0	0	0	0	0	36	1	0	0	100
	451	41	13	0	27	0	0	0	0	0	19	0	0	0	100
	Mean	43.20	16.00	1.20	9.40	.00	.00	1.00	.80	.00	27.40	1.00	.00	.00	100.00
	StDev	6.76	12.04	1.64	11.39	.00	.00	2.24	1.30	.00	13.13	1.00	.00	.00	.00
Endocladia	457	3	0	1	34	0	0	8	6	0	44	4	0	0	100
	458	10	1	8	32	0	0	2	0	0	44	3	0	0	100
	459	57	1	4	10	0	0	0	0	0	25	3	0	0	100
	460	52	12	0	28	0	0	0	0	0	8	0	0	0	100
	461	76	13	0	8	0	0	0	0	0	3	0	0	0	100
	Mean	39.60	5.40	2.60	22.40	.00	.00	2.00	1.20	.00	24.80	2.00	.00	.00	100.00
	StDev	31.61	6.50	3.44	12.44	.00	.00	3.46	2.68	.00	19.33	1.87	.00	.00	.00
Silvetia (Rockweed)	452	65	8	11	0	0	0	0	0	0	13	3	0	0	100
	453	79	3	9	0	0	0	1	0	0	7	1	0	0	100
	454	0	0	0	8	0	0	0	13	0	72	7	0	0	100
	455	30	0	6	20	0	0	0	9	0	32	3	0	0	100
	456	45	0	8	7	0	0	0	3	0	34	3	0	0	100
	Mean	43.80	2.20	6.80	7.00	.00	.00	.20	5.00	.00	31.60	3.40	.00	.00	100.00
	StDev	30.82	3.49	4.21	8.19	.00	.00	.45	5.79	.00	25.44	2.19	.00	.00	.00
Mussels	462	4	0	19	1	0	0	1	21	0	44	10	0	0	100
	463	15	1	13	1	0	0	10	30	0	27	3	0	0	100
	464	3	0	14	0	0	0	31	20	0	25	7	0	0	100
	465	2	0	12	0	0	0	6	30	0	33	17	0	0	100
	466	5	0	2	0	0	0	0	9	0	60	24	0	0	100
	Mean	5.80	.20	12.00	.40	.00	.00	9.60	22.00	.00	37.80	12.20	.00	.00	100.00
	StDev	5.26	.45	6.20	.55	.00	.00	12.62	8.69	.00	14.45	8.35	.00	.00	.00

B-20

Percent Cover of Index Species

S Frenchy's Cove, Anacapa Island - Fall 2010 (11/5/10)

Silvetia 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	16	0	44	0	0	0	16	0	1	0	0	0	100
	250	28	27	0	38	0	0	0	4	0	3	0	0	0	100
	251	59	24	0	10	0	1	0	6	0	0	0	0	0	100
	252	53	24	0	15	0	0	0	6	0	0	1	1	0	100
	253	12	11	0	71	4	1	0	1	0	0	0	0	0	100
	Mean	35.00	20.40	.00	35.60	.80	.40	.00	6.60	.00	.80	.20	.20	.00	100.00
	StDev	20.14	6.66	.00	24.54	1.79	.55	.00	5.64	.00	1.30	.45	.45	.00	.00
Endocladia	154	3	0	0	85	4	5	0	0	0	2	0	1	0	100
	155	2	0	0	78	0	14	0	4	0	2	0	0	0	100
	256	13	0	0	64	2	4	0	15	0	2	0	0	0	100
	257	4	0	0	92	0	0	0	0	0	4	0	0	0	100
	258	19	0	0	54	0	21	0	0	0	6	0	0	0	100
	Mean	8.20	.00	.00	74.60	1.20	8.80	.00	3.80	.00	3.20	.00	.20	.00	100.00
	StDev	7.46	.00	.00	15.49	1.79	8.53	.00	6.50	.00	1.79	.00	.45	.00	.00
Silvetia (Rockweed)	259	5	5	0	1	0	57	0	29	0	2	1	0	0	100
	260	11	1	0	1	2	73	0	6	0	6	0	0	0	100
	261	9	2	0	0	0	42	0	6	0	41	0	0	0	100
	262	29	4	0	18	1	12	0	21	0	12	2	0	0	99
	263	31	0	0	0	0	57	0	0	0	12	0	0	0	100
	Mean	17.00	2.40	.00	4.00	.60	48.20	.00	12.40	.00	14.60	.60	.00	.00	99.80
	StDev	12.08	2.07	.00	7.84	.89	23.02	.00	12.10	.00	15.36	.89	.00	.00	.45
Mussels	201	4	0	0	0	0	0	62	24	0	8	2	0	0	100
	202	2	0	0	0	0	0	62	22	0	6	8	0	0	100
	264	2	0	1	0	0	0	49	42	0	6	0	0	0	100
	265	5	0	0	0	0	0	80	13	1	0	1	0	0	100
	266	10	0	0	0	0	0	25	25	0	32	8	0	0	100
	Mean	4.60	.00	.20	.00	.00	.00	55.60	25.20	.20	10.40	3.80	.00	.00	100.00
	StDev	3.29	.00	.45	.00	.00	.00	20.35	10.52	.45	12.44	3.90	.00	.00	.00

B-21

Percent Cover of Index Species

Crook Point, San Miguel Island - Fall 2010 (12/6/10)

Silvetia 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	76	24	0	0	0	0	0	0	0	0	0	0	0	100
	147	54	46	0	0	0	0	0	0	0	0	0	0	0	100
	148	55	45	0	0	0	0	0	0	0	0	0	0	0	100
	149	69	12	0	16	0	0	3	0	0	0	0	0	0	100
	495	37	52	0	11	0	0	0	0	0	0	0	0	0	100
	Mean	58.20	35.80	.00	5.40	.00	.00	.60	.00	.00	.00	.00	.00	.00	100.00
	StDev	15.09	17.01	.00	7.60	.00	.00	1.34	.00	.00	.00	.00	.00	.00	.00
Endocladia	386	61	10	0	27	0	0	1	0	0	0	1	0	0	100
	387	28	6	3	15	0	0	1	0	2	32	13	0	0	100
	388	45	19	0	14	0	0	0	0	0	22	0	0	0	100
	389	4	16	0	11	14	0	39	0	3	13	0	0	0	100
	390	30	12	0	24	2	0	6	0	3	23	0	0	0	100
	Mean	33.60	12.60	.60	18.20	3.20	.00	9.40	.00	1.60	18.00	2.80	.00	.00	100.00
	StDev	21.22	5.08	1.34	6.91	6.10	.00	16.71	.00	1.52	12.10	5.72	.00	.00	.00
Silvetia (Rockweed)	396	21	11	0	34	3	0	13	0	3	15	0	0	0	100
	397	5	0	0	0	0	0	91	0	0	4	0	0	0	100
	398	30	25	0	9	0	0	28	0	5	3	0	0	0	100
	399	46	8	0	0	0	0	0	5	0	40	1	0	0	100
	400	33	2	1	42	8	0	2	0	1	3	8	0	0	100
	Mean	27.00	9.20	.20	17.00	2.20	.00	26.80	1.00	1.80	13.00	1.80	.00	.00	100.00
	StDev	15.22	9.88	.45	19.72	3.49	.00	37.57	2.24	2.17	15.92	3.49	.00	.00	.00
Mussels	381	8	5	0	0	0	0	83	0	1	3	0	0	0	100
	382	1	0	0	0	0	0	86	0	0	13	0	0	0	100
	383	2	0	0	0	0	0	98	0	0	0	0	0	0	100
	384	8	4	0	0	0	0	80	0	0	6	2	0	0	100
	385	8	5	1	0	0	0	81	0	2	2	1	0	0	100
	Mean	5.40	2.80	.20	.00	.00	.00	85.60	.00	.60	4.80	.60	.00	.00	100.00
	StDev	3.58	2.59	.45	.00	.00	.00	7.30	.00	.89	5.07	.89	.00	.00	.00

B-22

Percent Cover of Index Species

Cuyler Harbor, San Miguel Island - Fall 2010 (12/7/10)

Silvetia 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	32	68	0	0	0	0	0	0	0	0	0	0	0	100
	417	60	17	0	23	0	0	0	0	0	0	0	0	0	100
	418	23	75	0	1	0	0	1	0	0	0	0	0	0	100
	419	45	17	0	38	0	0	0	0	0	0	0	0	0	100
	420	69	5	0	25	0	0	0	0	0	1	0	0	0	100
	Mean	45.80	36.40	.00	17.40	.00	.00	.20	.00	.00	.20	.00	.00	.00	100.00
	StDev	19.04	32.51	.00	16.47	.00	.00	.45	.00	.00	.45	.00	.00	.00	.00
Endocladia	411	34	5	28	8	0	0	10	0	1	5	9	0	0	100
	412	11	30	0	40	0	0	16	0	1	2	0	0	0	100
	413	44	0	0	8	0	30	0	0	0	17	1	0	0	100
	414	26	1	3	60	0	0	2	1	0	6	1	0	0	100
	415	51	0	0	21	0	0	0	0	0	27	1	0	0	100
	Mean	33.20	7.20	6.20	27.40	.00	6.00	5.60	.20	.40	11.40	2.40	.00	.00	100.00
	StDev	15.64	12.91	12.26	22.45	.00	13.42	7.13	.45	.55	10.41	3.71	.00	.00	.00
Silvetia (Rockweed)	406	11	0	1	9	0	40	0	3	0	7	29	0	0	100
	407	5	0	0	0	0	87	0	0	0	4	4	0	0	100
	408	38	37	0	5	0	0	1	1	0	7	11	0	0	100
	409	38	37	0	5	0	0	1	1	0	7	11	0	0	100
	410	68	11	9	1	0	0	0	0	0	9	2	0	0	100
	Mean	32.00	17.00	2.00	4.00	.00	25.40	.40	1.00	.00	6.80	11.40	.00	.00	100.00
	StDev	25.19	18.80	3.94	3.61	.00	38.55	.55	1.22	.00	1.79	10.64	.00	.00	.00
Mussels	401	10	5	10	0	0	0	12	0	12	5	46	0	0	100
	402	0	0	0	0	0	0	58	16	0	6	20	0	0	100
	403	2	0	0	0	0	0	63	12	1	8	14	0	0	100
	404	6	1	21	0	0	0	29	8	1	13	21	0	0	100
	405	29	0	7	0	0	0	51	0	2	3	8	0	0	100
	Mean	9.40	1.20	7.60	.00	.00	.00	42.60	7.20	3.20	7.00	21.80	.00	.00	100.00
	StDev	11.61	2.17	8.68	.00	.00	.00	21.48	7.16	4.97	3.81	14.50	.00	.00	.00

B-23

Percent Cover of Index Species

Harris Point, San Miguel Island - Fall 2010 (12/5/10)

Silvetia 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
B-24	Chthamalus/Balanus	440	16	81	0	3	0	0	0	0	0	0	0	0	100
		441	7	93	0	0	0	0	0	0	0	0	0	0	100
		442	8	86	0	4	0	0	0	0	0	2	0	0	100
		443	55	39	0	0	0	0	0	0	0	0	6	0	100
		444	54	46	0	0	0	0	0	0	0	0	0	0	100
		Mean	28.00	69.00	.00	1.40	.00	.00	.00	.00	.00	.40	1.20	.00	100.00
		StDev	24.44	24.69	.00	1.95	.00	.00	.00	.00	.00	.89	2.68	.00	.00
	Endocladia	431	11	50	1	29	0	5	0	0	4	0	0	0	100
		432	37	25	0	31	0	1	0	0	5	1	0	0	100
		433	22	35	0	40	0	0	0	0	2	1	0	0	100
		434	66	7	0	27	0	0	0	0	0	0	0	0	100
		435	8	4	1	12	54	0	0	0	21	0	0	0	100
		Mean	28.80	24.20	.40	27.80	10.80	1.20	.00	.00	6.40	.40	.00	.00	100.00
		StDev	23.70	19.28	.55	10.13	24.15	2.17	.00	.00	8.38	.55	.00	.00	.00
	Mussels	426	13	10	4	2	0	52	2	2	12	3	0	0	100
B-24		427	10	46	11	17	1	5	0	0	10	0	0	0	100
		428	28	55	2	1	3	4	0	0	7	0	0	0	100
		429	17	61	0	3	0	4	5	0	9	1	0	0	100
		430	6	2	4	0	0	73	0	0	15	0	0	0	100
		Mean	14.80	34.80	4.20	4.60	.80	27.60	1.40	.40	10.60	.80	.00	.00	100.00
		StDev	8.41	26.98	4.15	7.02	1.30	32.72	2.19	.89	3.05	1.30	.00	.00	.00
	Tetraclita	436	12	7	14	0	0	50	2	0	14	1	0	0	100
		437	16	11	26	0	0	22	0	1	22	2	0	0	100
		438	35	0	0	2	0	0	10	0	46	7	0	0	100
		439	15	5	25	5	0	27	1	0	21	1	0	0	100
		445	12	16	20	0	0	31	1	0	17	3	0	0	100
		Mean	18.00	7.80	17.00	1.40	.00	26.00	2.80	.20	24.00	2.80	.00	.00	100.00
		StDev	9.67	6.06	10.63	2.19	.00	17.99	4.09	.45	12.71	2.49	.00	.00	.00
	Hesperophycus	421	24	1	0	33	41	0	0	0	0	1	0	0	100
		422	29	4	0	22	31	0	0	0	14	0	0	0	100
		423	23	10	1	55	7	0	0	0	4	0	0	0	100
		424	61	10	0	29	0	0	0	0	0	0	0	0	100
		425	39	2	0	0	56	0	0	0	2	1	0	0	100
		Mean	35.20	5.40	.20	27.80	27.00	.00	.00	.00	4.00	.40	.00	.00	100.00
		StDev	15.75	4.34	.45	19.84	23.36	.00	.00	.00	5.83	.55	.00	.00	.00

Percent Cover of Index Species

Otter Harbor, San Miguel Island - Fall 2010 (12/4/10)

Silvetia 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	94	6	0	0	0	0	0	0	0	0	0	0	0	100
	371	20	70	0	0	0	0	0	0	0	0	0	10	0	100
	372	37	62	0	0	0	0	0	0	0	0	1	0	0	100
	373	48	52	0	0	0	0	0	0	0	0	0	0	0	100
	374	0	0	0	0	0	0	0	29	0	70	1	0	0	100
	Mean	39.80	38.00	.00	.00	.00	.00	.00	5.80	.00	14.00	.40	2.00	.00	100.00
	StDev	35.32	32.65	.00	.00	.00	.00	.00	12.97	.00	31.30	.55	4.47	.00	.00
Endocladia	360	38	15	7	21	0	7	6	0	1	4	1	0	0	100
	361	59	13	2	20	0	0	1	0	0	3	2	0	0	100
	362	5	0	0	93	0	1	0	0	0	1	0	0	0	100
	363	27	1	0	64	0	0	0	0	0	8	0	0	0	100
	364	33	0	0	57	0	0	0	0	0	10	0	0	0	100
	Mean	32.40	5.80	1.80	51.00	.00	1.60	1.40	.00	.20	5.20	.60	.00	.00	100.00
	StDev	19.49	7.53	3.03	30.94	.00	3.05	2.61	.00	.45	3.70	.89	.00	.00	.00
Silvetia (Rockweed)	355	76	20	0	1	0	0	0	0	0	2	1	0	0	100
	356	23	0	1	52	0	3	0	0	0	20	1	0	0	100
	357	22	0	0	36	0	0	0	0	0	42	0	0	0	100
	358	13	60	0	24	0	0	0	0	0	3	0	0	0	100
	359	21	68	0	7	0	0	0	0	0	4	0	0	0	100
	Mean	31.00	29.60	.20	24.00	.00	.60	.00	.00	.00	14.20	.40	.00	.00	100.00
	StDev	25.47	32.57	.45	20.89	.00	1.34	.00	.00	.00	17.21	.55	.00	.00	.00
Mussels	375	22	0	5	0	0	0	46	0	7	17	3	0	0	100
	376	30	3	0	0	0	0	48	1	1	17	0	0	0	100
	378	10	0	1	1	0	0	49	0	14	24	1	0	0	100
	379	34	1	7	11	0	0	6	1	3	35	2	0	0	100
	380	7	1	0	0	0	0	67	0	6	17	2	0	0	100
	Mean	20.60	1.00	2.60	2.40	.00	.00	43.20	.40	6.20	22.00	1.60	.00	.00	100.00
	StDev	11.91	1.22	3.21	4.83	.00	.00	22.44	.55	4.97	7.87	1.14	.00	.00	.00

B-25

Percent Cover of Index Species

Landing Cove, Santa Barbara Island - Fall 2010 (10/6/10)

Silvetia 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	315	55	0	8	10	0	0	2	3	0	22	0	0	0	100
	316	45	0	6	4	0	0	2	12	0	31	0	0	0	100
	317	45	0	9	3	0	0	6	18	0	18	1	0	0	100
	318	11	0	22	0	0	0	37	10	0	19	1	0	0	100
	319	32	1	24	9	0	0	3	4	0	25	2	0	0	100
	Mean	37.60	.20	13.80	5.20	.00	.00	10.00	9.40	.00	23.00	.80	.00	.00	100.00
	StDev	16.96	.45	8.50	4.21	.00	.00	15.18	6.15	.00	5.24	.84	.00	.00	.00
Silvetia (Rockweed)	310	27	2	1	0	0	2	1	8	0	55	4	0	0	100
	311	34	4	1	0	0	1	1	3	0	49	7	0	0	100
	312	23	0	0	0	0	1	0	28	0	43	5	0	0	100
	313	20	0	0	0	0	1	0	28	0	47	4	0	0	100
	314	27	0	0	0	0	14	0	8	0	44	7	0	0	100
	Mean	26.20	1.20	.40	.00	.00	3.80	.40	15.00	.00	47.60	5.40	.00	.00	100.00
	StDev	5.26	1.79	.55	.00	.00	5.72	.55	12.04	.00	4.77	1.52	.00	.00	.00
Mussels	325	26	0	14	0	0	0	6	2	1	47	4	0	0	100
	326	0	0	0	0	0	0	0	0	0	100	0	0	0	100
	327	4	0	1	0	0	0	80	0	1	14	0	0	0	100
	328	0	0	3	0	0	0	91	0	0	3	3	0	0	100
	329	5	0	21	0	0	0	13	1	0	41	19	0	0	100
	Mean	7.00	.00	7.80	.00	.00	.00	38.00	.60	.40	41.00	5.20	.00	.00	100.00
	StDev	10.86	.00	9.26	.00	.00	.00	43.78	.89	.55	37.72	7.92	.00	.00	.00
Red Algal Turf/	320	0	0	0	0	0	0	0	91	0	9	0	0	0	100
	321	2	0	0	0	0	0	41	7	0	37	13	0	0	100
	322	0	0	0	0	0	0	30	1	0	25	11	0	33	100
	323	0	0	0	0	0	0	0	0	0	29	1	0	70	100
	324	0	0	0	0	0	0	0	69	0	31	0	0	0	100
	Mean	.40	.00	.00	.00	.00	.00	14.20	33.60	.00	26.20	5.00	.00	20.60	100.00
	StDev	.89	.00	.00	.00	.00	.00	19.83	43.15	.00	10.55	6.44	.00	31.09	.00

B-26

Percent Cover of Index Species

Sea Lion Rookery, Santa Barbara Island - Fall 2010 (10/7/10)

Silvetia 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	47	4	1	5	0	0	5	5	0	33	0	0	0	100
	346	77	13	1	3	0	0	0	0	0	6	0	0	0	100
	347	76	17	0	0	0	0	0	0	0	7	0	0	0	100
	348	36	5	2	3	0	0	0	0	0	52	2	0	0	100
	349	67	22	1	0	0	0	0	0	0	10	0	0	0	100
	Mean	60.60	12.20	1.00	2.20	.00	.00	1.00	1.00	.00	21.60	.40	.00	.00	100.00
	StDev	18.28	7.73	.71	2.17	.00	.00	2.24	2.24	.00	20.28	.89	.00	.00	.00
Endocladia	335	21	0	5	6	0	0	1	0	0	65	2	0	0	100
	336	33	0	0	0	0	0	0	0	0	67	0	0	0	100
	337	17	0	4	1	0	0	14	2	8	54	0	0	0	100
	338	36	0	4	15	0	1	4	0	0	39	1	0	0	100
	339	22	0	8	32	0	0	2	0	0	36	0	0	0	100
	Mean	25.80	.00	4.20	10.80	.00	.20	4.20	.40	1.60	52.20	.60	.00	.00	100.00
	StDev	8.23	.00	2.86	13.26	.00	.45	5.67	.89	3.58	14.34	.89	.00	.00	.00
Silvetia (Rockweed)	330	55	11	0	0	0	0	27	1	0	0	6	0	0	100
	331	18	0	1	2	0	44	4	0	0	31	0	0	0	100
	332	25	1	0	2	0	6	6	2	0	57	1	0	0	100
	333	13	0	0	0	0	7	0	27	0	53	0	0	0	100
	334	21	0	0	0	0	23	0	14	0	41	1	0	0	100
	Mean	26.40	2.40	.20	.80	.00	16.00	7.40	8.80	.00	36.40	1.60	.00	.00	100.00
	StDev	16.58	4.83	.45	1.10	.00	17.82	11.26	11.65	.00	22.78	2.51	.00	.00	.00
Mussels	350	0	0	14	0	0	0	1	23	0	53	9	0	0	100
	351	2	0	5	0	0	0	0	22	0	68	3	0	0	100
	352	2	0	13	0	0	0	0	16	0	56	13	0	0	100
	353	3	0	14	0	0	0	0	8	0	64	11	0	0	100
	354	4	0	17	0	0	0	0	10	0	63	6	0	0	100
	Mean	2.20	.00	12.60	.00	.00	.00	.20	15.80	.00	60.80	8.40	.00	.00	100.00
	StDev	1.48	.00	4.51	.00	.00	.00	.45	6.80	.00	6.14	3.97	.00	.00	.00

Percent Cover of Index Species

Fraser Cove, Santa Cruz Island - Fall 2010 (11/19/10)

Silvetia 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	11	74	0	6	0	0	3	0	0	4	2	0	0	100
	877	10	80	0	1	0	0	9	0	0	0	0	0	0	100
	878	39	50	0	6	0	0	0	0	0	0	0	5	0	100
	879	7	77	0	10	0	0	0	0	0	0	0	6	0	100
	880	31	66	0	0	0	0	0	0	0	0	0	3	0	100
	Mean	19.60	69.40	.00	4.60	.00	.00	2.40	.00	.00	.80	.40	2.80	.00	100.00
	StDev	14.42	12.03	.00	4.10	.00	.00	3.91	.00	.00	1.79	.89	2.77	.00	.00
Endocladia	881	6	29	0	28	0	0	21	0	0	15	1	0	0	100
	882	10	21	0	55	0	0	3	0	0	11	0	0	0	100
	883	22	34	0	44	0	0	0	0	0	0	0	0	0	100
	884	7	0	0	92	0	0	0	0	0	1	0	0	0	100
	885	35	14	0	38	0	0	0	0	0	10	3	0	0	100
	Mean	16.00	19.60	.00	51.40	.00	.00	4.80	.00	.00	7.40	.80	.00	.00	100.00
	StDev	12.39	13.35	.00	24.71	.00	.00	9.15	.00	.00	6.58	1.30	.00	.00	.00
Silvetia (Rockweed)	896	35	2	0	11	8	0	0	0	0	41	3	0	0	100
	897	20	0	0	16	23	12	0	2	0	21	2	0	4	100
	898	15	0	0	2	3	47	0	0	0	31	2	0	0	100
	899	53	4	0	17	3	0	0	1	0	17	5	0	0	100
	900	16	3	0	3	26	48	0	0	0	3	1	0	0	100
	Mean	27.80	1.80	.00	9.80	12.60	21.40	.00	.60	.00	22.60	2.60	.00	.80	100.00
	StDev	16.21	1.79	.00	7.05	11.10	24.33	.00	.89	.00	14.38	1.52	.00	1.79	.00
Mussels	891	3	0	0	0	0	0	76	0	0	1	20	0	0	100
	892	15	0	1	0	0	0	61	0	0	7	16	0	0	100
	893	7	0	0	0	0	0	92	0	0	1	0	0	0	100
	894	5	1	0	0	0	0	84	3	1	1	5	0	0	100
	895	10	0	2	0	0	0	47	0	1	7	33	0	0	100
	Mean	8.00	.20	.60	.00	.00	.00	72.00	.60	.40	3.40	14.80	.00	.00	100.00
	StDev	4.69	.45	.89	.00	.00	.00	18.07	1.34	.55	3.29	12.99	.00	.00	.00
Pollicipes	901	8	20	1	0	0	0	67	0	2	1	1	0	0	100
	902	27	3	8	25	0	0	1	1	0	18	17	0	0	100
	903	2	0	0	0	0	0	67	0	13	2	16	0	0	100
	904	7	0	1	0	0	0	73	0	12	2	5	0	0	100
	905	2	0	1	0	0	0	78	0	12	3	4	0	0	100
	Mean	9.20	4.60	2.20	5.00	.00	.00	57.20	.20	7.80	5.20	8.60	.00	.00	100.00
	StDev	10.33	8.71	3.27	11.18	.00	.00	31.75	.45	6.26	7.19	7.37	.00	.00	.00

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Percent Cover of Index Species

Fraser Cove, Santa Cruz Island - Fall 2010 (11/19/10) (continued)

Silvetia 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	40	21	0	0	0	0	0	0	0	9	0	30	0	100
	907	41	24	0	0	0	0	0	0	0	2	0	33	0	100
	908	38	16	0	0	0	0	0	0	0	0	0	46	0	100
	909	60	13	0	0	0	0	0	0	0	0	0	27	0	100
	910	26	14	0	0	0	0	0	0	0	0	0	60	0	100
	Mean	41.00	17.60	.00	.00	.00	.00	.00	.00	.00	2.20	.00	39.20	.00	100.00
	StDev	12.21	4.72	.00	.00	.00	.00	.00	.00	.00	3.90	.00	13.70	.00	.00
Hesperophycus	886	27	0	0	32	39	0	0	0	0	2	0	0	0	100
	887	57	5	0	12	20	0	0	0	0	6	0	0	0	100
	888	17	12	0	31	39	0	0	0	0	1	0	0	0	100
	889	34	0	0	4	34	3	0	0	0	25	0	0	0	100
	890	34	2	0	28	26	0	0	0	0	10	0	0	0	100
	Mean	33.80	3.80	.00	21.40	31.60	.60	.00	.00	.00	8.80	.00	.00	.00	100.00
	StDev	14.72	5.02	.00	12.64	8.38	1.34	.00	.00	.00	9.73	.00	.00	.00	.00

Percent Cover of Index Species

Orizaba Cove, Santa Cruz Island - Fall 2010 (11/3/10)

Silvetia Zone	Plot	Bare Rock	Acorn Barnacle	Tetraclita	Endocladia	Hesperophycus	Silvetia	Mussels	Turf-weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other	Total
Chthamalus/Balanus	851	83	11	1	0	0	0	0	0	0	4	1	0	0	100
	852	26	72	0	0	0	0	0	0	0	2	0	0	0	100
	853	45	54	0	0	0	0	0	0	0	1	0	0	0	100
	854	39	50	3	0	0	0	1	0	0	7	0	0	0	100
	855	28	68	0	0	0	0	0	0	0	4	0	0	0	100
	Mean	44.20	51.00	.80	.00	.00	.00	.20	.00	.00	3.60	.20	.00	.00	100.00
	StDev	23.06	24.19	1.30	.00	.00	.00	.45	.00	.00	2.30	.45	.00	.00	.00
Silvetia (Rockweed)	866	16	6	8	0	0	6	0	0	0	64	0	0	0	100
	867	26	1	1	16	5	18	0	1	0	32	0	0	0	100
	868	9	0	0	7	3	41	0	0	0	40	0	0	0	100
	869	6	0	4	19	0	60	0	0	0	11	0	0	0	100
	870	28	1	3	29	3	25	0	0	0	11	0	0	0	100
	Mean	17.00	1.60	3.20	14.20	2.20	30.00	.00	.20	.00	31.60	.00	.00	.00	100.00
	StDev	9.85	2.51	3.11	11.17	2.17	21.01	.00	.45	.00	22.19	.00	.00	.00	.00
Mussels	861	5	0	26	0	0	0	0	8	0	54	7	0	0	100
	862	1	0	8	0	0	0	0	9	0	76	6	0	0	100
	863	4	0	4	0	0	0	0	2	0	85	5	0	0	100
	864	1	0	4	0	0	0	0	3	0	91	1	0	0	100
	865	0	0	0	0	0	0	0	4	0	91	5	0	0	100
	Mean	2.20	.00	8.40	.00	.00	.00	.00	5.20	.00	79.40	4.80	.00	.00	100.00
	StDev	2.17	.00	10.24	.00	.00	.00	.00	3.11	.00	15.47	2.28	.00	.00	.00
Tetraclita	871	30	1	26	2	0	0	0	0	0	41	0	0	0	100
	872	21	2	18	0	0	0	0	0	0	58	1	0	0	100
	873	40	2	29	1	0	0	0	0	0	28	0	0	0	100
	874	26	1	23	1	0	0	0	0	0	47	2	0	0	100
	875	30	2	11	3	0	0	1	0	0	53	0	0	0	100
	Mean	29.40	1.60	21.40	1.40	.00	.00	.20	.00	.00	45.40	.60	.00	.00	100.00
	StDev	6.99	.55	7.09	1.14	.00	.00	.45	.00	.00	11.63	.89	.00	.00	.00
Hesperophycus	856	8	23	0	42	18	0	1	0	0	8	0	0	0	100
	857	9	3	2	10	64	1	0	0	0	11	0	0	0	100
	858	21	0	0	17	46	7	0	0	0	9	0	0	0	100
	859	15	32	0	47	4	0	0	0	0	1	1	0	0	100
	860	7	29	0	25	36	0	0	0	0	3	0	0	0	100
	Mean	12.00	17.40	.40	28.20	33.60	1.60	.20	.00	.00	6.40	.20	.00	.00	100.00
	StDev	5.92	14.91	.89	15.90	23.47	3.05	.45	.00	.00	4.22	.45	.00	.00	.00

B-30

Percent Cover of Index Species

Prisoner's Harbor, Santa Cruz Island - Fall 2010 (11/17/10)

Silvetia 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	35	57	0	1	0	1	0	0	0	1	5	0	0	100
	827	69	14	1	4	6	0	0	0	0	5	1	0	0	100
	828	12	52	0	30	1	0	1	1	0	0	3	0	0	100
	829	31	49	0	12	0	0	0	1	0	1	6	0	0	100
	830	19	30	0	40	3	0	0	3	0	1	4	0	0	100
	Mean	33.20	40.40	.20	17.40	2.00	.20	.20	1.00	.00	1.60	3.80	.00	.00	100.00
	StDev	22.03	17.95	.45	16.94	2.55	.45	.45	1.22	.00	1.95	1.92	.00	.00	.00
Endocladia	831	14	51	0	28	0	0	0	0	0	4	3	0	0	100
	832	10	67	0	16	1	0	0	0	0	5	1	0	0	100
	833	23	60	0	17	0	0	0	0	0	0	0	0	0	100
	834	35	35	0	25	4	0	0	0	0	0	1	0	0	100
	835	26	42	0	25	2	0	0	0	0	4	1	0	0	100
	Mean	21.60	51.00	.00	22.20	1.40	.00	.00	.00	.00	2.60	1.20	.00	.00	100.00
	StDev	9.91	12.98	.00	5.36	1.67	.00	.00	.00	.00	2.41	1.10	.00	.00	.00
Silvetia (Rockweed)	846	25	21	2	28	15	3	0	0	0	6	0	0	0	100
	847	70	11	2	5	0	0	0	0	0	8	4	0	0	100
	848	36	32	15	4	0	0	0	1	0	8	4	0	0	100
	849	11	11	4	2	0	45	0	0	0	27	0	0	0	100
	850	44	0	4	0	0	17	0	0	0	35	0	0	0	100
	Mean	37.20	15.00	5.40	7.80	3.00	13.00	.00	.20	.00	16.80	1.60	.00	.00	100.00
	StDev	22.13	12.06	5.46	11.45	6.71	19.22	.00	.45	.00	13.29	2.19	.00	.00	.00
Mussels	841	3	0	6	0	0	0	0	8	0	74	9	0	0	100
	842	12	3	24	0	0	0	0	11	0	34	16	0	0	100
	843	2	0	9	0	0	0	0	3	0	57	29	0	0	100
	844	1	0	1	0	0	0	0	29	0	66	3	0	0	100
	845	1	0	15	0	0	0	0	14	0	62	8	0	0	100
	Mean	3.80	.60	11.00	.00	.00	.00	.00	13.00	.00	58.60	13.00	.00	.00	100.00
	StDev	4.66	1.34	8.86	.00	.00	.00	.00	9.82	.00	15.09	10.07	.00	.00	.00
Hesperophycus	836	46	32	0	19	1	0	0	0	0	0	2	0	0	100
	837	48	35	0	10	3	0	0	0	0	0	4	0	0	100
	838	57	20	0	4	13	0	0	0	0	2	4	0	0	100
	839	18	64	0	10	8	0	0	0	0	0	0	0	0	100
	840	30	45	0	13	11	0	0	0	0	0	1	0	0	100
	Mean	39.80	39.20	.00	11.20	7.20	.00	.00	.00	.00	.40	2.20	.00	.00	100.00
	StDev	15.59	16.48	.00	5.45	5.12	.00	.00	.00	.00	.89	1.79	.00	.00	.00

B-31

Percent Cover of Index Species

Scorpion Rock, Santa Cruz Island - Fall 2010 (12/3/10)

Silvetia 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
B-32	Chthamalus/Balanus	801	32	13	3	50	0	0	0	0	2	0	0	0	100
		802	37	15	1	45	0	0	0	0	2	0	0	0	100
		803	46	4	0	47	0	0	0	0	3	0	0	0	100
		804	31	3	0	61	0	0	0	0	5	0	0	0	100
		805	58	40	0	2	0	0	0	0	0	0	0	0	100
		Mean	40.80	15.00	.80	41.00	.00	.00	.00	.00	2.40	.00	.00	.00	100.00
		StDev	11.30	14.95	1.30	22.66	.00	.00	.00	.00	1.82	.00	.00	.00	.00
	Endocladia	806	7	2	0	70	0	0	0	0	21	0	0	0	100
		807	3	2	2	49	0	1	0	1	42	0	0	0	100
		808	11	0	0	49	0	0	1	0	37	2	0	0	100
B-32		809	38	1	1	50	0	1	0	0	9	0	0	0	100
		810	12	2	0	66	0	0	0	0	20	0	0	0	100
		Mean	14.20	1.40	.60	56.80	.00	.40	.20	.20	25.80	.40	.00	.00	100.00
		StDev	13.77	.89	.89	10.33	.00	.55	.45	.45	13.48	.89	.00	.00	.00
	Mussels	816	5	0	27	0	0	0	3	0	64	1	0	0	100
		817	9	0	25	1	0	0	8	0	50	7	0	0	100
		818	8	0	31	1	0	0	6	0	51	3	0	0	100
		819	18	0	28	5	0	0	5	0	40	4	0	0	100
		820	11	0	27	0	0	0	0	0	50	12	0	0	100
		Mean	10.20	.00	27.60	1.40	.00	.00	4.40	.00	51.00	5.40	.00	.00	100.00
B-32		StDev	4.87	.00	2.19	2.07	.00	.00	3.05	.00	8.54	4.28	.00	.00	.00
	Tetraclita	821	39	2	16	13	0	2	0	0	27	1	0	0	100
		822	39	0	22	10	0	0	0	0	20	9	0	0	100
		823	41	0	39	4	0	0	0	0	7	9	0	0	100
		824	62	0	33	0	0	0	0	0	4	1	0	0	100
		825	60	0	18	2	0	0	0	0	17	3	0	0	100
		Mean	48.20	.40	25.60	5.80	.00	.40	.00	.00	15.00	4.60	.00	.00	100.00
		StDev	11.73	.89	9.96	5.50	.00	.89	.00	.00	9.46	4.10	.00	.00	.00
	Hesperophycus	811	35	0	0	10	55	0	0	0	0	0	0	0	100
		812	10	0	0	38	31	0	0	1	19	1	0	0	100
B-32		813	34	0	0	32	17	0	0	0	5	0	0	0	100
		814	73	0	0	23	0	0	0	0	3	1	0	0	100
		815	13	0	0	17	38	26	0	0	6	0	0	0	100
		Mean	33.00	.00	.00	24.00	28.20	7.60	.00	.20	6.60	.40	.00	.00	100.00
		StDev	25.17	.00	.00	11.25	20.87	11.52	.00	.45	7.30	.55	.00	.00	.00

Percent Cover of Index Species

Trailer, Santa Cruz Island - Fall 2010 (11/18/10)

Silvetia 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	30	50	0	13	0	0	0	0	0	6	1	0	0	100
	912	14	75	0	9	0	0	0	0	0	1	1	0	0	100
	913	21	53	0	21	0	0	1	0	0	3	1	0	0	100
	914	11	74	0	13	0	0	0	0	0	0	2	0	0	100
	915	35	63	0	0	0	0	0	0	0	1	1	0	0	100
	Mean	22.20	63.00	.00	11.20	.00	.00	.20	.00	.00	2.20	1.20	.00	.00	100.00
	StDev	10.23	11.55	.00	7.63	.00	.00	.45	.00	.00	2.39	.45	.00	.00	.00
Silvetia (Rockweed)	926	2	0	0	1	0	96	0	0	0	1	0	0	0	100
	927	56	7	0	0	0	31	0	0	0	6	0	0	0	100
	928	10	1	0	6	0	69	0	5	0	9	0	0	0	100
	929	6	1	0	0	0	86	0	0	0	5	2	0	0	100
	930	24	2	0	1	0	42	0	12	0	13	6	0	0	100
	Mean	19.60	2.20	.00	1.60	.00	64.80	.00	3.40	.00	6.80	1.60	.00	.00	100.00
	StDev	21.97	2.77	.00	2.51	.00	27.85	.00	5.27	.00	4.49	2.61	.00	.00	.00
Mussels	921	4	4	0	0	0	0	2	2	0	10	78	0	0	100
	922	2	1	0	0	0	0	1	3	0	60	33	0	0	100
	923	2	0	0	0	0	0	7	6	0	57	28	0	0	100
	924	14	0	0	0	0	0	2	1	0	40	43	0	0	100
	925	5	0	0	0	0	0	93	0	0	0	2	0	0	100
	Mean	5.40	1.00	.00	.00	.00	.00	21.00	2.40	.00	33.40	36.80	.00	.00	100.00
	StDev	4.98	1.73	.00	.00	.00	.00	40.32	2.30	.00	27.25	27.56	.00	.00	.00
Hesperophycus	916	5	0	0	5	18	72	0	0	0	0	0	0	0	100
	917	20	4	0	16	6	51	0	0	0	1	0	2	0	100
	918	5	1	0	2	16	76	0	0	0	0	0	0	0	100
	919	49	36	0	15	0	0	0	0	0	0	0	0	0	100
	920	20	1	0	22	16	33	0	0	0	7	1	0	0	100
	951	71	20	0	6	1	0	0	0	0	1	1	0	0	100
	Mean	28.33	10.33	.00	11.00	9.50	38.67	.00	.00	.00	1.50	.33	.33	.00	100.00
	StDev	26.36	14.65	.00	7.80	8.14	33.70	.00	.00	.00	2.74	.52	.82	.00	.00

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Percent Cover of Index Species

Willows Anchorage, Santa Cruz Island - Fall 2010 (11/22/10)

Silvetia 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	16	0	0	79	0	0	0	0	0	4	1	0	0	100
	932	25	0	0	71	0	0	0	0	0	3	1	0	0	100
	933	29	0	0	58	0	0	0	0	0	12	1	0	0	100
	934	9	0	2	81	0	0	0	0	0	8	0	0	0	100
	935	18	0	3	49	0	0	0	0	0	21	9	0	0	100
	Mean	19.40	.00	1.00	67.60	.00	.00	.00	.00	.00	9.60	2.40	.00	.00	100.00
	StDev	7.83	.00	1.41	13.78	.00	.00	.00	.00	.00	7.30	3.71	.00	.00	.00
Silvetia (Rockweed)	946	15	0	0	49	0	0	0	0	0	27	9	0	0	100
	947	8	1	0	35	0	0	0	0	0	40	16	0	0	100
	948	45	4	0	12	0	0	0	0	0	34	5	0	0	100
	949	64	0	0	3	0	8	0	1	0	16	8	0	0	100
	950	17	0	0	21	0	0	0	1	0	36	25	0	0	100
	Mean	29.80	1.00	.00	24.00	.00	1.60	.00	.40	.00	30.60	12.60	.00	.00	100.00
	StDev	23.76	1.73	.00	18.30	.00	3.58	.00	.55	.00	9.42	8.02	.00	.00	.00
Mussels	941	9	0	11	0	0	0	48	3	1	21	7	0	0	100
	942	5	0	0	0	0	0	19	4	3	56	13	0	0	100
	943	4	0	2	0	0	0	19	7	2	65	1	0	0	100
	944	7	0	2	0	0	0	10	14	1	64	2	0	0	100
	945	0	0	0	0	0	0	99	0	0	1	0	0	0	100
	Mean	5.00	.00	3.00	.00	.00	.00	39.00	5.60	1.40	41.40	4.60	.00	.00	100.00
	StDev	3.39	.00	4.58	.00	.00	.00	36.48	5.32	1.14	28.85	5.41	.00	.00	.00
Hesperophycus	936	8	0	0	77	0	0	0	0	0	15	0	0	0	100
	937	62	5	0	6	0	0	0	0	0	26	1	0	0	100
	938	70	1	0	12	2	0	0	0	0	15	0	0	0	100
	939	50	2	0	2	0	0	0	0	0	45	1	0	0	100
	940	39	1	0	7	35	1	0	0	0	17	0	0	0	100
	Mean	45.80	1.80	.00	20.80	7.40	.20	.00	.00	.00	23.60	.40	.00	.00	100.00
	StDev	24.19	1.92	.00	31.62	15.45	.45	.00	.00	.00	12.80	.55	.00	.00	.00

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Appendix C. Trip Reports

The following are trip reports from the Rocky Intertidal Monitoring 2010 field season (March 2010 through January 2011). 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.

San Miguel Island February 23-26, 2010

(Database event #2010-A))

Prepared by Dan Richards

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Bio-tech, CINP
Jacob Elliott, Bio-tech, CINP

PROCEDURE and general observations: The primary purpose of the trip was to measure black abalone, relocate and identify tagged abalone, and to tag additional abalone. Abalone were tagged with Passive Integrated Transponder (PIT) tags embedded in Z-Spar epoxy. Small yellow vinyl tags with printed four digit numbers were fixed to the epoxy giving a double tag. In most instances, only one patch of epoxy was used. Shell lengths, nearest neighbor distance, and condition were recorded. We mapped and identified individual crevices throughout the site so the location of each abalone was also recorded. Seastars were counted and measured. Motile invertebrates in the photoplots were counted and measured. The maximum number of shorebirds and pinnipeds observed was also recorded. Hobotemp Tidbit temperature loggers were downloaded. *Mytilus californianus* were collected for the NOAA Mussel Watch program. February 23 and 26 were used as transportation days. We are grateful for the use of the NMFS Point Bennett research station.

February 24, Otter Harbor. Low tide -0.6. ft. at 1313 hrs. Winds were SE at 6 mph. The surf was moderate and a light rain fell throughout the day. Monitoring conditions were good. At the site there were 10 harbor seals, 3 black oystercatchers, 1 American (hybrid?-blotchy) oystercatcher, 7 black turnstones and about 30 western gulls in the area. One elephant seal was on the narrow beach at the east end of the reef. We were on site from about 1130-1530 hrs.

Stephen counted motile invertebrates in photoplots, completing about half the plots. Jacob counted seastars in a 30 minute search of the reef finding 167 *Pisaster ochraceus*, 6 *P. giganteus*, and 1 *Patiria miniata*, then measured 50 *P. ochraceus*.

No *Haliotis cracherodii* were found in any of the fixed plots. Dan measured 145 *H. cracherodii*; stopping short of the far west end and the last two crevices normally checked due to the incoming waves. A total of 17 tagged individuals were found, though only 11 could be positively identified by either the PIT tag or vinyl number tag. One abalone appeared withered (was on edge of rock and I could see under the shell) but was holding onto the rock well. Another was not holding onto the rock at all when found and was slow reacting but was only slightly shrunken from the expected size and was not discolored at all. That animal was in an exposed location that was wet with rain. I wondered if the fresh water could have caused the lethargy, but no others were apparently affected. One shell was found with a small amount of foot muscle still attached. It was obviously a recent death. That shell was 148 mm. An old shell (96 mm) was also found. All shells were left in place. Because of the rain, emphasis was on measuring and identifying abalone and no new tags were attached.

Red algae, in particular *Mazzaella affinis*, *Mastocarpus papillatus*, *Chondracanthus canaliculatus*, and *Endocladia muricata*, seemed dense and robust, and the plants were large and fertile. New growth was evident on *Silvetia compressa* thalli. Young *Hesperophycus* (small form) and some young *S. compressa* were present and recruitment looked to be moderate. *Cladophora graminea* was particularly common in some crevices near the west end.

February 25, Otter Harbor. Low tide -1.0. ft. at 1352 hrs. Winds were NW about 15 mph and the swell was down from the day before. The water temperature was 15.0°C, which seemed warm for February. Conditions were excellent. There were 18 harbor seals and three stayed on the reef with us working around them all day. Only five black oystercatchers and 6 western gulls were present. The hybrid American oystercatcher was not seen.

Stephen completed counting motile invertebrates and then checked for needed plot repairs. Stephen also collected the mussel watch samples collecting approximately 60 mussels from each of three locations on the reef. Jacob downloaded the temperature loggers and added a second logger to each of the housings as a backup. He also recorded GPS polygons around each of the abalone crevices to map and label the areas we have been monitoring.

Dan tagged additional abalone with both PIT tags and vinyl number tags. Four tagged abalone were discovered among the abalone measured on 2/24. The tags were overgrown and two of the four no longer function, so only two were identified. A fifth (functioning) tag was found in a crevice at the west end, not measured yesterday. Thus the total number of tagged abalone found was 21. We also found an additional six abalone in one crevice that had been missed on 2/24. The poor, rainy conditions were a factor. All other tagged individuals found on 2/24 were found again in the same location. Sixteen abalone were tagged on 2/25 including one or two that had been previously tagged as noted below.

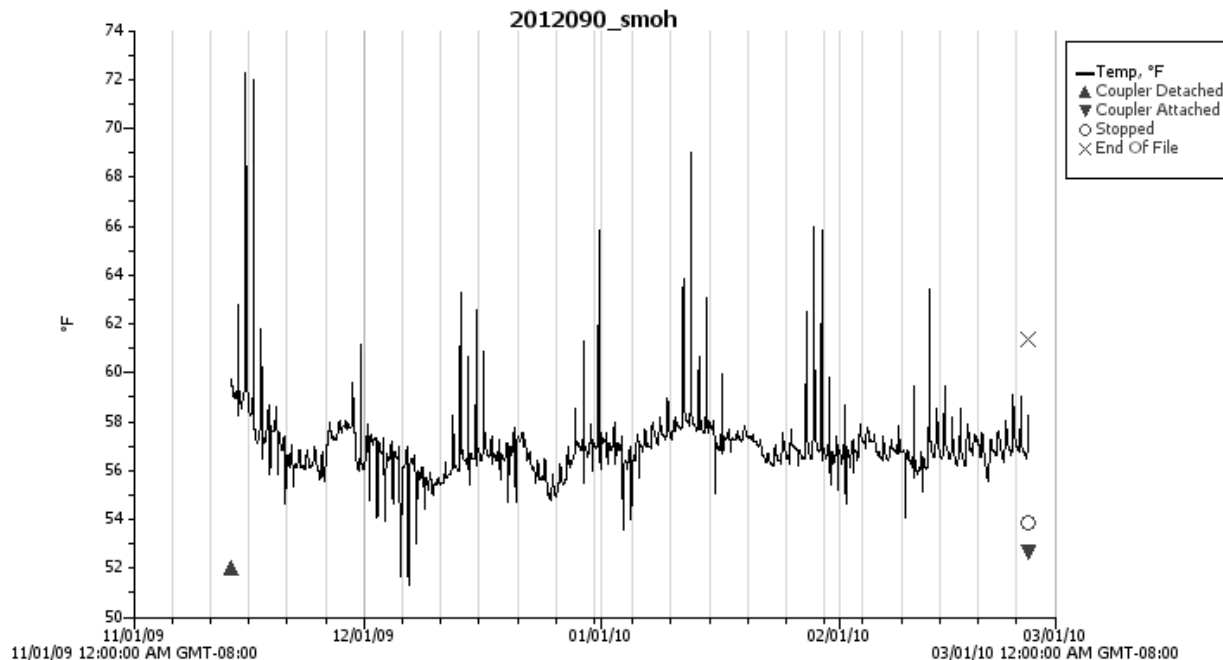
The abalone that was found unattached on 2/24 was still in the same location and was firmly attached on 2/25. A small bit of epoxy was noted on the shell of that abalone, presumably from a tag that had been lost because the epoxy did not bond with the shell. That animal was given a new tag. Another large individual that we consistently find in the same location in Crevice 5, had been previously tagged but the tag no longer functioned. It was given new PIT and visual tags.

The numbering of crevices was helpful to noting the location of each abalone. The GIS map will be useful in future monitoring. In the past we have struggled with inconsistent names for the locations. Most of the abalone do not appear to be moving very often. All tagged abalone were measured at least three times moving the calipers around to slightly different angles. Hopefully this will give a confidence to our ability to get a precise measurement. Variability can be quite high when they are measured in place because of the difficulty of getting calipers under rocks or over the longest part of the shell. This makes accurate growth measurements difficult, but the only real solution is to take animals off the rocks to measure and that would cause too much stress on the abalone.

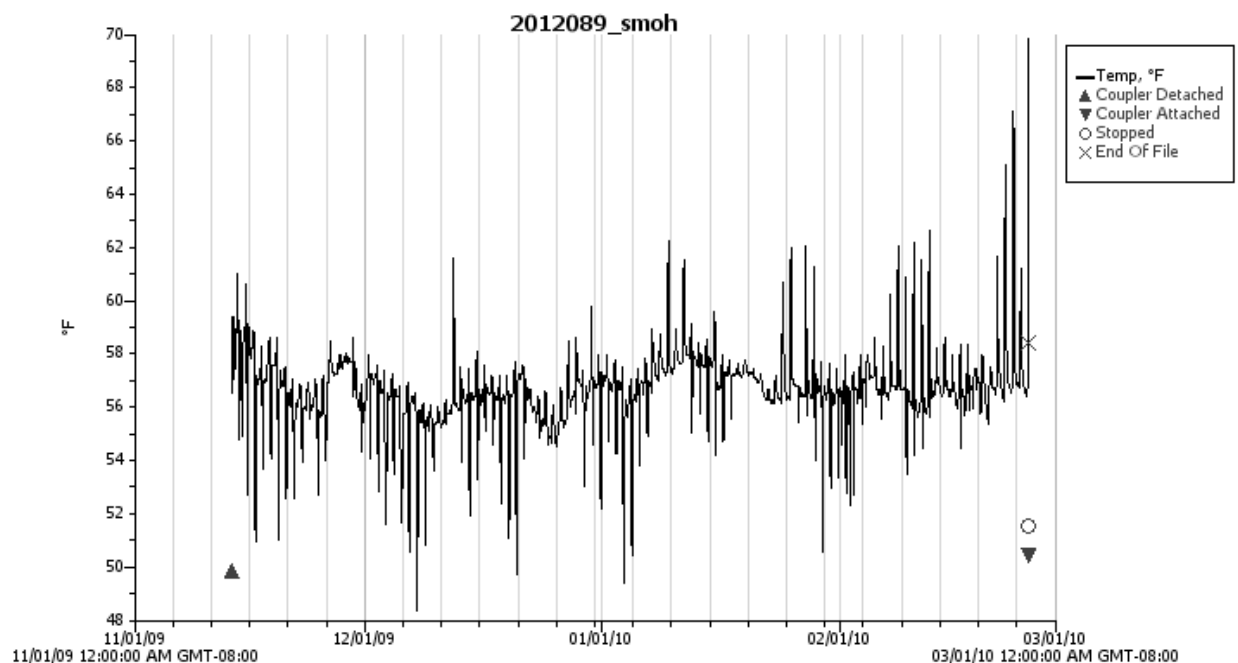
Abalone were measured in the farthest west crevices that we usually check. We were unable to check it on 2/24 because of the rising tide. We found an additional 23 abalone in Crevices 19 and 20. There were at least 10 more in the slot crevice (C-21) but no tags were detected there by holding the tag reader in the crevice and waving it over the abalone. Abalone can be seen end on in the crevice but the narrow opening does not allow us to see the shell from above to look for tags.

The mussel samples were bagged up and kept in the refrigerator overnight, then packed in an ice chest with an ice block for the flight to Ventura on 2/26. The samples had to be refrigerated over the weekend before shipping out on Monday. Their condition looked fine when shipped off.

We would have liked to check on the abalone population at Leuzarder Point and collect mussel samples there, but another larger storm was predicted to arrive late 2/26 so we took advantage of a scheduled flight to return to the mainland.



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



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

***Haliotis cracherodii* (black abalone) counts at Otter Harbor, San Miguel Island, winter 2010.**

<i>CountRandom</i>	<i>CountSized</i>	<i>MeanSize</i>	<i>StDev</i>	<i>MinSize</i>	<i>MaxSize</i>	<i>%<45mm</i>	<i>%45-126mm</i>	<i>%127-145mm</i>	<i>%>145mm</i>
174	174	100.86	25.72	30	162	1.15%	83.33%	11.49%	4.02%

Spring 2010 Rocky Intertidal Monitoring Trip Reports

Anacapa/Santa Cruz Island March 11-12, 2010

(Database event #2010-B)

Prepared by Stephen Whitaker

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biotech, Channel Islands National Park
Jacob Elliott, Biotech, Channel Islands National Park
Danielle Lipski, CINMS
Terrence Shinn, CINMS
Charlie Lara, CINMS

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. Cat Rock, South Frenchy's Cove, Middle West and Middle East sites at Anacapa 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 for all but four plots at Cat Rock and six plots at Middle West. All remaining plots will be scored from digital images. At Middle West, Stephen did the motile invertebrate counts because they were not completed last season. Motiles were counted at all other Anacapa sites last fall. Dan and Stephen scored plots at Cat Rock. 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, Cat Rock, and South Frenchy's Cove. The highest number of shorebirds and pinnipeds seen was recorded at each site. Temperature loggers were downloaded at Middle West and South Frenchy's Cove.

Results (Daily and Site Description)

March 11, 2010, Cat Rock, Anacapa Island. Low tide -0.2 ft. at 1352 hrs.

Clear sky, 5-6 mph winds out of SE and little swell, good conditions overall. Five black oystercatchers, 1 gull, and 1 wandering tattler were seen at the site prior to landing. Sixteen harbor seals including numerous pups were observed in the water surrounding the site. Ten more harbor seals were seen around Cat Rock proper (not the site). Several gray whales were seen passing by near to shore. Dan, Stephen, and Dani worked at Cat Rock from 1000-1200 hrs. and then again from 1400-1630. An hour and a half was spent working the site at South Frenchy's Cove. We observed several side-blotched lizards among the intertidal boulders (splash zone) on the walk between Cat Rock and South Frenchy's. Jacob worked the entire time at Cat Rock to GPS plots and other features at the site and count abalone/sea stars. Motile invertebrates were counted at this site last season.

There were no problems finding plots, and most bolts were in good shape. Stephen and Dani photographed the plots and panoramas. Following the work at Frenchy's, Stephen

and Dani counted *Lottia gigantea* and then Dan and Stephen scored plots. We were not able to score four plots because of time constraints. In the *Lottia* plots, n=32, n=21, and n=5 individuals were counted in plots 1-3, respectively. Sizes ranged 19-59 mm and the majority was around 30 mm. Jacob counted 20 *P. ochraceus* in 30 minutes then went back to measure 15 individuals. The majority was 120 mm (range= 40-160 mm). No other species of sea stars were seen. Jacob located six black abalone in 30 minutes throughout the site. Three individuals were <10 cm apart located in the crack offshore of plot 55, and three others were >5 m apart. Sizes ranged 40-130 mm.

Dan observed that mussel recruitment was common, *Chthamalus* were abundant, and rockweeds were present but not very dense or widespread throughout the site. The barnacle plots had a mean of 28.3% barnacles. *Endocladia* was measured as 30.2% mean cover in the representative plots and 18.7% in the *Silvetia* plots. *Silvetia* only accounted for 2% of the mean cover in the rockweed zone. Mean cover of mussels in the *Mytilus* plots was 30.6% and *Tetraclita* comprised 16.9%. Miscellaneous algae comprised primarily of articulated and prostrate corallines had a mean cover of 17% in the *Endocladia* zone, 11.4% in the rockweed plots, and 25.4% in the mussel plots.

March 11, 2010, South Frenchy's Cove, Anacapa Island. Low tide -0.2 ft. at 1352 hrs. Five black oystercatchers and two western gulls were observed at the site. Several harbor seal mother and pup pairs were seen during the walk between sites. No repairs were made, but corners were missing from nine plots. IPCO arrived around 1330 with a school group (approximately 60 students and adults) and proceeded to Blowhole. Motile invertebrates were not counted at the site because they were counted last season.

Stephen and Dani shot the plot and panoramic photos. Dan searched for *Pisaster ochraceus* and black abalone throughout the site for 30 minutes, but did not find any of either species. Dan and Stephen measured *Lottia gigantea* in the three plots while Dani recorded. N=5, 13, seven limpets were measured in plots 1-3, respectively. Sizes ranged 7-56 mm (mode = 47 mm).

Dan noticed that the site appeared to have high abundances of algae; *Ulva* was common in the upper intertidal and reds were lush and abundant in the lower intertidal. However, rockweed plots had low abundances of both species of rockweeds. Sand level next to plot 155 was approximately 46 cm. There was a low amount of tar observed at the site. The temp logger was downloaded at 1330 hrs.

Mean barnacle cover in the barnacle plots was 24%. *Endocladia* cover was relatively high in the barnacle zone (33.4%) and the *Endocladia* zone (78.4%). *Silvetia* accounted for 7.8% and 23% of the mean cover in the *Endocladia* and *Silvetia* plots, respectively. Mean cover of mussels in the *Mytilus* plots was 37.2%. Miscellaneous algae mean cover was 35.4% in the *Silvetia* plots (primarily composed of turf reds such as *Ceramium/Polysiphonia* spp.) and 23.4% in the mussel plots (primarily composed of *Chondracanthus canaliculatus* and *Gelidium coulteri*).

March 12, Middle Anacapa Island and Harbor Seal Arch. Low tide -0.2 ft. at 1417 hrs. Clear sky, 5 mph wind out of northwest and 2-3' surge. Conditions were fair, but swell increased throughout the day becoming problematic by late afternoon as lower intertidal including *Mytilus* plots were constantly wetted by waves. Pelicans were not yet nesting above the site. There were numerous western gulls on the bluff. Six black oystercatchers and two harbor seals (mother and pup) were observed in the vicinity of the reef when we arrived. We were on site from 1000-1600 hrs. Around 1600, Dan, Stephen, and Dani skiffed over to Harbor Seal Arch to search for abalone.

No repairs were made, but plot 454 along with several other plot corners needed some attention. Stephen counted motile invertebrates with Dani recording while Dan and Jacob climbed over to Middle East to photograph and GPS plots. Stephen and Dani then counted and measured *Lottia gigantea* in the three established plots. N=26 limpets were counted in plot 1 and both plots 2 and 3 had n=8. Sizes ranged 17-57 mm (mode=42 mm).

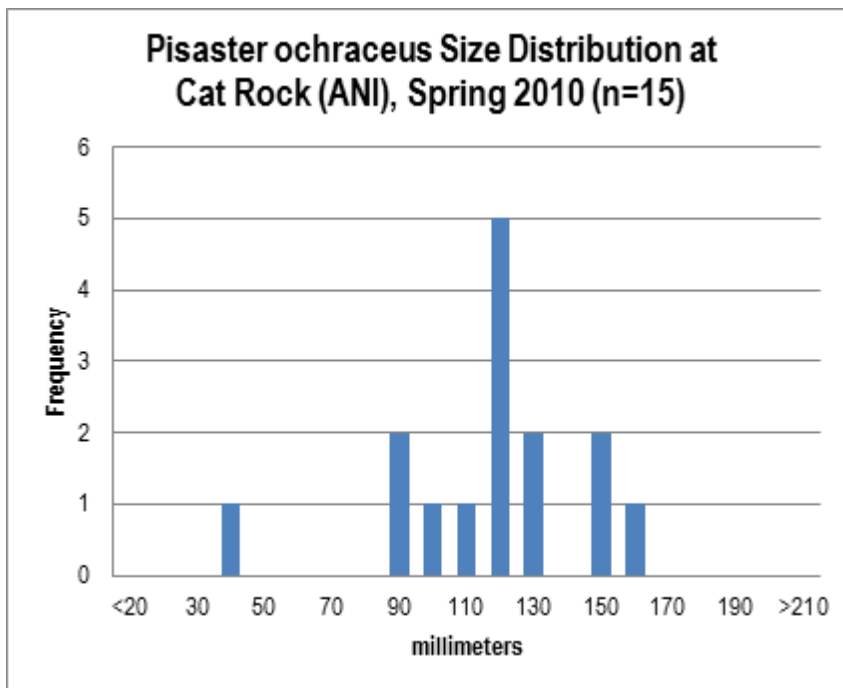
Dan counted and measured abalone for 30 minutes finding 18 individuals. Five more were located in an extended search. For reference, 10 abalone were found last season, 17 were located in spring 2009, and 37 were found in fall 2008. Sizes ranged 19-117 mm with the majority 50 mm. Approximately half the abalone were located <1 m apart, 8 others were >1 m but <5 m apart, and 5 were >5 m spread apart. Jacob used the GPS to map some features (ex. temp logger) at Middle West and then counted 286 *Pisaster ochraceus* in a 30 minute site-wide search. He measured 101 (range = 30-120 mm, mode = 90 mm) with Stephen recording. Note that the moderate-sized swell may have resulted in slightly lower counts for sea stars.

The reefs at Middle West and East were almost completely devoid of mussels with only a handful of small individuals noticed in a couple spots at each reef. The *Mytilus* plots were dominated by coralline algae, *Endocladia* appeared dense and healthy, *Chthamalus* were common and *Tetraclita* were present. *Sargassum muticum* was present in several spots along the reef. A few clumps of *Broses* were noticed. The invasive alga *Caulacanthus ustulatus* was fairly common but did not appear to have expanded in distribution at Middle West or Middle East. Average barnacle cover in the barnacle plots was 10.4% at Middle West and only 1.3% at Middle East. *Endocladia* averaged 19.8% and 16.3% at Middle West and East, respectively in the *Endocladia* zone. In the rockweed zone, both *Hesperophycus* and *Silvetia* were nearly absent at both sites (<1% mean *Silvetia* cover was measured at Middle East). Mussels were also nonexistent in the plots at both sites. Miscellaneous algae comprised primarily of articulated and prostrate corallines occupied the majority of space in the plots of all zones at both sites. Mean cover of miscellaneous algae ranged 22.6-60.4% in the 4 zones at Middle West and 22.3-80.7% at Middle East.

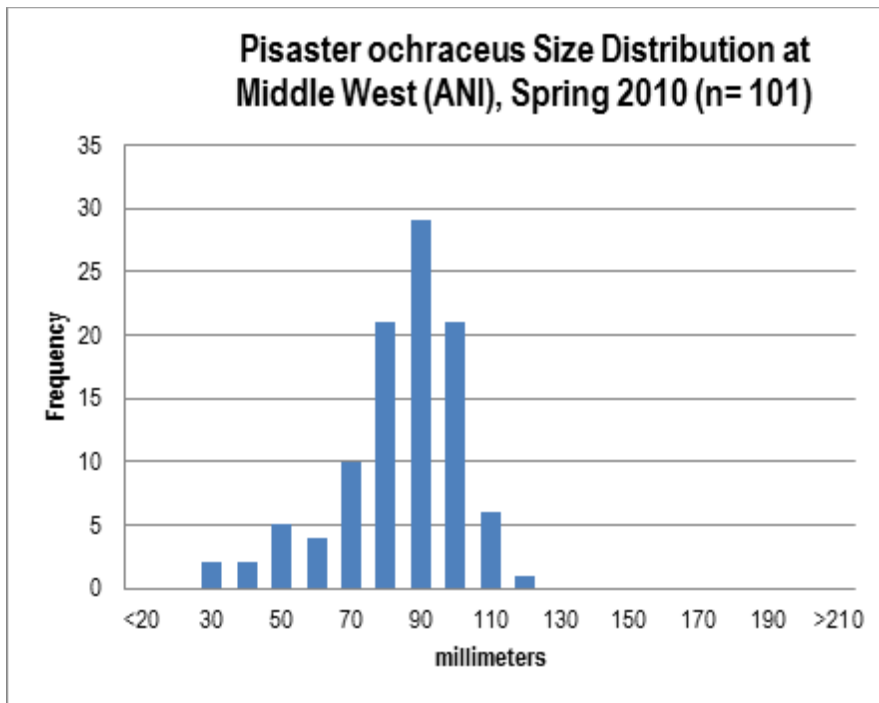
At Harbor Seal Arch, mussels were more common, but the reef appeared to have been recently damaged by large waves as several large patches of *Mytilus* had been removed. *Scytosiphon*, diatoms, and *Ectocarpus* dominated most of the bare patches in the absence of mussels though bare rock was also common. Low abundances of *Silvetia* and

Hesperophycus were observed. Waves washed over the reef on the larger sets, but we still located 5 black abalone. All were located in deep crevices and approximately 45-70 mm.

Motile invertebrates at Middle West were relatively low in abundance overall. The barnacle plots had an average of 2.6 *Lepidochitona* spp. and *Nuttallina* spp. There were several *Pachygrapsus*, large limpets and a couple *Acanthina* spp. present. *Littorina* spp., small and medium-sized limpets were not abundant in any of the plots. *Endocladia* plots 457, 460, and 461 were mostly devoid of inverts. Plot 458 had several *Nuttallina* spp. and *Acanthina* and a couple *Fissurella volcano*. Plot 459 had several *Nuttallina* and *Pachygrapsus*. Rockweed and *Mytilus* plots each had 2-5 different species of inverts excluding the littorines and small to medium-sized limpets. Exceptional counts consisted of 11 and 20 *Strongylocentrotus purpuratus* counted in plots 454 and 466, respectively. 8-10 *Nuttallina* spp. were counted in plots 455 and 456. *Ceratostoma nuttalli* were fairly common in the mid-upper intertidal. One was found in plot 466.



ANCR Pisaster Totals	
count	15
min size	40
max size	160
mean size	116.67
StDev	29.44



<i>ANMW Pisaster Totals</i>	
count	101
min size	30
max size	120
mean size	84.16
StDev	17.85

***Haliotis cracherodii* (black abalone) counts at Anacapa Island, spring 2010.**

Island Code	SiteCode	Timed count	Mean Size	StDev	MinSize	MaxSize	%<45mm	%45-126mm	%127-145mm	%>145mm
AN	CR	6	74.67	31.70	40	130	16.67%	66.67%	16.67%	-
AN	MW	23	57.87	22.22	19	117	21.74%	78.26%	-	-

Photoplot summary – mean percent cover by zone at Anacapa Island, spring 2010 (5 plots/zone except ANME with 3 plots/zone).

Island	Site	ZoneName	Bare Rock	Barnacle	Tetraclita	Endocladia	Hespero-phycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal
AN	ME	Barnacle	61.7	1.3	8.0	6.3	0.0	0.0	0.0	0.0	0.0	22.3	0.3
AN	ME	Endocladia	40.0	0.7	3.7	16.3	0.0	0.0	0.0	0.0	0.0	39.0	0.0
AN	ME	Silvetia	46.0	1.0	3.0	2.7	0.0	0.3	0.0	2.3	0.0	43.0	0.0
AN	ME	Mussels	8.3	0.0	5.0	0.0	0.0	0.0	0.0	5.0	0.0	80.7	0.3
<u>Island</u>	<u>Site</u>	<u>ZoneName</u>											
AN	MW	Barnacle	57.2	10.4	0.0	9.8	0.0	0.0	0.0	0.0	0.0	22.6	0.0
AN	MW	Endocladia	53.2	2.8	0.4	19.8	0.0	0.0	0.0	1.2	0.0	22.6	0.0
AN	MW	Silvetia	47.6	3.2	4.4	6.2	0.0	0.0	0.0	4.2	0.0	33.2	1.2
AN	MW	Mussels	11.8	0.0	14.0	1.2	0.0	0.0	0.0	11.6	0.0	60.4	0.6
<u>Island</u>	<u>Site</u>	<u>ZoneName</u>											
AN	CR	Barnacle	61.4	28.3	1.0	6.0	0.1	0.0	0.0	0.1	0.0	3.0	0.0
AN	CR	Endocladia	25.4	1.3	12.0	30.2	0.0	0.2	8.1	2.6	0.0	17.0	3.1
AN	CR	Silvetia	41.7	16.1	2.9	18.7	4.3	2.0	0.7	0.6	0.0	11.4	1.7
AN	CR	Mussels	21.4	0.3	16.9	1.9	0.0	0.0	30.6	1.6	0.0	25.4	1.9
<u>Island</u>	<u>Site</u>	<u>ZoneName</u>											
AN	SFC	Barnacle	36.8	24.0	0.0	33.4	0.0	0.0	0.0	0.0	0.0	5.6	0.0
AN	SFC	Endocladia	10.4	0.2	0.0	78.4	0.2	7.8	0.0	0.2	0.0	2.8	0.0
AN	SFC	Silvetia	26.8	2.2	0.0	12.2	0.0	23.0	0.0	0.4	0.0	35.4	0.0
AN	SFC	Mussels	10.0	0.0	0.0	0.0	0.0	0.0	37.2	29.4	0.0	23.4	0.0

Santa Cruz Island March 23-29, 2009

(Database event #2010-D))

Prepared by Stephen Whitaker

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Bio-tech, CINP
Jacob Elliott, Bio-tech, CINP
Jessie Altstatt, VIP

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 or Olympus 1030 digital camera. Motile invertebrates were counted in the photoplots at all sites except Scorpion Rock (motiles counted at SCSR last fall). Some photoplots were field scored at various sites. 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. We used the Park boat for transportation to the island and Island Packers to return. Dan, Stephen, and Jacob stayed at the research station three nights. On Friday, Dan took IPCO back to Ventura. Jacob and Stephen drove back out to the west end and stayed at Christy Ranch for one night. On Saturday, Jacob and Stephen took IPCO to Scorpion Anchorage and stayed in NPS housing for two nights. Summary tables of the data are presented at the end.

23 March, Prisoners Harbor, low tide 0.2 ft. at 1141 hrs. Air temperature was warm, skies mostly clear with light fog, slight northwest wind (approx. 2mph), and no apparent swell. Water in bay was murky. There was a dead loon on the cobble beach west of the reef. No birds were observed on the reef. Two black oystercatchers and one osprey were seen in the vicinity of the reef. Two day-visitors from IPCO investigated the reef while we were monitoring. No pinnipeds were seen in the area during our visit from 1130-1545 hrs.

Chthamalus/Balanus cover was dense within a narrow band along the reef. *Endocladia* was scarce but appeared healthy. Rockweed cover was low overall, but recruitment was observed from both species. Dan noticed that rockweed cover was often higher in areas outside of plots. *Scytosiphon dotyi* densely covered much of the western reef particularly in the upper intertidal. *Mytilus* were very scarce. The few mussels that were observed were likely *M. galloprovincialis*. Some *Septifer* were also present in a couple of small patches. The mussel zone was predominantly covered with a red filamentous algal mat that was, in turn, covered in silt. *Mazzaella leptorhynchus* and *Laurencia pacifica* were also common in the *Mytilus* zone. There were small patches of *Tetraclita* and *Corallina* spp. throughout the site though neither species formed expansive tracts.

Jacob and Dan photographed the plots and site. Jessie switched out the recruitment plates and tuffies at the site and then counted seastars (n=49 P.o.) and abalone (n=1) for 30 minutes

throughout the site. Stephen counted motile invertebrates in all of the plots with Jacob recording. Dan scored all but the *Hesperophycus* plots with Jessie recording.

The barnacle plots had 33% mean *Balanus/Chthamalus* cover. Other red algae (composed primarily of filamentous red species *Ceramium* sp. and *Polysiphonia* sp.) were moderately abundant (mean=19%) in the barnacle zone. Motile invertebrate spp. counts were typical of the barnacle zone with moderate counts of littorines and low numbers of small to medium-sized limpets. One *Pachygrapsus* was found in 4 out of 5 plots.

The *Endocladia* plots had 19% mean *Endocladia* cover. *Porphyra* (mean=11%) and barnacles (mean=37%) were also common in the five plots. Littorine snails were moderately abundant as were *Acanthina* spp. (mean=3.6). Plot 835 was especially diverse in terms of motile invertebrates as n=2-10 each of *Nucella*, *Acanthina*, *Tegula funebris*, and *Ocenebra* were counted.

There were no mussels in the *Mytilus* plots. Other red algae (mean=37%), *Mazzaella affinis* (mean=18%), and articulated corallines (mean=17%) were the most abundant assemblages and species in the mussel zone. One *Mytilus* plot had n=15 *Ocenebra circumtexta*, n=20 *Nuttallina* spp., and n=12 *Fissurella volcano* among other invertebrates. Three *Epitonium* were seen in the plots.

Silvetia zone only had *Silvetia* in three plots (mean=10.2%). *Endocladia* (mean=11.2%), *Mazzaella* (mean=11.2%), and non-coralline crust (mean=13.2%) were moderately abundant. *Nucella* and *Acanthina* (n=6-7) were particularly common in one of the plots.

Hesperophycus plots had 6.6% mean *Hesperophycus* cover. Mean barnacle cover was 38%, *Endocladia* and *Porphyra* had 6.2% and 16% mean covers, respectively. Littorine snails were moderately abundant but other invertebrates with the exception of *Tegula funebris* were uncommon.

24 March, Fraser Cove, low tide -0.2 at 1242 hrs. There was a medium amount of swell/surge out of the northwest and wind was approximately 6-8 mph out of the northwest. The sediment level was considerably high at the beach at Fraser Cove compared to previous years. Some fresh tar blobs were seen on the rocks at Fraser. One cormorant, 2 black oystercatchers, and 1 American oystercatcher hybrid were also observed. Two harbor seals were seen on the eastern beach while leaving Fraser. At Forney, approx. 30 gulls, and 2 black oystercatchers were observed. We monitored the sites from 1045 to 1600 hrs.

We started working at the Forney plots. Dan and Jacob photographed and made repairs at plot 888. Stephen counted motiles with Jessie recording. Dan and Jacob moved over to Fraser before Stephen and Jessie to photograph and count *Pisaster* (n=297) (range=60-160 mm, mode=110) and abalone (n=0) for 30 minutes. Jacob used the GPS to map all the plots and prominent features at both areas. Stephen and Jessie counted motiles in all the plots at Fraser.

Algae at Forney's appeared healthy, dense, and fertile. Some *Mytilus* and *Pollicipes* were observed at the site. At Fraser, *Mytilus* appeared healthy and numerous though *Pisaster*

abundances were high and likely impacting the mussel beds. *Endocladia* was noted as dense. *Chthamalus* recruitment was high. The surfgrass at Fraser looked healthy but a bit patchy. Red algae, *Chondracanthus spinosus* and *C. canaliculatus* along with other spp., were especially dense and abundant. *Phragmatopoma* was common at the south end of T3. *Phyllospadix* cover on the transects ranged 45-78%.

Barnacle cover averaged 51% in the barnacle plots. Mean *Endocladia* cover was 62% throughout the *Endocladia* zone. *Silvetia* only comprised 18% of the total cover in the *Silvetia* plots and *Hesperophycus* mean cover was 26% in the representative zone. Mean *Endocladia* cover was 14% in the *Silvetia* plots and 27% in the *Hesperophycus* zone. The *Pollicipes* plots only had a mean cover of 9% for *Pollicipes*, but *Mytilus* were fairly abundant throughout averaging 45%. *Phragmatopoma* was present in 4 out of 5 plots averaging 8%. *Mytilus* cover averaged 71% in the mussel plots. Tar cover in the tar plots averaged 39%.

Littorine snail counts were moderate to highly- abundant in the barnacle, *Hesperophycus* and tar plots. *Nucella emarginata* averaged 14 individuals per plot in the *Pollicipes* zone and $n=9.4$ in the *Mytilus* plots. *Tegula funebris* were most abundant in the rockweed zones averaging $n=13.2$ and $n=10.6$ in the *Hesperophycus* and *Silvetia* plots, respectively. Most rockweed plots had $n=1-6$ *Acanthina* spp. *Nuttallina*, *Fissurella volcano*, *Pachygrapsus crassipes*, and *Pagurus* spp. were present in low abundances in several plots within the *Silvetia* and *Pollicipes* zones.

25 March, Willows Anchorage, low tide -0.4 ft. at 1329. There was some moderate south swell in the water that was fading slowly from the peak the day before. Sets of waves (5-6) would impact the reef every few minutes sometimes washing over all *Mytilus* plots even during low tide. Some *Eisenia* plants were found washed up on the beach around the corner indicating the severity of the recent swell event. We accessed the site via Justiano Canyon since the status of the road down to Willows was unknown. Twenty-one abalone were seen at Justiano Reef. No abalone were seen at Little Justiano located on the east side of Willows. No birds or mammals were seen at the site, but two black oyster catchers and one American oystercatcher were seen downcoast. A dead fin whale was seen on the beach between Willows and Justiano. We were on site from 1050 to 1600 hrs.

Dan and Jacob shot photos of the plots and site. Stephen counted motile invertebrates in the plots with Jessie recording. Dan measured abalone and Jacob mapped the site and plots with a GPS. Stephen also walked over to boulder field slightly west of the site and counted $n=56$ (sizes ranged approximately 45-80 mm) in 5 minutes. Jacob counted seastars ($n=497$ *Pisaster ochraceus*, $n=1$ *P. giganteus*, $n=1$ *Patiria miniata*) for 30 minutes and proceeded to measure (range = 20-160mm, mode = 80mm). Stephen downloaded the temperature logger at 1445 and measured the sea temperature (15 degrees C) nearby rockweed reef.

Mean *Endocladia* cover in the *Endocladia* plots was 85%. *Silvetia* and *Hesperophycus* were absent from all but one plot in each of their representative zones. *Endocladia* (mean=14.6%) and Coralline crusts (mean=13.8%) occupied most of the cover in the *Hesperophycus* plots aside from bare rock. The *Silvetia* plots had nearly equivalent amounts of *Endocladia*, coralline crusts, non-coralline crust and *Phragmatopoma*. Mean cover for *Mytilus* in the mussel plots was 50%.

Articulated corallines occupied 18% of the mussel pots. *Tetraclita* and coralline crusts were common in most mussel plots.

Littorine snails were common in all zones except the *Mytilus*. Small and medium-sized limpets were common in most plots. Small limpets were particularly abundant in the *Silvetia* zone. Diversity of motile invertebrates was relatively high in most plots except those in the *Hesperophycus* zone. Several of the mussel plots had *Pisaster* and numerous purple urchins. One *Leptasterias* was found in a mussel plot and one *Epitonium* was located in an *Endocladia* plot.

26 March, Trailer, low tide -0.6 ft. at 1409. Stephen and Jacob drove from the research station in the morning to Christy to meet up with Jessie and Jay (TNC). We then headed over to Trailer. Northwest wind was blowing steadily 10-15 mph and a wind swell approximately 3-5' was washing over the reef when we arrived. Both the wind and swell increased throughout the day. The mussel plots were wetted frequently even during low tide and the surfgrass transects were constantly washed. Three black turnstones and 2 harbor seals (mother and pup) were seen at the reef at arrival.

Jessie put the yellow markers out at each plot, Stephen counted motile invertebrates and Jacob used the GPS to map plots. Jessie recorded for Stephen until tide receded enough to photograph the site with Jacob. Jay showed up around low tide and did the 30 minute survey for abalone. Jessie resurveyed the site for abalone finding 7 (sizes ranged 80-150mm). Jacob searched for (n=105) and measured (n=76) sea stars (range=40-120mm, mode=70mm). Jacob made a repair at plot 927 to lower corners. Stephen and Jessie worked together to sample the surfgrass transects which were significantly affected by the wind swell. We were able to safely work transects 1 and 2 but transect 3 was too wet.

Porphyra was highly abundant on the boulders west of the site near the access point. *Mytilus* was fairly common on the east end of the site, but occurred in low abundance near and in the mussel plots (mean cover=18%). Four out of five mussel plots were dominated primarily by *Phragmatopoma* (mean cover=26%) and *Ulva* (mean cover=23%). *Silvetia* was common (mean cover=55% in the *Silvetia* plots) and appeared healthy though without receptacles. *Hesperophycus* was scarce (mean cover=9% in the *Hesperophycus* plots). *Endocladia* appeared thick and healthy (mean cover=14% in the *Hesperophycus* plots). There was some *Tetraclita* recruitment. *Tegula funebris* were highly abundant in the rockweed zone and several *Tegula gallina* were counted. *Phyllospadix* was healthy overall though it was heavily fouled by *Smithora* particularly on transect #1. *Balanus* and *Chthamalus* were common in the barnacle plots (mean=56%).

Motile invertebrates were fairly diverse and common particularly in the rockweed plots. The *Silvetia* plots had n=50-194 *T. funebris* per plot, an average of n=3 *Acanthina* per plot, and most plots had at least one *Lepidochitona*, *Pachygrapsus*, and *Pagurus* spp. Five *T. gallina* were counted and measured in the *Silvetia* plots. *Hesperophycus* plots had similar species diversity but lower abundances. Littorines and small to medium-sized limpets were present in low abundances throughout most of the rockweed plots. The barnacle plots had markedly more littorines and small to medium-sized limpets, but few other invertebrates. One *Amphissa* was observed in a

barnacle plot. Nine purple urchins were observed in the *Mytilus* plots. *Nuttallina* spp. was the most abundant motile invertebrate in the mussel zone.

28 March, Scorpion Rock, low tide -0.4 ft. at 1521. Conditions were excellent with clear sky and unseasonably warm temperatures in the early afternoon. The day before was quite windy with Santa Ana's gusting upwards of approximately 30 mph. Today, northwest wind increased in the late afternoon around 1600 to 10-15 mph and then to 15-20 mph around 1700. We used Island Packers to transport from Prisoner's Harbor yesterday and stayed in NPS housing. Kayaks borrowed from David Mazurkiewicz and the seabird monitoring group were used to access the sites. One cormorant and three western gulls were in the water between the main site and Scorpion Rock. Two California sealions were observed thermo regulating approx. 100m offshore of the main site at arrival. At least two harbor seals swam in the vicinity of the main site most of the time while we were monitoring. Three pigeon guillemots were seen and heard near the cliff east of the main site. A sailboat was anchored approx. 75m offshore and a motor vessel was anchored approx. 100m east of the main site. Several groups of kayakers and two inflatable boats passed by the site during the day. We were on the main site from 1230 to 1645 and at Scorpion Rock from 1700 to 1745.

At the main reef, Stephen scored the *Mytilus* and *Tetraclita* plots while Jacob used the GPS to map the plots and prominent features of the site. Jacob then counted sea stars (n=128 in 30 minutes) and searched for black abalone. Both worked together to shoot the photos then Stephen recorded for Jacob as he measured stars (n=93, sizes ranged 50-130mm, mode=80mm) and abalone (n=7, sizes ranged 30-93mm). At Scorpion Rock, both photographed and Jacob GPS'd while Stephen searched for and measured abalone for 30 minutes (n=11, sizes ranged 57-140mm). All except one abalone were located on the north side of the large rock in the center of the site normally used for accessing and leaving the site via skiff. The one other abalone was found attached to a large boulder at the north end of the boulder field. Motile invertebrates were not counted in the plots this season because they were scored last fall.

The main reef looked similar this season to last fall. *Mytilus* were rare and only occurred in small patches in a few places along the reef. Several *Megathura crenulata* were seen though not as many as last visit to the site. *Endocladia* and *Mazzaella* appeared to be abundant and healthy. *Tetraclita* were highly abundant with numerous recruits present. The lower intertidal was predominantly covered with *Corallina vancouveriensis*, *C. pinnatifolia* and *Gelidium coulteri*. *Strongylocentrotus purpuratus* were abundant in the main large tidepool and throughout the lower intertidal. *Egregia* was common but many plants appeared discolored (orangish). At Scorpion Rock, *Silvetia* was common to abundant and reproductive. Note that it is the subspecies *deliquescens*. *Hesperophycus* is present but much less common. *Tegula funebris* and *Lottia gigantea* were common.

Barnacle plots supported low abundances of both *Balanus* and *Chthamalus* (mean cover=9%) and moderate amounts of *Endocladia* (mean cover=34%). *Endocladia* was abundant in the representative plots (mean cover=61%). *Mytilus* and *Tetraclita* plots were diverse. Mean *Tetraclita* cover measured in the *Mytilus* plots was 21% and in the *Tetraclita* plots was 15%. Mean *Mazzaella* cover was 23% and 12% in the *Mytilus* and *Tetraclita* plots, respectively. *Gelidium coulteri* was common in the mussel plots (mean cover=15%). Plot 823 was 50%

covered with what appeared to be a diatom mat that was covered with fine silt. The *Hesperophycus* plots only had small amounts of *Hesperophycus* (mean cover=9%) and *Silvetia* (8%). Bare rock comprised most of the cover in the rockweed plots.

***Haliotis cracherodii* (black abalone) counts at Santa Cruz Island, spring 2010.**

SiteCode	Timed count	MeanSize	StDev	MinSize	MaxSize	%<45mm	%45-126mm	%127-145mm	%>145mm
FC	0					-	-	-	-
SR	18	89.56	34.32	30	140	11.11%	72.22%	16.67%	-
TR	7	105.71	25.24	80	150	-	85.71%	-	14.29%

Surfgrass transects at Fraser Cove, Santa Cruz Island, spring 2010
(additional taxa with no values deleted from table)

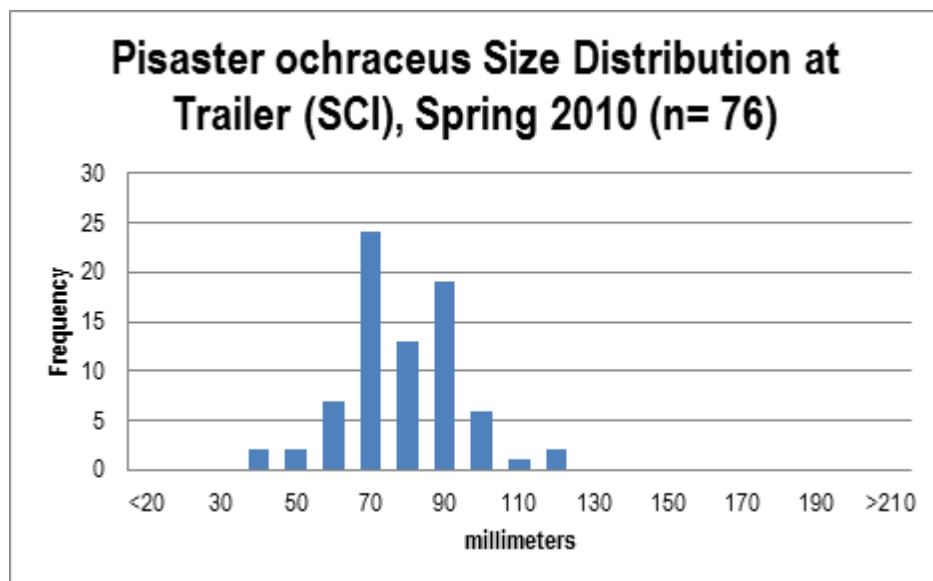
Location: Fraser Cove Site Code: SCFC
Date: 3/24/2010 recorders: Dan Richards

<u>Surf Grass Taxa</u>	<u>Transect 1</u>	<u>Transect 2</u>	<u>Transect 3</u>
<i>Phyllospadix</i> spp. overstory	44	57	76
<i>Phyllospadix</i> spp. understory	1	3	2
<i>Egregia menziesii</i>	1		
Erect coralline	9	1	3
other red algae	34	32	20
Other green algae			
<i>Anthopleura</i> spp.	1		
<i>Mytilus californianus</i>			
Rock	8	3	1
Sand		1	
total	98	97	102

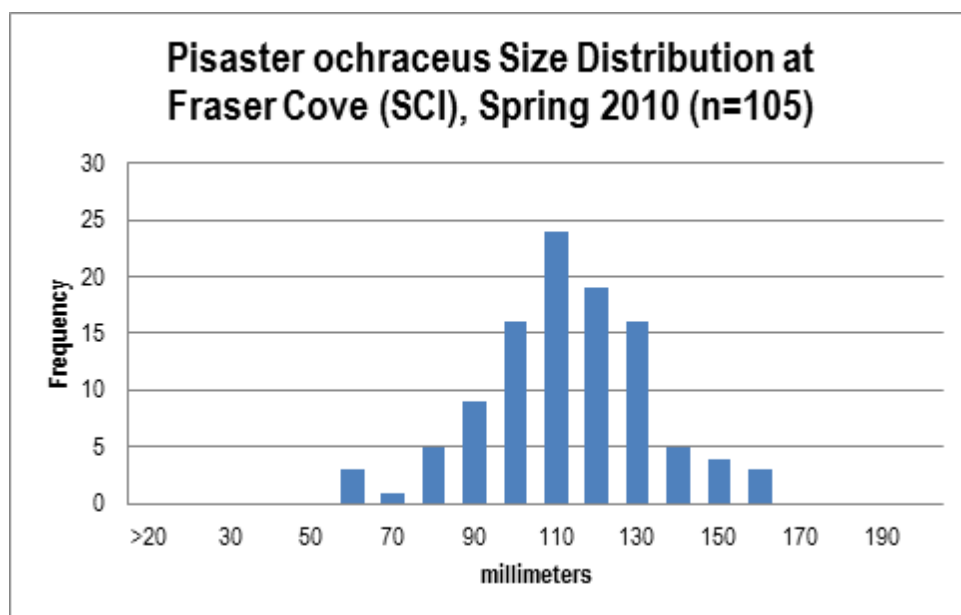
Surfgrass transects at Trailer, Santa Cruz Island, spring 2010
(additional taxa with no values deleted from table)

Location: Trailer Site Code: SCTR
Date: 3/26/2010 recorders: Stephen Whitaker, Jessie Altstatt

<u>Surf Grass Taxa</u>	<u>Transect 1</u>	<u>Transect 2</u>	<u>Transect 3</u>
<i>Phyllospadix</i> spp. overstory	40	62	ns
<i>Phyllospadix</i> spp. understory		2	
<i>Egregia menziesii</i>	2	2	
<i>Cystoseira/Halidrys</i>			
articulated corallines	14	3	
other red algae	35	19	
other green algae			
<i>Anthopleura</i> spp.		1	
<i>Phragmatopoma</i>			
<i>californica</i>	7	7	
barnacles	2	4	
total	100	100	ns

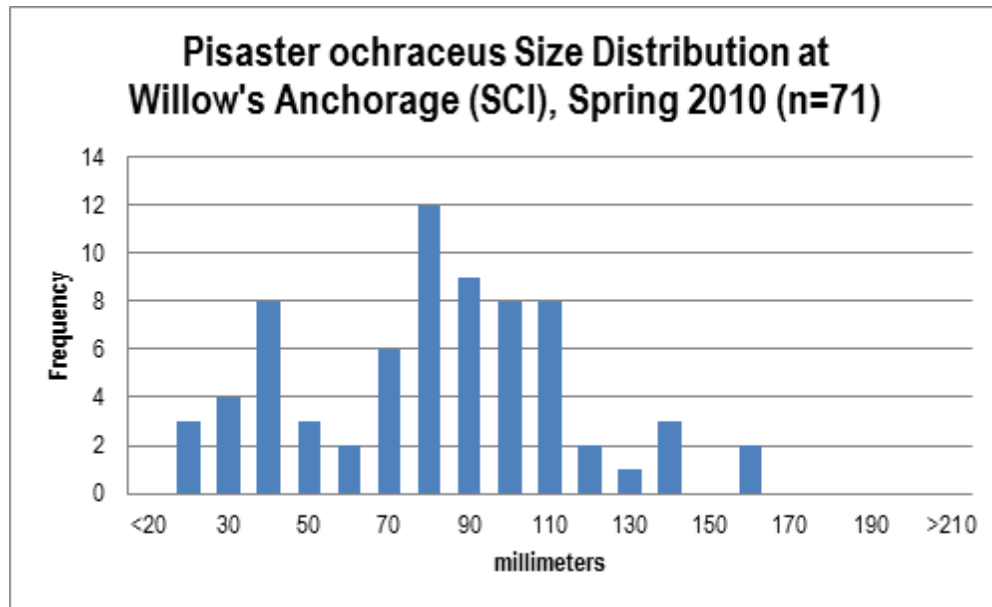


<i>SCTR Pisaster totals</i>	
count	76
min size	40
max size	120
mean size	78.68
StDev	15.69



<i>SCFC Pisaster Totals</i>	
count	105
min size	60
max size	160
mean size	112.76

StDev	20.73
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SCWA Pisaster Totals	
count	71
min size	20
max size	160
mean size	80.99
StDev	33.43

Photoplot summary – mean percent cover by zone at Santa Cruz Island, spring 2010 (5 plots/zone).

Site	ZoneName	Bare Rock	Barnacle	Tetraclita	Endocladia	Hespero-phycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal	tar	Other
FC	Chthamalus/Balanus (Barnacle)	35.0	51.4	0.0	6.4	0.0	0.0	1.2	0.2	0.0	3.8	0.2	1.8	0.0
FC	Endocladia	23.0	7.2	0.0	62.0	0.0	0.0	2.8	0.0	0.0	4.8	0.2	0.0	0.0
FC	Silvetia (Rockweed)	35.0	2.2	0.0	14.4	13.0	18.0	0.0	2.6	0.0	13.6	0.6	0.0	0.6
FC	Mussels	6.4	3.4	0.4	0.0	0.0	0.0	71.2	0.4	0.2	6.0	11.6	0.0	0.4
FC	Pollicipes	11.6	7.6	2.0	2.6	0.0	0.0	45.0	1.0	9.2	9.2	11.8	0.0	0.0
FC	Tar	41.8	14.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.0	39.2	0.0
FC	Hesperophycus	41.6	2.4	0.0	26.8	26.2	1.6	0.0	0.0	0.0	1.4	0.0	0.0	0.0
<u>Site</u>	<u>ZoneName</u>	<u>Bare Rock</u>	<u>Barnacle</u>	<u>Tetraclita</u>	<u>Endocladia</u>	<u>Hespero-phycus</u>	<u>Silvetia</u>	<u>Mussels</u>	<u>Turfweed</u>	<u>Leaf Barnacle</u>	<u>Misc Algae</u>	<u>Misc Animal</u>	<u>tar</u>	<u>Other</u>
PH	Chthamalus/Balanus (Barnacle)	10.6	33.0	0.0	15.8	1.2	0.0	0.0	3.2	0.0	35.0	1.2	0.0	0.0
PH	Endocladia	28.4	36.6	0.0	19.4	1.0	0.0	0.0	0.0	0.0	13.8	0.8	0.0	0.0
PH	Silvetia (Rockweed)	14.6	10.2	0.2	11.2	0.6	10.2	0.0	1.4	0.0	51.6	0.0	0.0	0.0
PH	Mussels	2.0	1.8	7.2	0.0	0.0	0.0	0.0	6.6	0.0	77.6	4.8	0.0	0.0
PH	Hesperophycus	33.4	37.6	0.0	6.2	6.6	0.0	0.0	0.0	0.0	16.2	0.0	0.0	0.0
<u>Site</u>	<u>ZoneName</u>	<u>Bare Rock</u>	<u>Barnacle</u>	<u>Tetraclita</u>	<u>Endocladia</u>	<u>Hespero-phycus</u>	<u>Silvetia</u>	<u>Mussels</u>	<u>Turfweed</u>	<u>Leaf Barnacle</u>	<u>Misc Algae</u>	<u>Misc Animal</u>	<u>tar</u>	<u>Other</u>
TR	Chthamalus/Balanus (Barnacle)	31.8	55.6	0.2	10.6	0.0	0.0	0.4	0.0	0.0	1.0	0.4	0.0	0.0
TR	Silvetia (Rockweed)	26.2	2.4	0.0	2.0	0.2	54.8	0.2	0.0	0.0	12.8	1.4	0.0	0.0
TR	Mussels	4.2	1.0	1.2	0.0	0.0	0.0	18.4	3.0	0.0	46.0	26.2	0.0	0.0
TR	Hesperophycus	43.8	5.5	0.0	13.5	7.5	26.7	0.0	0.0	0.0	3.0	0.0	0.0	0.0

<u>Site</u>	<u>ZoneName</u>	<u>Bare Rock</u>	<u>Barnacle</u>	<u>Tetraclita</u>	<u>Endocladia</u>	<u>Hespero -phycus</u>	<u>Silvetia</u>	<u>Mussels</u>	<u>Turf- weed</u>	<u>Leaf Barnacle</u>	<u>Misc Algae</u>	<u>Misc Animal</u>	<u>tar</u>
SR	Barnacle	56.4	8.8	0.0	34.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
SR	Endocladia	23.2	0.8	0.4	60.6	0.0	0.0	0.2	0.0	0.0	14.8	0.0	0.0
SR	Mussels	12.2	0.0	20.8	0.8	0.0	0.0	0.0	16.4	0.0	48.6	1.2	0.0
SR	Tetraclita	53.0	0.6	14.6	7.2	0.0	0.0	0.0	0.6	0.0	21.6	2.4	0.0
SR	Hespero- phycus	40.0	0.2	0.2	39.0	9.4	8.4	0.2	0.0	0.0	2.6	0.0	0.0
<u>Site</u>	<u>ZoneName</u>	<u>Bare Rock</u>	<u>Barnacle</u>	<u>Tetraclita</u>	<u>Endocladia</u>	<u>Hespero -phycus</u>	<u>Silvetia</u>	<u>Mussels</u>	<u>Turf- weed</u>	<u>Leaf Barnacle</u>	<u>Misc Algae</u>	<u>Misc Animal</u>	<u>tar</u>
WA	Endocladia	12.2	0.0	0.8	85.2	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0
WA	Silvetia	34.2	1.8	0.0	16.8	0.0	1.4	0.0	0.0	0.0	27.2	18.6	0.0
WA	Mussels	5.8	0.0	6.4	0.0	0.0	0.0	50.4	7.8	0.6	28.4	0.6	0.0
WA	Hespero- phycus	54.2	1.2	0.0	14.6	3.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0

Spring 2010 Rocky Intertidal Monitoring Trip Reports

Santa Miguel Island April 17-22, 2010

(Database event #2010-E)

Prepared by Stephen Whitaker

PURPOSE: To monitor rocky intertidal sites at Santa Miguel Island.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Bio-tech, CINP
Jacob Elliott, Bio-tech, CINP
Ann Vileisis, VIP

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 at Harris Point and Cuyler Harbor. Approximately half the photoplots were scored in the field at both Otter Harbor and Crook Point. 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 logger was only downloaded at Otter Harbor; the logger at Crook Point was not downloaded this season.

18 April 2010 Cuyler Harbor. Low tide -0.2 ft. at 0730 hrs. Conditions were mostly overcast due to a relatively thick marine layer. Winds were light at <5 mph. Swell/surge was low at approx. 1-2'. Water temperature was 14 degrees Celsius. There were two black turnstones and six elephant seals on or near the vicinity of the reef. A young elephant seal was seen in the surge channel, but only a few other elephant seals along with two black oystercatchers were seen on the beach near the site. We waited for the sun to rise before leaving the bunk house around 0545. The surge channel was devoid of sand forcing us to hike up and over the bluff above the channel. We arrived at the site just before 0700.

Jacob counted (n=137 in 16 minutes) and measured (range=30-180mm, mode=110-120mm) *Pisaster* while Stephen counted motile invertebrates in the photoplots with Ann recording. Dan scored plots, searched for abalone (n=0) and helped Jacob to photograph the site. Jacob also used a GPS to record the locations of all BLM markers that were found.

Mytilus were abundant and most were exceptionally large. The highest densities were seen on the reef closest to the beach. Some recruitment of mussels was observed throughout the site as well as on the outer reef. *Pisaster* was observed eating some of the mussels. Overall, *Silvetia* looked good throughout the site even though some plants showed signs of abrasion particularly on the upper reef near plots 408-410. *Endocladia* was relatively dense and healthy-looking. *Balanus* distribution was thin, but some dense patches were present.

The *Mytilus* plots were relatively diverse; mussels occupied the greatest surface area (mean=30.2%). *Mazzaella* (mean=9%), *Tetraclita* (mean=11.8%) and *Phragmatopoma* (mean=14.6%) were also relatively abundant in the mussel plots. The *Endocladia* plots had

48.4% mean *Endocladia* cover. *Silvetia* was only present in four out of five plots (mean=23.4%). *Phragmatopoma* (mean=8%) was the second most abundant species in the *Silvetia* plots. Mean barnacle cover=27.4% in the barnacle plots. *Endocladia* cover (mean=27%) was nearly equal to barnacles in the barnacle plots.

Motile invertebrates were relatively diverse and moderately abundant in all four zones. The barnacle plots mostly had moderate numbers of *Littorina* spp. Plot 420 had n=13 *Tegula funebris*. The *Endocladia* plots had *Nuttallina* (mean=3), *Pachygrapsus* (mean=2.8), *Nucella* (mean=4.4), *Acanthina* (mean=2), *Tegula funebris* (mean=6.4), and *Lottia gigantea* (mean=0.8). *Ocenebra*, *Amphissa*, and *Lepidochitona* were also present in lower abundances in the *Endocladia* plots. The *Silvetia* plots had slightly lower abundances of species found in *Endocladia* plots with exception of *Tegula funebris* (mean=14.6). *Mytilus* plots had *Nuttallina* (mean=18.6), *Pachygrapsus* (mean=3.2), *Nucella* (mean=6.4), and *Lottia gigantea* (mean=7.2), along with lower abundances of *Lepidochitona*, *S. purpuratus*, and *Ocenebra*.

19 April 2010, Harris Point. Low tide -0.1 ft. at 0900 hrs. Conditions were sunny and clear with light wind (approx. 5mph) and light swell/surge. We arrived at the site at 0750 and were able to work all of the plots until we left at 1345. There were 3 black oystercatchers on the site. Two elephant seals were swimming in the surge channel. No birds or seals were on the rocks when we arrived. Pigeon guillemots were heard in the cove west of the site.

Jacob counted (n=30 in 44 minutes) and measured (range=50-180mm, mode=160mm) *Pisaster ochraceus*, and also found *P. giganteus* (n=2), *Pycnopodia* (n=3), *Leptasterias* (n=2), *Henricia* (n=1) and *Patiria* (n=8). Dan searched the site for abalone (n=19 located and measured in 48 minutes) (range=80-148mm) and helped Jacob to photograph. Stephen counted motile invertebrates with Ann recording. Dan scored plots. Jacob made plot repairs.

For reference, the following excerpt is from our visit to Harris Point last season (fall 2009): *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 searched for and measured abalone finding 14 outside of plots and 1 in plot #3.*

Tar cover appeared similar to previous visits. *Balanus/Chthamalus* and *Tetraclita* recruitment were very high throughout the site. *Mytilus* abundances were low in most mussel beds, as they typically are at this site. *Tegula gallina* were relatively common in the vicinity of abalone plot 445, but none were found in any of the photoplots. *Lottia limatula*, *Pagurus* spp. and *Littorina* spp. were abundant throughout the site. The central area was dominated by *Chondracanthus canaliculatus*, *Mazzaella* and *Mastocarpus*.

Barnacle plots had 67.4% mean *Balanus/Chthamalus* cover. Plot 443 had 10% tar cover. Mussels were present in plot 444. There were no motile invertebrates in the plots besides *Littorina* spp. (common-abundant) and small to medium-sized limpets (present in low numbers).

Endocladia plots had 24.8% mean *Endocladia* cover and 22.4% mean *Balanus/Chthamalus* cover. Motile invertebrates were scarce in the plots aside from a few large limpets, *Nucella emarginata*, and *Nuttallina*. Littorines were common.

Rockweed plots had 26.6% mean *Hesperophycus* cover and 21.8% mean *Endocladia* cover. *Hesperophycus* was not present in plot 424. Motile invertebrates were uncommon. There were n=5 *Pachygrapsus* and n=4 large limpets distributed throughout the plots in addition to n=1 *Nuttallina* and n=3 *Ocenebra*.

Tetracrita plots had 27.2% mean *Tetracrita* cover, 15.6% mean *Mytilus* cover, 10.4% mean non-coralline cover, 9.2% mean barnacle cover, and 5% *Mazzaella* cover among other less dominant species and assemblages. Motile invertebrates were the most common in *Tetracrita* plots compared with plots in other zones. *Lepidochitona* (mean=4.2), *Nuttallina* (mean=12.2), *Pachygrapsus* (mean=1.6), large limpets (mean=5), *Nucella* (mean=6.6), and *Lottia gigantea* (mean=3.2) were the most common invertebrates present.

Mytilus plots had 22.8% mean *Mytilus* cover, 24.6% mean barnacle cover 6.6% mean *Tetracrita* cover, 5.6% mean *Mazzaella* cover, 4.4% mean *Endocladia* cover, and 4.4% mean non-coralline cover among other less dominant species and assemblages. Common motile invertebrates included *Nuttallina* (mean=1.4), *Pachygrapsus* (mean=1.8), large limpets (mean=2.6), *Nucella* (mean=4.2), and *Lottia gigantea* (mean=1).

Beachwalk- Simonton Beach-1430. We surveyed Simonton Beach for debris and carcasses. Marine debris was abundant composed primarily of buoys, plastic fragments, light bulbs, irrigation pipe, flower pots, cans, and bottles. There were tar blobs everywhere along with fox tracks. six carcasses were seen: three sea lions, one immature adult male elephant seals, feathers and wings of an alcid, and one beached toothed whale was located. It measured 3.5m and appeared to be a pilot whale though at the time we thought it was a Risso's dolphin or perhaps a pygmy sperm whale. Note that a second whale was found on 4/22 that we had missed. All the carcasses were mummified or in advanced stages of decay.

20 April 2010 Crook Point. Low tide 0.0 ft. at 0951 hrs. Light rain showers passed over the island intermittently beginning about 0530. It began to rain hard as soon as we arrived at the site at 0815. We ducked behind some rocks for approximately one hour while the squall passed over. Some medium-sized waves (3-4') continuously washed over most of the main reef during our visit. Wind was gusty at times and steadily blew approximately 15-20 mph. There was 1 cormorant, 2 gulls, 7 black oystercatchers, 9 black turnstones, 1 ruddy turnstone, and 3 elephant seals in the vicinity of the site. The marginally-low tide combined with the moderate swell/surge made for difficult conditions to search for abalone. We did not attempt to count motile invertebrates. We also did not download the temperature logger.

Jacob counted n=83 *Pisaster ochraceus* in 30 minutes. Dan searched for (n=17) and measured (n=11, range=75-122mm) abalone for approximately 30 minutes. The swell made it impossible to search the front of the reef and difficult to sample the tidepools. Stephen scored 10 of the most diverse and therefore 'difficult to score' plots with Ann recording. Dan and Jacob photographed the plots and site panoramas.

For reference, the following excerpt is from our visit to Crook Point last season (fall 2009):

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).

Analphus japonica was very common throughout the reef along with *Microcladia borealis*. Other less common algal species included *Mazzaella* (*Iridaea*) sp., *Laurencia spectabilis*, *Gastroclonium subarticulatum*, *Scytosiphon lomentaria*, and *Chondracanthus spinosus*.

Barnacle plots had 29.8% mean *Balanus/Chthamalus* cover. *Endocladia* plots had 39.2% mean *Endocladia* cover, 14% mean misc. algal cover (comprised of *Mazzaella* spp., *Mastocarpus*, *Cladophora*, *Porphyra*), 10.4% mean *Mytilus* cover, and 6.6% mean barnacle cover. *Silvetia* plots had 0.2% mean *Silvetia* cover, 25.4% mean *Endocladia* cover, 21.2% mean misc. algal cover (comprised of *Mazzaella* spp., *Mastocarpus*, *Cladophora*, *Porphyra*), and 28% mean *Mytilus* cover. *Mytilus* plots had 81.4% mean mussel cover.

21 April 2010 Otter Harbor. Low tide -0.1 ft. at 1127. Conditions were mostly cloudy with numerous squalls passing over out of the northwest. Wind was heavy at a steady 25-30 mph and gusts higher as squalls approached. Swell/surge was also heavy causing dense foam and white water throughout the lower intertidal. There were 25 gulls, 6 black oystercatchers, 14 harbor seals, and 12 elephant seals on the reef when we arrived. Several elephant seals and 2 harbor seals were hauled out on the small beach east of the site. We did not count motile invertebrates or search for *Pisaster ochraceus* since both were done at this site during our last visit in February. Temperature loggers were not downloaded.

Stephen and Jacob photographed the site and scored some of the plots. Jacob scored several plots under the supervision of Stephen. Dan searched for (n=125) and measured abalone with Ann recording. N=20 individuals were tagged. Several of the lower crevices could not be accessed due to the swell. No additional abalone were tagged. The large abalone in C5 could be seen but not measured. One shrunken animal was found in C25 that was relatively active and easy to remove from the rock. All other abalone in the surrounding area appeared healthy.

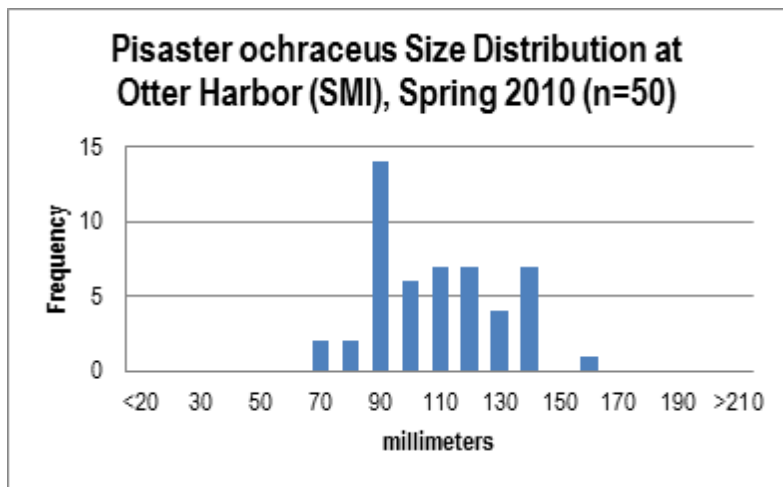
In February, Dan found 180 black abalone. Because of time, he did not measure all of them and did not read the pit tags though he found 18 with tags. Two old and two new black abalone shells were found during a search of the site. Steve found 130 *Pisaster ochraceus*, 16 *P. giganteus*, and 3 *Patiria 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.

Barnacle plots had 29.6% mean *Balanus/Chthamalus* cover and 20.4% mean miscellaneous algal cover (comprised mostly of *Chondracanthus*, *Mazzaella affinis*, *Ulva*, and *Porphyra*). *Endocladia* plots had 54.8 % mean *Endocladia* cover (note that plot 361 was not scored in field and a picture was not taken). *Silvetia* plots had 27% mean *Endocladia* and 18.8% mean miscellaneous algae (mostly comprised of *Mastocarpus*, *Mazzaella*, and *Porphyra*). Mussel plots had 42.6% mean *Mytilus* cover and 41.4% mean miscellaneous algae (mostly comprised of coralline crusts, articulated corallines, non-coralline crusts, *Mazzaella* spp., and *Porphyra*).

22 April 2010 Simonton Cove. Dan, Stephen and Ann along with Ian and Charles hiked out to Simonton to obtain more measurements of the beached whale. We located a second beached whale nearby that appeared to be the same species. Both whales appeared to have been beached for several days or more. We collected tissue samples from the first whale we encountered and a tooth from each of the whales for identification purposes.

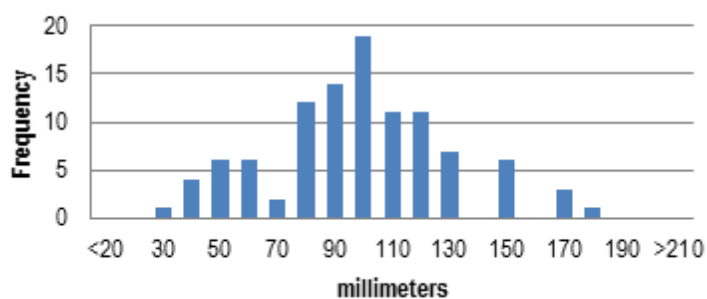
Post script: Michele Berman from Santa Barbara Museum of Natural History let us know that the genetic samples confirmed the carcasses were *Grampus griseus*, Risso's dolphin.

No *Pisaster* measurements taken at Crook Point



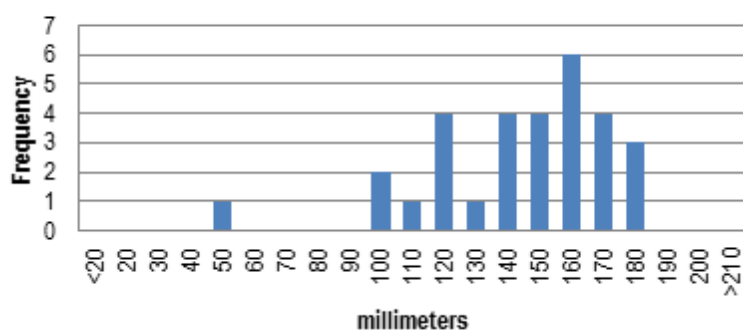
count	50
min size	70
max size	163
mean size	108.66
StDev	21.58

**Pisaster ochraceus Size Distribution at
Cuyler Harbor (SMI), Spring 2010
(n=103)**



count	103
min size	30
max size	180
mean size	98.45
StDev	31.24

**Pisaster ochraceus Size Distribution at
Harris Point (SMI), Spring 2010 (n=30)**



count	30
min size	50
max size	180
mean size	143.67
StDev	29.18

		PhotoZoneAvgCover												
Site	ZoneName	Bare Rock	Barnacle	Tetraclita	Endocladia	Hesperophycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
CH	Barnacle	44.8	27.4	0.0	27.0	0.0	0.0	0.2	0.0	0.0	0.6	0.0	0.0	0.0
CH	Endocladia	24.0	4.4	1.2	48.4	0.0	4.6	6.4	0.4	0.4	9.0	1.2	0.0	0.0
CH	Rockweed	43.4	3.6	3.6	6.8	0.0	23.4	0.2	0.2	0.0	9.2	9.6	0.0	0.0
CH	Mussels	15.0	1.2	11.8	0.0	0.0	0.0	30.2	3.8	2.6	15.4	20.0	0.0	0.0
CP	Barnacle	63.6	29.8	0.0	5.6	0.0	0.0	0.6	0.0	0.0	0.4	0.0	0.0	0.0
CP	Endocladia	26.6	6.6	0.0	39.2	2.8	0.0	10.4	0.0	0.2	14.0	0.2	0.0	0.0
CP	Rockweed	18.4	2.0	0.0	25.4	1.4	0.2	28.0	2.0	0.6	21.2	0.8	0.0	0.0
CP	Mussels	7.2	2.6	0.8	0.2	0.0	0.0	81.4	0.0	1.2	6.4	0.2	0.0	0.0
HP	Barnacle	29.4	67.4	0.0	1.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	2.0	0.0
HP	Endocladia	30.0	22.4	1.0	24.8	13.8	0.0	0.8	0.2	0.0	7.0	0.0	0.0	0.0
HP	Mussels	18.0	24.4	6.6	4.4	0.6	0.0	22.8	1.4	1.0	18.6	2.2	0.0	0.0
HP	Tetraclita	15.2	9.2	27.2	2.8	0.0	0.0	15.6	3.2	0.2	23.8	2.8	0.0	0.0
HP	Hesperophycus	40.2	6.2	0.0	21.6	26.6	0.0	0.0	0.2	0.0	4.6	0.2	0.4	0.0
OH	Barnacle	37.0	29.6	0.0	0.0	0.0	0.0	0.0	7.6	0.0	20.4	0.6	4.8	0.0
OH	Endocladia	16.8	1.8	0.4	54.8	0.0	1.2	0.4	0.0	0.2	4.0	0.4	0.0	0.0
OH	Rockweed	32.0	20.8	0.2	27.0	0.0	0.2	0.0	0.0	0.0	18.8	0.8	0.2	0.0
OH	Mussels	7.2	0.0	0.4	2.8	0.0	0.0	42.6	1.4	4.0	41.4	0.2	0.0	0.0

Prepared by Dan Richards

Santa Cruz Island

June 14-17, 2010

(Database event #2010-F)

PURPOSE: To monitor and tag black abalone at Santa Cruz Island.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biological Technician, Channel Islands National Park
Susan Wang, National Marine Fisheries Service

PROCEDURE and general observations: Apply PIT tags to shells of *Haliotis cracherodii* with Z-spar epoxy, measure shell length to nearest millimeter where possible, record nearest neighbor distance using MARINE categories, and record location according to site map area numbers. Susan and Dan went out on Island Packers on 6/14. Stephen went out on 6/15. All returned on 6/17, on Island Packers. We stayed at the University of California Natural Reserve System Field Station on The Nature Conservancy portion of the island, and rented UC vehicles.

15 June, Willows Anchorage. Low tide -1.0 ft. at 0656 hrs. We departed the field station at 0500. Conditions were good with only a light breeze and swell. There was a marine layer that burned off most of the morning returning again about the time we left. Two black oystercatchers and two common ravens were on the reef when we arrived. Western gulls in the area were all out on Ship Rock. Barn swallows were feeding and apparently nesting in the area. We were on site from about 0630-1000 hrs.

We tagged 13 abalone using a double tag method when possible with the PIT tag in one epoxy spot and the vinyl number tag on a small separate epoxy spot. Sizes of tagged abalone ranged from 43-97 mm. There were a couple of abalone that were too small to fit a second epoxy spot. All abalone received both a PIT tag and a visual number tag. We found one previously tagged abalone in area 2. Most of the tags placed on abalone in the groups in areas 2 and 3. Four tags were applied to abalone in area 10. One abalone was tagged in crevice 13. Candidates for tags were abalone that were accessible for application to the shell and could be measured accurately. All measurements were an average of at least three measurements of the shell length. We know from experience that a slight variation in measurement angle can lead to different measurement readings. Rocks or other obstacles can interfere with the calipers thus we made sure each shell could be measured at least this time.

We downloaded both temperature loggers around 0926 hrs. Water temperature was measured at 14.0 °C. Both loggers reside in a PVC housing under a boulder in area 7. We also measured all the abalone we could find in area 17, the large pool and crevice adjacent to the *Endocladia* plots. We found 23 black abalone there.

Endocladia muricata was abundant and healthy at the site. There was very little rockweed but both species appeared healthy when present. Several *Hesperophycus californicus* conceptacles appeared to be ripe. *Pisaster ochraceus* were numerous though not always obvious, as the majority were small (<60 mm) and cryptic. A fair amount of *Ulva* sp. was present on the inner reef.

16 June, Willows Anchorage. Low tide -1.0 ft. at 0720 hrs. We had some moderate swell making it somewhat difficult to work on the outer reef. The sky was clear and winds were light. There was an Osprey flying over the cove when we arrived and two bald eagles (sub-adult and adult) followed shortly, being pursued by gulls. One black oystercatcher and one common raven were seen on the reef. The ravens may have a nest on the cliff above the site. We departed the field station at 0500 again and were on site from 0545-1120 hrs. We had to walk back to the field station as the u-joint broke on the jeep just as we got to the parking area in the canyon.

Stephen measured abalone in area 19, west of Lottia plot 5. He measured 116 *H. cracherodii* before the tide and swell forced him out of the area. Susan and I worked the rest of the reef starting on near the Lottia plots and reference bolt 3. We measured 196 *H. cracherodii* and 11 juvenile *H. rufescens* that were found in the intertidal zone. Most of the red abalone were around 20 mm. Quite a few black abalone under 30 mm were found. One new red abalone shell and one old and one fresh black abalone shell were found and measured. The tide came in before we could check areas 1-3 and 9. We only found three tags from 6/15. Two were from a brief check of area 2. All three were in approximately the same location as the previous day. Two abalone tagged in area 10 were not found.

I found two *Tonicella lineata*, lined chiton, in crevices on the lower zones of area 18 while searching for abalone. *Tonicella* are northern species not often found at the islands, especially Santa Cruz, possibly indicating how cold the water has been for the last year or so. Juvenile *Macrocystis pyrifera* was fairly common in the intertidal.

The return hike took about three hours.

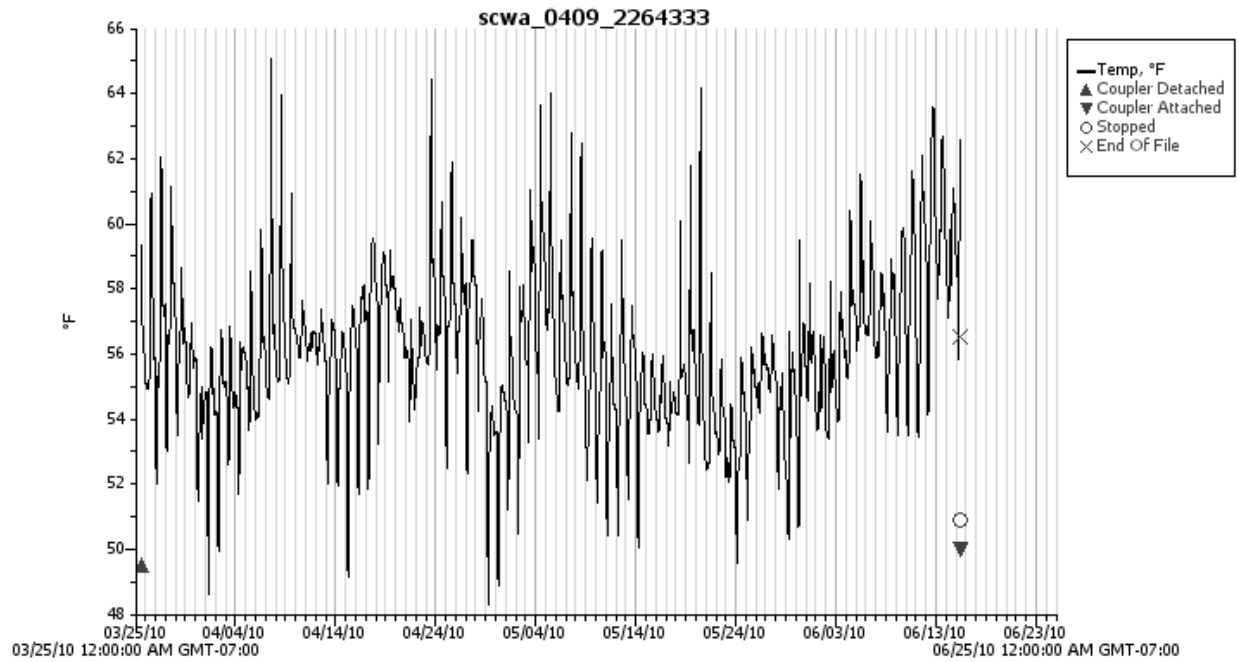
17 June, Willows Anchorage. Low tide -0.2 ft. at 0720 hrs. Conditions were good with clear sky, light breeze and light swell. One common raven was on the reef. Oystercatchers were heard on Ship Island. Western gulls and barn swallows were in the area again. We were on site from 0630-0930 hrs.

We continued measuring from where we left off the day before. Stephen measured an additional 26 *H. cracherodii* in area 19. Dan and Susan began with a search of area 10 for the missing tags before searching the last areas. One of the missing tags was found nearby in area 5, having

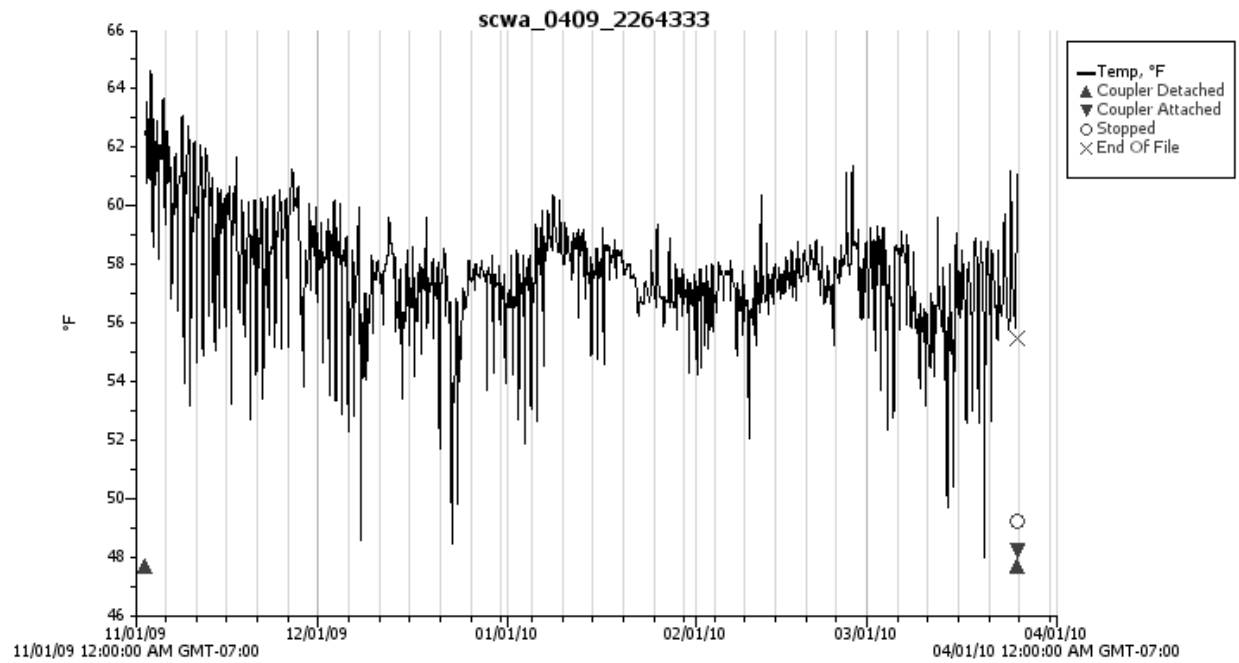
moved 4.7 m. The missing abalone from area 10 was 43 mm, the smallest abalone tagged and quite mobile at tagging time. Overall, we measured 63 abalone not measured on 6/16. There was one more found under a boulder next to Hesp-1 photoplot. Six tagged abalone were found including the one of the two found in area 2 on 6/16. The other of this pair was not found on 6/17. Three abalone had moved from area 2 on 6/15 to area 3 on 6/16; a distance of about 2 meters with part of it on gravel.

Two fresh abalone shells were found; one red (14 mm found in area 9) and one black (22 mm found in area 12).

A quick search of some of the other areas revealed that a number of abalone had moved from where they were found on 6/16. Some may have moved deeper in to crevices in the same area. I photographed the 19 areas from the map and made notes to improve the map polygons.



Temperature log from Willows Anchorage, March-June. (both loggers recorded similar profiles on overlapping dates)



Temperature log from Willows Anchorage, November-March.

Santa Barbara Island
October 6-13, 2010
(Database event #2010-G))

Prepared by Dan Richards

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Bio-tech, CINP

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. Counts were made of all motile invertebrates inside the photoplots. Thirty-minute searches were conducted to count seastars and black abalone at both sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded.

6 October 2010. Landing Cove. Low tide -0.1 ft. at 1501 hrs. Conditions were partly cloudy with no wind and only light swell. There were 2 black oystercatchers and two black turnstones in the area. A wandering tattler and four or five sea lion pups were on the north reef. We were onsite from 1400-1700 hrs.

We came out on the Ocean Ranger today and helped Laurie pump water, and then she went back in. We photographed the mussel and barnacle plots finding all of them in good shape. There were no mussels in plot 326 making it easy to find the corner bolts. *Egregia menziesii* was abundant and was the dominant cover in plot 326. *Pisaster ochraceus* were common but did not seem that numerous. *Mytilus californianus* was very dense with young mussels in the mid to high intertidal but the lower intertidal was mostly barren of mussels and was dominated by *Egregia menziesii* and coralline algae. Stephen counted motile invertebrates and Dan scored the plots. *Tetraclita rubescens* was the dominant barnacle in plots. *Balanus glandula* was present but in low numbers and mostly in splash zone, higher than the barnacle plots. Plot 318 had high coverage of *M. californianus*. *Ulva californica* was common in most of the barnacle zone plots. *Ocenebra circumtexta* was the most common snail found in the plots. Chitons, especially *Nuttallina* spp., were present in many plots and quite abundant in some. *Littorina* were rare in the plots.

7 October 2010. Sea Lion Rookery. Low tide -0.5 at 1547 hrs. Excellent conditions with partly cloudy sky, calm wind and seas. There were approximately 200 *Zalophus californianus* in the area. All the pups were quite fat and healthy looking. There were five black turnstones and two black oystercatchers in the area. We were on site from 1230- 1900 hrs.

The upper plots (barnacle and *Endocladia* zones) were dominated by short *Ulva californica*. *Mazzaella affinis* was common in all but the barnacle plots. *Endocladia muricata* was rare but did occur in four of the *Endocladia* zone plots and a few of the barnacle and *Silvetia* zone plots. *Gelidium coulteri* was common as were low mats that we tentatively identified as *G. pusillum*. *Mytilus californianus* was present in moderate densities on the mid-reef but there were no

mussels in the mussel plots except for a few small juveniles. Coralline algae, *Egregia menziesii*, and *Gelidium coulteri* dominated the mussel zone plots.

Pisaster ochraceus were abundant but mostly clumped in dense patches. Dan counted 487 in a 30-minute count. Sizes ranged from 70-190 mm, but stars under 100 mm were rare. No abalone were found in plots or a general search. We measured 106 *Lottia gigantea* in the general area to obtain a size frequency. Sizes ranged from 26-66 mm with no strong mode. Densities seemed normal.

Dan scored all the photoplots in the field and Stephen counted motile invertebrates. *Ocenebra circumtexta* and *Ocenebra* sp. were the most common snails. Chitons, *Fissurella volcano*, *Homalopoma lurida*, *Pachygrapsus crassipes*, *Pagurus* spp. and *Strongylocentrotus purpuratus*. were all encountered regularly in the mussel and *Silvetia* zone plots. Motile invertebrate numbers were low in the barnacle and *Endocladia* zones though *Littorina* spp. numbers were fairly high in the barnacle zone.

We added new corner bolts to mussel plots 351, 353, and 354. Those plots were marked with only two bolts and orientation was somewhat confusing. The bolt added to plot 353 was placed in the original upper left corner. When this plot was covered with mussels we could not find the original corner and bolts had been added in the wrong location. Plot 353 now has a notched stainless steel bolt in the upper left, a bronze bolt in the upper right and offset in the lower right corner is a stainless steel bolt. An extra bolt that should be removed lies below the lower right corner. One barn owl was seen on the walk back to housing, though three were later seen around the bunkhouse.

8 October. Landing Cove. Low tide -0.7 ft. at 1641 hrs. Conditions were excellent with little swell and calm wind. We completed the north site plots and then counted seastars on the south section.

There was little *Silvetia compressa* in the plots, but each of the *Silvetia* zone plots had at least a few points of it. There were some dense patches of *Silvetia* in other areas of the reef. As at Sea Lion Rookery, the thalli were all very delicate, probably *S. compressa* var. *deliquescent*. *Gelidium/Pterocladia* and *Chondracanthus canaliculata* dominated in only two of the red-algal turf zone plots. *Mytilus californianus* was dominant in plot 321 and *Phyllospadix torreyi* dominated plots 322 and 323. *Mazzaella leptorhynchus* was present in some *Silvetia* zone plots and *Prionitis lanceolata* was common in the tarweed zone.

The snails we have been finding at the other areas were common here too. We have some confusion as to what species. The shells have some ribbing like *Ocenebra* but the color pattern is more like *Acanthina*. *Ocenebra circumtexta* was present and these shells could be eroded. No tooth was present on any of the specimens.

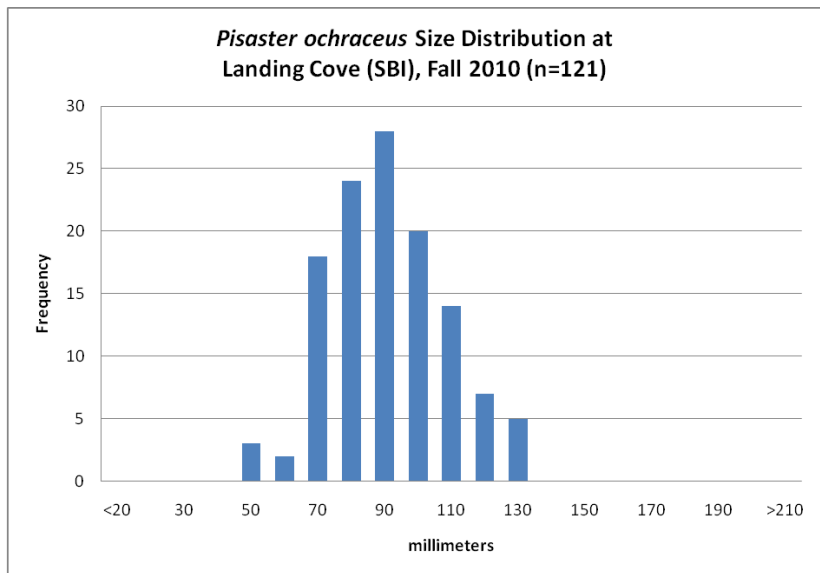
Bolts were added to plots 321, 322, 323 to clarify the plot orientation. New interplot measurements were taken for several plots as the original measurements were off for 323 at least. Notches were cut in the upper left bolt head of plots 320, 321, 323.

On the south site, Stephen counted 375 *Pisaster ochraceus* on the reef in 30-minutes. Dan counted seastars in the transect and found a total of 86 *P. ochraceus*. The sizes were smaller than at Sea Lion Rookery with a median size of about 90 mm. and overall range from 50-130 mm. *P. ochraceus* were present on the north reef.

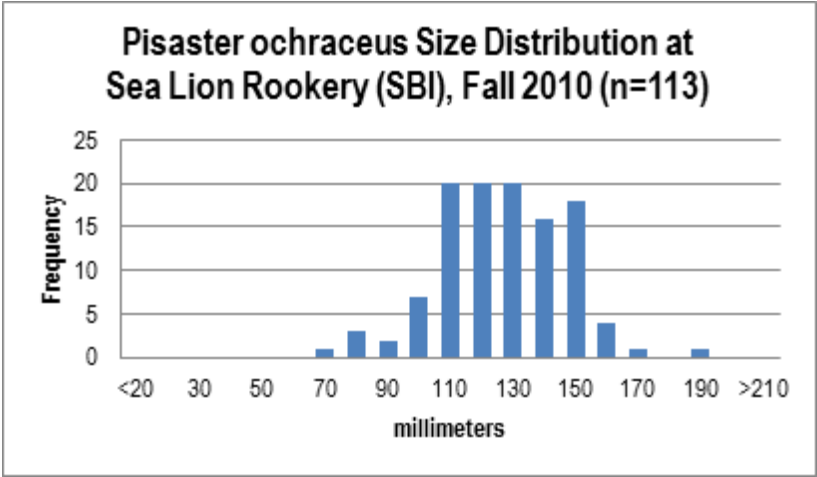
We noticed that there is a fair-sized patch of *Hesperophycus californicus* growing on the rock in the middle of the cove.

Birds this tour:

- Barn owl
- Black turnstone
- Black oystercatcher
- Wandering tattler
- Brandt’s cormorant
- Double crested cormorant
- Brown pelican
- Western gull
- Royal tern
- Canada goose (minima)
- Belted kingfisher
- Say’s phoebe
- Yellow-rumped warbler
- Imm. White crowned sparrow
- Brewer’s black bird
- Western meadowlark
- Horned lark
- American Kestrel
- Peregrine falcon
- Bewick’s wren



count	121
min size	50
max size	130
mean size	90.90
StDev	17.79



count	113
min size	37
max size	176
mean size	126.81
StDev	20.49

***Haliotis cracherodii* (black abalone) counts at Santa Barbara Island, fall 2010.**

SiteCode	Year	Season	Count Random	Count Density	Area	Density	Count Sized	MeanSize	StDev	MinSize	MaxSize	%<45mm	%45-126mm	%127-145mm	%>145mm
LC	2010	3	2	0		.000	2	117.50	3.54	115	120	-	100.00%	-	-
SLR	2010	3	0	0	31.300	.000	0					-	-	-	-

Photoplot summary – mean percent cover by zone at Santa Barbara Island, fall 2010 (5 plots/zone).

Site	ZoneName	Bare Rock	Barnacle	Tetraclita	Endocladia	Hesperophycus	Silvetia	Mussels	Turfweed	Leaf Barnacle	Misc Algae	Misc Animal	Tar	Other
LC	Chthamalus/Balanus (Barnacle)	37.6	0.2	13.8	5.2	0.0	0.0	10.0	9.4	0.0	23.0	0.8	0.0	0.0
LC	Silvetia (Rockweed)	26.2	1.2	0.4	0.0	0.0	3.8	0.4	15.0	0.0	47.6	5.4	0.0	0.0
LC	Mussels	7.0	0.0	7.8	0.0	0.0	0.0	38.0	0.6	0.4	41.0	5.2	0.0	0.0
LC	Red Algal Turf/ Gelidium- Pterocladia	0.4	0.0	0.0	0.0	0.0	0.0	14.2	33.6	0.0	26.2	5.0	0.0	20.6
SLR	Chthamalus/Balanus (Barnacle)	60.6	12.2	1.0	2.2	0.0	0.0	1.0	1.0	0.0	21.6	0.4	0.0	0.0
SLR	Endocladia	25.8	0.0	4.2	10.8	0.0	0.2	4.2	0.4	1.6	52.2	0.6	0.0	0.0
SLR	Silvetia (Rockweed)	26.4	2.4	0.2	0.8	0.0	16.0	7.4	8.8	0.0	36.4	1.6	0.0	0.0
SLR	Mussels	2.2	0.0	12.6	0.0	0.0	0.0	0.2	15.8	0.0	60.8	8.4	0.0	0.0

***Lottia gigantea* (owl limpet) counts at Santa Barbara Island, fall 2010.**

IslandCode	SiteCode	Year	Season	CountRandom	CountDensity	Area	Density	CountSized	MeanSize	StDev	MinSize	MaxSize
SB	SLR	2010	3	106	0		.000	106	43.56	10.19	26	65

%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100mm
0.00%	10.38%	22.64%	37.74%	22.64%	6.60%	0.00%	0.00%	0.00%	0.00%

Anacapa/Santa Cruz Island November 3-5, 2010

(Database event #2010-H)

Prepared by Stephen Whitaker

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Biotech, Channel Islands National Park
Danielle Lipski, CINMS
Jessie Altstatt, VIP, CINMS
David Mazurkiewicz, seabird tech, Channel Islands National Park
Terrence Shinn, CINMS
Charlie Lara, CINMS

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. Cat Rock, South Frenchy's Cove, at Anacapa Island and Orizaba Cove at Santa Cruz were monitored. Standard procedures were followed for photographing and counting motile invertebrates in fixed plots at all both Anacapa sites. Percent cover of photo plots was determined in the field at South Frenchy's Cove and about half of the Cat Rock plots. All remaining plots will be scored from digital images. Black abalone, *Haliotis cracherodii*, and seastars were counted in 30-minute searches and measured for size distribution at both Anacapa sites, but only seastars were counted and measured at Orizaba Cove. Owl limpets, *Lottia gigantea*, were measured in 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. Waves from a very large swell event hampered data collection at Orizaba Cove.

Results (Daily and Site Description)

November 3, 2010, Orizaba Cove, Santa Cruz Island. Low tide -0.1 ft. at 1433 hrs. Clear sky, and light wind but a large swell was hitting the site making it difficult to work in the lower zones. Water temperature was 16.8°C. Fifteen black oystercatchers and five black turnstones were seen at the site. One harbor seal was swimming in the cove. Dan, Stephen, and Dani worked from 1130-1430 hrs. David replaced the camera on Orizaba Cove then helped us with photos at the site.

Stephen counted sea stars throughout most of the site (large waves inhibited access to the lowest zone) for 30 minutes finding 283 *Pisaster ochraceus* (n=71 measured, range= 60-110mm, mode= 90mm). Dan, David and Dani worked together to photograph the plots and site. Photoplots were scored in the office by Stephen.

Barnacle plots had 51% mean barnacle cover. *Hesperophycus* plots had 34% mean *Hesperophycus* cover, 28% mean *Endocladia* cover and 17% mean barnacle cover among other less common species. *Silvetia* plots had 30% mean *Silvetia* cover, 14% *Endocladia* cover, 9% non-coralline crust cover, 14% *Ulva* cover, as well as other less abundant species. *Mytilus* plots had 0% mussels. Most of the space in the *Mytilus* plots was

occupied by articulated corallines (mean= 39%), *Mazzaella* (mean= 30%), and *Tetraclita* (mean= 8%). *Tetraclita* plots had 21% mean *Tetraclita* cover, 23% *Ulva* cover, 12% *Polysiphonia*/*Ceramium* cover, as well as other less common species.

November 4, 2010, Cat Rock, Anacapa Island. Low tide -0.6 ft. at 1519 hrs. We had excellent conditions with light swell and no wind, clear sky and water temperature at 18.2 °C. The day was hot with the sun reflecting off the wall. Eleven black oystercatchers, and 2 American oystercatchers were observed at the site together in one group when we arrived. At least six or seven harbor seals watched us from the water but none were seen ashore even before our arrival.

Island Packers conducted a field trip to Frenchy's Cove. Stephen counted motile invertebrates in the photoplots. Dan scored 23 plots in the field. Stephen scored the remaining plots (11) in the office. Dani recorded for Stephen. Jessie helped Dan to photograph plots and sample the *Lottia gigantea* plots (plot 1= 32 limpets, plot 2= 28 limpets, plot 3= 7 limpets [overall range= 18-65mm, mode= 27mm]). Jessie counted and measured 21 *Pisaster ochraceus* (range= 80-160mm, mode= 120mm) throughout the site. She also found three black abalone measuring approx. 70, 120, 110mm.

Barnacle plots had 40% mean barnacle cover and 14% mean *Endocladia* cover. *Endocladia* plots mostly had 34% *Endocladia* cover, 10% *Tetraclita* cover, and 10% *Mazzaella* cover. Numerous other species comprised the remaining substrata throughout the *Endocladia* zone. *Silvetia* plots only had 6% mean *Silvetia* cover. Other more prominent species in the rockweed plots were *Endocladia* (28%), barnacles (12%), and *Hesperophycus* (10%). *Mytilus* plots had 24% mean mussel cover, 19% articulated corallines, 14% *Tetraclita* cover, and 10% *Gelidium* cover.

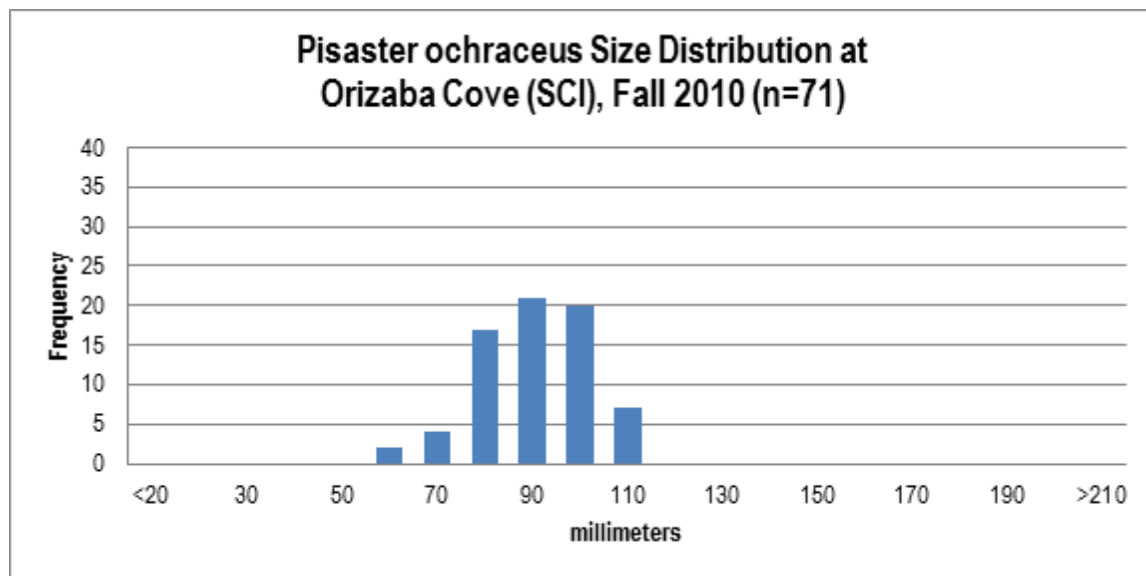
Motile invertebrates in the barnacle plots were rare with the exception of littorine snails. Several plots had 2-3 *Acanthina* spp. among other less common species. Most abundant invertebrates counted in the *Endocladia* plots were *Ocenebra circumtexta* (average=2/plot), *Lepidochitona* (3/plot), *Nuttallina* (8/plot). Other less common motile species were present in the *Endocladia* plots. Rockweed plots primarily had large limpets (>15mm) (5/plot), *Acanthina* (2/plot), *Lepidochitona* (2/plot), and *Pachygrapsus* (2/plot) among other less common species. Mussel plots primarily had *Nuttallina* (5/plot), *Lottia gigantea* (3/plot), *Fissurella* (2/plot), *Ocenebra* (2/plot), and several other less abundant species present.

November 5, South Frenchy's Cove, Anacapa Island. Low tide -0.9 ft. at 1604 hrs. Clear sky, light wind and light surge gave us excellent conditions. Water temperature was 17.5°C and the air was pleasant. Two black oystercatchers were the only birds seen on the south side. Two wandering tattlers were seen on the north shore. The sand level was quite high, only 13 cm below plot 155. There were eight staff and teachers from the Naturalist Corps out to learn and conduct the LiMPETS monitoring on the reef adjacent to our site.

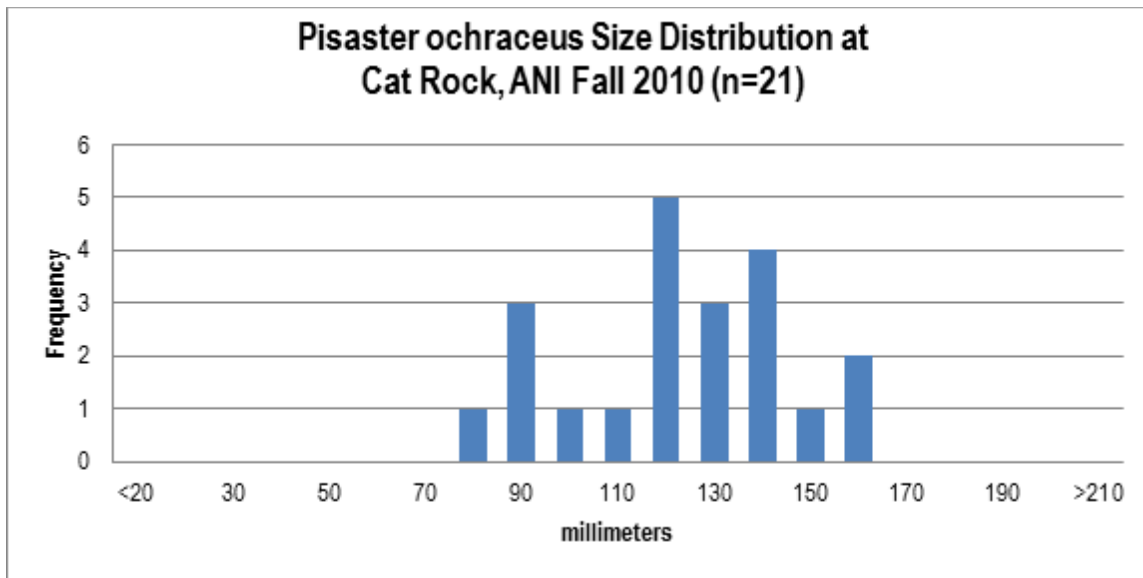
Stephen counted motile invertebrates in the photoplots. Jessie measured *Lottia gigantea* in the limpet plots (plot 1= 3 limpets, plot 2= 17 limpets, plot 3= 5 limpets [overall range= 15-59mm, mode= 46mm]). Jessie also counted and measured *Pisaster ochraceus* (n= 18, range= 50-130mm, mode= 80mm). Dan scored the photoplots in the field.

Barnacle plots had 20% mean barnacle cover, 36% *Endocladia* cover, and 7% *Gelidium*. *Endocladia* plots had 75% *Endocladia* cover, 9% *Silvetia* and various other less abundant non-motile species present. *Silvetia* plots were comprised of 48% *Silvetia* cover, 12% *Gelidium* cover, as well as several other less common species. *Mytilus* plots had 56% mussel cover, 20% *Chondracanthus* cover, 6% *Mazzaella*, 5% *Gelidium* among other less abundant species.

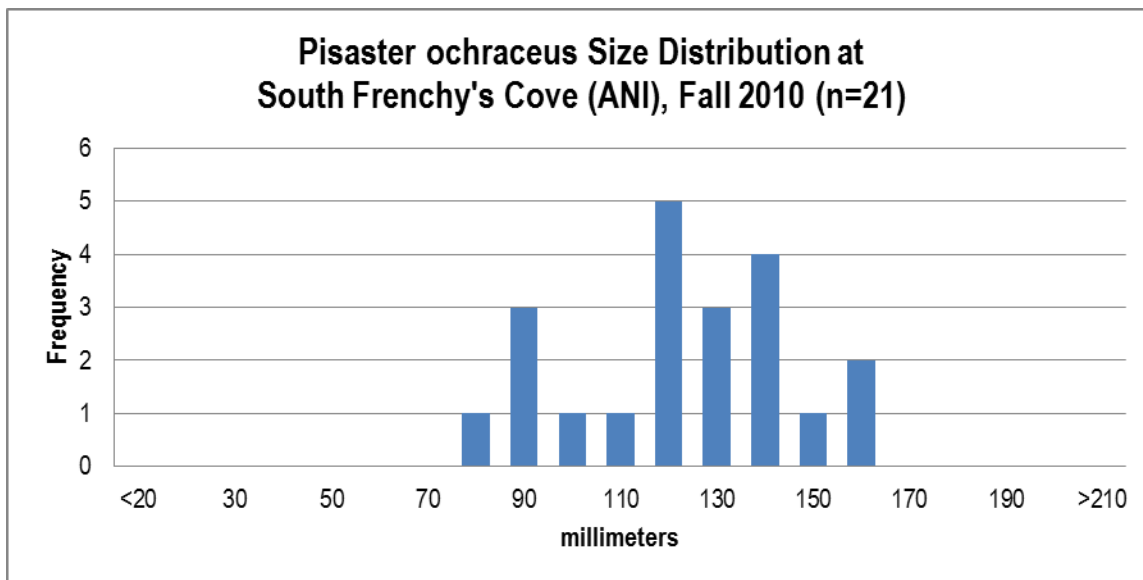
Motile invertebrates (including littorine snails) in the barnacle and *Endocladia* plots were uncommon. Several barnacle plots had 1-2 shore crabs present. *Silvetia* plots had 1-2 individuals of *Lepidochitona* and *Pachygrapsus* in most plots as well as 10 *Acanthina* in plot 260. *Mytilus* plots had 1-4 individuals of *Nuttallina*, *Pachygrapsus*, and *Acanthina* in most plots as well as approx. 5 *Nucella emarginata* per plot.



count	71
min size	60
max size	110
mean size	90.42
StDev	11.88



count	21
min size	80
max size	160
mean size	122.8571429
StDev	23.05273458



count	21
min size	80
max size	160
mean size	122.8571429
StDev	23.05273458

***Haliotis cracherodii* (black abalone) counts at Orizaba Cove, Santa Cruz Island, fall 2010.**

<i>Count Random</i>	<i>Count Sized</i>	<i>Mean Size</i>	<i>StDev</i>	<i>Min Size</i>	<i>Max Size</i>	<i>%<45mm</i>	<i>%45-126mm</i>	<i>%127-145mm</i>	<i>%>145mm</i>
8	8	77.25	20.47	60	122	-	100.00%	-	-

***Haliotis cracherodii* (black abalone) counts at Cat Rock, Anacapa Island, fall 2010.**

<i>Site Code</i>	<i>Count Random</i>	<i>Count Sized</i>	<i>Mean Size</i>	<i>StDev</i>	<i>Min Size</i>	<i>Max Size</i>	<i>%< 45mm</i>	<i>%45- 126mm</i>	<i>%127- 145mm</i>	<i>%> 145mm</i>
CR	3	3	100.00	26.46	70	120	-	100.00%	-	-

***Lottia gigantea* counts in plots at Cat Rock and South Frenchy's Cove, Anacapa Island, fall 2010.**

<i>Site Code</i>	<i>Count Density</i>	<i>Area</i>	<i>Density</i>	<i>Count Sized</i>	<i>Mean Size</i>	<i>StDev</i>	<i>Min Size</i>	<i>Max Size</i>
CR	66	9.42	7.004	66	36.12	11.02	18	65
SFC	25	9.42	2.653	25	40.48	12.87	15	59

<i>Site Code</i>	<i>%< 20mm</i>	<i>%20- 29mm</i>	<i>%30- 39mm</i>	<i>%40- 49mm</i>	<i>%50- 59mm</i>	<i>%60- 69mm</i>	<i>%70- 79mm</i>	<i>%80- 89mm</i>	<i>%90- 99mm</i>	<i>%>= 100mm</i>
CR	4.55%	30.30%	30.30%	21.21%	9.09%	4.55%	0.00%	0.00%	0.00%	0.00%
SFC	12.00%	12.00%	8.00%	40.00%	28.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Photoplot summary – mean percent cover by zone at Orizaba Cove, Santa Cruz Island, fall 2010 (5 plots/zone).

<i>Site</i>	<i>Zone Name</i>	<i>Bare Rock</i>	<i>Barnacle</i>	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesper- ophycus</i>	<i>Silvetia</i>	<i>Mussels</i>	<i>Turf weed</i>	<i>Leaf Barnacle</i>	<i>Misc Algae</i>	<i>Misc Animal</i>	<i>Tar</i>
OC	Barnacle	44.2	51.0	0.8	0.0	0.0	0.0	0.2	0.0	0.0	3.6	0.2	0.0
OC	Rockweed	17.0	1.6	3.2	14.2	2.2	30.0	0.0	0.2	0.0	31.6	0.0	0.0
OC	Mussels	2.2	0.0	8.4	0.0	0.0	0.0	0.0	5.2	0.0	79.4	4.8	0.0
OC	Tetraclita	29.4	1.6	21.4	1.4	0.0	0.0	0.2	0.0	0.0	45.4	0.6	0.0
OC	Hesperophycus	12.0	17.4	0.4	28.2	33.6	1.6	0.2	0.0	0.0	6.4	0.2	0.0

Photoplot summary – mean percent cover by zone at Cat Rock and South Frenchy's Cove, Anacapa Island, fall 2010 (5 plots/zone).

<i>Site</i>	<i>Zone Name</i>	<i>Bare Rock</i>	<i>Barnacle</i>	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesper- ophycus</i>	<i>Silvetia</i>	<i>Mussels</i>	<i>Turf weed</i>	<i>Leaf Barnacle</i>	<i>Misc Algae</i>	<i>Misc Animal</i>	<i>Tar</i>
CR	Barnacle	61.4	28.3	1.0	6.0	0.1	0.0	0.0	0.1	0.0	3.0	0.0	0.0
CR	Endocladia	25.4	1.3	12.0	30.2	0.0	0.2	8.1	2.6	0.0	17.0	3.1	0.0
CR	Rockweed	41.7	16.1	2.9	18.7	4.3	2.0	0.7	0.6	0.0	11.4	1.7	0.0
CR	Mussels	21.4	0.3	16.9	1.9	0.0	0.0	30.6	1.6	0.0	25.4	1.9	0.0
SFC	Barnacle	36.8	24.0	0.0	33.4	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.2
SFC	Endocladia	10.4	0.2	0.0	78.4	0.2	7.8	0.0	0.2	0.0	2.8	0.0	0.0
SFC	Rockweed	26.8	2.2	0.0	12.2	0.0	23.0	0.0	0.4	0.0	35.4	0.0	0.0
SFC	Mussels	10.0	0.0	0.0	0.0	0.0	0.0	37.2	29.4	0.0	23.4	0.0	0.0

Santa Cruz Island November 16-23, 2010

(Database event #2010-I))

Prepared by Dan Richards

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Stephen Whitaker, Bio-tech, CINP
Cristian Monaco, graduate student Univ. South Carolina

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 or Olympus 1030 digital camera. Motile invertebrates were counted in the photoplots at all Prisoners Harbor. All photoplots were field scored at all sites. Seastars and black abalone were counted and measured at all sites. Owl limpets were counted in fixed plots, and 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. We used the Park boat for transportation. Summary tables of the data are presented at the end.

17 November, Prisoners Harbor, low tide 0.6 ft. at 1334 hrs. Air temperature was pleasant, skies clear, slight northwest wind (approx. 2mph), and no apparent swell. Water in bay was fairly clear and 16.2°C. No birds were seen on the reef but there was a common raven and a great blue heron to the west and in the evening there were two belted kingfishers flying in the area. No pinnipeds were seen in the area during our visit from 1130-1700 hrs.

Chthamalus/Balanus cover was dense within a narrow band along the reef. It looked like there was recent recruitment with very high cover in areas especially in the *Hesperophycus* plots. *Chthamalus/Balanus* cover in the barnacle plots ranged from 14-57% and was even slightly higher 35-67% in the Endocladia zone.

Endocladia was scarce but appeared healthy. Cover was generally low (16-28%) but one barnacle plot had 40% cover of *E. muricata*. Rockweed cover was low overall, but recruitment was observed from both species.

In the *Hesperophycus* zone, *H. californicus* occupied 1-13% of the cover and *S. compressa* covered 0-45% in the *Silvetia* zone. As we noticed last spring, rockweed cover was often higher in areas outside of plots. Plants looked healthy but had little reproductive material. *Scytosiphon dotyi* was scarce unlike last spring.

Mytilus were very scarce. The few mussels that were observed were mostly *M. galloprovincialis*. Some *Septifer* were also present in a couple of small patches. The mussel zone was predominantly covered with a red macroalgae. *Mazzaella leptorhynchus*, *C. canaliculatus*, *Mazzaella affinis*, coralline algae, and *Laurencia pacifica* were common in the *Mytilus* zone. *Tetraclita rubescens* occupied 1-24% of the space in the mussel plots and appeared to have had high recruitment recently. Numerous purple Nemerteans were found under the settling plates next to the mussel plots. Stephen found a few small colonies of an encrusting bryozoan that may

be *Watersipora subtorquata* (http://www.exoticguide.org/species_pages/w_subtorquata.html) in two of the mussel zone plots. This bryozoan is apparently an introduced species well known on the mainland coast but not previously recorded in the intertidal zone at the islands.

Dan photographed and scored the plots. Cristian switched out the recruitment plates and tuffies at the site and then counted seastars (n=20 *P. ochraceus*). Dan found one abalone near Endocladia plot 1. Stephen counted motile invertebrates in all of the plots. *Acanthina* sp. were especially abundant. A few small *Tegula funebris* were found and *Nucella emarginata* were present in a few of the mussel zone plots where there was some cover for them. *Littorina* spp. were very abundant.

18 November, Trailer, low tide 0.3 ft. at 1357 hrs. We had very nice conditions with calm seas and wind, mostly overcast sky and pleasant temperature. Water temperature was 16.4°C. Three black oystercatchers were seen and two harbor seals watched us from the water. A great blue heron was observed flying by near the end of the day. We drove from the field station in the morning and were on site from 1220-1630 hrs. We camped at the lean-to.

Stephen scored all the photoplots. Dan shot photos, measured *L. gigantea* and scored surfgrass transects. Dan searched for abalone finding 28 in the 30-minute search then continued searching to the south finding another 70 *H. cracherodii*. Most were large, with several over 160 mm, but a few under 60 mm were found. Nearly all were with at least one other abalone and groups up to fifteen were found within one-meter of another. At the furthest south reef we found 35 within a two meter diameter area. Cristian changed the plates and tuffies and changed the robomussels, then counted and measured seastars (44). The count is an underrepresentation as he only counted what he measured.

Chthamalus/Balanus were very numerous and dense. Cover ranged from 50-75% in the plots. Large portions of the reef were dominated by barnacles.

Silvetia dominated most of the rockweed plots though *Hesperophycus* cover was as high as 18%. The damaged plot (919) and its replacement (951) were both predominantly bare rock and barnacles.

Except for plot 925, *M. californianus* cover was quite low (range of 1-93%) and *Phragmatopoma californica* dominated the other four plots.

Phyllospadix spp. covered 45-71% of the transects (including the understory cover). There was a small amount of bleached or abraded blades.

Phragmatopoma californica and *Tetraclita rubescens* dominated Lottia plots 3 and 5 and only 1 *L. gigantea* was found in the two plots. The other plots had a wide range of sizes (12-102 mm).

19 November, Fraser Cove, low tide -0.1 at 1430 hrs. There was a medium amount of swell/surge out of the northwest but the wind was light. The sky was overcast and we had light drizzle off and on through the day. The sediment level was considerably high at the beach at Fraser Cove as it was last spring. Fresh tar blobs were common on the rocks at Fraser. Three

black oystercatchers, and 2 black turnstones were in the area. Two harbor seals watched us from the water. At Forney, there were numerous gulls (western, California, and Herrmann's) and royal terns near the point. Cormorants and pelicans were numerous and there were an estimated 500 *Zalophus californianus* on the rock at the point, more than I have seen before. We worked at the site from 1030 to 1600 then drove back to the field station.

Stephen scored all the photoplots. Dan shot photos, measured *L. gigantea* and scored surfgrass transects. Dan searched for abalone finding none. Cristian changed the plates and tuffies and changed the robomussels, then counted seastars (180) and measured 50.

Balanus/Chthamalus were extremely abundant and were dominants over large portions of the site. The plots had cover of 50-80% *Balanus glandula*.

Tar was common in the upper parts of the site, however tar only covered 27-60% of the plots.

Endocladia muricata was common but not as thick as we have seen in past years. *E. muricata* cover in the Endocladia zone was 28-92% and was moderate in the rockweed plots.

Hesperophycus plants were rare at Fraser but generally we don't see any there. At Forney's, *H. californicus* were abundant, with cover of 20-39% and mostly healthy in appearance, though not very reproductive. *Silvetia compressa* was also abundant though patchy. *S. compressa* cover was 0-48%.

Mytilus californianus were common with mostly fairly dense cover on the reef where they were not replaced by *P. californica*. Mussel cover in *Mytilus* zone was 61-92% and in the *Pollicipes* zone is occupied 1-78% of the cover.

Pollicipes polymerus formed some dense mono-specific mats on the outer reef but the density in the plots was not very high (0-13%). Plot 902 typically has high cover of *P. californica* and *E. muricata*.

A total of 39 *L. gigantea* were found in the littoral plots. Only one limpet was found in plots 2. *Mytilus*, *Balanus*, and to a lesser extent, *P. californicus* had high cover in the plots.

Phyllospadix spp. ranged from 62-84% cover in the three transects. This site had moderate bleaching and abrasion of the blades.

Motile invertebrate counts were not done but we noticed that there *Nucella emarginata* were numerous, *Acanthina* sp. and chitons (*Mopalia muscosa*, *Lepidochitona hartwegii*, *Nuttallina californica*) were common. Purple nemerteans were found at this site, though not in the numbers seen at Prisoners. *Phragmatopoma californica* was also very abundant, particularly in the low zone surrounding *Pollicipes* plot 1. *Egorgia menziesii* was abundant but looked like leather straps with most of the blades striped off. On some of the lower reefs near R3 there were several sponges including *Spherospongia confederata*, possibly *Leucetta losangelensis*. There were also large mats of *Archidisoma psammion*. During the abalone search I counted three *Cancer antennarius*.

20 November, Valley Anchorage, low tide -0.3 ft. at 1504 hrs. We had heavy rain last night but the sky was clear in the afternoon and the predicted high winds did not materialize. We did not see any birds or mammals at the site. There was a moderate swell but conditions were generally good. We were on site from 1400-1700 hrs.

Cristian replaces the PISCO settlement plates and tuffies as well as the robomussels. Stephen and Dan spent 2.5 hours measuring *H. cracherodii* (217 total). It seemed like small *H. cracherodii* were everywhere. We worked from the mouth of the cave around the point to the east and part way down the boulder beach. The abalone were mostly in small crevices or under boulders where they were well protected. Sizes ranged from 20-145mm with the most numerous size classes being 50 mm or smaller. Very few solitary abalone over one-meter from others were found. The majority by far were within 10 cm of at least one other abalone. Groups of up to 21 were found in a single crevice and within less than one-meter of another. All appeared healthy. Numerous *Pisaster* were seen in the area though most were fairly small. Three black abalone and one red abalone shell were found. *Tegula funebris* especially juveniles were numerous. *Phragmatopoma californica* was common but did not form the large structures we have seen at other sites this fall.

21 November, Willows Anchorage, low tide -0.5 ft. at 1540. We had moderate swell but light wind and partly cloudy sky. It was fairly cold and the water was colder at 13.6°C. Torrential rain fell early in the morning but only for an hour dropping about .12 inches. There were two black oystercatchers on the reef and to one point a large flock of pelagic cormorants, pelicans, and gulls were right at the surf line excitedly chasing prey, but we could not see what it was. We were on site from 1415-1730 hrs.

Dan shot photos of the plots and site, and downloaded the temperature loggers. Stephen measured *L. gigantea* then began scoring plots. Dan measured abalone. Cristian replaced robomussels, measured their tidal height, then replaced recruitment plates and tuffies. Cristian also counted seastars (436 in a 30-minute search) but we did not have time for size frequencies. All sizes were found though the majority was very small. At least one *P. giganteus* and one *Leptasterias hexactis* were found.

The abalone search was over an hour just between the beach and the pool and crevice next to the Endocladia plots. Most of the abalone found were under 45 mm. I found 19 tagged abalone. Tal Ben-Horin (UCSB) has been tagging some and he was just out and reported finding 45 tagged abalone. I was concentrating on counting all abalone in this part of the reef and noting nearest neighbor distances.

22 November, Willows Anchorage, low tide -0.6 ft. at 1618. Conditions were the same as the day before, but with a little more down canyon wind cooling us. Two common ravens were perched above the site but otherwise it was quiet for birds. We were at the site from about 1330-1630 hrs. Stephen finished scoring the photo plots, Cristian measured and weighed *P. ochraceus*. Dan completed the field log notes and measured *H. cracherodii* on the west side of the site, then recorded tagged abalone again.

One thing we noticed was that very little *Chondracanthus canaliculatus* was growing in the lower intertidal compared to other sites. Coralline algae (*Bossiella californica* and *Corallina* spp., predominately) shared that zone with *Laurencia pacifica* which was very abundant and *Gelidium* sp. *Halidrys dioica* formed a wide zone on the lowest part of the outer reef. Several *H. cracherodii* were found on the flat rocks hidden only by *H. dioica*. *Mazzaella leptorhynchos* and *Mastocarpus papillatus* were quite abundant on the inshore part of the site. *Egregia menziesii* and *Macrocystis pyrifera* were abundant in the shallows on the inshore edge of the reef.

I found 25 tagged abalone, including one in a crevice that could not be read. Some found on 11/21 were not relocated on 11/22, but most were in the same location both days.

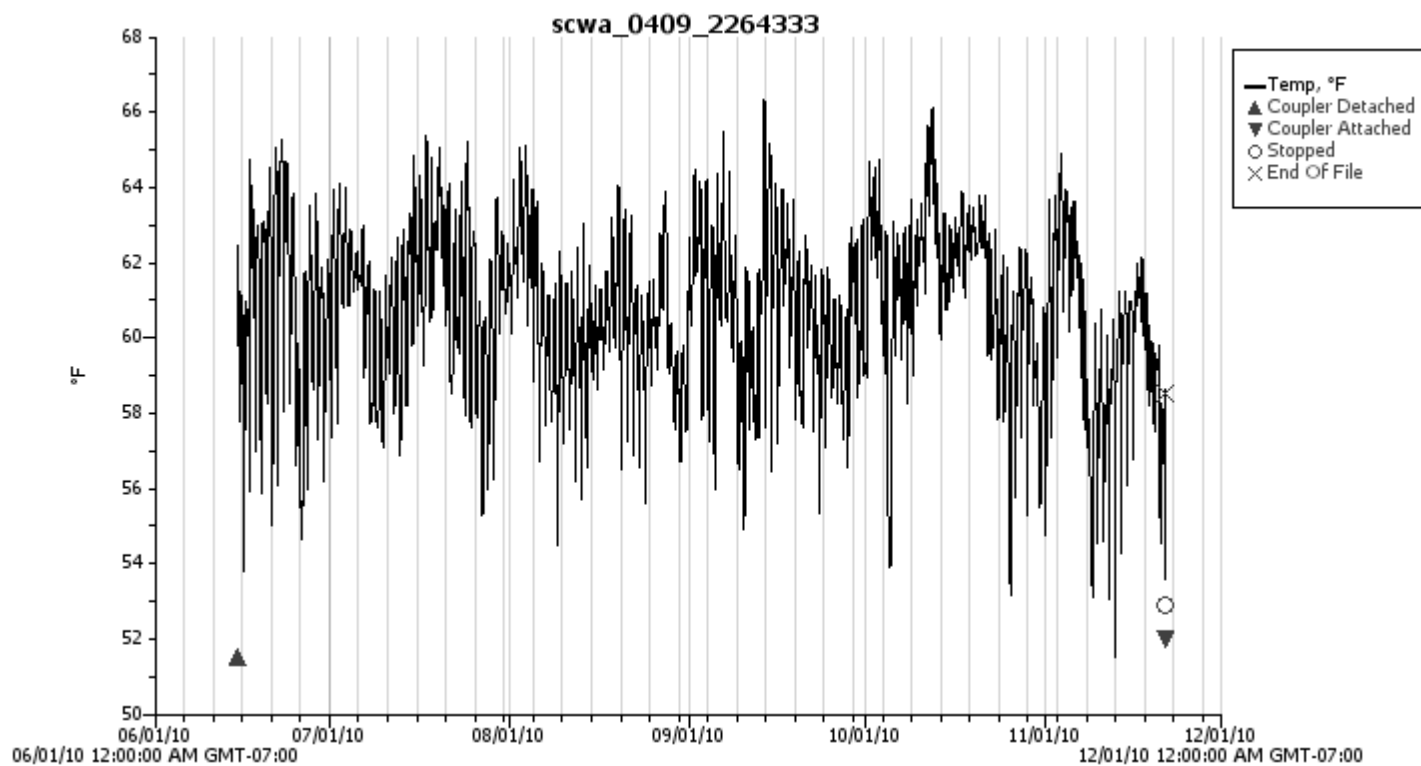
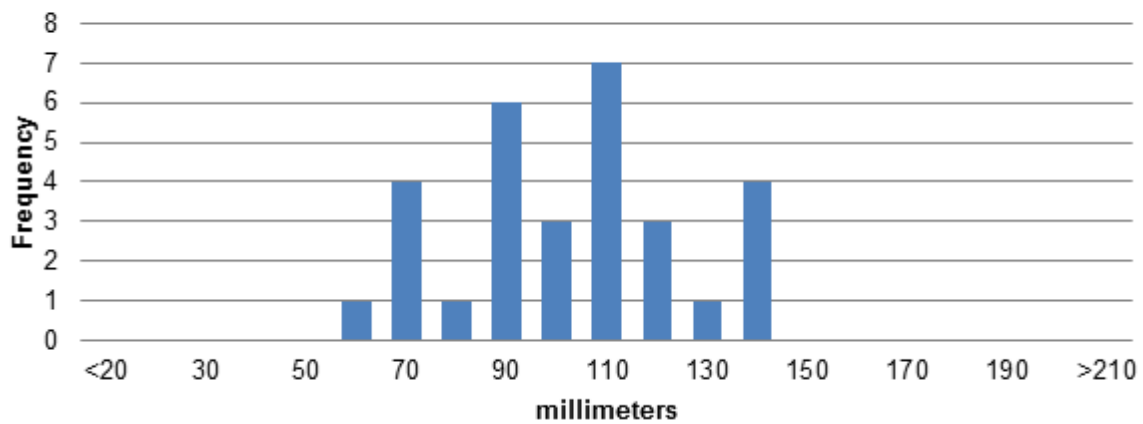


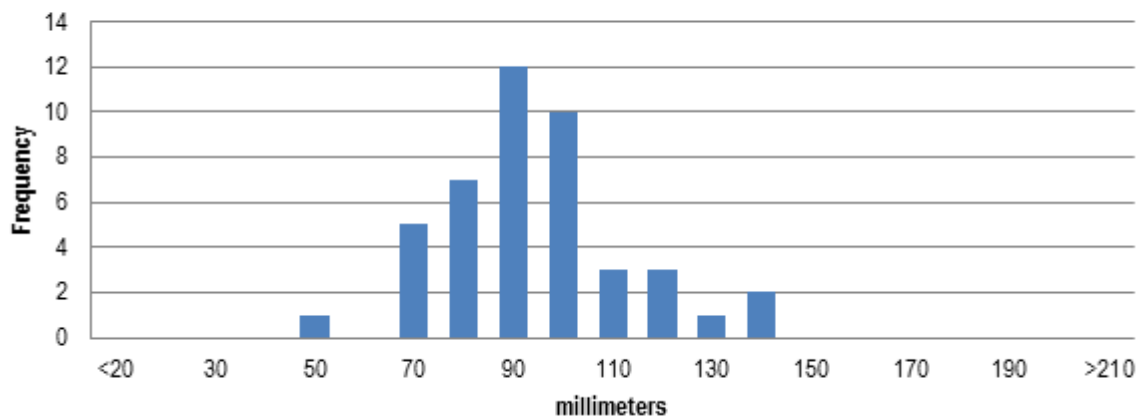
Figure1. Temperature logger data from Willows Anchorage.

**Pisaster ochraceus Size Distribution at
Prisoner's Harbor (SCI), Fall 2010 (n=30)**

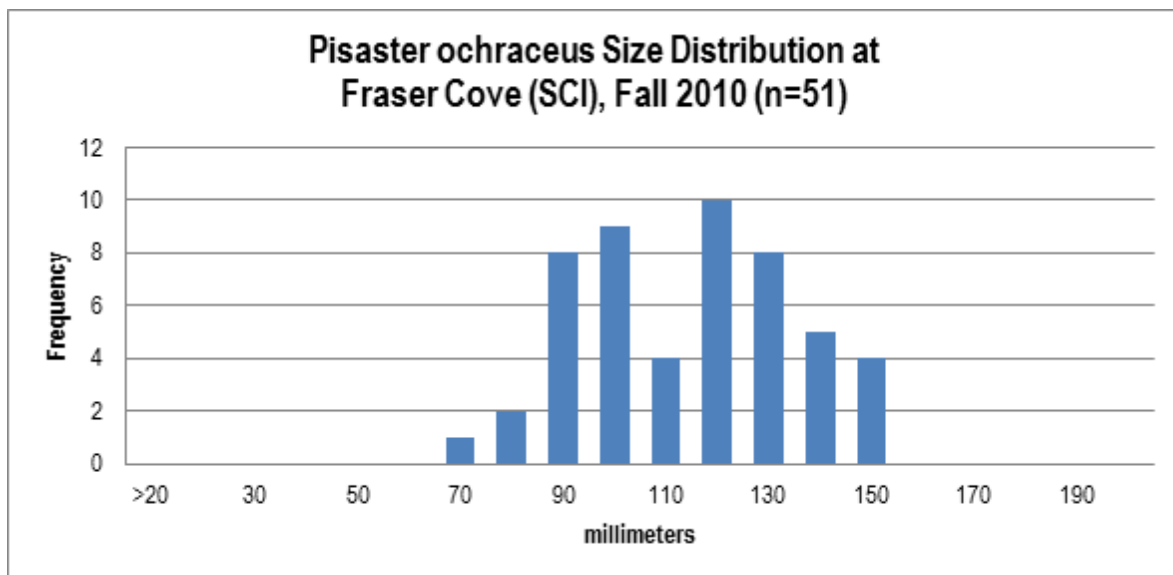


count	30
min size	60
max size	140
mean size	102.66
StDev	22.88

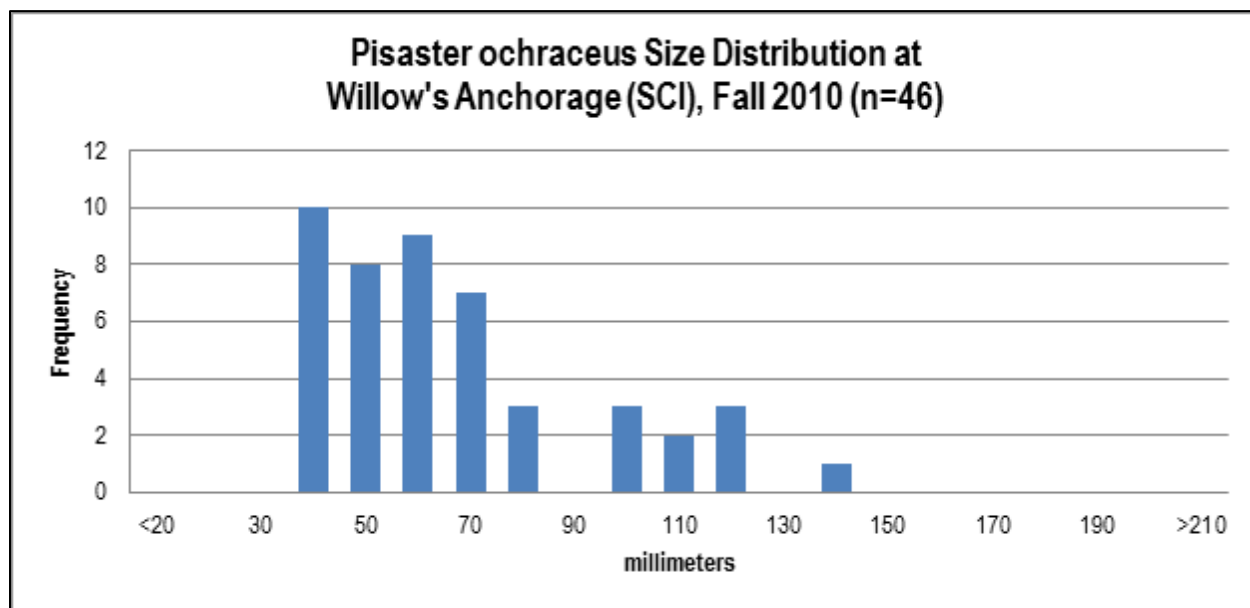
**Pisaster ochraceus Size Distribution at
Trailers (SCI), Fall 2010**



count	44
min size	50
max size	140
mean size	92.15
StDev	18.94



count	51
min size	70
max size	150
mean size	112.15
StDev	20.10



count	46
min size	35
max size	135
mean size	6.44
StDev	2.60

***Haliotis cracherodii* (black abalone) counts at Santa Cruz Island, fall 2010.**

Island Code	Site Code	Count Random	Count Sized	Mean Size	StDev	Min Size	Max Size	%<45mm	%45-126mm	%127-145mm	%>145mm
SC	FC	0	0					-	-	-	-
SC	PH	1	1	103.00		103	103	-	100.00%	-	-
SC	SR	16	16	104.75	20.95	67	140	-	81.25%	18.75%	-
SC	TR	70	42	104.10	38.90	30	186	4.76%	66.67%	11.90%	16.67%
SC	VA	217	217	60.53	27.67	20	145	35.94%	62.21%	1.84%	-
SC	WA	359	289	60.64	20.79	25	127	26.64%	73.01%	0.35%	-

***Lottia gigantea* counts at Santa Cruz Island, fall 2010.**

Island Code	Site Code	Count Density	Area	Density	Count Sized	Mean Size	StDev	Min Size	Max Size
SC	FC	53	15.71	3.375	53	35.04	18.69	14	72
SC	TR	61	12.56	4.855	61	54.15	29.82	14	102
SC	WA	139	15.71	8.851	139	29.99	12.20	14	67

Island Code	Site Code	%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm	%70-79mm	%80-89mm	%90-99mm	%>=100mm
SC	FC	32.08%	13.21%	13.21%	16.98%	9.43%	11.32%	3.77%	0.00%	0.00%	0.00%
SC	TR	27.87%	3.28%	3.28%	8.20%	6.56%	9.84%	14.75%	16.39%	6.56%	3.28%
SC	WA	25.90%	24.46%	28.06%	15.11%	4.32%	2.16%	0.00%	0.00%	0.00%	0.00%

Site	Zone Name	Bare Rock	Barnacle	Tetraclita	Endocladia	Hesperophycus	Silvetia	Mussels	Turf weed	Leaf Barnacle	Misc Algae	Misc Animal	Tar
FC	Barnacle	19.6	69.4	0.0	4.6	0.0	0.0	2.4	0.0	0.0	0.8	0.4	2.8
FC	Endocladia	16.0	19.6	0.0	51.4	0.0	0.0	4.8	0.0	0.0	7.4	0.8	0.0
FC	Rockweed	27.8	1.8	0.0	9.8	12.6	21.4	0.0	0.6	0.0	22.6	2.6	0.0
FC	Mussels	8.0	0.2	0.6	0.0	0.0	0.0	72.0	0.6	0.4	3.4	14.8	0.0
FC	Pollicipes	9.2	4.6	2.2	5.0	0.0	0.0	57.2	0.2	7.8	5.2	8.6	0.0
FC	Tar	41.0	17.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	39.2
FC	Hesperophycus	33.8	3.8	0.0	21.4	31.6	0.6	0.0	0.0	0.0	8.8	0.0	0.0
PH	Barnacle	33.2	40.4	0.2	17.4	2.0	0.2	0.2	1.0	0.0	1.6	3.8	0.0
PH	Endocladia	21.6	51.0	0.0	22.2	1.4	0.0	0.0	0.0	0.0	2.6	1.2	0.0
PH	Rockweed	37.2	15.0	5.4	7.8	3.0	13.0	0.0	0.2	0.0	16.8	1.6	0.0
PH	Mussels	3.8	0.6	11.0	0.0	0.0	0.0	0.0	13.0	0.0	58.6	13.0	0.0
PH	Hesperophycus	39.8	39.2	0.0	11.2	7.2	0.0	0.0	0.0	0.0	0.4	2.2	0.0
SR	Barnacle	40.8	15.0	0.8	41.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0
SR	Endocladia	14.2	1.4	0.6	56.8	0.0	0.0	0.4	0.2	0.2	25.8	0.4	0.0
SR	Mussels	10.2	0.0	27.6	1.4	0.0	0.0	0.0	4.4	0.0	51.0	5.4	0.0
SR	Tetraclita	48.2	0.4	25.6	5.8	0.0	0.0	0.4	0.0	0.0	15.0	4.6	0.0
SR	Hesperophycus	33.0	0.0	0.0	24.0	28.2	7.6	0.0	0.0	0.2	6.6	0.4	0.0
TR	Barnacle	22.2	63.0	0.0	11.2	0.0	0.0	0.2	0.0	0.0	2.2	1.2	0.0
TR	Rockweed	19.6	2.2	0.0	1.6	0.0	64.8	0.0	3.4	0.0	6.8	1.6	0.0
TR	Mussels	5.4	1.0	0.0	0.0	0.0	0.0	21.0	2.4	0.0	33.4	36.8	0.0
TR	Hesperophycus	28.3	10.3	0.0	11.0	9.5	38.7	0.0	0.0	0.0	1.5	0.3	0.3
WA	Endocladia	19.4	0.0	1.0	67.6	0.0	0.0	0.0	0.0	0.0	9.6	2.4	0.0
WA	Rockweed	29.8	1.0	0.0	24.0	0.0	1.6	0.0	0.4	0.0	30.6	12.6	0.0
WA	Mussels	5.0	0.0	3.0	0.0	0.0	0.0	39.0	5.6	1.4	41.4	4.6	0.0
WA	Hesperophycus	45.8	1.8	0.0	20.8	7.4	0.2	0.0	0.0	0.0	23.6	0.4	0.0

Anacapa/Santa Cruz Island December 2-3, 2010

(Database event #2010-J)

Prepared by Stephen Whitaker

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
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Charlie Lara, CINMS

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 Anacapa Island including Harbor Seal Arch and Scorpion Rock at Santa Cruz Island were monitored. Standard procedures were followed for photographing fixed plots and counting motile invertebrates in the plots (motile invertebrates not counted at Middle Anacapa Island). Percent cover of photo plots was determined in the field at both sites sampled during trip. Black abalone, *Haliotis cracherodii*, and seastars were counted in 30-minute searches and measured for size distribution at both sites. Owl limpets, *Lottia gigantea*, were measured in fixed one-meter radius plots at Middle Anacapa. The highest number of shorebirds and pinnipeds seen was recorded at both sites.

Results (Daily and Site Description)

December 2, 2010, Middle Anacapa Island. Low tide -0.5 ft. at 1329 hrs. Light wind and minimal swell; good sampling conditions. Water temperature was 13.4°C. Two black oystercatchers and one wandering tattler, black phoebe, and song sparrow were seen at the site. No marine mammals were observed near the site.

Dan, Stephen, Dani, Connie and Matt worked from 1100-1530 hrs. Stephen scored plots on the west reef and Dan scored the east reef plots. Dan and Matt photographed all plots and panoramas. Dani and Connie measured *Lottia gigantea* in the three established plots (plot 1= 22 limpets, plot 2= 5 limpets, plot 3= 4 limpets, sizes ranged 26-63mm) and then Dani and Matt worked together to search for and measure *Pisaster ochraceus* (423 sea stars counted in 45 minutes, 114 stars measured [range=30-140mm, mode=90mm]) and *Haliotis cracherodii* (24 individuals were found and measured throughout the entire site, sizes ranged 22-113mm). Connie assisted Stephen by recording photoplot scoring data. All members were skiffed over to Harbor Seal Arch following completion of sampling at both Middle Anacapa reefs. We measured 43 black abalone in approximately 30 minutes (sizes ranged 25-113mm).

Throughout the main site, Dan noticed that *Eggregia* plants appeared tattered and that the lowest zones were populated primarily by a mixture of coralline algae, *Mastocarpus*

papillatus, and *Mazzaella affinis*. *Codium fragile* was common along a narrow band and *Tegula gallina* was present in low numbers. The barnacle plots on the west reef only had 16% mean cover of barnacles. Several of the barnacle plots had moderately-high *Ulva* cover (approx. 30%). *Endocladia* plots had 22% mean *Endocladia* cover. *Silvetia* was absent from the *Silvetia* plots. *Mazzaella affinis* (mean=16%) was the most dominant species within the *Silvetia* plots. *Mytilus* plots had 10% mean mussel cover along with 19% mean *Gelidium coulteri* cover, 14% mean *Mazzaella*, and 12% mean *Tetraclita* cover among other less dominant species.

On the east reef, the barnacle plots had less than 5% mean *Chthamalus/Balanus* cover but 14% mean *Tetraclita* cover. *Endocladia* plots had 13% mean *Endocladia* cover. *Silvetia* was absent in the rockweed plots; coralline algae, *Mazzaella* and the invasive alga *Caulacanthus ustulatus* were the most dominant algae observed in the *Silvetia* plots. *Mytilus* plots had 12% mean mussel cover. Articulated corallines (mean=21%) and *Phragmatopoma* (mean=16%) comprised the majority of cover in the mussel plots.

The invasive alga, *Caulacanthus ustulatus*, was present on both reefs in approximately the same concentrations and areas as observed in spring 2010 and previous seasons. Another invasive species, an encrusting bryozoan, *Watersipora subtorquata*, was observed in the form of a small colony at Harbor Seal Arch.

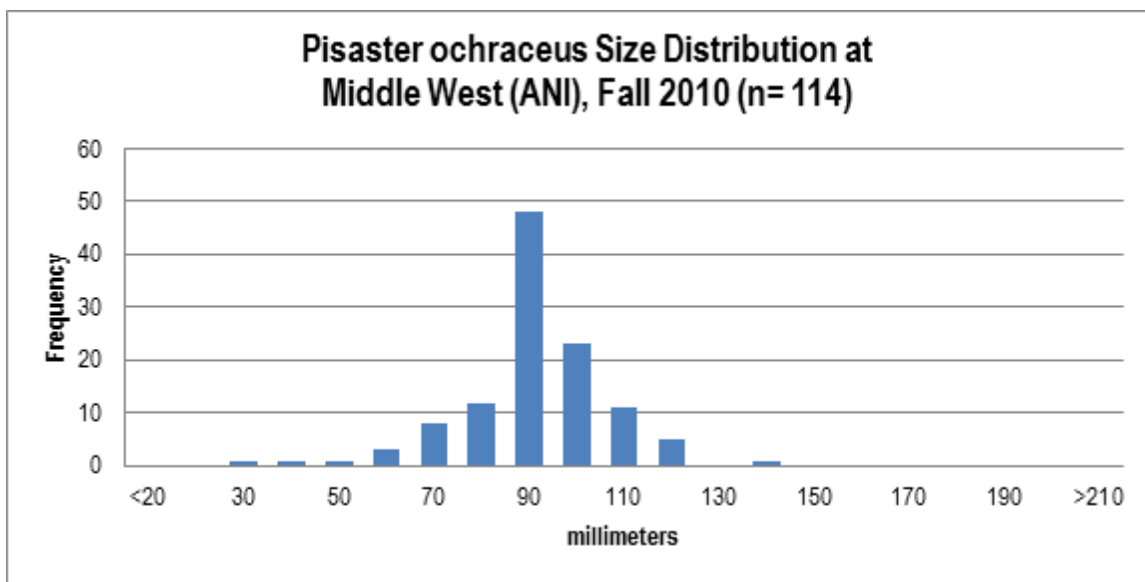
December 3, 2010, Scorpion Rock, Santa Cruz Island. Low tide -1.0 ft. at 1415 hrs. Weather conditions were generally overcast with increasing clouds throughout the day and low wind and surge. Water temperature was 13.3 °C. Two western gulls, four black oystercatchers, one snowy egret, common raven, and black phoebe were observed at the site. One harbor seal was in the water but no others were seen ashore even before our arrival.

Dan, Stephen and Matt worked from 1100-1600 hrs. Dan and Matt worked together to photograph the plots and panoramas at Area A. Matt then recorded for Stephen as he counted motile invertebrates in the plots. Dan scored photoplots and counted sea stars (79 *Pisaster ochraceus* [range=50-150mm, mode=80mm], 4 *P. giganteus*, 8 *Patiria miniata* were observed in 20 minutes throughout the main site). Dan located and measured four black abalone (range=75-100mm) at the main site. At Area B, Matt located and measured 12 black abalone (range=67-140mm).

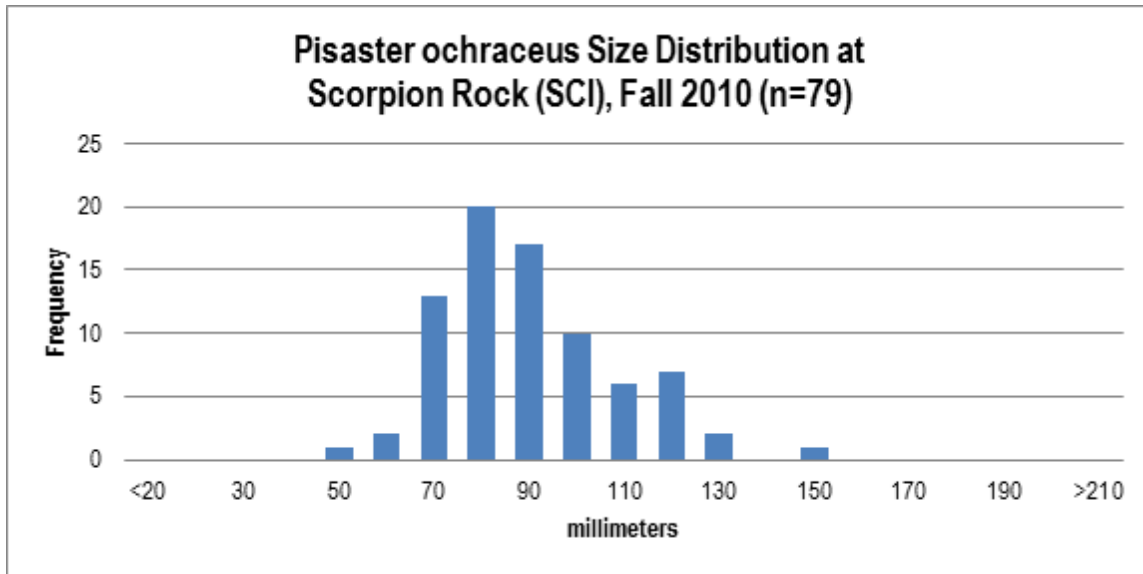
At Area A, barnacle plots had 15% mean barnacle cover and 41% mean *Endocladia* cover. Most barnacle plots had at least 1-2 *Lepidochitona*, *Pachygrapsus*, large limpets, *Nucella emarginata*, and *Ocenebra circumtexta* counted within. *Littorina* snails were moderately abundant in the barnacle plots. *Endocladia* plots had 57% mean *Endocladia* cover and similar abundances of all the motile invertebrate species found in the barnacle plots except *Ocenebra circumtexta* which were slightly more abundant in the *Endocladia* plots. *Tetraclita* and *Mytilus* plots had similar abundances of *Tetraclita* (means=26% and 28% in *Tetraclita* and *Mytilus* plots, respectively). Mussels only comprised 2% of one *Tetraclita* plot and were absent from all other plots including mussel plots. *Mazzaella* comprised 8% of *Tetraclita* plots and 21% of *Mytilus* plots. *Mytilus* plots also had

moderate abundances of articulated corallines (mean=26%). Abundances of motile invertebrate species such as *Lepidochitona*, *Nuttallina*, *Fissurella*, *Pachygrapsus*, and *Ocenebra circumtexta* were comparable within the *Tetracrita* and mussel plots with *Ocenebra* being the most common (mean=approx. 15 individuals/plot). Mussel plots also had moderately-high numbers of purple urchins (mean=16/plot).

At Area B, the *Hesperophycus* plots had 28% mean *Hesperophycus* cover and 24% mean *Endocladia* cover. At least 1-2 *Lepidochitona*, *Nuttallina*, *Pachygrapsus*, large limpets, *Nucella emarginata*, and *Acanthina* were counted in 2-3 plots within the *Hesperophycus* plots.



count	114
min size	30
max size	140
mean size	91.20
StDev	15.72



count	79
min size	50
max size	150
mean size	90.12
StDev	18.63

***Haliotis cracherodii* (black abalone) counts at Middle West, Anacapa Island, fall 2010.**

Island Code	Site Code	Count Random	Count Sized	Mean Size	StDev	Min Size	Max Size	%<45mm	%45-126mm
AN	MW	24	24	54.08	26.28	22	113	37.50%	62.50%

***Haliotis cracherodii* (black abalone) counts at Scorpion Rock, Santa Cruz Island, fall 2010.**

Island Code	Site Code	Count Random	Count Sized	Mean Size	StDev	Min Size	Max Size	%<45mm	%45-126mm	%127-145mm
SC	SR	16	16	104.75	20.95	67	140	-	81.25%	18.75%

***Lottia gigantea* counts in plots at Middle West, Anacapa Island, fall 2010.**

Island Code	Site Code	Count Density	Area	Density	Count Sized	Mean Size	StDev	Min Size	Max Size
AN	MW	31	9.42	3.291	31	42.35	9.75	26	63

%<20mm	%20-29mm	%30-39mm	%40-49mm	%50-59mm	%60-69mm
0.00%	6.45%	32.26%	29.03%	25.81%	6.45%

Photoplot summary – mean percent cover by zone at Anacapa and Santa Cruz Islands, fall 2010 (5 plots/zone except ANME with 3 plots/zone).

Island	Site	Zone	Bare Rock	Barnacle	Tetraclita	Endocladia	Hesperophycus	Silvetia	Mussels	Turfweed	Leaf Barnacles	Misc. Algae	Misc. Invert	Tar
AN	ME	Barnacle	61.0	4.7	13.7	8.3	0.0	0.0	0.3	0.0	0.0	10.3	1.7	0.0
AN	ME	Endocladia	49.3	3.0	10.7	12.7	0.0	0.0	0.0	0.0	0.0	24.0	0.3	0.0
AN	ME	Rockweed	35.7	0.7	7.3	1.3	0.0	0.0	0.0	1.7	0.0	49.0	4.3	0.0
AN	ME	Mussels	2.0	0.0	11.3	0.0	0.0	0.0	12.0	12.0	0.0	42.0	20.7	0.0
AN	MW	Barnacle	43.2	16.0	1.2	9.4	0.0	0.0	1.0	0.8	0.0	27.4	1.0	0.0
AN	MW	Endocladia	39.6	5.4	2.6	22.4	0.0	0.0	2.0	1.2	0.0	24.8	2.0	0.0
AN	MW	Rockweed	43.8	2.2	6.8	7.0	0.0	0.0	0.2	5.0	0.0	31.6	3.4	0.0
AN	MW	Mussels	5.8	0.2	12.0	0.4	0.0	0.0	9.6	22.0	0.0	37.8	12.2	0.0
SC	SR	Barnacle	40.8	15.0	0.8	41.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0
SC	SR	Endocladia	14.2	1.4	0.6	56.8	0.0	0.0	0.4	0.2	0.2	25.8	0.4	0.0
SC	SR	Mussels	10.2	0.0	27.6	1.4	0.0	0.0	0.0	4.4	0.0	51.0	5.4	0.0
SC	SR	Tetraclita	48.2	0.4	25.6	5.8	0.0	0.0	0.4	0.0	0.0	15.0	4.6	0.0
SC	SR	Hesperophycus	33.0	0.0	0.0	24.0	28.2	7.6	0.0	0.0	0.2	6.6	0.4	0.0

Fall 2010 Rocky Intertidal Monitoring Trip Reports

Prepared by Stephen Whitaker

San Miguel Island, December 4-8, 2010

(Database event #2010-K)

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

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park

Stephen Whitaker, Bio-tech, CINP

Dani Lipski, CINMS, VIP

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 with the exception of two *Tetraclita* plots at Harris Point. Sea stars and black abalone were counted at all sites except Crook Point; high surf impeded safe and accurate counts for both species at Crook Point. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers were downloaded at Otter Harbor and Crook Point.

4 December 2010, Otter Harbor. Low tide -1.2 ft. at 1310 hrs. Conditions were mostly cloudy all day; it rained approximately 0.2" early in the morning. Winds were light at <5 mph. Swell/surge was low at approx. 1-2'. Water temperature was 13.4 degrees C. We landed on the airstrip located at the west end. Both airstrips were still damp from earlier precipitation.

There were five western gulls, four black oystercatchers, two common ravens, one Brandt's cormorant and one American oystercatcher. Eighteen harbor seals and six elephant seals were counted on or near the vicinity of the reefs. Four elephant seals were seen on the beach east of the site. We arrived at the site at 1130 and worked until 1640.

Stephen scored photo plots while Dan and Dani photographed the plots and site. Dan scored barnacle plot 374 which is arguably inappropriately located on a near-vertical surface above a fairly-deep tide pool. Dan and Dani then worked together to measure *Lottia gigantea* in the limpet plots (plot 1= 35, plot 2= 31, plot 3= 27, plot 4= 15, plot 5= 28, overall range= 12-68mm, mode of combined plots= 21mm). There were numerous *Lottia limatula* observed in the plots. Mussel cover was 50% or greater in all five plots. Dani counted (98 *P. ochraceus* in 30 minutes) and measured (n= 68, mode= 110-120mm, range= 50-160mm) *Pisaster ochraceus* throughout the site. She then assisted Dan to search for, measure and record black abalone presence. The two counted and measured 159 black abalone during a 120 minute effort. Twenty-four individuals were tagged. Most measurements were estimates (sizes ranged 30-165mm, mode= 110mm).

The four barnacle plots excluding plot 374 had 48% mean barnacle cover; plot 374 had 0% barnacles and continued to be dominated by red foliose algae (*Chondracanthus canaliculatus*= 29% and *Mazzaella affinis*= 43%). *Endocladia* plots had 51% *Endocladia* cover, 32% bare rock and extremely low percentages of various other species. *Silvetia* was only scarcely present in one

plot (comprising 3% of the total cover) within the *Silvetia* zone even though *Silvetia* plants were common and healthy throughout the site. The most dominant species/groups observed in the *Silvetia* plots were *Endocladia* (mean= 24%), barnacles (mean= 30%, only present in three plots) and *Mazzaella* (mean= 9%). *Mytilus* plots had 43% mean mussel cover and other much- less common species or assemblages including articulated corallines (9%), *Pollicipes* (mean=6%), coralline crusts (6%) and non-coralline crusts (4%).

5 December 2010, Harris Point. Low tide -1.2 ft. at 1552 hrs. Conditions were overcast with a few light showers throughout the day progressing to heavy rain as we completed the site survey. The predicted squall arrived earlier than expected and included at least one lightning bolt within close proximity to the site. Heavy rain continued during our trek back to housing and throughout the night. Winds were variable with moderate gusts in excess of 10-15 mph. We walked Simonton Beach prior to monitoring Harris Point (several dead *Mola mola* were observed washed up on the beach with missing dorsal and ventral fins). We arrived at the site at 1300 and departed at 1700. Two black oystercatchers and two harbor seals were seen at the site when we arrived.

Stephen scored all but two *Tetraclita* plots before the squall and impending darkness forced our departure. Dan and Dani photographed the plots and site then measured *Lottia gigantea* in the limpet plots (plot 1= 4 limpets, plot 2= 13, plot 3= 28, plot 4= 60, plot 5= 32, overall range= 12-79mm, mode of combined limpets= 35mm). Afterwards Dani counted and measured sea stars during a 30-minute effort (n= 9 *Pisaster ochraceus* [range= 120-170mm], n= 2 *Pycnopodia*, n= 18 *Patiria miniata*). She also observed several small *Leptasterias*. Dan searched for and measured abalone for 45 minutes (n= 24 black abalone, range= 65-165mm).

Barnacle plots had 69% mean barnacle cover. *Endocladia* plots had 28% mean *Endocladia* cover, 24% barnacle cover, 6% non-coralline cover and several other infrequently-occurring species. *Silvetia* was non-existent in the representative plots and was noted as absent throughout the site. The most common space-occupiers in the *Silvetia* plots were *Endocladia* (mean= 35%), *Hesperophycus* (mean= 34%) and barnacles (mean= 5%). *Mytilus* comprised 28% of the five combined mussel plots. Other fairly common species/assemblages in the mussel plots were barnacles (mean= 35%), *Endocladia* (mean= 5%), *Tetraclita* (mean= 4%) and non-coralline crust (mean= 4%). *Tetraclita* plots had 17% mean *Tetraclita* cover as well as other fairly dominant species such as mussels (mean= 26%), non-coralline crust (mean= 10%) and *Mazzaella affinis* (mean= 8%).

6 December 2010, Crook Point. Low tide -1.1 ft. at 1634 hrs. Skies were mostly clear throughout the day with a steady breeze out of west at approx. 15 mph. There was a fairly large wind swell directed at the site causing the reefs to be mostly underwater until 1330. We arrived at the site at 1200 and waited for the tide to ebb. Even at low tide waves frequently washed over the outer reef which prevented abalone and sea star counts. There were 20 Brandt's cormorants, seven black oystercatchers, and two black turnstones at the site upon arrival. One elephant seal was lying on the beach located east of the site.

Dan and Dani photographed the plots and site panoramas. Stephen scored the photo plots. Dan also downloaded the temperature logger around 1400 hours and then recorded for Stephen. Dan

noticed three black abalone near the vicinity of plot 393. *Pisaster ochraceus* densities were observed to be low on top of the reef and inside the channel.

Barnacle plots had 36% mean barnacle cover. *Endocladia* plots had 18% mean cover of the representative species. Other dominant species/groups included barnacles (mean= 13%), mussels (mean= 9%), *Cladophora columbiana* (8%) and *Mastocarpus papillatus* (7%). *Silvetia* was absent from the *Silvetia* plots and was noted as absent from the site. The *Silvetia* plots were primarily composed of mussels (mean cover= 27%, plot 387 had 91% mussel cover), *Endocladia* (mean= 17%, only present in three plots), barnacles (mean= 9%) and *Ulva* (mean= 4%). *Mytilus* plots had 86% mean mussel cover and several other rare occurrences of species in plots 381 and 385.

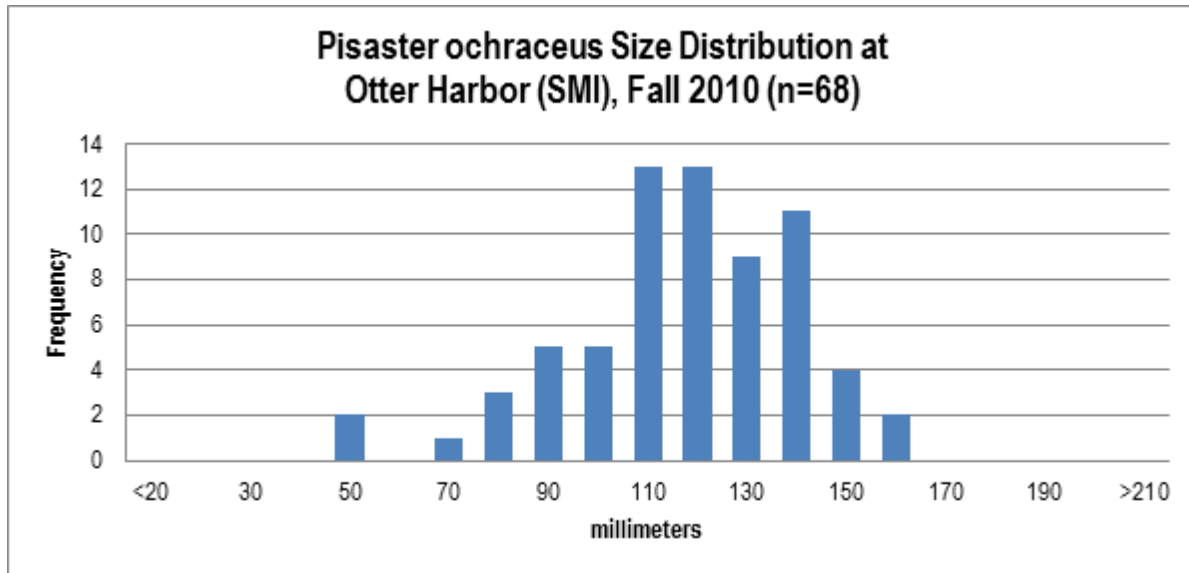
7 December 2010, Cuyler Harbor. Low tide -0.9 ft. at 1715. Clear skies and a light northwest wind at 5-7 mph prevailed throughout most of the day. Small waves approx. 1' were seen washing up along Cuyler beach. Dani flew off the island leaving Dan and Stephen to complete the monitoring. We were able to walk past the "middle rocks area" on the beach to the site. Large cuts were made in the dunes on the back slope of the beach two weeks prior, but the sand apparently was redistributed to the east end of the beach and the surge channel was filled. While walking to the site, a few elephant seals were observed lying on the beach as well as four snowy plovers near the east end of the beach. Additionally there were seven small *Mola molas* that had already or were in the process of washing up on the beach and were missing dorsal and ventral fins similar to the fish seen at Simonton Cove. Overall, there were not many birds in the harbor. At the site, two black oystercatchers, one black-bellied plover and two common ravens were observed.

Stephen helped Dan to photograph the plots and then scored all photo-plots. Dan made numerous corner repairs (new epoxy was placed at 405-LL and LR, 401-LR, 417-UR, 418-UR, 408-LR, and 406-LR). Dan counted and measured sea stars throughout the entire site (n= 62 *Pisaster ochraceus*, range= 50-200mm, mode= 130mm). Zero black abalone were seen during the search.

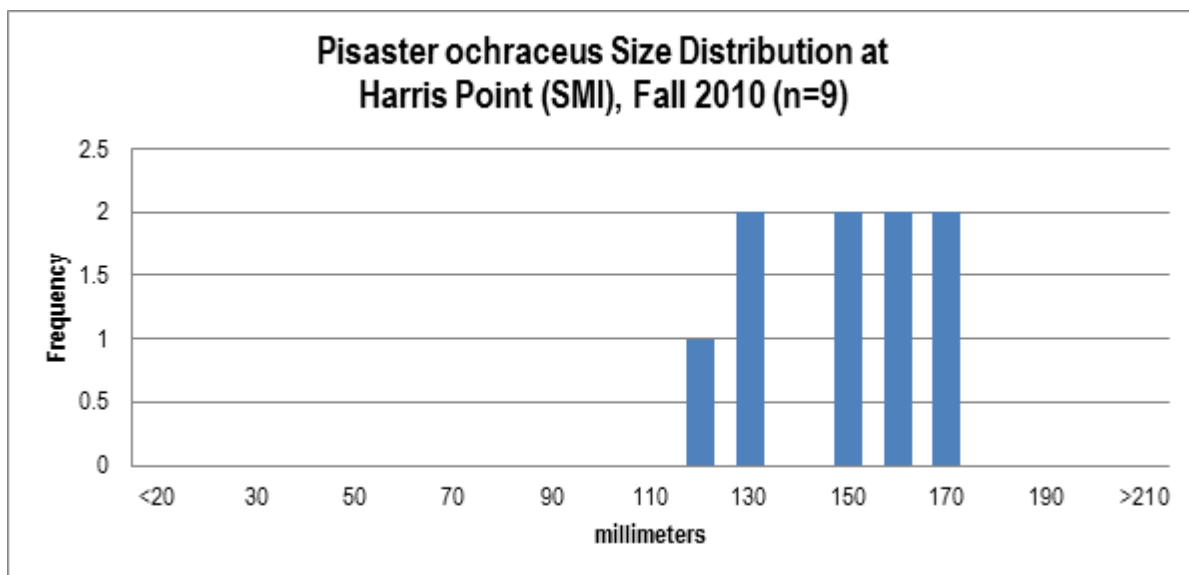
Dan observed that *Phragmatopoma* was abundant with extensive colonies in the lower crevices. Red algae including *Prionitis*, *Mazzaella spinosus*, *Gelidium robustum* among others, was dense and lush in the lowest zones. *Phyllospadix* also appeared lush and healthy. *Mytilus* were abundant and exceptionally large. Some mussel recruitment was also observed. Several *Hesperophycus* plants were seen near plot 413. *Silvetia* was common throughout the site but not in the *Silvetia* plots. Numerous sponges and tunicates encrusted a large tidepool and lower reaches of the site.

Barnacle plots had 36% mean barnacle cover. *Endocladia* was present in four of the barnacle plots (range= 1-38%). *Endocladia* plots had 27% mean *Endocladia* cover, 7% mean barnacle cover, 7% *Mazzaella affinis*, 6% mussel cover (only present in three plots), 6% *Tetraclita* cover (only present in two plots) and several other less common species/groups. *Silvetia* was only present in two of the representative plots (plot 406= 40%, plot 407= 87%). Most of the biotic cover in the *Silvetia* plots was comprised of barnacles (mean= 15%, only present in three plots), *Phragmatopoma* (mean= 8%) *Endocladia* (mean= 5%), *Mazzaella affinis* (mean= 4%), and *Tetraclita* (3%, present in three plots). *Mytilus* plots had 43% mussel cover, 19%

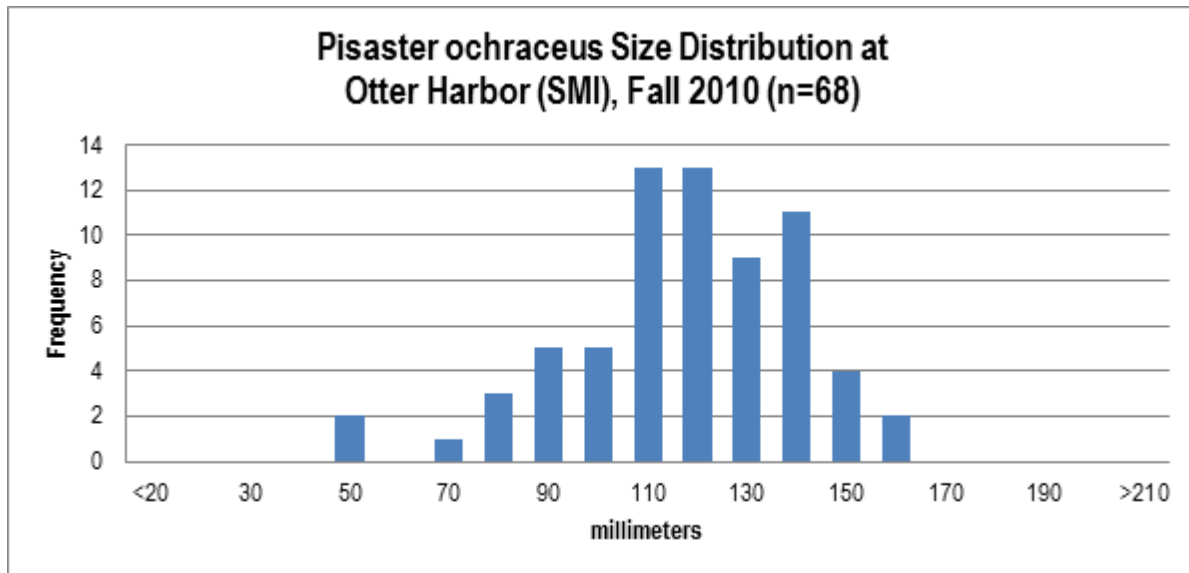
Phragmatopoma cover, 5% *Mazzaella affinis* cover, 5% *Gelidium* and 3% *Chondracanthus canaliculatus*. *Tetraclita* was present in plot 404= 21% and plot 405= 7%.



count	68
min size	50
max size	160
mean size	117.24
StDev	23.19



count	9
min size	120
max size	170
mean size	148.88
StDev	18.33



count	62
min size	50
max size	200
mean size	115.80
StDev	33.56

***Haliotis cracherodii* (black abalone) counts at Cuyler Harbor, Harris Point, and Otter Harbor, San Miguel Island, fall 2010.**

Site Code	Count Sized	Mean Size	St Dev	Min Size	Max Size	%< 45mm	%45-126mm	%127-145mm	%> 145mm
CH	0					-	-	-	-
HP	24	124.08	24.85	65	165	-	58.33%	16.67%	25.00%
OH	159	105.79	25.98	30	165	0.63%	75.47%	16.98%	6.92%

***Lottia gigantea* counts in plots at Harris Point and Otter Harbor, San Miguel Island, fall 2010.**

Site Code	Count Density	Area	Density	Count Sized	Mean Size	St Dev	Min Size	Max Size
HP	138	15.71	8.787	138	34.62	14.22	12	79
OH	136	15.71	8.660	136	29.73	12.88	12	68

Site	%<	%20-	%30-	%40-	%50-	%60-	%70-	%80-	%90-	%>=
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<i>Code</i>	<i>20mm</i>	<i>29mm</i>	<i>39mm</i>	<i>49mm</i>	<i>59mm</i>	<i>69mm</i>	<i>79mm</i>	<i>89mm</i>	<i>99mm</i>	<i>100mm</i>
HP	15.22%	23.19%	31.88%	17.39%	5.80%	3.62%	2.90%	0.00%	0.00%	0.00%
OH	22.79%	35.29%	22.06%	7.35%	10.29%	2.21%	0.00%	0.00%	0.00%	0.00%

Photoplot summary – mean percent cover by zone at San Miguel Island, fall 2010 (5 plots/zone).

<i>Site</i>	<i>ZoneName</i>	<i>Bare Rock</i>	<i>Barnacle</i>	<i>Tetraclita</i>	<i>Endocladia</i>	<i>Hesperophycus</i>	<i>Silvetia</i>	<i>Mussels</i>	<i>Turfweed</i>	<i>Leaf Barnacle</i>	<i>Misc Algae</i>	<i>Misc Animal</i>	<i>Tar</i>
CH	Barnacle	45.8	36.4	0.0	17.4	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0
CH	Endocladia	33.2	7.2	6.2	27.4	0.0	6.0	5.6	0.2	0.4	11.4	2.4	0.0
CH	Rockweed	32.0	17.0	2.0	4.0	0.0	25.4	0.4	1.0	0.0	6.8	11.4	0.0
CH	Mussels	9.4	1.2	7.6	0.0	0.0	0.0	42.6	7.2	3.2	7.0	21.8	0.0
CP	Barnacle	58.2	35.8	0.0	5.4	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
CP	Endocladia	33.6	12.6	0.6	18.2	3.2	0.0	9.4	0.0	1.6	18.0	2.8	0.0
CP	Rockweed	27.0	9.2	0.2	17.0	2.2	0.0	26.8	1.0	1.8	13.0	1.8	0.0
CP	Mussels	5.4	2.8	0.2	0.0	0.0	0.0	85.6	0.0	0.6	4.8	0.6	0.0
HP	Barnacle	28.0	69.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2
HP	Endocladia	28.8	24.2	0.4	27.8	10.8	0.0	1.2	0.0	0.0	6.4	0.4	0.0
HP	Mussels	14.8	34.8	4.2	4.6	0.8	0.0	27.6	1.4	0.4	10.6	0.8	0.0
HP	Tetraclita	18.0	7.8	17.0	1.4	0.0	0.0	26.0	2.8	0.2	24.0	2.8	0.0
HP	Hesperophycus	35.2	5.4	0.2	27.8	27.0	0.0	0.0	0.0	0.0	4.0	0.4	0.0
OH	Barnacle	39.8	38.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	14.0	0.4	2.0
OH	Endocladia	32.4	5.8	1.8	51.0	0.0	1.6	1.4	0.0	0.2	5.2	0.6	0.0
OH	Rockweed	31.0	29.6	0.2	24.0	0.0	0.6	0.0	0.0	0.0	14.2	0.4	0.0
OH	Mussels	20.6	1.0	2.6	2.4	0.0	0.0	43.2	0.4	6.2	22.0	1.6	0.0

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 (subsampling 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>Nuttallina</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

SiteID	Sampling SeasonCode	Target Zone	# Plots Sampled	LEPSPP	NUTSPP	MOPSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
ANMW	SP10	barnacles	5	2.5	3.3	0.0	0.3	0.8	0.3	0.0	0.8	0.0	0.5	0.0	0.0	0.0	21.9	53.1	64.8	0.0	0.0
ANMW	SP10	Endocladia	5	0.8	2.3	0.0	0.5	1.3	0.3	0.0	0.3	0.0	0.8	0.0	0.0	0.0	18.0	45.3	153.1	0.0	0.0
ANMW	SP10	Mytilus	5	0.4	1.6	0.0	2.2	0.4	0.0	0.6	0.0	0.4	0.0	0.0	0.0	0.4	26.9	61.9	0.0	0.2	4.2
ANMW	SP10	Silvetia	5	1.4	3.6	0.0	0.4	1.0	0.0	0.4	0.4	0.0	1.0	0.0	0.0	0.8	14.4	93.8	16.9	0.0	2.2
ANMW Mean				1.3	2.7	0.0	0.8	0.9	0.1	0.3	0.4	0.1	0.6	0.0	0.0	0.3	20.3	63.5	58.7	0.1	1.6
ANMW SE				0.2	0.2	0.0	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	1.2	4.8	15.4	0.0	0.5
SCFC	SP10	barnacles	5	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	1.8	0.6	0.0	0.0	48.1	53.8	2312.5	0.0	0.0
SCFC	SP10	Endocladia	5	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	2.0	3.6	2.6	0.0	0.0	33.8	47.5	352.5	0.0	0.0
SCFC	SP10	Hesperophycus	5	0.8	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.2	2.6	13.2	0.0	0.0	14.4	39.4	426.3	0.0	0.0
SCFC	SP10	Mytilus	5	0.0	0.4	0.0	0.2	0.2	0.0	0.2	0.0	9.4	0.4	1.0	0.0	0.6	12.5	20.6	2.5	0.0	0.0
SCFC	SP10	Pollicipes	5	0.2	2.0	0.0	0.2	0.2	0.2	0.0	0.0	14.0	0.0	0.0	0.0	0.2	18.8	28.1	2.5	0.0	0.0
SCFC	SP10	Silvetia	5	0.4	0.2	0.0	0.0	1.0	1.4	0.0	0.4	0.0	1.8	10.6	0.0	0.0	26.9	80.0	38.8	0.0	0.0
SCFC	SP10	tar	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	0.0	1140.6	0.0	0.0
SCFC Mean				0.3	0.4	0.0	0.1	0.3	0.2	0.0	0.1	3.7	1.5	4.0	0.0	0.1	22.1	38.5	610.8	0.0	0.0
SCFC SE				0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	1.0	0.2	0.9	0.0	0.0	2.7	4.3	143.8	0.0	0.0
SCPH	SP10	barnacles	5	0.6	0.0	0.0	0.0	0.8	0.0	0.4	0.0	0.2	0.2	0.0	0.2	0.0	76.9	51.9	488.8	0.0	0.0
SCPH	SP10	Endocladia	5	0.6	0.2	0.0	0.0	0.4	0.0	2.0	0.0	0.6	3.6	0.6	0.2	0.0	58.8	43.1	875.0	0.0	0.0
SCPH	SP10	Hesperophycus	5	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.4	1.8	0.0	0.0	20.0	48.1	1387.5	0.0	0.0
SCPH	SP10	Mytilus	5	0.0	5.4	0.0	2.4	1.6	0.0	4.0	0.0	0.4	0.6	0.0	0.0	0.0	90.0	48.8	0.0	0.0	0.0
SCPH	SP10	Silvetia	5	1.8	0.3	0.0	0.0	0.5	0.0	1.5	1.0	2.0	2.0	0.0	0.0	0.0	78.1	85.2	122.7	0.0	0.0
SCPH Mean				0.7	1.2	0.0	0.5	0.7	0.0	1.6	0.3	0.6	1.4	0.5	0.1	0.0	64.8	55.4	574.8	0.0	0.0
SCPH SE				0.1	0.5	0.0	0.2	0.1	0.0	0.3	0.1	0.2	0.3	0.2	0.0	0.0	5.5	3.4	113.7	0.0	0.0

SiteID	Sampling SeasonCode	Target Zone	# Plots Sampled	LEPSPP	NUTSPP	MOPSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
SCTR	SP10	barnacles	5	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.0	0.0	0.4	0.0	0.0	59.4	141.9	1567.5	0.0	0.0
SCTR	SP10	Hesperophycus	6	2.7	0.0	0.0	0.0	1.2	0.0	0.0	0.2	1.5	1.2	5.5	0.2	0.0	32.3	21.9	354.7	0.0	0.0
SCTR	SP10	Mytilus	5	0.0	1.8	0.0	1.0	0.3	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.3	18.8	8.6	2.3	0.0	2.0
SCTR	SP10	Silvetia	5	1.0	0.2	0.0	0.0	2.0	2.2	0.0	1.2	0.2	3.2	90.2	1.0	0.0	15.0	23.1	31.9	0.0	0.0
SCTR Mean				1.0	0.5	0.0	0.3	0.9	0.6	0.0	0.3	0.7	1.2	24.0	0.3	0.1	31.4	48.9	489.1	0.0	0.5
SCTR SE				0.3	0.2	0.0	0.1	0.2	0.2	0.0	0.1	0.1	0.3	9.6	0.1	0.0	4.4	13.6	160.7	0.0	0.2
SCWA	SP10	Endocladia	5	1.0	0.2	0.0	0.0	2.8	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	56.3	21.3	309.4	0.0	0.0
SCWA	SP10	Hesperophycus	5	2.2	0.0	0.0	0.0	1.4	0.6	0.2	0.0	0.0	1.0	0.2	0.0	0.0	271.3	48.1	455.6	0.0	0.0
SCWA	SP10	Mytilus	5	0.0	1.6	0.0	1.4	2.8	0.0	0.0	0.2	2.2	0.0	0.0	0.0	0.2	93.1	88.1	0.6	1.4	4.4
SCWA	SP10	Silvetia	5	0.6	2.8	0.2	0.0	2.2	1.0	0.2	0.4	0.6	1.8	0.0	0.0	0.0	650.0	53.1	151.3	0.0	0.0
SCWA Mean				1.0	1.2	0.1	0.4	2.3	0.4	0.1	0.2	1.3	0.7	0.1	0.0	0.1	267.7	52.7	229.2	0.4	1.1
SCWA SE				0.2	0.3	0.0	0.2	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.0	0.0	60.7	6.1	44.0	0.2	0.5
SMCH	SP10	barnacles	5	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.4	0.2	0.6	3.2	0.0	0.0	13.1	35.6	1147.5	0.0	0.0
SMCH	SP10	Endocladia	5	0.4	3.0	0.0	0.0	2.8	0.0	0.6	0.0	4.4	2.0	6.4	0.0	0.8	62.5	65.0	228.8	0.0	0.0
SMCH	SP10	Mytilus	5	0.2	18.6	0.0	0.6	3.2	0.0	0.2	0.0	6.4	0.0	0.0	0.0	7.2	100.6	175.0	0.0	0.0	1.4
SMCH	SP10	Silvetia	5	1.0	3.2	0.0	0.0	1.0	1.6	0.8	2.0	2.4	1.8	14.6	0.0	0.6	70.6	100.6	465.0	0.0	0.2
SMCH Mean				0.4	6.2	0.0	0.2	1.9	0.4	0.4	0.6	3.4	1.1	6.1	0.0	2.2	61.7	94.1	460.3	0.0	0.4
SMCH SE				0.1	1.9	0.0	0.1	0.3	0.2	0.1	0.2	0.6	0.2	1.4	0.0	0.8	8.1	13.4	110.9	0.0	0.2
SMHP	SP10	barnacles	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	28.1	40.6	1314.4	0.0	0.0
SMHP	SP10	Endocladia	5	0.2	0.4	0.0	0.0	0.2	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	38.1	77.5	341.3	0.0	0.0
SMHP	SP10	Hesperophycus	5	0.0	0.2	0.0	0.0	1.0	0.2	0.6	0.8	0.0	0.0	0.0	0.0	0.0	5.0	23.8	385.0	0.0	0.0
SMHP	SP10	Mytilus	5	0.0	1.6	0.0	0.4	1.8	0.0	0.8	2.6	4.2	0.0	0.0	0.0	1.0	155.6	150.0	310.0	0.0	0.4
SMHP	SP10	Tetraclita	5	4.2	12.2	0.6	0.2	1.6	0.4	1.0	5.0	6.6	0.0	0.6	0.0	3.2	156.3	206.9	21.9	0.0	0.0
SMHP Mean				0.9	2.9	0.1	0.1	0.9	0.1	0.5	1.8	2.3	0.0	0.1	0.0	0.8	76.6	99.8	474.5	0.0	0.1
SMHP SE				0.4	1.0	0.1	0.0	0.2	0.0	0.1	0.4	0.6	0.0	0.1	0.0	0.3	14.7	15.4	98.1	0.0	0.0

SiteID	Sampling SeasonCode	Target Zone	# Plots Sampled	LEPSPP	NUTSPP	MOPSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
SMOH	SP10	barnacles	5	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	20.0	0.0	0.0	2.9	16.2	710.0	0.0	0.0
SMOH	SP10	Endocladia	5	0.4	0.6	0.0	0.0	2.8	0.0	0.0	0.6	0.6	0.4	2.6	0.0	0.2	28.8	99.4	129.4	0.0	0.0
SMOH	SP10	Mytilus	5	0.2	4.6	0.0	0.0	2.2	0.8	0.0	6.2	12.8	0.0	1.8	0.0	2.8	40.6	123.8	0.0	0.0	0.4
SMOH	SP10	Silvetia	5	0.2	0.0	0.0	0.0	0.6	0.0	0.0	4.8	0.2	0.0	2.8	0.0	0.0	66.3	75.6	695.6	0.0	0.0
SMOH Mean				0.5	1.4	0.0	0.0	1.4	0.2	0.0	3.0	3.4	0.1	6.8	0.0	0.8	34.6	78.7	383.8	0.0	0.1
SMOH SE				0.1	0.5	0.0	0.0	0.3	0.1	0.0	0.7	1.4	0.0	2.0	0.0	0.3	5.9	10.3	83.2	0.0	0.0
ANCR	FA10	barnacles	9	0.1	0.0	0.0	0.0	0.3	0.0	0.0	1.9	0.0	0.8	0.0	0.0	0.0	4.7	16.8	1289.1	0.0	0.0
ANCR	FA10	Endocladia	9	2.9	8.4	0.0	2.1	0.9	0.0	2.4	1.2	0.0	0.4	0.0	0.0	0.6	27.4	162.5	41.0	0.0	0.0
ANCR	FA10	Mytilus	9	1.2	5.2	0.0	2.0	0.1	0.0	1.8	0.0	0.0	0.0	0.0	0.0	3.2	12.5	138.9	70.8	0.0	1.7
ANCR	FA10	Silvetia	9	1.8	0.8	0.0	0.4	2.0	0.1	0.9	4.7	0.0	1.7	0.0	0.0	0.0	15.3	63.2	511.1	0.0	0.0
ANCR Mean				1.5	3.6	0.0	1.1	0.8	0.0	1.3	1.9	0.0	0.7	0.0	0.0	0.9	15.0	95.3	478.0	0.0	0.4
ANCR SE				0.2	0.7	0.0	0.2	0.1	0.0	0.2	0.3	0.0	0.1	0.0	0.0	0.3	1.6	11.2	97.0	0.0	0.1
ANSFC	FA10	barnacles	5	0.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	6.9	28.8	367.5	0.0	0.0
ANSFC	FA10	Endocladia	5	0.6	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	5.0	6.3	1.9	0.0	0.0
ANSFC	FA10	Mytilus	5	0.8	2.6	0.0	0.0	1.4	0.0	0.0	0.0	4.0	2.8	0.0	0.0	0.0	20.0	48.1	0.0	0.0	0.0
ANSFC	FA10	Silvetia	5	0.6	0.2	0.2	0.0	1.4	0.0	0.0	0.4	0.0	2.4	0.0	0.0	0.0	18.8	40.6	57.5	0.0	0.0
ANSFC Mean				0.6	0.7	0.1	0.0	1.0	0.0	0.0	0.1	1.0	1.6	0.0	0.0	0.0	12.7	30.9	106.7	0.0	0.0
ANSFC SE				0.1	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.3	0.0	0.0	0.0	1.7	4.1	39.3	0.0	0.0
SBLC	FA10	barnacles	5	6.2	6.8	0.0	0.0	0.6	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	29.4	170.0	10.0	0.0	0.0
SBLC	FA10	Mytilus	5	1.0	13.8	0.0	1.2	0.4	0.0	12.8	0.0	0.0	0.0	0.0	0.0	0.0	63.1	173.8	0.0	0.0	5.2
SBLC	FA10	Silvetia	5	2.4	1.4	0.0	0.6	0.2	0.4	1.6	0.6	0.0	0.0	0.2	0.0	0.0	8.1	193.1	0.6	0.0	0.0
SBLC Mean				3.2	7.3	0.0	0.6	0.4	0.1	6.7	0.2	0.0	0.0	0.1	0.0	0.0	33.5	179.0	3.5	0.0	1.7
SBLC SE				0.7	1.6	0.0	0.2	0.1	0.1	1.5	0.1	0.0	0.0	0.0	0.0	0.0	7.2	3.2	1.4	0.0	0.8

SiteID	Sampling SeasonCode	Target Zone	# Plots Sampled	LEPSPP	NUTSPP	MOPSPP	FISVOL	PACCRA	PAGSPP	OCECIR	LIMPLG	NUCEMA	ACASPP	TEGFUN	TEGGAL	LOTGIG	LSMALL	LMDALL	LITSPP	PISOCH	STRPUR
SBSLR	FA10	barnacles	5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.2	0.6	11.9	411.3	0.0	0.0
SBSLR	FA10	Endocladia	5	0.6	0.6	0.0	0.0	0.2	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	65.6	15.0	0.0	0.0
SBSLR	FA10	Mytilus	5	0.6	5.2	0.0	11.0	1.8	0.0	5.0	0.0	0.0	0.2	0.0	0.0	0.0	6.3	36.3	0.0	0.6	47.6
SBSLR	FA10	Silvetia	5	3.0	2.4	0.0	1.4	0.6	6.6	5.4	11.4	0.0	0.0	0.0	0.0	1.8	0.6	116.3	12.5	0.0	0.0
SBSLR Mean				1.1	2.1	0.0	3.1	0.9	1.7	2.6	3.8	0.0	0.1	0.0	0.0	0.5	1.9	57.5	109.7	0.2	11.9
SBSLR SE				0.3	0.5	0.0	1.2	0.2	0.7	0.7	1.2	0.0	0.0	0.0	0.0	0.2	0.7	10.0	45.0	0.1	5.3
SCPH	FA10	barnacles	5	1.6	1.0	0.0	0.0	0.4	0.0	0.8	0.2	0.6	0.4	0.0	0.0	0.0	65.0	355.0	1090.0	0.0	0.0
SCPH	FA10	Endocladia	5	0.8	0.0	0.0	0.0	0.2	0.4	2.2	0.2	4.0	23.0	2.0	0.0	0.0	95.0	120.0	747.5	0.0	0.0
SCPH	FA10	Hesperophycus	5	0.8	0.0	0.0	0.0	0.2	0.0	2.6	1.8	0.2	15.8	1.0	0.0	0.0	27.5	127.5	625.0	0.0	0.0
SCPH	FA10	Mytilus	5	2.4	13.4	0.0	2.2	0.0	1.4	5.0	0.0	0.0	0.8	1.8	0.0	0.0	125.0	90.0	0.6	0.0	0.0
SCPH	FA10	Silvetia	5	4.2	0.4	0.0	0.0	0.4	0.0	2.4	1.8	0.8	0.2	0.0	0.0	0.0	305.0	391.3	125.0	0.0	0.0
SCPH Mean				2.0	3.0	0.0	0.4	0.2	0.4	2.6	0.8	1.1	8.0	1.0	0.0	0.0	123.5	216.8	517.6	0.0	0.0
SCPH SE				0.3	1.2	0.0	0.2	0.0	0.1	0.3	0.2	0.3	2.1	0.2	0.0	0.0	21.5	28.8	90.2	0.0	0.0
SCSR	FA10	barnacles	5	0.8	0.0	0.0	0.0	0.8	0.2	1.4	1.4	2.4	0.4	0.0	0.0	0.0	30.0	71.3	1335.0	0.0	0.0
SCSR	FA10	Endocladia	5	0.8	1.4	0.0	0.0	0.4	0.2	4.4	0.4	2.8	0.8	0.0	0.0	0.0	61.3	78.8	497.5	0.0	0.2
SCSR	FA10	Hesperophycus	5	0.6	1.6	0.0	0.0	2.2	0.0	0.2	0.8	0.4	0.6	1.8	0.0	0.0	20.0	85.0	140.0	0.0	0.0
SCSR	FA10	Mytilus	5	3.0	8.3	0.0	3.5	1.0	0.0	14.8	0.0	0.0	0.0	0.0	0.0	0.0	162.5	240.6	0.0	0.8	12.5
SCSR	FA10	Tetraclita	5	3.2	6.0	0.0	0.2	1.2	0.2	12.6	2.6	0.6	0.0	0.0	0.0	0.0	183.1	309.4	23.8	0.0	0.0
SCSR Mean				1.7	3.5	0.0	0.7	1.1	0.1	6.7	1.0	1.2	0.4	0.4	0.0	0.0	91.4	157.0	399.3	0.2	2.5
SCSR SE				0.3	0.7	0.0	0.3	0.1	0.0	1.3	0.2	0.3	0.1	0.2	0.0	0.0	15.2	22.1	111.9	0.1	1.1