



# Rocky Intertidal Community Monitoring at Channel Islands National Park

## *2013 Annual Report*

Natural Resource Data Series NPS/MEDN/NRDS—2020/1305



The production of this document cost \$100,113, including costs associated with data collection, processing, analysis, and subsequent authoring, editing, and publication.

**ON THE COVER**

Hermit crab (*Pagurus samuelis*) and anemone (*Anthopleura sola*)

Photograph by: J. Altstatt

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# **Rocky Intertidal Community Monitoring at Channel Islands National Park**

## *2013 Annual Report*

Natural Resource Data Series NPS/MEDN/NRDS—2020/1305

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December 2020

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

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Please cite this publication as:

Whitaker, S. G. 2020. Rocky intertidal community monitoring at Channel Islands National Park: 2013 annual report. Natural Resource Data Series NPS/MEDN/NRDS—2020/1305. National Park Service, Fort Collins, Colorado.

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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 are 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 1998. Site selection considered visitation, accessibility, presence of representative organisms, wildlife disturbance, and safety. This report summarizes the 2013 sampling year efforts (March 2013 to January 2014) and findings of the Channel Islands National Park (CHIS) Rocky Intertidal Community 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 Community Monitoring Program. Fixed photo-plots were used to monitor the percent cover of thatched and acorn barnacles (*Tetraclita rubescens*, *Balanus glandula*/*Chthamalus* spp., respectively), 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.

All sites except the two at Santa Barbara Island, Anacapa Middle East and Orizaba Cove were monitored in spring. Anacapa Middle East and Orizaba Cove were the only sites not sampled in fall. Monitoring was not conducted at the aforementioned sites due to logistical constraints, or the need to avoid disturbing nesting California brown pelicans (e.g., Sea Lion Rookery, Santa Barbara Island). Weather conditions during the spring and fall site-visits were satisfactory, but high wind coupled with strong swell and surge limited some of the abalone and sea star searches.

Abundances for most key species or assemblages targeted in the photo plots were highly variable among sites, but only varied minimally between spring and fall monitoring seasons. Mussel, *Mytilus californianus*, cover remained below average at Anacapa, Santa Rosa and particularly Santa Cruz

Islands. Yet, mussels increased markedly at the two Santa Barbara sites and remained stable at San Miguel Island. Both rockweed species, *Silvetia compressa* and *Hesperophycus californicus*, continued to decrease markedly in abundance this year at the majority of sites compared to combined averages for previous years. Barnacle, *Chthamalus/Balanus* spp., cover was comparable to long-term averages at approximately half the sites sampled in spring and fall. *Endocladia muricata* abundances remained comparable to long-term means calculated for previous years at nearly all sites during both monitoring seasons.

Black abalone abundances at the islands are still less than one percent of 1985 population levels. Only four black abalone were seen within fixed plots in 2013. Zero abalone were found at Cuyler Harbor, Sea Lion Rookery and South Frenchy's Cove during routine site searches. At most other sites, black abalone abundances were near or slightly above long-term mean values calculated for years (1995–2012) following the population collapse. Size frequencies for black abalone at Anacapa, Santa Cruz and Santa Rosa Islands indicate the effects of recruitment in recent years since the populations included smaller (< 50 mm) animals. The opposite is typically true at San Miguel Island where we tend to find very few juvenile abalone; instead, the population is usually dominated by larger, and presumably, older individuals. However, in fall, the San Miguel population was negatively-skewed indicating the presence of numerous smaller individuals.

Ochre sea stars were moderately abundant in 2013 at most sites around the islands. In contrast to recent years, extremely high (e.g. >500) numbers of ochre sea stars were not observed at any sites this year. Between 100 and 300 *P. ochraceus* were observed during timed searches at nearly half of all sites. Ochre star populations at most sites followed normal size frequency distributions with modes typically between 70 mm and 130 mm with few exceptions. Several *P. ochraceus* were observed in 2013 at two different sites exhibiting signs of wasting disease.

Giant owl limpet abundances decreased at all sites except Willows Anchorage in 2013 relative to past years. At Willows Anchorage, owl limpets were markedly more abundant this year. The mean sizes of giant owl limpet in 2013 varied spatially among sites and islands, and to a lesser degree, temporally within most sites. The smallest limpets were measured at Ford Point and the largest individuals were seen at Northwest-Talcott.

Surfgrasses are typically monitored biannually at two sites each on Santa Cruz and Santa Rosa Islands. Surfgrass cover remained comparable between spring and fall at all sites except Northwest-Talcott in which surfgrass was slightly less abundant in spring. At Fraser Cove, surfgrass abundances have been increasing since 2007. The opposite is true at Trailer, where surfgrass cover has been slowly decreasing in recent years. Surfgrass cover at both sites monitored on Santa Rosa Island has remained relatively stable over time.

Black oystercatchers were the most ubiquitous shorebird seen at all sites; seasonal abundances in 2013 were comparable to counts in recent years. American oystercatchers were not seen at any sites. Black turnstones were not as common as they have been in years past, but a relatively large flock was observed at Johnson's Lee in fall. Other notable observations include several relatively-large (20–50

birds) flocks of gulls counted at Northwest-Talcott and Sea Lion Rookery, and cormorants at East Point and Crook Point.

Harbor seals, *Phoca vitulina*, were seen at eight sites in 2013. As in past years, harbor seals were most abundant at Otter Harbor. Elephant seals, *Mirounga angustirostris*, were seen at three sites during the year. California sea lions, *Zalophus californianus*, were observed at Sea Lion Rookery and Landing Cove, Santa Barbara Island. Approximate numbers of sea lions at the two sites ranged 40–50.

Visitation to all but two intertidal sites, South Frenchy's Cove on Anacapa and Prisoner's Harbor at Santa Cruz, is low or nonexistent. Frenchy's Cove, however, receives moderate usage due to its close proximity to the mainland and relative ease of access. In 2013, Island Packers Company conducted six trips to Frenchy's Cove to allow visitors access to the tidepools. Total visitation was 431 passengers. Most visitation (84%) occurred during February through May with March being the busiest month (297 visitors).

## Acknowledgments

The National Park Service (NPS), Channel Islands National Park (CHIS) funded this program. Boat time (three days in fall) was provided by CHIS. The NPS Mediterranean Coast Network Inventory and Monitoring Program provided support for data analyses and database assistance. Temperature loggers 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.

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

We are grateful to the many people that assisted with the monitoring during the 2013 sampling seasons including Jessie Altstatt, VIP; Kate Buckeridge, VIP; Mario Diaz, VIP; Kari Eckdahl, VIP; Connie Jenkins, VIP; Laura Jurgens; Ashley Kidd, VIP; David Kushner, CHIS; Dan Richards, VIP; Josh Sprague, VIP; Taylor Weber, VIP.

We are especially grateful for the database support that Lena Lee (MEDN I&M) provided to ensure smooth program operation.

## List of Acronyms

|        |                                                             |
|--------|-------------------------------------------------------------|
| ANI    | Anacapa Island                                              |
| CDFG   | California Department of Fish and Game                      |
| CHIS   | 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                                           |
| SSWD   | Sea Star Wasting Disease                                    |
| 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.

Channel Islands National Park (CHIS) and Channel Islands National Marine Sanctuary (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).

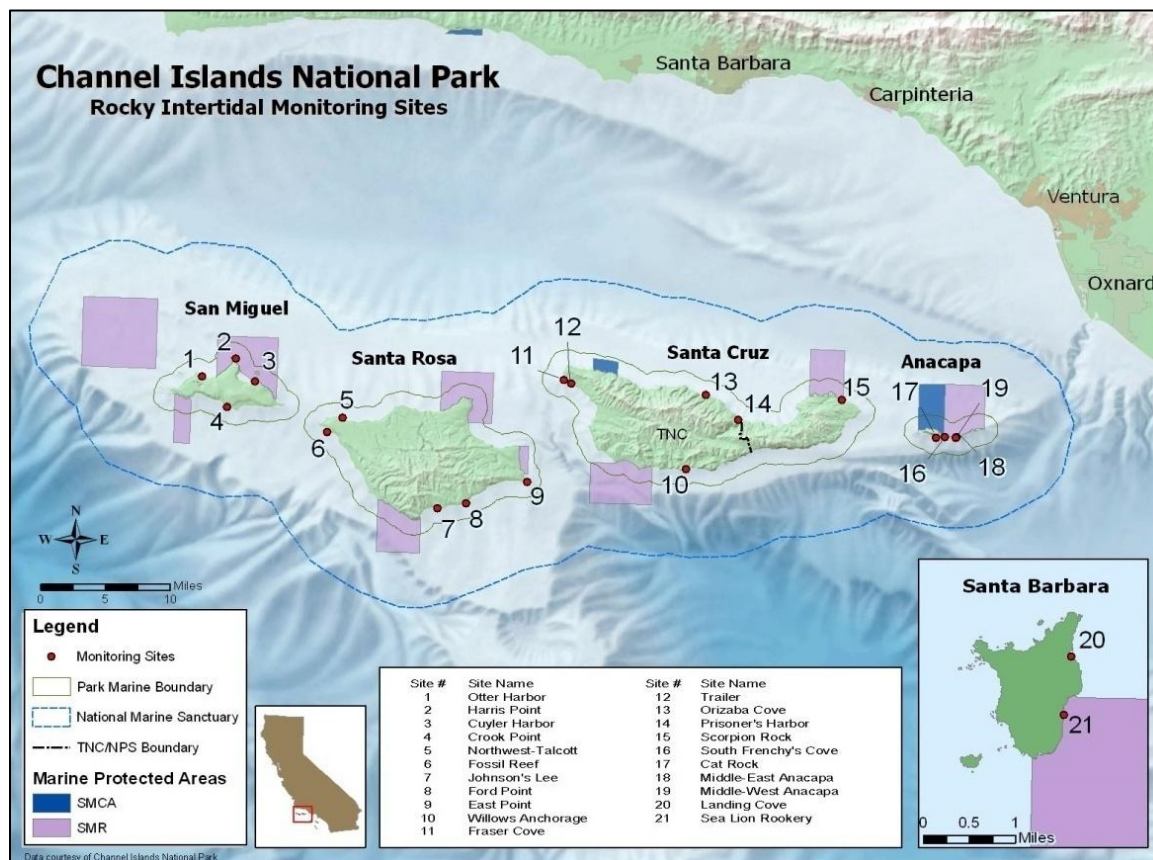


**Figure 1.** Rocky Intertidal Community Monitoring site locations in Channel Islands National Park. Note: TNC= The Nature Conservancy, SMCA= State Marine Conservation Area, SMR= State Marine Reserve, Sites 18 and 19 are on adjacent reefs.

The “undisturbed tide pools” are unique features specifically mentioned in the enabling legislation for CHIS. 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, 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 targeted 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 initially began at Anacapa Island (VTN Oregon 1984) following concerns that visitor usage (e.g., trampling, collecting, etc.) may increase and thus negatively impact rocky intertidal communities (see Littler 1978). Beginning in 1985, the program was expanded to include sites at Santa Barbara, Santa Rosa and San Miguel Islands. Sites were added at Santa Cruz Island in 1994–1998 by UCSB personnel and assumed by CHIS in 1998. Monitoring of the intertidal zone was part of a long-term “vital signs” ecological monitoring program developed at CHIS (Davis et al. 1994) that eventually served as the model for ecological monitoring conducted through the NPS Inventory and Monitoring Program (Davis 2005). CHIS is one of three parks in the Mediterranean Coast Network of the NPS Inventory and Monitoring Program.

Sampling site locations were chosen subjectively based on accessibility, safety and the relative locations of target organisms, among other variables. 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 (see Ambrose et al. [1992, 1995] and Murray et al. 2006). Therefore a sampling design involving fixed plots was selected in an attempt to maximize the ability to detect temporal changes in target species distribution and abundance. The disadvantage of this sampling design is that results from plots cannot be extrapolated to the larger, un-sampled population (Engle 2008), and statistical comparison among sites is not possible (Murray et al. 2006).

CHIS 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, the goal is to standardize collection of data at sites spanning from Baja California to Alaska, including the Channel Islands, and make it available to member groups in a centralized database (Engle 2008). By working with MARINe we have access to consistent data that can be used for much broader regional analyses of changes to intertidal communities.

This report summarizes the 2013 sampling year efforts (from March 2013 to January 2014) and documents activities and observations of the CHIS Rocky Intertidal Community Monitoring

Program. Monitoring results were previously reported in Richards 1986, 1988, 1998; Richards and Lerma 2000, 2002, 2005; Richards et al. 2011, 2013; Richards and Rich 2009, 2012; Richards and Whitaker 2012a, 2012b, 2012c, 2012d; and Whitaker and Richards 2012. Additional black abalone monitoring results have been presented in Haaker et al. 1992, Davis et al. 1992, and Richards and Davis 1993. The annual reports are available on the internet at <https://www.nps.gov/im/medn/reports-publications.htm>.

## Methods

### Study Area

The California Channel Islands are comprised of eight islands in the Southern California Bight; five of the islands are located within the CHIS. The five park islands have about 323 kilometers (176 miles) of coastline, the majority (approximately 80%) of which is rocky shore. 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, cloud cover, and 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.

### Monitoring

The CHIS Rocky Intertidal Community Monitoring Program has 21 sites on the five park islands (Figure 1) that were established between 1982 and 1998. Sites generally consist of an array of 15–35 photoplots, 3–5 irregular-shaped and circular plots used to monitor black abalone and owl limpet densities, respectively, and *P. ochraceus* transects. Surfgrass transects are monitored at four sites. The site selection procedure considered visitation, accessibility, presence of representative organisms, wildlife disturbance, and safety. Sampling is usually conducted twice each year, once in spring and fall. In 2013, monitoring occurred at 17/21 sites in spring (March–May) and 19/21 sites in fall (October–January 2013). 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. (2011), and Engle (2008). See Appendices A-B for additional notes about the 2013 monitoring.

Data are maintained in Microsoft Access databases and Excel files in the Channel Islands National Park network and MARINE. Electronic data were verified (checked against the original datasheet) and validated (queried to identify outliers or nonsensical values) and then certified as ready to analyze.

The percent coverage of thirteen core species or assemblages is monitored in fixed photoplots (Table 1). The chosen target species and assemblages commonly occur throughout the SCB and are 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., respectively), 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 taxa<sup>1</sup>). 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 had been devoid of mussels for over 15 years (Whitaker and Richards 2012).

**Table 1.** Core Species, Higher Taxa, and Substrata Scored in Photoplots, Point Intercept Transects, Circular Plots, Abalone/Seastars, and Mobile Invertebrate<sup>a</sup> Counts at all CHIS Sites.

| Category    | Species or Substrate                                                                    | 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                   | –              | –                 | –              |
|             | <b><i>Hesperophycus californicus</i></b> <sup>b</sup> (= <i>H. harveyanus</i> )         | X           | –                   | –              | –                 | –              |
|             | <i>Sargassum muticum</i>                                                                | –           | X                   | –              | –                 | –              |
|             | <i>Scytosiphon</i> spp.                                                                 | X           | –                   | –              | –                 | –              |
|             | <b><i>Silvetia compressa</i></b> <sup>b</sup> (= <i>Pelvetia fastigiata</i> )(Rockweed) | X           | –                   | –              | –                 | –              |
|             | Other Brown Algae (any browns not listed above)                                         | X           | X                   | –              | –                 | –              |
|             | Ephemeral browns                                                                        | X           | –                   | –              | –                 | –              |
| Red algae   | <b><i>Endocladia muricata</i></b> <sup>b</sup> (Turfweed)                               | X           | –                   | –              | –                 | –              |
|             | <i>Chondracanthus canaliculatus</i> (= <i>Gigartina canaliculata</i> )                  | X           | –                   | –              | –                 | –              |
|             | <i>Chondracanthus spinosus</i>                                                          | X           | –                   | –              | –                 | –              |
|             | <i>Gelidium coulteri/ Pterocladia capillacea</i>                                        | X           | –                   | –              | –                 | –              |

<sup>a</sup> Motile Invertebrate counts were dropped from the standard protocol in 2011.

<sup>b</sup> Target species (also shown in bold)

<sup>1</sup> 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 (continued).** Core Species, Higher Taxa, and Substrata Scored in Photoplots, Point Intercept Transects, Circular Plots, Abalone/Seastars, and Mobile Invertebratea Counts at all CHIS Sites.

| Category              | Species or Substrate                                                 | Photo plots | Surfgrass Transects | Circular Plots | Abalone/ Sea star | Motile Inverts |
|-----------------------|----------------------------------------------------------------------|-------------|---------------------|----------------|-------------------|----------------|
| Red algae (continued) | <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          | <b><i>Phyllospadix scouleri/torreyi</i></b> <sup>b</sup> (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                   | –              | –                 | –              |
| Molluscs              | <i>Acanthina</i> spp.                                                | –           | –                   | –              | –                 | X              |
|                       | Chitons                                                              | X           | –                   | –              | –                 | X              |
|                       | <i>Fissurella volcano</i>                                            | –           | –                   | –              | –                 | X              |
|                       | <b><i>Halotis cracherodii</i></b> <sup>b</sup> (Black Abalone)       | –           | –                   | –              | X                 | –              |
|                       | <i>Lepidochitona hartwegii</i>                                       | –           | –                   | –              | –                 | X              |
|                       | <i>Littorina</i> spp.                                                | –           | –                   | –              | –                 | X              |
|                       | <b><i>Lottia gigantea</i></b> <sup>b</sup> (Owl Limpet)              | –           | –                   | X              | –                 | X              |
|                       | <i>Mopalia</i> spp.                                                  | –           | –                   | –              | –                 | X              |
|                       | <b><i>Mytilus californianus</i></b> <sup>b</sup> (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           | –                   | –              | –                 | –              |

<sup>a</sup> Motile Invertebrate counts were dropped from the standard protocol in 2011.

<sup>b</sup> Target species (also shown in bold)

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

| Category             | Species or Substrate                                                                              | Photo plots | Surfgrass Transects | Circular Plots | Abalone/ Sea star | Motile Inverts |
|----------------------|---------------------------------------------------------------------------------------------------|-------------|---------------------|----------------|-------------------|----------------|
| Molluscs (continued) | 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            | <b><i>Chthamalus dalli/fissus</i> &amp; <i>Balanus glandula</i></b> <sup>b</sup> (Acorn Barnacle) | X           | –                   | –              | –                 | –              |
|                      | <b><i>Tetraclita rubescens</i></b> <sup>b</sup> (Thatched Barnacle)                               | X           | –                   | –              | –                 | –              |
|                      | <b><i>Pollicipes polymerus</i></b> <sup>b</sup> (Goose Barnacle)                                  | X           | –                   | –              | –                 | –              |
|                      | Barnacles                                                                                         | –           | X                   | –              | –                 | –              |
| Echinoderms          | <b><i>Pisaster ochraceus</i></b> <sup>b</sup> (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                   | –              | –                 | –              |

<sup>a</sup> Motile Invertebrate counts were dropped from the standard protocol in 2011.

<sup>b</sup> Target species (also shown in bold)

In 2013, all photoplots were photographed with a digital camera (Olympus 1030 SW). The percent cover of core organisms was determined either in the field by laying a grid (50 x 75 cm) of one-hundred evenly-spaced points (10 x 10) over the plot (Figure 2), or in rare cases in the office from digital images of the plots, when conditions were unfavorable or insufficient time was available. In the office, a digitized grid was created in Adobe Photoshop and overlaid on the image to provide complete coverage of the plot. Under both scoring protocols, layered organisms were not counted separately. Therefore the total cover of the top-most layer (with few exceptions – see Engle 2008) summed 100%. Data were recorded onto pre-printed data sheets, transcribed into the computer

database, verified (checked against the original datasheet), validated (queried to identify outliers or nonsensical values) and then certified as ready to analyze.



**Figure 2.** Dan Richards scoring photoplots at Ford Point, Santa Rosa Island.

Relative abundance and size structure data were collected for black abalone at each site by searching a defined area of the reef or by utilizing a timed-interval search. Sites are of variable sizes and the areas are defined by natural breaks in the reef allowing repeated searches of similar area. Timed searches are typically 30-minutes long. More time is often devoted to searches at sites that have the greatest numbers of abalone (e.g., Otter Harbor, San Miguel Island and Willows Anchorage, Santa Cruz Island). These protocols were implemented in response to abalone population levels declining. Prior to the effects of Withering Syndrome, black abalone were counted and measured in fixed-irregular plots (5 plots per site) at 11 sites. Fixed plots were used when abalone were abundant and often too numerous to count and measure over the whole reef. However, the fixed plots became inadequate for sampling by the early 1990s as abalone disappeared. Fixed plots are still checked for comparison to early samples but abalone are rarely encountered in the plots.

During the timed or defined-area searches for black abalone, typically one observer searches for individuals by carefully inspecting crevices and cavities among boulders, and checking under kelp or other canopy-forming seaweeds. Abalone are identified to species, shell lengths are measured with vernier calipers or estimated if an accurate measurement is not possible, and the nearest neighbor distance is recorded using five spatially-descriptive categories (touching, < 10 cm, 10–100 cm, 1–5

m, >5 m). Aggregation sizes (number of abalone within one meter of another) are generally noted as well. Shell size serves as a proxy for age, and thus provides a glimpse of the population structure. Nearest neighbor distance and aggregation size provide insight to the theory that abalone aggregate naturally. The information may also serve as an indication of spawning potential, since, as broadcast spawners, black abalone reproductive options increase with proximity to other individuals.

*Lottia gigantea*, giant owl limpet, abundance and size structure were assessed within fixed, circular plots (3 to 5 plots per site) at 12 sites (Figure 3). Within each plot, an area of 3.14 m<sup>2</sup> delineated by circling a fixed bolt with a pre-measured (1 m in length) line was used to measure and count all owl limpets > 15 mm (< 15 mm limpets can be difficult to identify to species) for maximum shell length.



**Figure 3.** Stephen Whitaker measuring giant owl limpets at Otter Harbor, San Miguel Island.

*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.

From 2002 to 2011, 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. Motile-invertebrates were usually sampled once annually. In 2012, it was decided that motile invertebrates would no longer be sampled due to the labor intensive methods that produced highly variable results that were difficult to interpret (Miner et al. 2015).

*Phyllospadix* spp., surfgrass, cover was measured using three 10m fixed point-intercept transects (100 points per transect) per site (Figure 4), 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.



**Figure 4.** Stephen Whitaker and Jessie Altstatt sampling a surfgrass transect at Trailer, Santa Cruz Island.

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 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 B.

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

Taxonomy and nomenclature follow Smith and Carlton (1975), Carlton (2007), Abbott and Hollenberg (1976), McLean (1978), Morris et al. (1980), and [http://ucjeps.berkeley.edu/californiaseaweeds\\_refs.html](http://ucjeps.berkeley.edu/californiaseaweeds_refs.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 2013. 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 JMP software (JMP, Version 12. SAS Institute Inc., Cary, NC, 1989–2019). To minimize variability, photoplot target types were not pooled from different zones for analysis. For example, the percent cover of mussels is only reported for plots within the mussel zone. Descriptive statistics (density, average 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 abundances are provided for comparative purposes, plots were chosen within high density areas, were 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 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.

As in most years, the mean percent cover of nearly all targeted species in 2013 was highly variable among sites. Temporal comparisons between spring and fall sampling seasons indicated that most species, with the minor exceptions of *Endocladia* and *Hesperophycus*, exhibited very little change.

Mussel, *Mytilus californianus* mean percent cover in 2013 remained relatively comparable to the mean of previous years at most sites in spring and fall (Figures 5–8). However, record-low abundances for *M. californianus* were measured at Fossil Reef, Harris Point, Prisoner's Harbor and Scorpion Rock. In the case of the latter two sites which both occur on Santa Cruz Island, mussels plummeted to near zero percent cover. Overall at Santa Cruz, mussel cover decreased markedly from the long-term mean during the last several years (Figure 7). The same is true to a lesser degree for mussel cover at sites on Santa Rosa and Anacapa Islands (Figure 8). In contrast, *M. californianus* percentages at Santa Barbara increased above the long-term mean this year. Abundances of mussels at San Miguel Island have remained relatively stable over the course of the monitoring program.

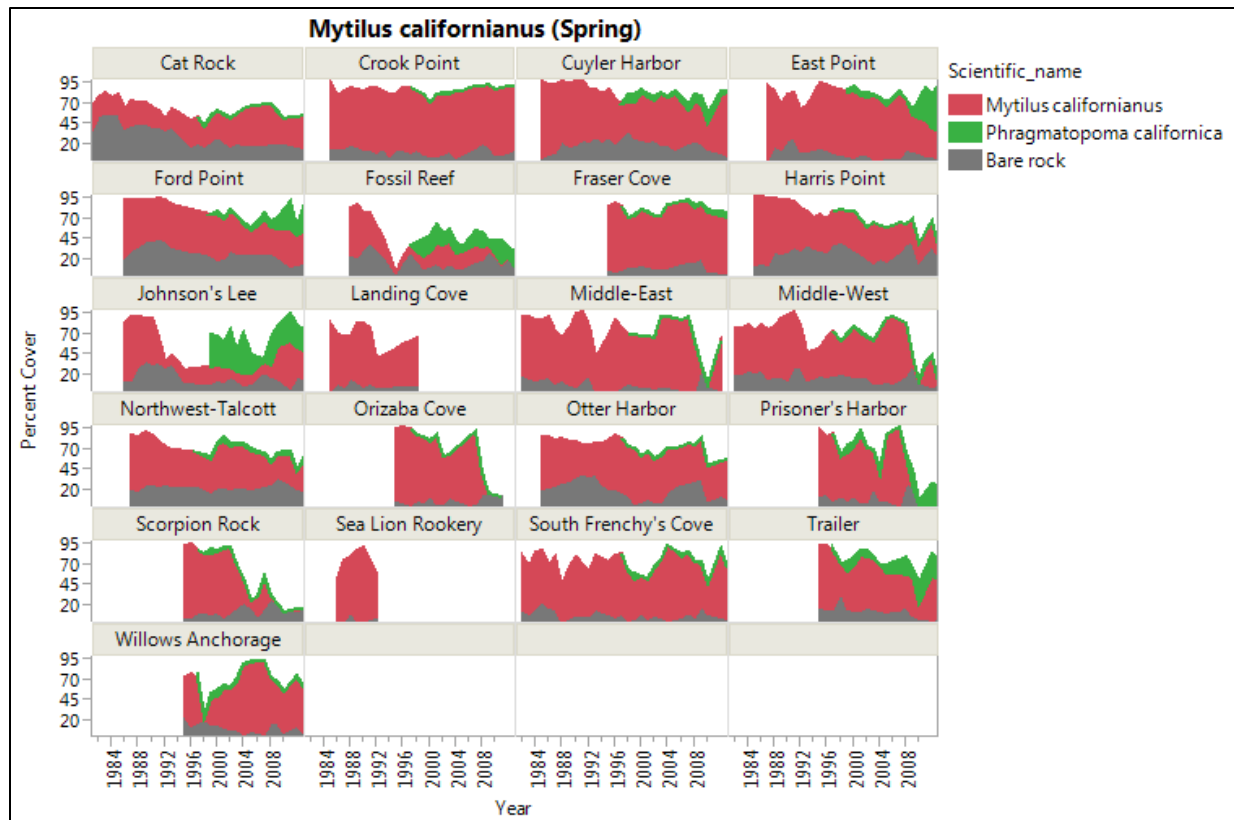


**Figure 5.** Percent cover of *Mytilus californianus* along with *Phragmatopoma californica* and bare rock in fixed plots within the *Mytilus* zone at each site in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Mytilus* plots. Note that Sea Lion Rookery was not sampled in spring (only fall) after 1992.

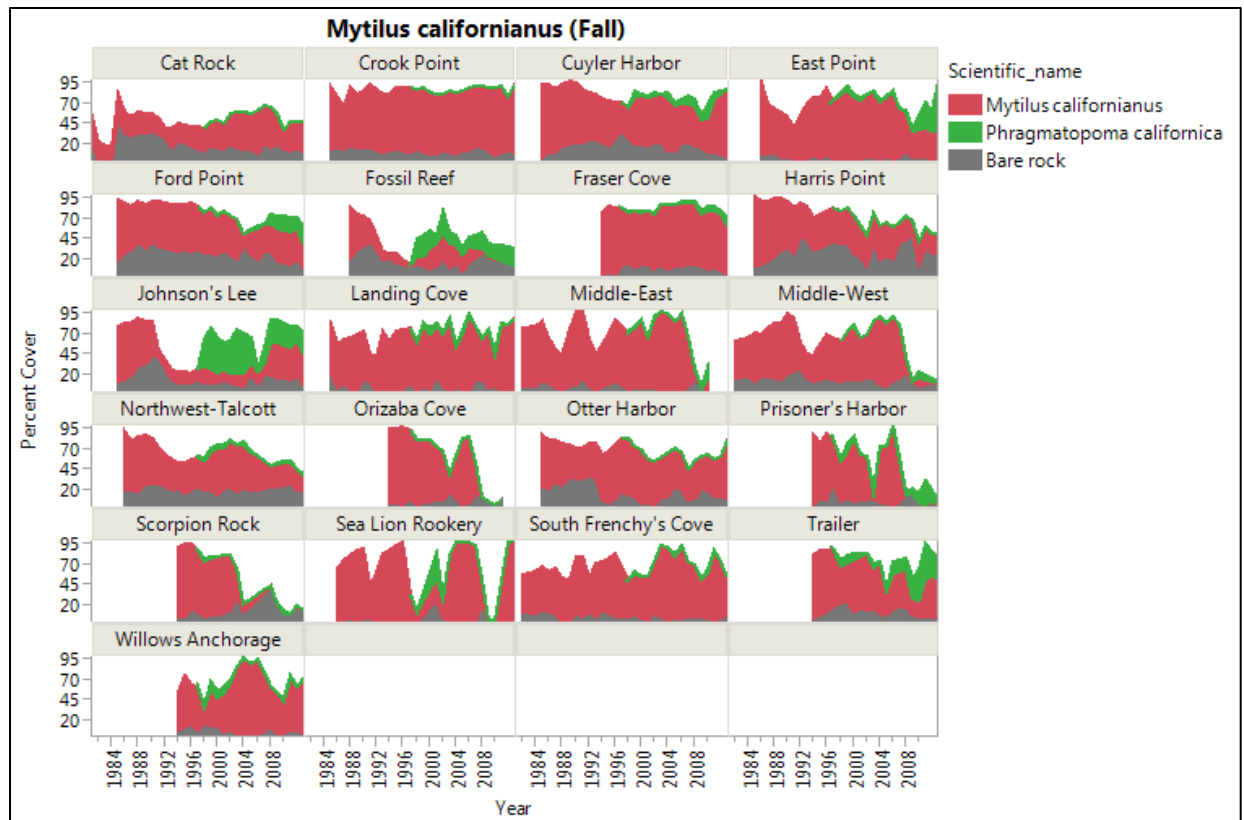


**Figure 6.** Percent cover of *Mytilus californianus* along with *Phragmatopoma californica* and bare rock in fixed plots within the *Mytilus* zone at each site in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Mytilus* plots.

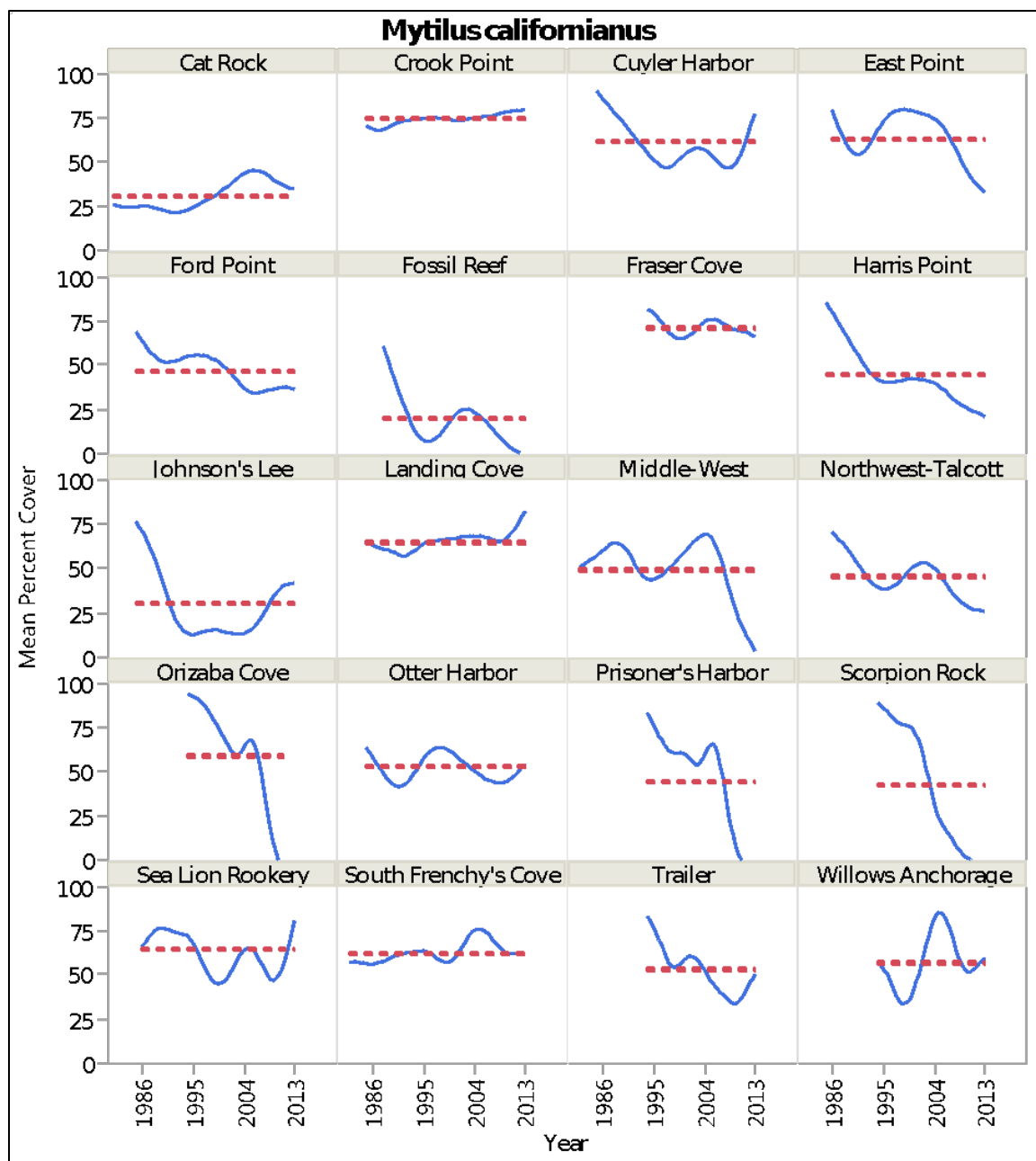


**Figure 7.** Departure from the long-term mean for *Mytilus californianus*. Blue lines represent mean cover of *M. californianus* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2013–14.

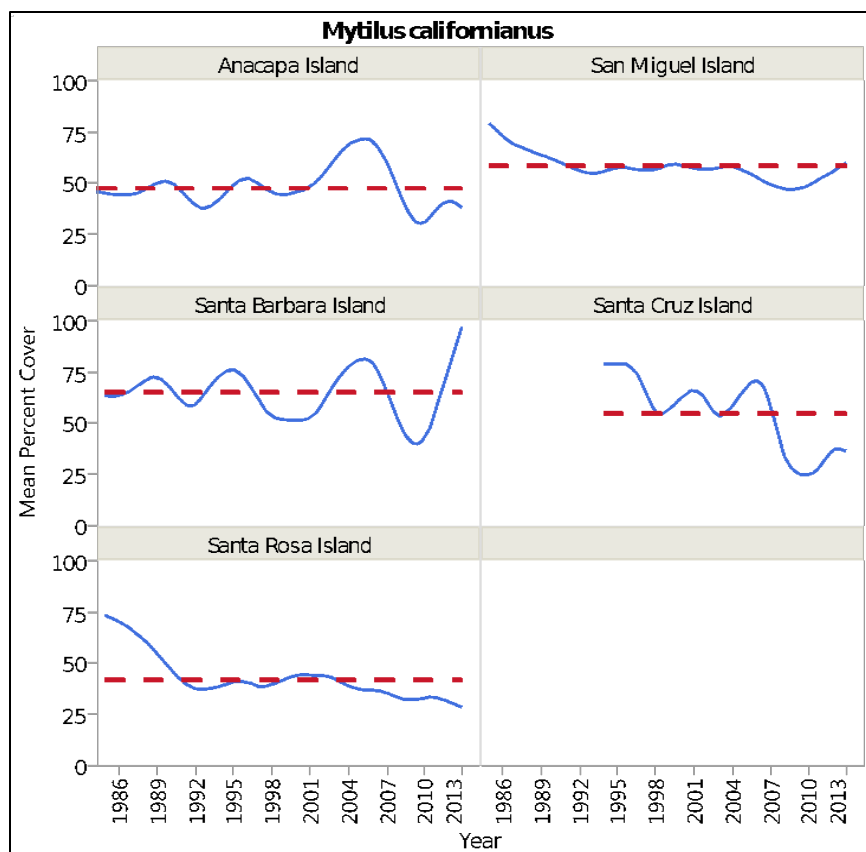


**Figure 8.** Departure from the long-term mean for *Mytilus californianus*. Blue lines represent mean cover of *M. californianus* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

Rockweed, *Silvetia compressa* abundances were again very low in 2013 compared to previous years. *S. compressa* cover averaged across representative plots at each site was well below long-term averages and measured < 20% absolute cover at most (10 of 15 sites) sites sampled in spring and fall (Figures 9–12). Most sites exhibited marked declines in *S. compressa* abundances beginning in 2005–2006 with little recovery observed for the rockweed through 2013. Nearly all plots have been dominated primarily by *S. compressa* and other less common species such as *Chthamalus/Balanus* and *Endocladia*. When pooled across sites, *S. compressa* cover was markedly lower than the long-term average at all islands except Santa Rosa (Figure 12). At Santa Rosa Island, rockweed cover in 2013 was only slightly below the long-term mean.

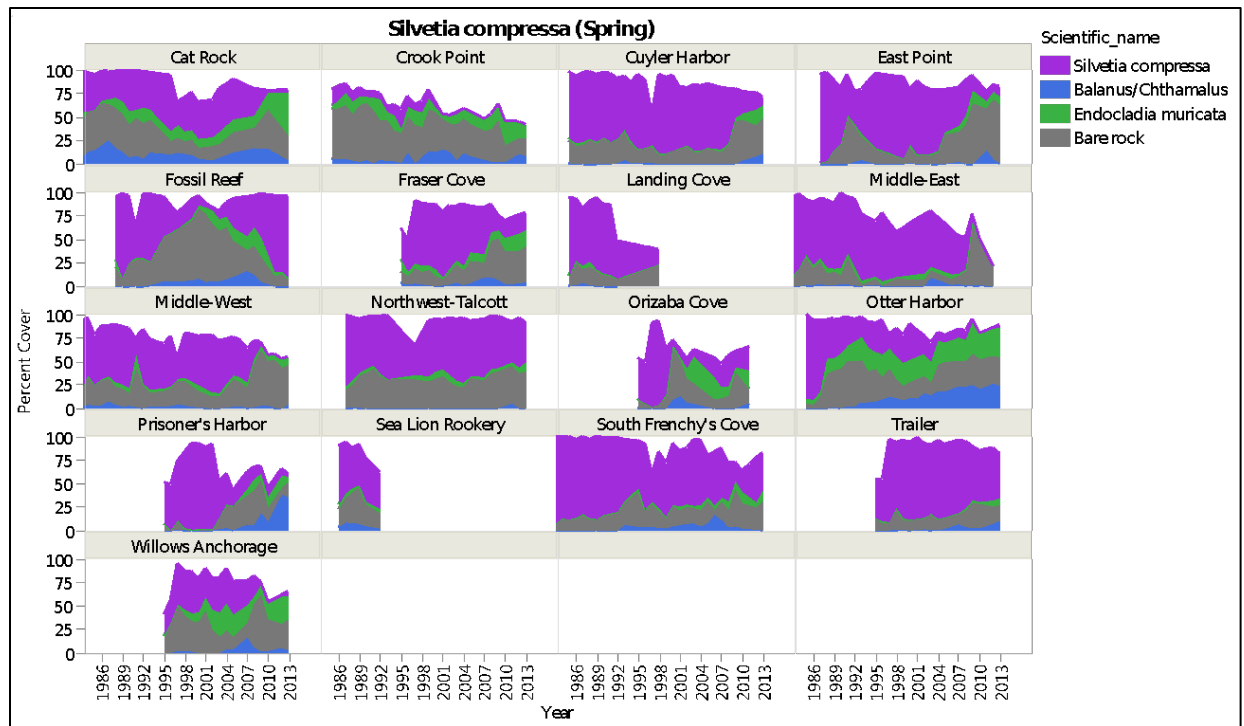


**Figure 9.** Percent cover of *Silvetia compressa* along with other dominant taxa and bare rock in fixed plots within the *Silvetia* zone at each site in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Silvetia* plots. Note that Sea Lion Rookery was not sampled in spring (only fall) after 1992.

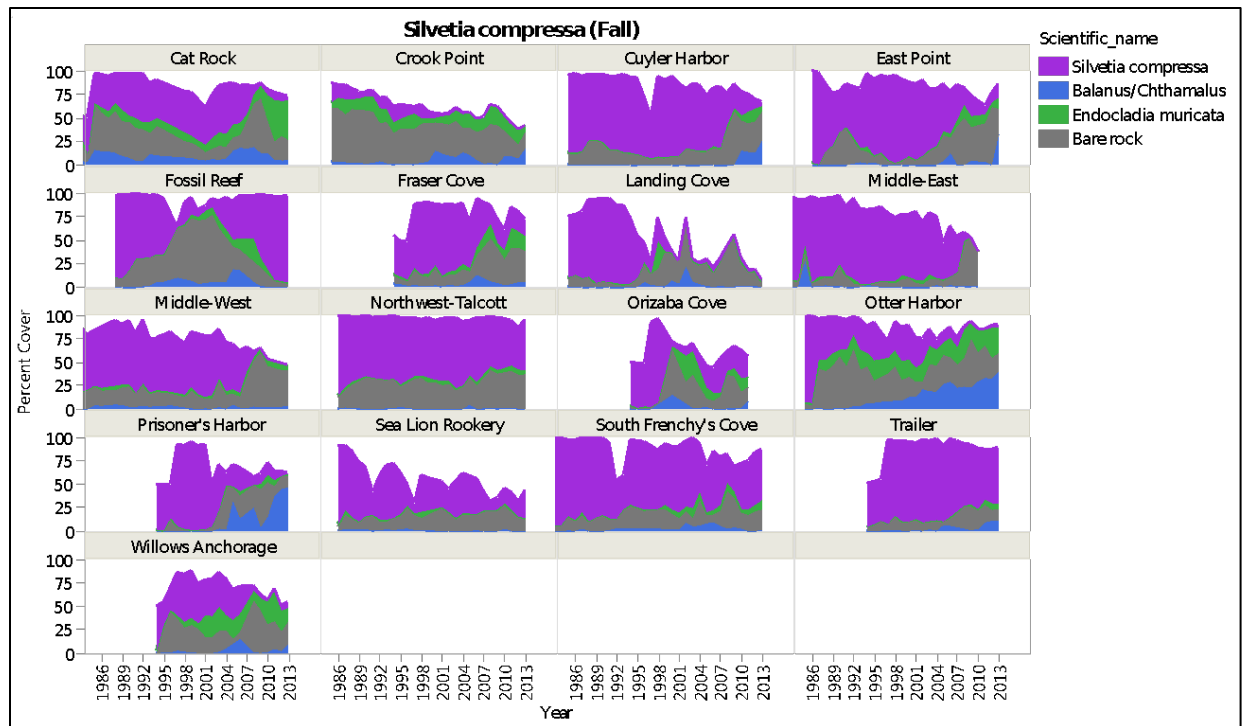


**Figure 10.** Percent cover of *Silvetia compressa* along with other dominant taxa and bare rock in fixed plots within the *Silvetia* zone at each site in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Silvetia* plots.

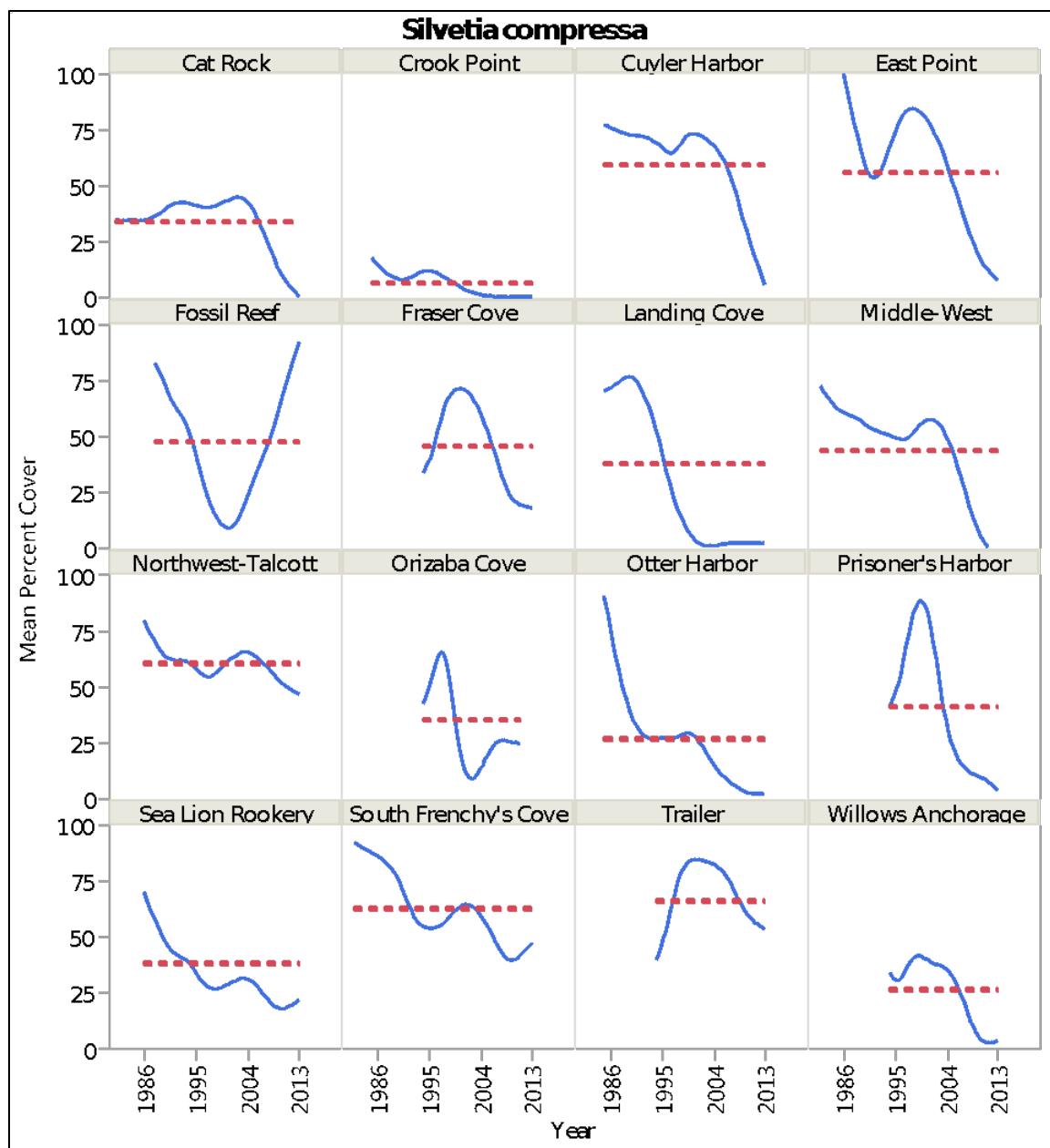


**Figure 11.** Departure from the long-term mean for *Silvetia compressa*. Blue lines represent mean cover of *S. compressa* within the representative zone pooled across plots at each island. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

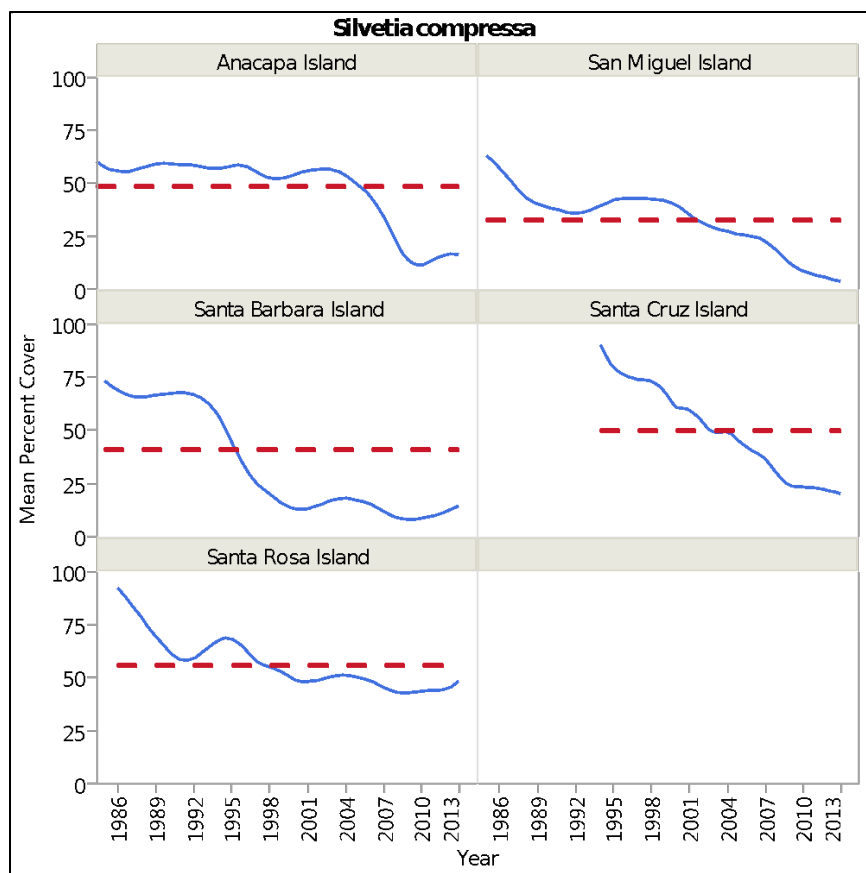


**Figure 12.** Departure from the long-term mean for *Silvetia compressa*. Blue lines represent mean cover of *S. compressa* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

The other rockweed, *Hesperophycus californicus*, commonly encountered at the islands also declined or remained low in abundance at several monitoring sites (Figures 13–16). *H. californicus* cover was lower in 2013 than most years at Prisoner’s Harbor, Trailer and Willows Anchorage. However, above average cover of the rockweed was measured at Fraser Cove, Scorpion Rock, and to a lesser degree at Harris Point and Orizaba Cove. Pooled across sites, *H. californicus* cover measured slightly above the long-term mean at San Miguel and Santa Rosa Islands; slightly below average cover was measured at Santa Cruz Island (Figure 16). Over time, plots at most sites have been composed largely of *H. californicus*, *S. compressa*, *E. muricata*, and *Chthamalus/Balanus* (Figures 13–14).

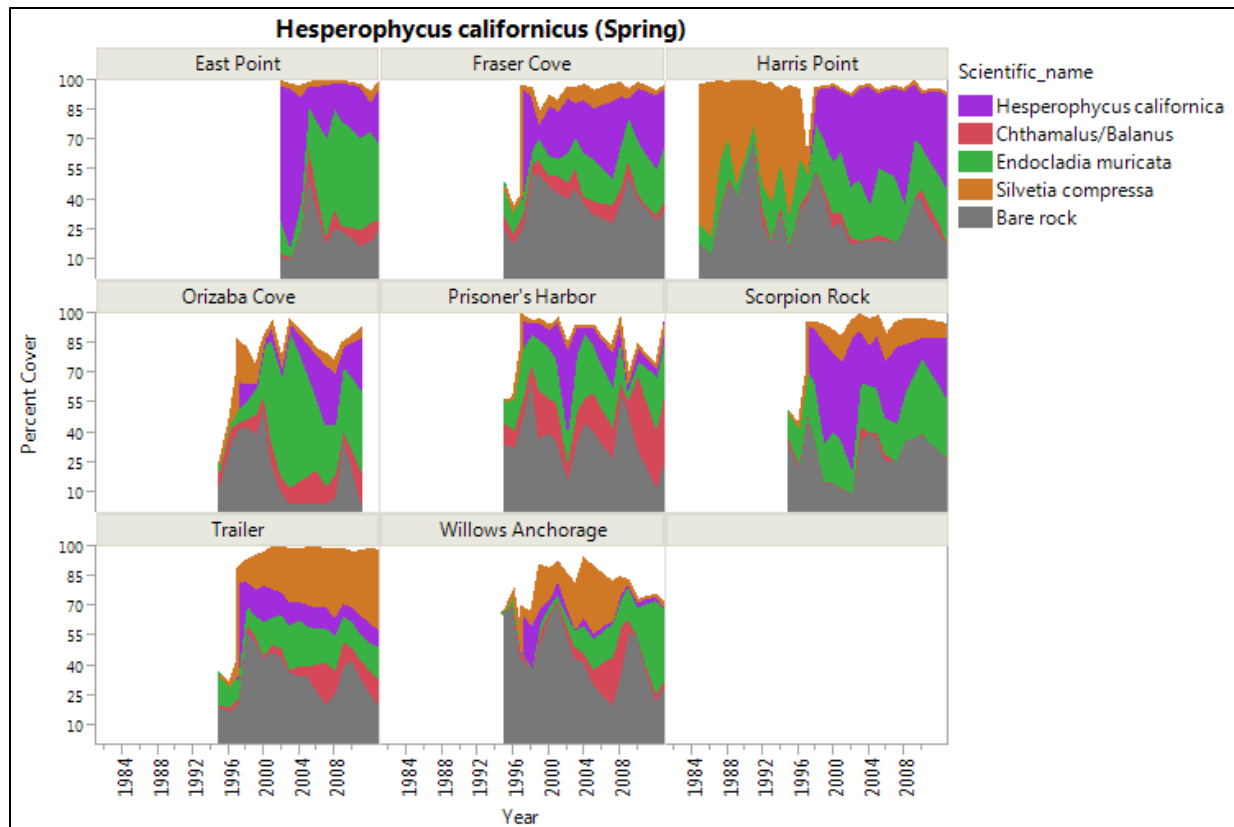


**Figure 13.** Percent cover of *Hesperophycus californicus* along with other dominant taxa and bare rock in fixed plots within the *Hesperophycus* zone at each site in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Hesperophycus* plots.

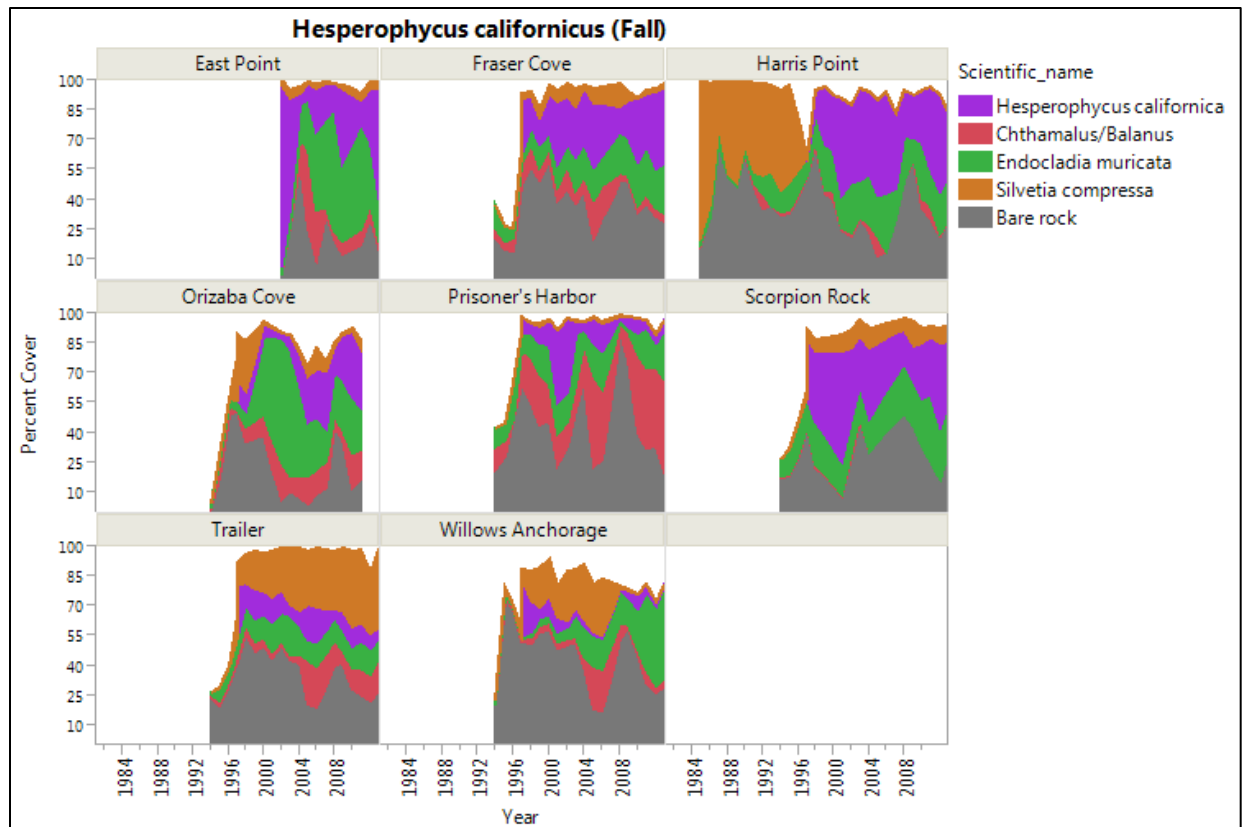


**Figure 14.** Percent cover of *Hesperophycus californicus* along with other dominant taxa and bare rock in fixed plots within the *Hesperophycus* zone at each site in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Hesperophycus* plots.

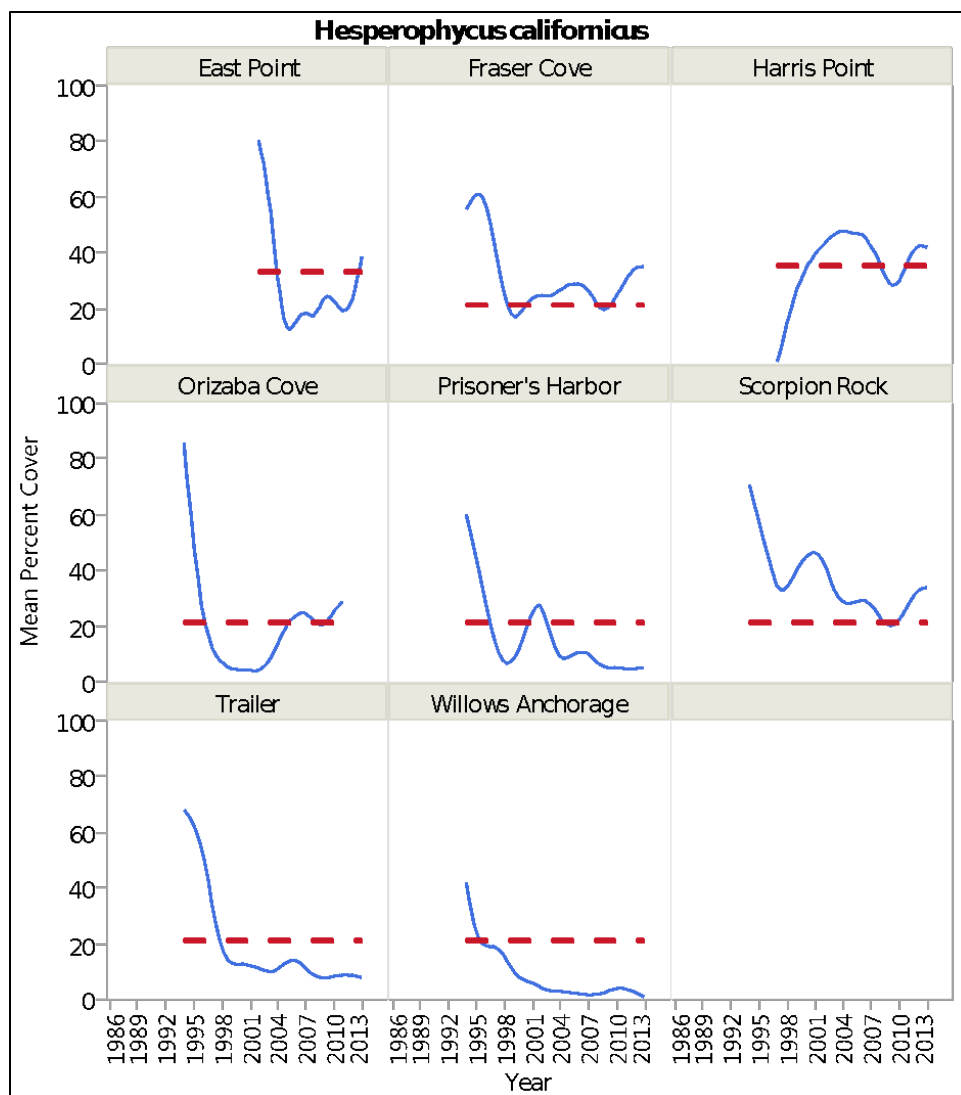


**Figure 15.** Departure from the long-term mean for *Hesperophycus californicus*. Blue lines represent mean cover of *H. californicus* within the representative zone pooled across plots and sites at each site. Red dashed lines represent long-term mean.

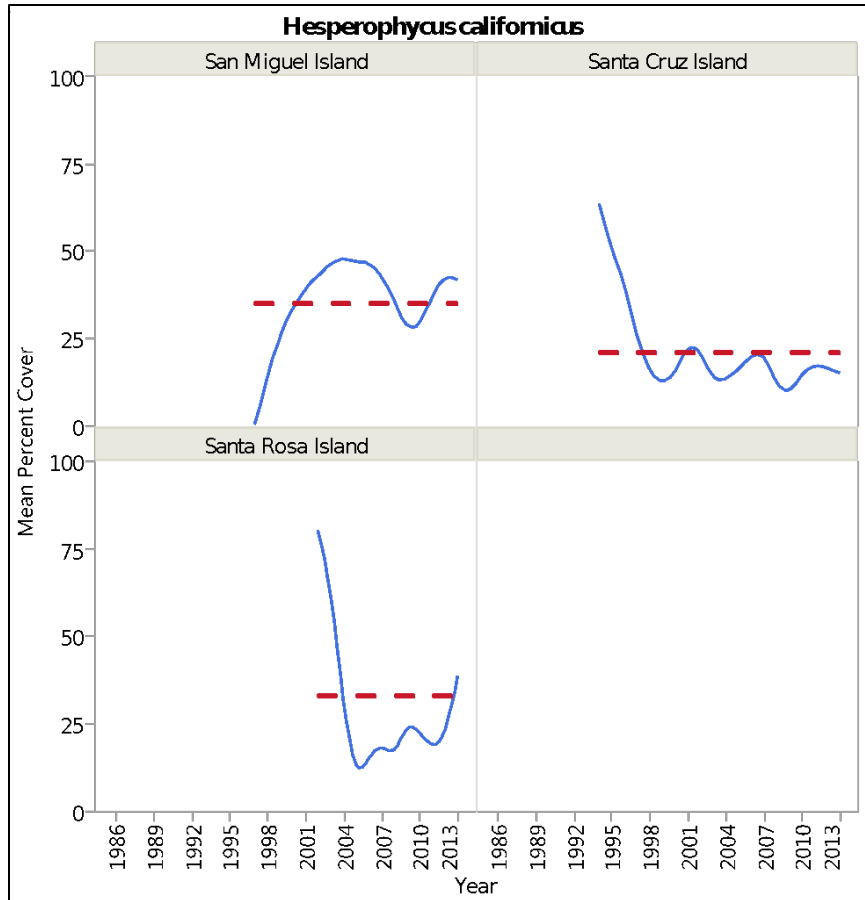


**Figure 16.** Departure from the long-term mean for *Hesperophycus californicus*. Blue lines represent mean cover of *H. californicus* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

*Endocladia muricata* cover in 2013 remained roughly equivalent to mean abundances measured in past years at most sites (Figures 17–20). Slight exceptions included Crook Point, Anacapa Middle West and Northwest-Talcott which all had relatively low *E. muricata* abundances relative to past years. In contrast, South Frenchy’s Cove had moderately-high cover of *E. muricata* in 2013 compared to the long-term mean at that site. Pooled across sites, *E. muricata* abundances were relatively comparable to long-term averages at each of the islands (Figure 20). Other dominant species in *E. muricata* plots have been *S. compressa* and *Chthamalus/ Balanus*.

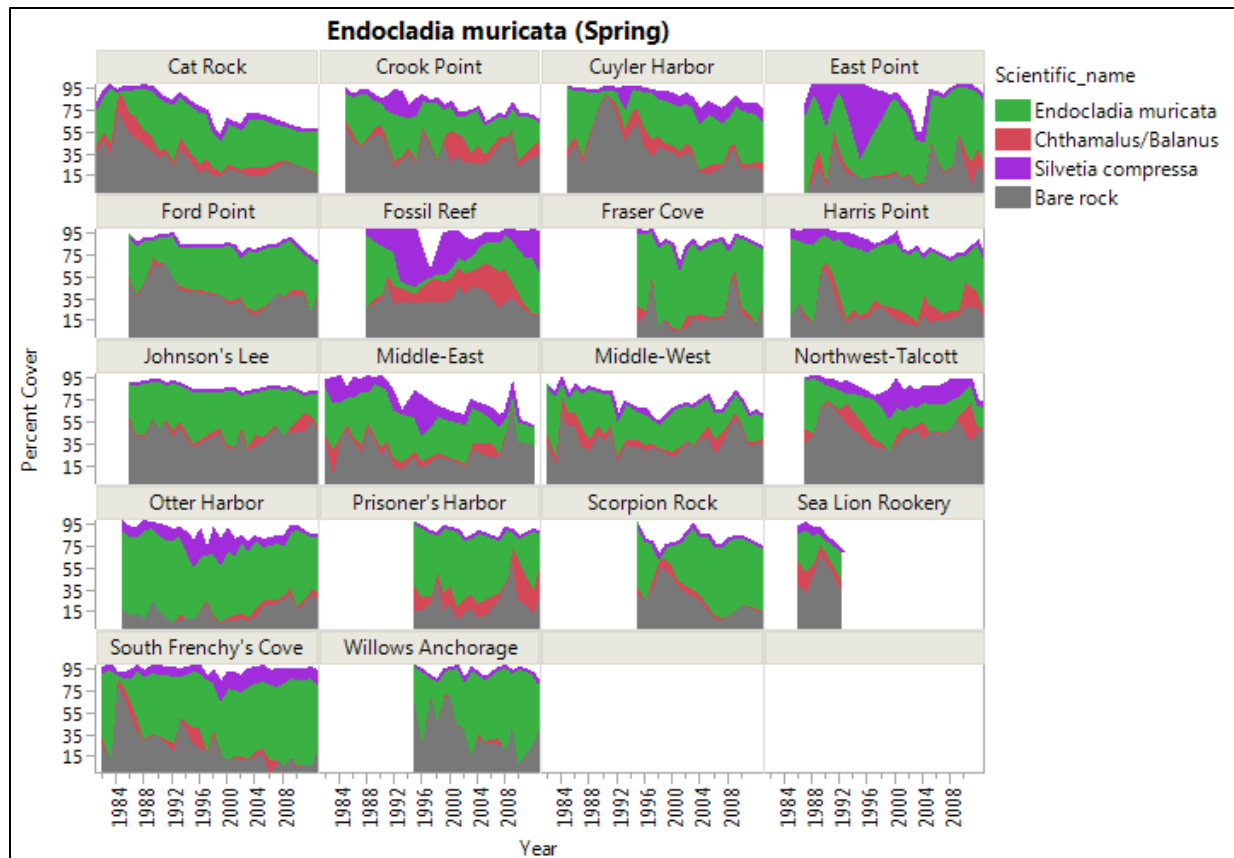


**Figure 17.** Percent cover of *Endocladia* along with other dominant taxa and bare rock in fixed plots within the *Endocladia* zone at each site in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Endocladia* plots. Note that Sea Lion Rookery was not sampled in spring (only fall) after 1992.

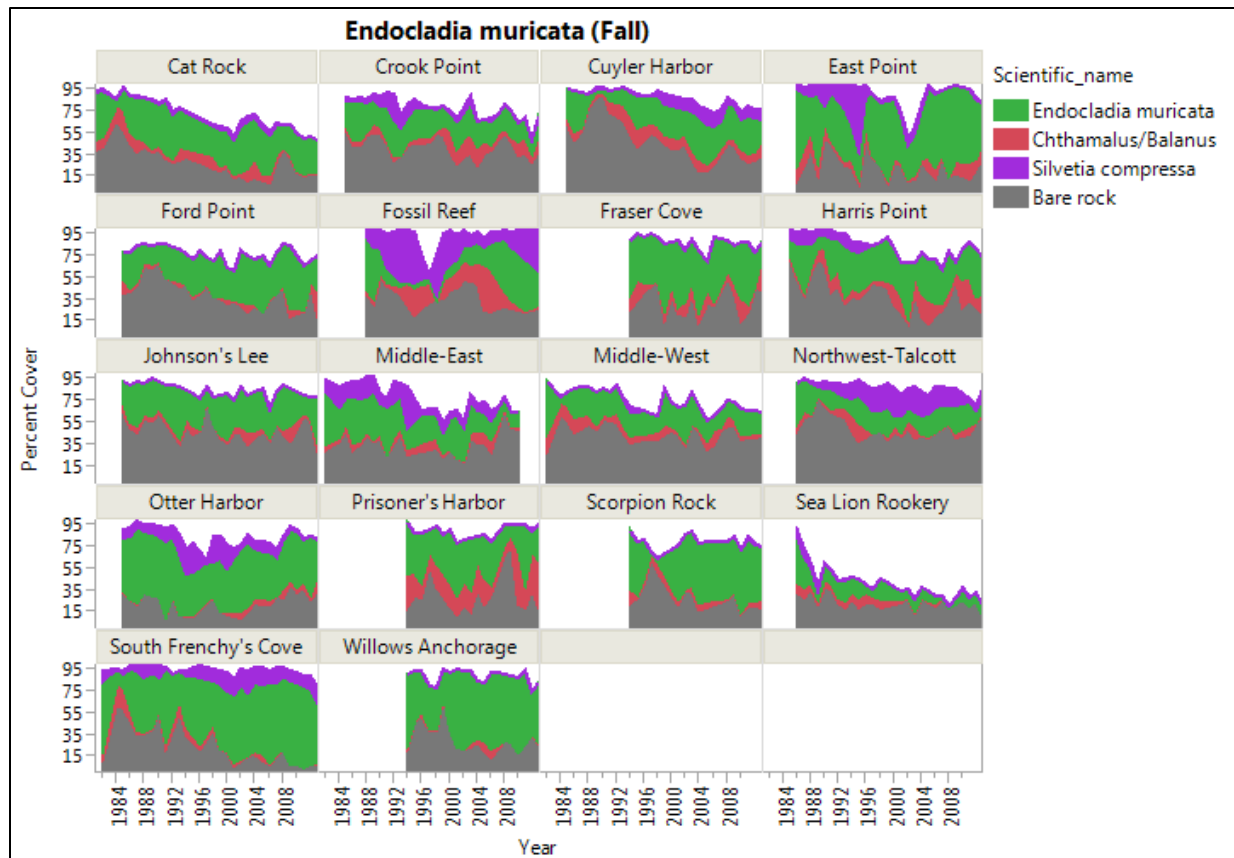


**Figure 18.** Percent cover of *Endocladia* along with other dominant taxa and bare rock in fixed plots within the *Endocladia* zone at each site in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Endocladia* plots.

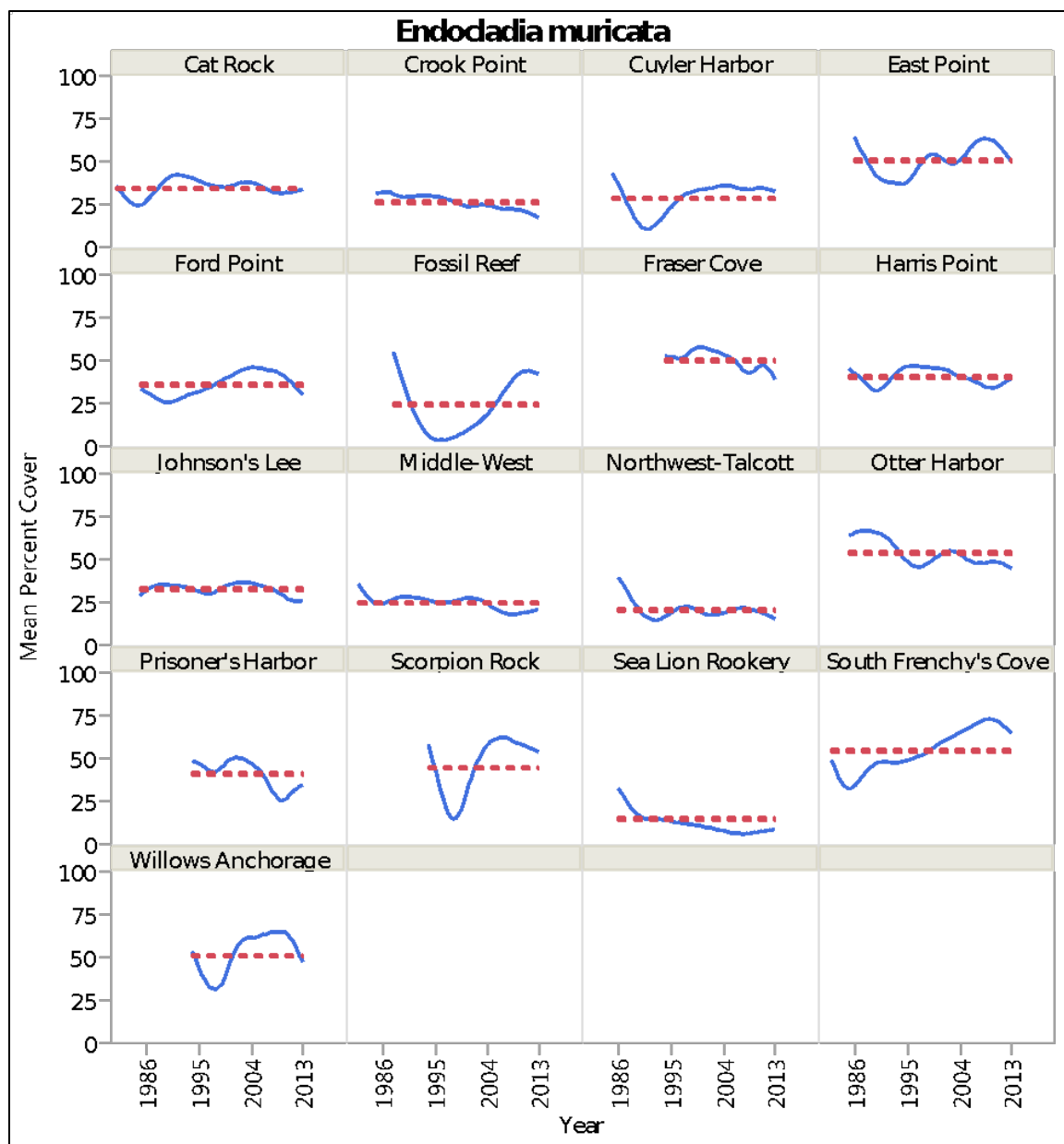


**Figure 19.** Departure from the long-term mean for *Endocladia muricata*. Blue lines represent mean cover of *E. muricata* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

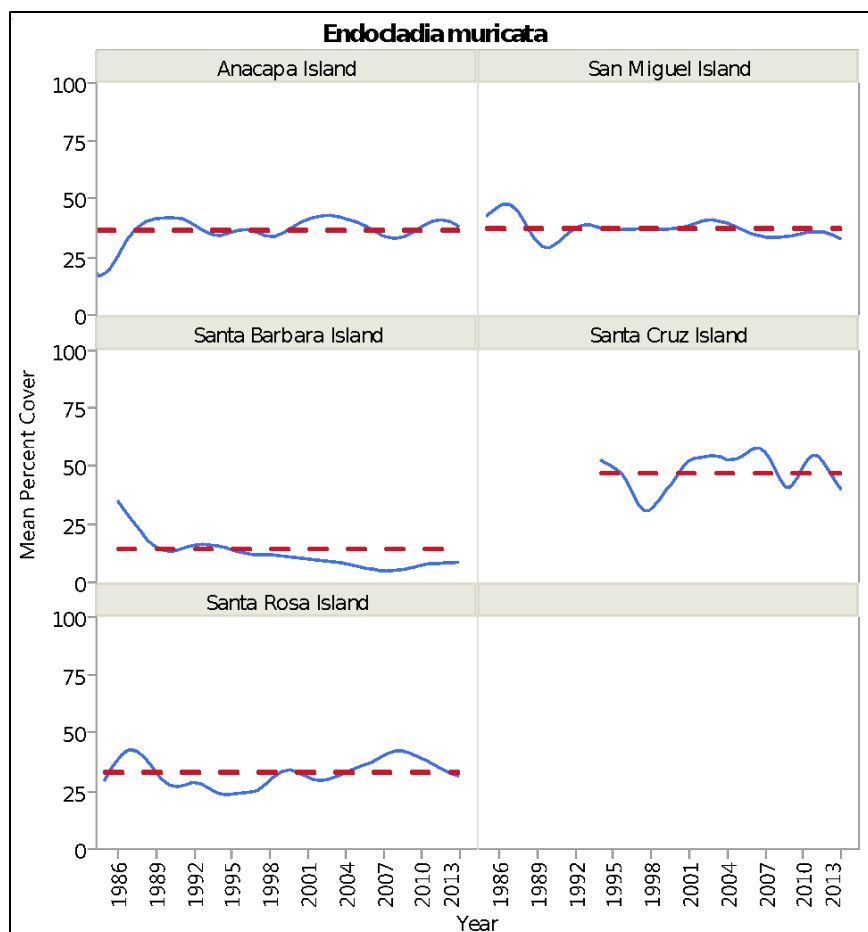


**Figure 20.** Departure from the long-term mean for *Endocladia muricata*. Blue lines represent mean cover of *E. muricata* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

Barnacle, *Chthamalus/Balanus* spp. abundances pooled across sites in 2013 fell slightly below the long-term means at Anacapa, Santa Rosa, and more so at Santa Barbara Island (Figures 21–24). In contrast, at San Miguel, barnacle cover was above average relative to past years. At the site level, *Chthamalus/Balanus* spp. abundances in 2013 appeared comparable to past years with the exceptions of Landing Cove, Northwest-Talcott, Sea Lion Rookery and South Frenchy’s Cove which all had record-low abundances (Figures 23). Cuyler Harbor and Harris Point had near record-high abundances of barnacles. Other dominant species in *Chthamalus/Balanus* plots over the years include *E. muricata* (Figures 21–22).

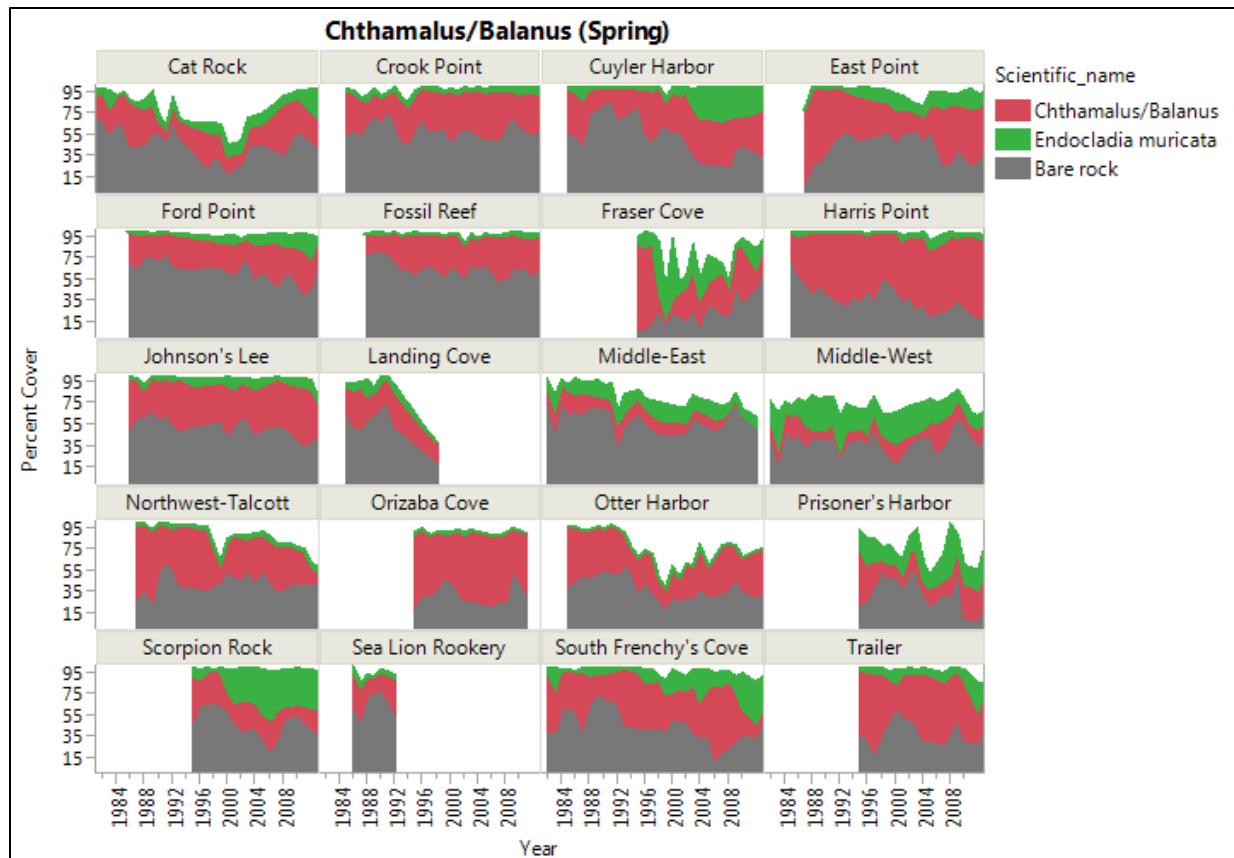


**Figure 21.** Percent cover of barnacles, *Chthamalus/Balanus*, along with *Endocladia* and bare rock in fixed plots within the barnacle (*Chthamalus/Balanus*) zone at each site in spring. Note that barnacle species were not separated. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated plots (usually five) within the *Chthamalus/Balanus* zone. Landing Cove and Sea Lion Rookery were not sampled in spring during most years.

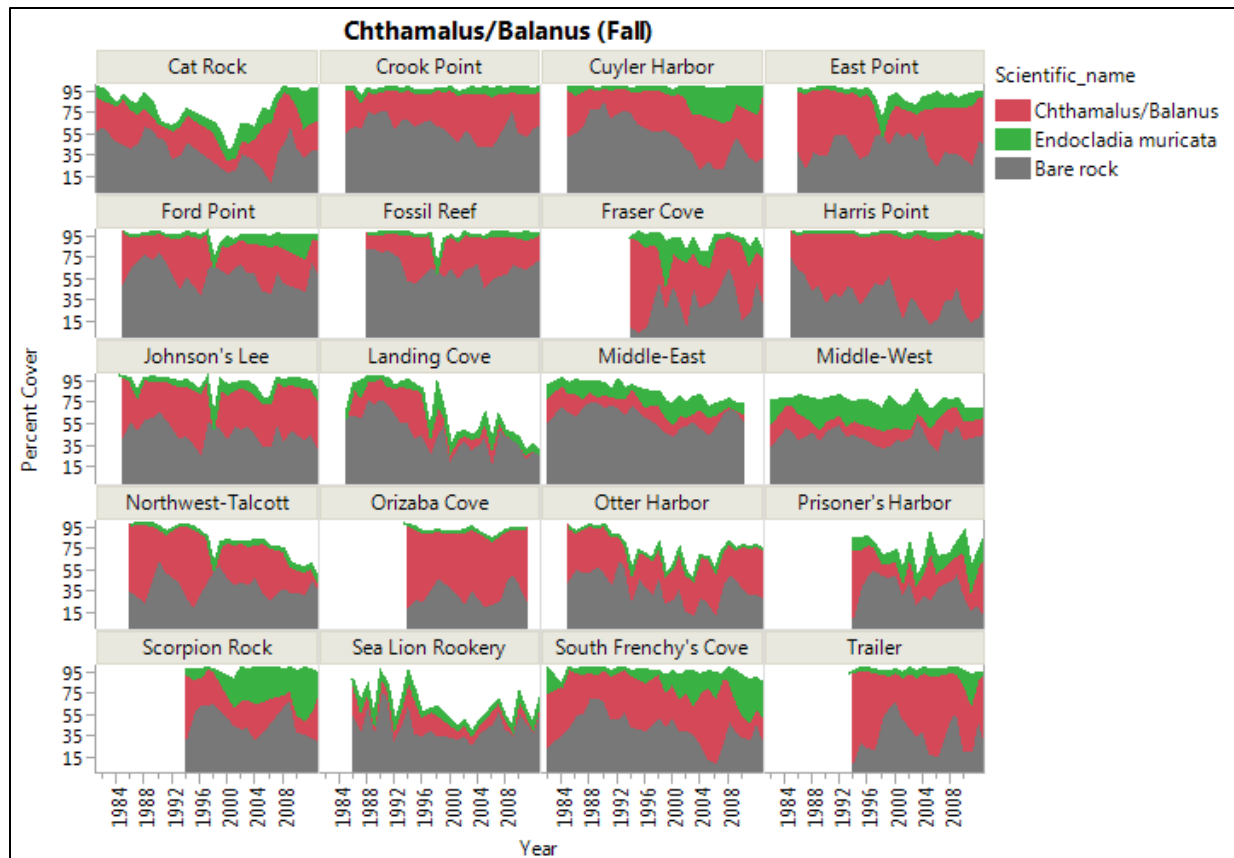


**Figure 22.** Percent cover of barnacles, *Chthamalus/Balanus*, along with *Endocladia* and bare rock in fixed plots within the barnacle (*Chthamalus/Balanus*) zone at each site in fall. Note that barnacle species were not separated. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from replicated plots (usually five) within the *Chthamalus/Balanus* zone.

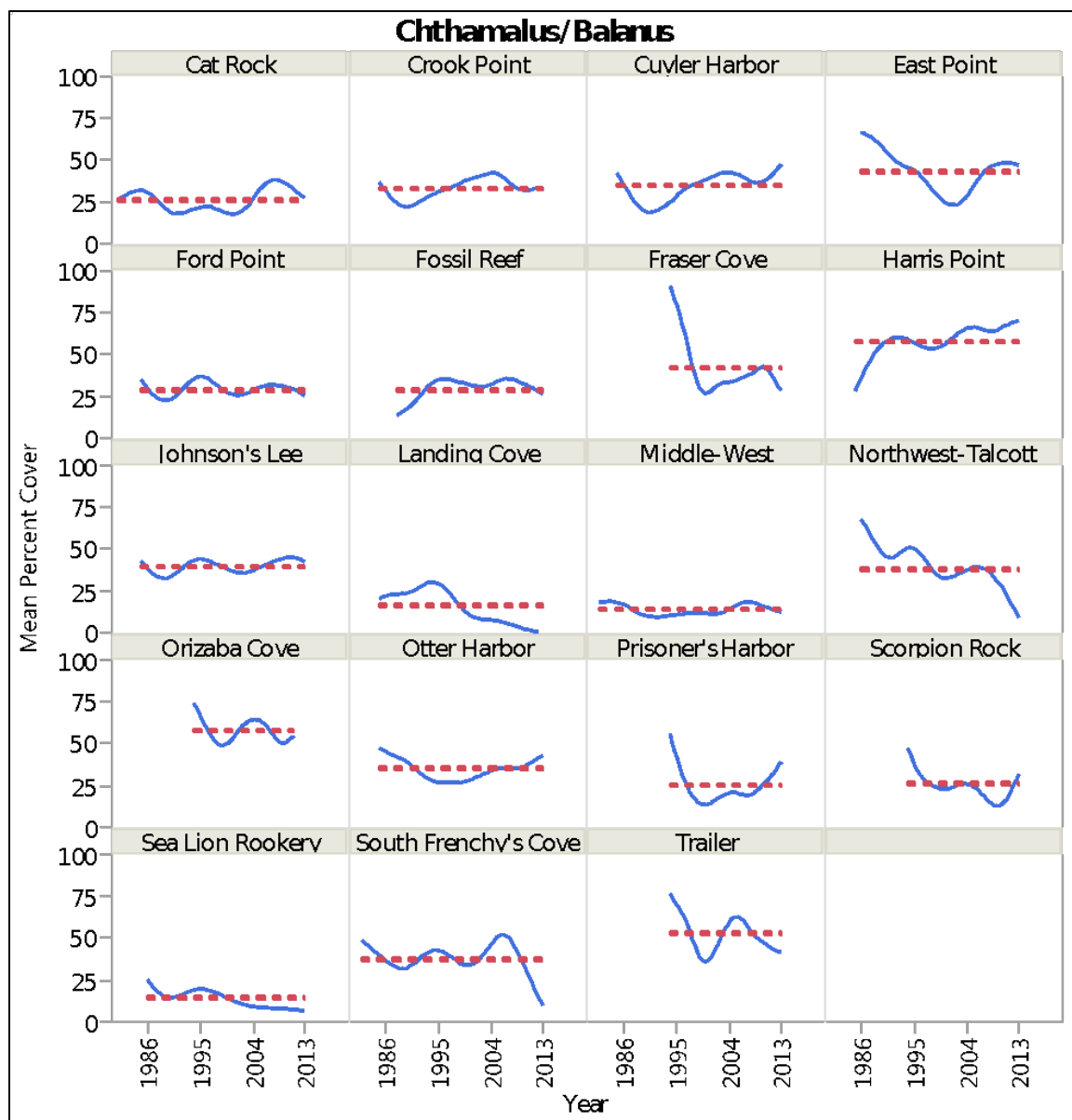


**Figure 23.** Departure from the long-term mean for *Chthamalus/Balanus*. Blue lines represent mean cover of *Chthamalus/Balanus* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

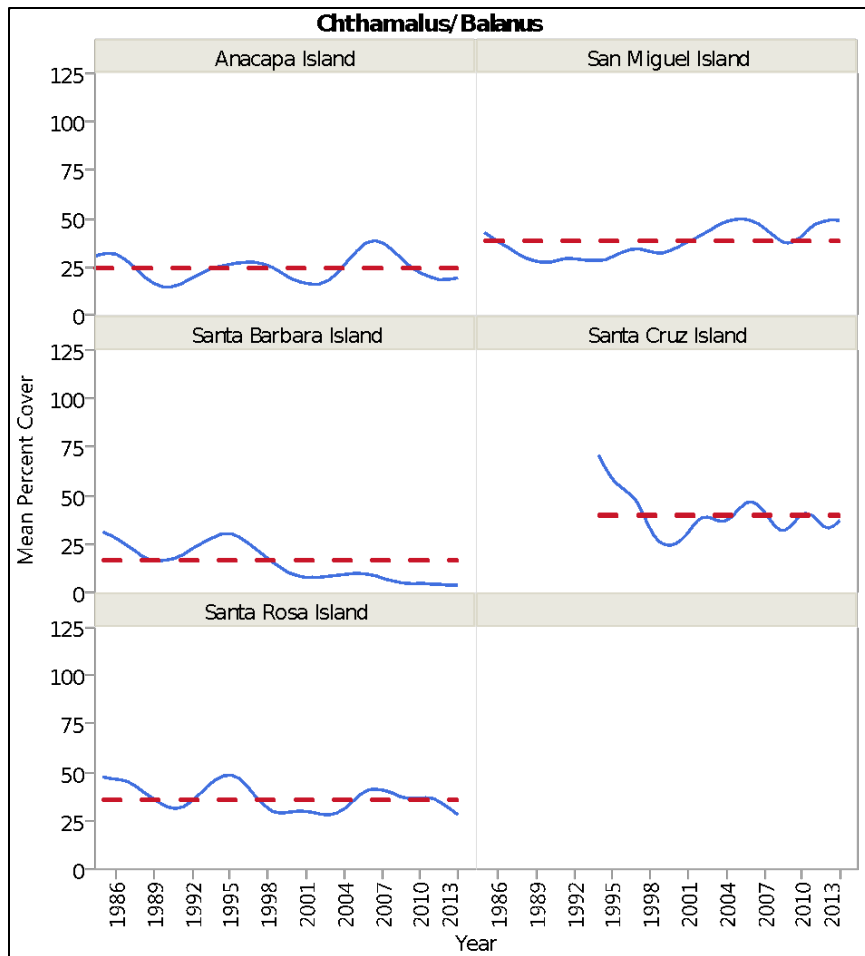


**Figure 24.** Departure from the long-term mean for *Chthamalus/Balanus*. Blue lines represent mean cover of *Chthamalus/Balanus* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

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 2013, red algal turf abundance was comparable to that of recent years. *Phyllospadix* decreased markedly and *Mytilus* increased in cover (Figure 25).

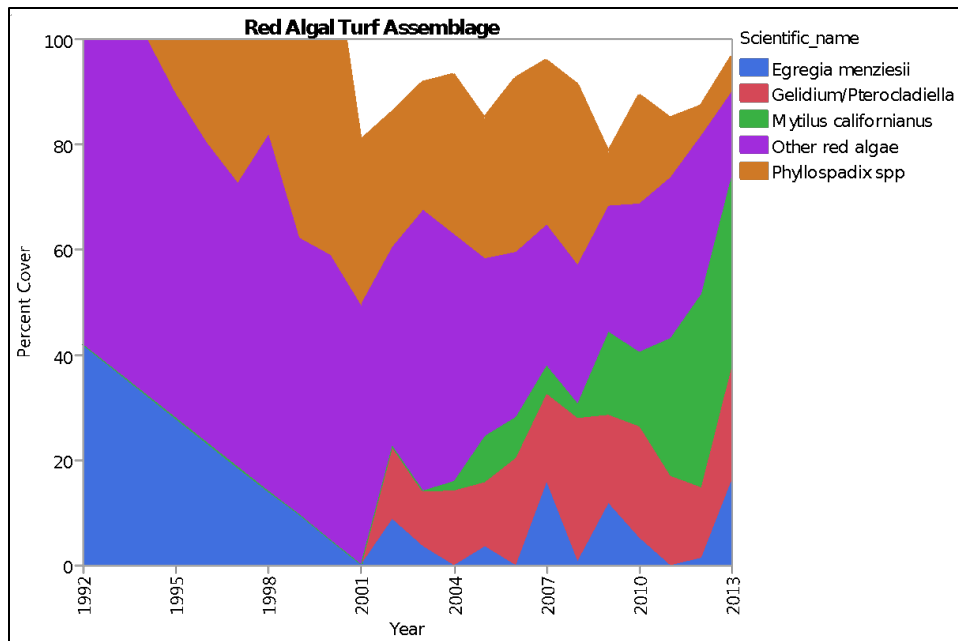


**Figure 25.** Percent cover of dominant taxa in fixed plots within the red turf assemblage at Landing Cove, Santa Barbara Island. Colored areas represent the mean percent cover for representative and dominant taxa/ substrata from five red turf assemblage plots.

Goose or leaf barnacle, *Pollicipes polymerus* zone plots have only been established at Fraser Cove. There, goose barnacle cover has declined slowly over time from approximately 20% to well below 10% by 2009. *P. polymerus* cover increased since then and was slightly above the long-term mean in 2013 (Figures 26–28). Other dominant species in the *P. polymerus* plots have included *M. californianus* and *T. rubescens*.

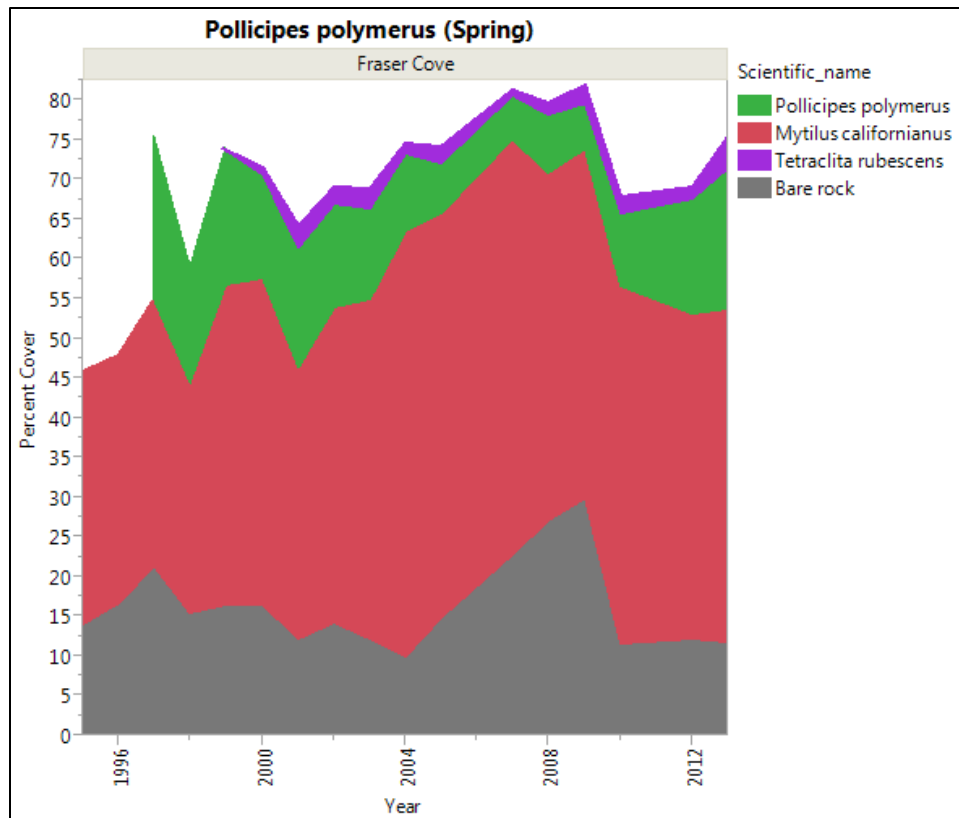


**Figure 26.** Percent cover of *Pollicipes polymerus* along with other dominant taxa and bare rock in fixed plots within the *Pollicipes* zone at Fraser Cove, Santa Cruz Island in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Pollicipes* plots.

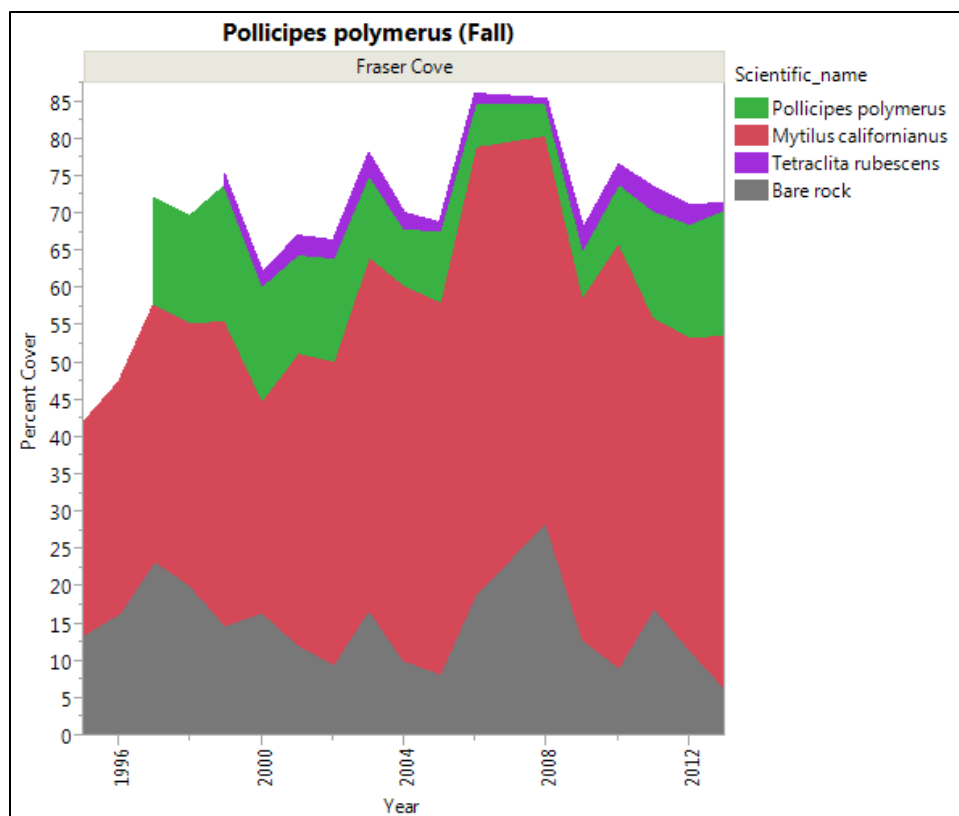


**Figure 27.** Percent cover of *Pollicipes polymerus* along with other dominant taxa and bare rock in fixed plots within the *Pollicipes* zone at Fraser Cove, Santa Cruz Island in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Pollicipes* plots.

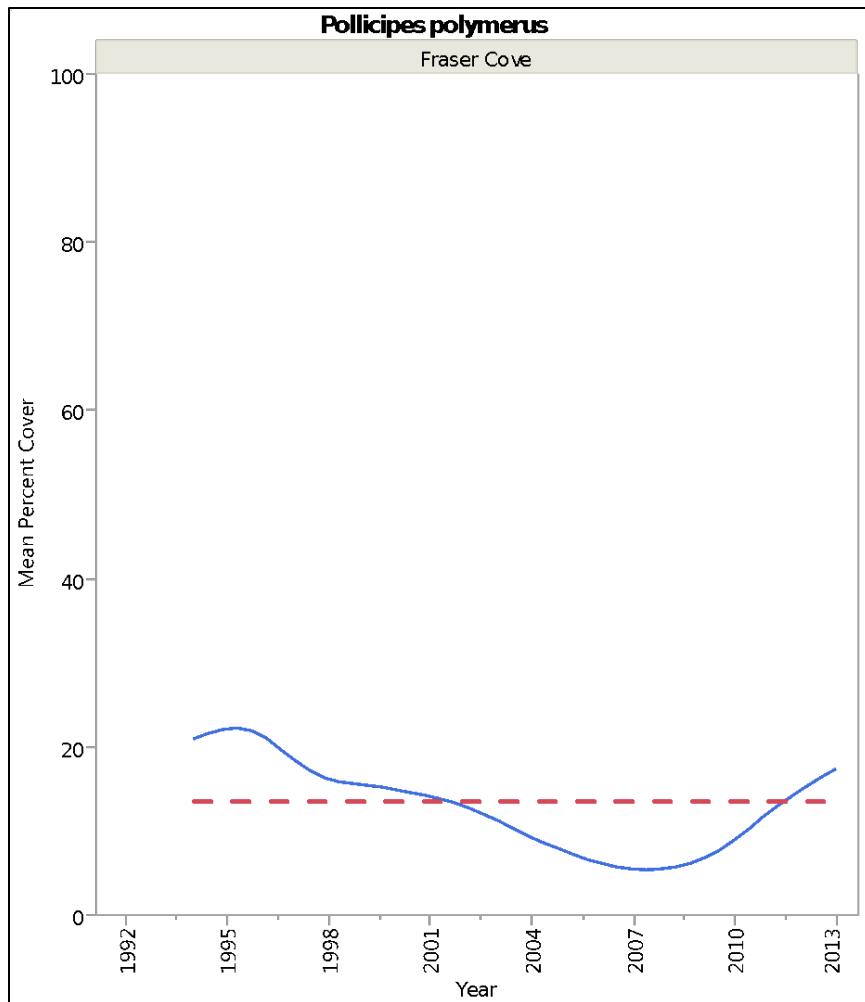


**Figure 28.** Departure from the long-term mean for *Pollicipes polymerus*. Blue lines represent mean cover of *P. polymerus* within the representative zone pooled across plots at Fraser Cove. Red dashed line represents long-term mean.

The thatched barnacle, *Tetraclita rubescens* is only monitored at three sites (Harris Point, Orizaba Cove and Scorpion Rock). This year at Harris Point, *T. rubescens* cover fell slightly below the long-term mean (Figures 29–31). In contrast, thatched barnacles increased markedly above the long-term mean at Scorpion Rock. Note that Orizaba Cove was not sampled in 2013. Other dominant species in the *T. rubescens* plots have included *M. californianus* and *P. polymerus*.

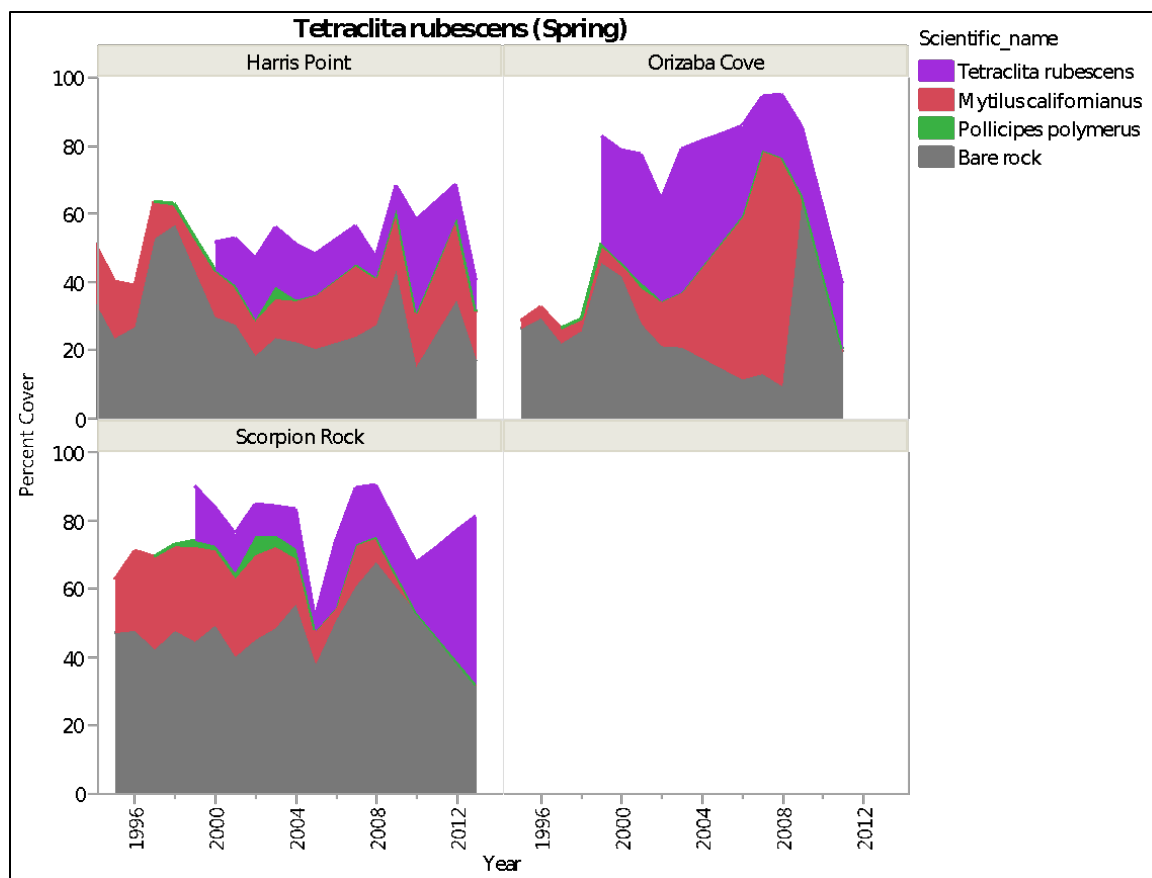


**Figure 29.** Percent cover of *Tetracita rubescens* along with other dominant taxa and bare rock in fixed plots within the *Tetracita* zone at each site in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Tetracita* plots.

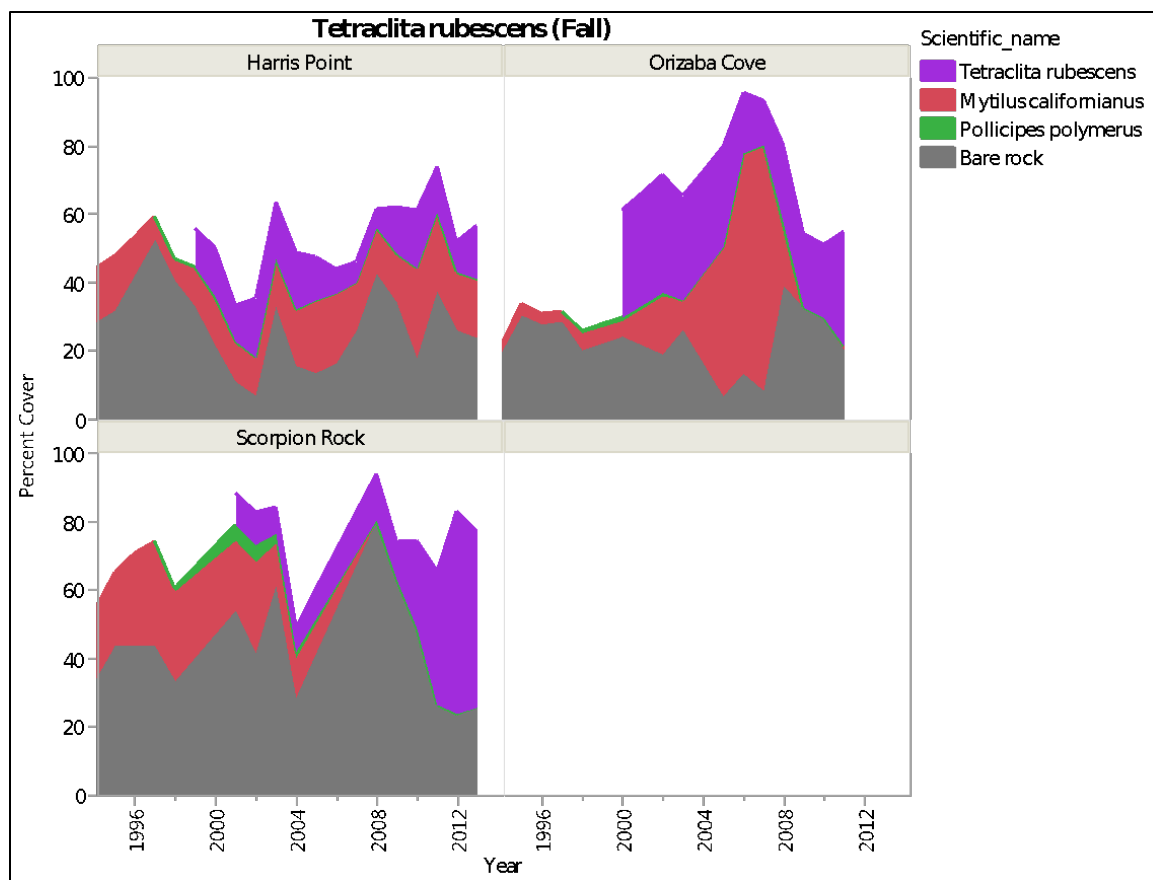


**Figure 30.** Percent cover of *Tetraclita rubescens* along with other dominant taxa and bare rock in fixed plots within the *Tetraclita* zone at each site in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Tetraclita* plots.

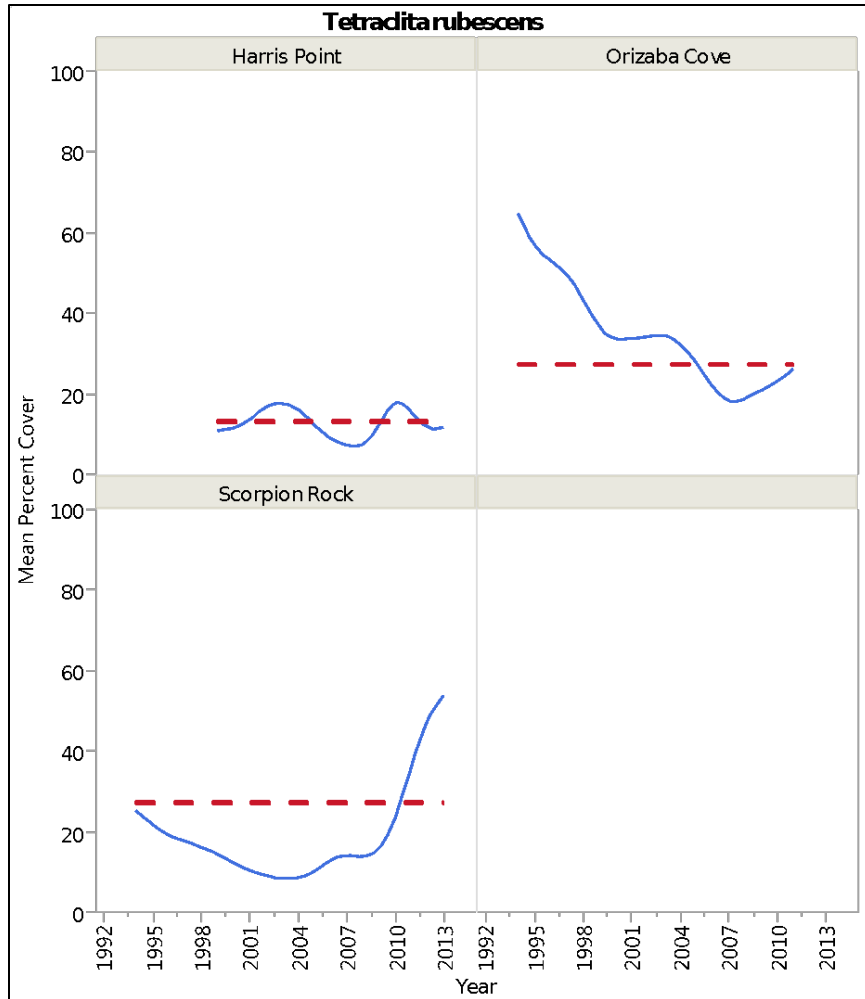


**Figure 31.** Departure from the long-term mean for *Tetradita rubescens*. Blue lines represent mean cover of *T. rubescens* within the representative zone pooled across plots at each site. Red dashed line represents long-term mean.

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. In 2013, there was only a slight decline (< 10%) in tar cover in fall from the long-term mean (approximately 50%) (Figure 32–34). *Chthamalus* spp. and *Littorina* spp. are typically the only species that reside in the tar plots.

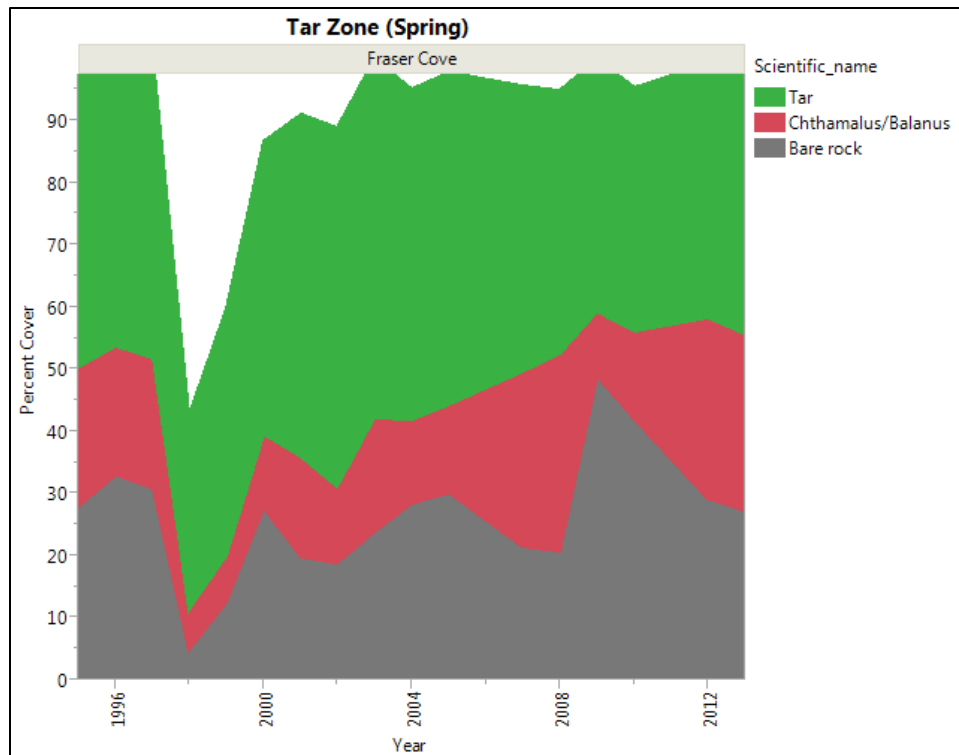


**Figure 32.** Percent cover of tar along with other dominant taxa and bare rock in fixed plots within the tar zone at Fraser Cove, Santa Cruz Island in spring. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five tar plots.

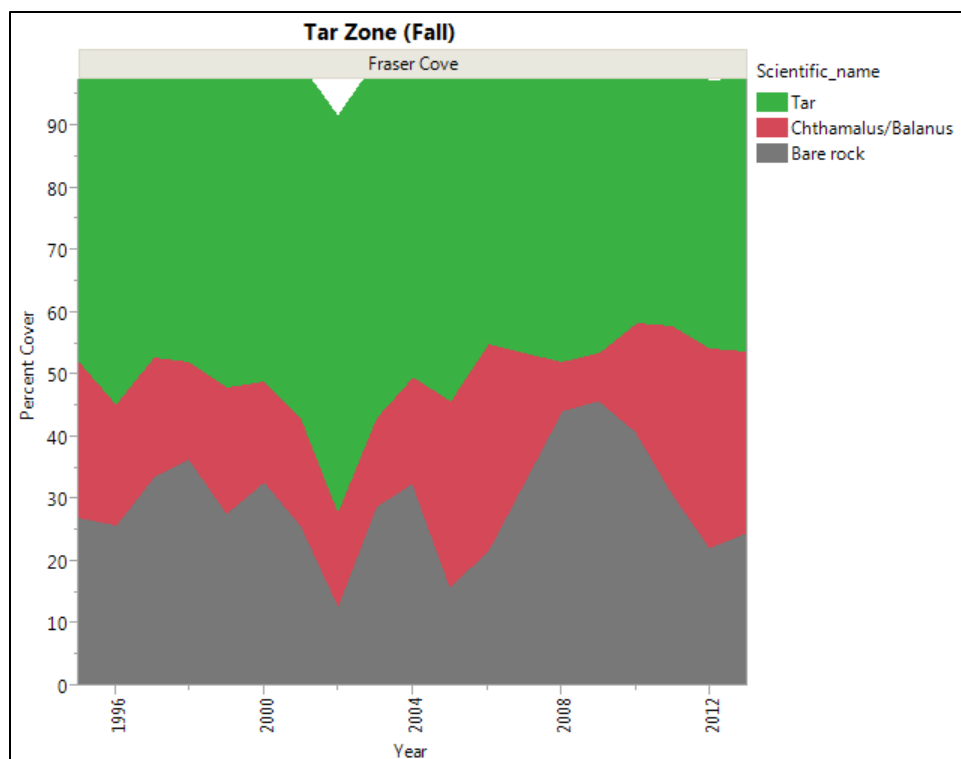


**Figure 33.** Percent cover of tar along with other dominant taxa and bare rock in fixed plots within the tar zone at Fraser Cove, Santa Cruz Island in fall. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five tar plots.

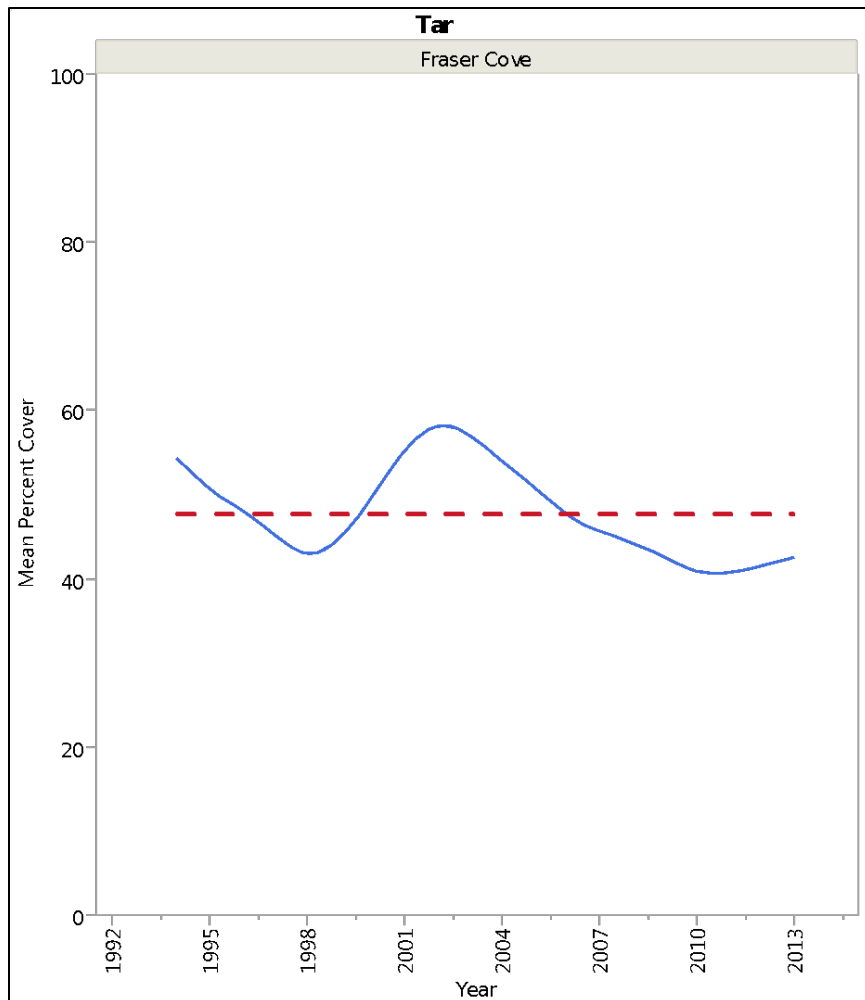


**Figure 34.** Departure from the long-term mean for tar. Blue lines represent mean cover of tar within the representative zone pooled across plots at Fraser Cove. Red dashed line represents long-term mean.

### Motile Invertebrates

Smaller motile invertebrates such as various species of limpets, chitons and snails were sampled within the fixed photoplots in past years. However, in 2013, motile invertebrates were not sampled at any site due to changes in personnel and insufficient assistance to implement the protocol. The motile invertebrate protocol is extremely time-consuming and requires a relatively high level of expertise to conduct. In addition, it has recently been determined by another intertidal monitoring group in the region that the protocol may require adjustments to improve effectiveness in detecting significant changes in motile invertebrate communities (Miner et al. 2015). Therefore the decision was made to cancel routine monitoring of smaller motile invertebrates until staffing increased and/or a complete data analysis is conducted. Motile invertebrate data from earlier years are included in CHIS Rocky Intertidal Community Monitoring Program annual reports for years 2009–2011.

### *Haliotis cracherodii*

Following the collapse of the black abalone population in southern California due to Withering Syndrome in the late 1980s and 1990s, most monitoring sites at CHIS have supported extremely low

numbers of abalone relative to historical abundances (Figures 36–39 [density and timed search graphs]). In 2013, only four black abalone (N=1 at Crook Point and Ford Point and N=2 at Otter Harbor) were found within fixed plots (Figure 35).

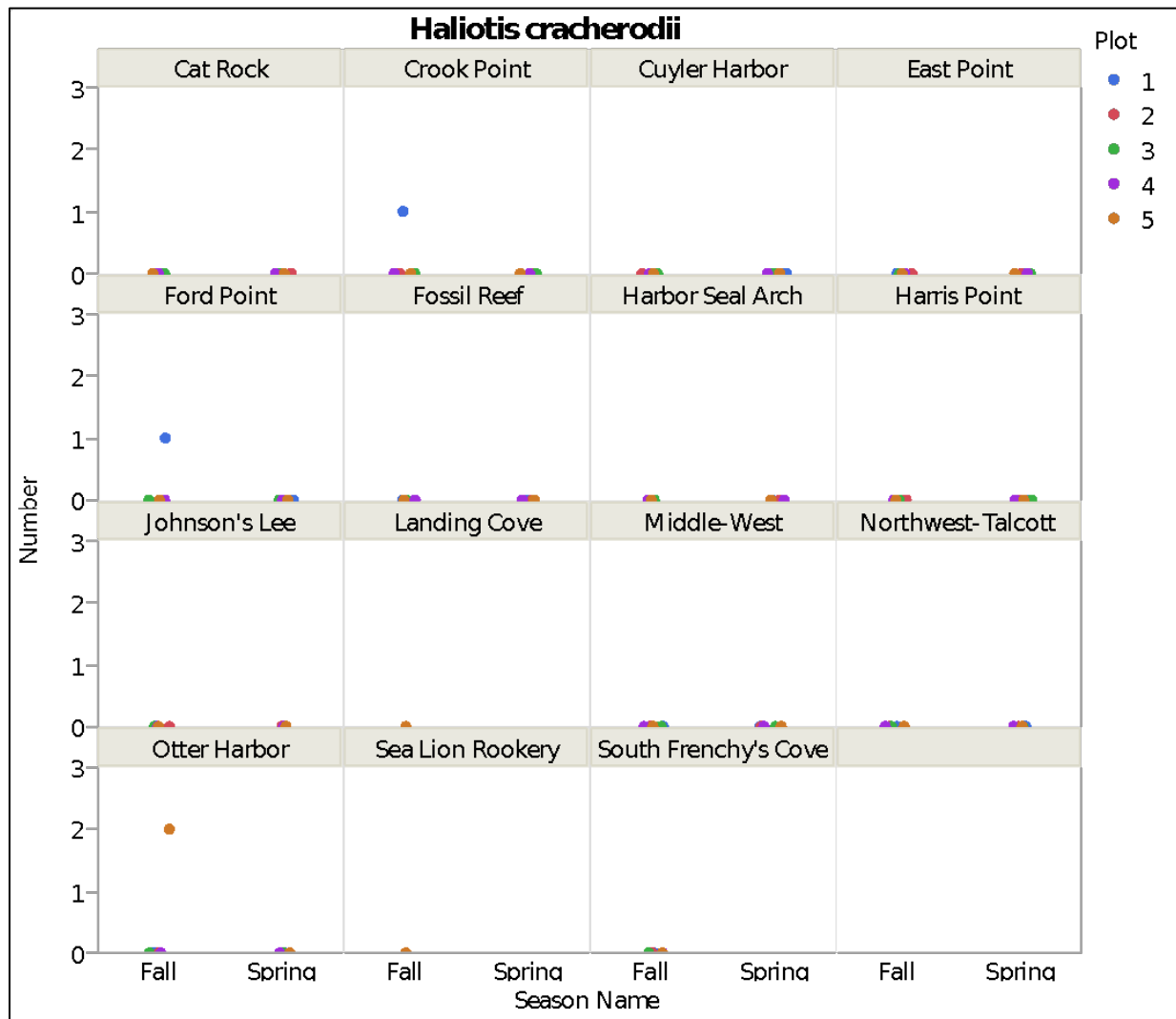


**Figure 35.** *Haliotis cracherodii* counts in 2013 at all sites where fixed plots have been established.

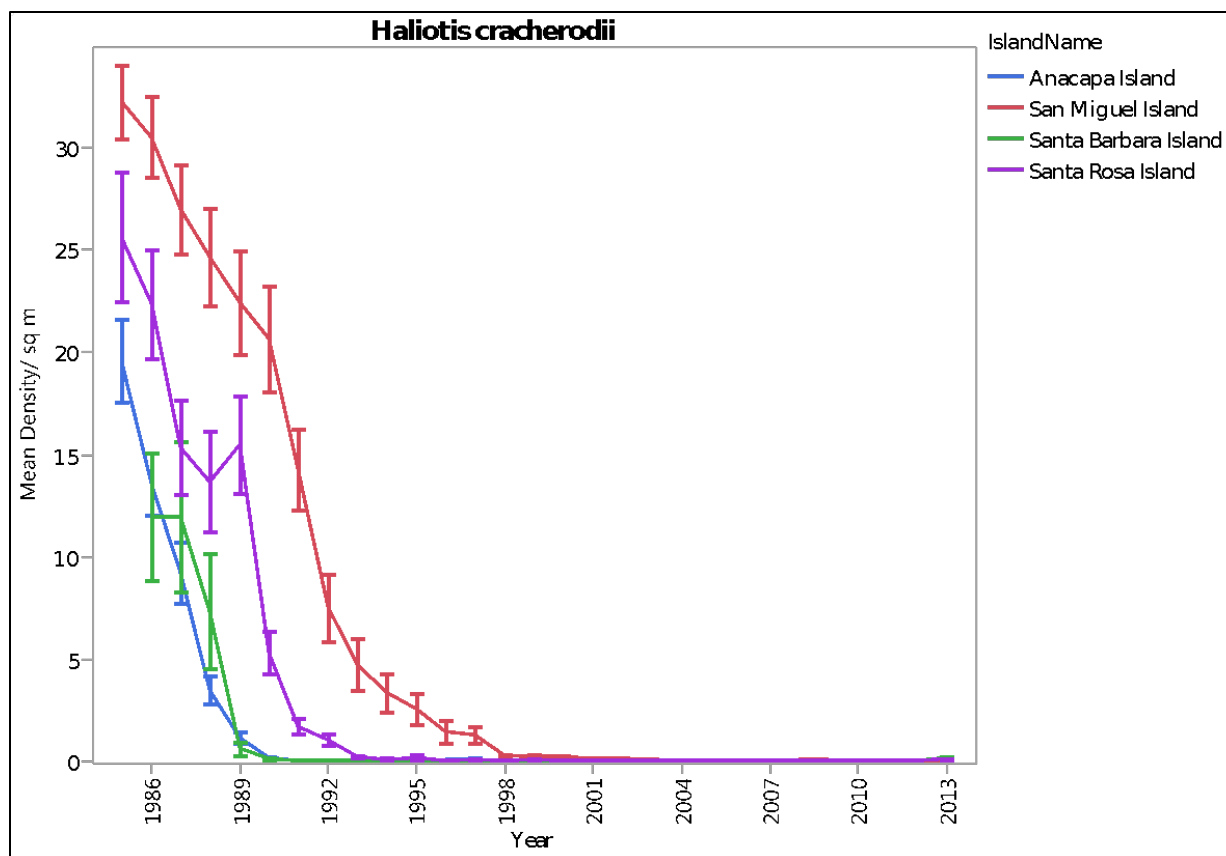


**Figure 36.** *Haliotis cracherodii* counts from fixed plots at all islands except Santa Cruz from 1985–2013. Note that fixed plots were not established at Santa Cruz Island. Standard error bars were constructed using 1 standard error from the mean.

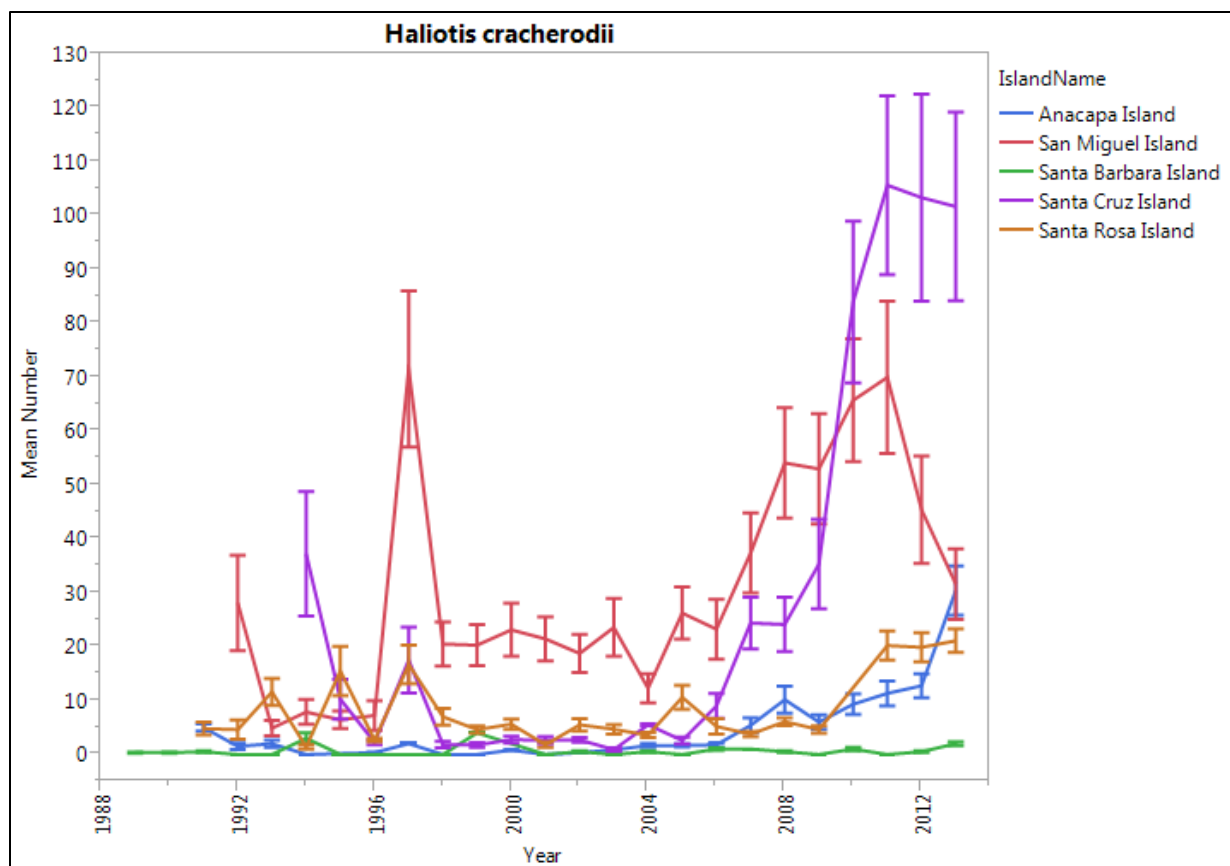


**Figure 37.** *Haliotis cracherodii* counts at all islands from 1989–2013. Count data are generally derived from site-wide searches. Error bars were constructed using 1 standard error from the mean.

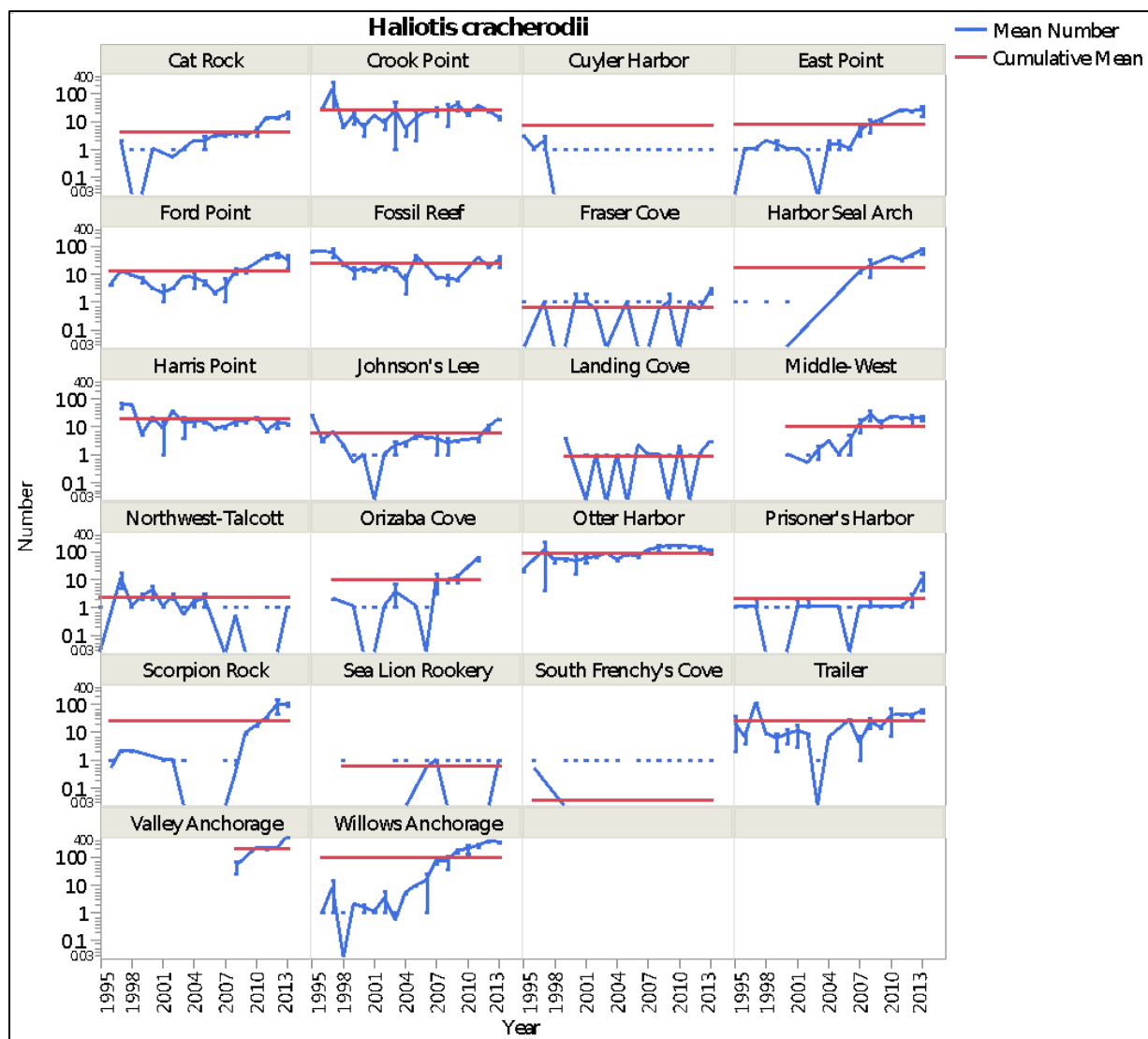


**Figure 38.** Departure from the long-term mean for *Haliotis cracherodii* at each site. Blue lines represent mean number of *H. cracherodii* at each site. Red lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean. Note that data are displayed on a logarithmic scale.

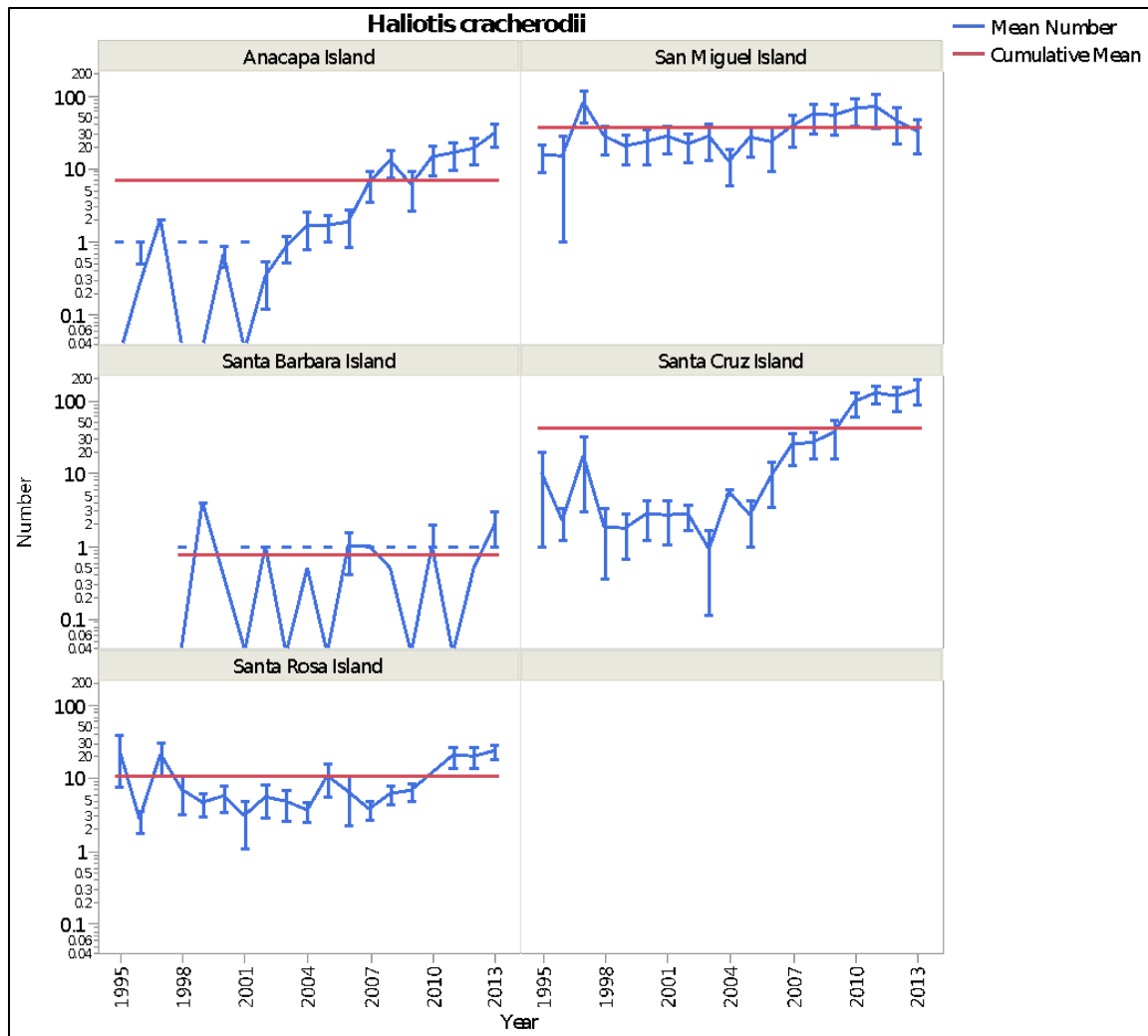


**Figure 39.** Departure from the long-term mean for *Haliotis cracherodii* at each island. Blue lines represent mean number of *H. cracherodii* at each island. Red lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean. Note that data are displayed on a logarithmic scale.

During routine timed searches in 2013, black abalone were entirely absent from Cuyler Harbor, Sea Lion Rookery and South Frenchy's Cove. Of the remaining sites where black abalone were seen, fewer than 10 individuals were located at Fraser Cove and Landing Cove. In contrast, >100 black abalone were observed at three sites (Otter Harbor, Valley Anchorage [site only surveyed for black abalone presence] and Willows Anchorage). At all other sites, abundances of *H. cracherodii* ranged 10–100. Note that search effort increased at Harbor Seal Arch (site is monitored as part of Anacapa Middle West) and Trailer due to the greater number of abalone that occurred at those locations and the greater availability of time. Searches at all sites except Willows Anchorage were conducted within the confines of the site boundaries as defined by the CHIS Rocky Intertidal Monitoring Program (Richards and Davis 1988) and updated protocol summaries (Richards and Lerma 2000). At Willows, a subset of the entire site was searched both seasons (see corresponding trip reports in Appendix B for details).

With the exception of approximately half the sites, counts of black abalone in 2013 were fairly consistent with the range of counts seen since 1995 (Figure 37–38). At all other sites, black abalone counts increased above the long-term mean calculated for previous years at each site. In some cases, increases were only slightly above the long-term mean, but substantial increases in abundances were documented in 2013 at Cat Rock, East Point, Ford Point, Harbor Seal Arch, Johnson’s Lee, Prisoner’s Harbor, Valley Anchorage and Willows Anchorage. At most locations where black abalone counts have increased above the long-term mean, abundances began increasing approximately 2007–2009.

At the island level, mean abundances of *H. cracherodii* in 2013 measured above the cumulative mean respective to each island at all but San Miguel. Note that the increase in black abalone observed at Santa Barbara Island was only due to the presence of a few individuals observed at Landing Cove. Therefore, the population at that island has yet to exhibit any signs of recovery. At San Miguel Island, the mean number of black abalone observed in 2013 was comparable to the cumulative mean.

In 2013, the size frequency distributions for all islands except Santa Barbara reflected the effects of recruitment and the presence of juvenile black abalone (Figures 40–45). Modes ranged 70–130 mm at all islands sampled in spring and 80–130 mm in fall. Anacapa Island had a slight positive skew to the abalone population measured in spring and a relatively flat but normally-distributed population in fall. The population at Santa Cruz Island appeared slightly bimodal in spring with modes centered on 70–90 mm and 100–110 mm. In fall, black abalone sizes at Santa Cruz were right-skewed and again somewhat bimodal (modes at 30–50 mm and 100 mm). Santa Rosa *H. cracherodii* were skewed towards smaller individuals in spring and bimodally distributed in fall. At San Miguel, the size distribution was fairly normal in spring and slightly negative-skewed in fall with a weak mode at approx. 90–100 mm. The Santa Barbara Island size-distribution was not estimated in 2013 because only three black abalone were seen at one (Landing Cove) of the two sites on the island.

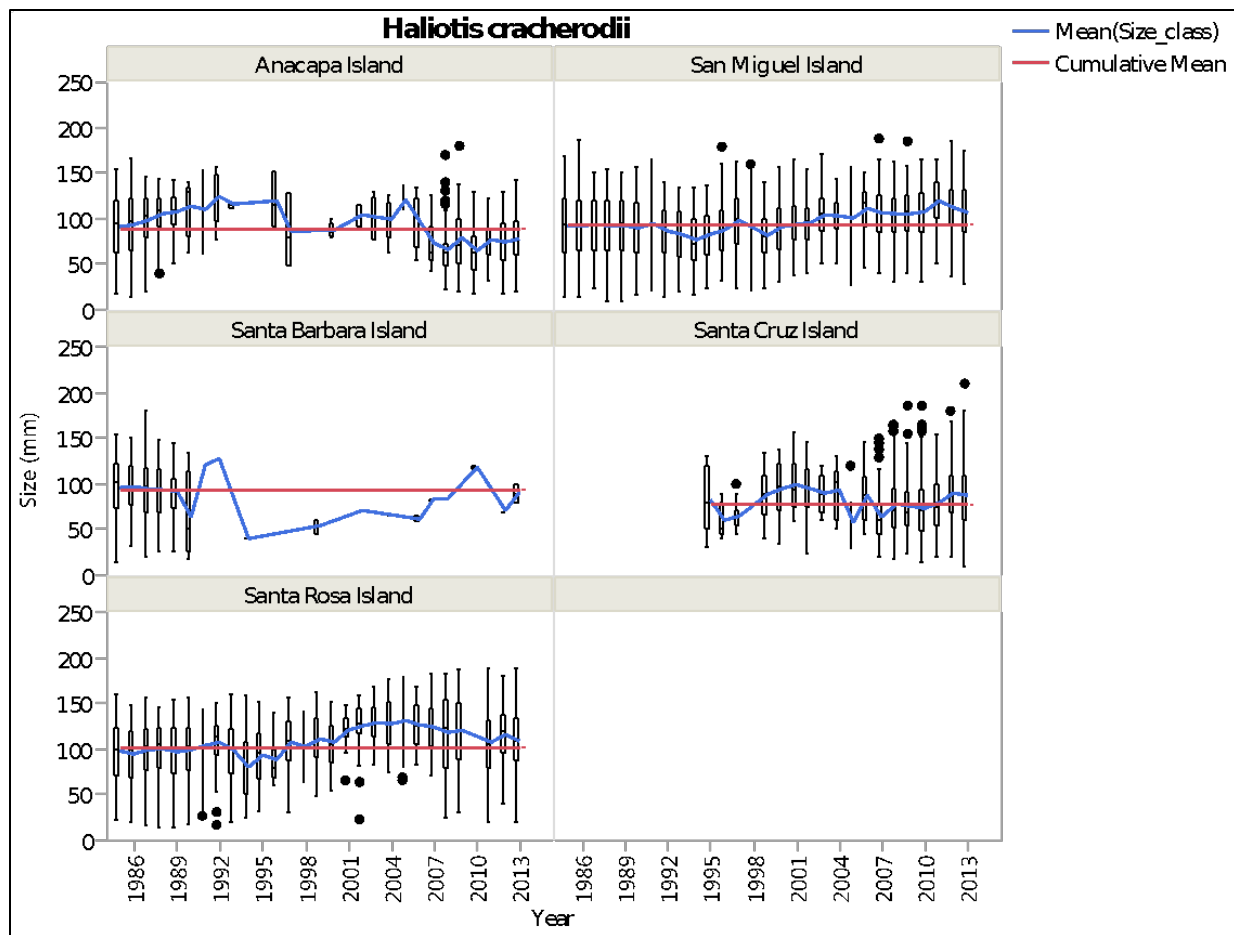


**Figure 40.** Box plots for annual size frequency distributions of *Haliotis cracherodii* at each island. Blue lines represent mean sizes of *H. cracherodii* at each island pooled across and sites. Red lines represent the cumulative mean.

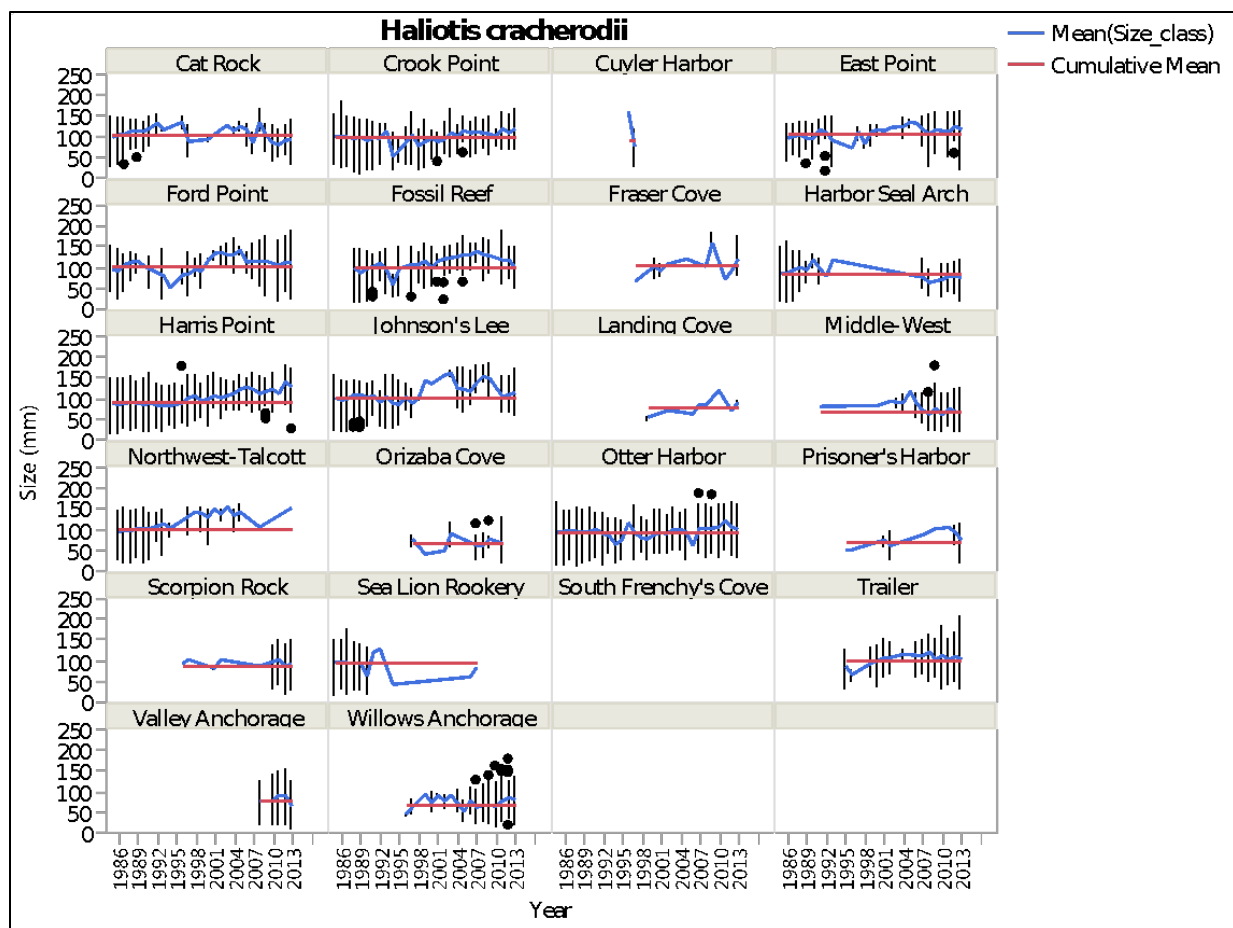


**Figure 41.** Box plots for annual size frequency distributions of *Haliotis cracherodii* at each site. Blue lines represent mean sizes of *H. cracherodii* at each site. Red lines represent the cumulative mean.

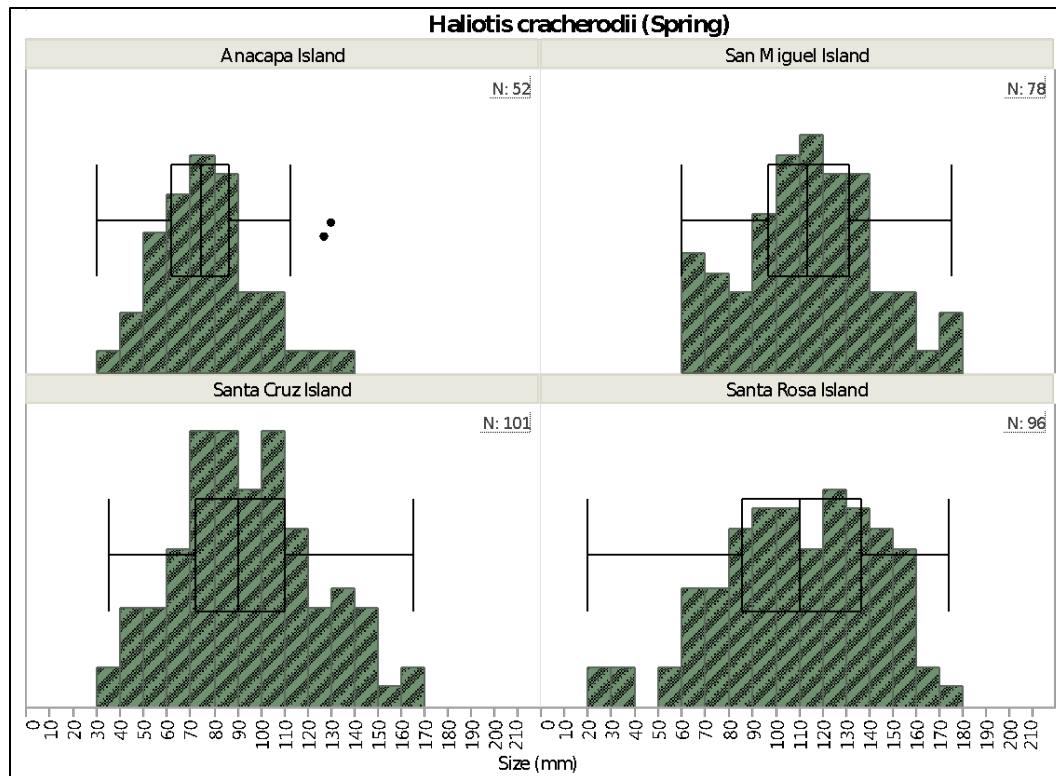


**Figure 42.** Size frequency distributions of *Haliotis cracherodii* measured at each island in spring 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

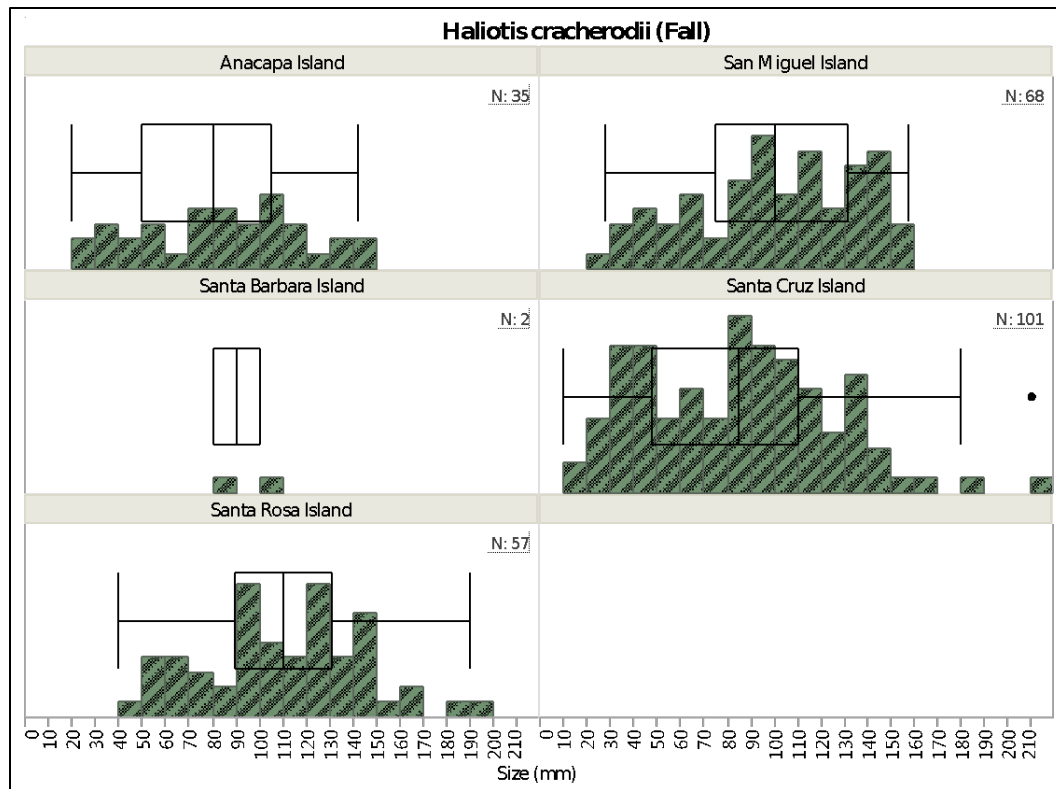


**Figure 43.** Size frequency distributions of *Haliotis cracherodii* measured at each island in fall 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

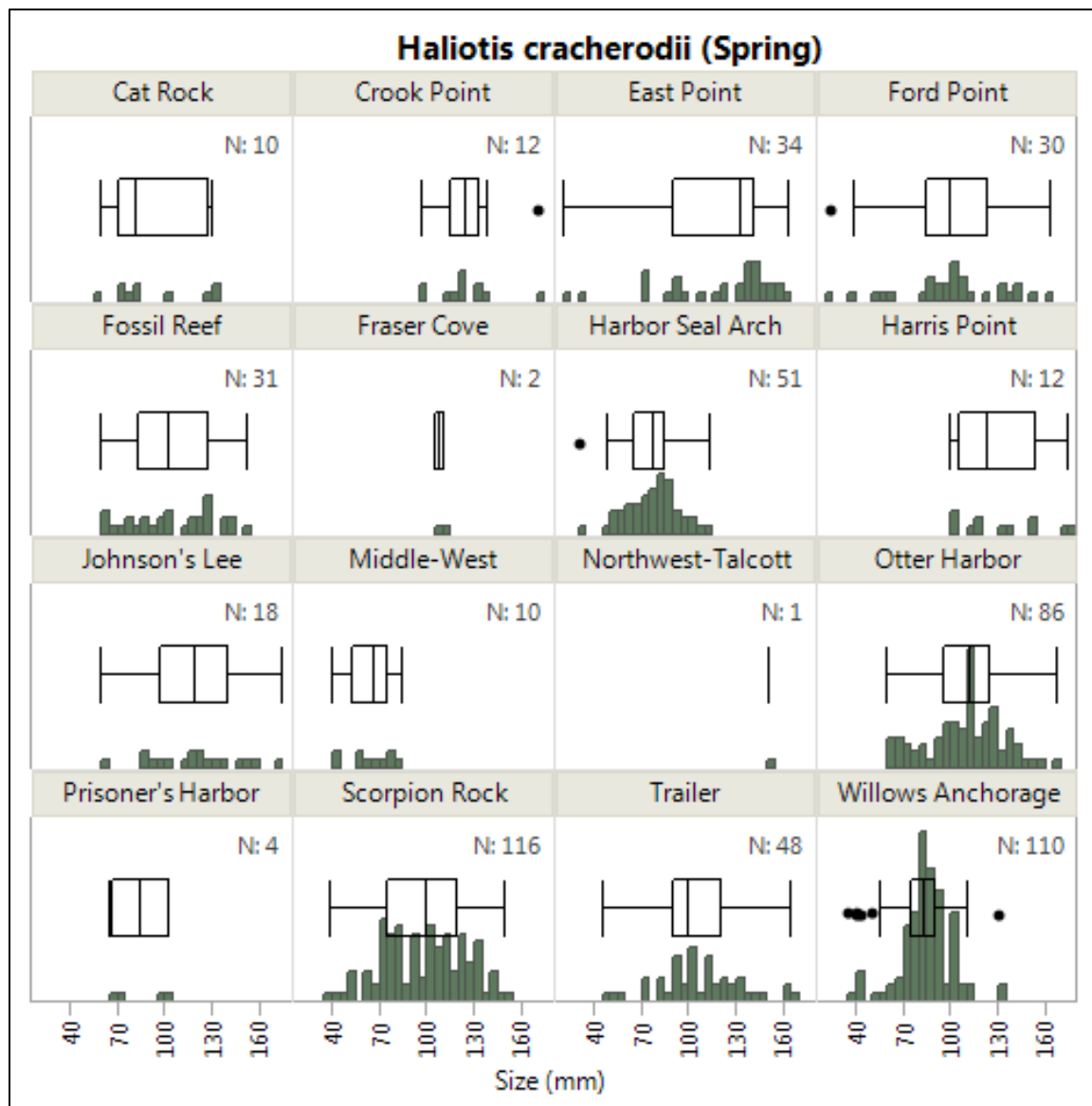


**Figure 44.** Size frequency distributions of *Haliotis cracherodii* measured at each site in spring 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

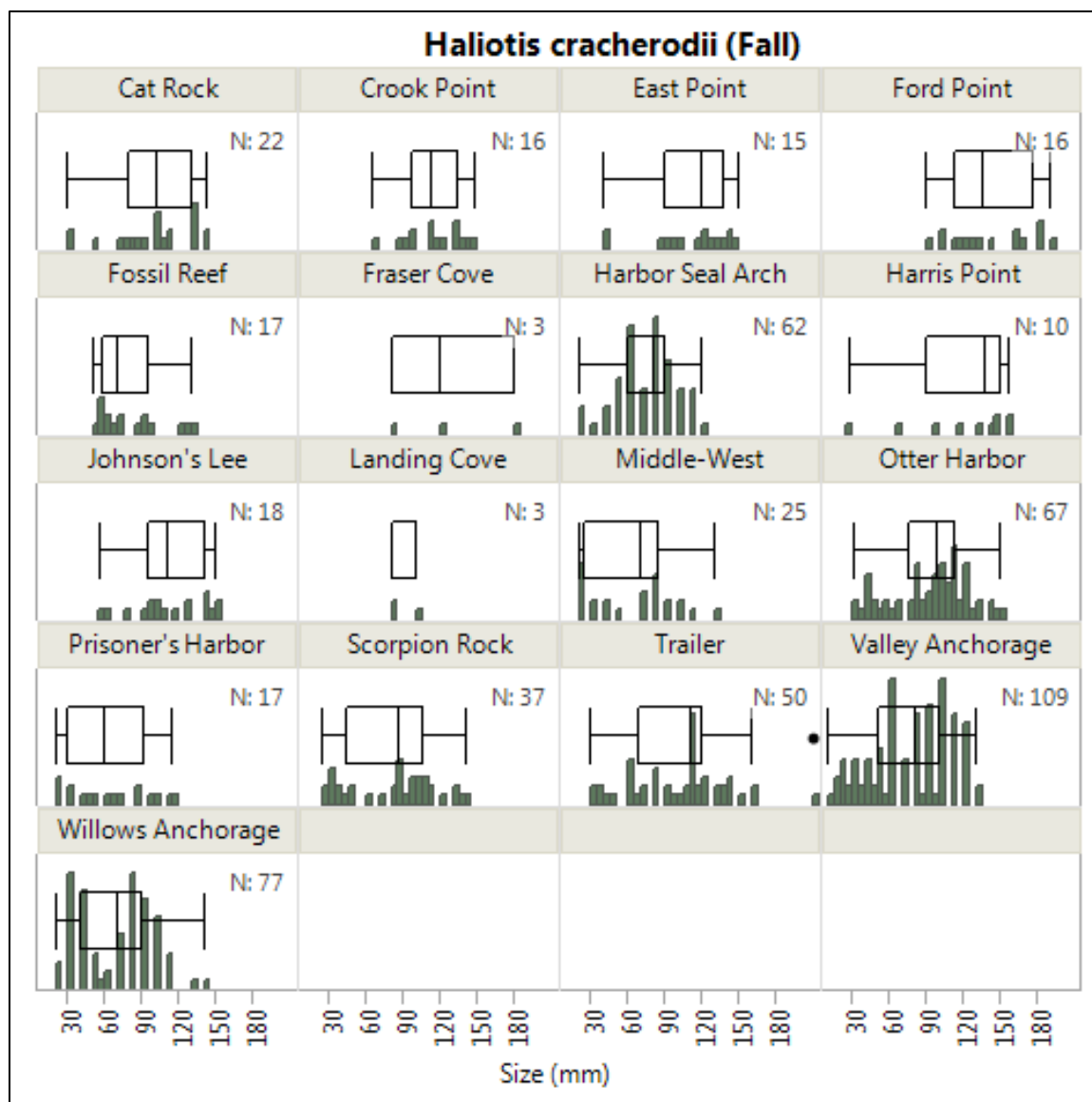


**Figure 45.** Size frequency distributions of *Haliotis cracherodii* measured at each site in fall 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

In 2011, one large abalone that appeared to be shrunk, a symptom of Withering Syndrome (WS), was found at Otter Harbor during the spring sample. The animal was however, firmly attached to the substratum and responded with movement and increased grip when it was measured. No other abalone with signs of WS were observed at any of the monitoring sites in 2011. In 2012 and 2013, no signs of WS were observed.

In December 2013, extremely high sand cover was observed at Valley Anchorage and Willows Anchorage at Santa Cruz Island. At Valley, several black abalone were seen partially covered by sand (Figure 46), and numerous others were likely completely buried.

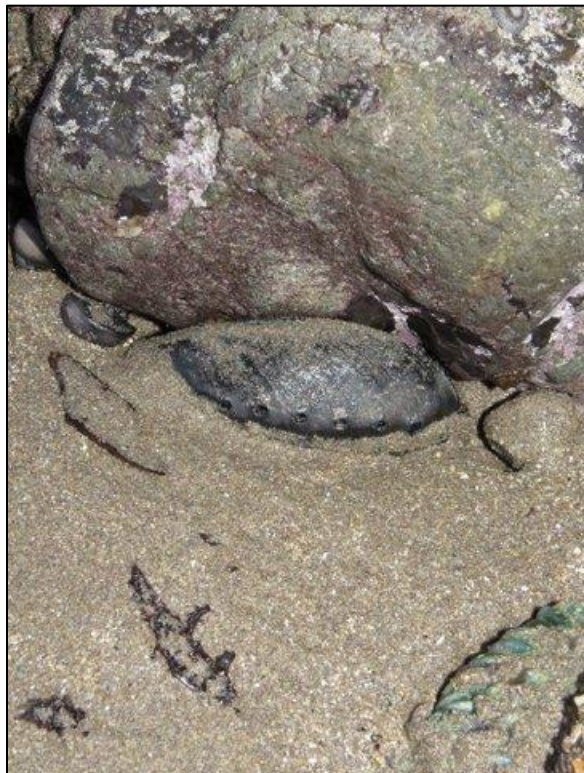


**Figure 46.** Black abalone covered by sand at Valley Anchorage (December 2013).

### ***Lottia gigantea***

Owl limpets, *Lottia gigantea*, are typically sampled in fall, alternating with motile invertebrate counts in spring. All sites with fixed plots for *L. gigantea* were sampled in 2013.

Departure from the long-term mean graphs indicate that negative changes in mean abundances of *L. gigantea* occurred at all islands in 2013 compared to previous years (Figures 47–48). Note that 2013 data are not presented for Santa Barbara Island since fixed plots for *L. gigantea* have not been established.

The mean number of limpets ranged 5–51.4 per plot across all sites that were sampled in 2013 (Figure 48). Fossil Reef had the greatest number of *L. gigantea* and South Frenchy's Cove had the least. Two sites had mean abundances for owl limpets that were less than 10 individuals per plot. Mean abundances of limpets ranged 10–20 per plot at four sites and greater than 20 per plot at four sites. Nearly all sites exhibited only small changes if any in mean abundances of *L. gigantea* in 2013 compared to data collected during the most recent five years. The only exception was Harris Point which appeared to have experienced a gradual decrease in abundance of owl limpets since 2008. Mean abundances of *L. gigantea* in 2013 were comparable or slightly below the long-term mean at

all sites except Willows Anchorage. At Willows, owl limpets were slightly more abundant than past years.

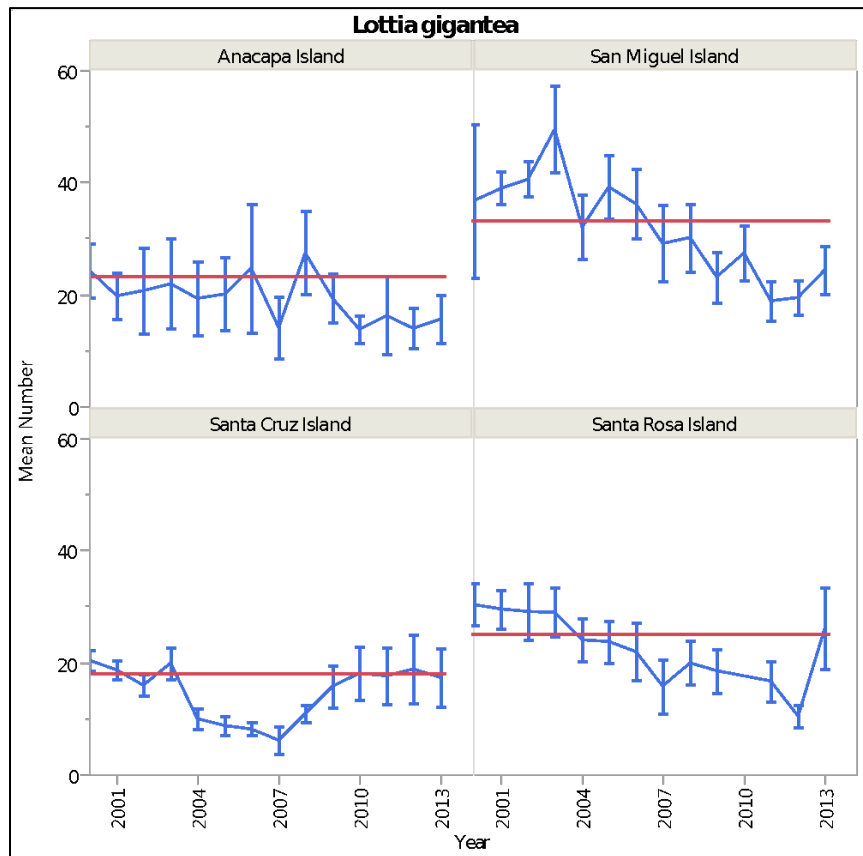


**Figure 47.** Departure from the long-term mean for *Lottia gigantea* at each island. Blue lines represent mean number of *L. gigantea* at each island pooled across fixed plots and sites. Red dashed lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean.

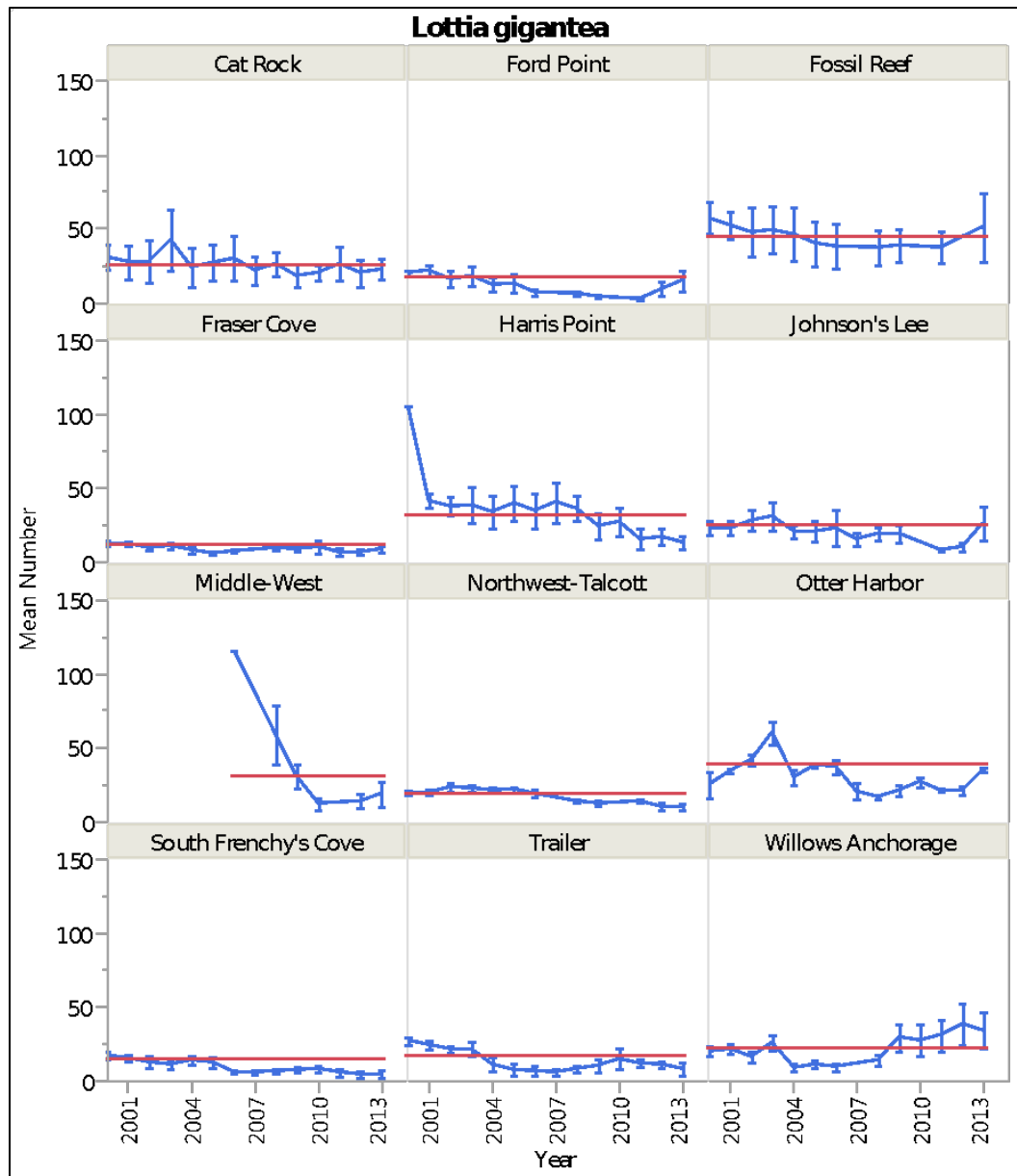


**Figure 48.** Departure from the long-term mean for *Lottia gigantea* at each site. Blue lines represent mean number of *L. gigantea* at each site pooled across fixed plots. Red dashed lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean.

The sizes of *L. gigantea* in 2013 varied among sites and islands, but only minimal temporal changes were documented within most sites (Figure 49). Median sizes ranged approx. 26–74.5 mm across all sites sampled in 2013 with the smallest owl limpets measured at Ford Point and the largest at Northwest-Talcott. When pooled across islands, the smallest (median~ 39 mm) limpets occurred at Anacapa and San Miguel followed by Santa Rosa (median ~ 44 mm) and Santa Cruz (~ 47 mm).

Compared with previous years, the mean sizes of *L. gigantea* at most islands in 2013 declined slightly from long-term means generated for each island (Figure 50). The only exception may be

Anacapa Island which had limpets that were comparable in size to past years. Mean sizes in 2013 ranged 39–50 mm at the island level with the smallest *L. gigantea* at Anacapa and San Miguel Islands and the largest at Santa Cruz.

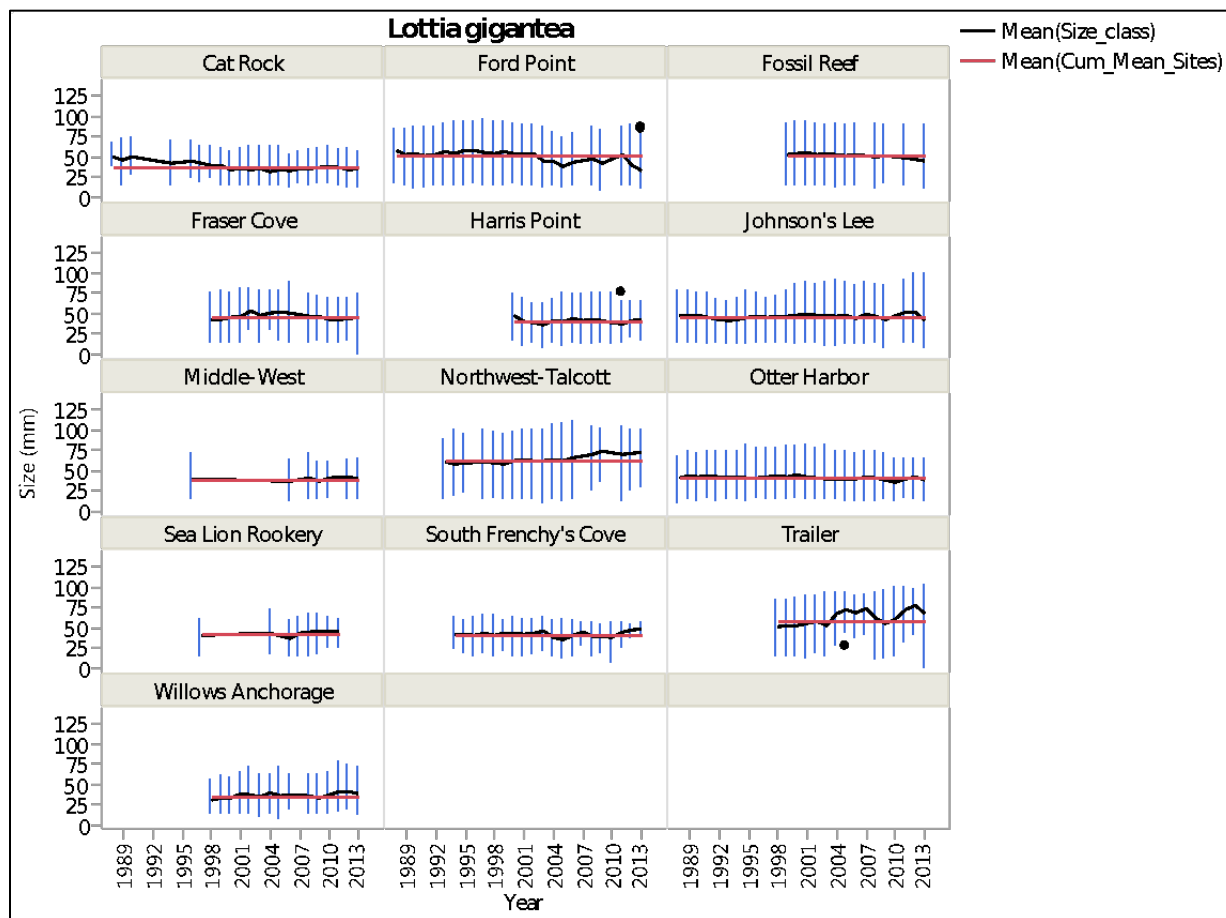


**Figure 49.** Box plots for annual size frequency distributions of *Lottia gigantea* at each site. Black lines represent mean sizes of *L. gigantea* at each site pooled across fixed plots. Red lines represent the cumulative mean.

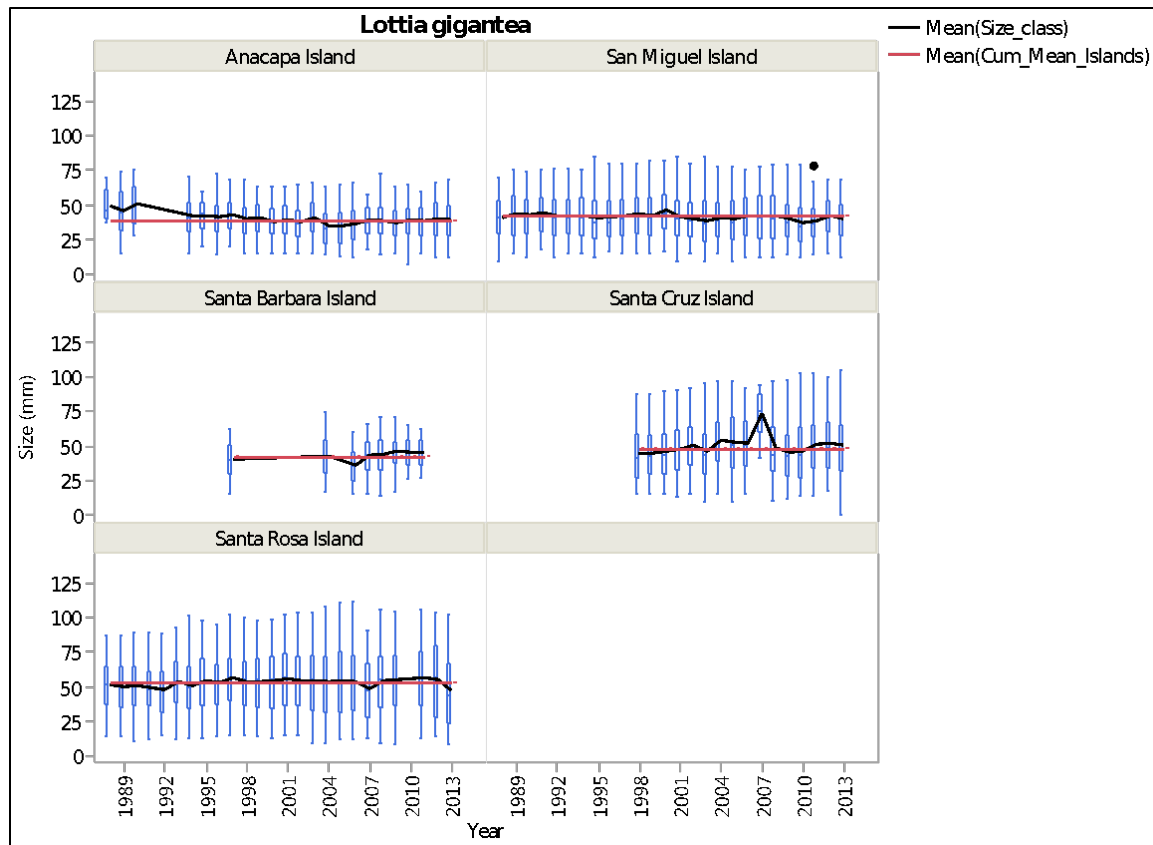


**Figure 50.** Box plots for annual size frequency distributions of *Lottia gigantea* at each island. Black lines represent mean sizes of *L. gigantea* at each island pooled across fixed plots and sites. Red lines represent the cumulative mean.

*L. gigantea* size distributions pooled by sites and islands are displayed in Figures 51–52. The size distribution at Anacapa appeared slightly bimodal with modes centered on 20–25 mm and 45–50 mm. The distributions at Santa Cruz, Santa Rosa and San Miguel were positive-skewed whereby mean values were slightly higher than the median sizes and modes ranged 15–35 mm.

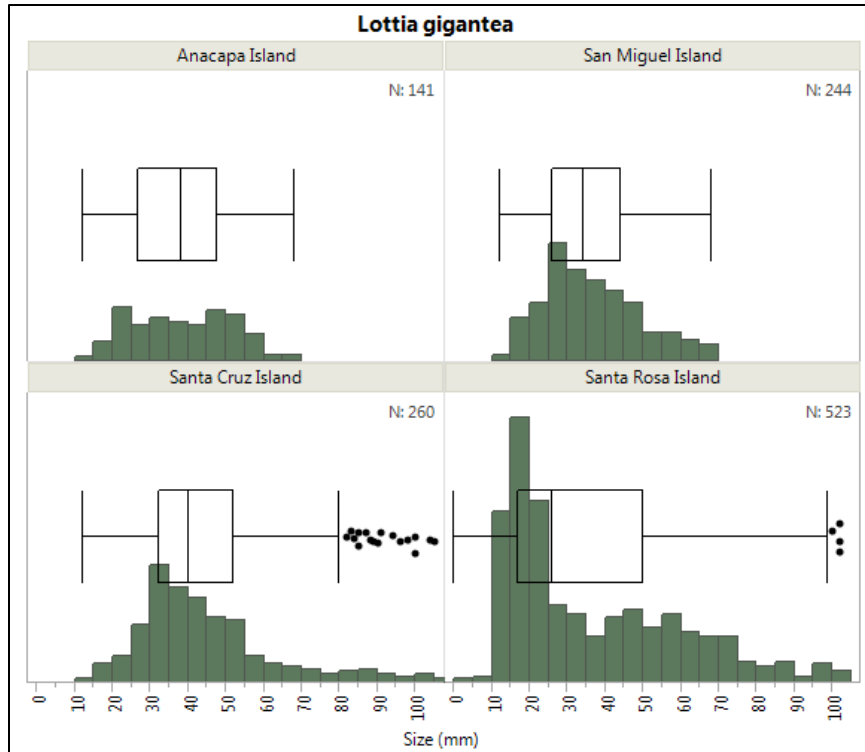


**Figure 51.** Size frequency distributions of *Lottia gigantea* measured at each island in 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

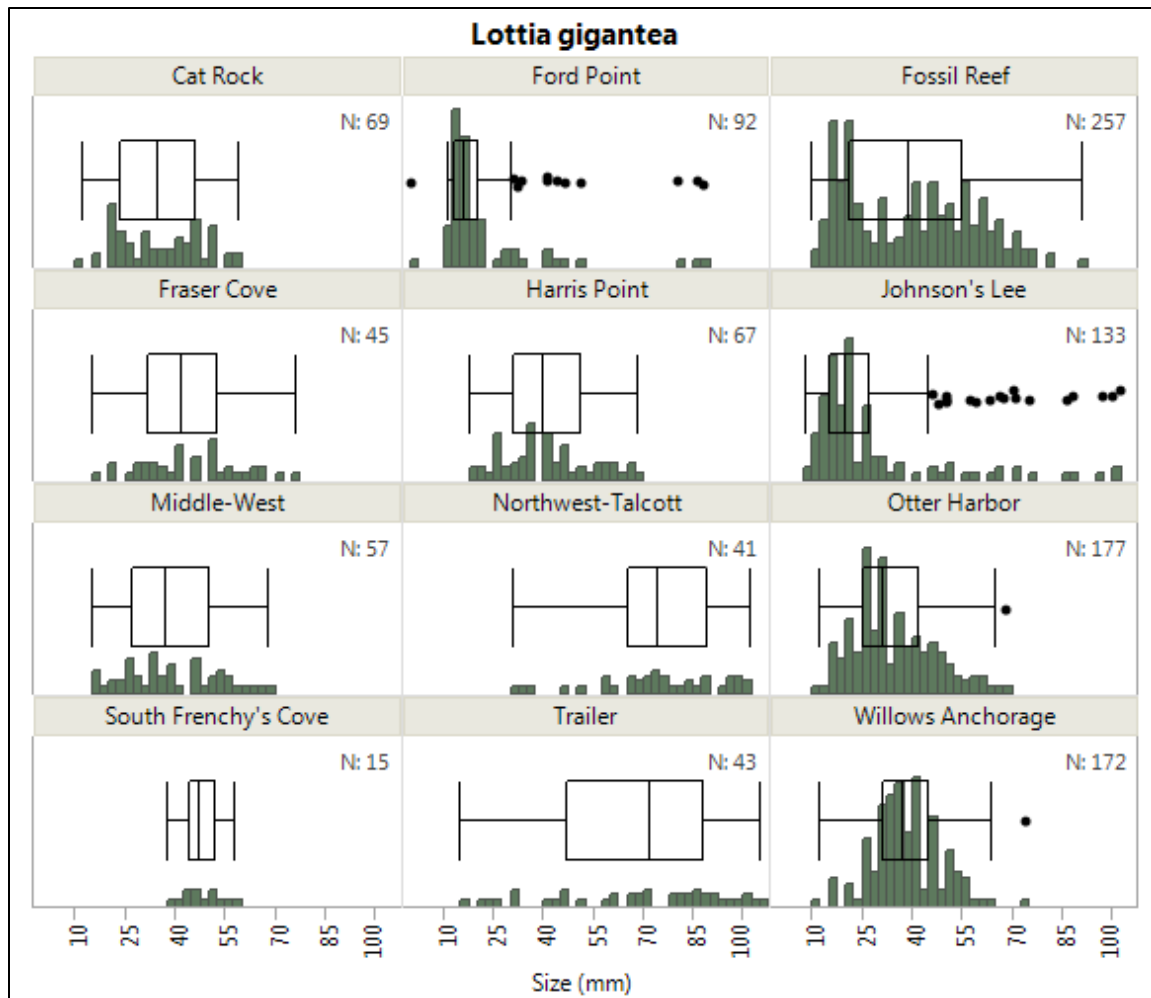


**Figure 52.** Size frequency distributions of *Lottia gigantea* measured at each site in 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

### ***Pisaster ochraceus***

Temporally, the abundances of *P. ochraceus*, sea stars have fluctuated markedly at most sites, with the exceptions of Cat Rock, Harris Point, Northwest-Talcott, and South Frenchy's Cove which have historically supported low (i.e. < 35 *P. ochraceus*) numbers of sea stars. Sites are generally sampled for sea star abundance in both spring and fall. However in 2013, only one site (Prisoner's Harbor) was sampled in spring, and all sites but Orizaba Cove were sampled in fall.

Compared with previous years, sea stars were moderately abundant at most sites in 2013 (Figure 53). Extremely high abundances (~ 500 *P. ochraceus*) were not documented at any sites in contrast to past years in which as many as five sites had unusually high numbers of sea stars counted during 30-minute site-wide searches. Still, 9 of 20 sites had between 100 and 300 sea stars observed in 2013. Less than 35 sea stars were seen at Cat Rock, Prisoner's Harbor and South Frenchy's Cove. Zero *P.*

*ochraceus* were present at Northwest-Talcott, but it is not unusual to find very few, if any, ochre stars at that site.

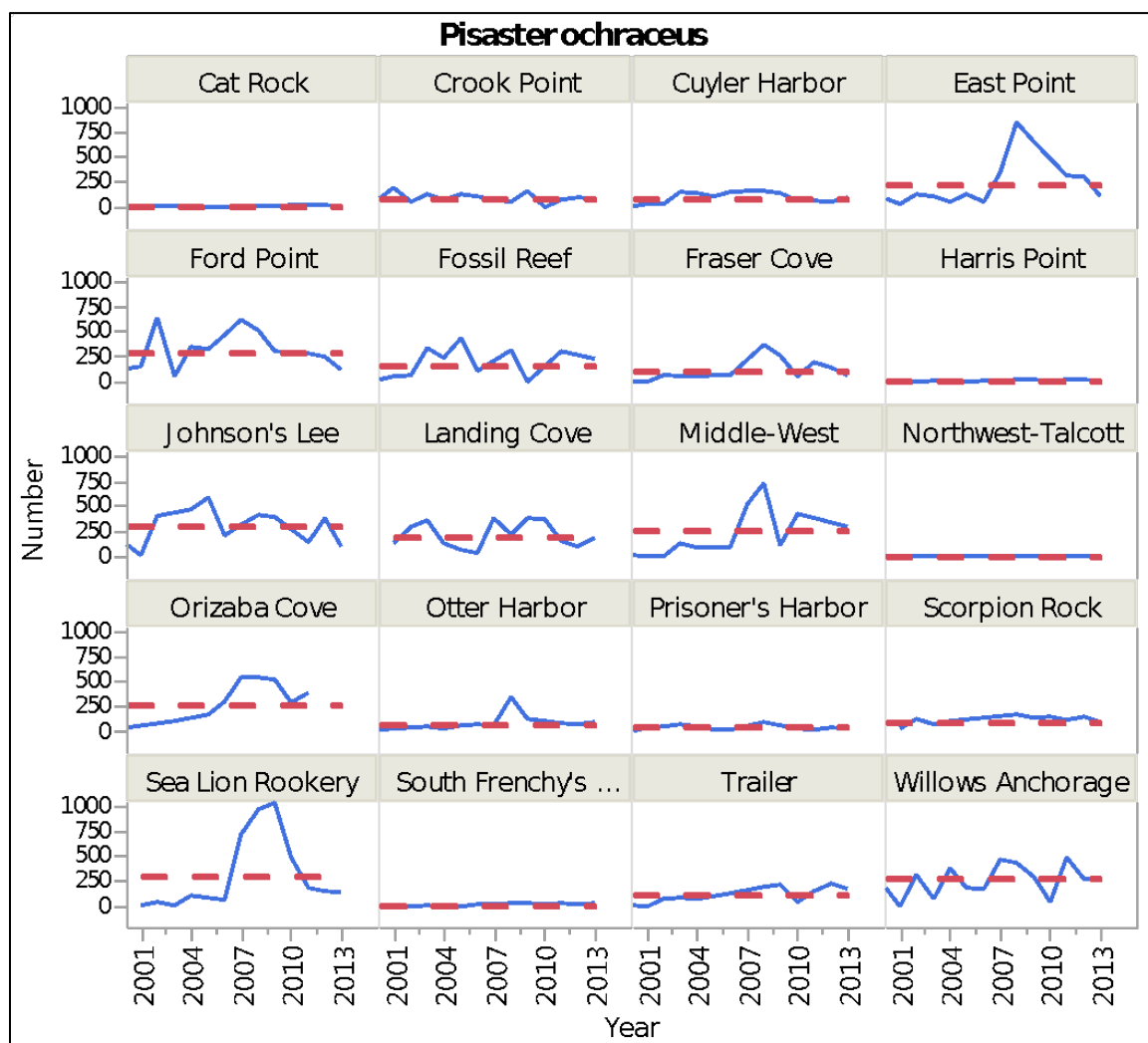


**Figure 53.** *Pisaster ochraceus* counts at each site from 1999–2013. Count data were obtained from timed-(30 minute) searches. Blue lines represent the number of *P. ochraceus* and red dashed lines indicate the long-term mean number of *P. ochraceus* at each site.

Departure from the mean graphs indicate that negative changes in mean abundances of *P. ochraceus* occurred at Santa Barbara, Santa Rosa and to a lesser degree, Santa Cruz Island in 2013 compared to previous years (Figures 54, 55). Mean abundances at Anacapa and San Miguel Islands in 2013 remained comparable to long-term means at both islands.

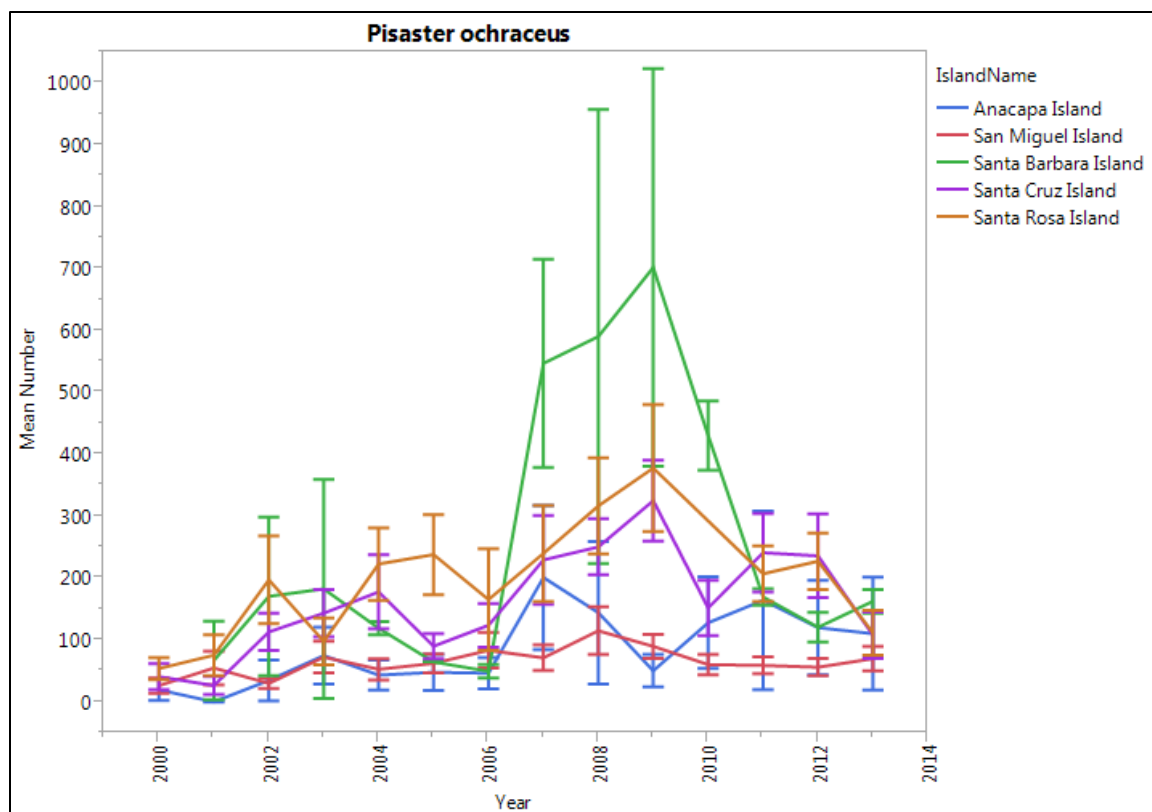


**Figure 54.** *Pisaster ochraceus* counts pooled across each island from 1999–2013. Count data were obtained from timed-(30 minute) searches.

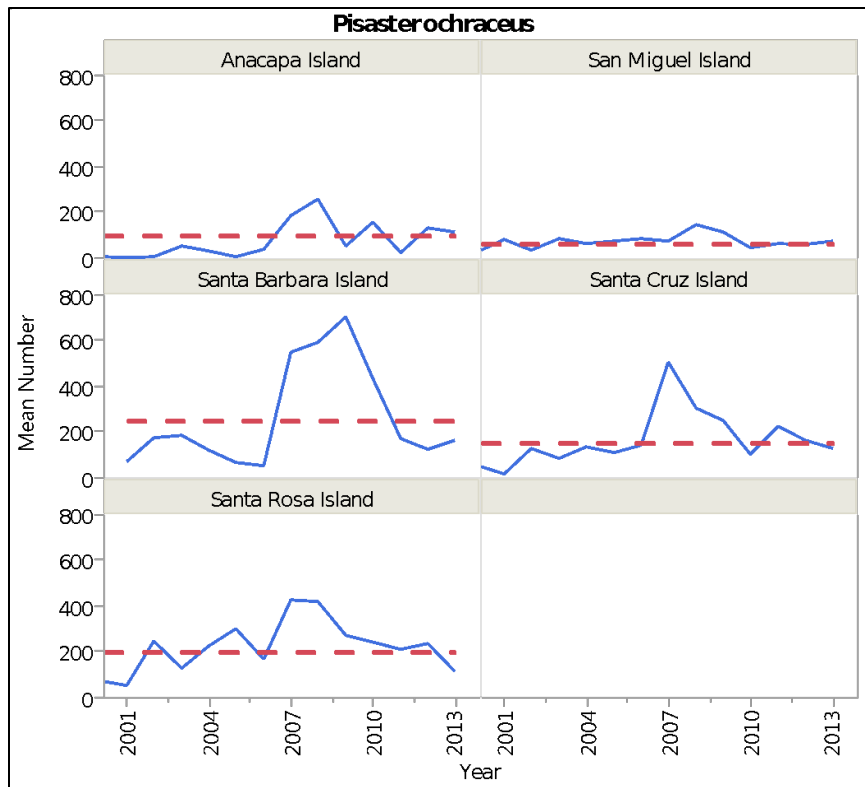


**Figure 55.** *Pisaster ochraceus* counts at each island from 2000–2013. Count data were obtained from timed-(30 minute) searches. Blue lines represent the number of *P. ochraceus* and red dashed lines indicate the long-term mean number of *P. ochraceus* at each site.

Size frequency measurements were collected at all sites except Orizaba Cove in 2013 (Figures 56–59). *P. ochraceus* populations at most sites were normally-distributed with modes typically between 70 mm and 130 mm. Exceptions were at Crook Point, Scorpion Rock, South Frenchy’s Cove, Trailer and Willows Anchorage whereby populations were low to moderately negative-skewed. Proportionally, Ford Point and Fossil Reef had the smallest sea stars and Trailer had the largest.

Sea stars (*P. ochraceus* and other species) exhibiting signs of wasting disease were observed at several intertidal locations in Olympic National Park, Washington beginning in summer 2013. Sickened sea stars then began appearing at other sites along the Pacific west coast including southern California and the Channel Islands by December 2013. Sea star wasting disease (SSWD) is a general description for symptoms that manifest in sea stars as lesions that often progress and lead to fragmentation of the body and death.

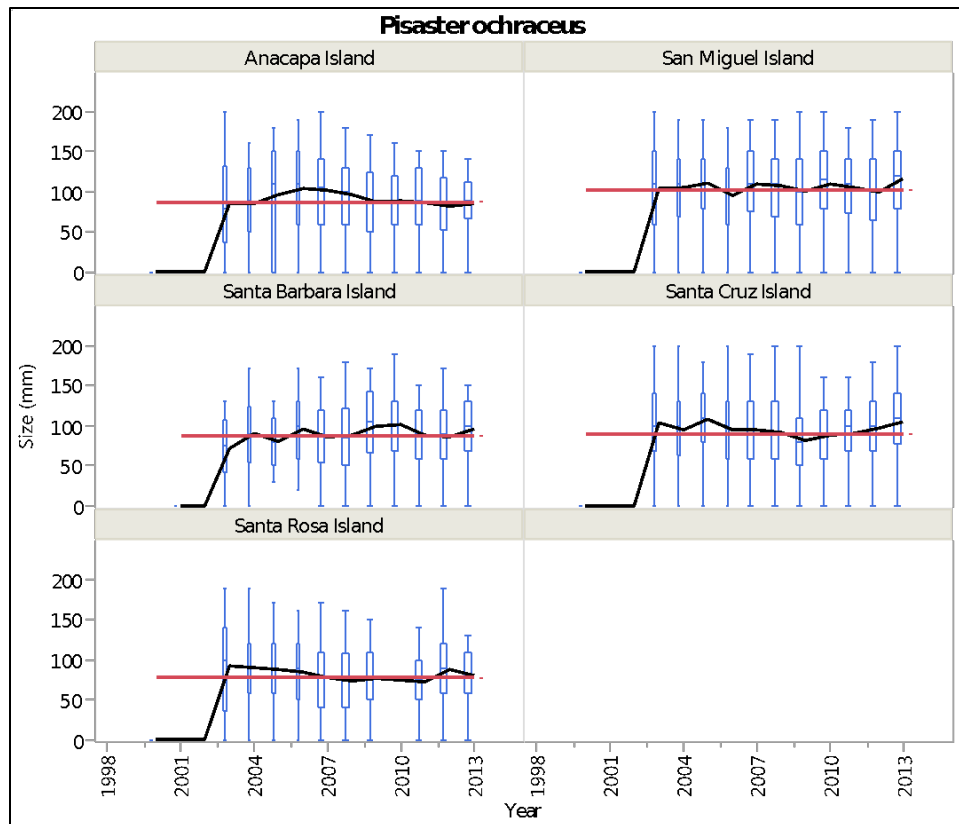


**Figure 56.** Box plots for annual size frequency distributions of *Pisaster ochraceus* at each island. Black lines represent mean sizes of *P. ochraceus* at each island pooled across sites. Red lines represent the cumulative mean.

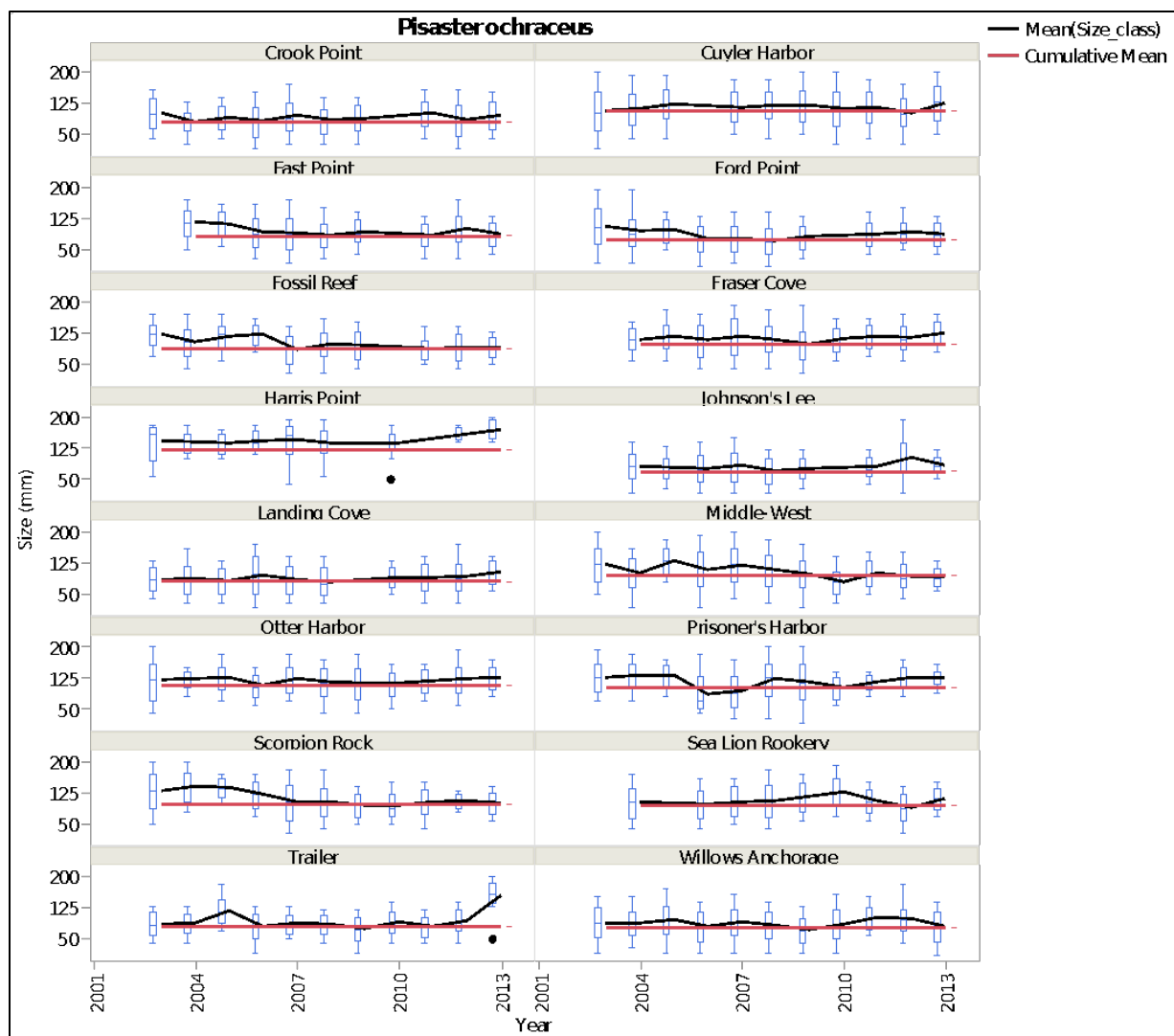


**Figure 57.** Box plots for annual size frequency distributions of *Pisaster ochraceus* at each site. Black lines represent mean sizes of *P. ochraceus* at each site. Red lines represent the cumulative mean. Note that data for some sites are not shown due to insufficient numbers of *P. ochraceus* located for measurement.

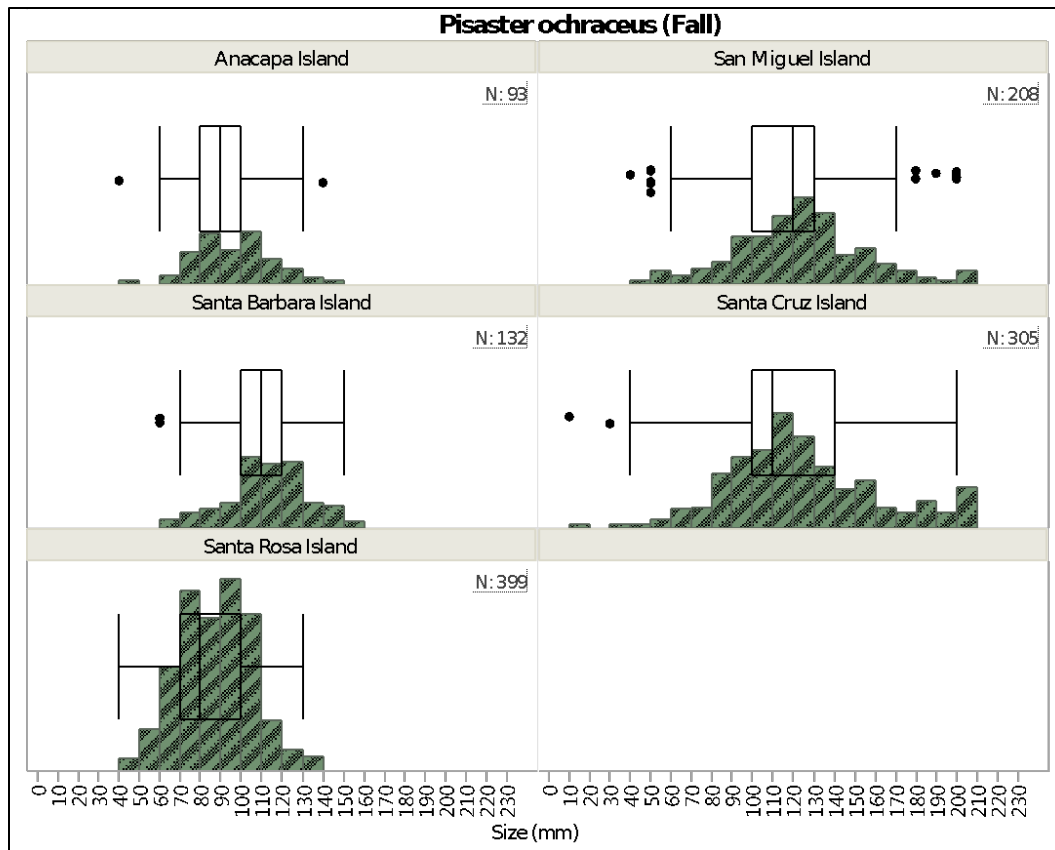


**Figure 58.** Size frequency distributions of *Pisaster ochraceus* measured at each island in fall 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

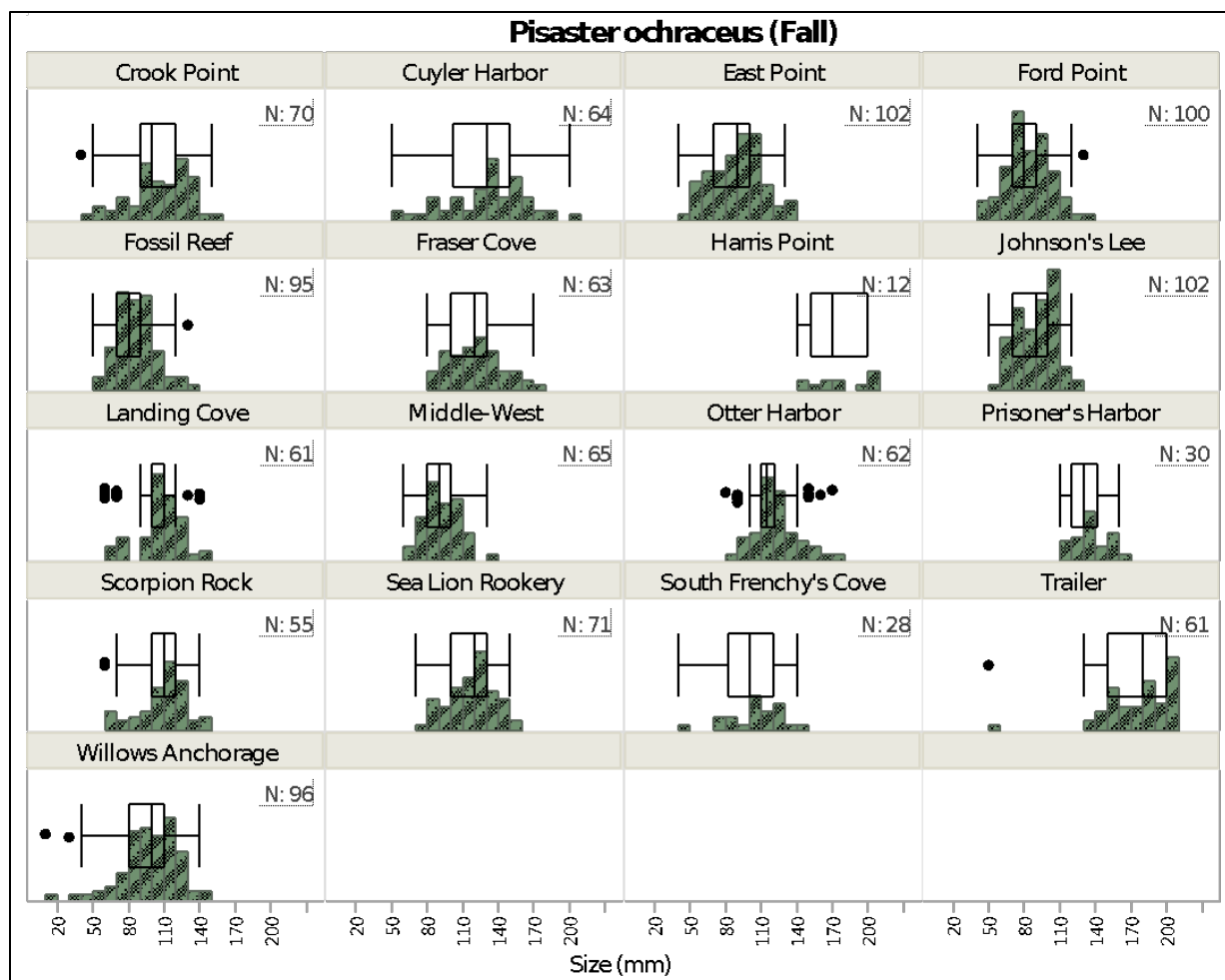


**Figure 59.** Size frequency distributions of *Pisaster ochraceus* measured at each site in fall 2013. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25<sup>th</sup> and 75<sup>th</sup> quartiles, the vertical line inside the box indicates the median value, the whiskers extend from the ends of the box to the outermost data point that falls within 1.5 of the lower and upper quartiles and dots indicate outlier values.

At the Channel Islands, one *P. ochraceus* with white, decomposed tissue on at least one ray was observed at Johnson's Lee in November (Figure 60). Three other sea stars exhibiting progressed symptoms of SSWD were observed at Cuyler Harbor in January 2014; all were collected for analysis. No other observations of SSWD in 2013 or January 2014 were made directly by CHIS staff. However, UCSB researchers observed several sea stars with SSWD at multiple locations on Santa Cruz Island in December (C. Blanchette, personal communication, December 2013). Note that the disease event progressed significantly throughout southern California including the islands in early 2014 (see 2014 annual report).



**Figure 60.** Sea star exhibiting signs of wasting syndrome at Johnson's Lee in November.

### ***Phyllospadix* spp.**

*Phyllospadix* spp., surfgrass cover has been monitored at two sites (Fraser Cove and Trailer) on Santa Cruz Island since spring 1995, and at two sites (East Point and Northwest-Talcott) on Santa Rosa Island since spring 2002. The four sites were chosen for study based on the relatively high abundance of surfgrass habitat present when the sites were established. *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, whereby surfgrass overstory cover has routinely declined in spring and increased in fall. In 2013, there was minimal seasonal variation in surfgrass cover at both sites (Figure 61). At Trailer, surfgrass cover remained low relative to previous years (Figures 61–64). *Phyllospadix* spp. on Transect-3 reached record-low abundances in 2013 (Figures 61–64). At Fraser Cove, the opposite has occurred in which surfgrass cover has been increasing since 2007. Over time, *Phyllospadix* spp. cover has ranged approximately 45–75 % at Fraser Cove and approximately 50–80 % at Trailer.

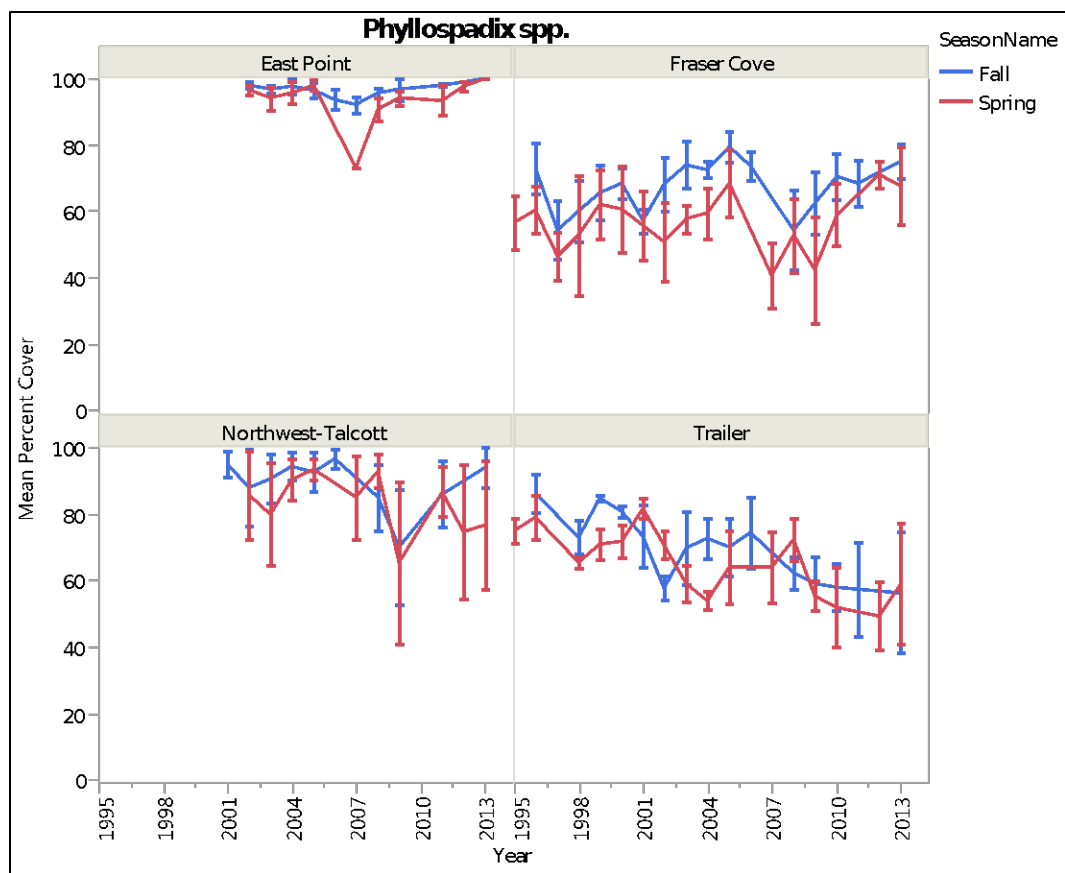


**Figure 61.** Mean percent cover of *Phyllospadix* spp. pooled across transects at each site. Note that *Phyllospadix* spp. cover was quantitatively estimated at East Point in spring and fall 2013.

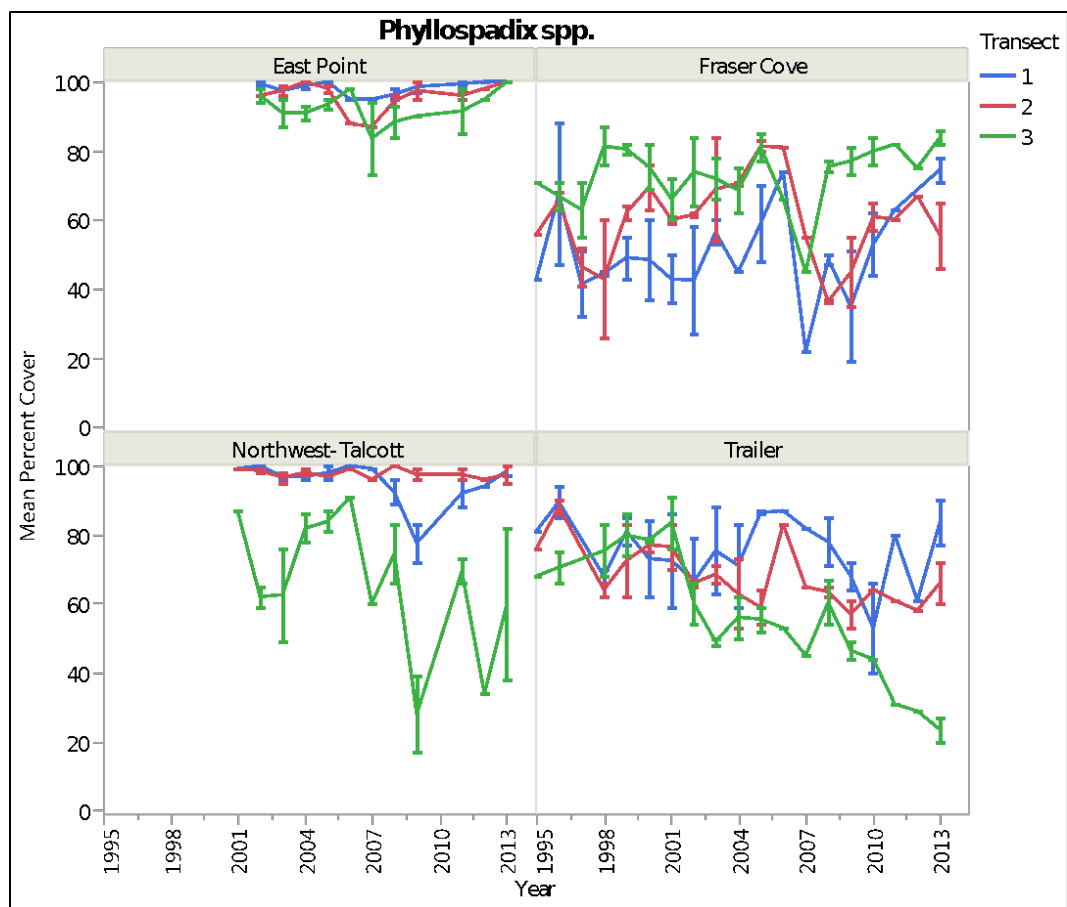


**Figure 62.** Mean percent cover of *Phyllospadix* spp. at each site. Note that *Phyllospadix* spp. cover was quantitatively estimated at East Point in spring and fall 2013.

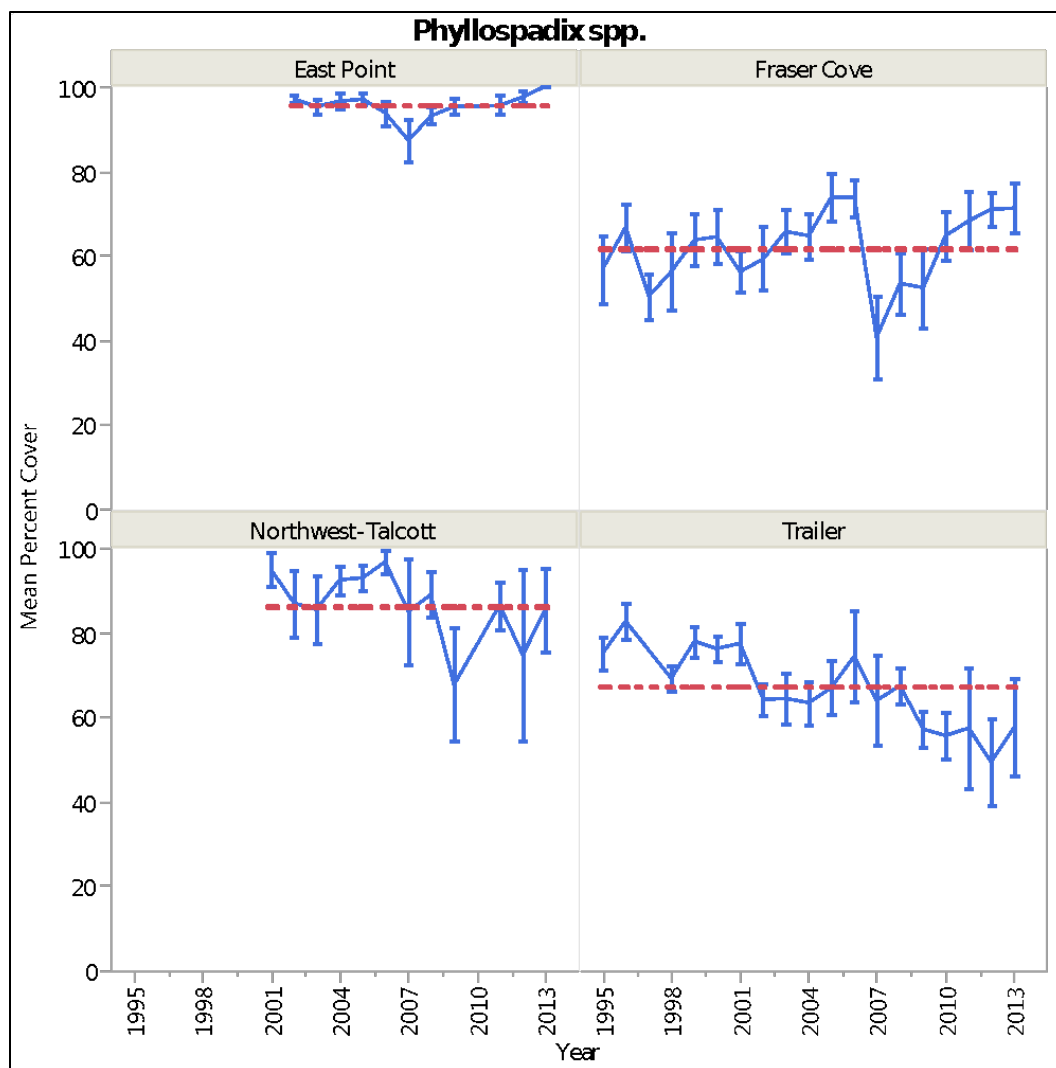


**Figure 63.** Mean percent cover of *Phyllospadix* spp. pooled across transects at each site. Blue lines represent the mean percent cover of *Phyllospadix* spp. and red dashed lines indicate the long-term mean percent cover of *Phyllospadix* spp. at each site.

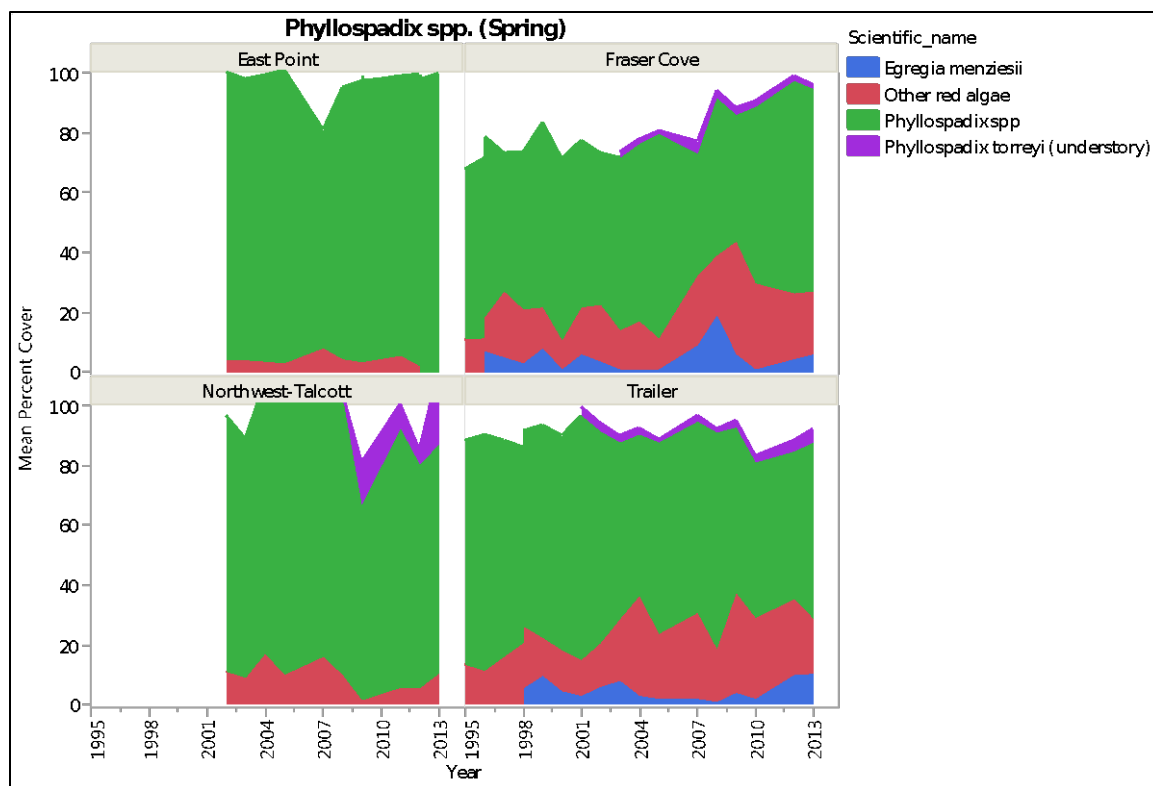


**Figure 64.** *Phyllospadix* spp. cover at all sites in spring. Colored areas represent the seasonal mean percent cover for *Phyllospadix* spp. and other dominant taxa from 10m point-intercept transects. Note that percent cover can be greater than 100 percent with the inclusion of *Phyllospadix* spp. (understory). *Phyllospadix* spp. cover was quantitatively estimated at East Point in spring 2013.

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. In 2013, surfgrass overstory cover at East Point was visually-estimated during both monitoring seasons since poor oceanic conditions (large waves) made it difficult and unsafe to deploy transect tapes. Surfgrass abundances on all three transects at East Point appeared to remain stable at approximately 100% cover during both seasons relative to past years (Figures 61–63). At Northwest-Talcott, *Phyllospadix* decreased in spring, but cover increased in fall to become comparable to abundances measured in the early 2000s. As in the past, Transect-3 at Northwest-Talcott had markedly less surfgrass cover relative to the two other transects at the site (Figures 61–63).

Red algae, composed primarily of *Chondracanthus canaliculatus*, *Prionitis lanceolata*, and *Mazzaella affinis*, were relatively common on the three transects at both Fraser Cove and Trailer in 2013 (Figures 64–65). Red algae abundances averaged across the three transects at the two sites ranged approx. 16% to 18%. At Santa Rosa Island, red algae (mean ranged 2–11%) was less common.

The overall condition of surfgrass at the two sites on Santa Cruz and Santa Rosa Islands appeared to be healthy, but moderate cover of epiphytic algae (e.g. *Smithora naiadum*, *Ulva* spp. and *Melobesia mediocris*) and low to medium level of bleaching was observed.

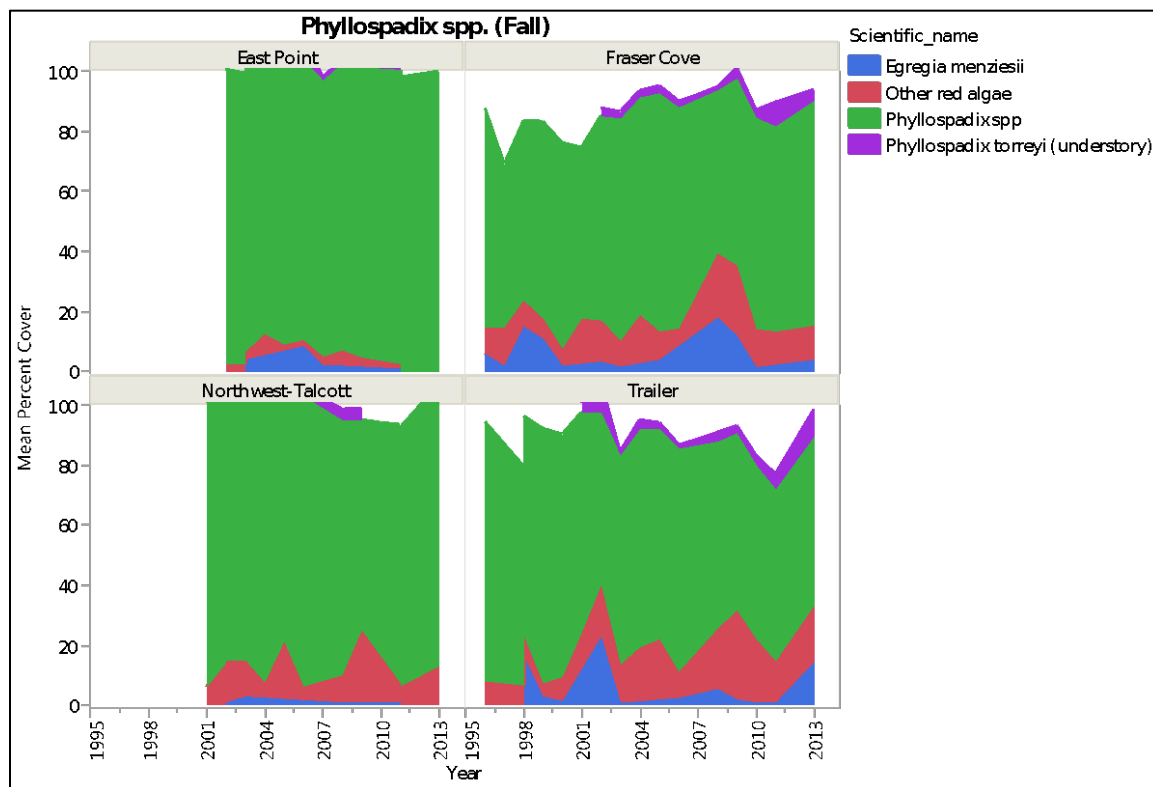


**Figure 65.** *Phyllospadix* spp. cover at all sites in fall. Colored areas represent the seasonal mean percent cover for *Phyllospadix* spp. and other dominant taxa from 10m point-intercept transects. Note that percent cover can be greater than 100 percent with the inclusion of *Phyllospadix* spp. (understory). *Phyllospadix* spp. cover was quantitatively estimated at East Point in fall 2013.

### Shorebirds and Pinnipeds

The maximum number of shorebirds and pinnipeds observed at any one time during visits to the sites in 2013 is summarized in Tables 2 and 3. Overall, the abundances and diversity of shorebirds in 2013 at all islands appeared similar to observations made in recent years, although the numbers of cormorants were relatively high at Santa Rosa and San Miguel Islands (Figure 66). The high numbers of cormorants at Santa Rosa and San Miguel were due to observations made at East Point and Crook Point. Likewise, there were no marked changes to the abundances of pinnipeds observed in 2013 with the exception of the reduction of California sea lions observed at Santa Barbara Island.

Black oystercatchers were again the most ubiquitous shorebirds at the rocky intertidal sites (Figure 67). With the exception of one site (Cuyler Harbor), at least one black oystercatcher was present at each site during spring. In spring, a relatively large flock of 10 black oystercatchers was observed at Fraser Cove, and smaller flocks were seen at numerous other sites.

American oystercatchers have gradually become more common at the islands in recent years. However, this year, American oystercatchers were not seen at any sites. In 2012, one American oystercatcher was sighted at South Frenchy's Cove in spring, and another was seen at Cat Rock in fall.

**Table 2.** Shorebirds and pinnipeds most commonly encountered at monitoring sites in spring 2013 (maximum seen at any one time). BLOY, black oystercatcher; BLTU, black turnstone; CORM, cormorant; ELSE, elephant seal; HASE, harbor seal; WEGU, western gull.

| Site Code         | Species Code |          |           |          |           |           |            |
|-------------------|--------------|----------|-----------|----------|-----------|-----------|------------|
|                   | BLOY         | BLTU     | CORM      | ELSE     | HASE      | WEGU      | All        |
| Cat Rock          | –            | –        | –         | –        | 10        | 3         | 13         |
| Crook Point       | 2            | 1        | 16        | –        | –         | 5         | 24         |
| Cuyler Harbor     | 1            | –        | –         | –        | –         | –         | 1          |
| East Point        | 2            | –        | –         | –        | –         | –         | 2          |
| Ford Point        | 5            | 3        | –         | –        | –         | –         | 8          |
| Fossil Reef       | 3            | –        | –         | 7        | 6         | 6         | 22         |
| Fraser Cove       | 5            | –        | –         | –        | –         | 1         | 6          |
| Harris Point      | –            | –        | –         | –        | 5         | –         | 5          |
| Johnson's Lee     | 6            | –        | –         | 2        | –         | 2         | 10         |
| Middle-West       | 1            | –        | –         | –        | –         | 1         | 2          |
| Northwest-Talcott | 2            | –        | –         | –        | 10        | 22        | 34         |
| Otter Harbor      | 4            | –        | –         | –        | 21        | 5         | 30         |
| Scorpion Rock     | 1            | –        | –         | –        | –         | –         | 1          |
| Trailer           | 1            | 1        | –         | –        | 3         | –         | 5          |
| Willows Anchorage | 3            | –        | –         | –        | –         | 1         | 4          |
| <b>All</b>        | <b>36</b>    | <b>5</b> | <b>16</b> | <b>9</b> | <b>55</b> | <b>46</b> | <b>167</b> |

**Table 3.** Shorebirds and pinnipeds most commonly encountered at monitoring sites in fall 2013 (maximum seen at any one time). BLOY, black oystercatcher; BLTU, black turnstone; CASL, California sea lion; CORM, cormorant; GULL, generic gull; HASE, harbor seal; WEGU, western gull.

| Site Code         | Species Code |           |           |           |          |           |          |           |            |
|-------------------|--------------|-----------|-----------|-----------|----------|-----------|----------|-----------|------------|
|                   | BLOY         | BLTU      | CASL      | CORM      | ELSE     | GULL      | HASE     | WEGU      | All        |
| Cat Rock          | –            | –         | –         | –         | –        | 30        | 3        | –         | <b>33</b>  |
| East Point        | –            | –         | –         | 50        | –        | –         | –        | 2         | <b>52</b>  |
| Ford Point        | 6            | 1         | –         | –         | 1        | –         | –        | –         | <b>8</b>   |
| Fossil Reef       | 2            | –         | –         | –         | 2        | –         | –        | 13        | <b>17</b>  |
| Fraser Cove       | 3            | –         | –         | –         | –        | –         | –        | –         | <b>3</b>   |
| Johnson's Lee     | 1            | 17        | –         | –         | –        | –         | 1        | –         | <b>19</b>  |
| Landing Cove      | 2            | 3         | 50        | –         | –        | –         | –        | –         | <b>55</b>  |
| Middle-West       | –            | –         | –         | –         | –        | –         | 2        | –         | <b>2</b>   |
| Northwest-Talcott | 11           | –         | –         | –         | –        | –         | –        | 2         | <b>13</b>  |
| Sea Lion Rookery  | 2            | 3         | 40        | –         | –        | –         | –        | 30        | <b>75</b>  |
| Trailer           | –            | –         | –         | –         | –        | –         | 1        | –         | <b>1</b>   |
| <b>All</b>        | <b>27</b>    | <b>24</b> | <b>90</b> | <b>50</b> | <b>3</b> | <b>30</b> | <b>7</b> | <b>47</b> | <b>278</b> |

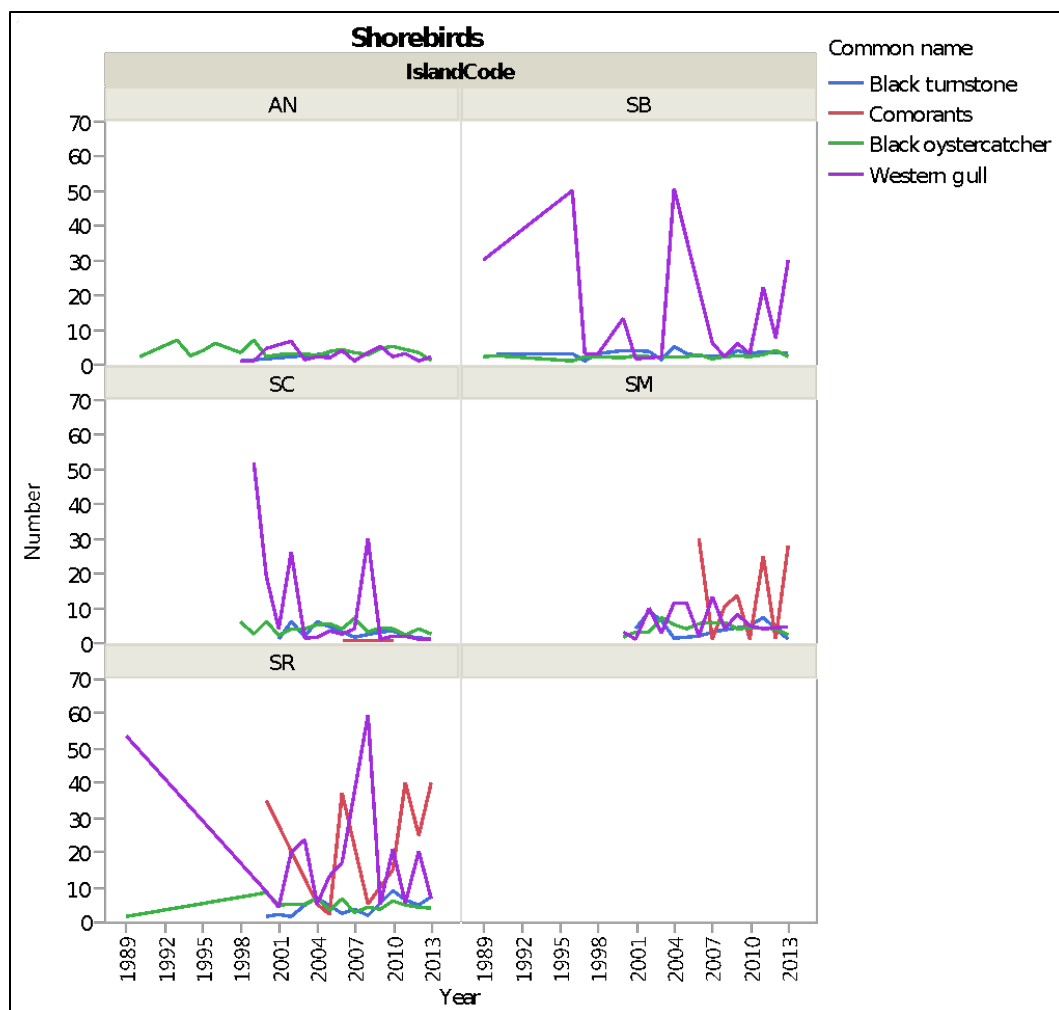


**Figure 66.** Mean number of common shorebirds pooled across sites at each island. AN, Anacapa Island; SB, Santa Barbara Island; SC, Santa Cruz Island; SM, San Miguel Island; SR, Santa Rosa Island.

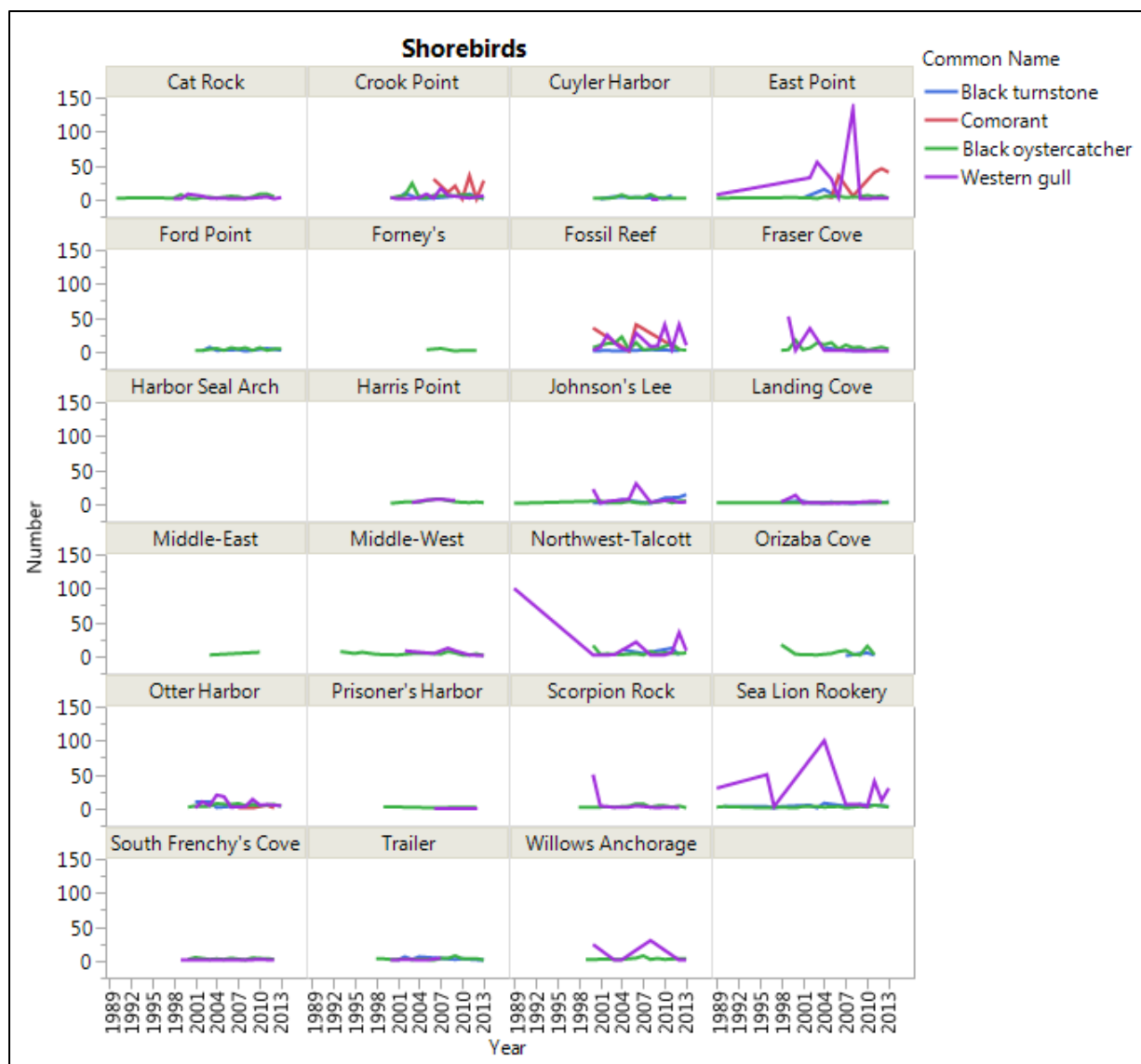


**Figure 67.** Number of common shorebirds at each site.

Black turnstones were not common in 2013 like they have been in recent years. However, one large (17 birds) flock was observed at Johnson's Lee in fall. Three black turnstones were observed at Ford Point, Landing Cove and Sea Lion Rookery in either spring or fall, and one turnstone was seen at Crook Point, Ford Point and Trailer during one of the biannual visits. For reference, last year, only a handful of turnstones were present at all sites. In spring 2013, turnstones were present at three out of eight sites (Ford Point, Fossil Reef and Northwest-Talcott), and abundances ranged 2–12 individuals per site. In fall 2013, 2–16 turnstones were seen at eight sites (Crook Point, Cuyler Harbor, Fossil Reef, Johnson's Lee, Landing Cove, Northwest-Talcott, Orizaba Cove and Sea Lion Rookery).

Less common shorebirds such as wandering tattlers and willets are occasionally seen on the reefs while black-bellied plovers and snowy plovers usually inhabit adjacent beaches. Seabirds such as

cormorants, gulls, pelicans and occasionally pigeon guillemots, are sometimes observed resting on the reef or hunting in the nearshore zone.

Abundances of gulls often vary widely spatially and temporally. Less than 10 gulls (primarily western gulls) are typically seen at most sites. When large groups of gulls are observed they are normally just resting on the reef, whereas smaller groups and individuals are sometimes witnessed feeding. In 2013, gulls were more common than usual; flocks (20–30 gulls) were seen at Northwest-Talcott and Sea Lion Rookery. Additionally, 1–13 gulls were seen at nine other sites surveyed in spring or fall.

Cormorant numbers also tend to fluctuate in space and time. When present, they are typically not abundant. However, it is not uncommon to encounter several dozen cormorants at some sites such as East Point and Crook Point (common roosting locations) in fall. This year, 16 cormorants were seen at Crook Point in spring, and 50 cormorants were seen at East Point in fall.

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 at or within the immediate vicinity of 6 (Cat Rock, Fossil Reef, Harris Point, Northwest-Talcott, Otter Harbor and Trailer) out of the 17 sites sampled in spring (Figure 68). In fall, harbor seals were seen at four sites (Cat Rock, Johnson's Lee, Anacapa Middle West and Trailer). Note that all but two sites were sampled 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 typically observe weaned pups that have not yet gone to sea or adults coming ashore to molt. Seven elephant seals were seen at or nearby Fossil Reef and two were observed at Johnson's Lee in spring 2013 (Figure 68). In fall, 1–2 elephant seals were seen at Ford Point and Fossil Reef.

California sea lions, *Zalophus californianus*, were only seen at the two sites monitored at Santa Barbara Island. Approximately 40 individuals were observed at Sea Lion Rookery and 50 were at Landing Cove (Figure 68).

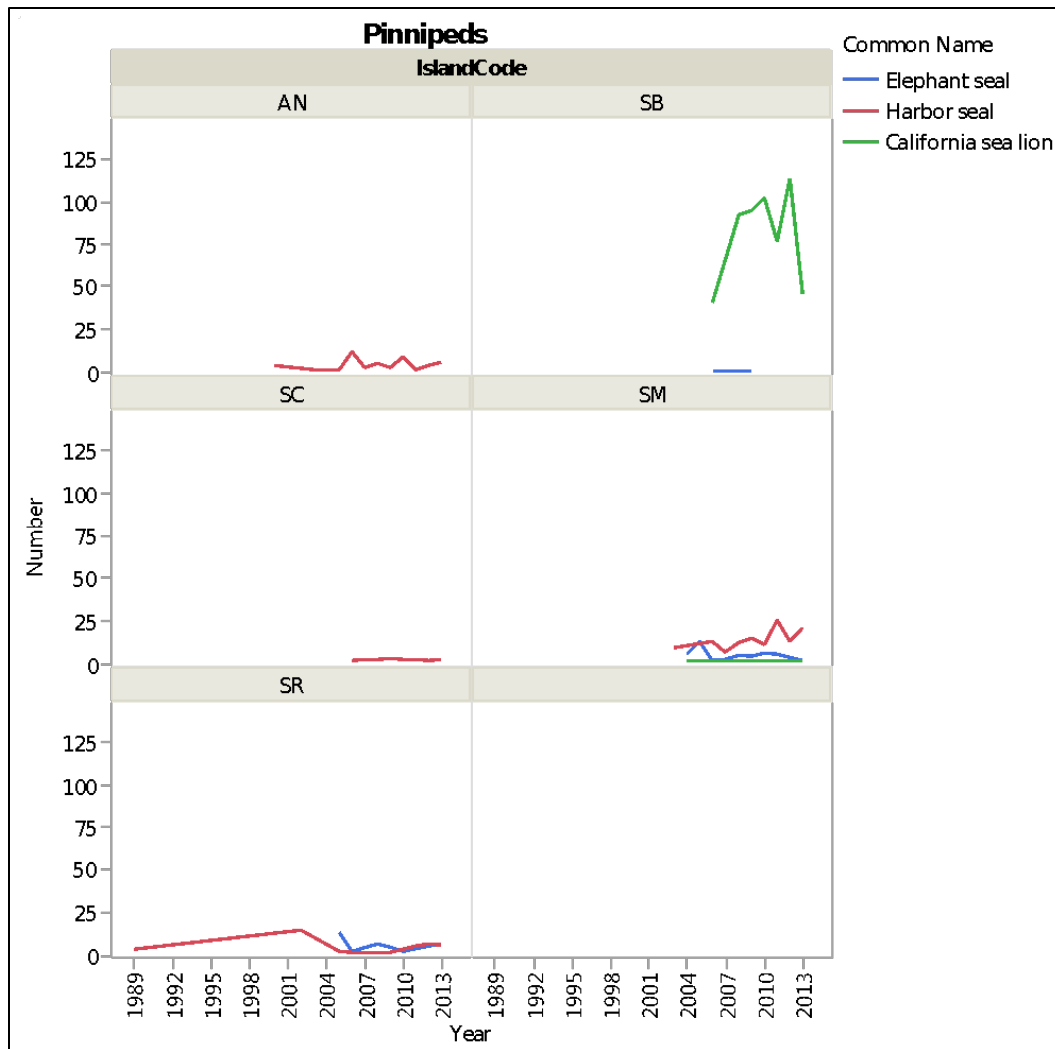


**Figure 68.** Mean number of pinnipeds pooled across sites at each island. AN, Anacapa Island; SB, Santa Barbara Island; SC, Santa Cruz Island; SM, San Miguel Island; SR, Santa Rosa Island.

## Visitation

Most visitors accessed the rocky intertidal at Frenchy's Cove, though some visitors also explored East Point and Prisoner's Harbor tidepools among other locations 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 4, Figure 69). 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.

**Table 4.** Visitors to South Frenchy's Cove, Anacapa Island in 2013 (visitation with Island Packers).

| Year | Month        | #Passengers | #Trips   |
|------|--------------|-------------|----------|
| 2013 | January      | 0           | 0        |
| 2013 | February     | 77          | 1        |
| 2013 | March        | 133         | 2        |
| 2013 | April        | 153         | 2        |
| 2013 | May          | 0           | 0        |
| 2013 | June         | 0           | 0        |
| 2013 | July         | 0           | 0        |
| 2013 | August       | 0           | 0        |
| 2013 | September    | 0           | 0        |
| 2013 | October      | 0           | 0        |
| 2013 | November     | 68          | 1        |
| 2013 | December     | 0           | 0        |
| 2013 | <b>Total</b> | <b>431</b>  | <b>6</b> |

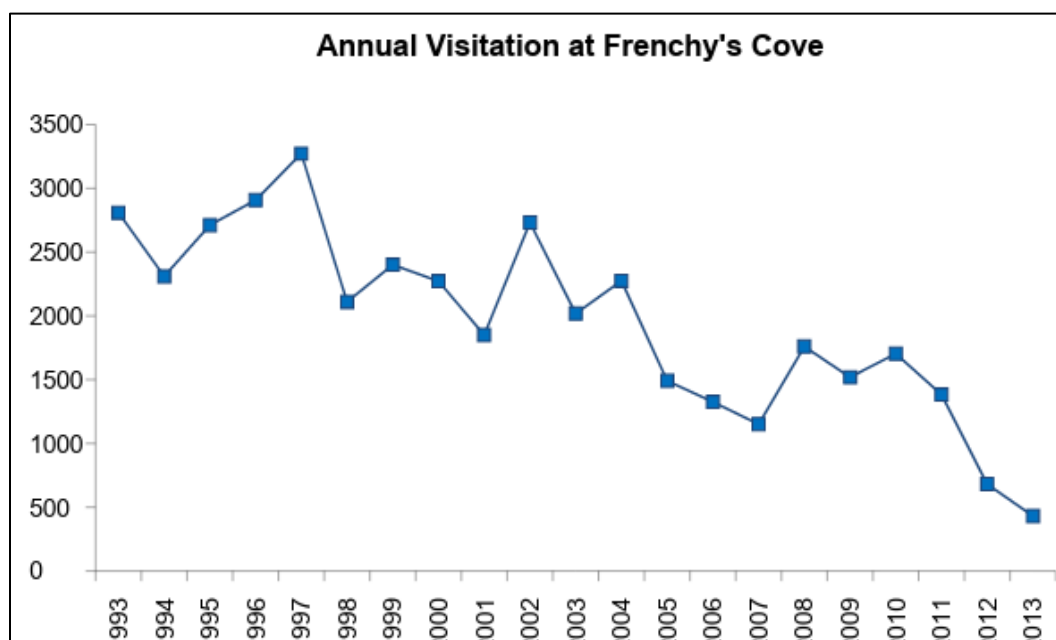


**Figure 69.** Annual commercial visitation at Frenchy's Cove, Anacapa (via Island Packers Company).

The total number of visitors from concession boats in 2013 was 431 passengers in 6 trips (Table 4). This was markedly less than the number of visitors in 2012 (681) and 2011 (1383) (Figure 70). In fact, visitation in 2013 was the lowest year since record keeping initiated in 1993. April was the top month for visitation with 153 passengers on 2 trips. Eighty-four percent of the visitation occurred in spring (February–May). No visitation by concession boats occurred from May to October and December.

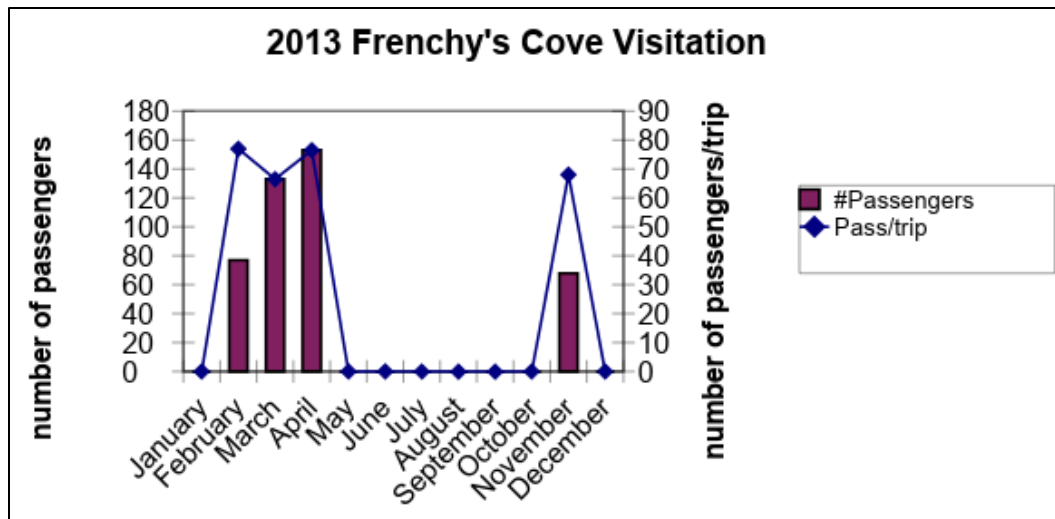


**Figure 70.** Monthly visitation at Frenchy's Cove, Anacapa Island (via Island Packers Company).

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## Appendix A. Program Notes

We experienced excellent working conditions at most sites throughout the year. However, strong northwest swell impacted our ability to complete field-scoring for some or all photo plots at Willows Anchorage, Northwest-Talcott and Cat Rock in spring. Additionally, above-average sized swell compromised searches for black abalone and sea stars at many of the same sites as well as Crook Point, East Point, Ford Point and South Frenchy's Cove. At East Point, swell impeded our ability to safely and accurately monitor the surfgrass transects during both monitoring seasons. Still, surfgrass cover was visually-estimated to be approximately 100% cover on all three transects in spring and fall.

We were unable to secure time on the NOAA Vessel Shearwater this year to assist with monitoring sites on Anacapa Island and the two sites (Scorpion Anchorage and Orizaba Cove) on Santa Cruz Island that require vessel access. In spring, we utilized kayaks to access the sites on Anacapa Island. Island Packers provided transportation to and from Scorpion Anchorage in spring and fall. The NPS Vessel Sea Ranger was used to access Anacapa sites in fall.

Orizaba Cove and Anacapa Middle East were not monitored in 2013 due to logistical constraints. It should be noted however that Anacapa Middle East was originally set up as a control site to monitor the effects of visitor usage on the adjacent site, Anacapa Middle West. As such, it has not received the full complement of monitoring including searches or measurements for black abalone, sea stars or owl limpets. Photo plots at Anacapa Middle East are also less numerous than other sites since they are only replicated three times per zone. Over the course of the program, it has been determined that visitor usage at Anacapa Middle West is significantly lower than originally expected. Based on this information and logistical difficulties in access, the program will be evaluating the need to continue monitoring Anacapa Middle East.

We participated in the MARINE workshop at Forks, Washington in Olympic National Park. Discussions centered on database management, citizen science, vouchering and program reviews for the NPS and BOEM.

One of the benefits of a long-term monitoring program at a network of sites is the capability to recognize and document the colonization and spread of non-native species. The invasive red alga, *Caulacanthus ustulatus*, has been observed at Anacapa Middle East and West sites since 2005. It was first documented in southern California in 1999 and has since exceeded the cover of several native red algal species at mainland sites south of Santa Monica Bay. It was still present at Anacapa Middle East and West in 2013, but did not appear to be significantly increasing in abundance. In fall 2013, we observed *C. ustulatus* to be growing at Northwest-Talcott, Santa Rosa Island. Some patches of the alga measured approx. 14 cm across. This is the first time that *Caulacanthus* has been observed at any site besides the two sites at Middle Anacapa. Unfortunately, the invasive alga is likely here to stay at Northwest-Talcott and Anacapa since removal experiments have proven unsuccessful (Smith et al. 2014).

Another invasive species, the brown alga, *Sargassum horneri*, was observed at Anacapa Middle West in fall 2013 for the first time. It was first observed in southern California in Long Beach Harbor in October 2003. Since then, it has appeared in numerous subtidal locations along the mainland as far south as Baja, CA and around the islands: San Clemente, Catalina, Santa Barbara, Anacapa, and Santa Cruz. *Sargassum horneri* was documented in the intertidal zone at one of the MARINe monitoring sites at Shaw's Cove in Laguna Beach in fall 2009 (J. Smith personal communication, n.d.). This species is not expected to impact the intertidal zone to the same extent it does in the subtidal, but it may occur anywhere from 0 ft MLLW to about 20 m depth and form dense thickets that could shade out other species. Its palatability is unknown at this time but it does not appear to be a preferred food item.

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

## Appendix B. Trip Reports

The following are trip reports from the Rocky Intertidal Monitoring 2013 field season (March 2013 through January 2014). Reports were prepared by Stephen Whitaker. The reports summarize the work done during each monitoring event, provide a quick summary of the data collected and serve as metadata for the information collected.

### **San Miguel Island, March 8–12, 2013**

(Database event #2013-A)

Prepared by Stephen Whitaker

#### **Purpose:**

To monitor rocky intertidal sites at San Miguel Island.

#### **Personnel:**

- Stephen Whitaker, Biological Technician, Channel Islands National Park
- David Kushner, Marine Biologist, CHIS
- Josh Sprague, Biological Technician, CHIS

#### **Procedure and General Observations:**

Channel Islands Aviation transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at all four sampling sites. Sea stars and black abalone were counted during 30-minute site-wide searches at all four sampling sites. *Lottia gigantea* were not sampled this season at any of the four sampling sites. Motile invertebrates were not sampled this season at any of the four sampling sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded at all sites. Hobotemp Tidbit temperature loggers were downloaded at Otter Harbor and Crook Point. Mussel sizes and mussel bed depth were not measured at any of the four sampling sites. Channel Islands Aviation provided transportation off the island on Friday, March 12th.

#### 3/8/13. Otter Harbor.

Low tide –0.7 ft at 1350 hrs. The conditions were conducive to sampling with partly cloudy sky, moderate (10–15 kt) wind and relatively small (3–4') swell. Over an inch of rain fell last night and early this morning. Surprisingly, we were still able to land on both airstrips on the island during late morning. After dropping our gear at the Ranger Station we flew to the west end which allowed for quick access to Otter Harbor. There were 5 western gulls and 4 black oystercatchers along with 21 harbor seals at the site upon arrival. Unfortunately the charismatic harbor seal that we have encountered at the site during the past several visits was not present. No harbor seal pups were observed at the site. One large immature male elephant seal was seen in the surge channel. Water temperature was 13.3 degrees Celsius. The site was monitored from 1200 to 1645.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by David. He began the search approximately 40 m west of R2 and ended at the east end of the site near the surge channel. Admittedly, less effort was spent searching the east end of the site compared to the rest of the site. N=144 black abalone were observed site-wide (sizes ranged 60–177 mm, most individuals were either touching or were located 1–10 cm apart from one another). A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=121 ochre stars were observed site-wide from approximately 40 m west of R2 to the east end near the surge channel (sizes ranged 80–160 mm, mode = 120 mm). Owl limpets (*Lottia gigantea*) were not counted and measured in the fixed plots. Mobile invertebrates were not sampled. The field log was completed by Stephen.

No plot repairs were conducted during this visit due to lack of time. However, plot 370 was missing LR corner, 362 was missing LL and 379 was missing part of the number tag. All plots were easily located.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 38.2% mean barnacle cover. The majority of cover in the five plots was occupied by barnacles. Plot 374 remains dominated by red algae comprised primarily of *Chondracanthus* and *Mazzaella*. *Endocladia* plots had 49.8% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 3.2% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Endocladia* (mean=31.8%). Mussel (*Mytilus californianus*) plots had 47.6% mean cover. The majority of cover in the five plots was occupied by mussels.

### 3/9/2013. Crook Point.

Low tide –0.7 ft at 1427 hrs. The conditions were less than ideal with partly cloudy sky, high (15–25 kt) wind and moderate-sized (2–4') swell. There were 16 cormorants, 5 gulls, 2 black oystercatchers and 1 black turnstone at the site upon arrival. One immature male elephant seal was seen near the bluff at the entry to the site. N=44 elephant seal wieners were observed on the beach east of the site. The site was monitored from 1100 to 1630.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All photoplots were scored in the field by Stephen. A fifteen-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by David. N= 8 black abalone were observed site-wide from the east end excluding the offshore reef to the east end in line with plot 388. An extended search lasting 10 minutes from plot 388 to the west end of the reef resulted in five additional black abalone (sizes ranged 97–170 mm, most individuals were located 1–5 m or more than 5 m apart from one another). A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=42 ochre stars were observed site-wide (from the east end excluding the offshore reef to the east end in line with plot 388) (sizes ranged 50–130 mm, mode = 120 mm). Note that conditions were not optimal for conducting sea star or black abalone searches. Mobile invertebrates were not sampled. The field log was completed by Stephen.

Plot repairs were conducted by David and Josh. Bolts were not added but corners were repaired on plots 148, 137, 150, 389, 397, 398 and 387. Photos were consulted to properly locate plot 397.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 34.4% mean barnacle cover. The majority of cover in the five plots was bare rock. *Endocladia* plots had 16.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plot 389 had 45% mussels present. The rockweed plots had 4.8% mean *Hesperophycus* and no *Silvetia* cover. Most of the cover within the rockweed zone was dominated by mussels (mean=28.4%). Mussel (*Mytilus californianus*) plots had 78.6% mean cover. The majority of cover in the five plots was occupied by mussels.

*Ulva/Cladophora* remain dominant throughout the site. *Mytilus* is very abundant on both reefs. The rockweed is surprisingly difficult to identify at Crook Point. Most plants have very sparse tiny white hairs present on their underside indicating the presence of small *Hesperophycus* (Harris Point variety). Otherwise the rockweed appears the same as *Silvetia*.

### 3/10/2013. Harris Point.

Low tide -0.6 ft at 1545 hrs. The conditions were acceptable with partly cloudy sky, mild (10–15 kt) wind and moderate (3–4') swell. There were not any shore birds observed at the site, but two black oystercatchers were seen throughout the day on the reef located east of the site. Five harbor seals were seen lounging at the site upon arrival. No pups were present. The site was monitored from 1230 to 1730.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All 25 photoplots at the site were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by David. N=12 black abalone were observed site-wide (from R2 at the west end within the boulder field to the crack east of plot 430) (sizes ranged 100–175 mm, most individuals were located spaced 1–5m or more apart from one another). A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=24 ochre stars were observed site-wide (from R2 at the west end within the boulder field to the crack east of plot 430) (sizes ranged 70–200 mm, weak mode = 160–170 mm). Additionally, N=8 *Patiria* and N=5 *Pycnopodia* were seen throughout the site. Owl limpets (*Lottia gigantea*) were not counted and measured in the fixed plots. Mobile invertebrates were not sampled. The field log was completed by Stephen.

Plot repairs were conducted by Josh and David. Plots 427, 439 and 436 received new number tags and plots 429 and 430 had the LR and LL corners repaired, respectively.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 70.2% mean barnacle cover. The majority of cover in the five plots was occupied by barnacles. *Endocladia* plots had 55% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 47.2% mean *Hesperophycus* cover. Most of the cover within the rockweed zone was dominated by *Hesperophycus*. Mussel (*Mytilus californianus*) plots had 13% mean cover. The majority of cover in the five plots was occupied by non-coralline crust (mean=27%). The *Tetraclita* zone had 9.2% mean *Tetraclita* cover and was dominated by non-coralline crust (mean=30.4%).

Overall the biological condition of the site appears similar to that of previous visits with little to no change observed to the plots or species assemblages. Unlike many other sites, most plots at Harris Point remain dominated by the taxa they were originally designed to monitor. However this site also is somewhat unique in that several of the *Endocladia* plots (primarily upper intertidal) have lower intertidal species such as *Gelidium coulteri* gradually creeping in to occupy space; the opposite transition is occurring in some of the mussel and *Tetraclita* plots which have measurable abundances of *Endocladia* and *Chthamalus* spp./ *Balanus* spp. *Mastocarpus*/ *Mazzaella* spp. were difficult to decipher during this visit.

### 3/11/13. Cuyler Harbor.

Low tide -0.1 ft at 1617 hrs. The conditions were good with partly cloudy sky, light-medium (5–15 kt) wind and medium-sized (4–6') swell. There was one black oystercatcher at the site upon arrival. One elephant seal weiner was observed swimming near the base of the site after we arrived. Along the beach the following were observed: Approx. 161 elephant seal wieners, 7 elephant seal bulls, 3 black oystercatchers, approx. 35 whimbrels, approx. 200 gulls (mixture of western and California gulls, roughly 3:1 ratio), one harbor seal mother and pup pair, and two gaunt California sealion pups. At the entrance to Nidever Canyon, approx. 135 elephant seal wieners were seen bathing in the freshwater pool near the base of the stairs. Dead animals seen along the beach included: 3 sealion pups, 2 elephant seal wieners and one unidentified pinnipeds. The site was monitored from 1355 to 1700.

Plots were photographed by David. Site panoramas were photographed by David. All 20 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by David. Zero black abalone were observed site-wide. A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=52 ochre stars were observed site-wide (sizes ranged 50–160 mm, mode = 130 mm). The field log was completed by Stephen.

Plot repairs were conducted by David and Josh. Plots 411, 415, 404, 402 and 401 received repairs (epoxy patches).

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 42.2% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 37.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 8.6% mean *Silvetia* cover. The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 78% mean cover. The majority of cover in the five plots was occupied by mussels.

At the site, all sizes of mussels were seen (extremely large mussels along with newly recruited individuals). The barnacle zone was dominated by *Balanus*. Rockweeds present were primarily *Silvetia*, but a small patch of *Hesperophycus* was present. *Silvetia* appeared tattered at the lower reaches of the zone.

## **Santa Cruz Island, March 22–26, 2013**

(Database event #2013-C)

Prepared by Stephen Whitaker

### **Purpose:**

To monitor rocky intertidal sites at Santa Cruz Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Jessie Altstatt, VIP
- Connie Jenkins, VIP

### **Procedure and General Observations:**

Island Packers transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at all sampling sites. Sea stars and black abalone were counted during 30-minute site-wide searches. Surfgrass transects were read at Fraser Cove and Trailer. *Lottia gigantea* were not sampled this season at any sites. Motile invertebrates were not sampled this season at any sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded at all sites. The Hobotemp Tidbit temperature logger was downloaded at Willows Anchorage. Mussel sizes and mussel bed depth were not measured at any sites. Island Packers provided transportation off the island on 3/26.

#### 3/22/2013. Prisoners Harbor.

Low tide 0.2 ft at 1340 hrs. The conditions were conducive to sampling with clear sky, moderate (10–15 kt) wind and medium-sized (for Prisoners Harbor) swell. The water in the harbor was murky due to the wind stirring it up. No measurable precipitation occurred in the last week. There were no birds or pinnipeds at the site upon arrival, but one harbor seal was seen offshore of the site during the survey. One sailboat was anchored nearby the site with two people on board. The site was monitored from 1230 to 1645.

Plots were photographed by Jessie. Site panoramas were photographed by Jessie. In addition, Jessie photographed several plots emphasizing the presence of the stainless steel bolts to use for a project review (installing more bolts at monitoring sites). All 25 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Jessie. N=4 black abalone were observed site-wide (sizes were 98, 72, 65 and 103 mm, most individuals were located several meters apart from one another). A twenty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Jessie. N=31 ochre stars were observed site-wide (sizes ranged 90–140 mm, mode = 100 mm). The field log was completed by Stephen.

No plot repairs were conducted during the visit. However, *Mytilus* 841 needs UR and LL corner markers.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 29.6% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 29.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The *Silvetia* plots had 3.8% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Chthamalus* spp./ *Balanus* spp. The *Hesperophycus* plots had 4.8% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean= 33.2%). Mussel (*Mytilus californianus*) plots only had 0.8% mean cover. The majority of cover in the five plots was occupied by *Chondracanthus canaliculatus* (mean= 33.8%) and *Phragmatopoma* (mean= 24.2%).

Despite the incredibly low abundances of mussels in the *Mytilus* plots, mussels were numerous (most were small). Both *Mytilus californianus* and *M. trossulus/ galloprovincialis* were present at an approximate 80:20 ratio, respectively. *Septifer* was also fairly common. *Scytosiphon* remained abundant near the splash zone on the west reef. Polysiphonious red algae were seen commonly growing epiphytically on other algae and fauna. Some (approx. 10%) algae (mostly *Mazzaella*, articulated corallines and *Chondracanthus*) appeared to be bleached. Barnacles (*Chthamalus* spp./ *Balanus* spp.) appeared to be highly abundant particularly on the west reef. Both species of rockweeds appeared tattered and in poor condition overall (maybe only due to long emersion time).

### 3/23/13. Willows Anchorage.

Low tide 0.1 ft at 1430 hrs. The conditions were limiting due to the powerful waves/ surge. The sky was clear and wind was light. Three black oystercatchers and one western gull were seen at the site throughout the day. One harbor seal was seen swimming in the cove. Numerous pods of whales (likely gray whales) were seen offshore of the site throughout the day. A sailboat (trimaran) anchored in the cove and four people skiffed ashore and went for a hike. Three other people went SCUBA diving. The site was monitored from 1145 to 1645.

Plots were photographed by Jessie. Site panoramas were photographed by Jessie (note that R3 was not photographed due to large waves). All of the photoplots except the mussel plots (swell was too big to safely and accurately sample the lower zone) were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Jessie. N=314 black abalone were observed in the area of the site between plots 936 and 950 (sizes ranged 40–130 mm, most individuals were observed touching one another). A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen. N=175 ochre stars were observed site-wide (sizes ranged 50–140 mm, mode = 100 mm). It should be noted that searches for black abalone and particularly sea stars were compromised by large waves frequently inundating the site. The field log was completed by Stephen. The temperature logger was downloaded at 1540.

No plot repairs were conducted this visit, but several of the mussel plots could use new bolts to mark the locations of corners.

*Endocladia* plots had 33.8% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The *Silvetia* plots had 5.6% mean *Silvetia* cover (only one plot had *Silvetia* present). The majority of point contacts in the five plots were bare rock. The *Hesperophycus* plots had 0.8%

mean *Hesperophycus* cover (only one plot had *Hesperophycus* present). The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 56.2% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

Most of the articulated corallines and a small proportion of *Endocladia* (primarily in the upper reaches of the site) appeared bleached. The presence of black abalone at the site is quite significant since abalone can be seen virtually everywhere including out in the open. The site appeared to be in good shape overall. The only apparent damage to the site was seen in the *Phragmatopoma* zone on the eastern side along with some tattered rockweed thalli.

### 3/24/13. Trailer.

Low tide 0.0 ft at 1532 hrs. The conditions were good with clear sky, light wind and medium-sized (2–4') swell. There was a mother/pup (the pup was relatively large indicating that it was older) pair of harbor seals along with a black oystercatcher and a black turnstone present at the site upon arrival. An urchin fishing vessel worked an area several hundred meters offshore of the site. The site was monitored from 1300 to 1645.

Plots were photographed by Jessie. Site panoramas were photographed by Jessie. All photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Jessie. N=59 black abalone were observed site-wide from the surge channel at the east end just passed surfgrass transect-3 to the *Mytilus* plots at the west end (sizes ranged 45–165 mm, most individuals were located 1–10 cm apart from one another). An extended search from mussel plots to the owl limpet plots at west end of site revealed N=8 additional black abalone. A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Jessie. N=179 ochre stars were observed site-wide (sizes ranged 70–160 mm, mode = 80 mm). Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 92, 60 and 13%, respectively. *Phyllospadix* was moderately fouled by *Smithora*. The field log was completed by Stephen.

No plot repairs were conducted. All plot markers were intact, but some epoxy corners should be replaced with bolts.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 36.8% mean barnacle cover. The majority of point contacts in the five plots were bare rock. The *Silvetia* plots had 47.2% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Silvetia*. The *Hesperophycus* plots had 8.2% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was *Silvetia* (mean= 39%). Mussel (*Mytilus californianus*) plots had 48.2% mean cover. The majority of cover in the five plots was dominated by mussels, though *Phragmatopoma* (mean= 25.6%) was also dominant particularly in three plots.

Both species of rockweeds were abundant and appeared healthy. Some recruitment of *Silvetia* was observed. Barnacles (particularly *Chthamalus*) were very common throughout the upper reaches of the site and recruitment appeared to be high. *Mytilus* was common even though recruitment for the species was low and several photoplots were dominated by *Phragmatopoma*. Motile invertebrates (primarily *Pachygrapsus*, *Tegula funebris*, *Acanthina* and *Nucella*) were highly abundant.

3/25/13. Fraser Cove.

Low tide 0.0 ft at 1359 hrs. The conditions were excellent with mostly clear sky, light wind and moderate-sized (2–4') swell. Throughout the course of the day, one western gull and 5 black oystercatchers were seen at the site. One elephant seal weiner was seen on the beach in the cove located east of the site. It appeared emaciated. The site was monitored from 1300 to 1815.

Plots were photographed by Jessie. Site panoramas were photographed by Jessie. All 35 photoplots were scored in the field by Stephen. The 10 rockweed photoplots were scored in the field the day before (3/24) following the completion of monitoring at Trailer. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Jessie. N=2 black abalone were observed site-wide from plot 891 to plot 905 (sizes were 110 and 105 mm). A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Jessie. N=56 ochre stars were observed site-wide from plot 891 to plot 905 (sizes ranged 90–180 mm, mode = 130 mm). Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 71, 46 and 86%, respectively. Note that T-1 was located through triangulation. It was drawn incorrectly on the map (it actually is orientated opposite of the direction that it is drawn). It is necessary to determine how long the transect has been sampled incorrectly. I know that the last time it was monitored (12/12) it was incorrectly placed. However, I think that Dan always monitored it in the correct placement. The field log was completed by Stephen.

No plot repairs were necessary. A bolt was added at the east end of surfgrass T-1 (epoxy marker was present).

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 22.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 45% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots had 17.6% mean *Silvetia* cover (only three plots had *Silvetia* present). The majority of point contacts in the five plots were bare rock. The *Hesperophycus* plots had 27.8% mean *Hesperophycus* cover. The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 66.8% mean mussel cover. The majority of cover in the five plots was occupied by *Mytilus californianus*. *Pollicipes* plots had 17.8% mean *Pollicipes* cover. The majority of cover in the five plots was occupied by *Mytilus californianus* (mean= 42%). Tar plots had 41.4% mean tar present.

All core species (*Mytilus*, *Endocladia*, *Chthamalus*, *Balanus*, *Pollicipes* and *Tetraclita*) were abundant at Fraser Cove despite abundances in the photoplots. Low levels of recruitment were observed for *Mytilus* and *Chthamalus*. *Phragmatopoma* remains dominant throughout much of the lower zone. At Forney's Cove, both species of rockweeds were abundant and appeared healthy. No recruitment for either species was observed, but we were rushed to complete the monitoring due to the incoming tide.

## **Santa Rosa Island, April 2–9, 2013**

(Database event #2013-C)

Prepared by Stephen Whitaker

### **Purpose:**

To monitor rocky intertidal sites at Santa Rosa Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Connie Jenkins, VIP
- Kari Eckdahl, VIP
- Mario Diaz, VIP

### **Procedure and General Observations:**

(Park boat, Island Packers, Channel Islands Aviation) transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at all sites with the exception of Northwest-Talcott whereby only the *Mytilus* plots were scored. Sea stars and black abalone were counted during 30-minute site-wide searches at all five sites. Surfgrass transects were read at Northwest-Talcott, but could not be safely and accurately sampled at East Point. *Lottia gigantea* were (not) sampled this season at any of the monitoring sites. Motile invertebrates were not sampled this season at any of the monitoring sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded at all sites. Hobotemp Tidbit temperature loggers were downloaded at Johnson's Lee and Fossil Reef but not at Northwest-Talcott. Mussel sizes and mussel bed depth were not measured at any of the monitoring sites. Channel Islands Aviation provided transportation off the island on 4/9.

### 4/2/2013. Skunk Point.

Low tide –0.1 ft at 1010 hrs. The conditions were decent with clear sky, high (20–25 kt) wind and light (2–3') swell. *No precipitation has occurred on the island during the past week.* The beach was monitored from 1400 to 1800.

We travelled out to the island today on the Ocean Ranger. Given the mid-morning low tide we decided to count snowy plovers, carcasses and marine debris at Skunk Point. The reefs west of Skunk Point had N=13 black oystercatchers and N=6 western gulls. N=9 snowy plovers were observed on the beach in the vicinity of the shipwreck. Three immature California sealion carcasses were seen with no discernible cause of mortality. One harbor seal carcass was also seen. Near Abalone Rocks, approximately 150 grebes were observed several hundred meters offshore. Inshore, a group (N=15) of birds later determined to be Brant geese were observed. As a side note, a similar-sized group of Brant geese were seen later (4/5) in the week nearby Northwest-Talcott.

#### 4/3/2013. Johnson's Lee.

Low tide 0.0 ft at 1126 hrs. The conditions were excellent with overcast sky in the morning becoming mostly clear and in the afternoon, no wind and light (1–3') swell. There were two western gulls and six black oystercatchers along with two elephant seals at the site upon arrival. N=12 elephant seals (mostly juveniles) were present on the beach situated behind the site. The sand level at the site appears to be much higher than usual particularly around plots 504 and 509 at the east end of the site. In fact, plot 504 was mostly inundated with sand. The site was monitored from 0900 to 1415.

Plots were photographed by Kari. Site panoramas were photographed by Kari. All 19 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=18 black abalone were observed site-wide from R1 at the west end to the tip of the reef at the east end not including any of the offshore reefs (sizes ranged 85–174 mm, most individuals were either located 11–50 cm or >5 m apart from one another). The black abalone plots were not sampled. Note that a flashlight was used during the abalone search. A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen. N=251 ochre stars were observed site-wide (see area searched during black abalone search) (sizes ranged 40–130 mm, mode = 90 mm). The field log was completed by Stephen.

No plot repairs were necessary during this visit.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 32.4% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 28.4% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 34.2% mean cover overall including the four new plots. Without the additional plots the original five plots had 10.2% mean mussel cover (only two plots had mussels present and of those two, plot 513 only had 1% mussels). The majority of cover in the five plots was occupied by *Phragmatopoma*.

*Phragmatopoma* remains high particularly in the lower reaches of the site. Still, *Mytilus* along with *Pollicipes* are abundantly located slightly above *Phragmatopoma*. *Tetraclita* are mixed in at low abundances throughout the mussel beds. *Anthopleura sola*, *A. elegantissima*, and to a lesser degree, *A. xanthogrammica*, dominate tidepools not covered by *Phragmatopoma* in the lower zones. At approximately 0.0 MLLW *Chondracanthus canaliculatus* is most common. *Phyllospadix* spp. and *Egregia* are fairly abundant below 0.0 MLLW. The high tide zone is populated with moderate to high abundances of *Chthamalus/ Balanus* spp. and *Porphyra*. *Porphyra* is most abundant near the center of the site where the elephant seals frequently trample during haul-out. Plot 513 appears to be scoured.

#### 4/4/2013. Fossil Reef.

Low tide –0.2 ft at 1228 hrs. The conditions were excellent with partly cloudy sky in the morning turning mostly sunny in the afternoon, light (5–10 kt) wind and minimal (1–3') swell. There were six gulls and three black oystercatchers along with six harbor seals (included two mother/ pup pairs) and seven elephant seals at the site upon arrival. There were N=35 elephant seals on the beach located west of the access rock. The site was monitored from 1030 to 1615.

Plots were photographed by Kari. Site panoramas were photographed by Stephen. All 20 photoplots were scored in the field by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=21 black abalone were observed site-wide from the east end of the western reef including the monitoring reef and the flat area with large boulders back to the west side of the eastern reef (sizes ranged 60–152 mm, most individuals were located 1–5 m apart from one another). An additional N=10 black abalone were located while measuring individuals at the site. An extended search of the area located outside of the survey area (mostly around east reef) resulted in N=9 additional black abalone. One abalone appeared to have withering syndrome since its foot was about half the volume of its shell. The black abalone plots were not sampled. A flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen. N=457 ochre stars were observed site-wide from the cobble beach along the west side of east reef including the flats, main monitoring reef and flats on west side of the monitoring reef (the east side of the west reef was not sampled) (sizes ranged 40–140 mm, mode = 90 mm). During the search, N=14 *P. giganteus* and N=2 *Patiria* were observed. The field log was completed by Stephen.

Bolts were added to several plots by the entire field crew (Table B-1). All bolts added to the upper left corners of plots were etched with 1–5 as it corresponded to their chronological order.

**Table B-1.** Bolts added to fixed plots.

| Plot Number | Corners receiving bolts |
|-------------|-------------------------|
| 617         | Lower left, upper right |
| 618         | Lower left, upper right |
| 619         | Lower left, upper right |
| 610         | Upper left              |
| 615         | Upper right             |
| 608         | Upper left              |
| 609         | Upper left              |
| 611         | Upper left, upper right |
| 614         | Upper left              |

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 26.8% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 39.4% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 87.6% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 0.2% mean cover (plot 623 was the only plot with mussels present – 1%). The majority of cover in the five plots was occupied by a diverse mixture of species dominated by *Phragmatopoma*.

*Mytilus* was only seen in relatively small patches toward the end of the reef and as solitary individuals scattered throughout the vicinity of the lower reef. *Silvetia* was highly abundant and occupied more space than most other biota. *Endocladia* may have been the second most abundant taxa present at the site. Diversity of invertebrates and algae appears to be higher at Fossil Reef compared to most other monitoring sites since partly because numerous species normally encountered in the subtidal were commonly seen in the intertidal.

#### 4/5/2013. Northwest-Talcott.

Low tide -0.2 ft at 1317 hrs. The conditions were decent despite the relatively high (20–25 kt) wind. The light (3–4') swell/surge allowed for ample time working in the lower intertidal zone. There were 22 gulls and 2 black oystercatchers along with 10 harbor seals (including one pup) at the site upon arrival. A flock (approx. 12) of Brant geese were seen on the water near shore east of the monitoring site before departing. Dan Richards informed me that they commonly feed on seagrasses such as *Phyllospadix*. The site was monitored from 1100 to 1645.

Plots were photographed by Kari. Site panoramas were photographed by Stephen. Only the mussel photoplots were scored in the field by Stephen. All others will be scored from photographs in the office. Rather than spend valuable time scoring photoplots in the field, it was decided that conducting plot repairs was a more valuable use of time. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. One black abalone (151 mm) was observed during the site-wide search near *Mytilus* plot 554. The black abalone plots were not sampled. A flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Kari. N=1 *P. ochraceus* and N=3 *P. giganteus* were observed site-wide (sizes were not recorded). Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 97, 95 and 40%, respectively. *Phyllospadix* on T-1 had minimal cover of epiphytic algae (primarily *Ulva*), but surfgrass nearby T-2 and T-3 was heavily fouled with both *Smithora* and *Ulva*. The field log was completed the next day after visiting the site by Stephen.

A significant amount of time was spent conducting plot repairs. Bolts etched with 1–5 notches (corresponding to the chronological order of plots within each zone) were added to the upper left corners of nearly every plot. Additionally, most plot corners received new epoxy markers indicating the correct orientation. See the photolog for details on plot repairs.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 9% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 20.4% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots had 42.2% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 39.2% mean cover. The majority of cover in the five plots was occupied by mussels, but the all the plots were fairly diverse with coralline crusts and articulated corallines the next most abundant taxa.

Mussels were present in low to moderate densities as was *Endocladia*. *Silvetia* appeared to be second only to *Phyllospadix* in terms of abundance throughout the site. Ephemeral algae (*Ulva*, *Porphyra*, *Scytosiphon* and *Endarachne*) were present in high abundances throughout many of the lower areas including the tidepools and surfgrass beds.

#### 4/6/2013. East Point.

Low tide -0.2 ft at 1359 hrs. The conditions were okay for sampling all the photoplots, but the powerful swell (6-8') prevented the surfgrass transects from being sampled and the sea star and black abalone searches were compromised. The sky was clear with high (20-30 kt) wind. There were two black oystercatchers and one unidentified small brown bird (likely a sparrow) at the site upon arrival. N=37 cormorants were seen on the reef north of the site at arrival. The site was monitored from 1110 to 1600.

Plots were photographed by Kari. Site panoramas were photographed by Stephen. All 25 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=32 black abalone were observed site-wide (sizes ranged approx. 20-163 mm, most individuals were touching one another). Note that two small (approx. 20 and 30 mm) black abalone were revealed in a picture taken at the site. The black abalone plots were not sampled. A flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Connie. N=140 ochre stars were observed site-wide (sizes [measured by Mario] ranged 60-120 mm, mode = 100 mm). Note that both the abalone and sea star searches were compromised slightly by the presence of large waves impacting the lower reaches of the site.

Surfgrass transects were not sampled due to the large waves. However, lulls between the sets of waves allowed for qualitative observations revealing that *Phyllospadix* in the transects appeared to be healthy and abundant (appeared to be nearly 100% cover within all three transects) even though most of the surfgrass was heavily-fouled with *Smithora*.

The field log was completed by Stephen.

No plot repairs were necessary during this visit.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 46.2% mean barnacle cover. The majority of cover in the five plots was occupied by barnacles. *Endocladia* plots had 58.2% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots had 10.6% mean *Silvetia* cover. The majority of point contacts in the five plots were bare rock. The *Hesperophycus* plots had 26.8% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Endocladia* (mean= 39.6%). Mussel (*Mytilus californianus*) plots had 34.2% mean cover. However, only two plots (593 and 594) had mussels present. The majority of cover in the five plots was occupied by *Phragmatopoma* (mean= 58.8%).

The mussel bed on the north side of the reef is still dominated by *Phragmatopoma* and only solitary mussels were seen scattered throughout. Sea star abundances appear to be lower compared to

previous visits. Little to no mussel recruitment was observed. Barnacles, particularly *Chthamalus*, were densely populated in the upper reaches of the site with high recruitment observed.

4/7/2013. Ford Point.

Low tide 0.0 ft at 1454 hrs. The conditions were decent for sampling despite high (30–40 kt) wind and medium to large (5–6') swell. The conditions were workable since the site was largely protected from the high wind. Gusts would blow through along shore from time to time requiring that all objects be tucked away to avoid losing them. Large sets of waves originating out of the south impacted the site enough to compromise the black abalone and sea star searches. There were five black oystercatchers and three black turnstones at the site upon arrival. Four to five black oystercatchers flew on and off the site all day long. The beach located east of the site was densely packed with elephant seal wieners along with approx. a dozen harbor seals comprised mostly of mother/pup pairs. The site was monitored from 1145 to 1700.

Plots were photographed by Kari. Site panoramas were photographed by Stephen. All 15 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=47 black abalone were observed site-wide (from the area in the vicinity of abalone plot 535 to east end of the site near 534) (sizes ranged 38–163 mm, most individuals were located 1–10 cm apart from one another). The black abalone plots were not sampled. A flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen. N=105 ochre stars were observed site-wide (from the area in the vicinity of abalone plot 535 to east end of the site near 534) (sizes [measured by Mario] ranged 40–140 mm, mode = 80 mm). The field log was completed by Stephen.

Etched bolts were installed in the upper left corners of plots 527, 529 and 532–533. Plot 529 also received bolts in the upper right and lower left corners. 528 received bolts in the upper right and lower left corners.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 17.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 24.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 36.8% mean cover. The majority of cover in the five plots was occupied by mussels despite the fact that *Mytilus* were only present in three out of five plots. The second-most abundant species in the mussel plots was *Phragmatopoma*.

*Phragmatopoma* was abundant throughout most of the zone previously occupied by *Mytilus*. Medium-sized mussel beds were still present however, but recruitment was not observed for the species. Black abalone densities appear to be increasing every successive visit and recruitment is likely occurring since several individuals measuring <60 mm were observed. There appears to be a lot of bare rock at this site and diversity appears to be lower than most other sites. Still, most target species aside from rockweeds are present in moderate abundances.

## **Santa Cruz Island, April 19, 2013**

(Database event #2013-D)

Prepared by Stephen Whitaker

### **Purpose:**

To monitor the rocky intertidal site Scorpion Rock at Santa Cruz Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Josh Sprague, Biological Technician, CHIS
- Dan Richards, Retired CHIS Biologist

### **Procedure and General Observations:**

Island Packers transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at Scorpion Rock. Sea stars and black abalone were counted during 30-minute site-wide searches at Site A and Site B (note that an extended search was conducted for black abalone at Site B). There are no *Lottia gigantea* plots at Scorpion Rock. Motile invertebrates were not sampled this season at Scorpion Rock. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers are not present at Scorpion Rock. Mussel sizes and mussel bed depth were not measured at Scorpion Rock. Island Packers provided transportation off the island at the end of the day.

#### 4/19/2013. Scorpion Rock.

Low tide 0.6 ft at 1231 hrs. The conditions were excellent with clear sky, light (5–10 kt) wind and minimal (1–2') swell. No precipitation had been detected for more than a week. There were no shore birds or pinnipeds at Site A upon arrival. However, at Site B two surf scoters and one black oystercatcher were seen. The sites were monitored from 1030 to 1500.

Plots were photographed by Josh. Site panoramas were photographed by Josh. The 20 photoplots at Site A were scored in the field by Stephen, and the five rockweed plots at Site B were scored by Dan.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence at Site A by Dan. N=15 black abalone were observed site-wide at Site A (sizes ranged 40–131 mm, most individuals were located 11–50 cm apart from one another). N=101 black abalone were observed site-wide (area includes the boulder field) at Site B during a 83 minute survey (sizes ranged 50–150 mm, most individuals were located 1–10 cm apart from one another). One slightly shrunken abalone (still active) was observed at site B by Dan.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence at Site A by Josh. N=162 ochre stars were observed site-wide (sizes ranged 70–150 mm, mode = 100 mm). The field log was completed by Stephen.

Josh installed bolts in the lower right corners of plots 802 and 819.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 23.6% mean barnacle cover. The majority of cover in the five plots was either bare rock (mean= 37.8%) or *Endocladia* (mean= 34.4%). *Endocladia* plots had 58% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Hesperophycus* plots had 31.4% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Endocladia* (mean= 30.4%). Mussel (*Mytilus californianus*) plots had 1% mean mussel cover. The majority of cover in the five plots was occupied by *Tetraclita* (mean= 31.4%). The *Tetraclita* plots had 52.2% mean *Tetraclita* cover.

*Chthamalus/Balanus* and particularly *Tetraclita* were very abundant at Site A, and recruitment appears to be high for all barnacle species. *Endocladia* appears to be healthy and abundant at the small site (Site A). Dan recalls *S. purpuratus* being significantly more abundant compared to previous visits. *Mytilus* is still scarce throughout the reef as only small patches of mussels were observed. Black abalone counts at both sites were significantly lower this visit compared to the counts conducted in fall 2012. The lower counts may be due to mortality of smaller, younger abalone observed during the previous visit, but this needs further investigation. At any rate, the survey conditions were optimum for conducting searches. *Anthopleura elegantissima* and *A. sola* were extremely common throughout particularly within the tidepool located at the northern tip of the reef. *Megathura* was less common compared with previous visits.

### **Anacapa Island, May 3–4, 2013**

(Database event #2013-E)

Prepared by Stephen Whitaker

#### **Purpose:**

To monitor rocky intertidal sites at Anacapa Island.

#### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Josh Sprague, Biological Technician, CHIS

#### **Procedure and General Observations:**

One of the park patrol boats piloted by Merrill McCauley was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. The trip was originally scheduled for 5/1–5, but the threat of high wind generated from Santa Ana's on 5/2 caused us to lose one sampling day. Therefore, we were forced to sample three sites in two days. To accomplish this, we sampled Middle Anacapa on 5/3 and visited both Cat Rock and South Frenchy's Cove the following day. At both Cat Rock and South Frenchy's Cove, photographs of plots were taken but plots were not scored. Photoplots were only scored in the field at Middle Anacapa. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Timed-searches for black abalone and sea stars were conducted at Middle Anacapa and Cat Rock. Additionally, black abalone were counted and measured at Harbor Seal Arch during an approximate 60-minute survey. *Lottia gigantea* were not sampled this season at any of the monitoring sites. Motile invertebrates were not sampled

this season at any sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature logger was downloaded at Middle Anacapa, but the logger at South Frenchy's Cove was not downloaded since we arrived at the site after the tide had risen too high to access the logger. Mussel sizes and mussel bed depth were not measured at any of the sampling sites. One of the park rangers (Merrill McCauley) provided transportation off the island on 5/4 around 1900. We left the island earlier than planned since a significant storm was forecasted to arrive the following day.

#### 5/3/2013. Anacapa Middle West.

Low tide 0.1 ft at 1205 hrs. The conditions were excellent with hazy sky due to smoke from a large fire burning from Camarillo to Oxnard near Boney Mountain, light (<5kt) wind and small (approx. 1') swell. No precipitation has been measured on the island for more than two weeks. There was one western gull and one black oystercatcher at the site upon arrival. Several hundred gulls were observed resting on the water in front of the site and many more including pelicans were stationed on the island behind the site. The site was monitored from 1050 to 1600.

Plots were photographed by Stephen. Site panoramas were photographed by Stephen. All 20 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. N=17 black abalone were observed site-wide (sizes ranged 40–84 mm, most individuals were located 1–5 m apart from one another). Josh paddled over to Harbor Seal Arch (HSA) to count and measure black abalone. N=51 black abalone were seen and measured during a survey lasting approximately 60 minutes and covering the usual survey location (reef located north of the arch). Sizes of abalone at HSA ranged 30–113 mm and most individuals were touching each other though almost as many were located 11–50 cm and 51–100 cm apart.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=308 ochre stars were observed site-wide (sizes ranged 60–130 mm, mode = 90 mm). The field log was completed by Stephen.

No plot repairs were necessary during this visit.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 18.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 18.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots had 0% mean *Silvetia* cover. In fact, *Silvetia* appeared to be completely absent from the site. The majority of point contacts in the five plots were bare rock, but the plots were composed of a diverse mixture of species dominated by *Mazzaella* (mean= 19%). Mussel (*Mytilus californianus*) plots only had 0.4% mean mussel cover (plot 463 had 2% mussels present). The majority of cover in the five plots was occupied by articulated corallines (mean= 22.8%) and *Mazzaella* (mean= 22.6%). Note that plot 464 appeared to have recently been scraped clean of all biota since it was mostly dominated *Ulva*. The disturbance was largely contained to the area within the plot.

*Caulacanthus* was still fairly common throughout the site particularly on the east side. The invasive alga appeared in plots 450 (3%) and 457 (1%). *Mytilus* is becoming more common again as it is forming continuous beds several meters long at various locations throughout the site. *Sargassum muticum* is common in most tidepools. *S. horneri* may be present in moderately-high densities near the west end of the site. It was difficult to verify whether the plants seen were *S. horneri* or large *Halidrys*. However, based on the fact that *S. horneri* has become commonly-distributed along the north side of Anacapa, it's likely that the invasive species was observed at this monitoring site.

#### 5/4/2013. Cat Rock.

Low tide 0.3 ft at 1256 hrs. The conditions were marginal for working due to the moderate-sized (2–4') swell that frequently wetted the outer plots. The sky was cloudy in the morning turning to mostly clear in the afternoon and wind remained 5–10 kt all day long. There were three western gulls and 10 harbor seals at the site upon arrival. At least two mother/pup harbor seal pairs were seen at the site and on the cobble beach located east of the site. The site was monitored from 1040 to 1400.

Plots were photographed by Stephen. Site panoramas were photographed by Stephen. Note that the OT2 marker was not located, but the estimated location (area that bags are usually placed) used to shoot the pans appears to be the same as previous visits. Note that conversations with Dan Richards confirm that the panorama photos were taken in the correct locations. None of the photoplots were scored in the field due to tight time constraints and poor conditions.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. N=13 black abalone were observed site-wide from plot 305 on the east side to 309 in the west (sizes ranged 59–130 mm, most individuals were located 1–10 cm apart from one another).

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=12 ochre stars were observed site-wide from plot 305 on the east side to 309 in the west (sizes were not measured due to poor survey conditions and time-constraints). The field log was completed by Stephen, but note that limited observations were made in the field since the conditions were poor.

No plot repairs were conducted, but several plots including 33, 5, 53, 10, 52, and 51 were missing corners.

Note that all the plots were scored in the office. The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 28% mean barnacle cover. The majority of cover in the five plots was occupied by *Endocladia* (mean= 27.3%). *Endocladia* plots had 38.7% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 2.9% mean *Silvetia* and 11.3% *Hesperophycus* cover. Most of the cover within the rockweed zone was dominated by *Endocladia* (mean= 46.4%). Mussel (*Mytilus californianus*) plots had 40.2% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

*Mytilus* and *Endocladia* were considerably abundant (estimated to be 11–20%). All other species including *Silvetia* and *Chthamalus* were estimated to comprise 1–5% of the entire site. Overall nothing unusual was noticed as the site appeared to be in a similar condition to the last visit.

5/4/2013. South Frenchy's Cove.

Low tide 0.3 ft at 1256 hrs. The conditions were not ideal partially due to the frequent wetting of the reefs due to the short period wind swell, and because we arrived at the site after the tide had flooded much of the site. The sky was mostly clear and wind was 5–10 kt. The swell was fairly large (3–5') for the south side of the island. No birds or pinnipeds were observed at the site upon arrival. Our plan for sampling the site involved photographing plots and conducting timed-searches for black abalone and sea stars if time allowed. However, due to the mediocre low tide, marginal conditions and the necessity to sample Cat Rock the same day we only photographed the plots and spent minimal time completing the field log. The site was monitored from 1415 to 1500.

Plots were photographed by Stephen. Site panoramas were not photographed due to the relatively high tide at time of visit. None of the photoplots were scored in the field. Searches were not conducted for black abalone (*Haliotis cracherodii*) or ochre stars (*Pisaster ochraceus*). The field log was completed by Stephen; note that search effort was reduced when completing the field log due to the poor survey conditions.

No plot repairs were conducted during this visit. Plot 256 was missing all corners except the upper left number tag. Most other plot markers appeared to be in fair condition.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 8.4% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 67% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 40% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 60.8% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

Despite the marginal conditions and spending minimal time at the site, nothing unusual was observed. Sand level at the site did appear to be very high. Plots 154 and 155 were partially covered by sand.

As a side note, Josh accidentally rolled his kayak while attempting to access the beach west of the site. He was not injured, but he lost his sunglasses. Before departing, we carried the kayaks over the reef to the north side of the island to transit to Landing Cove.

## Santa Barbara Island, October 18–20, 2013

(Database event #2013-F)

Prepared by Stephen Whitaker

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Dan Richards, Marine Biologist emeritus, CHIS

### **Procedure and general observations:**

Standard procedures were used for monitoring rocky intertidal sites. All plots and site overviews were photographed with an Olympus 1030 digital camera. All photoplots were scored in the field. Counts were not made of 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.

#### 18 October 2013. Landing Cove.

Low tide –0.18 ft at 1549 hrs. Conditions were excellent with clear sky, minimal (1–2') swell and light wind. There were 2 black oystercatchers and 3 black turnstones on the reef south of the pier. Within the cove, approx. 50 sea lions (mostly juveniles) along with 1 belted kingfisher were observed. We were onsite from 1400–1745 hrs.

We came out on Island Packers today following a 16-day government shutdown. Originally, the trip was planned to be longer (10/16–20). However, timing for the trip was perfect for our needs to conduct intertidal monitoring since it allowed us just enough time to monitor both sites on the island.

We worked together to photograph the plots on the south side of the site. Then I scored the plots while Dan counted/measured sea stars (N=182 counted, N=61 measured) throughout the reef located south of the pier. On the permanent transect, Dan located 9 *P. ochraceus* on the offshore side and 21 individuals inshore. Dan also searched the south side of the site for black abalone (N=3, range= 80–100mm). Many of the photo plots were difficult to find particularly plots 326 and 329 that were both missing two out of three bolts. Numerous plots were missing corner markers, but we were unable to attend to them due to the incoming tide and impending darkness. As observed during our visit here last year, mussel cover was high and dense recruitment of mussels was seen throughout.

After completely monitoring the south side of the site, we crossed the chasm to the 10 remaining plots on the north side of the cove. We photographed together then Dan recorded for me as I scored the plots. Surprisingly, all the plots were located relatively easily; a task that was likely simplified due to the lack of swell/surge.

Barnacle plots were deplete of *Balanus/Chthamalus* cover and appear to be transitioning to a community more representative of the mid to lower intertidal zone. In the barnacle plots, *Tetraclita* cover ranged 9–25% (mean=15.4%), *Mytilus* mean cover was 33.2%, *Gelidium/Pterocladia* cover averaged 9.4%, *Mazzaella* averaged 1.6% and *Ulva* averaged 7.0% among other less abundant taxa. *Silvetia* plots were devoid of *Silvetia* except for one plot that had 8% cover. The *Silvetia* plots were

instead dominated by *Mytilus* (mean=22.4%), *Gelidium/Pterocladia* (mean=25.8%), *Mazzaella* (mean=21.2%), *Ulva* (mean=10.4%) and *Chondracanthus* (mean=6.4%). Red turf plots were dominated by *Mytilus* (mean=36.4%), *Gelidium/Pterocladia* (mean=21.6%), *Chondracanthus* (mean=7.4%) and *Prionites lanceolata* (mean=8.0%). Mussel cover in *Mytilus* plots ranged 37–94% and averaged 70%. The next most abundant species in mussel plots was *Egregia* (mean=17.8%).

*Pisaster ochraceus* sizes ranged 60–140mm (mode=100mm) and N=182 were found during a 30-minute timed search of the south reef. For reference, 97 stars were found here last fall and 157 sea stars were seen in 2011. Three abalone were located during a timed search of the south reef. Two of the abalone (range= 80–100) were found together near M1 and the solitary individual was seen again in a shallow crevice near plot 328.

Motile invertebrates were not counted during this visit. The motile invertebrate protocol has not been implemented since 2011. For reference, the following is an excerpt from the 2011 trip report:

Motile invertebrates were relatively abundant and diverse within the barnacle plots. On average, 5.2 *Lepidochitona*, 7.2 *Nuttalina* and 5.6 *Ocenebra circumtexta* were found in the barnacle plots along with very few littorine snails, and low to moderate numbers of small and medium-sized limpets. *Silvetia* plots averaged 0.4 *Lepidochitona*, 1.2 *Nuttalina*, 1 *Pachygrapsus*, 1.4 *Pagurus*, 4.6 *Ocenebra* sp. per plot with spotty occurrences of several other motile taxa. Littorine snails and small limpets were scarce, but medium-sized limpets were moderately abundant in the rockweed plots. We encountered the same snail that was difficult to identify last fall. We are tentatively calling it *Ocenebra* sp. since it primarily bears the same characteristics as *Ocenebra circumtexta* (the snail in question has a shell that appears more worn down). *Mytilus* plots averaged 1.2 *Lepidochitona*, 5.2 *Nuttalina*, 1.2 *Pachygrapsus* and 15.2 *Ocenebra circumtexta* per plot among other rare-occurring taxa. Medium-sized limpets were moderately common and small limpets were rare in the mussel zone. We do not count motile invertebrates in red turf plots.

#### 19 October 2013. Sea Lion Rookery.

Low tide –0.2 at 1628 hrs. Good conditions prevailed with clear sky, moderate and light swell/surge (1–3'). We used kayaks to access the site leaving the pier around 1100 and spending approximately two hours exploring the southeast side of the island while the tide receded. Upon arrival, approximately 40 or more sea lions (mostly mothers and pups with several large males present) were seen in the vicinity of the monitoring site. The number of sea lions seemed to be lower this year compared with abundances counted on previous visits. In addition, there were 2 black oystercatchers, 3 black turnstones and 30 western gulls nearby. We were on site from 1315–1730 hrs.

We worked together to locate and photograph the plots. It took an exorbitant amount of time to find all the plots due to the fact that nearly all plots were missing corners. Some, including most of the mussel plots only had one marker present. Dan had to estimate the locations of the mussel plots since only two bolts were located. However, regardless of the approximate locations of the plots, all five plots had 100% cover of *Mytilus*. Fortunately, Dan was able to dedicate a significant amount of time

this visit to place at least one numbered (etched 1–5) bolt in the upper left corner of all plots except those in the *Mytilus* zone.

Stephen scored all plots. Many of the plots appeared to be heavily disturbed as a result of trampling from the sea lions and were composed largely of turf algae (*Gelidium*, *Chondracanthus*, *Mazzaella*, *Ulva*). Other than *Mytilus*, there were no distinct biotic zones throughout the site. As usual the site was dominated by *Ulva*.

Dan counted/measured sea stars (N=144) and searched for abalone (N=0) for 30 minutes. Sizes of *Pisaster ochraceus* ranged (70–150mm) with most measuring 120mm. For reference, N=143 sea stars were counted last fall and N=188 were seen in 2011.

Barnacle plots only averaged 10.8% *Balanus/Chthamalus* cover but had 26% *Ulva*. *Endocladia* plots had 8.2% mean *Endocladia* cover along with 45.8% *Ulva*, 20% *Mazzaella*, 5.6% *Tetraclita* cover and 4.6% *Mytilus* among other less common taxa. Rockweed plots averaged 30.2% *Silvetia*, 27.6% *Mazzaella*, 8.4% *Gelidium/Pterocladia* and 5.8% *Ulva* cover along with scarce amounts of several other taxa. *Mytilus* plots were composed only of mussels (mean=100%).

Motile invertebrates were not counted during this visit. The motile invertebrate protocol has not been implemented since 2011. For reference, the following is an excerpt from the 2011 trip report:

Motile invertebrates were not common in the barnacle plots with the exception of littorine snails. A couple of the barnacle plots had 1–11 *Ocenebra* sp. present along with 1–2 *Pachygrapsus* and large limpets. *Endocladia* plots primarily had large limpets (mean=2.6) and *Ocenebra circumtexta* (1–10 present in two plots), and sporadic occurrences of *Nuttalina*, *Pachygrapsus* and *Ocenebra* sp. Limpets and littorines were rare in the *Endocladia* zone. *Silvetia* plots averaged 9.8 *Pagurus*, 4.6 large limpets, 3.6 *Ocenebra* sp., 1.6 *Lepidochitona* and 1.4 *Ocenebra circumtexta* among other less abundant species. *Mytilus* plots primarily had *Ocenebra circumtexta* (mean=9.4), *Fissurella* (mean=10.8), *Nuttalina* (mean=8.8), *Strongylocentrotus purpuratus* (mean=8.4) and *Pachygrapsus* (mean=3.8). Littorine snails and small limpets were nonexistent and rare, respectively in the mussel plots, but mid-sized limpets were moderately abundant.

#### 20 October 2013.

Today was a cleaning and travel day. We helped the seabird group do some planting and cleaned the bunkhouse. Travel back to Ventura was on the Island Packers vessel.

## **Santa Cruz Island, October 31-November 5, 2013**

(Database event #2013-G)

Prepared by Stephen Whitaker

### **PURPOSE:**

To monitor rocky intertidal sites at Santa Cruz Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Ashley Kidd, VIP
- Mario Diaz, VIP

### **Procedure and General Observations:**

Island Packers transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at all sampling sites. Sea stars and black abalone were counted during 30-minute site-wide searches. Surfgrass transects were read at Fraser Cove and Trailer. *Lottia gigantea* were sampled in fixed plots at all sites except Prisoners Harbor (there are no *Lottia* plots at Prisoners Harbor). Motile invertebrates were not sampled this year at any sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded at all sites. The Hobotemp Tidbit temperature logger was downloaded at Willows Anchorage. Mussel sizes and mussel bed depth were not measured at any sites. NPS Ocean Ranger provided transportation off the island on 11/5.

#### 10/31/2013. Prisoners Harbor.

Low tide 0.58 ft at 1436 hrs. The conditions were excellent for sampling with clear sky, light (< 5 kt) wind and minimal swell. The water in the harbor was remarkably clear. No measurable precipitation occurred in the last week. There were no birds or pinnipeds at the site upon arrival, but one raven was seen near the west side of the site during the survey. Two humpback whales were seen approx. one mile offshore of Prisoners Harbor. The site was monitored from 1230 to 1700.

Plots were photographed by Stephen. Site panoramas were photographed by Ashley. All 25 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. A record N=17 black abalone were observed site-wide (sizes ranged 20–115 mm, most individuals were located 11–50 cm apart from one another). A 15-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Jessie. N=30 ochre stars were observed site-wide (sizes ranged 110–160 mm, mode = 130 mm). The field log was completed by Stephen.

Bolts were placed in the upper-right and lower-left corners of *Mytilus* plot 841.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 53.6% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 32.8% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./

*Balanus* spp. (mean=44.4%). The *Silvetia* plots were deplete of *Silvetia* except for plot 849 which had 3 % *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean=47%). The *Hesperophycus* plots had 5.6% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Chthamalus* spp./ *Balanus* spp (mean= 46.4%). Mussel (*Mytilus californianus*) plots were devoid of mussels with the exception of plot 842 that had 1% cover of *M. californianus*. The majority of cover in the five plots was occupied by *Chondracanthus canaliculatus* (mean= 29.4%) and articulated corallines (mean= 19.4%).

Despite the incredibly low abundances of mussels in the *Mytilus* plots, mussels were scattered in low densities throughout the west end of the site (most were small). Both *Mytilus californianus* and *M. trossulus*/ *galloprovincialis* were present at an approximate 60:40 ratio, respectively. *Septifer* was also fairly common. Barnacles (*Chthamalus* spp./ *Balanus* spp.) appeared to be highly abundant and high recruitment was observed particularly on the west reef.

#### 11/1/13. Trailer.

Low tide 0.08 ft at 1512 hrs. The conditions were excellent with clear sky, light wind and minimal (1–3') swell. There were no shorebirds or marine mammals present at the site upon arrival. One harbor seal was seen in the water. An urchin fishing vessel worked an area several hundred meters offshore of the site. The site was monitored from 1340 to 1800.

Plots were photographed by Stephen. Site panoramas were photographed by Ashley. All photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. N=43 black abalone were observed site-wide from the surge channel at the east end just passed surfgrass transect-3 to the *Mytilus* plots at the west end (sizes ranged 45–165 mm, most individuals were located 1–10 cm apart from one another). Ashley and Mario measured black abalone throughout the site and found an additional seven individuals. A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Mario. N=169 ochre stars were observed site-wide (sizes ranged 50–200 mm, mode = 200 mm). Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 86, 74 and 35%, respectively. *Phyllospadix* was moderately fouled by *Smithora* and bleaching was fairly common. The field log was completed by Stephen.

The fixed owl limpet plots were sampled by Stephen. Plots 1–5 had N= 15, 22, 0, 6 and 0 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged 15–100mm.

No plot repairs were conducted. All plot markers were intact, but some epoxy corners should be replaced with bolts.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 63.6% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. The *Silvetia* plots had 60.6% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Silvetia*. The *Hesperophycus* plots had 6.2% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was occupied by *Silvetia* (mean=46.4%). Mussel (*Mytilus californianus*) plots

had 47.4% mean cover. The majority of cover in the five plots was dominated by mussels, though *Phragmatopoma* (mean= 28%) was also dominant particularly in three plots.

Both species of rockweeds were abundant and appeared healthy. In fact, *Silvetia* abundances appeared higher compared with recent visits to the site. Barnacles (particularly *Chthamalus*) were very common throughout the upper reaches of the site and recruitment appeared to be high. *Mytilus* was common even though recruitment for the species was low and several photoplots were dominated by *Phragmatopoma*. Motile invertebrates (primarily *Pachygrapsus*, *Tegula funebris*, *Acanthina* and *Nucella*) were highly abundant.

#### 11/2/13. Fraser Cove.

Low tide -0.33 ft at 1551 hrs. The conditions were good overall with partly-cloudy sky, moderate (10–15 kt) wind and moderate-sized (2–4') swell. Throughout the course of the day, three black oystercatchers were seen at Fraser Cove. At Forney's, approx. 40 black-bellied plovers were observed in close proximity to the photoplots. The site was monitored from 1215 to 1800.

Plots were photographed by Stephen. Site panoramas were photographed by Ashley and Mario. All 35 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Mario and Ashley (Stephen conducted a focused-search for black abalone in the areas of the site that are considered high value habitat for the species). N=2 black abalone were observed site-wide from plot 891 to plot 905 (sizes were 120 and 80 mm). One additional black abalone was seen in the vicinity of the surfgrass transect #3. A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Ashley. N=66 ochre stars were observed site-wide from plot 891 to plot 905 (sizes ranged 90–170 mm, mode = 130 mm). Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 71, 46 and 86%, respectively. Most of the surfgrass appeared to be in good shape overall with minimal bleaching and only minor fouling from *Melobesia*. The field log was completed by Stephen.

No plot repairs were necessary.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 39.4% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 45% mean *Endocladia* cover. The majority of cover in the five plots was bare rock. The *Silvetia* plots had 18% mean *Silvetia* cover (three plots had *Silvetia* present). Most of the cover within the *Silvetia* zone was bare rock. The *Hesperophycus* plots had 37.6% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was bare rock. Mussel (*Mytilus californianus*) plots had 60.4% mean mussel cover. The majority of cover in the five plots was occupied by *Mytilus californianus*. *Pollicipes* plots had 16.8% mean *Pollicipes* cover. The majority of cover in the five plots was occupied by *Mytilus californianus* (mean= 49%). Tar plots had 43.6% mean cover of tar. *Chthamalus* spp./ *Balanus* spp. (mean=29.2%) were also quite common within the tar plots.

All core species (*Mytilus*, *Endocladia*, *Chthamalus*, *Balanus*, *Pollicipes* and *Tetraclita*) were abundant at Fraser Cove despite abundances in the photoplots. Medium levels of recruitment were observed for *Chthamalus*. *Phragmatopoma* remains dominant throughout much of the lower zone.

At Forney's Cove, both species of rockweeds were abundant and appeared healthy. No recruitment for either species was observed, but as usual we were rushed to complete the monitoring due to impending darkness so there was little time to inspect thoroughly.

The fixed owl limpet plots were sampled by Stephen. Plots 1–5 had N= 12, 2, 15, 9 and 6 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged 15–76 mm.

#### 11/3/13. Willows Anchorage.

Low tide –0.6 ft at 1531 hrs. The conditions were excellent since there was very little south swell in the water allowing us to safely monitor all the plots including the those in the *Mytilus* zone along with the *Lottia* plots. The sky was clear and wind was light. No birds or marine mammals were seen at the site throughout the day. A recreation vessel (Radon) was anchored outside of the cove on the east side of the islets when we arrived. The site was monitored from 1215 to 1700.

Plots were photographed by Stephen. Site panoramas were photographed by Ashley. All of the photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. N=355 black abalone were observed in the area of the site between plots 936 and 931. Mario measured black abalone (sizes ranged 20–130 mm, most individuals were observed to be 1–10 cm apart from one another). A thirty-minute search throughout the entire site from H-1 to *Lottia*-5 was conducted for ochre star (*Pisaster ochraceus*) presence by Ashley. N=265 ochre stars were observed site-wide (sizes ranged 10–140 mm, mode = 110 mm). The field log was completed by Stephen. The temperature logger was downloaded by Mario.

No plot repairs were conducted this visit, but several of the mussel plots could use new bolts to mark the locations of corners since many have been bent over sideways. Additionally, despite spending nearly half an hour to locate *Lottia* plot #5 including using the measurements and compass headings from other nearby plots, we did not find the bolt. We need to install a new bolt during the next visit.

*Endocladia* plots had 54.8% mean *Endocladia* cover. The majority of cover in the five plots was dominated by *Endocladia*. The *Silvetia* plots had 6% mean *Silvetia* cover (only plot 949 had *Silvetia* present). The majority of point contacts in the five plots were bare rock. The *Hesperophycus* plots had 0.8% mean *Hesperophycus* cover (only plot 940 had *Hesperophycus* present). Most of the cover within the *Hesperophycus* zone was occupied by *Endocladia* (mean=45.8%). Mussel (*Mytilus californianus*) plots had 66% mean cover. The majority of cover in the five plots was occupied by *M. californianus*.

The fixed owl limpet plots were sampled by Stephen. Plots 1–5 had N= 43, 38, 51, 13 and 2 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged 12–74 mm. Note that plot-5 was located approximately since the bolt was not found. We used the measurements and compass headings from other nearby plots to locate the position of plot-5. There were few limpets in the vicinity of the plot, and varying the location of the plot by short distances did not appear to affect densities of limpets much.

The presence of black abalone at the site is quite significant since abalone can be seen virtually everywhere including out in the open. The site appeared to be in good shape overall.

#### 11/4/13. Valley Anchorage.

Low tide -0.73 ft at 1616 hrs. The conditions were excellent since there was very little south swell in the water allowing us to safely count and measure black abalone throughout the site including the entire boulder field at the entrance to the site. The sky was clear and wind was light. One great blue heron was seen at the site upon arrival, but no marine mammals were seen at the site throughout the day. A sport dive vessel anchored offshore of the site just before dark. The site was monitored from 1415 to 1700.

A thirty-minute search across the rocky bench was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. N=70 black abalone were observed on the reef exclusively. A separate thirty-minute search was conducted for the portion of the boulder field from the rocky bench to the pipe located in the lower intertidal near the middle of the boulder field. N=200 black abalone were observed in this area. The remaining portion of the boulder field was then sampled for black abalone presence (N= 255 black abalone were observed during a 60-minute search). Mario and Ashley measured black abalone (sizes ranged 15–120 mm, most individuals were observed to be 1–10 cm apart from one another).

There appeared to be a similar number of black abalone to the number seen last fall throughout the western half of the site. The eastern half of the boulder field may have had slightly fewer abalone present during this visit. The sand level appeared to be much higher in the eastern portion of the boulder field than usual, and may have covered a portion of the boulder habitat.

#### **Santa Rosa Island, November 12–19, 2013**

(Database event #2013-H)

Prepared by Stephen Whitaker

#### ***Purpose:***

To monitor rocky intertidal sites at Santa Rosa Island.

#### ***Personnel:***

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Laura Jurgens, VIP, UC Davis PhD Candidate

#### ***Procedure and General Observations:***

(Park boat, Island Packers, Channel Islands Aviation) transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at all sites. Sea stars and black abalone were counted during 30-minute site-wide searches at all five sites. Surfgrass transects were read at Northwest-Talcott, but could not be safely and accurately sampled at East Point. *Lottia gigantea* were sampled this season at all of the monitoring sites. Motile invertebrates were not sampled this season at any of the monitoring sites. The maximum number of

shorebirds and pinnipeds observed at each site was recorded. The Hobotemp Tidbit temperature logger was downloaded at Fossil Reef but not at Northwest-Talcott or Johnson's Lee since the shuttle failed. Mussel sizes and mussel bed depth were not measured at any of the monitoring sites.

#### 11/12/2013. Skunk Point.

Low tide 1.19 ft at 1216 hrs. The conditions were decent with clear sky, high (20–25 kt) wind and light (2–3') swell. *No precipitation has occurred on the island during the past week.* The beach was monitored from 1400 to 1700.

We travelled out to the island today on the Ocean Ranger. Given the relatively-high early-afternoon low tide we decided to count snowy plovers, carcasses and marine debris at Skunk Point. The reefs west of Skunk Point had N=4 black oystercatchers and N=1 spotted sandpiper. Two immature California sealion carcasses were seen with no discernible cause of mortality. Four cormorant carcasses were also seen.

The beach was partially submerged by seawater near the center. No snowy plovers were seen on the western half of the beach. However on the other side of the point we encountered two large groups of plovers separated by a couple hundred meters of unoccupied shoreline. One group had approximately N=27 plovers and the other had at least N=71 additional plovers. It is likely that we missed several plovers in our counts, but we are confident that we saw most of the birds that could have been present on the beach.

There was a noticeable amount of debris on the beach below the high tide line consisting primarily of plastic items including plastic buckets, buoys, bottles and other plastic items. Most of the junk was piled together apparently by a recent beachgoer. We managed to find a cylinder half buried in the sand that resembled a SCUBA tank, but had the appearance of being homemade.

#### 11/13/2013. Northwest-Talcott.

Low tide 0.54 ft at 1306 hrs. The conditions were decent despite the relatively high (20–25 kt) wind. The light (2–3') swell/surge allowed for ample time working in the lower intertidal zone. There were 2 western gulls, 1 tern and 11 black oystercatchers at the site upon arrival. No pinnipeds were observed. The site was monitored from 1030 to 1630.

Plots were photographed by Stephen. Site panoramas were photographed by Stephen. All photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Laura. No black abalone were observed. For reference, last spring one black abalone (151 mm) was observed during the site-wide search near *Mytilus* plot 554. The black abalone plots were all sampled. A flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Laura. N=0 *P. ochraceus* and N=5 *P. giganteus* were observed site-wide (sizes ranged 40–117 mm). All observed *P. ochraceus* appeared to be healthy.

Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 100, 100 and 82%, respectively. Cover of *Phyllospadix* on all three transects increased to that of last season.

*Phyllospadix* on T-1 and T-2 had minimal cover of epiphytic algae (primarily *Melobesia*), and appeared bleached/browned throughout most of the bed.

The *Lottia gigantea* plots were sampled by Stephen. Plots 1–5 had N= 9, 4, 13, 0 and 15 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 31–102 mm.

The field log was completed by Stephen. No repairs were necessary since a significant amount of time was spent conducting plot repairs last season.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 5% mean barnacle cover. The majority of cover in the five plots was occupied by *Silvetia compressa* (mean= 39.6%). *Endocladia* plots had 10.8% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots had 53.8% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 29.8% mean cover. The majority of cover in the five plots was occupied by mussels, but the all the plots were fairly diverse with coralline crusts and articulated corallines ranking as the next most abundant taxa. Mussels were present in low to moderate densities as was *Endocladia*. *Silvetia* appeared to be second only to *Phyllospadix* in terms of abundance throughout the site.

Perhaps of greatest concern, the invasive alga, *Caulacanthus ustulatus*, was seen throughout the site from plots 555–559. Some patches of the alga measured approx. 14 cm across. This is the first time that *Caulacanthus* has been observed at any site besides the two sites at Middle Anacapa. Unfortunately, the invasive alga is likely here to stay at Northwest-Talcott and Anacapa since removal experiments have proven unsuccessful (J. Smith, per com).

#### 11/14/2013. Fossil Reef.

Low tide 0.04 ft at 1349 hrs. The conditions were fair due to minimal (3–4') swell, but the wind was blowing approx. 25–35 mph making it challenging to stay balanced particularly when holding the sunshade to photograph the plots. There were 13 gulls and 2 black oystercatchers along with 2 elephant seals at the site upon arrival. Approx. 50 cormorants were seen on the west reef when we arrived. There were also several elephant seals on the beach located west of the access rock. The site was monitored from 1030 to 1700.

Plots were photographed by Laura. Site panoramas were photographed by Stephen. All 20 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Laura. N=17 black abalone were observed site-wide from the east end of the western reef including the monitoring reef and the flat area with large boulders back to the west side of the eastern reef (sizes ranged 50–130 mm, most individuals were close enough to be touching one another). A flashlight was used during the abalone search. No black abalone were observed in any of the fixed abalone plots.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Laura. N=227 ochre stars were observed site-wide from the west side of the abalone plots, east to the cobble beach, placing the reef with the monitoring plots in the center (sizes ranged 50–130 mm, mode = 70 mm). During the search, N=1 *P. giganteus* was observed. The sea star transect between *Mytilus* plots 620

and 624 was sampled. Note only the first 15 m transect was sampled. On the west and east side, N=51 and N=6 *P. ochraceus* were observed, respectively. All observed *P. ochraceus* appeared to be healthy.

The *Lottia gigantea* plots were sampled by Stephen. Plots 1–5 had N= 1, 3, 53, 71 and 126 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 13–91 mm. The field log was completed by Stephen. No plot repairs were necessary in part since a significant amount of time was spent last spring installing bolts in most of the plots.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 21.8% mean barnacle cover. The majority of cover in the five plots was bare rock. *Endocladia* plots had 32.4% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Silvetia* (mean= 36.6%). The rockweed plots had 92.4% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 0% mean cover. The majority of cover in the five plots was occupied by a diverse mixture of species dominated by *Phragmatopoma* (mean= 22%) and articulated corallines (20.6%).

*Mytilus* was only seen in relatively small patches toward the end of the reef and as solitary individuals scattered throughout the vicinity of the lower reef. *Silvetia* was highly abundant and occupied more space than most other biota. *Endocladia* may have been the second most abundant taxa present at the site. Diversity of invertebrates and algae appears to be higher at Fossil Reef compared to most other monitoring sites since partly because numerous species normally encountered in the subtidal were commonly seen in the intertidal.

#### 11/15/2013. East Point.

Low tide –0.3 ft at 1429 hrs. The conditions were okay for sampling all the photoplots, but the moderate swell (3–4') created enough surge to completely inundate the surfgrass transects at low tide which prevented us from sampling them. The sea star and black abalone searches were not compromised. The sky was clear with high (25–30 kt) wind. There were 2 black oystercatchers, 2 western gulls, approx. 50 cormorants and 2 least sandpipers at the site upon arrival. The site was monitored from 1045 to 1545.

Plots were photographed by Stephen. Site panoramas were photographed by Laura. All 25 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Laura. N=15 black abalone were observed site-wide from the sand channel on the north side of the site to plot 594 on the south end (sizes ranged approx. 40–149 mm, most individuals were spaced 11–50 cm apart from one another). For reference, N=32 black abalone were found at this site last spring. It is not clear why more than half the number of abalone observed last season were not seen this tour. Laura is highly-skilled at searching for black abalone since she conducted her undergraduate thesis on the species and she worked as a technician in Pete Raimondi's lab. Therefore, it is unlikely that she overlooked such a high number of individuals. One black abalone (132 mm—more than 5m away from any other individuals) was seen within the fixed abalone transect. Note that a flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Laura. N=109 ochre stars were observed site-wide (sizes ranged 40–130 mm, mode = 90–100 mm). Note that one sea star was observed missing one ray. There was no open wound where the ray had been removed and the star looked healthy otherwise. Pictures were taken of the sea star for reference. Overall, it appears that the number of *P. ochraceus* has decreased slightly at the site. All observed *P. ochraceus* appeared to be healthy.

Surfgrass transects were not sampled due to the large waves. However, lulls between the sets of waves allowed for qualitative observations revealing that *Phyllospadix* in the transects appeared to be healthy and abundant (appeared to be approx. 100% cover within all three transects); surfgrass was mildly-fouled with *Melobesia* and a small portion of the bed was bleached/ browned and abraded. The field log was completed by Stephen.

No plot repairs were made during this visit, but plot 593 was missing both lower corners.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 44.4% mean barnacle cover. The majority of cover in the five plots was bare rock. *Endocladia* plots had 32.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots had 14.6% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was occupied by *Chthamalus* spp./ *Balanus* spp. (mean=32.8%). The *Hesperophycus* plots had 53.6% mean *Hesperophycus* cover which is approximately twice the cover seen for this species last season. Most of the cover within the *Hesperophycus* zone was dominated by *Hesperophycus*. Mussel (*Mytilus californianus*) plots had 38.2% mean cover. However, only two plots (593 and 594) had mussels present. The majority of cover in the five plots was occupied by *Phragmatopoma* (mean= 59.8%).

The mussel bed on the north side of the reef is still dominated by *Phragmatopoma* and only solitary mussels were seen scattered throughout. Sea star abundances appear to be lower compared to previous visits. Mussel recruitment was observed within the *Phragmatopoma*. Barnacles, particularly *Chthamalus*, were densely populated in the upper reaches of the site with high recruitment observed. Ephemeral species such as *Scytosiphon*, *Endarachne* and especially *Ulva californica* were observed in medium to high abundances, respectively.

#### 11/16/2013. Johnson's Lee.

Low tide –0.48 ft at 1505 hrs. The conditions were excellent with light wind and (1–3') swell. There were 2 willets, 1 black oystercatcher and a group of 17 black turnstones at the site at various times throughout the day. Additionally, there was one harbor seal seen offshore in near proximity to the site. The site was monitored from 1145 to 1700.

Plots were photographed by Laura. Site panoramas were photographed by Laura. All 19 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Laura. N=18 black abalone were observed site-wide from R1 at the west end to the tip of the reef at the east end not including any of the offshore reefs (sizes ranged 56–150 mm, most individuals were close enough to be touching one another). The black abalone

plots were searched and found to be devoid of black abalone. Note that a flashlight was used during the abalone search.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen. N=84 ochre stars were observed site-wide (see area searched during black abalone search) (sizes ranged 50–120 mm, mode = 100 mm). For reference, N=251 sea stars were seen at this site last spring. All observed *P. ochraceus* appeared to be healthy except for one diseased *P. ochraceus* that was seen near the east end of abalone plot 518 and the temperature logger. The tissue on one ray was mostly white and decomposed giving the appearance of an open wound and/or deterioration. Tissue on the other rays may also have been damaged, but that could not be determined since the star was tucked tightly into a depression in the reef. Several pictures were taken of the diseased animal.

It is possible that other sea stars may have been diseased at this site in the recent past since there was a marked decrease in the number of *P. ochraceus* seen during this visit compared to last spring.

The *Lottia gigantea* plots were sampled by Stephen. Plots 1–5 had N= 2, 20, 5, 62 and 44 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 11–97 mm.

The field log was completed by Laura.

No plot repairs were made during this visit, but plots 516 and 511 were missing markers in upper-right corners and 514 needs a bolt in the lower-left corner.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 44.2% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 39.2% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. Mussel (*Mytilus californianus*) plots had 37.3% mean cover overall including the four new plots. Without the additional plots the original five plots had 13% mean mussel cover (only two plots had mussels present and of those two, plot 511 only had 1% mussels). The majority of cover in the five plots was occupied by *Phragmatopoma* (mean=44.8%). The splash plots were devoid of biota.

*Phragmatopoma* remains high particularly in the lower reaches of the site. Still, *Mytilus* along with *Pollicipes* are abundantly located slightly above *Phragmatopoma* and the mussels are starting to recruit within the *Phragmatopoma*. *Tetraclita* are mixed in at low abundances throughout the mussel beds. *Anthopleura sola*, *A. elegantissima*, and to a lesser degree, *A. xanthogrammica*, dominate tidepools not covered by *Phragmatopoma* in the lower zones. At approximately 0.0 MLLW *Chondracanthus canaliculatus* is most common. *Phyllospadix* spp. and *Egregia* are fairly abundant below 0.0 MLLW. The high tide zone is populated with moderate to high abundances of *Chthamalus*/ *Balanus* spp.

#### 11/17/2013. Ford Point.

Low tide –0.52 ft at 1541 hrs. The conditions were excellent for sampling given that the wind and swell (1–3') were minimal. We had ample time to work the entire site without interruption. There were 6 black oystercatchers and 1 black turnstone at the site at various times throughout the day. One elephant seal was seen lounging in the lower intertidal near the end of the day. The beach located east

of the site had approx. 125 elephant seals present when we arrived. The site was monitored from 1145 to 1700.

Plots were photographed by Stephen. Site panoramas were photographed by Stephen and Laura. All 15 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Laura. N=16 black abalone were observed site-wide (from the area in the vicinity of abalone plot 535 to east end of the site near 534) (sizes ranged 90–190 mm, most individuals were located 1–10 cm apart from one another). The black abalone plots were sampled. Plots 536–539 did not have any black abalone present. Plot 535 may have had one abalone present, but it was difficult to determine definitively since the bolts marking the boundaries of the plot have disappeared. A flashlight was used during the abalone search.

For reference, last spring N=47 black abalone were observed site-wide (sizes ranged 38–163 mm, most individuals were located 1–10 cm apart from one another). We only found less than one-third the number of black abalone this time indicating that something may be going on.

A large trash bag full of clothes and some personal items was found on the upper (above high-tide line) portion of the reef above the monitoring site at Ford Point. Other park personnel (Mark Senning and Angela G.) mentioned that a man has been known recently to camp and stash gear at La Jolla Vieja and other locations around the island including Carrington Point. Photographs taken by Angela G. indicate that he may have been poaching black abalone since several empty shells and one animal without a shell was seen near the remnants of an extinguished camp fire. The black abalone had a fishing hook and line through it indicating that the guy may have planned to use it as bait. The Park Ranger, Mark Senning, plans to interview the vagrant and determine whether he has enough evidence to convict him for poaching among other things.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Laura. N= 123 ochre stars were observed site-wide (from the area in the vicinity of abalone plot 535 to east end of the site near 534) (sizes ranged 40–130 mm, mode = 70 mm). All observed *P. ochraceus* appeared to be healthy.

The field log was completed by Laura.

A rare abundance of time allowed us to install bolts in many of the plots that were in desperate need. Etched bolts were installed in the upper left corners of plots 520–521. Plain bolts were placed in 1–2 corners of plots 530, 532–534 and *Lottia* plots 2–5.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 29.4% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 32.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. Mussel (*Mytilus californianus*) plots had 32.2% mean cover. The majority of cover in the five plots was occupied by mussels despite the fact that *Mytilus* were only present in three out of five plots. The second-most abundant species in the mussel plots was *Phragmatopoma*. The splash plots were devoid of biota aside from cyanobacteria.

The *Lottia gigantea* plots were sampled by Laura. Plots 1–5 had N= 12, 0, 10, 25 and 44 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 11–88 mm.

The field log was completed by Laura.

*Phragmatopoma* was abundant throughout most of the zone previously occupied by *Mytilus*. Medium-sized mussel beds were still present however, but recruitment was not observed for the species.

### **Anacapa Island, December 2, 2013**

(Database event #2013-I)

Prepared by Stephen Whitaker

#### **Purpose:**

To monitor rocky intertidal sites at Anacapa Island.

#### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Josh Sprague, Marine Ecologist, CHIS
- Dan Richards, Retired, CHIS
- Taylor Weber, VIP, Buena High School

#### **Procedure and General Observations:**

The Sea Ranger was utilized to access the island. The trip was originally scheduled for 12/2–4, but the threat of high wind caused us to lose two sampling days. Therefore, we were only able to survey Middle Anacapa, and plan to reschedule surveys for the two other sites on later dates. Photoplots were scored in the field at Middle Anacapa. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Timed-searches for black abalone and sea stars were conducted at Middle Anacapa. Additionally, black abalone were counted and measured at Harbor Seal Arch during an approximate 45-minute survey. *Lottia gigantea* were sampled at Middle Anacapa. Motile invertebrates were not sampled this season at any sites. The maximum number of shorebirds and pinnipeds observed was recorded. The Hobotemp Tidbit temperature logger was not downloaded at Middle Anacapa. Mussel sizes and mussel bed depth were not measured at any of the sampling sites.

#### 12/2/2013. Anacapa Middle West.

Low tide –1.26 ft at 1513 hrs. The conditions were excellent with overcast sky, light (<5kt) wind and minimal (approx. 1') swell. Approx. 0.10" of precipitation was measured on the island on 11/30. Two harbor seals were seen in the water near the site. Two black oystercatchers and one American oystercatcher were seen at Harbor Seal Arch. A blue-footed booby was observed flying overhead as we were waiting for the tide to drop. The site was monitored from 1200 to 1630.

Plots were photographed by Dan. Site panoramas were photographed by Dan. All 20 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis*

*cracherodii*) presence by Dan and Josh. N=25 black abalone were observed site-wide (sizes ranged 20–130 mm, most individuals were located 1–10 cm apart from one another). With the assistance of boat captain Keith Duran, Josh and Dan skiffed over to Harbor Seal Arch (HSA) to count and measure black abalone. N=85 black abalone were seen and measured during a survey lasting approximately 45 minutes and covering the usual survey location (reef located north of the arch). Sizes of abalone at HSA ranged 20–120 mm and most individuals were touching each other though almost as many were located 1–10 cm apart. All the abalone plots were searched by Dan (N=0 for all 5 plots).

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=293 ochre stars were observed site-wide (sizes ranged 60–130 mm, mode = 80 mm). The field log was completed by Stephen.

The *Lottia gigantea* plots were sampled by Stephen. Plots 1–3 had N= 28, 2, and 27 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 15–68 mm.

No plot repairs were necessary during this visit.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 15.8% mean barnacle cover. The majority of cover in the five plots was bare rock. *Endocladia* plots had 19.2% mean *Endocladia* cover. The majority of cover in the five plots was bare rock. The rockweed plots had 0% mean *Silvetia* cover. In fact, *Silvetia* appeared to be completely absent from the site. The majority of point contacts in the five plots were bare rock, but the plots were composed of a diverse mixture of species dominated by *Mazzaella* (mean= 19.2%). Mussel (*Mytilus californianus*) plots had 0% mean mussel cover. The majority of cover in the five plots was occupied by articulated corallines (mean= 21%) and *Mazzaella* (mean= 22.4%). Note that plot 464 which appeared to have been scraped clean of all biota shortly before the last visit (5/3), appears to have recovered somewhat since significantly less *Ulva* is present. The disturbance was largely contained to the area within the plot.

*Caulacanthus* was still fairly common throughout the site particularly on the east side. The invasive alga appeared in plots 450 (3%) and 457 (1%). *Mytilus* is becoming more common again as it is forming continuous beds several meters long at various locations throughout the site. However, very little if any recruitment of *Mytilus* was observed anywhere at the site. *Sargassum muticum* is common and even dominant in most tidepools.

*S. horneri* was observed in high abundance at the lower (< 0.0 FSW) reaches of the site. This is the first time that it has been observed at any of the intertidal sites. Last season it was suspected growing at the base of the reef in the subtidal because the invasive alga is highly prevalent on the north side of Anacapa. This season, we observed *S. horneri* forming nearly continuous beds along most of the lower intertidal of the reef. More than 100 plants were seen, most of which ranged several inches to 18” long. We did not see any fertile plants.

## **Santa Cruz Island, December 13, 2013**

(Database event #2013-J)

Prepared by Stephen Whitaker

### **Purpose:**

To monitor the rocky intertidal site Scorpion Rock at Santa Cruz Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Josh Sprague, Biological Technician, CHIS
- Kate Faulkner, Chief Resource Management, CHIS

### **Procedure and General Observations:**

Island Packers transportation was utilized to access the island. Standard procedures were used for monitoring the rocky intertidal site. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at Site A; the five *Hesperophycus* plots at Site B will be scored in the office. Sea stars and black abalone were counted during 30-minute site-wide searches at Site A and Site B (note that an extended search was conducted for black abalone at Site B). There are no *Lottia gigantea* plots at Scorpion Rock. Motile invertebrates were not sampled this season at Scorpion Rock. The maximum number of shorebirds and pinnipeds observed at each site was recorded. Hobotemp Tidbit temperature loggers are not present at Scorpion Rock. Mussel sizes and mussel bed depth were not measured at Scorpion Rock. Island Packers provided transportation off the island at the end of the day.

### 12/13/2013. Scorpion Rock.

Low tide -0.2 ft at 1319 hrs. The conditions were excellent with clear sky, light (5–10 kt) wind and minimal (1–2') swell. No precipitation had been detected for more than a week. There were no shore birds or pinnipeds at Site A upon arrival. However, at Site B 8 ravens were seen. The sites were monitored from 1115 to 1430.

Plots were photographed by Josh. Site panoramas were photographed by Josh. The 20 photoplots at Site A were scored in the field by Stephen, and the five rockweed plots at Site B will be scored by Stephen in the office.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence at Site A by Josh. N=17 black abalone were observed site-wide at Site A (sizes ranged 25–105 mm, most individuals were located 11–50 cm apart from one another). N=149 black abalone were observed site-wide (area includes the boulder field) at Site B during a 40 minute survey (sizes ranged 30–140 mm, most individuals were close enough to be touching one another). Note that very few abalone were measured at Site B due to lack of time.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence at Site A by Kate. N=89 ochre stars were observed site-wide (sizes ranged 60–140 mm, mode = 110 mm). The field log was completed by Stephen.

No repairs were necessary as all plots appeared to be in good condition.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 46.2% mean barnacle cover. The majority of point contacts in the five plots were bare rock (mean= 32.4%). *Endocladia* plots had 48.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Hesperophycus* plots had 30.6% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Hesperophycus*. Mussel (*Mytilus californianus*) plots had 0% mean mussel cover. The majority of cover in the five plots was occupied by articulated corallines (mean= 31.4%). The *Tetraclita* plots had 51.4% mean *Tetraclita* cover.

*Chthamalus/Balanus* and particularly *Tetraclita* were very abundant at Site A. *Endocladia* appears to be healthy and abundant at the small site (Site A). *Mytilus* is still scarce throughout the reef as only small patches of mussels were observed. Some of the small patches had both *M. californianus* and *M. galloprovincialis* present. *Anthopleura elegantissima* and *A. sola* were extremely common throughout the reef particularly within the tidepool located at the northern tip of the reef. *Megathura* was less common compared with previous visits.

## **Anacapa Island, December 16, 2013**

(Database event #2013-K)

Prepared by Stephen Whitaker

### **Purpose:**

To monitor rocky intertidal sites at Anacapa Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- David Kushner, Marine Ecologist, CHIS
- Josh Sprague, Marine Ecologist, CHIS
- Dan Richards, Retired, CHIS
- Ashley Kidd, VIP
- Kate Buckeridge, VIP

### **Procedure and General Observations:**

The Sea Ranger was utilized to access the island. Standard procedures were used to monitor rocky intertidal sites. The trip was originally scheduled for 12/2–4, but the threat of high wind caused us to lose two sampling days. Therefore, we were only able to survey Middle Anacapa on December 2<sup>nd</sup> (see trip report 2013i\_ani for details), and had to sample Cat Rock and South Frenchy's Cove together on December 16th. This was accomplished by deploying two teams of biologists (one at Cat Rock consisting of Stephen Whitaker, Dan Richards and Ashley Kidd, and another at South Frenchy's Cove with David Kushner, Josh Sprague and Kate Buckeridge). Photoplots were scored in the field at both Cat Rock and South Frenchy's Cove. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Timed-searches for black abalone and sea stars were conducted at both sites. *Lottia gigantea* were sampled in fixed plots at both sites. Motile

invertebrates were not sampled this season at any sites. The maximum number of shorebirds and pinnipeds observed each site was recorded. The Hobotemp Tidbit temperature logger was replaced at South Frenchy's Cove. Mussel sizes and mussel bed depth were not measured either one of the sampling sites.

12/16/2013. Cat Rock.

Low tide -0.6 ft at 1505 hrs. Field team consisted of Stephen Whitaker, Dan Richards and Ashley Kidd. The conditions were good for working due in part to the moderate-sized (2-3') inconsistent south swell and light wind. The sky was mostly clear all afternoon and wind remained 5-8 kt all day long. There were three harbor seals at the site upon arrival (one was hauled out on the reef). Approx. 30 western gulls and 11 black oystercatchers were seen at or around the site throughout the day. One American oystercatcher was observed on the reef located east of the site. The site was monitored from 1245 to 1600.

Plots were photographed by Dan. Site panoramas were photographed by Dan. All of the photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Dan. N=22 black abalone were observed site-wide from plot 305 on the east side to 309 in the west (sizes ranged 30-142 mm, most individuals were located 1-10 cm apart from one another). For reference, last spring N=13 black abalone were observed throughout the site. All the abalone plots were searched by Dan (N=0 for all 5 plots). A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Ashley. N=11 ochre stars were observed site-wide from plot 305 on the east side to 309 in the west (sizes were not measured). The field log was completed by Dan.

No plot repairs were conducted, but several plots including 4, 212, 470, 471, 472, 473, 203, 13, 33, 5, 53, 10, 52, and 51 were missing corners.

The *Lottia gigantea* plots were sampled by Dan. Plots 1-3 had N= 30, 30, and 9 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 12-59 mm.

Note that all the plots were scored in the field. The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 26.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock, but *Endocladia* cover was relatively high (mean= 39%). *Endocladia* plots had 29.9% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia* though all nine of the plots had a diverse composition of species. The rockweed plots had 3.9% mean *Silvetia* and 13.4% *Hesperophycus* cover. Most of the cover within the rockweed zone was dominated by *Endocladia* (mean= 42.4%). Mussel (*Mytilus californianus*) plots had 36.6% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

*Mytilus* and *Endocladia* were considerably abundant (estimated to be 6-10% and 11-20%, respectively). All other key species including *Silvetia* and *Chthamalus* were estimated to comprise 1-5% of the entire site. *Petalochonchus* was seen occurring in small patches at various places throughout the site. Overall nothing unusual was noticed as the site appeared to be in a similar condition to the last visit.

12/16/2013. South Frenchy's Cove.

Low tide -0.6 ft at 1505 hrs. The conditions were good for sampling with only a moderate-sized south swell and light breeze. The sky was mostly clear the entire day and temperature was unseasonably warm. No birds or pinnipeds were observed at the site upon arrival or any other time throughout the day. The site was monitored from 1215 to 1615.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All of the photoplots were scored in the field by David. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Josh. N=0 black abalone were observed site-wide from the first reef to the second reef located about 50 m to the west. A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=28 ochre stars were observed site-wide from the first reef to the second reef located about 50 m to the west (sizes ranged 40–140 mm). The field log was completed by David.

The *Lottia gigantea* plots were sampled by Josh. Plots 1–3 had N= 1, 10 and 4 *L. gigantea*, respectively. Sizes of owl limpets in all the plots combined ranged 38–58 mm.

No plot repairs were conducted during this visit. Numerous plots were missing corners. See photo log for details.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 14.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 55.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 53.8% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 46% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

Sand level at the site appeared to be higher than usual. In fact, Dan didn't recall ever seeing the sand level as high in past years. Plots 154 and 155 were partially covered by sand.

## **San Miguel Island, January 14–21, 2014**

(Database event #2013-L)

Prepared by Stephen Whitaker

### **Purpose:**

To monitor rocky intertidal sites at San Miguel Island.

### **Personnel:**

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- David Kushner, Marine Biologist, CHIS
- Josh Sprague, Marine Ecologist, CHIS

### **Procedure and General Observations:**

Channel Islands Aviation transportation was utilized to access the island. Standard procedures were used for monitoring rocky intertidal sites. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Photoplots were scored in the field at all four sampling sites. Sea stars and black abalone were counted during 30-minute site-wide searches at all four sampling sites. *Lottia gigantea* were sampled this season at the two sites (Otter Harbor and Harris Point) that have fixed plots. Motile invertebrates were not sampled this season at any of the four sampling sites. The maximum number of shorebirds and pinnipeds observed at each site was recorded at all sites. Hobotemp Tidbit temperature loggers were replaced at Otter Harbor (only one logger was replaced at the site; one of the loggers located near the west end of the site) and Crook Point. Mussel sizes and mussel bed depths were not measured at any of the four sampling sites. Channel Islands Aviation provided transportation off the island on Tuesday, December 21<sup>st</sup>.

#### 1/14/2014. Otter Harbor.

Low tide –0.5 ft at 1523 hrs. The conditions were excellent for sampling with clear sky and light breeze due to the Santa Ana's that were predicted to blow all week. The moderate-sized (4–5') swell did not affect our ability to monitor the entire site. We flew directly to the west end of the island (lake bed) for quicker access to the site. There were 4 western gulls, 4 black oystercatchers along with 36 harbor seals, 5 California sea lions and 2 elephant seals at the site upon arrival. It appeared that the charismatic harbor seal that we have encountered at the site during the past several visits hauled out a few minutes before we departed. No harbor seal pups were observed at the site. The site was monitored from 1215 to 1730.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Josh. He began the search at the east end of the site near the surge channel and ended near R2. N=115 black abalone were observed site-wide (sizes ranged 40–144 mm, most individuals were either touching or were located 1–10 cm apart from one another). Abalone plots 365–367 were not sampled; plot 368 had zero black abalone present and 369 had N=2 abalone (sizes= 31, 57 mm).

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by David. N=96 ochre stars were observed site-wide from R2 to the east end near the surge channel (sizes ranged 80–170 mm, mode = 110 mm). Additionally, N=6 *Pisaster giganteus* were seen throughout the entire site. No signs of sea star wasting disease were observed.

Owl limpets (*Lottia gigantea*) were counted and measured in the fixed plots by Josh and Stephen. Plots 1–5 had N= 33, 36, 37, 32, and 40 owl limpets, respectively. Sizes throughout all five plots ranged 12–68 mm.

Mobile invertebrates were not sampled. The field log was completed by Stephen.

Numerous plot repairs were conducted during this visit. Bolts were installed in three corners of abalone plots 367–369 as well as the lower-left and upper-right corners of plot 378 and upper-right/lower-right corners of plot 379. Epoxy markers were added to corners of plots 370, 359 and 363.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 45% mean barnacle cover. The majority of cover in the five plots was occupied by barnacles. Plot 374 remains dominated by red algae comprised primarily of *Chondracanthus* and *Mazzaella*/ *Mastocarpus*. *Endocladia* plots had 31.2% mean *Endocladia* cover. The majority of cover in the five plots was bare rock. The rockweed plots had 4% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean=31.8%). Mussel (*Mytilus californianus*) plots had 67% mean cover; a marked increase from 47% measured last visit in March. The majority of cover in the five plots was occupied by mussels.

No obvious disturbances to the site were observed. All target zones with the exception of *Silvetia* were common to abundant. *Silvetia* was present in low abundances throughout the site along with *Hesperophycus* (Harris Point variety). A low level of recruitment was observed for *Mytilus* but not for other species. A thin layer of *Ulva* was observed at various locations throughout the site presumably due to the wastes emitted from the high number of harbor seals that commonly haul out at the site. Black abalone and sea star abundances appeared to be comparable to that of previous visits. One *Leptasterias* was observed while sampling the *Lottia* plots.

#### 1/15/2014. Crook Point.

Low tide –0.5 ft at 1551 hrs. The conditions were good overall, but hampered slightly by a relatively large (4–5') ground swell. Sky was clear due to Santa Ana conditions on the mainland and wind was 5–10 kt. There were 15 cormorants, 2 western gulls, 2 black oystercatchers and 3 black turnstones at the site upon arrival. One female elephant seal was seen near the bluff at the entry to the site and two bull elephant seals were lounging in the surge channel at various times throughout the day.

N=approx. 100 elephant seal females and weiners were observed on the beach east of the site. The site was monitored from 1145 to 1730.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All photoplots were scored in the field by Stephen. A 30-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Josh. N= 26 black abalone were observed site-wide from the east end excluding the offshore reef to the east end in line with plot 388. Sizes of black abalone ranged 65–

148 mm, most individuals were located 1–5 m or more than 5 m apart from one another). Abalone plots 3–5 were not sampled, but plot 1 had N=1 black abalone (134 mm) present.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=83 ochre stars were observed site-wide (from the east end excluding the offshore reef to the east end in line with plot 388) (sizes ranged 40–150 mm, mode = 120 mm). Note that conditions were not perfect for conducting sea star or black abalone searches. Mobile invertebrates were not sampled. The field log was completed by Stephen.

Plot repairs were conducted by all three samplers. Bolts were installed in three corners (upper-left, lower-left and upper-right) of plots 381, 397, 382, 399, 384, 385, and 387. Additionally, bolts were added to the corners of black abalone plots 1–2 (combined) and plot 3.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 31.6% mean barnacle cover. The majority of cover in the five plots was bare rock. *Endocladia* plots had 16% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plot 389 had 54% mussels present. The rockweed plots had 6.4% mean *Hesperophycus* and no *Silvetia* cover. Most of the cover within the rockweed zone was dominated by mussels (mean=29.4%). Mussel (*Mytilus californianus*) plots had 83% mean mussel cover. The majority of cover in the five plots was occupied by mussels.

*Ulva/Cladophora* remain dominant throughout the site. *Mytilus* is very abundant on both reefs. The rockweed is surprisingly difficult to identify at Crook Point. Most plants have very sparse tiny white hairs present on their underside indicating the presence of small *Hesperophycus* (Harris Point variety). Otherwise the rockweed appears the same as *Silvetia*.

#### 1/16/2014. Harris Point.

Low tide –0.5 ft at 1618 hrs. The conditions were acceptable with clear sky, light (5–10 kt) wind and fairly large (6–8') swell. The powerful ground swell coupled with a marginally-low tide that occurred late in the day made it tricky to score all the plots and conduct thorough searches for black abalone and sea stars. Otherwise, weather was beautiful due to a Santa Ana event that lasted all week long.

There were not any shore birds observed at the site, but two black oystercatchers were seen throughout the day flying overhead and resting on the reef located east of the site. Ten harbor seals were seen lounging at the site upon arrival. They did not spook easily as during previous visits. No pups were present. The site was monitored from 1215 to 1730.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All 25 photoplots at the site were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Josh. N=13 black abalone were observed site-wide (from R2 at the west end within the boulder field to the crack east of plot 430) (sizes ranged 28–157 mm, most individuals were spaced 11–50cm apart from one another).

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by David. N=12 ochre stars were observed site-wide (from R2 at the west end within the boulder field to the crack

east of plot 430) (sizes ranged 140–210 mm). Additionally, N=2 *Pisaster giganteus* were seen throughout the site.

Owl limpets (*Lottia gigantea*) were measured in the fixed plots by Stephen. Plots 1–5 had N= 3, 6, 13, 28 and 17 owl limpets, respectively. Sizes of *L. gigantea* lumped across the five plots ranged 18–68mm, mode= 35mm).

Mobile invertebrates were not sampled. The field log was completed by Stephen.

Plot repairs were conducted by Josh and David. Etched number bolts were installed in the upper-left corners of plots 436, 429, 430, 426, 445, 437 and 433. A bolt was also installed at R2.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 59.8% mean barnacle cover. The majority of cover in the five plots was occupied by barnacles. *Endocladia* plots had 33.8% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 31.6% mean *Hesperophycus* cover. Most of the cover within the rockweed zone was dominated by *Hesperophycus*. Mussel (*Mytilus californianus*) plots had 24.4% mean cover (nearly double the percentage of mussels measured last spring). The majority of point contacts in the five plots were bare rock (mean= 28%), or occupied by non-coralline crust (mean=21.8%). The *Tetraclita* zone had 15.8% mean *Tetraclita* cover and was dominated by bare rock (mean= 23.8%) or non-coralline crust (mean=24.6%).

Overall the biological condition of the site appears similar to that of previous visits with little to no change observed to the plots or species assemblages. We did notice some small patches of *Balanus* removed in the vicinity of plots 440 and 444. Unlike many other sites, most plots at Harris Point remain dominated by the taxa they were originally designed to monitor. However this site also is somewhat unique in that several of the *Endocladia* plots (primarily upper intertidal) have lower intertidal species such as *Gelidium coulteri* gradually creeping in to occupy space; the opposite transition is occurring in some of the mussel and *Tetraclita* plots which have measurable abundances of *Endocladia* and *Chthamalus* spp./ *Balanus* spp.

We were unable to devote any time to relocating and installing new bolts into the black abalone plots. This, along with repairing all the photoplots, should be a high priority for the next visit.

#### 1/17/2014. Cuyler Harbor.

Low tide –0.4 ft at 1645 hrs. The conditions were excellent with clear sky, light (<5 kt) wind and medium-sized (3–5') swell. There were no shorebirds at the site upon arrival. One bull elephant seal was observed swimming near the base of the site. One black oystercatcher was seen on the reef located north of the site. Along the beach the following were observed: Approx. 100 female elephant seals, approx. 50 weiners and 3 bulls west of Nidever Canyon; approx. 75 elephant seal mothers and roughly the same number of wieners, 6 elephant seal bulls and approximately 25 western gulls between Nidever Canyon and the surge channel; approx. 125 female elephant seals, approx. 85 weiners, approx. 21 male seals including bulls, 12 whimbrels and 4 Herrman gulls between the surge channel and monitoring site. The sand level on the beach was perhaps the highest I've ever observed

it, and Ian Williams confirmed that it is higher than usual. We were able to easily cross the surge channel at mid tide.

No dead animals were seen along the beach. The site was monitored from 1345 to 1745.

Plots were photographed by Josh. Site panoramas were photographed by Josh. All 20 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Josh. Zero black abalone were observed site-wide.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Josh. N=99 ochre stars were observed site-wide (sizes ranged 50–210 mm, mode = 130 mm). Several sea stars (N=3) were observed to have severe tissue deterioration and/or >3 missing arms and one individual had a lesion on an arm. We collected three diseased *P. ochraceus* to send to Ian Hewson at Cornell University where he has been conducting pathology exams. Note that subsequent visits to the site over the next several days revealed the presence of several *P. ochraceus* that were regenerating arms.

The field log was completed by Stephen. Plot repairs were conducted by David and Josh. An etched number bolt was installed in the upper-left corner of plots 410 and 416–419. A bolt was also installed in the lower-left corner of plot 401. No markers were found for plot 402, and only one corner was located for 401.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 62.4% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 18.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots only had 4% mean *Silvetia* cover. The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 83.8% mean cover. The majority of cover in the five plots was occupied by mussels.

At the site, all sizes of mussels were seen (extremely large mussels along with a low level of newly-recruited individuals). Mussel cover appeared to be higher than observed during previous visits. The barnacle zone was dominated by *Balanus*. Rockweeds present were primarily *Silvetia*, but a small patch of *Hesperophycus* was present.

#### 1/18/2014. Cuyler Harbor.

Low tide –0.2 ft at 1712 hrs. Conditions remained good for working in the intertidal zone, so we used the time to continue installing bolts. The rock at the site is perhaps the hardest of any other monitoring sites. Drilling holes into it proved to be a difficult and time-consuming task. Josh and Stephen installed etched, number bolts into plots 403–409 and 411–415 before depleting both batteries for the cordless drill.

Along the beach, elephant seals were not counted, but approx. 100 surf scoters were seen in the water and 5 black oystercatchers, approx. 35 whimbrels and approx. 50 western gulls were seen on the beach.

1/19/2014. Cuyler Harbor.

Low tide 0.1 ft at 1740 hrs. Conditions remained good for working in the intertidal zone, so we used the time to continue installing bolts. Josh and Stephen installed etched, number bolts into several more plots before depleting both batteries for the cordless drill.

1/19/2014. Simonton Beach.

The beach at Simonton was sampled from 1230 to 1400 for carcasses, trash, birds and pinnipeds. Ian joined David and Stephen for the survey. The area surveyed included the expanse of beach between Harris Point and the first cove encountered to the west. Approx. 104 adult female elephant seals, approx. 40 weiners, 20 bulls and 10 subadult male elephant seals were present on the beach. Several dead organisms including 4 fulmars, 1 immature elephant seal, 1 California sea lion and 1 unidentified seal were seen during the survey. We conducted a thorough search of the beach for marine debris despite the high number of pinnipeds present. No tsunami debris was observed.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 159/173902, December 2020

National Park Service  
U.S. Department of the Interior



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