



Rocky Intertidal Community Monitoring at Channel Islands National Park

2014 Annual Report

Natural Resource Data Series NPS/MEDN/NRDS—2020/1306



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ON THE COVER

Stephen Whitaker scoring a photoplot at Forney's Cove, Santa Cruz Island

Photograph by: Kari Eckdahl

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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 were recognized as special features 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 2014 sampling year efforts (from March 2014 to January 2015) 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, 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.

Some sites including Anacapa Middle East and Middle West, Cat Rock, Landing Cove and Sea Lion Rookery were not monitored in spring due to a combination of inclement weather and logistical difficulties, or to avoid disturbing nesting California brown pelicans. All sites except the five on Santa Rosa Island and Anacapa Middle East were sampled during the fall monitoring season. The Santa Rosa sites were not sampled due to a rain event in early December that caused a partial closure of the island road system during the winter. Anacapa Middle East was not monitored because vessel time was limited. Weather conditions during the spring and fall site-visits were satisfactory, but high wind coupled with strong swell and surge limited or prevented the completion of some of the abalone and sea star searches.

The percent cover for most key species or assemblages targeted in the photo-plots was highly variable among sites. Mussel, *Mytilus californianus*, cover remained below average at Anacapa, Santa Rosa and particularly Santa Cruz Islands. In the cases of several sites, mussels nearly plummeted to zero percent cover. Yet, mussels increased markedly at the two Santa Barbara sites and reached above average abundance 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 fell below the long-term means at Anacapa, Santa Barbara and Santa Rosa Islands and increased slightly above averages at Santa Cruz and San Miguel. *Endocladia muricata* abundances remained comparable to grand means calculated for previous years at Santa Barbara and Santa Rosa Islands, while cover of the alga decreased slightly below the long-term means at Anacapa, San Miguel and Santa Cruz.

Black abalone abundances at the islands remain less than one percent of 1985 population levels. Only five black abalone were seen within fixed plots in 2014. Zero abalone were found throughout the entire site at Cuyler Harbor, Sea Lion Rookery and South Frenchy's Cove. Counts for black abalone were fairly consistent with the range of counts seen since 1995 at approximately half the sites. At all other sites, counts increased above the long-term mean calculated for previous years at each site. For the first year since Withering Syndrome decimated populations of black abalone, size frequencies for all islands except Santa Barbara reflected signs of recruitment through the presence of juvenile (< 50 mm) abalone.

Ochre sea star populations crashed this year at all monitoring sites due to Sea Star Wasting Syndrome, an illness characterized by a suite of symptoms that generally result in death. The mortality event was widely considered to be the largest mortality event for marine diseases ever seen. Beginning in June 2013, the disease swiftly and significantly impacted *P. ochraceus* (among other species of sea stars) populations along the North American Pacific coast from Alaska to Baja California, Mexico. By the beginning of 2014, *P. ochraceus* abundances had declined by >95% at nearly all Channel Islands long-term intertidal monitoring sites, in addition to numerous other locations along the west coast. At various times during the past decade, extremely high abundances (~ 500 *P. ochraceus*) have been observed at multiple sites, and most locations have supported >100 sea stars counted during 30-minute site-wide searches. This year, abundances ranged 0–23 individuals per site with the majority having fewer than 10 *P. ochraceus* seen during routine searches. Insufficient numbers of sea stars were seen to accurately estimate the size structure of *P. ochraceus* populations.

Giant owl limpet densities in 2014 were comparable or slightly below the long-term mean at all sites except Otter Harbor and Willows Anchorage. At both latter sites, owl limpets were slightly more abundant than abundances measured last year. The sizes of *L. gigantea* in 2014 varied among sites and islands. While only minimal temporal changes in median sizes of limpets were documented within most sites, below-median sized limpets relative to the most recent five years were measured at Ford Point, Fraser Cove, Johnson's Lee and Willows Anchorage. When pooled across islands, the smallest (median = 36 mm) limpets occurred at San Miguel followed by Santa Cruz (median = 39

mm) and Anacapa (median = 40 mm). Note that demographic data for *L. gigantea* were not obtained for Santa Rosa Island sites in 2014.

Surfgrasses are typically monitored biannually at two sites each on Santa Cruz and Santa Rosa Islands. This year, the combined effect of large waves and precipitation which caused partial closure of the Santa Rosa Island road system prevented monitoring from occurring at Fraser Cove, Santa Cruz in spring and East Point, Santa Rosa during both spring and fall. Additionally, for the same reasons, at Northwest-Talcott on Santa Rosa, only two transects were sampled in spring and the site was not sampled in fall. Based on the available data, surfgrass cover decreased below the long-term mean at Trailer and increased at Fraser relative to historical abundances. At Northwest-Talcott, cover of surfgrass on the two sampled transects was approximately 100% which is comparable to abundances measured in past years. Qualitative observations at East Point in which surfgrass cover was estimated to be near 100% on all three transects provide an indication that the surfgrass bed is healthy at that site and remains comparable to historical abundances.

Overall, the abundances and diversity of shorebirds in 2014 at all sites appeared similar to observations made in recent years. Black oystercatchers were the most ubiquitous shorebird seen at all sites. One American oystercatcher was sighted at Otter Harbor in spring. Black turnstones were relatively common whereby a total of 16 birds was seen across three sites in fall. Other notable observations include several relatively-large (28–45 birds) roosts of cormorants counted at East Point and Crook Point at various times during the year.

Pinniped abundances remained comparable in 2014 to historical counts for all species with the slight exception of California sea lions which decreased at Santa Barbara Island. Harbor seals, *Phoca vitulina*, were seen at six sites in 2014. As in past years, harbor seals were most abundant at Otter Harbor; the numbers of seals counted at the site in spring and fall were 22 and 38, respectively. Elephant seals, *Mirounga angustirostris*, were seen at five sites during the year whereby abundances ranged 1–26 individuals per location.

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 2014, Island Packers Company conducted five trips to Frenchy's Cove during the months of April and November to allow visitors to access the tidepools. Total visitation was 433 passengers. Most visitation (53%) occurred in April.

Acknowledgments

The National Park Service (NPS), Channel Islands National Park (CHIS) funded this program. The NPS Mediterranean Coast Network Inventory and Monitoring (MEDN I&M) 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).

The Water Resources Division (WRD) of the NPS provided funding to Pacific West Region coastal parks including CHIS in response to the unprecedented disease outbreak for sea stars along the northeast Pacific coast that occurred in 2013–2014. Funding was used to increase monitoring for ochre stars (*Pisaster ochraceus*) in west coast National Parks to fill in spatial and temporal gaps. In addition, sea star tissue was collected throughout the parks for genetic analysis. A synthesis report providing a summary of the disease outbreak with information on genetic analysis and new sea star sampling methodology along with recommendations for future monitoring and management is due for completion in fall 2016.

Through the funding provided by the NPS WRD, two rocky intertidal researchers (Cori Hume-Flannery and Emily Tucker) from Dr. Pete Raimondi's lab at UCSC were able to assist the CHIS Rocky Intertidal Monitoring Program (RIMP) at nearly all monitoring sites during the fall field season. The primary goals of Emily and Cori's work were to gather information on the spatial and size structure of sea stars as well as collect tissue for genetic analysis. However the two researchers helped tremendously with other duties including conducting searches and measurements for black abalone and owl limpets as well as assisting with photographing plots and site panoramas.

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 CHIS 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 Laughlin and staff at the UC reserve field station for their assistance. Thanks also to Carol Blanchette and others from the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) Marine Science Institute, University of California, Santa Barbara (UCSB) and UC Santa Cruz (UCSC) for their collaboration.

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

Glossary

ANI	Anacapa Island
C	Centigrade
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
MEDN I&M	Mediterranean Network Inventory and Monitoring
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
PVC	Polyvinyl chloride
SCA	Student Conservation Association
SBI	Santa Barbara Island
SCI	Santa Cruz Island
SMCA	State Marine Conservation Area
SMI	San Miguel Island
SMR	State Marine Reserve
SRI	Santa Rosa Island
TNC	The Nature Conservancy
UCLA	University of California Los Angeles
UCSB	University of California Santa Barbara
UCSC	University of California Santa Cruz
WS	Withering Syndrome

Introduction

The rocky intertidal zone is a compact, biologically diverse area between marine and terrestrial habitats. Marine organisms living in this zone are highly adapted to physical disturbance and severe temperature fluctuations. They 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, evident in the vast number of organisms that cannot live without the alternating exposure to both air and sea.

CHIS and CINMS encompass the four northern Channel Islands and Santa Barbara Island off the coast of southern California. The park islands and surrounding waters bear the designations 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, and 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 assess 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 (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 2014 sampling year efforts (from March 2014 to January 2015) 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 comprised 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 (Dailey 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 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. Site selection considered visitation, accessibility, presence of representative organisms, wildlife disturbance, and safety. Sampling is usually conducted twice each year, once in spring and fall. In 2014, monitoring occurred at 16/21 sites in spring (March–May) and 15/21 sites in fall (October–January 2015). 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 Appendix A for additional notes about the 2014 program.

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 taxa¹). Fixed plots (50 x 75 cm) are photographed on each visit. In most cases, there are five replicate plots in each zone that were initially established over high densities of the target species. Not all core species (zones) are represented at each site. Four new *M. californianus* plots were established in the *Mytilus* zone at Johnson's Lee in fall 2008 to replace plots that 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^a 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	–	–	–
	<i>Hesperophycus californicus</i> ^b (= <i>H. harveyanus</i>)	X	–	–	–	–
	<i>Sargassum muticum</i>	–	X	–	–	–
	<i>Scytosiphon</i> spp.	X	–	–	–	–
	<i>Silvetia compressa</i> ^b (= <i>Pelvetia fastigiata</i>)(Rockweed)	X	–	–	–	–
	Other Brown Algae (any browns not listed above)	X	X	–	–	–
	Ephemeral browns	X	–	–	–	–
Red algae	<i>Endocladia muricata</i> ^b (Turfweed)	X	–	–	–	–
	<i>Chondracanthus canaliculatus</i> (= <i>Gigartina canaliculata</i>)	X	–	–	–	–
	<i>Chondracanthus spinosus</i>	X	–	–	–	–

^a Motile Invertebrate counts were dropped from the standard protocol in 2011.

^b Target species (also shown in bold)

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

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

Category	Species or Substrate	Photo plots	Surfgrass Transects	Circular Plots	Abalone/ Sea star	Motile Inverts
Red algae (continued)	<i>Gelidium coulteri/ Pterocladia capillacea</i>	X	–	–	–	–
	<i>Mastocarpus papillatus</i> (blade)	X	–	–	–	–
	<i>Mazzaella affinis</i> (= <i>Rhodoglossum affine</i>)	X	–	–	–	–
	<i>Mazzaella</i> spp. (= <i>Iridaea</i> spp.)	X	–	–	–	–
	<i>Porphyra</i> spp.	X	–	–	–	–
	<i>Prionitis</i> spp.	X	–	–	–	–
	Articulated Corallines (Erect Corallines)	X	X	–	–	–
	Crustose Corallines (Encrusting Corallines)	X	X	–	–	–
	Other Red Algae (any reds not listed above)	X	X	–	–	–
Algae/plants	<i>Phyllospadix scouleri/torreyi</i> ^b (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
	<i>Haliotis cracherodii</i> ^b (Black Abalone)	–	–	–	X	–
	<i>Lepidochitona hartwegii</i>	–	–	–	–	X
	<i>Littorina</i> spp.	–	–	–	–	X
	<i>Lottia gigantea</i> ^b (Owl Limpet)	–	–	X	–	X
	<i>Mopalia</i> spp.	–	–	–	–	X
	<i>Mytilus californianus</i> ^b (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

^a Motile Invertebrate counts were dropped from the standard protocol in 2011.

^b 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 Invertebrate Counts at all CHIS Sites.

Category	Species or Substrate	Photo plots	Surfgrass Transects	Circular Plots	Abalone/ Sea star	Motile Inverts
Molluscs (continued)	<i>Chlorostoma gallina</i> (= <i>Tegula gallina</i>)	–	–	–	–	X
	<i>Chlorostoma</i> spp. (= <i>Tegula</i> spp.)	X	–	–	–	–
	Limpets	X	–	–	–	–
	Large Limpets > 15mm (excluding <i>L. gigantea</i>)	–	–	–	–	X
	Medium Limpets 5–15mm	–	–	–	–	X
	Small Limpets < 5mm	–	–	–	–	X
	<i>Littorina</i> spp.	X	–	–	–	X
	<i>Septifer/Brachydontes</i>	X	–	–	–	–
Barnacles	<i>Chthamalus dalli/fissus</i> & <i>Balanus glandula</i> ^b (Acorn Barnacle)	X	–	–	–	–
	<i>Tetraclita rubescens</i> ^b (Thatched Barnacle)	X	–	–	–	–
	<i>Pollicipes polymerus</i> ^b (Goose Barnacle)	X	–	–	–	–
	Barnacles	–	X	–	–	–
Echinoderms	<i>Pisaster ochraceus</i> ^b (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	–	–	–

^a Motile Invertebrate counts were dropped from the standard protocol in 2011.

^b Target species (also shown in bold)

In 2014, 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 there was insufficient time. 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. Photograph of Stephen Whitaker scoring photoplots at Harris Point, San Miguel 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. The sites vary in size and natural breaks in the reef defined the areas, facilitating 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 the decline of abalone population levels. Prior to the effects of Withering Syndrome (WS), 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. The fixed plots became inadequate for sampling, however, 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. Within each plot, an area of 3.14 m² 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).



Figure 3. Stephen Whitaker measuring giant owl limpets and volunteer, Connie Jenkins recording at Fossil Reef, Santa Rosa 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. However, after 2011 the protocol was no longer implemented due to changes in personnel and insufficient assistance. The motile invertebrate protocol was extremely time-consuming and required a relatively high level of expertise to conduct. In addition, it was determined by another intertidal monitoring group in the region that the protocol may require adjustments to improve effectiveness to detect 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.

Phyllospadix spp., surfgrass, cover was measured on three 10m fixed point-intercept transects (100 points per transect) at four sites (Trailer, Fraser Cove, East Point, Northwest-Talcott) (Figure 4). 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. 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. Concessionaires (Island Packers Company and Truth Aquatics) reported numbers of visitors to the park. No independent counts of visitors were made to verify reported figures.

Fieldwork 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. Stephen Whitaker conducted sampling with assistance from others 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 and fixed with epoxy 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. 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 2014. 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 (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 in only mussel zone plots was considered. 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 for each target zone and season. Mean percent cover of target species and other dominant taxa along with bare rock cover are pooled for all replicate plots per zone by site and season. Departure from the long-term mean graphs are displayed for each target species pooled across sites at each island.

As in most years, the mean percent cover of nearly all targeted species in 2014 was highly variable among sites. Temporal comparisons between spring and fall sampling seasons indicated that most species, with the minor exception of *Endocladia*, exhibited very little change.

Mussel, *Mytilus californianus* mean percent cover in 2014 remained comparable to the mean of previous years at many sites (Figures 5–7). However, record or near record-low abundances for *M. californianus* were measured at Anacapa Middle West, East Point, Ford Point, Fossil Reef, Harris Point, Northwest-Talcott, Prisoner’s Harbor, Scorpion Rock and South Frenchy’s Cove. In the cases of Anacapa Middle West, Fossil Reef, Prisoner’s Harbor and Scorpion Rock mussels plummeted to near zero percent cover. Overall, mussel cover has decreased below the long-term mean at Anacapa, Santa Cruz and Santa Rosa Islands during the past five years (Figure 6). *M. californianus* percentages measured slightly above average at San Miguel and Santa Barbara Islands in 2014 (Figure 6). At most sites with several exceptions, mussel plots have been and remain populated with moderate to high cover of *M. californianus* and relatively low cover of *Phragmatopoma* among other species.

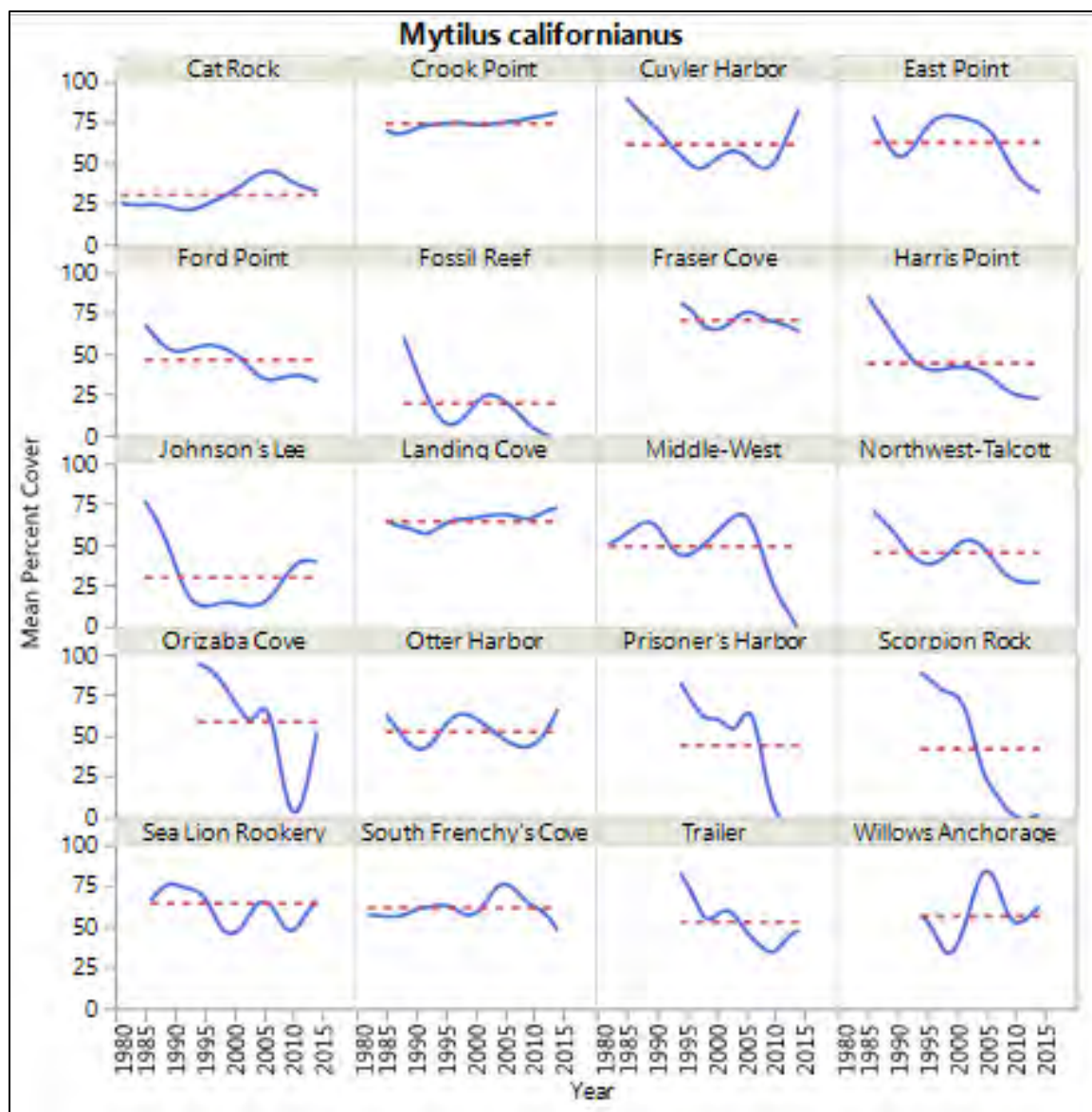


Figure 5. Departure from the long-term mean for *Mytilus californianus*. Blue lines represent mean cover of *M. californianus* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

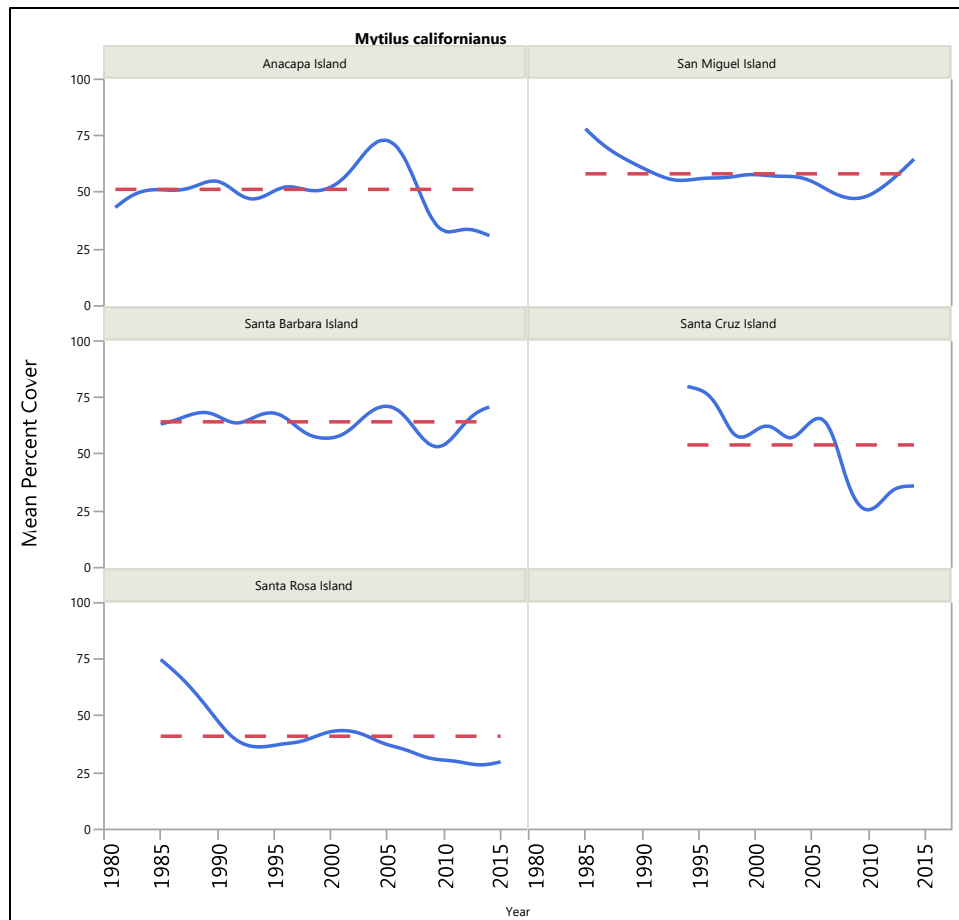


Figure 6. Departure from the long-term mean for *Mytilus californianus*. Blue lines represent mean cover of *M. californianus* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

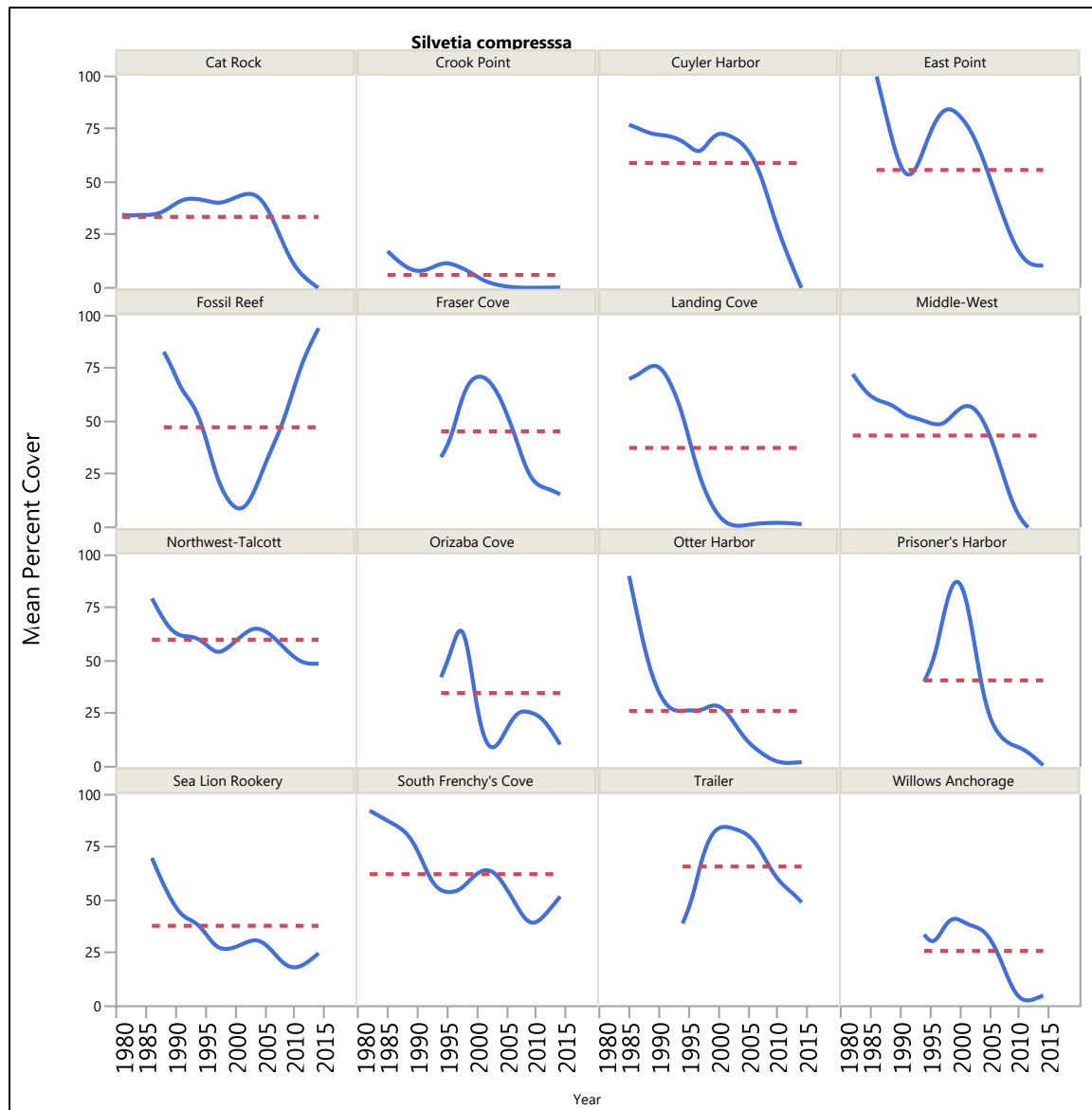


Figure 8. Departure from the long-term mean for *Silvetia compressa*. Blue lines represent mean cover of *S. compressa* within the representative zone pooled across plots at each island. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

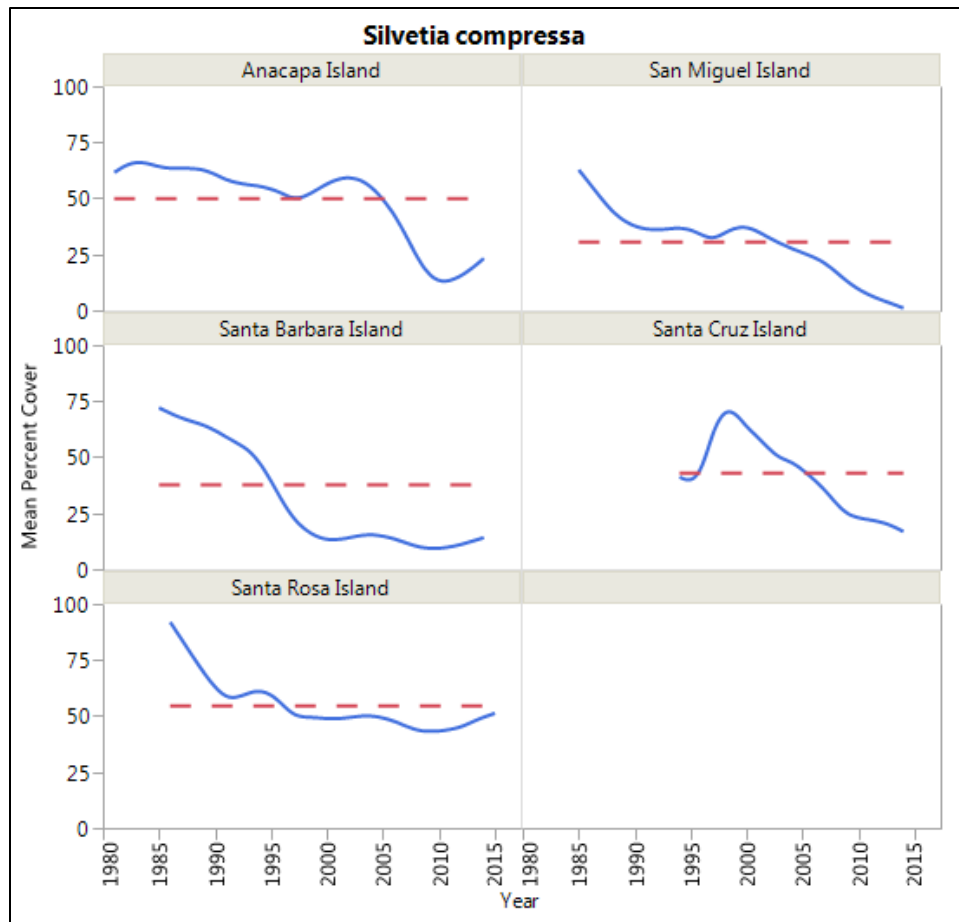


Figure 9. Departure from the long-term mean for *Silvetia compressa*. Blue lines represent mean cover of *S. compressa* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

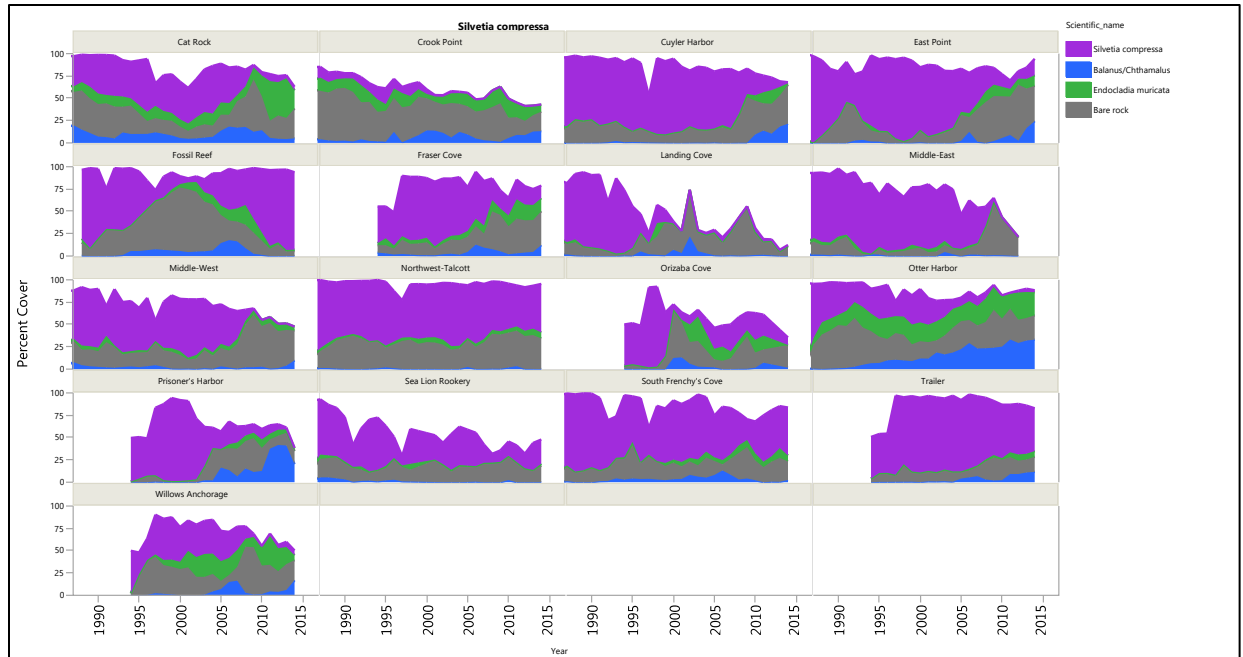


Figure 10. Percent cover of *Silvetia compressa* along with other dominant taxa and bare rock in fixed plots within the *Silvetia* zone at each site. Colored areas represent the mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Silvetia* plots.

The other rockweed, *Hesperophycus californicus* that occurs in the region, also declined or remained low in abundance at several monitoring sites (Figures 11–13). *H. californicus* cover was slightly lower in 2014 than most years at Harris Point, Prisoner's Harbor, Scorpion Rock, Trailer and Willows Anchorage. However, relatively high cover of the rockweed was measured at East Point, Fraser Cove and Orizaba Cove. Pooled across sites, *H. californicus* cover measured above the long-term mean at Santa Rosa and below that of Santa Cruz and San Miguel Islands. Over time, plots at most sites have been composed largely of *H. californicus*, *S. compressa*, *E. muricata*, and *Chthamalus/ Balanus* (Figure 13).

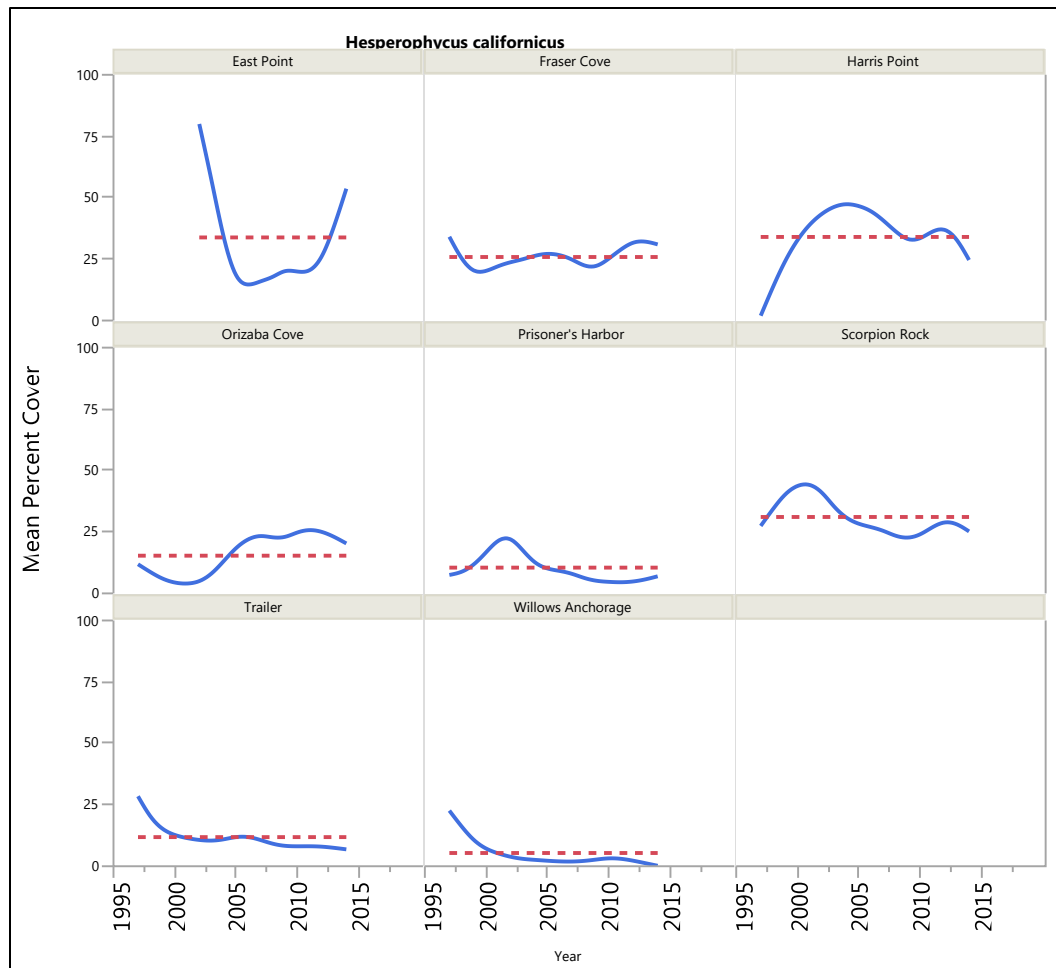


Figure 11. Departure from the long-term mean for *Hesperophycus californicus*. Blue lines represent mean cover of *H. californicus* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean.

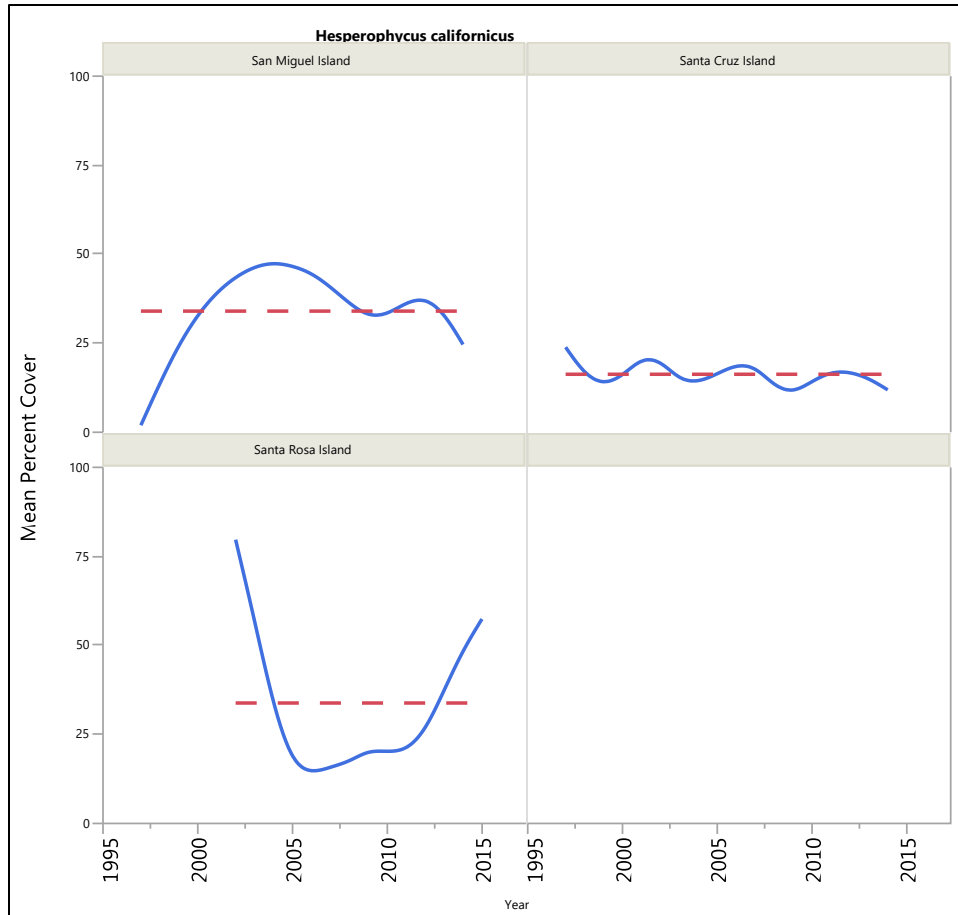


Figure 12. Departure from the long-term mean for *Hesperophycus californicus*. Blue lines represent mean cover of *H. californicus* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

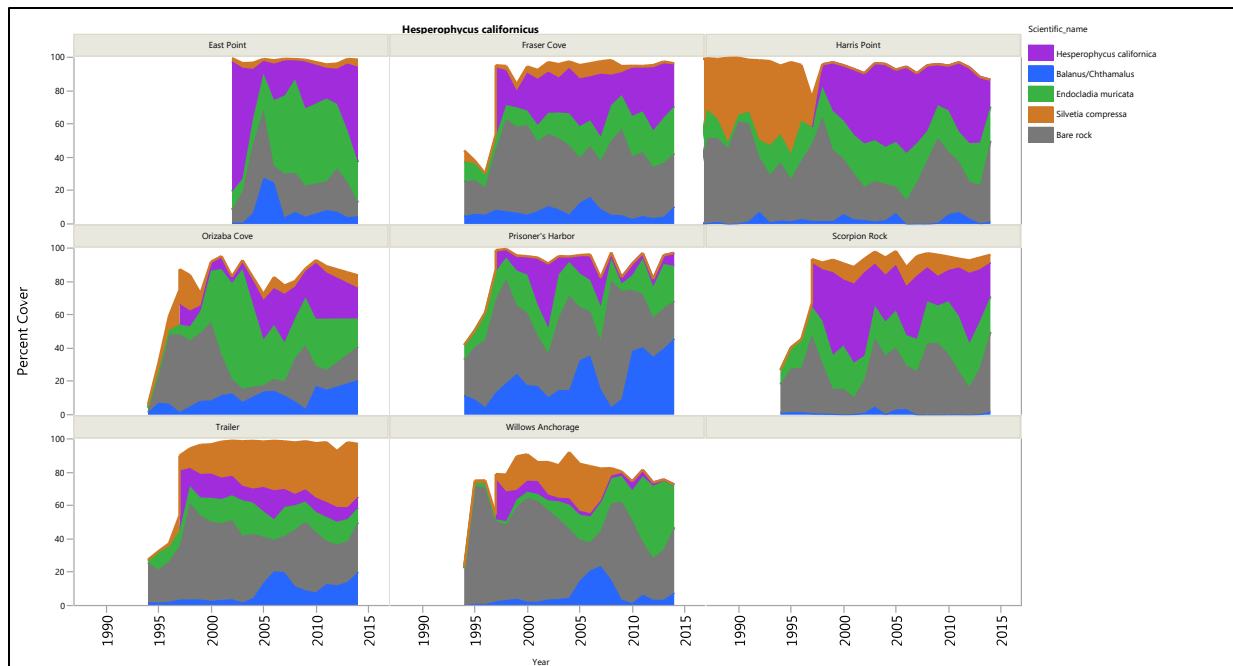


Figure 13. Percent cover of *Hesperophycus californicus* along with other dominant taxa and bare rock in fixed plots within the *Hesperophycus* zone at each site. Colored areas represent the mean percent cover for representative and dominant taxa/ substrata from five *Hesperophycus* plots.

Endocladia muricata cover in 2014 remained roughly equivalent to mean abundances measured in past years at most sites (Figures 14–16). Exceptions included Anacapa Middle West, Crook Point, Otter Harbor, Willows Anchorage and particularly Fraser Cove which had low *E. muricata* abundances relative to long-term means at the respective sites. In contrast, moderately-high cover of *E. muricata* was measured at Fossil Reef in 2014 compared to earlier years. Pooled across sites, *E. muricata* abundances were approximately average at Santa Barbara and Santa Rosa. Cover of the alga was slightly below the long-term means at Anacapa, San Miguel and particularly Santa Cruz Islands (Figure 15). Other dominant species in *E. muricata* plots have been *S. compressa* and *Chthamalus/ Balanus* (Figure 16).

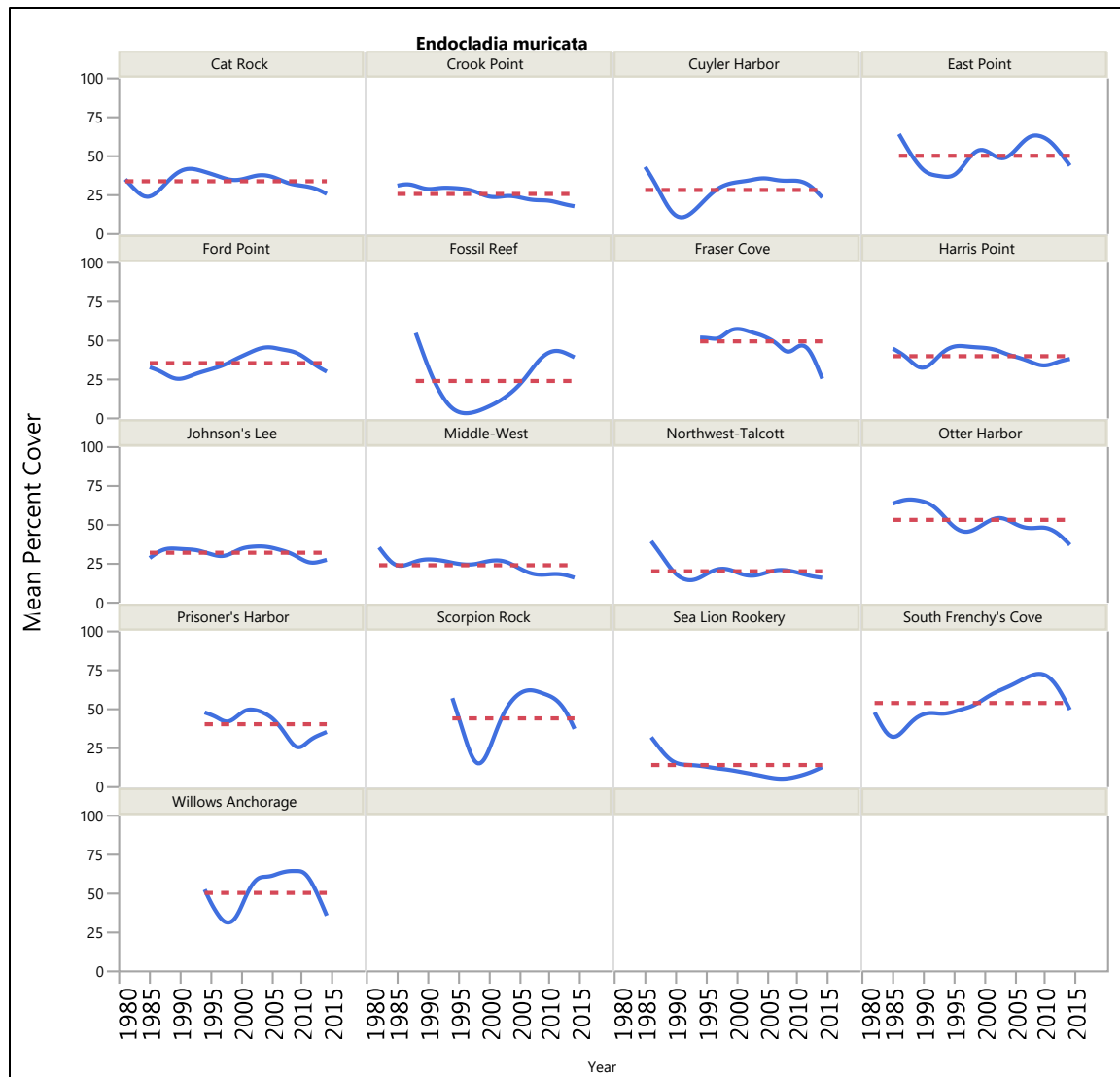


Figure 14. Departure from the long-term mean for *Endocladia muricata*. Blue lines represent mean cover of *E. muricata* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

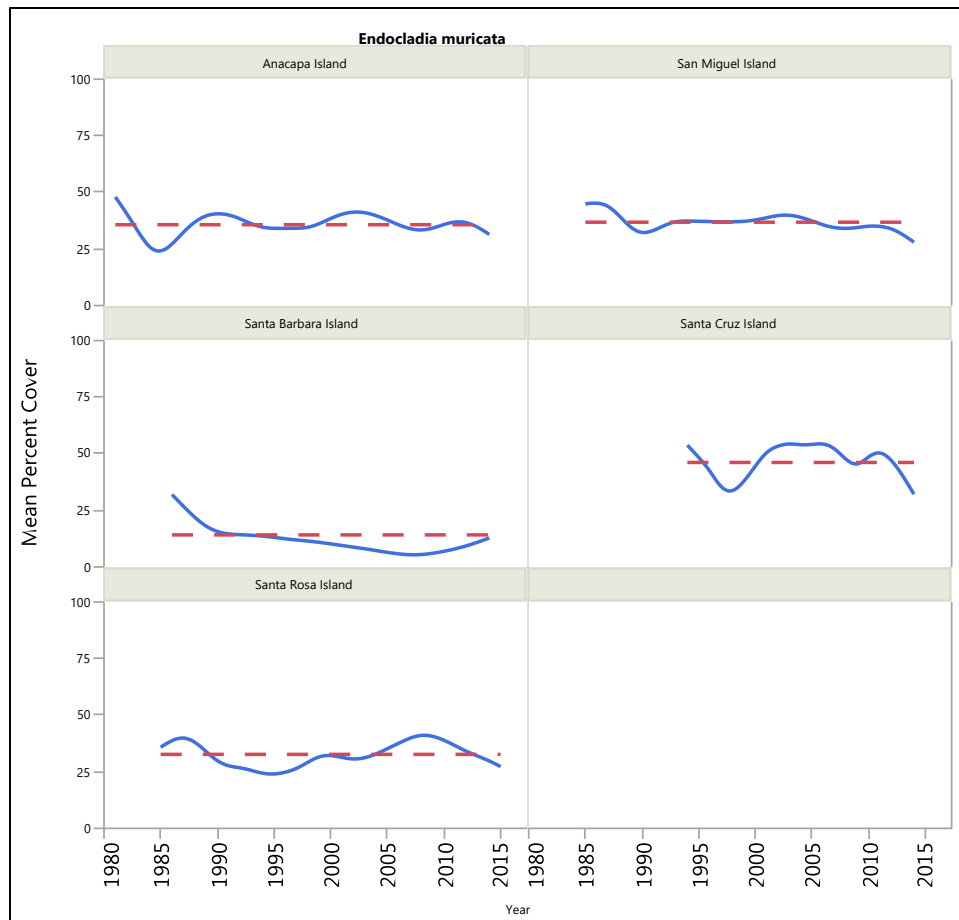


Figure 15. Departure from the long-term mean for *Endocladia muricata*. Blue lines represent mean cover of *E. muricata* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

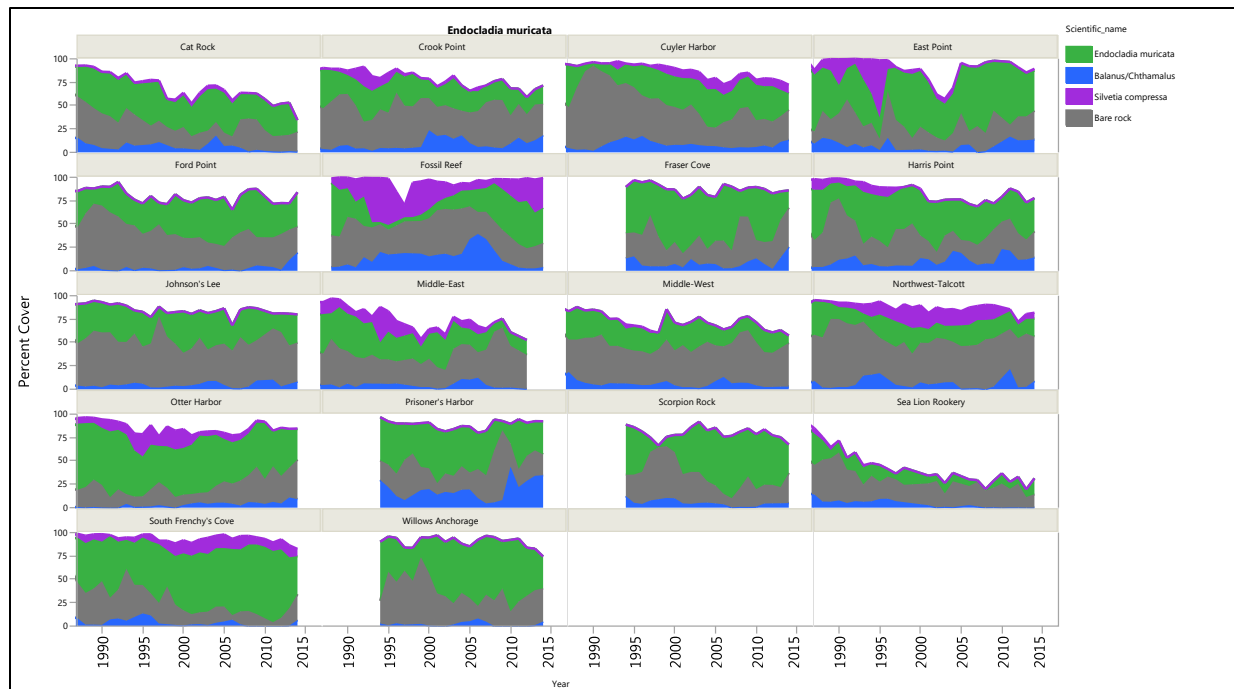


Figure 16. Percent cover of *Endocladia* along with other dominant taxa and bare rock in fixed plots within the *Endocladia* zone at each site. Colored areas represent the mean percent cover for representative and dominant taxa/ substrata from replicated (usually five) *Endocladia* plots.

Barnacle, *Chthamalus/Balanus* spp. abundances pooled across sites in 2014 fell below the long-term means at Anacapa, Santa Barbara and Santa Rosa Islands (Figures 17–19). In contrast, at San Miguel and Santa Cruz, barnacle cover was slightly elevated in comparison to past years (Figure 18). At the site level, *Chthamalus/Balanus* spp. abundances in 2014 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. Cuyler Harbor was the only site that had record-high abundances of barnacles. Other dominant species in *Chthamalus/Balanus* spp. plots have primarily been *S. compressa* and *E. muricata* (Figure 19).

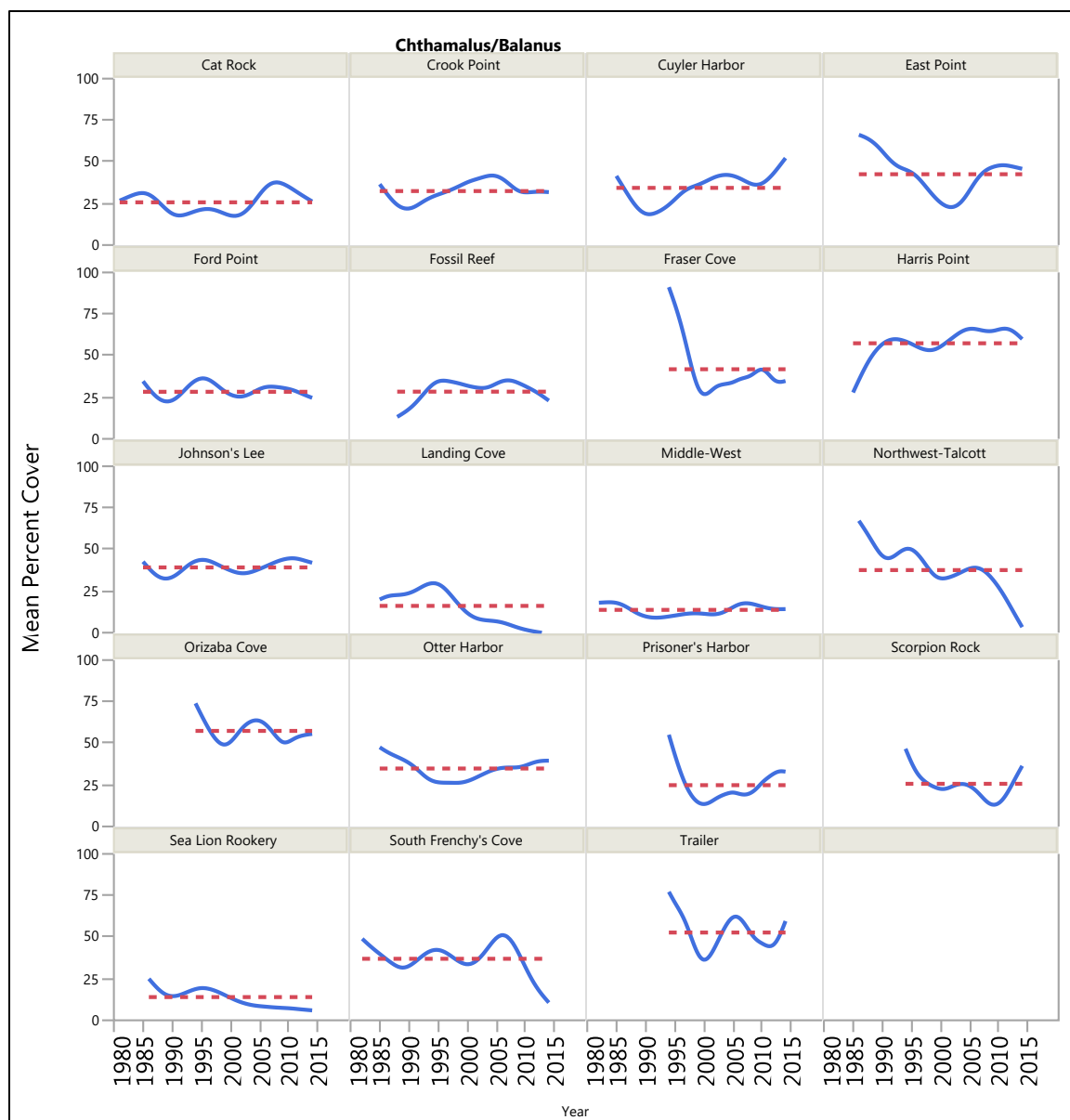


Figure 17. Departure from the long-term mean for *Chthamalus/Balanus*. Blue lines represent mean cover of *Chthamalus/Balanus* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean. Note that Anacapa Middle East data were excluded since the site was not sampled in 2014.

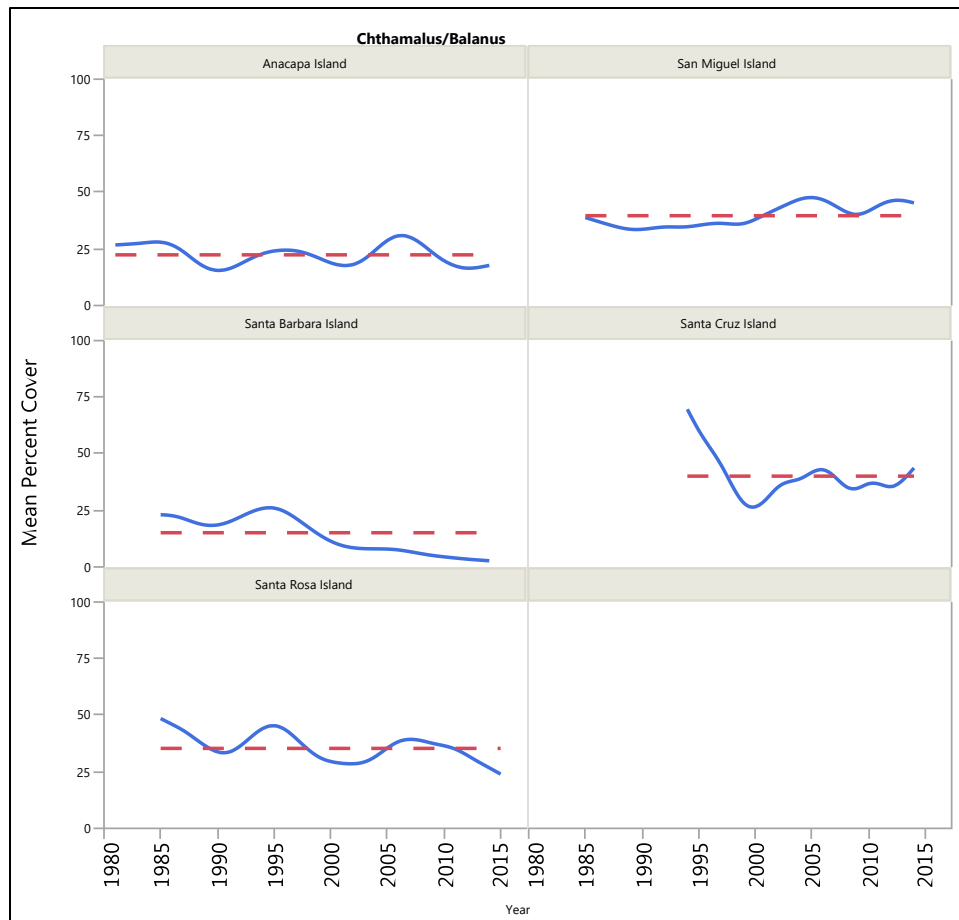


Figure 18. Departure from the long-term mean for *Chthamalus/Balanus*. Blue lines represent mean cover of *Chthamalus/Balanus* within the representative zone pooled across plots and sites at each island. Red dashed lines represent long-term mean.

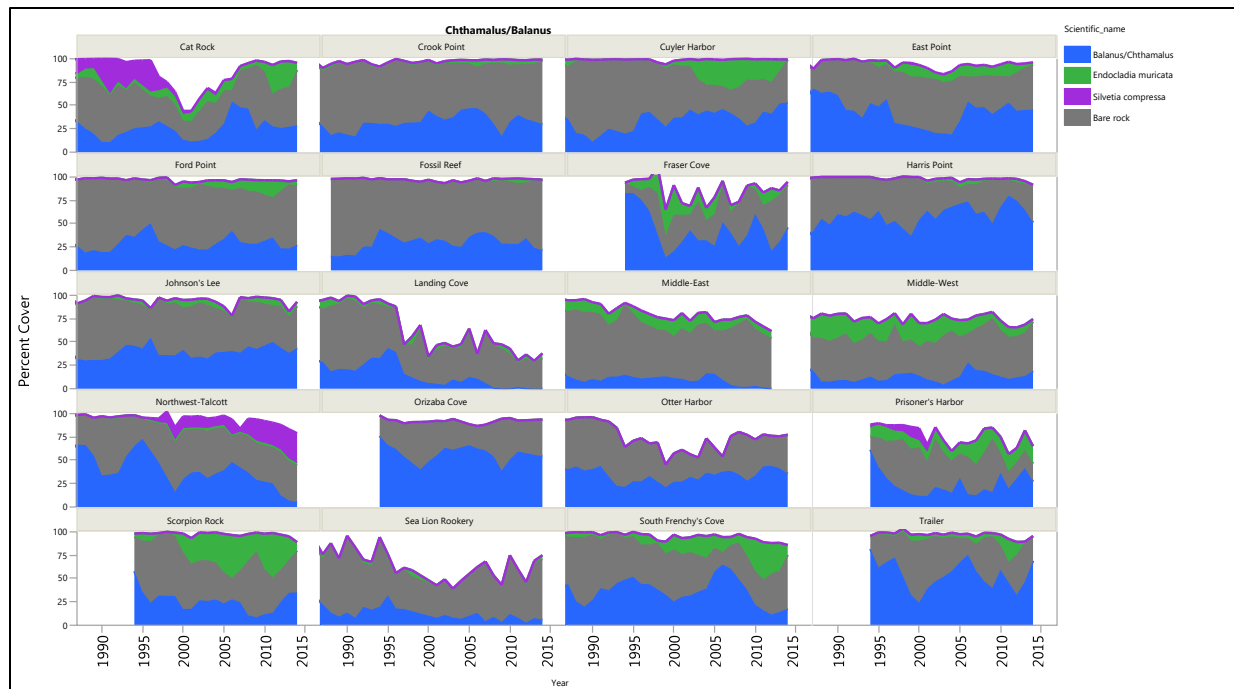


Figure 19. Percent cover of barnacles, *Chthamalus/Balanus*, along with *Endocladia*, *Silvetia compressa* and bare rock in fixed plots within the barnacle (*Chthamalus/Balanus*) zone at each site. Note that barnacle species were not separated. Colored areas represent the mean percent cover for representative and dominant taxa/ substrata from replicated plots (usually five) within the *Chthamalus/Balanus* zone.

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 2014, the red algal turf plots were not monitored due to large swell and the inability to revisit the site. Data from previous years are displayed in Figure 20.

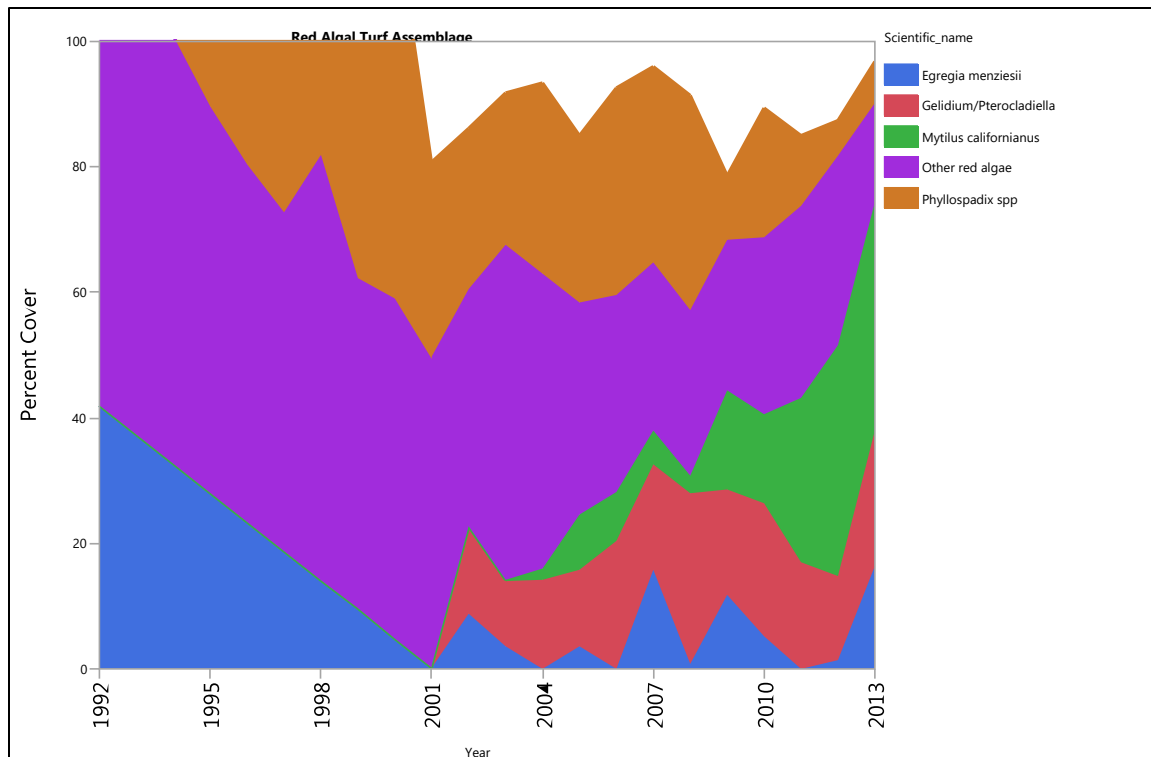


Figure 20. Percent cover of dominant taxa in fixed plots within the red turf assemblage at Landing Cove, Santa Barbara Island. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/substrata from five red turf assemblage plots.

Goose or leaf barnacle, *Pollicipes polymerus* zone plots have only been established at Fraser Cove, where goose barnacle cover has declined slowly over time from approximately 20% to well below 10% by 2009. *P. polymerus* cover increased markedly since 2009 and was above the long-term mean in 2014 (Figures 21–22). Other dominant species in the *P. polymerus* plots have included *M. californianus* and *T. rubescens* (Figure 22).

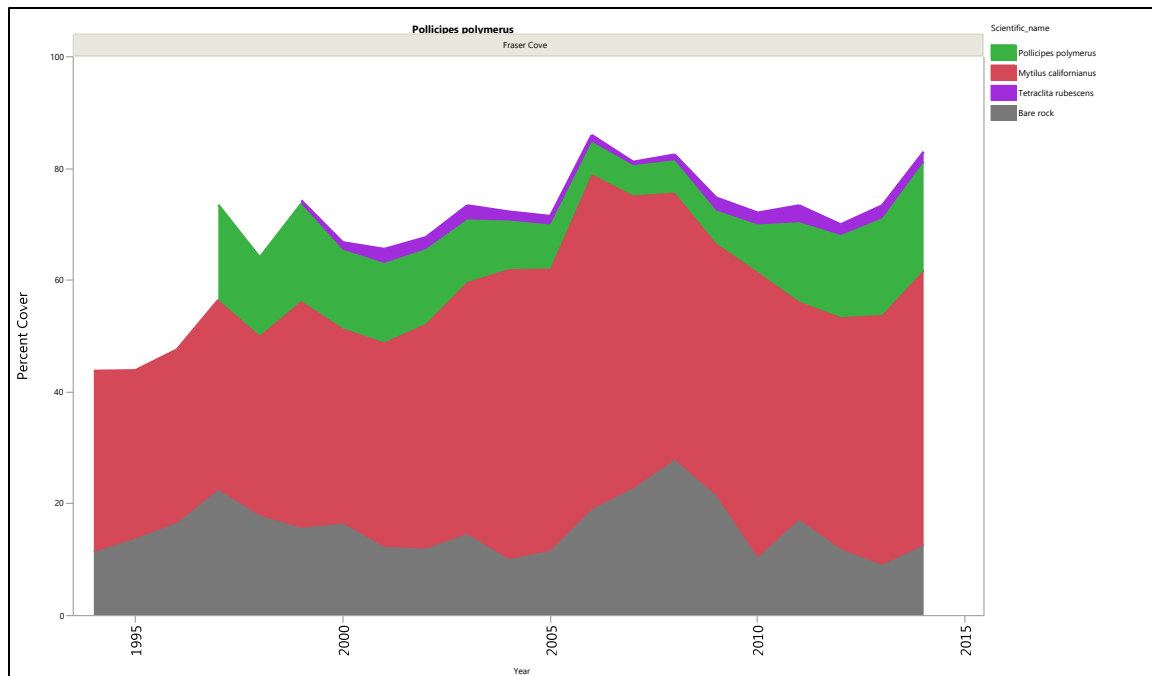


Figure 21. Percent cover of *Pollicipes polymerus* along with other dominant taxa and bare rock in fixed plots within the *Pollicipes* zone at Fraser Cove, Santa Cruz Island. Colored areas represent the mean percent cover for representative and dominant taxa/ substrata from five *Pollicipes* plots.

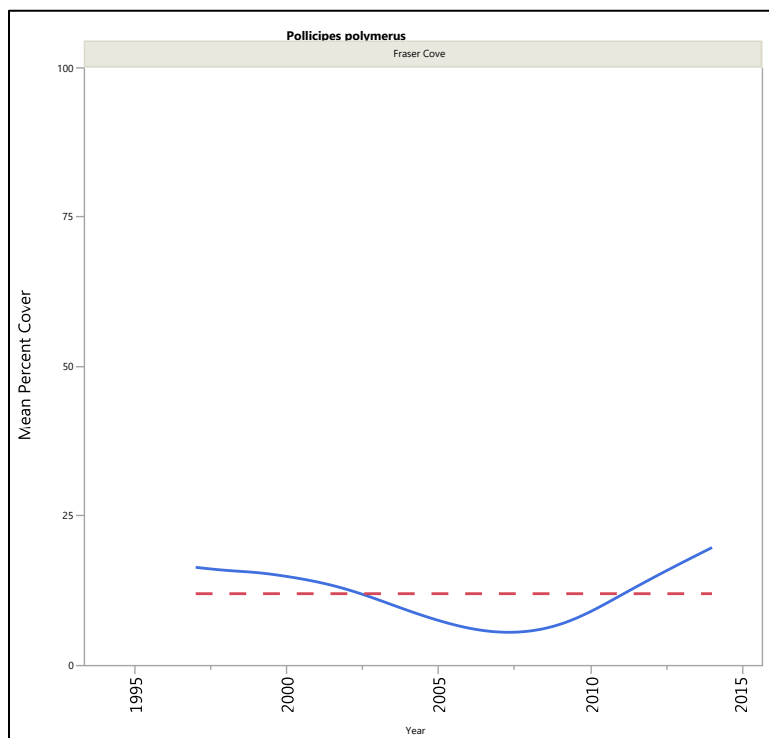


Figure 22. Departure from the long-term mean for *Pollicipes polymerus*. Blue lines represent mean cover of *P. polymerus* within the representative zone pooled across plots at Fraser Cove. Red dashed line represents long-term mean.

The thatched barnacle, *Tetraclita rubescens* is only monitored at three sites (Harris Point, Orizaba Cove and Scorpion Rock). Thatched barnacles increased above the long-term mean markedly at the Santa Cruz Island sites (Orizaba Cove and Scorpion Rock) and marginally at Harris Point (Figures 23–24).

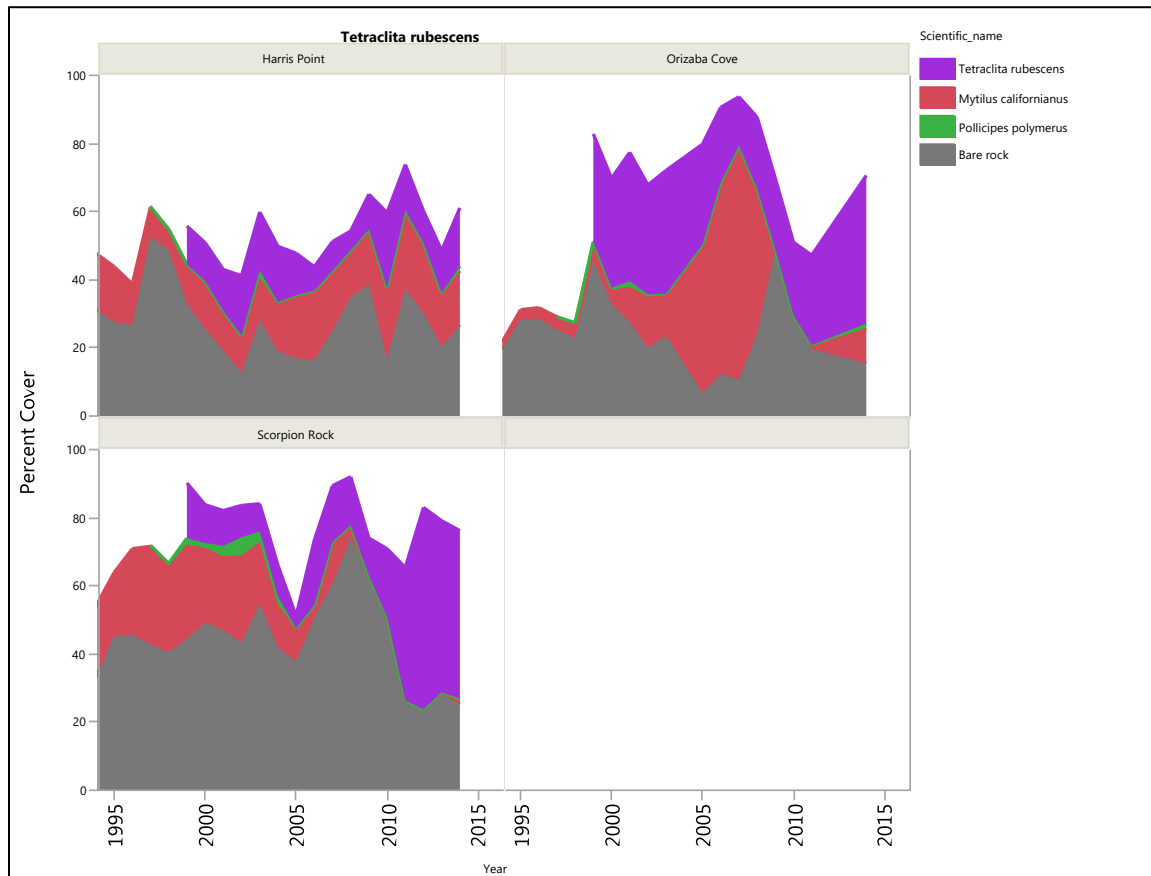


Figure 23. Percent cover of *Tetraclita rubescens* along with other dominant taxa and bare rock in fixed plots within the *Tetraclita* zone at each site. Colored areas represent the seasonal mean percent cover for representative and dominant taxa/ substrata from five *Tetraclita* plots.

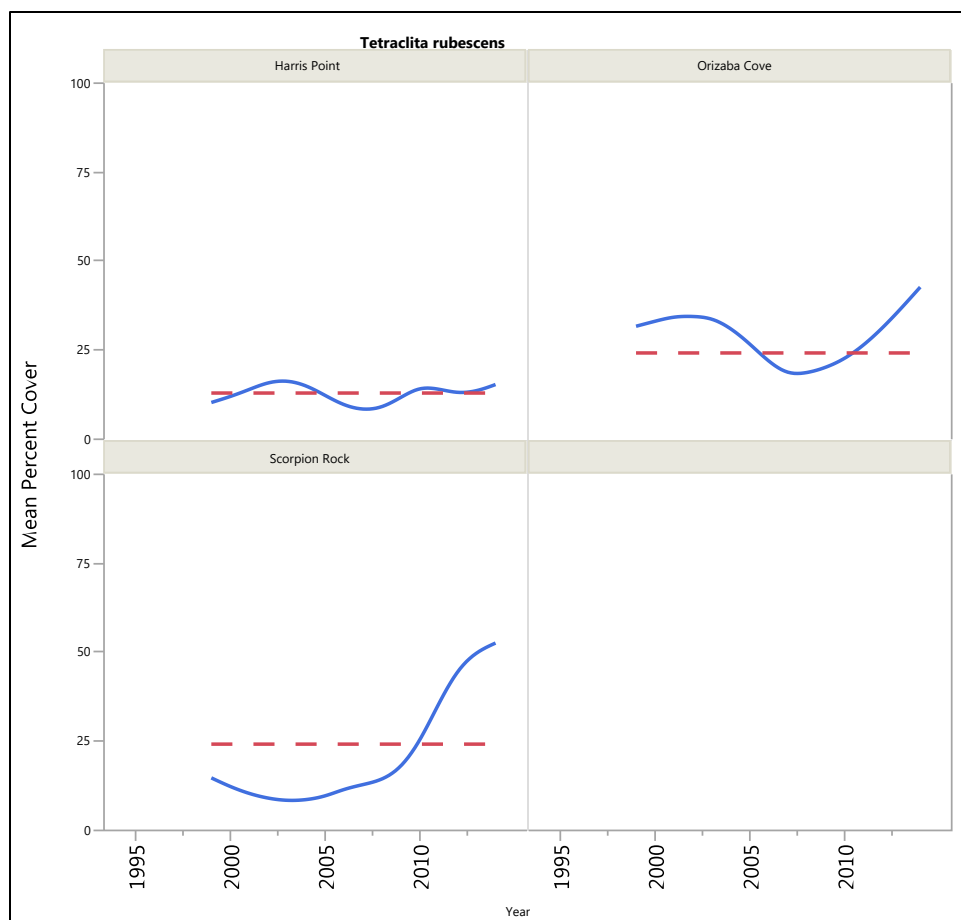


Figure 24. Departure from the long-term mean for *Tetracita rubescens*. Blue lines represent mean cover of *T. rubescens* within the representative zone pooled across plots at each site. Red dashed lines represent long-term mean.

Tar is only monitored at Fraser Cove where it is naturally deposited from seeps in the Santa Barbara Channel onto extensive stretches of the upper intertidal on the west end of Santa Cruz Island. There was only a slight decline (< 10%) in tar cover in 2014 from the long-term mean (approximately 50%) (Figures 25–26).

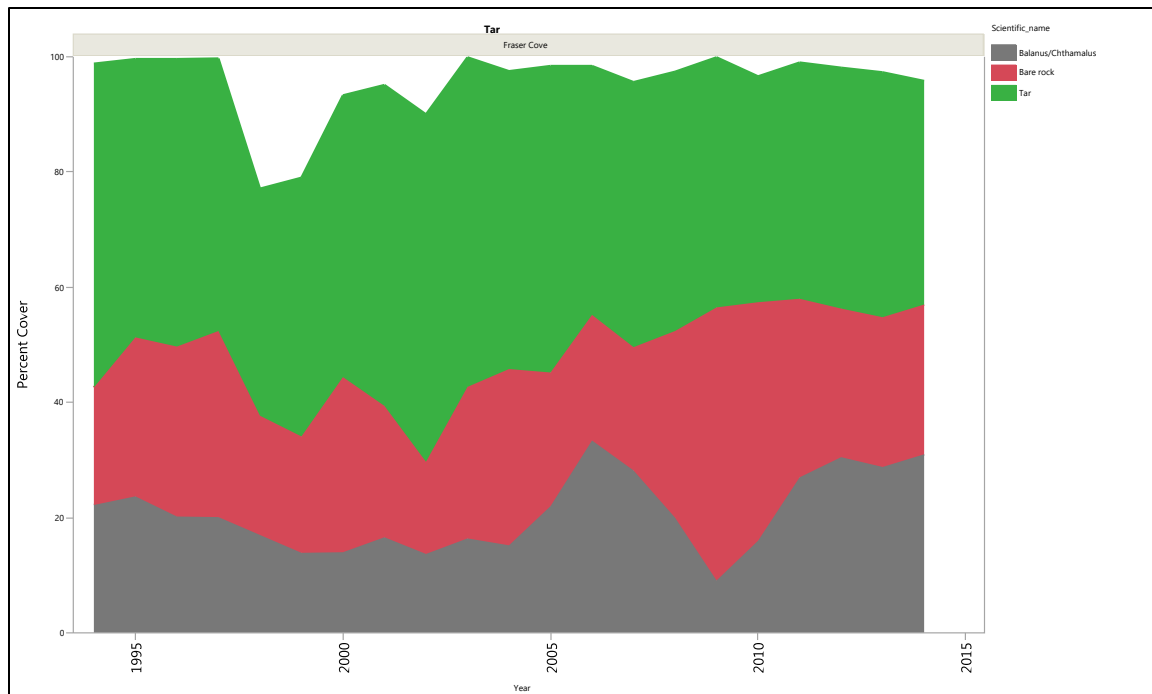


Figure 25. Percent cover of tar along with other dominant taxa and bare rock in fixed plots within the tar zone at Fraser Cove, Santa Cruz Island. Colored areas represent the mean percent cover for representative and dominant taxa/substrata from five tar plots.

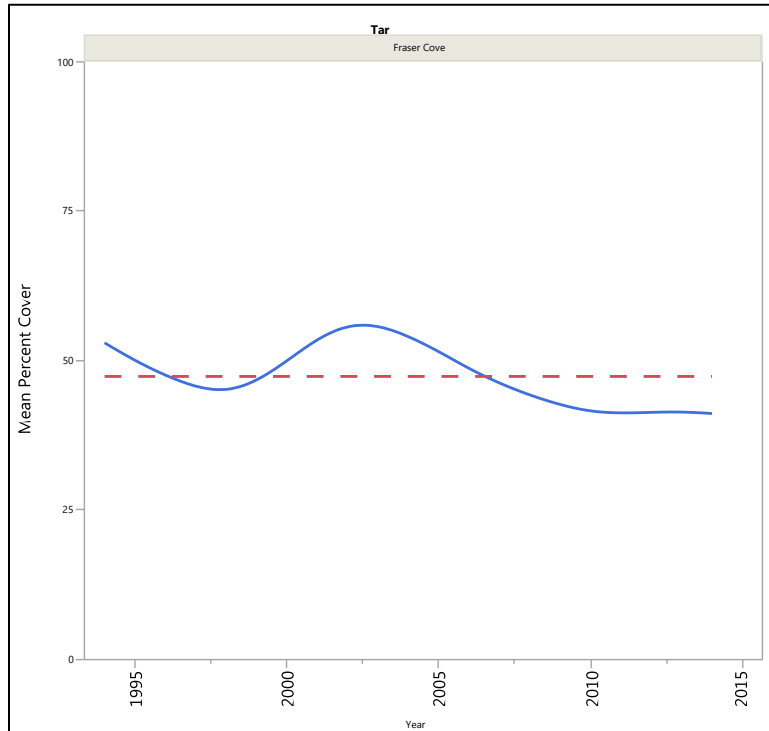


Figure 26. Departure from the long-term mean for tar. Blue lines represent mean cover of tar within the representative zone pooled across plots at Fraser Cove. Red dashed line represents long-term mean.

Haliotis cracherodii

Following the collapse of the black abalone population in southern California due to Withering Syndrome (WS) in the late 1980s and 1990s, most monitoring sites at CHIS have supported extremely low numbers of abalone relative to historical abundances (Figures 27–28 [density and timed search graphs]). In 2014, only three black abalone (N=1 at Cat Rock, Harris Point and Sea Lion Rookery) were found within fixed plots in spring; three black abalone (N=2 at Northwest-Talcott and N=1 at Harris Point) were also observed inside plots in fall (Figure 29). Note that not all plots were searched at all sites both seasons. Refer to Figure 29 and trip reports in Appendix B for details.

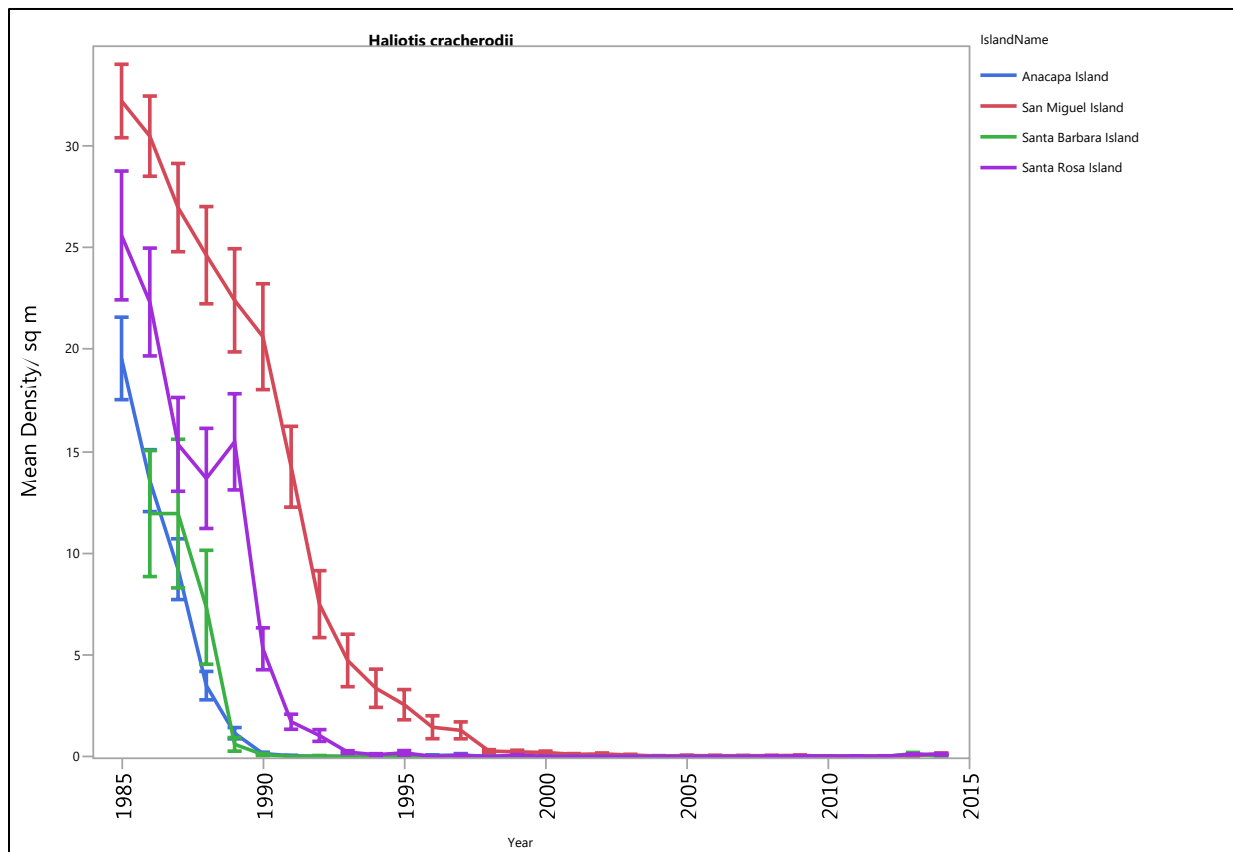


Figure 27. *Haliotis cracherodii* counts from fixed plots at all islands except Santa Cruz from 1985–2014. Note that fixed plots were not established at Santa Cruz Island. Standard error bars were constructed using 1 standard error from the mean.

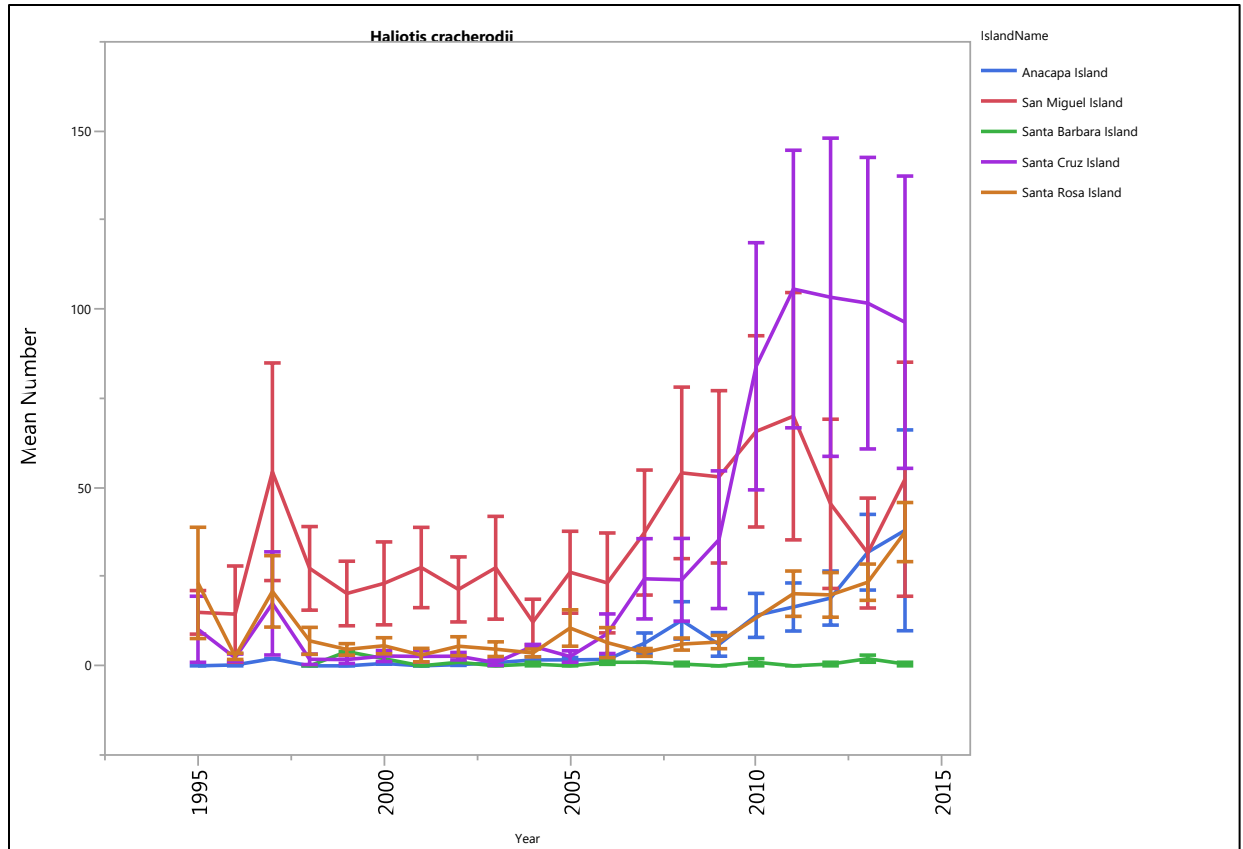


Figure 28. Black abalone, *Haliotis cracherodii*, mean counts at all islands from 1995–2014. Count data are generally derived from site-wide searches. Error bars were constructed using 1 standard error from the mean.

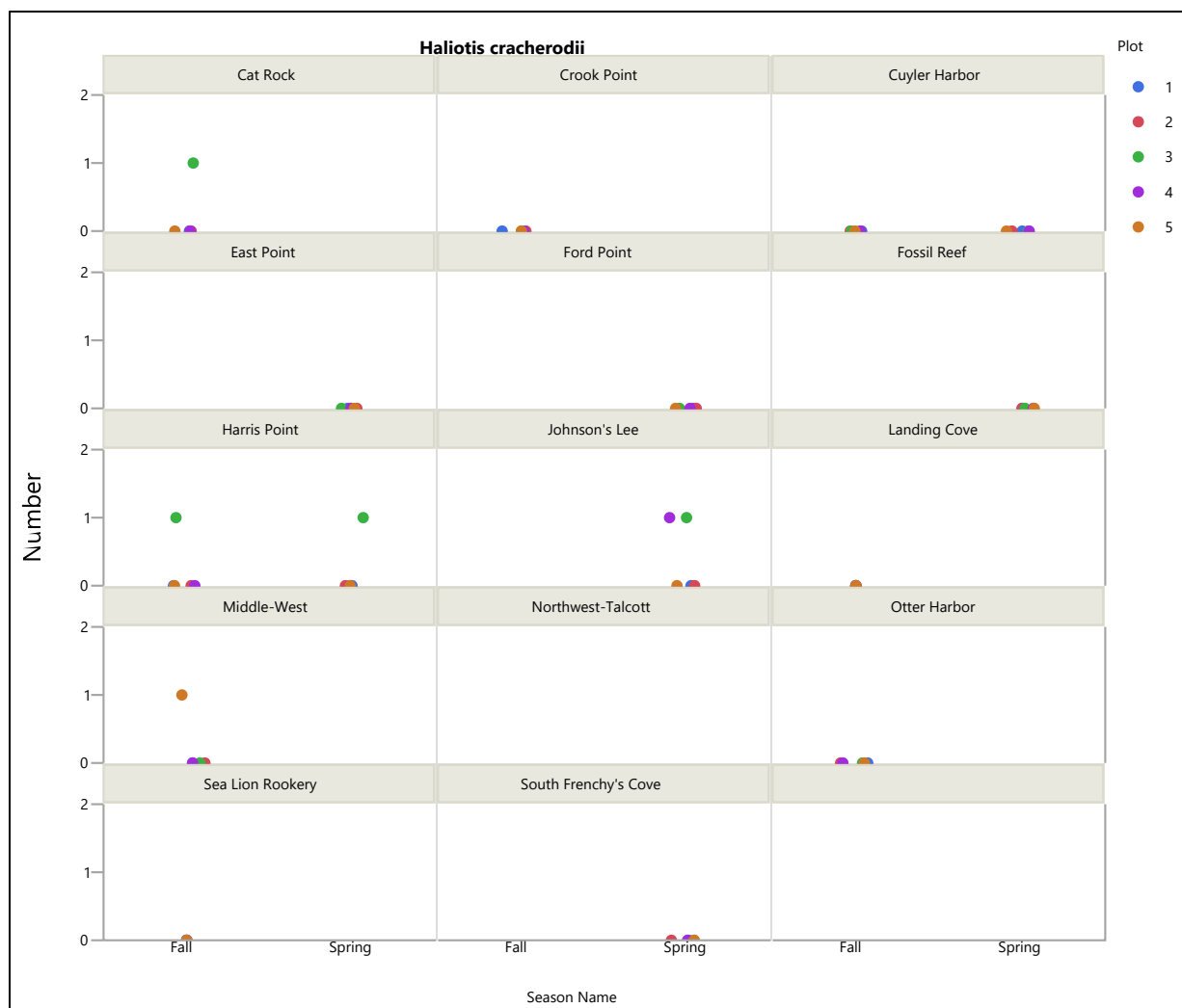


Figure 29. *Haliotis cracherodii* counts in 2014 at all sites where fixed plots have been established.

During routine timed searches, 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 (Orizaba Cove, Otter Harbor and Willows Anchorage) (Figure 30). Note that search effort increased at Crook Point, Harris Point, Anacapa Middle West, Orizaba Cove, Otter Harbor, Trailer and Willows Anchorage 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 2014 were fairly consistent with the range of counts seen since 1995 (Figure 30). 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 2014 at Anacapa Middle West, Cat Rock, East Point, Ford Point, Harbor Seal Arch, Johnson's Lee, Orizaba Cove, Prisoner's Harbor and Willows Anchorage. At most locations where black abalone counts have increased above the long-term mean, abundances began increasing approximately 2007–2009.

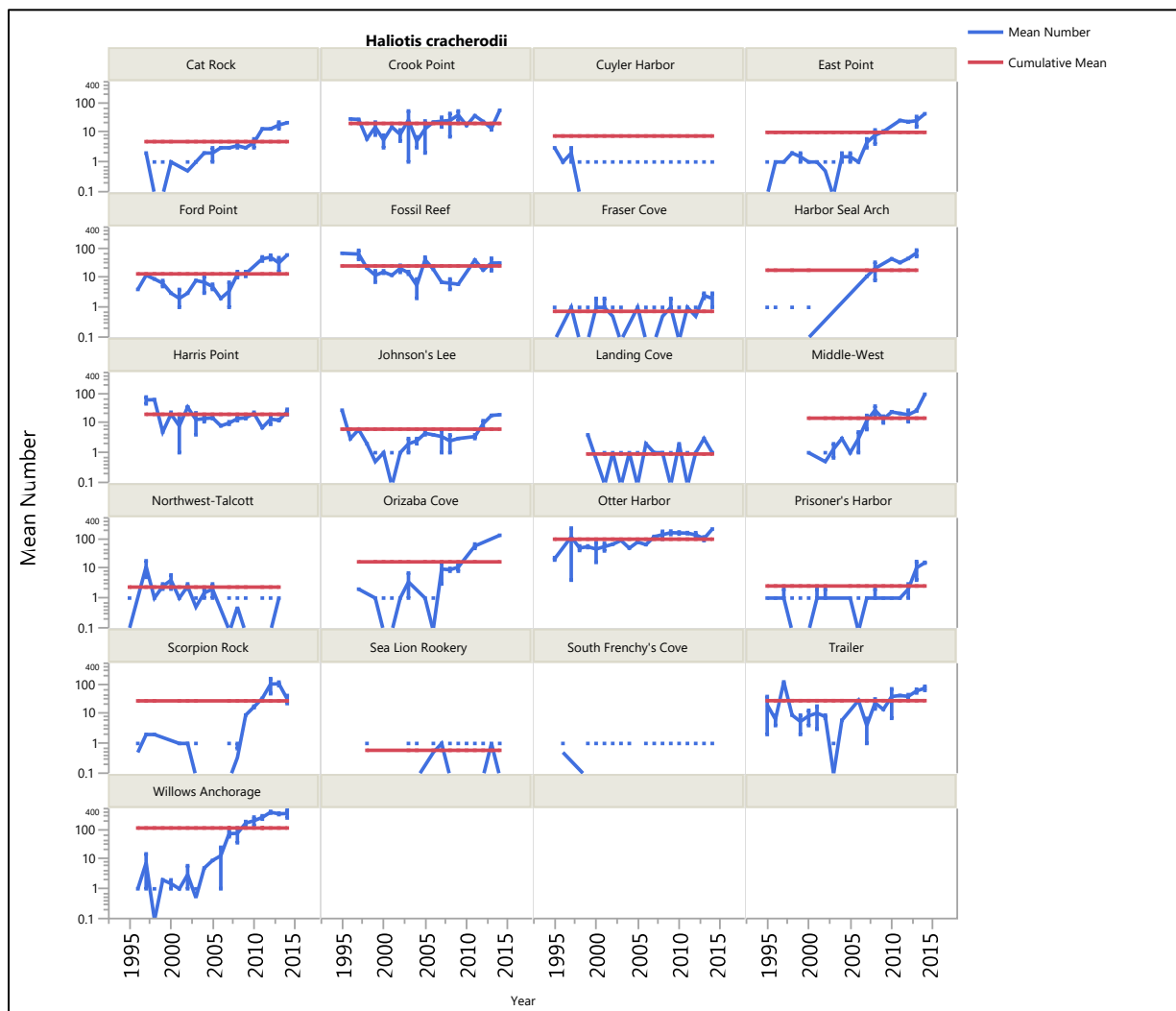


Figure 30. Departure from the long-term mean for *Haliotis cracherodii* at each site. Blue lines represent mean number of *H. cracherodii* at each site. Red lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean. Note that data are displayed on a logarithmic scale.

At the island level, mean abundances of *H. cracherodii* in 2014 measured above the cumulative mean respective to each island at Anacapa, Santa Cruz and Santa Rosa (Figure 31). Note that only a few black abalone have been observed at Santa Barbara Island in recent years, and 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 2014 was comparable to the cumulative mean.

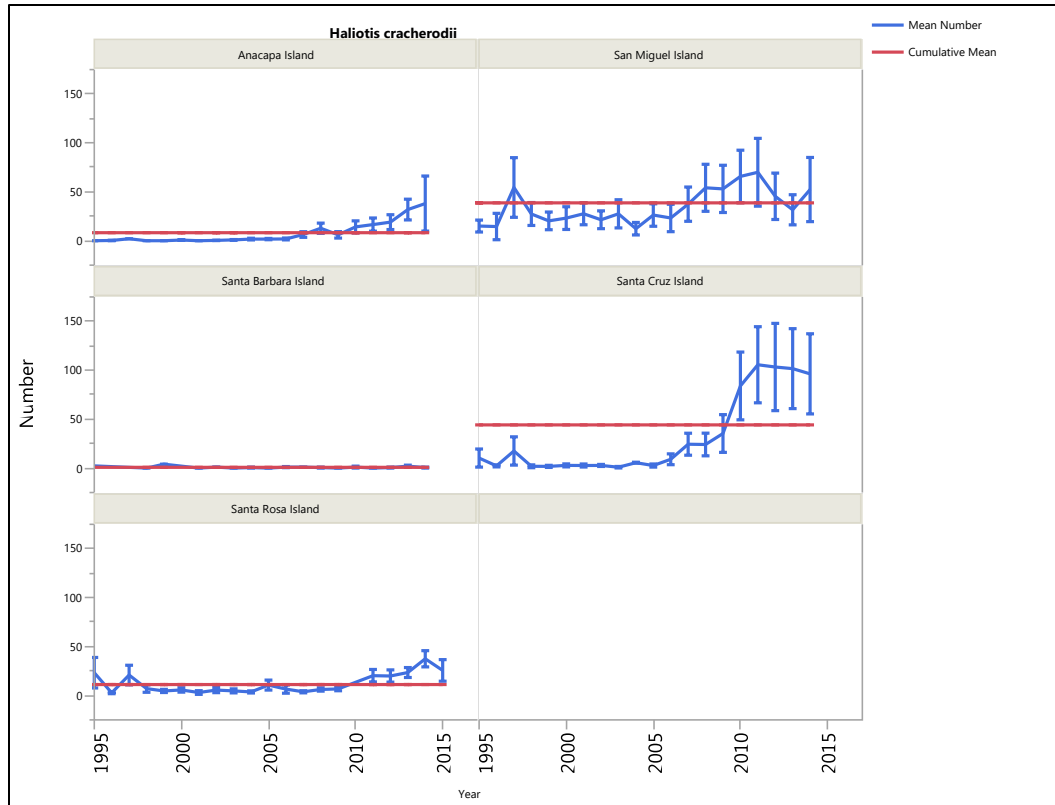


Figure 31. Departure from the long-term mean for *Haliotis cracherodii* at each island. Blue lines represent mean number of *H. cracherodii* at each island. Red lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean. Note that data are displayed on a logarithmic scale.

In 2014, the size frequency distributions for all islands except Santa Barbara reflected the effects of recruitment through the presence of juvenile black abalone (Figures 32–36). Modes ranged 40–120 mm at all islands sampled in spring and fall. Anacapa Island had a relatively flat but normally-distributed population in fall. The population at Santa Cruz Island appeared slightly bimodal with modes centered at approximately 30 mm and 70–90 mm in spring and fall. Santa Rosa *H. cracherodii* were skewed towards smaller individuals in spring with a mode at 120 mm; the population was not assessed in fall. At San Miguel, the size distribution was bimodal in fall with modes at 60 mm and 110 mm. The Santa Barbara Island size-distribution was not estimated in 2014 because only one black abalone was seen at one (Landing Cove) of the two sites on the island.

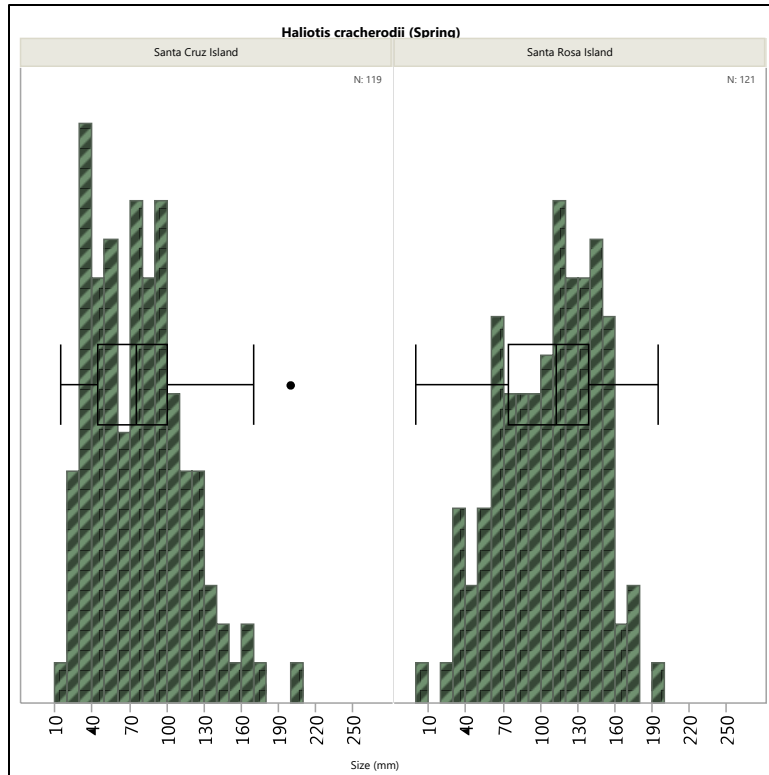


Figure 32. *Haliotis cracherodii* size distributions pooled across sites at each island measured in spring 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates 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.

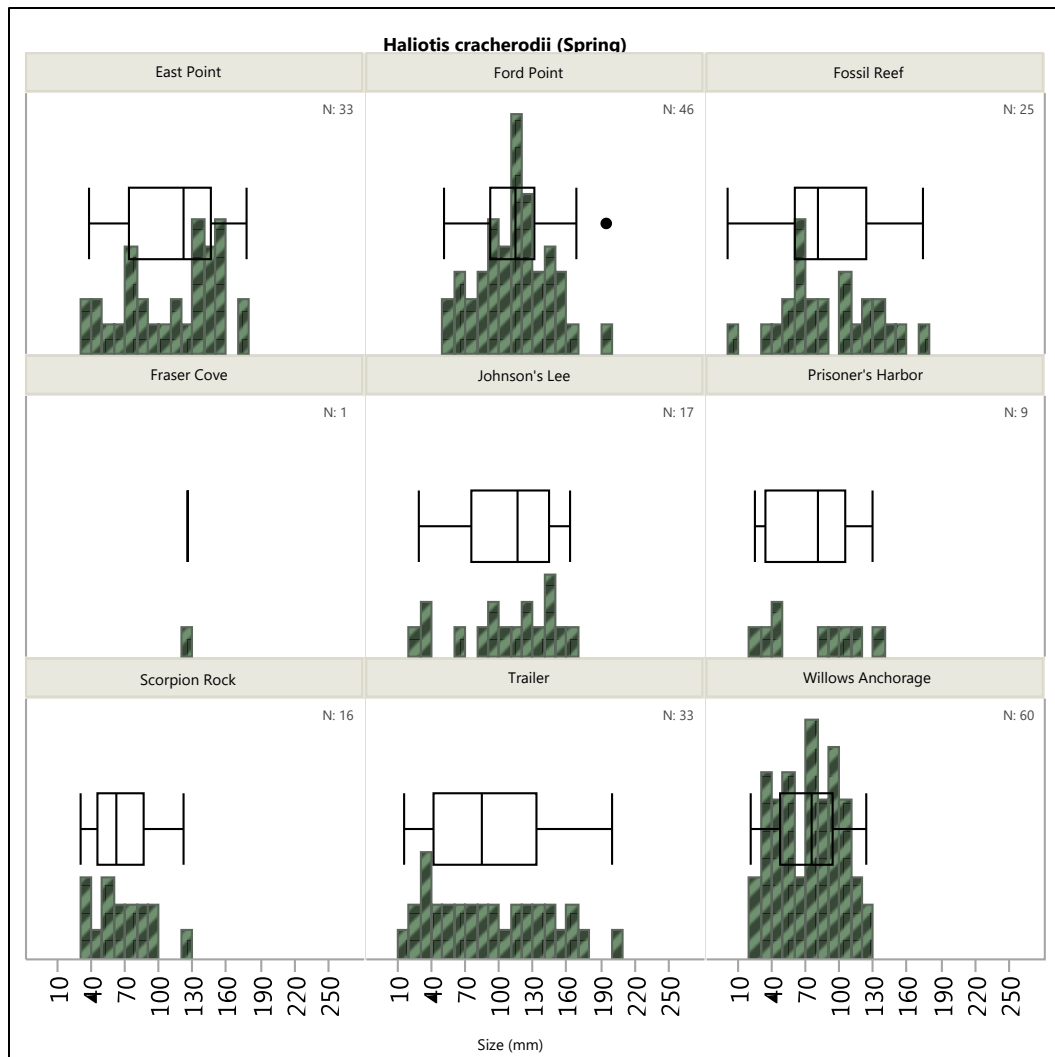


Figure 33. Size frequency distributions of *Haliotis cracherodii* measured at each site in spring 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates 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.

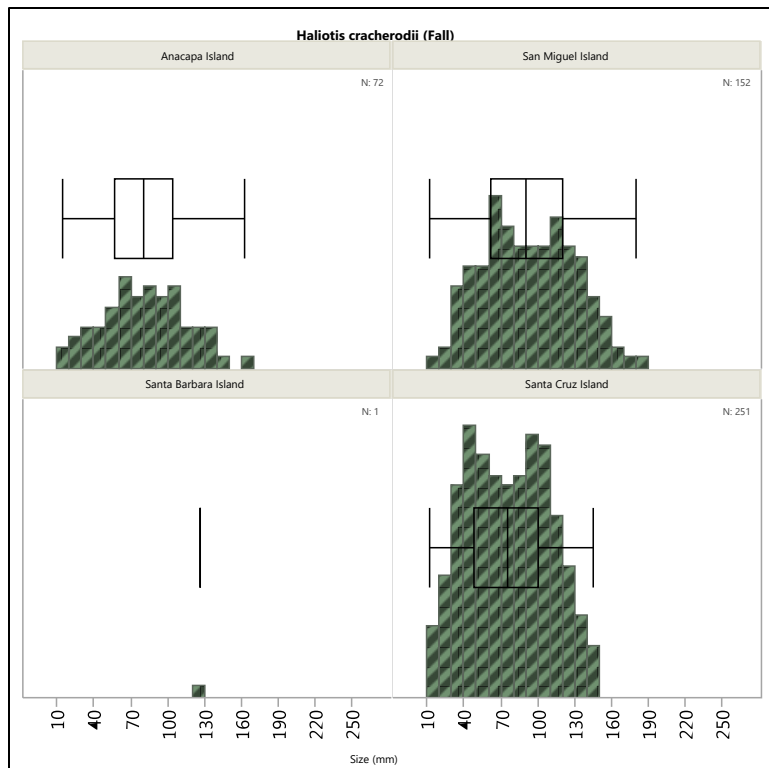


Figure 34. *Haliotis cracherodii* size distributions pooled across sites at each island measured in fall 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates 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.

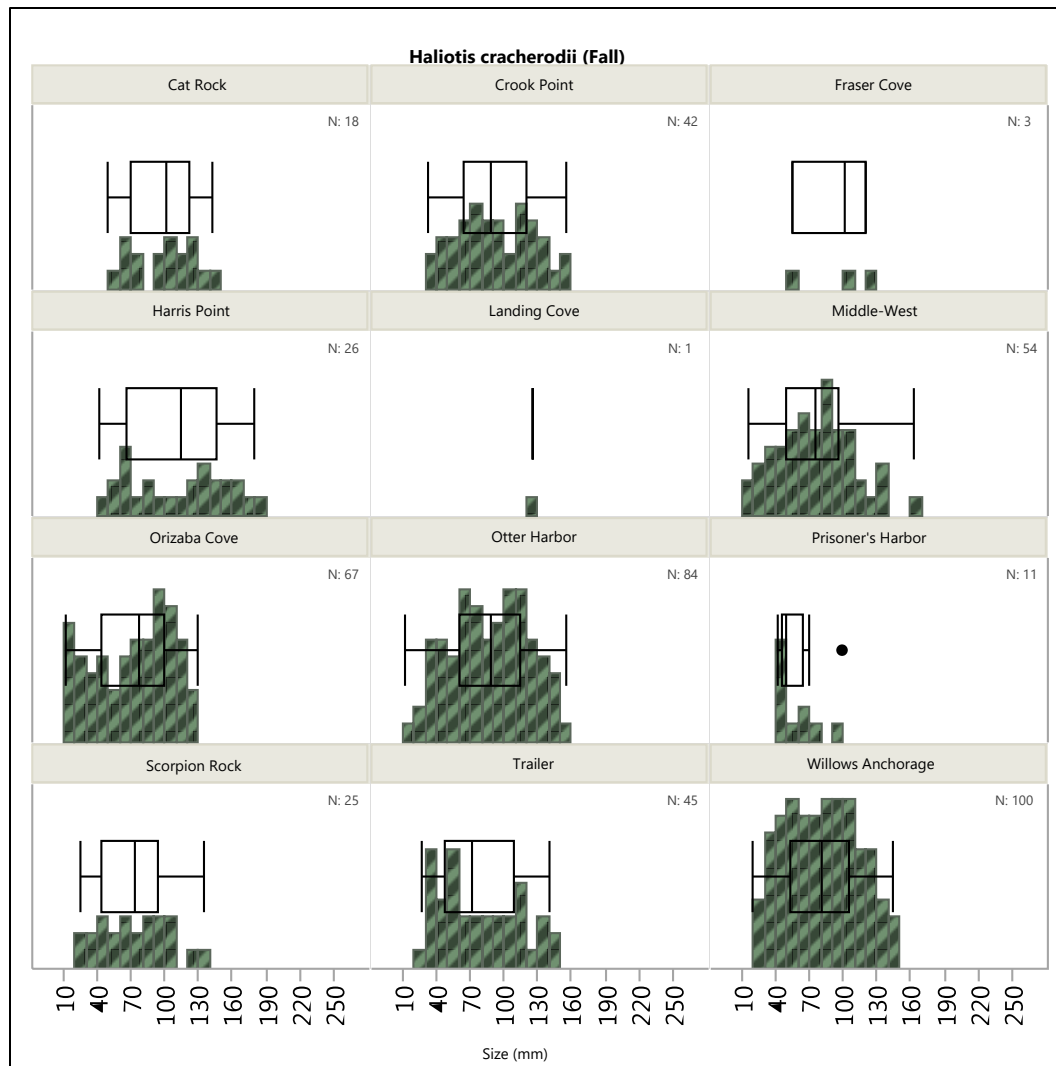


Figure 35. Size frequency distributions of *Haliotis cracherodii* measured at each site in fall 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates the 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.

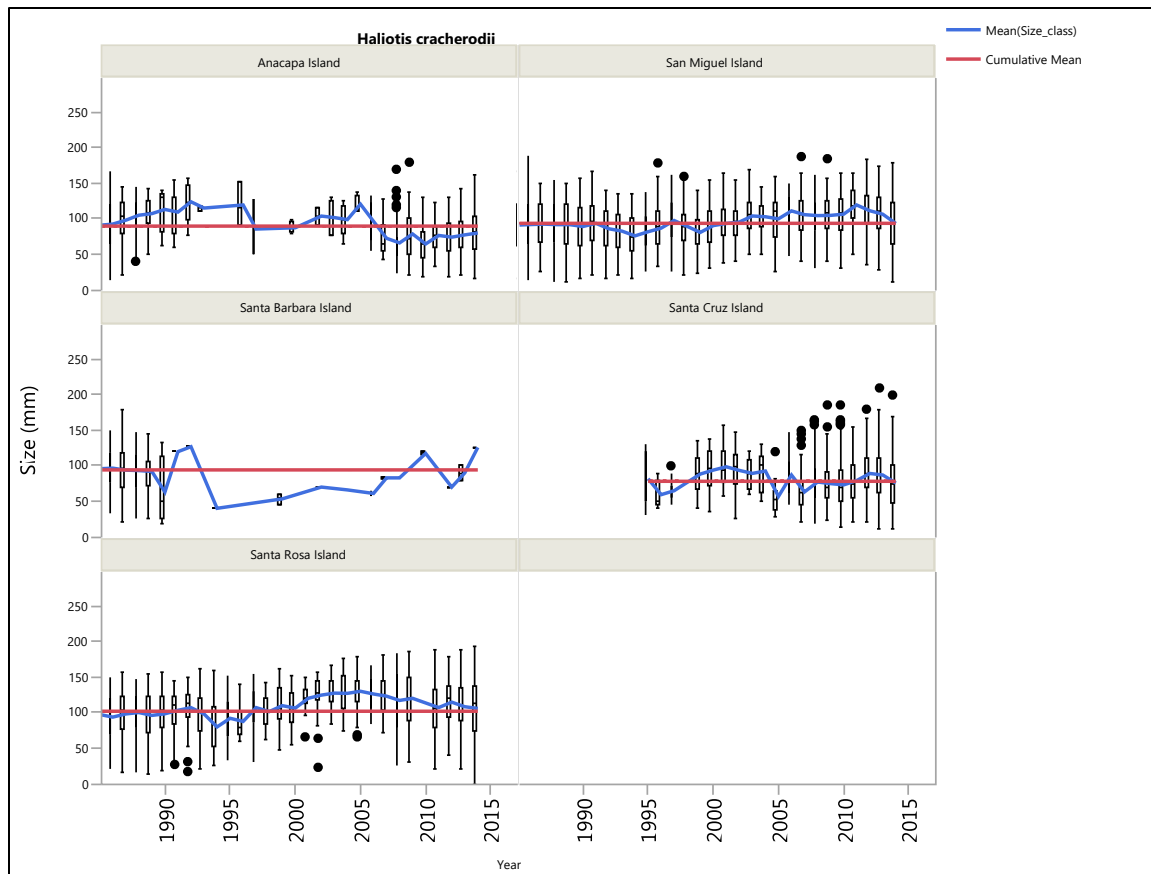


Figure 36. Box plots for annual size frequency distributions of *Haliotis cracherodii* at each island. Blue lines represent mean sizes of *H. cracherodii* at each island pooled across and sites. Red lines represent the cumulative mean.

Shrunken foot, one of the symptoms of Withering Syndrome (WS), was observed for three individuals in 2014 at Willows Anchorage during the fall sample. Two of the animals were however, firmly attached to the substratum and responded with movement and increased grip when they were measured. The remaining withered abalone was dead so it was collected and remains frozen in the NPS CHIS Annex freezer for future analysis. Another dead black abalone that appeared shrunken was found at Cuyler Harbor in December. No other abalone with signs of WS were observed at any of the monitoring sites in 2014. In 2013 and 2012, no signs of WS were observed. It is unknown whether any of the abalone that appeared shrunken were suffering from WS.

Extremely high sand cover was observed at Willows Anchorage during both spring and fall visits. Several black abalone were seen partially covered by sand and others may have been completely buried.

Lottia gigantea

Owl limpets, *Lottia gigantea*, are typically sampled in fall. All sites with fixed plots for *L. gigantea* were sampled in 2014 except the four (Ford Point, Fossil Reef, Johnson's Lee and Northwest-Talcott) on Santa Rosa Island (Figure 37).

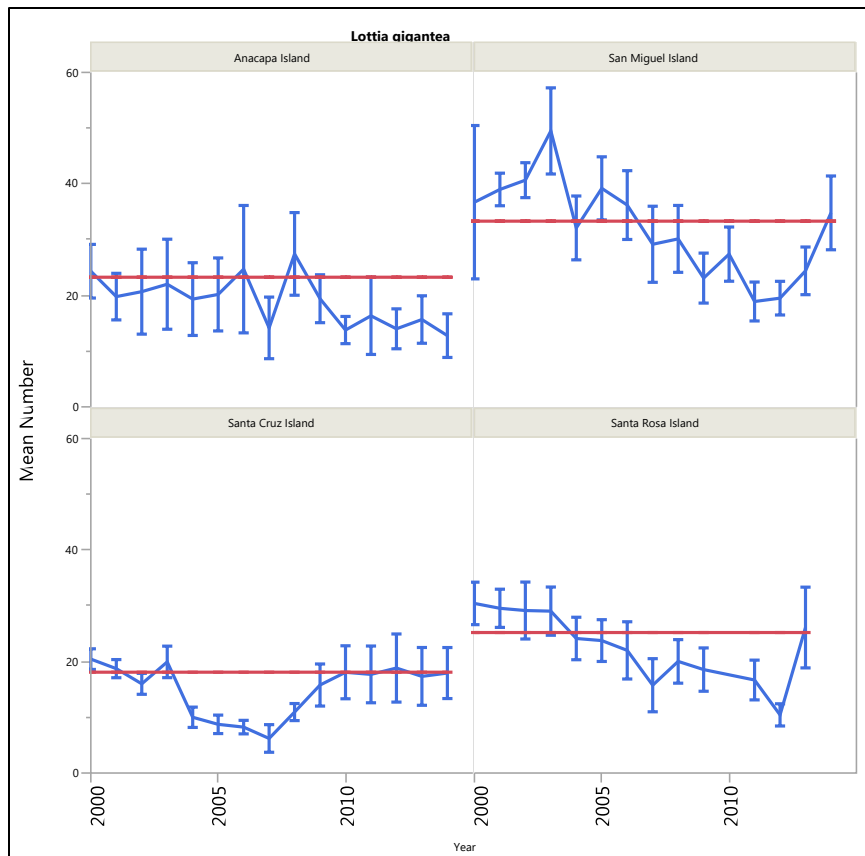


Figure 37. Departure from the long-term mean for *Lottia gigantea* at each island. Blue lines represent mean number of *L. gigantea* at each island pooled across fixed plots and sites. Red dashed lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean. Note that 2014 data from Santa Rosa Island are not presented.

The mean number of limpets ranged 4.3–50.6 per plot across all sites that were sampled in 2014 (Figure 38). Otter Harbor had the greatest number of *L. gigantea* and South Frenchy’s Cove had the least. Mean abundances of limpets ranged 4–20 per plot at six sites and greater than 20 per plot at two sites. Mean abundances of *L. gigantea* in 2014 were comparable or slightly below the long-term mean at all sites except Otter Harbor and Willows Anchorage. At both latter sites, owl limpets were slightly more abundant than abundances measured last year.

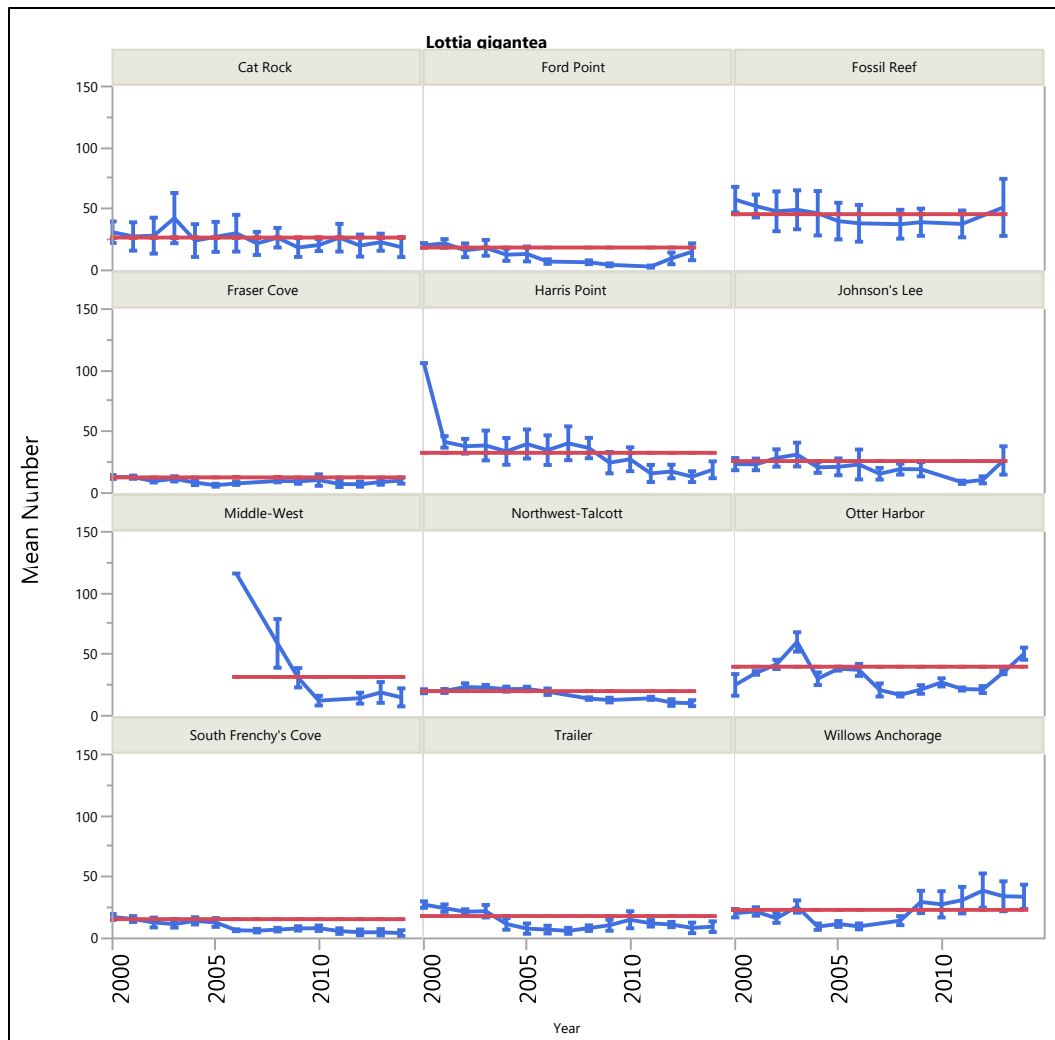


Figure 38. Departure from the long-term mean for *Lottia gigantea* at each site. Blue lines represent mean number of *L. gigantea* at each site pooled across fixed plots. Red dashed lines represent cumulative mean. Error bars were constructed using 1 standard error from the mean. Note that 2014 data from Santa Rosa Island sites are not presented.

The sizes of *L. gigantea* in 2014 varied among sites and islands. While only minimal temporal changes in median sizes of limpets were documented within most sites, below-median sized limpets relative to the most recent five years were measured at Ford Point, Fraser Cove, Johnson's Lee and Willows Anchorage (Figures 39–40). Median sizes ranged 32–66 mm across all sites sampled in 2014 with the smallest owl limpets measured at Willows Anchorage and the largest at Trailer. When pooled across islands, the smallest (median = 36 mm) limpets occurred at San Miguel followed by Santa Cruz (median = 39 mm) and Anacapa (median = 40 mm) (Figure 41).

The mean sizes (range = 32.4–59 mm) of *L. gigantea* in 2014 remained comparable at most sites to long-term means generated for each respective site (Figure 39). Similarly, when pooled across islands, mean sizes (range = 38–44.1 mm) of owl limpets were compatible with historical measurements (Figure 41).

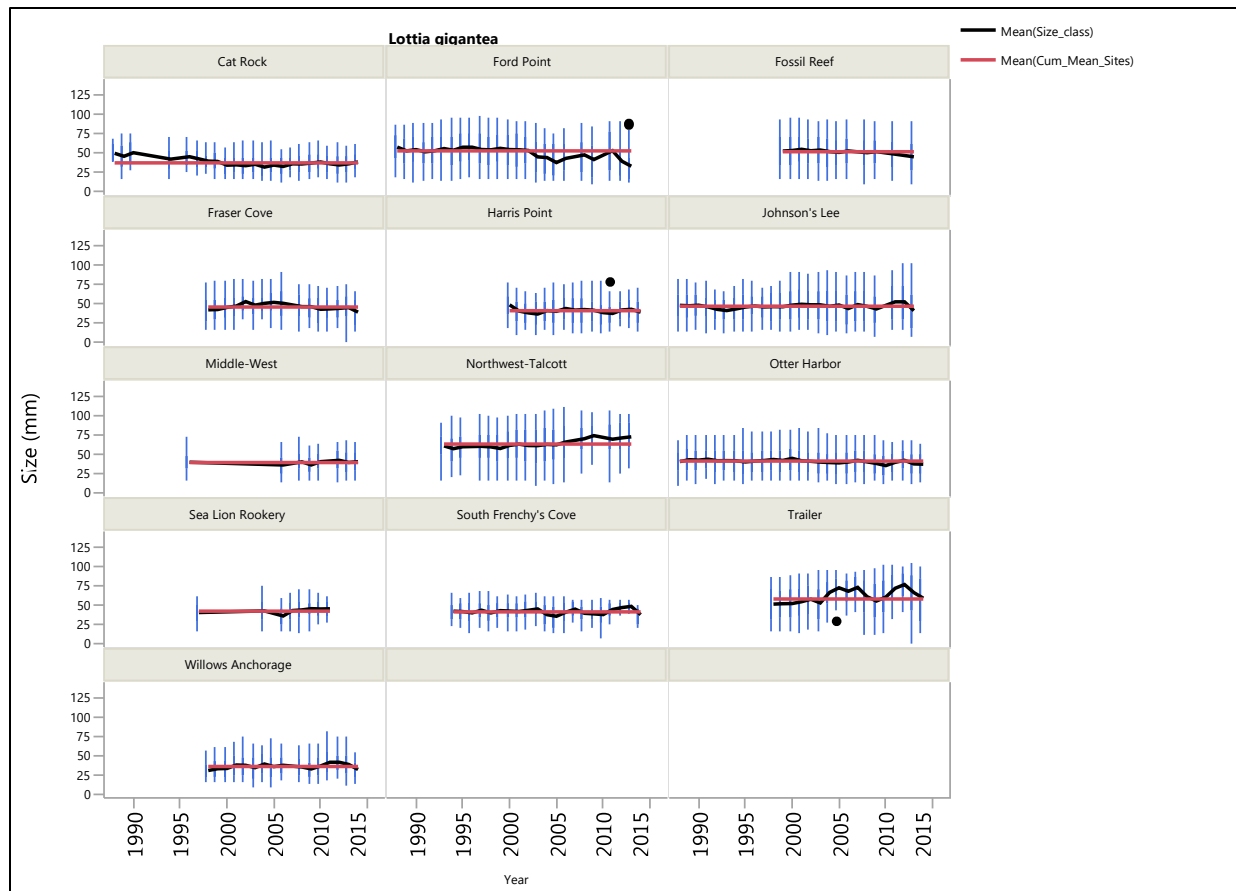


Figure 39. Box plots for annual size frequency distributions of *Lottia gigantea* at each site. Black lines represent mean sizes of *L. gigantea* at each site pooled across fixed plots. Red lines represent the cumulative mean.

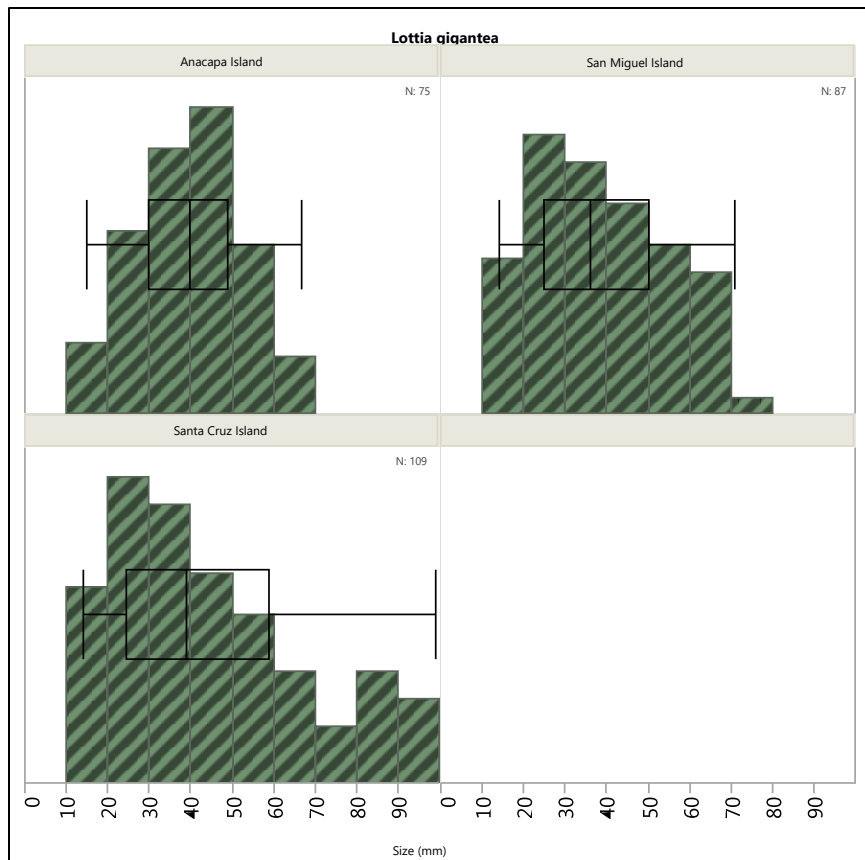


Figure 40. *Lottia gigantea* size distributions at each site measured in fall 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates the median value, the 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.

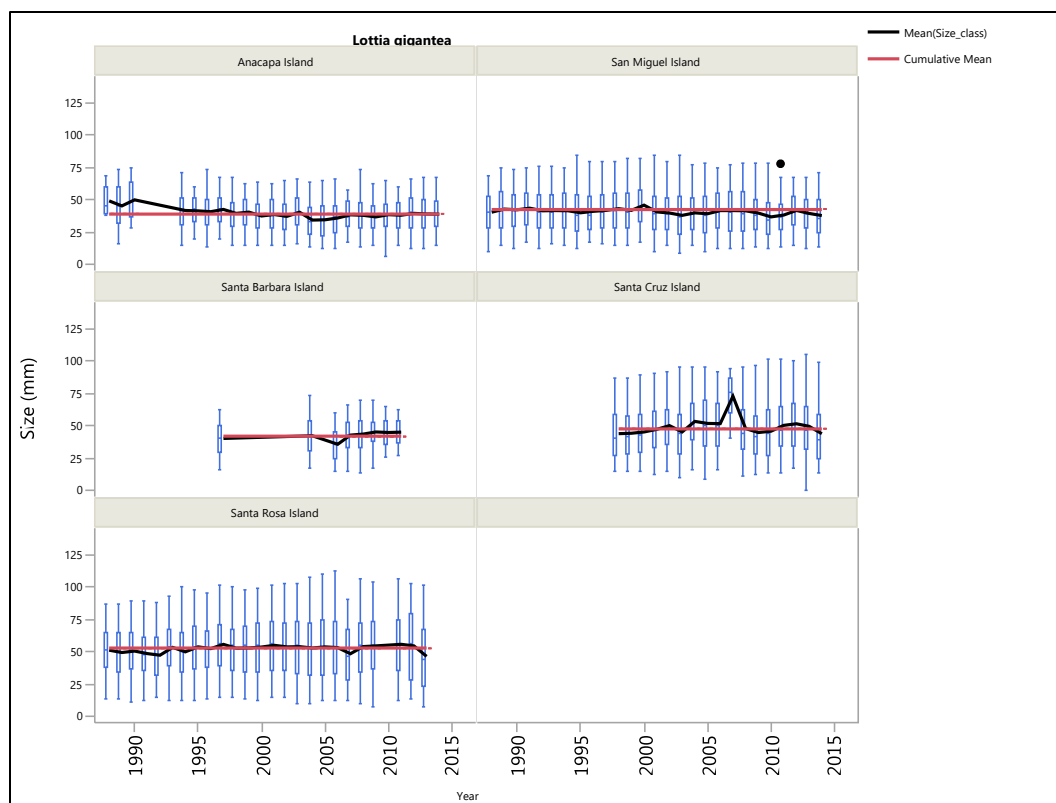


Figure 41. Box plots for annual size frequency distributions of *Lottia gigantea* at each island. Black lines represent mean sizes of *L. gigantea* at each island pooled across fixed plots and sites. Red lines represent the cumulative mean.

L. gigantea size distributions pooled across sites for each island are displayed in Figure 40. The size distribution at Anacapa appeared to be nearly uniform with a mode centered on 40–50 mm. Distributions for both San Miguel and particularly Santa Cruz islands exhibited more positive skewness whereby mean values were slightly higher than the median sizes and modes ranged 20–30 mm.

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 historically have supported low (i.e. < 35 *P. ochraceus*) numbers of sea stars. Sites are generally sampled for sea star abundance in both spring and fall. Some sites, however, were only sampled in spring or fall. In 2014, the following sites were only sampled in spring: Crook Point, East Point, Ford Point, Johnson's Lee, South Frenchy's Cove, Trailer and Willows Anchorage. The following sites were monitored for sea star abundance and size frequency only in the fall: Cat Rock, Cuyler Harbor, Fraser Cove, Landing Cove, Anacapa Middle West, Orizaba Cove, Otter Harbor, Scorpion Rock and Sea Lion Rookery. The sites Anacapa Middle East, Fossil Reef and Northwest-Talcott were not sampled for sea star abundance in 2014.

Compared with previous years, sea star abundances in 2014 plummeted at all sites that were sampled (Figures 42–44). At various times during the past decade, extremely high abundances (~ 500 *P. ochraceus*) have been observed at multiple sites, and most locations have supported >100 sea stars counted during 30-minute site-wide searches. This year, abundances ranged 0–23 individuals per site with the majority having fewer than 10 *P. ochraceus* seen during routine searches.

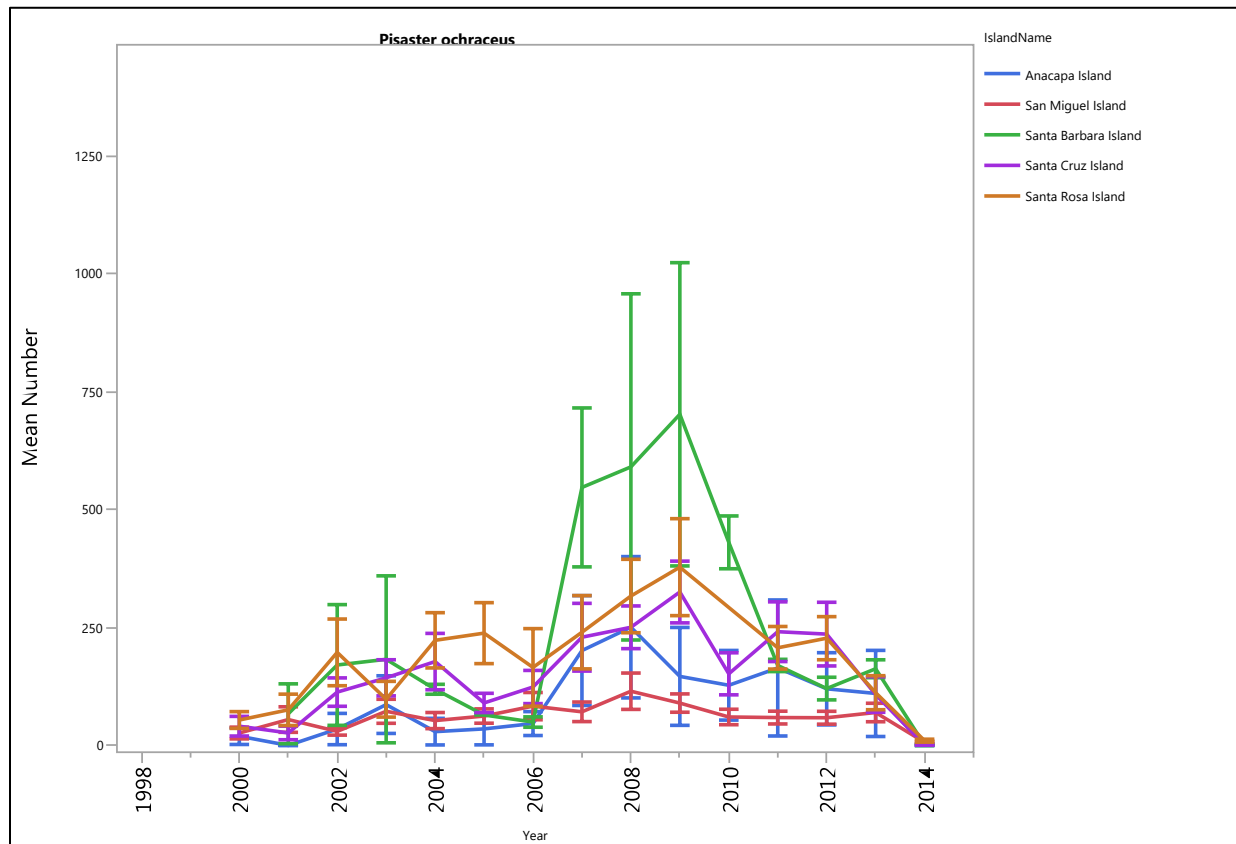


Figure 42. *Pisaster ochraceus* counts pooled across all sites at each island from 1999–2014. Count data were obtained from timed-(30 minute) searches.

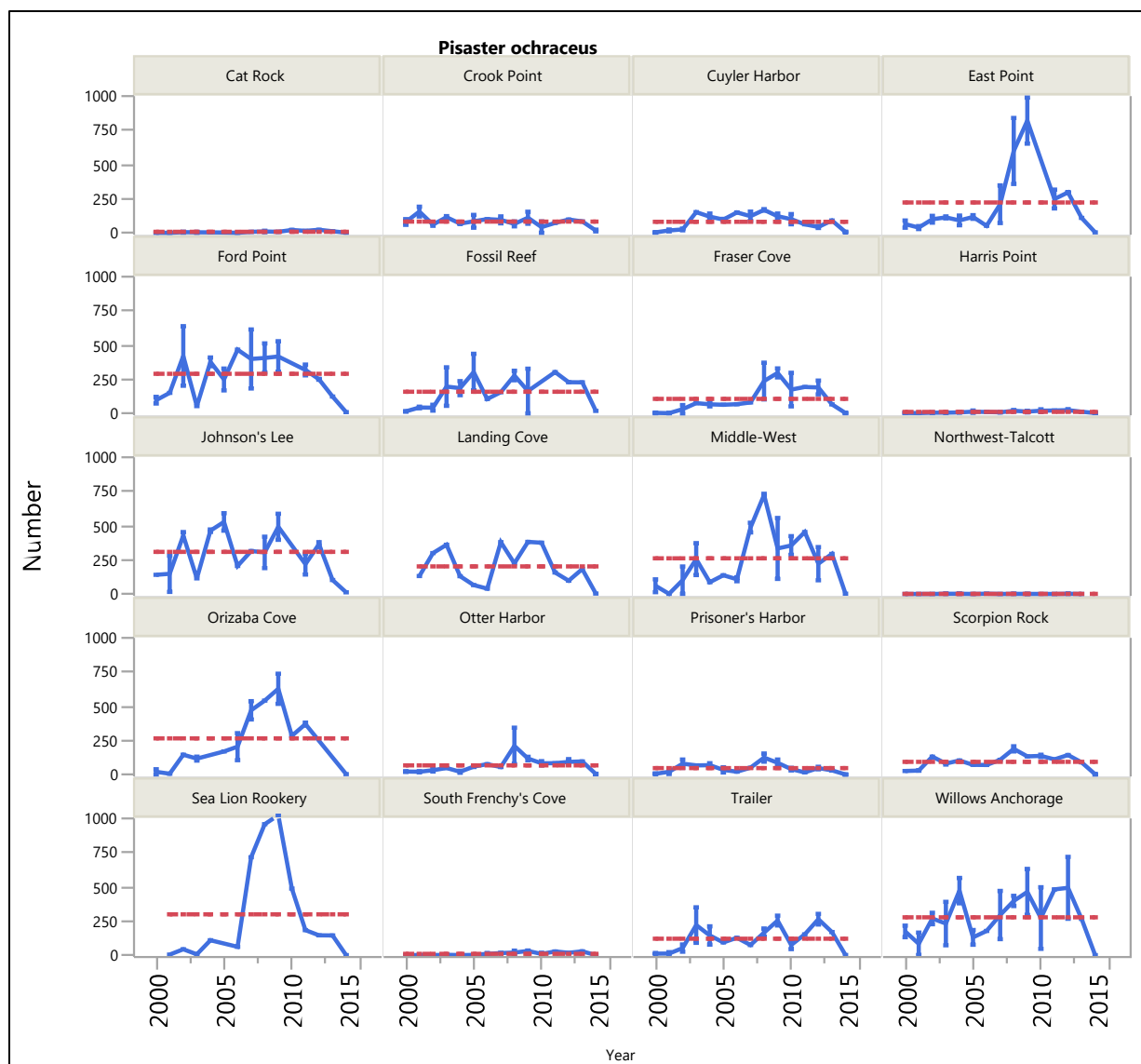


Figure 43. *Pisaster ochraceus* counts at each site from 1999–2014. Count data were obtained from timed-(30 minute) searches. Blue lines represent the number of *P. ochraceus* and red dashed lines indicate the long-term mean number of *P. ochraceus* at each site.

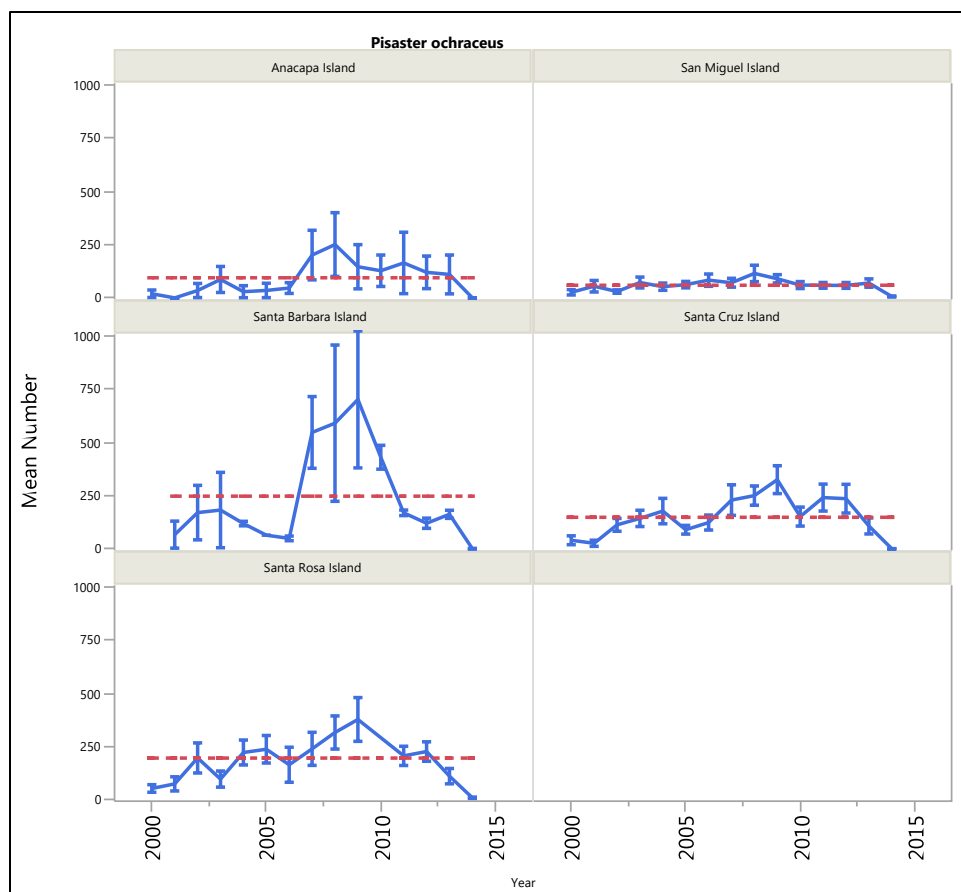


Figure 44. *Pisaster ochraceus* counts at each island from 2000–2014. Count data were obtained from timed-(30 minute) searches. Blue lines represent the number of *P. ochraceus* and red dashed lines indicate the long-term mean number of *P. ochraceus* at each site.

Beginning in June 2013, a disease event swiftly and significantly impacted *P. ochraceus* (among other species of sea stars) populations along the North American Pacific coast from Alaska to Baja California, Mexico. By the beginning of 2014, *P. ochraceus* abundances had declined by >95% at nearly all CHIS long-term intertidal monitoring sites, in addition to numerous other locations along the west coast. The magnitude and spatial scale of this wasting event were unprecedented by any other die-offs that have been documented in recent decades.

The mortality event, often referred to as sea star wasting syndrome (SSWS) or disease (SSWD), is typically characterized by a suite of symptoms that initially consist of lesions forming in the ectoderm which then leads to fragmentation of the body and death as the illness progresses. The manifestation of symptoms and subsequent death can occur in as little as two days. It's unclear what causes the syndrome although there is evidence that a densovirus (SSaDV) is linked to SSWS (Hewson et al. 2014).

According to Hewson et al. (2014), SSaDV was observed in higher quantities within sick sea stars compared to asymptomatic individuals. When inoculated with the densovirus, outwardly-appearing healthy animals rapidly succumbed to the symptoms of SSWS. However, it should be noted that the

densovirus was also detected in museum specimens of sea stars dating back to 1942, and it was observed within other species of echinoderms that were asymptomatic. More research is needed to determine causative agents for the disease.

Size frequency measurements for *P. ochraceus* were collected at all sites sampled in 2014. However, insufficient numbers of sea stars were seen to accurately estimate the size structure of *P. ochraceus* populations. Therefore, only measurements from previous years are presented in Figures 45–46. Despite low abundances of sea stars in 2014, size frequency data for each island (sites lumped across islands) are displayed in Figures 47–48.

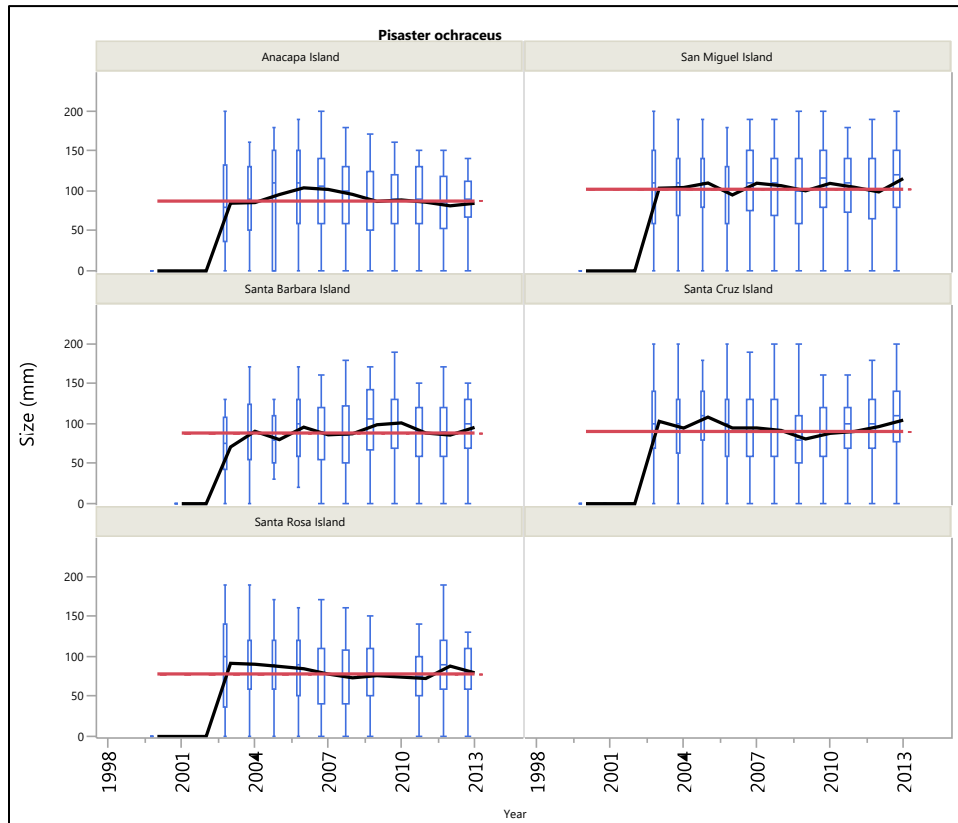


Figure 45. Box plots for annual size frequency distributions of *Pisaster ochraceus* at each island. Black lines represent mean sizes of *P. ochraceus* at each island pooled across sites. Red lines represent the cumulative mean. Note that data for 2014 are not presented due to insufficient numbers of *P. ochraceus* encountered to estimate population size frequency.

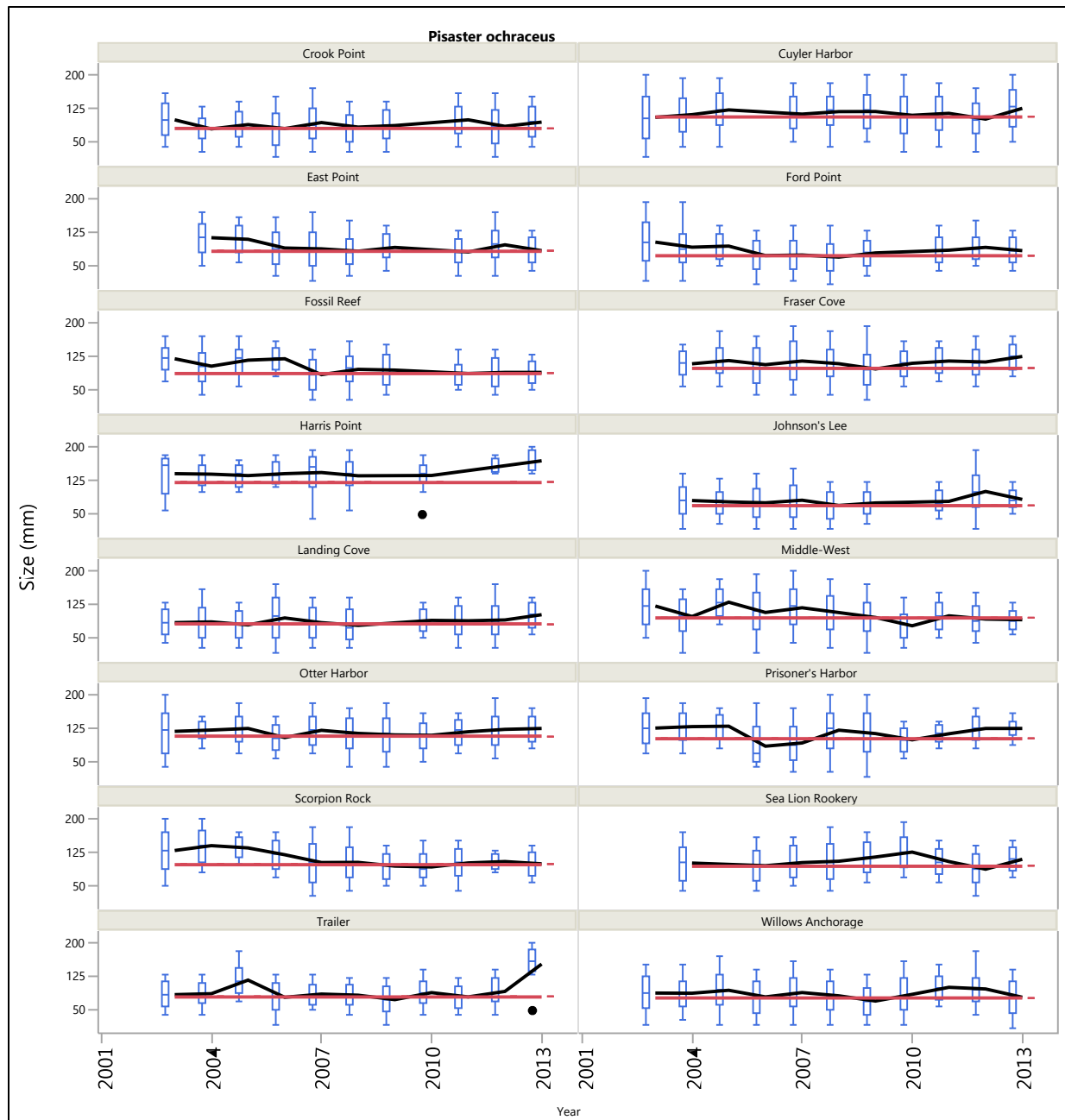


Figure 46. Box plots for annual size frequency distributions of *Pisaster ochraceus* at each site. Black lines represent mean sizes of *P. ochraceus* at each site. Red lines represent the cumulative mean. Note that data for some sites are not shown due to insufficient numbers of *P. ochraceus* located for measurement. Data for 2014 are not presented due to insufficient numbers of *P. ochraceus* encountered to estimate population size frequency.

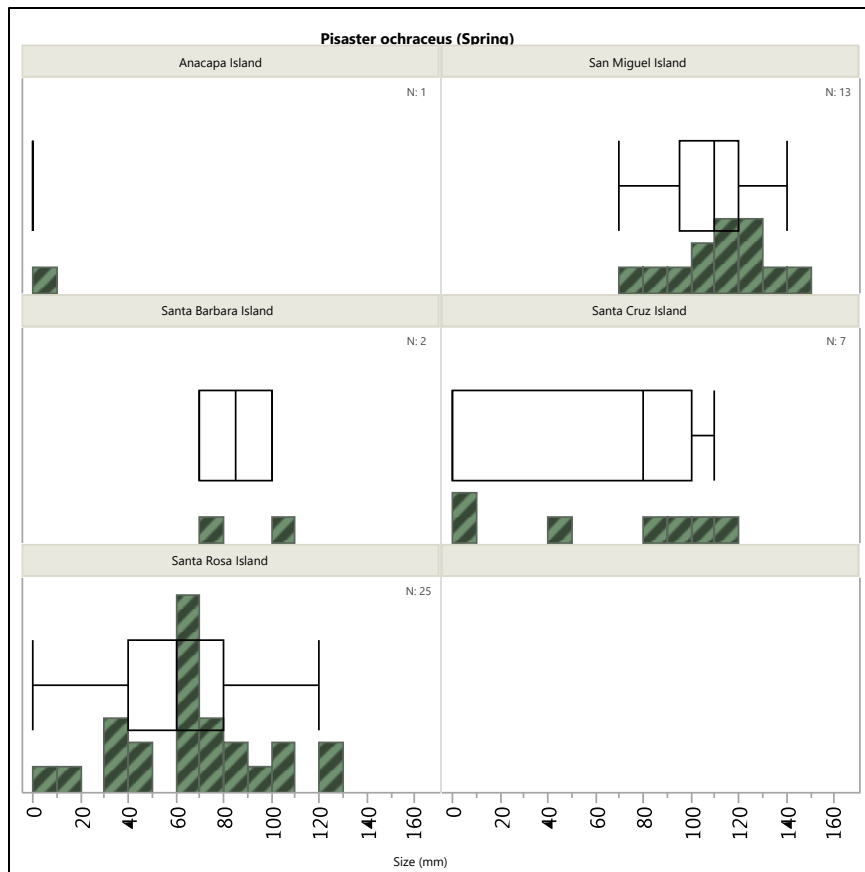


Figure 47. *Pisaster ochraceus* size distributions at each island measured in spring 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates the median value, 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.

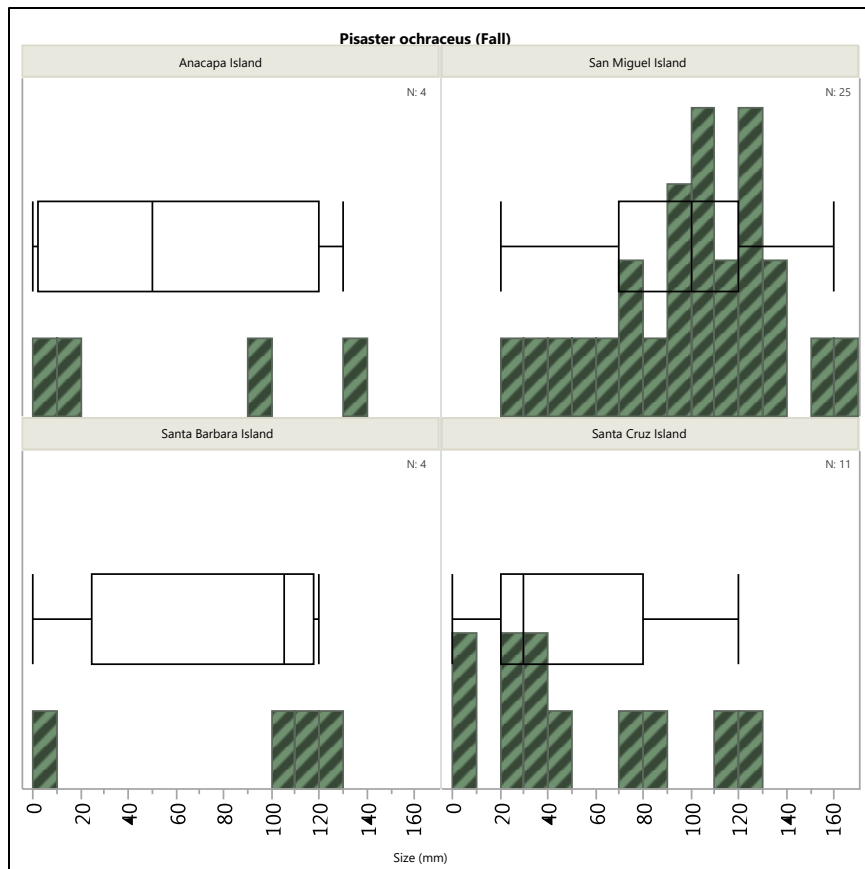


Figure 48. *Pisaster ochraceus* size distributions at each island measured in fall 2014. Box-and-whisker plots indicate the spread and degree of skewness of the size frequency data. The ends of the boxes represent the 25th and 75th quartiles, the vertical line inside the box indicates the median value, 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.

***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 (Figures 49–53). 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. An attempt is made each year to sample surfgrass abundance on the fixed transects at each of the four monitoring sites in the spring and fall. In 2014, large waves prevented monitoring from occurring at Fraser Cove and East Point during the spring sample. Precipitation in November caused the roads on Santa Rosa Island to be shutdown making it impossible to access the Santa Rosa sites during the fall monitoring season.

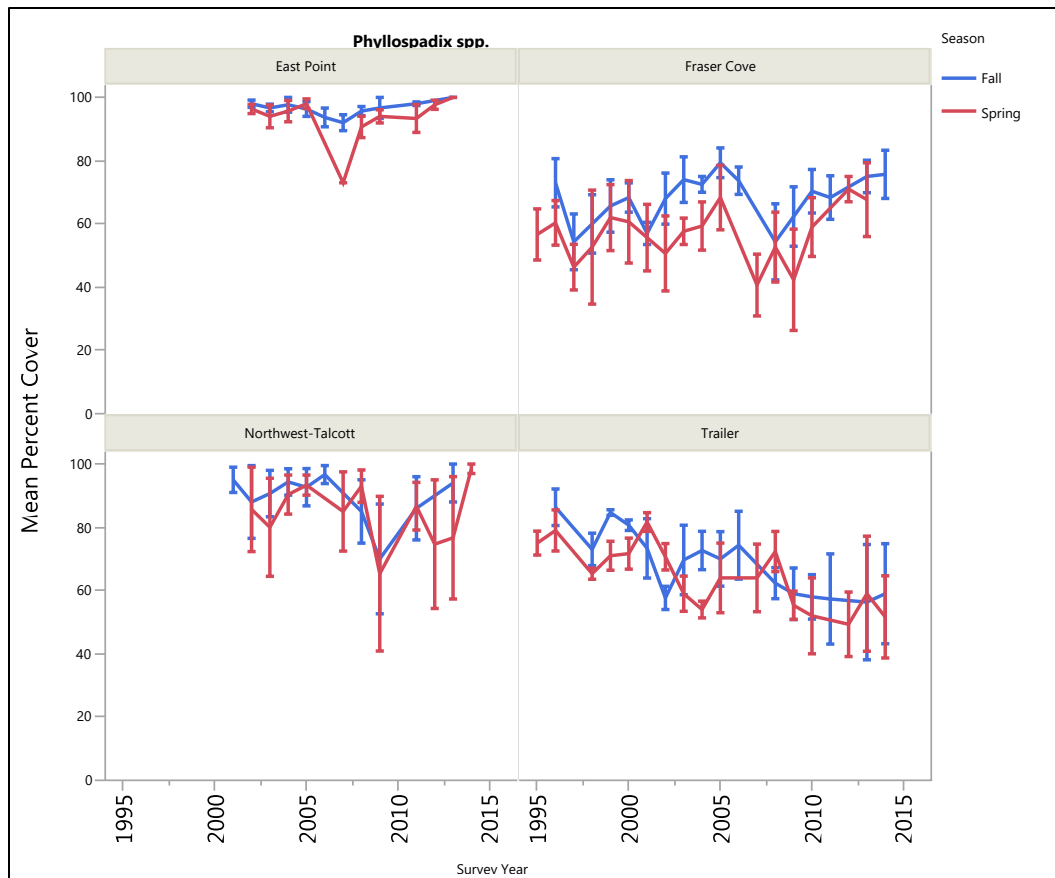


Figure 49. Mean percent cover of *Phyllospadix* spp. pooled across transects at each site. Note that *Phyllospadix* was not monitored at East Point in 2014.



Figure 50. Mean percent cover of *Phyllospadix* spp. at each site. Note that *Phyllospadix* was not monitored at East Point in 2014.

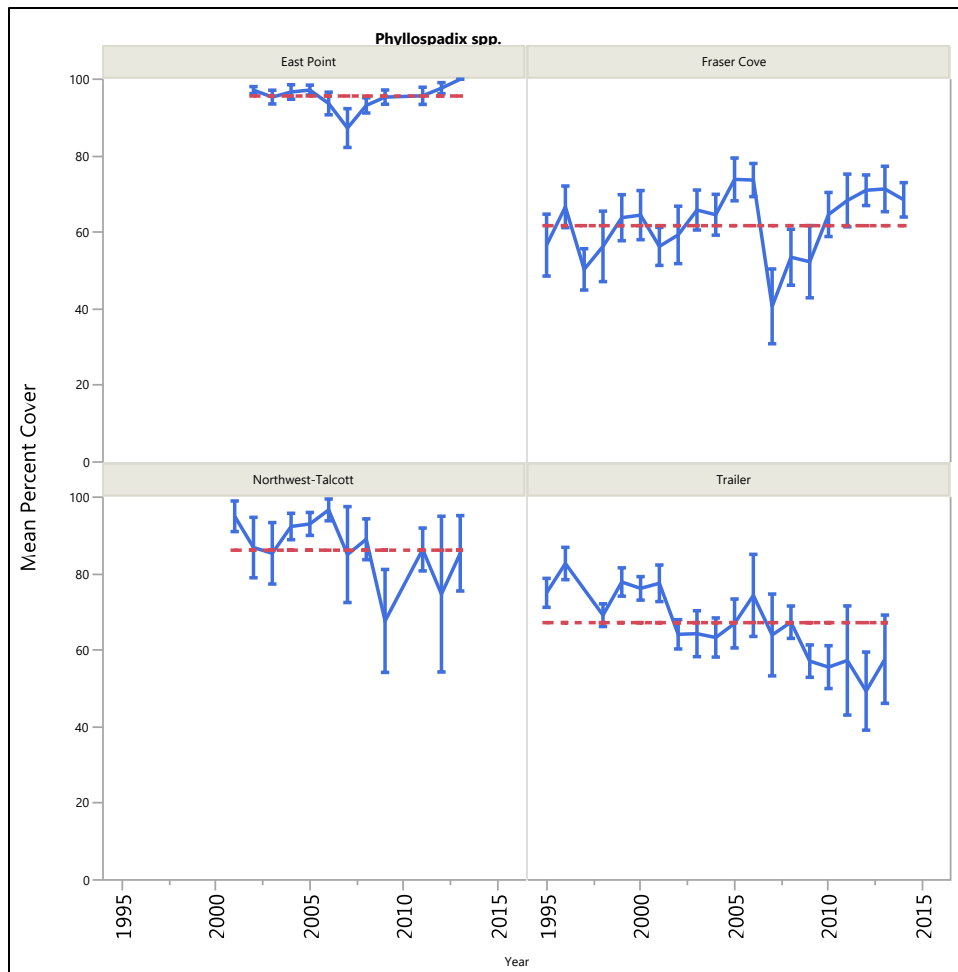


Figure 51. Mean percent cover of *Phyllospadix* spp. pooled across transects at each site. Blue lines represent the mean percent cover of *Phyllospadix* spp. and red dashed lines indicate the long-term mean percent cover of *Phyllospadix* spp. at each site. Note that *Phyllospadix* was not monitored at East Point in 2014.

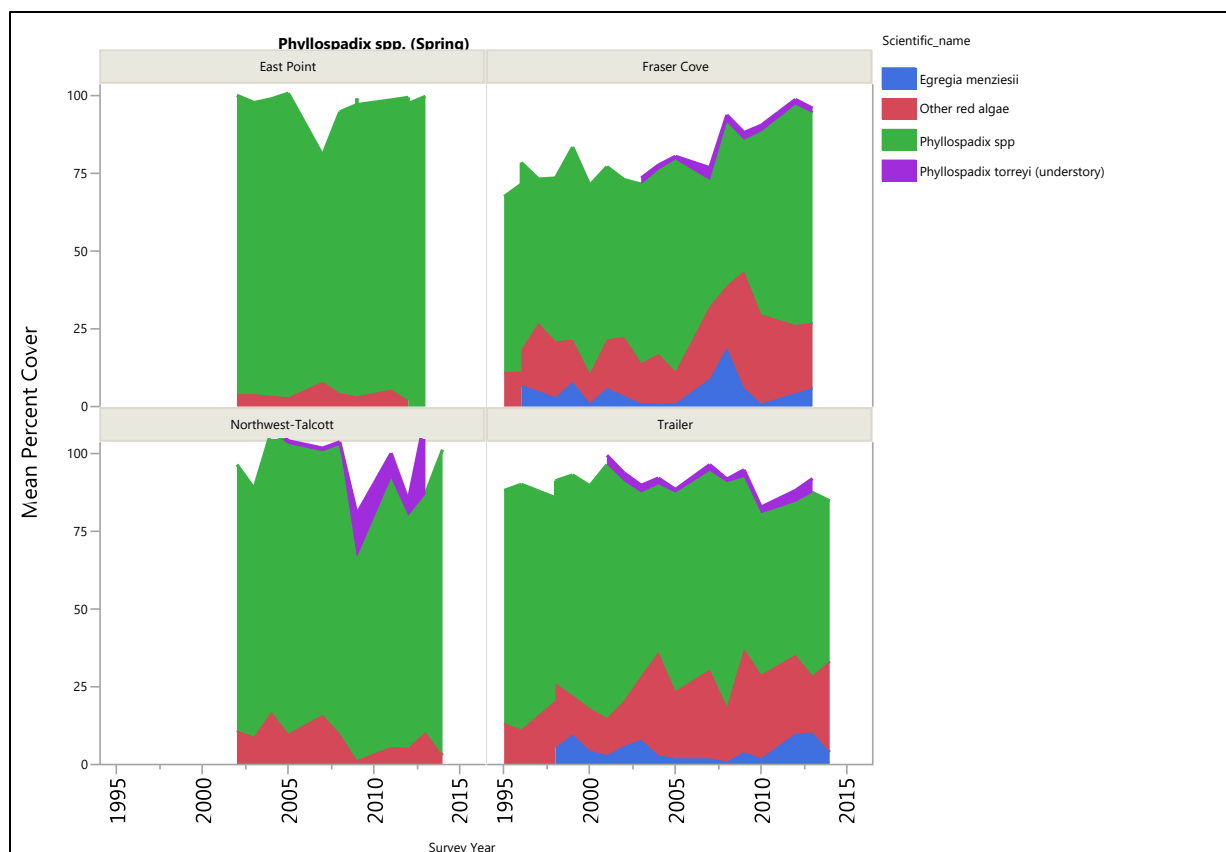


Figure 52. *Phyllospadix* spp. cover at all sites in spring. Colored areas represent the seasonal mean percent cover for *Phyllospadix* spp. and other dominant taxa from 10m point-intercept transects. Note that *Phyllospadix* was not monitored at East Point in 2014.



Figure 53. *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 *Phyllospadix* was not monitored at East Point in 2014.

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 2014, there was minimal seasonal variation in surfgrass cover at Trailer; seasonal variation could not be assessed at Fraser Cove since surfgrass was not monitored there in spring (Figure 49). At Trailer, surfgrass cover remained below the long-term mean perpetuating a trend that has occurred during the last several years (Figure 51). At Fraser Cove, the opposite has occurred in which surfgrass cover has increased above the long-term mean since 2007. Over time, *Phyllospadix* spp. cover has ranged approximately 45–75 % at Fraser Cove and approximately 50–80 % at Trailer.

Santa Rosa sites, East Point and Northwest-Talcott, typically have not displayed a strong seasonal pattern in *Phyllospadix* spp. abundances (Figure 49). 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 2014, surfgrass overstory cover at East Point was not assessed due to poor sampling conditions. However, based on qualitative estimates, cover of surfgrass was near 100% on all three transects which is typical of past year abundances at this site. The three transects at East Point are located in an area that receives

moderate, consistent wave disturbance from multiple directions and is submerged even during negative tides. Combined, these factors may provide optimal conditions for population subsistence for *Phyllospadix*, but they make it challenging to safely and accurately sample the transects. At Northwest-Talcott, *Phyllospadix* cover was only monitored on two transects in spring and the site was not sampled in fall. However, cover of surfgrass was approximately 100% on the two transects that were sampled.

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 2014 (Figures 52–53). Red algae abundances averaged across the three transects at the two sites ranged approx. 14% to 36%. At the two Santa Rosa Island sites, red algae has historically been much less abundant, particularly at East Point.

The overall condition of surfgrass at the two sites on Santa Cruz appeared to be healthy with only low to medium cover of epiphytic algae (e.g. *Smithora naiadum* and *Melobesia mediocris*) and minimal bleaching observed. At Northwest-Talcott on Santa Rosa, epiphytic algal cover was low, but bleached blades were moderately abundant throughout the two transects that were sampled in spring.

Shorebirds and Pinnipeds

The maximum number of shorebirds and pinnipeds observed at any one time during a visit to the sites in 2014 is summarized in Tables 2–3 and Figure 54. Overall, the abundances and diversity of shorebirds in 2014 at all sites appeared similar to observations made in recent years. Likewise, there were no marked changes to the abundances of pinnipeds observed in 2014 with perhaps the exception of a slightly lower number of California sea lions observed at Sea Lion Rookery, Santa Barbara Island in January 2015.

Table 2. Shorebirds and pinnipeds most commonly encountered at monitoring sites in spring 2014 (maximum seen at any one time) .

Site Name	American Oystercatcher	Black Oystercatcher	Black Turnstone	California Sea Lion	Harbor Seal	Elephant Seal	Western Gull
Crook Point	0	2	1	0	0	2	0
Cuyler Harbor	0	2	2	0	0	0	2
East Point	0	0	0	0	1	0	1
Ford Point	0	1	3	1	1	0	0
Fossil Reef	0	4	0	0	8	1	12
Fraser Cove	0	2	0	0	0	0	0
Harris Point	0	2	0	1	8	0	1
Johnson's Lee	0	4	0	0	0	26	1
Northwest-Talcott	0	3	0	0	0	8	2

Table 2 (continued). Shorebirds and pinnipeds most commonly encountered at monitoring sites in spring 2014 (maximum seen at any one time) .

Site Name	American Oystercatcher	Black Oystercatcher	Black Turnstone	California Sea Lion	Harbor Seal	Elephant Seal	Western Gull
Otter Harbor	1	4	0	0	22	1	9
Prisoner's Harbor	0	0	0	0	0	0	0
Scorpion Rock	0	0	0	0	0	0	1
South Frenchy's Cove	0	3	0	0	0	0	0
Trailer	0	8	0	0	2	0	0
Willows Anchorage	0	0	0	0	0	0	0
All	1	35	6	2	42	38	29

Table 3. Shorebirds and pinnipeds most commonly encountered at monitoring sites in fall 2014 (maximum seen at any one time) .

Site Name	Black Oystercatcher	Black Turnstone	California Sea Lion	Common Raven	Harbor Seal	Elephant Seal	Western Gull
Crook Point	2	0	0	0	0	4	2
Cuyler Harbor	2	7	1	0	0	0	1
Fraser Cove	1	0	0	2	0	0	0
Harris Point	0	0	0	0	3	0	0
Landing Cove	2	4	17	0	0	0	7
Orizaba Cove	0	0	0	0	2	0	0
Otter Harbor	4	0	1	0	38	7	3
Prisoner's Harbor	0	0	0	0	1	0	0
Sea Lion Rookery	1	5	75	0	0	0	0
Trailer	0	0	0	0	0	0	1
Willows Anchorage	2	0	0	0	0	0	0
All	14	16	19	2	44	86	14

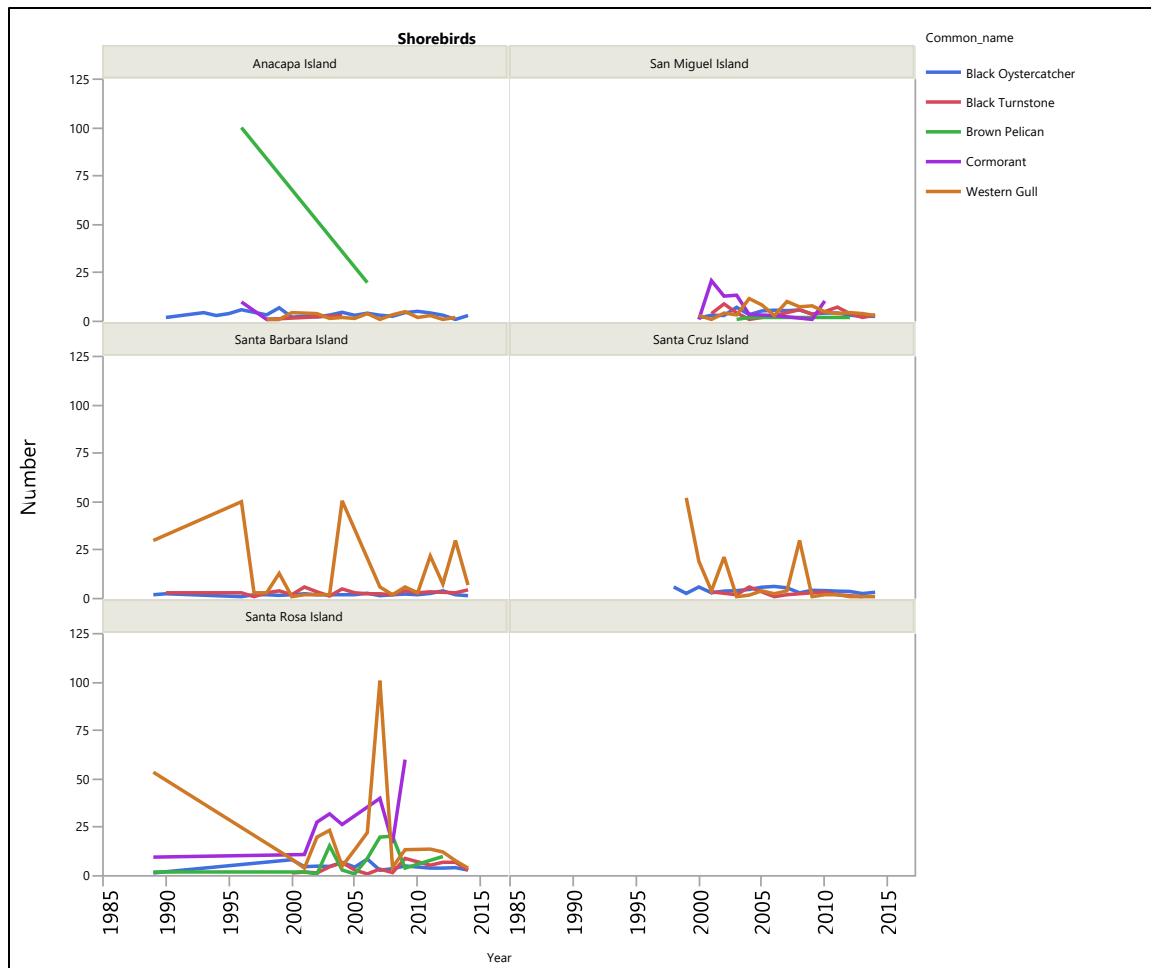


Figure 54. Mean number of shorebirds pooled across sites at each island.

Black oystercatchers were again the most abundant and ubiquitous shorebirds at the rocky intertidal sites, at least in the spring. With the exception of four sites (East Point, Prisoner’s Harbor, Scorpion Rock, Willows Anchorage), at least one black oystercatcher was present at each site during spring. In spring, a relatively large flock of 8 black oystercatchers was observed at Trailer, and smaller flocks were seen at numerous other sites. Black oystercatchers were much less common at all sites in fall.

American oystercatchers have gradually become more common at the islands in recent years. However, in 2014, only one American oystercatcher was sighted at Otter Harbor in spring. The birds were not seen at any other sites.

Black turnstones were relatively common in 2014 compared with previous years. In spring, six black turnstones were seen across three sites (Crook Point, Cuyler Harbor and Ford Point). Markedly more turnstones were seen in fall whereby a total of 16 birds was seen across three sites (Cuyler Harbor, Landing 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 2014, gulls were less common than usual since they were only present at approximately half the sites sampled during both monitoring seasons. At the locations gulls were seen, abundances ranged 1–12 individuals per site.

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, 45 cormorants were seen at East Point in spring. At Crook Point, 28 cormorants were observed in spring and 40 birds were roosting on the reef during the fall sample. Twelve cormorants were seen at Fossil Reef in spring. A few other sites had 1–2 cormorants present in spring or 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*, (Tables 2–3, Figure 55) were observed at or within the immediate vicinity of six sites (Eat Point, Ford Point, Fossil Reef, Harris Point, Otter Harbor and Trailer) sampled in spring; abundances ranged 1–22. In fall, 1–38 harbor seals were observed across five sites. Otter Harbor had the greatest number of seals during both monitoring seasons. Abundances in 2014 were comparable to counts obtained in past years.

Northern elephant seals, *Mirounga angustirostris*, (Tables 2–3, Figure 55) 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 they are typically observed as weaned pups that have not yet gone to sea or adults coming ashore to molt. In spring 2014, elephant seals were seen at or nearby Crook Point, Fossil Reef, Johnson’s Lee, Northwest-Talcott and Otter Harbor; abundances ranged 1–26 individuals per site. The greatest number of elephant seals was seen at Johnson’s Lee. In fall, 4–7 elephant seals were seen at Crook Point and Otter Harbor. Abundances in 2014 were comparable to counts obtained in past years.



Figure 55. Mean number of pinnipeds pooled across sites at each island.

California sealions, *Zalophus californianus*, (Tables 2–3, Figure 55) were common (approximately 75) at the aptly named, Sea Lion Rookery on Santa Barbara Island as well as the other site (Landing Cove) sampled on the island whereby 17 individuals, mostly juveniles, were observed. One sea lion was also seen nearby Ford Point and Harris Point in spring and Cuyler Harbor and Otter Harbor in fall. Relative to past years, abundances this year were low at Santa Barbara Island, mostly due to Sea Lion Rookery, but they were considered average at other locations. The low abundances observed at Santa Barbara may be attributed to temporal differences in sampling. Typically, the two sites are sampled early in the fall season (i.e. October). However, due to weather and logistical constraints, sampling during the fall 2014 season did not occur until January 2015. The numbers of California sea lions at Santa Barbara Island may typically be lower in January relative to October. It is also possible that the sea lions were simply not on the site at the time we arrived, and instead were out feeding or swimming offshore.

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 (Figures 56–57, Table 4). 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.

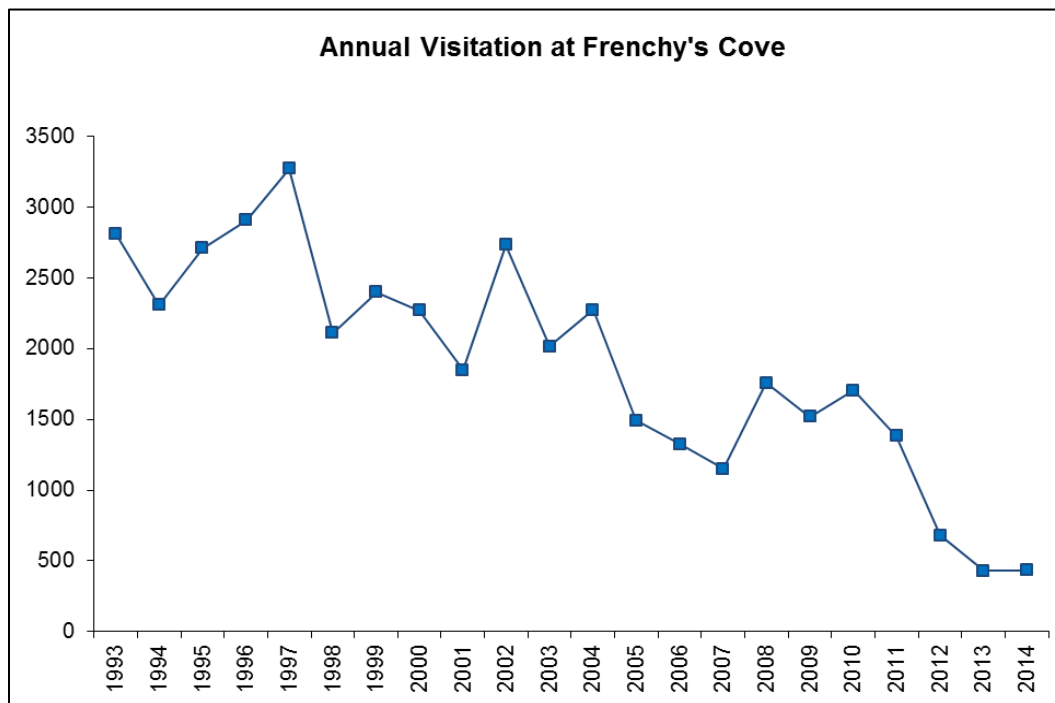


Figure 56. Annual commercial visitation at Frenchy's Cove, Anacapa (Island Packers Company).

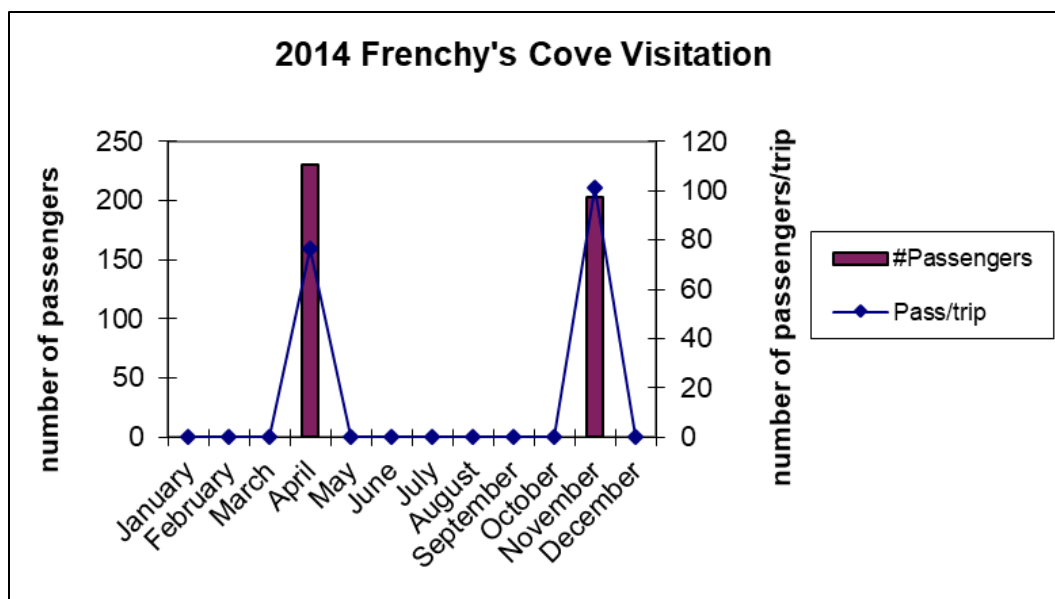


Figure 57. Monthly visitation at Frenchy's Cove, Anacapa Island (via Island Packers Company).

Table 4. Visitors to South Frenchy's Cove, Anacapa Island in 2014 (Island Packers).

Year	Month	#Passengers	#Trips
2014	January	0	0
2014	February	0	0
2014	March	0	0
2014	April	230	3
2014	May	0	0
2014	June	0	0
2014	July	0	0
2014	August	0	0
2014	September	0	0
2014	October	0	0
2014	November	203	2
2014	December	0	0
2014	Total	433	5

The total number of visitors from concession boats in 2014 was 433 passengers in 3 trips (Table 4). This was nearly the same as the number of visitors in 2013 (433), but markedly less than the number in 2012 (681) and 2011 (1383) (Table 4). In fact, visitation in 2014 and 2013 was lowest since record keeping initiated in 1993. April was the top month for visitation with 230 passengers on 3 trips. Fifty-three percent of the visitation occurred in spring (February–May). No visitation by concession boats occurred from January to March, May to October and December.

Literature Cited

- Abbott, I. A., and G. J. Hollenberg. 1976. Marine Algae of California. Stanford University Press, Stanford, CA.
- Ambrose, R. F., P. T. Raimondi, and J. M. Engle. 1992. Final study plan for inventory of intertidal resources in Santa Barbara County. U.S. Minerals Management Service, Pacific OCS Region.
- Ambrose, R. F., J. M. Engle, P. T. Raimondi, M. Wilson, and J. Altstatt. 1995. Rocky intertidal and subtidal resources: Santa Barbara County mainland. Final Report, OCS Study MMS 95-0067, U.S. Minerals Management Service, Pacific OCS Region.
- Dailey, M. D., J. W. Anderson, D. J. Reish, and D. S. Gorsline. 1993. The southern California Bight: background and setting. *In* Dailey, M. D., D. J. Reish, and J. W. Anderson (eds.) Ecology of the Southern California Bight, A Synthesis and Interpretation. University of California Press, Berkeley, CA.
- Davis, G. E., D. V. Richards, P. L. Haaker, and D. O. Parker. 1992. Abalone population declines and fishery management in southern California. Pages 237–249 *in* S. A. Shepherd, M. J. Tegner, and S. A. Guzmán del Próo, editors. Abalone of the World. Blackwell Scientific Publications, Oxford, England.
- Deirdre, A.R., G.E. Hoffman, and G. N. Somero. 1997. Heat-shock protein expression in *Mytilus californianus*: acclimatization (seasonal and tidal-height comparisons) and acclimation effects. Biological Bulletin 192:309–320.
- Dunaway, M. E., R. A. Ambrose, J. Campbell, J. M. Engle, M. Hill, Z. Hymanson, and D. Richards. 1998. Establishing a Southern California rocky intertidal monitoring network. Pages 1278–1294 *in*: O. T. Magoon, H. Converse, B. Baird, and M. Miller-Henson, eds. California and the World Ocean '97. American Society of Civil Engineers, Reston, VA,
- Eisenlord, M. E., M. L. Groner, R. M. Yoshioka, J. Elliott, J. Maynard, S. Fradkin, M. Turner, K. Pyne, N. Rivlin, R. van Hooideonk, and C. D. Harvell. 2016. Ochre star mortality during the 2014 wasting disease epizootic: role of population size structure and temperature. Philosophical transactions of the Royal Society B. 371(1689).
- Engle, J. M. 2008. Unified Monitoring Protocols for the Multi-Agency Rocky Intertidal Network (November 2008 Update). OCS Study MMS 08. Minerals Management Service. Camarillo, CA.
- Engle, J. M., D. L. Martin, J. Altstatt, R. F. Ambrose, and P. T. Raimondi. 1998. Rocky Intertidal Monitoring Handbook for Santa Cruz Island. Santa Cruz Island Shoreline Inventory, Appendix A. Prepared for: California Coastal Commission.
- Engle J. M., and D. V. Richards. 2001. New and unusual marine invertebrates discovered at the California Channel Islands during the 1997–1998 El Nino. Southern California Academy of Sciences. 100(3):186–198.

- Haaker, P. L., D. V. Richards, C. S. Friedman, G. E. Davis, D. O. Parker, and H. A. Togstad. 1992. Mass mortality and withering syndrome in black abalone, *Haliotis cracherodii*, in California. Pages 214–224 in S. A. Shepherd, M. J. Tegner, and S. A. Guzmán del Prío, editors. Abalone of the World. Blackwell Scientific Publications, Oxford, England.
- Hewson I., J. B. Button, B. M. Gudenkauf, B. Miner, A. L. Newton, J. K. Gaydos, J. Wynne, C. L. Groves, G. Hendler, M. Murray, S. Fradkin, M. Breitbart, E. Fahsbender, K. D. Lafferty, A. M. Kilpatrick, C. M. Miner, P. Raimondi, L. Lahner, C. S. Friedman, S. Daniels, M. Haulena, J. Marliave, C. A. Burge, M. E. Eisenlord, and C. D. Harvell. 2014. Densovirus associated with sea-star wasting disease and mass mortality. *Proceedings of the National Academy of Sciences of the United States of America* 111(48):17278–17283.
- Hurtado L.A., M. Mateos, and C. A. Santamaria. 2011. Phylogeography of Supralittoral Rocky Intertidal Ligia Isopods in the Pacific Region from Central California to Central Mexico. *PLoS ONE* 5(7): e11633. doi:10.1371/journal.pone.0011633
- JMP, Version 10. SAS Institute Inc., Cary, NC, 1989-2007.
- Littler, M. M. 1978. Assessments of visitor impact on spatial variations in the distribution and abundance of rocky intertidal organisms on Anacapa Island, California. United States National Park Service, Contract No. CX 8000-8-0010, Ventura, CA.
- McLean, J. H. 1978. Marine Shells of Southern California. Natural History Museum of Los Angeles County, Science Series 24, Revised Edition: 1-104.
- Miner, C. M, R. N. Gaddam, and P. T. Raimondi. 2015. Pacific rocky intertidal monitoring: Trends and synthesis – Update 2015. OCS Study BOEM 2015-011. US Dept. of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA.
- Morris, R. D., D. P. Abbott, and E. Haderlie. 1980. Intertidal Invertebrates of California. Stanford University Press, Stanford, CA.
- Murray, S. N., R. F. Ambrose, and M. N. Dethier. 2006. Monitoring Rocky Shores. University of California Press, Berkeley and Los Angeles, CA.
- Regents of the University of California. 2014. Seaweeds of California. UC-JEPS. Available at: http://ucjeps.berkeley.edu/californiaseaweeds_refs.html (accessed 28 June 2014).
- Richards, D. V. 1986. Rocky intertidal ecological monitoring at Channel Islands National Park, California 1982–1985. Channel Islands National Park and National Marine Sanctuary Natural Science Reports, CHIS-86-002.
- Richards, D. V. 1988. Rocky intertidal ecological monitoring at Channel Islands National Park, California 1986–1987. Channel Islands National Park Natural Science Reports, CHIS-88-001.

- Richards, D. V. 1998. Rocky Intertidal Community Monitoring, Channel Islands National Park: 1997 Annual Report. Channel Islands National Park Technical Report 98-07.
- Richards, D. V., and G. E. Davis. 1988. Rocky Intertidal Communities Monitoring Handbook. National Park Service. Channel Islands National Park. Ventura, CA. NTIS.
- Richards, D. V., and G. E. Davis. 1993. Early warnings of modern population collapse in black abalone *Haliotis cracherodii*, Leach, 1814 at the California Channel Islands. Journal of Shellfish Research 12(2):189–194.
- Richards, D. V., and D. Lerma. 2000. Rocky Intertidal Community Monitoring, Channel Islands National Park: 1998 Annual Report. Channel Islands National Park Technical Report 2000-03.
- Richards, D. V., and D. Lerma. 2002. Rocky Intertidal Community Monitoring, Channel Islands National Park: 1999 Annual Report. Channel Islands National Park Technical Report 2002-03.
- Richards, D. V., and D. Lerma. 2005. Rocky Intertidal Community Monitoring, Channel Islands National Park: 2000 Annual Report. Channel Islands National Park Technical Report 2005-05.
- Richards, D. V., D. Lerma, and P. J. Rich. 2011. Rocky Intertidal Community Monitoring at Channel Islands National Park: 2002 Annual Report. Natural Resource Technical Report NPS/CHIS/NRTR—2011/362. National Park Service, Fort Collins, CO.
- Richards, D. V., and P. J. Rich. 2009. Rocky Intertidal Community Monitoring: 2003 Annual Report. Natural Resource Technical Report NPS/CHIS/NRTR—2009/263. National Park Service, Fort Collins, CO.
- Richards, D. V., and P. J. Rich. 2011. Rocky intertidal community monitoring at Channel Islands National Park: 2004 Annual Report. Natural Resource Data Series NPS/CHIS/NRDS—2011/064. National Park Service, Fort Collins, CO.
- Richards, D. V., and P. J. Rich. 2012. Rocky Intertidal Community Monitoring at Channel Islands National Park: 2005 annual Report. Natural Resource Data Series NPS/CHIS/NRDS—2012/370. National Park Service, Fort Collins, CO.
- Richards, D. V., S. Tharratt and S.G. Whitaker. 2013. Rocky Intertidal Community Monitoring at Channel Islands National Park: 2006 annual Report. Natural Resource Data Series NPS/CHIS/NRDS—2011/582. National Park Service, Fort Collins, CO.
- Richards, D. V., and S. G. Whitaker. 2012a. Black abalone monitoring at Channel Islands National Park 2008–2010: Channel Islands National Park report to National Marine Fisheries, October 2010. Natural Resource Report NPS/CHIS/NRDS—2012/542. National Park Service, Fort Collins, Colorado.

- Richards, D. V., and S. G. Whitaker. 2012b. Rocky intertidal community monitoring at Channel Islands National Park: 2007 annual report. Natural Resource Data Series NPS/CHIS/NRDS—2012/400. National Park Service, Fort Collins, Colorado.
- Richards, D. V., and S. G. Whitaker. 2012c. Rocky intertidal community monitoring at Channel Islands National Park: 2008 annual report. Natural Resource Data Series NPS/CHIS/NRDS—2012/401. National Park Service, Fort Collins, Colorado.
- Richards, D. V., and S. G. Whitaker. 2012d. Rocky Intertidal Community Monitoring at Channel Islands National Park: 2009 annual Report. Natural Resource Data Series NPS/CHIS/NRDS—2012/372. National Park Service, Fort Collins, CO.
- Smith, J. R., F. Creedon, L. Elsberry, B. Lucas, S. C. Vogt, and L. Williamson. 2014. Non-native seaweeds in the rocky intertidal zone in the Little Corona Del Mar Area of Special Biological Significance: Effects on native community structure and diversity and investigation into the feasibility of local eradication. Technical Report for Weston Solutions Inc., Carlsbad, CA.
- Smith, R. I., and J. T. Carlton (eds.). 1975. Light's Manual: Intertidal Invertebrates of the Central California Coast (3rd edition). University of California Press, Berkeley, CA.
- VTN Oregon, Inc. 1984. Visitor impact and recover on Channel Islands tide pools: Management Report. U.S. National Park Service, Contract No. CX 8000-1-0054. Ventura, CA.
- Whitaker, S. G., and D. V. Richards 2012. Rocky intertidal community monitoring at Channel Islands National Park: 2010 Annual Report. Natural Resource Data Series NPS/CHIS/NRDS—2012/371. National Park Service, Fort Collins, Colorado.

Appendix A. Program Notes

Excellent working conditions were experienced at most sites throughout the year. However, strong northwest swell impacted the ability to complete field-scoring for some photo plots at South Frenchy's Cove in spring and Landing Cove in January. Additionally, above-average sized swell prohibited the ability to safely and accurately assess black abalone and sea star abundances through timed-searches at Northwest-Talcott, Otter Harbor and South Frenchy's Cove in spring. Sub-optimal conditions slightly compromised sea star and abalone searches at a number of sites in spring including Crook Point, Cuyler Harbor, East Point, Fraser Cove, Harris Point and Scorpion Rock. During the fall sample, searches were hampered due to swell at Anacapa Middle West, Fraser Cove, Landing Cove, Sea Lion Rookery, South Frenchy's Cove and Trailer. Surfgrass cover was not assessed in spring at East Point or Fraser Cove due to moderately-low tides combined with relatively-large sized swell. In the fall, surfgrass was not monitored at either of the Santa Rosa Island sites that have fixed transects due to closure of part of the island road system.

Time was secured on the CINMS NOAA Vessel Shearwater this year to assist with several of the monitoring sites that require vessel access. In spring, one of the Anacapa Island sites, South Frenchy's Cove, was accessed via the Shearwater; the other two sites were not monitored due to cancellations caused by inclement weather. All three Anacapa sites were sampled in fall thanks to CINMS staff and the Shearwater. The other two locations (Scorpion Rock and Orizaba Cove) that traditionally have required a vessel to access, were monitored at least once in 2014 by means of kayaks.

The only site that was not monitored in 2014 was Anacapa Middle East. The site was not monitored due to logistical constraints. However, it should be noted 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.

The annual MARINe workshop was held in Newport Beach, CA this year. Several of the marine ecologists at CHIS participated in the workshop since it was relatively local. Discussions centered on sea star wasting disease, marine protected areas and citizen science among many other topics. A hands-on field exercise was conducted to illustrate how vertical distribution surveys (VDS) are implemented. VDS is a protocol designed by Pete Raimondi's lab at UCSC to collect data on the upper and lower tidal distributional limits of focal sessile species to document changes in elevational position hypothesized to be caused by global climate change effects such as sea level rise.

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 prevalent throughout Anacapa Middle West (Anacapa Middle East was not sampled) in 2014 and perhaps more abundant relative to past years. In fall 2013, *C. ustulatus* was observed growing at Northwest-Talcott, Santa Rosa Island. Some patches of the alga measured approx. 14 cm across. This was the first time that *Caulacanthus* was observed at any other site beside the two 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 following islands: San Clemente, Catalina, Santa Barbara, Anacapa, and Santa Cruz. *S. 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. In 2014, *S. horneri* appeared to have expanded its distribution at Anacapa Middle West and now occupies a portion of one fixed photo plot.

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 spring and winter months 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 2014 field season (March 2014 through January 2015). 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.

Santa Rosa Island, March 11–18, 2014

(Database event #2014-A)

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at Santa Rosa Island.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Sean Vogt, VIP
- Faye Creedon, VIP

Procedure and General Observations:

Park 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 1 and 2 were read at Northwest-Talcott, but T-3 at Northwest-Talcott and all three transects at East Point could not be safely and accurately sampled due to large swell and/or poor low tide conditions. *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. The Hobotemp Tidbit temperature loggers were exchanged with fresh loggers at Fossil Reef and Johnson's Lee but not at Northwest-Talcott due to large surf. Mussel sizes and mussel bed depth were measured at all monitoring sites except Northwest-Talcott and Fossil Reef due to large surf and the absence of mussels, respectively.

3/11/2014. Skunk Point.

Low tide 0.14 ft at 1421 hrs. The conditions were excellent with clear sky, minimal (<5 kt) wind and medium-sized (4–5') swell. No precipitation has occurred on the island during the past week. However, > 4" of rain fell over the course of several days from 2/28 to 3/2. 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 and carcasses at Skunk Point. The reefs west of Skunk Point had N=4 black oystercatchers and N=3 western gulls.

Skunk Point beach appeared to have been recently partially submerged by seawater near the center. All snowy plovers were seen on the western half of the beach. We counted N=82 plovers from the area near the wreck to approximately 100 m west of the point. 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.

In addition to the snowy plovers, one black-bellied plover, N=15 black oystercatchers, approx. 75 western gulls, approx. 25 California gulls and at least one Herrman's gull were seen on the western half of the beach. In the water, approx. 1000 surf scoters were drifting relatively close to the shore.

There was a minimal 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. Two marine mammal carcasses were seen on the beach. One was a mature elephant seal and the other was likely a California sea lion. Both were relatively fresh but appeared to have been scavenged recently and therefore were somewhat unrecognizable. No cause of death was readily discernable.

3/12/2014. Ford Point.

Low tide .02 ft at 1450 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 was 1 black oystercatcher and 3 black turnstones at the site at various times throughout the day. One harbor seal and one California sea lion were seen in the water near the site in addition to approx. 35 surf scoters that were drifting on the surface nearly 100 m offshore. The beach located east of the site had over 125 elephant seals present when we arrived. The site was monitored from 1030 to 1630.

Plots were photographed by Sean. Site panoramas were photographed by Sean. All 15 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen. Note that a separate search was conducted by Sean and Faye whereby the same number of black abalone (N=58) black abalone were observed site-wide (from the area in the vicinity of abalone plot 535 to the east end of the site near 534) (sizes ranged 51–195 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.

For reference, last fall N=16 black abalone were observed site-wide which was less than one-third the number of black abalone observed here last spring (N=47). Based on the markedly lower number of abalone, we presumed that something may be wrong. Poaching was deemed possible since evidence that someone had been camping on the island illegally and the remnants of black abalone had been seen in the vicinity of the camp site and the monitoring site (see trip report from fall 2013). However, the higher than usual number of abalone found at Ford Point this visit makes it seem unlikely that anything such as poaching has occurred to the population recently.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Faye. N= 9 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 30–70 mm, mode = 70 mm). All observed *P. ochraceus* appeared to be healthy except one that was classified as stage four since it had severe tissue deterioration. For

reference, last November 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). It is apparent that the wasting disease significantly affected the *P. ochraceus* population at this site since our last visit approximately four months ago.

The field log was completed by Stephen.

No plot repairs were necessary since numerous bolts were installed last season.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 27.4% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 36.4% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. Mussel (*Mytilus californianus*) plots had 29.6% mean cover; mussels were only present in three plots. The majority of cover in the five plots was occupied by *Phragmatopoma* (mean= 32%). The splash plots were devoid of biota aside from *Chthamalus*, littorine snails and cyanobacteria. See data sheet for details.

Mussels were measured in the *Mytilus* plots by Stephen. Only three plots had mussels present; all of which formed a monolayer.

The *Lottia gigantea* plots and motile invertebrates were not sampled this season.

Phragmatopoma was abundant throughout most of the zone previously occupied by *Mytilus*. Medium-sized mussel beds were still present however, but only low levels of recruitment were observed for the species. Small patches of barnacles (primarily *Balanus*) were observed to have been removed at various locations throughout the site.

3/13/2014, Northwest-Talcott.

Low tide –0.05 ft at 1516 hrs. The conditions were considered poor due to the large-sized swell (8–10'). We were unable to sample the mussel plots or conduct the searches for black abalone and sea stars. Wind was moderate (10–15 kt). There were 2 western gulls, 1 California gull 3 black oystercatchers at the site upon arrival. Eight harbor seals (6 adults/ 2 pups) were also observed. Two black-bellied plovers were observed west of the site. The site was monitored from 1300 to 1700.

Plots were photographed by Sean. Site panoramas were photographed by Sean. All photoplots except those in the *Mytilus* zone were scored in the field by Stephen. A thirty-minute search was not conducted for black abalone (*Haliotis cracherodii*) presence. For reference, last fall zero black abalone were observed.

A thirty-minute search was not conducted for ochre star (*Pisaster ochraceus*) presence.

Surfgrass transects 1 and 2 were sampled by Stephen. Transect 3 was covered by water at low tide and could not be sampled. Transects 1–2 had *Phyllospadix* cover = 100 and 90%, respectively. *Phyllospadix* on T-1 and T-2 was devoid of epiphytic algae, but appeared bleached/browned throughout approx. 50% of the bed.

The *Lottia gigantea* plots were not sampled this season. The field log was completed by Stephen. No repairs were completed during this visit since a significant amount of time was spent conducting plot repairs last spring. However, all plots could use bolts in the lower-left and upper-right corners and plot 568 still needs a number bolt in the upper-left corner.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 5.2% mean barnacle cover. The majority of cover in the five plots was occupied by *Silvetia compressa* (mean= 31.8%). *Endocladia* plots had 19.4% mean *Endocladia* cover. The majority of cover in the five plots was bare rock. The rockweed plots had 54.4% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 31% mean cover. The majority of cover in the five plots was occupied by *Mytilus*, but the all the plots were fairly diverse with coralline crusts and articulated corallines ranking as the next most abundant taxa.

Mussels were not measured in the *Mytilus* plots due to the large swell/surge.

The invasive alga, *Caulacanthus ustulatus*, was first seen last November occupying small areas throughout the site from plots 555–559. Some patches of the alga measured approx. 14 cm across. This was 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). *Caulacanthus* was seen again during this visit, but it appeared to be in the same locations as last November and likely did not spread much.

Site appeared similar to past visits with no obvious disturbances. As usual, *Silvetia* and *Phyllospadix* dominated the site and both taxa appeared to be healthy with the exception of some bleaching on parts of the surfgrass. *Chondracanthus* was mostly bleached out around the mussel plots. The mussel plots appeared unchanged from the last visit. 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. A lobster trap was seen on the beach east of the site with at least three dead lobsters stuck inside.

3/14/2014. Johnson's Lee.

Low tide –0.05 ft at 1540 hrs. The conditions were excellent with moderate wind (15–20 kt) and light (2–3') swell. There were 4 black oystercatchers and one western gull at the site at various times throughout the day. Additionally, there were 26 elephant seals on the beach in the middle of the site (two were on the reef). The site was monitored from 1230 to 1800.

Plots were photographed by Laura. Site panoramas were photographed by Sean. All 19 photoplots were scored in the field by Stephen. A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Sean and Faye. N=19 (nearly the same amount that was seen last season) 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 29–163 mm, most individuals were spaced 1–5 m apart from one another). The black abalone plots were searched; plots 3–4 each had one black abalone present, all other plots were devoid of abalone.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Faye. N=11 ochre stars were observed site-wide (see area searched during black abalone search) (sizes ranged 10–80 mm). For reference, N=84 sea stars were seen at this site last season, and N=251 were seen last spring. Note that one diseased *P. ochraceus* was seen that appeared to have one significant lesion. Additionally, one *Patiria* was seen at the site.

The *Lottia gigantea* plots were not sampled during this visit.

No plot repairs were made during this visit, but plot 517 needs an upper-left bolt and 514 needs a bolt in the lower-left corner. In addition, all abalone plots require new bolts.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 43.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 30% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 36.3% mean cover overall including the four new plots. Without the additional plots the original five plots had 11% mean mussel cover (only one plot had mussels present). The majority of cover in the five plots was occupied by *Phragmatopoma* (mean=30%). The splash plots were devoid of biota.

Mussels were measured in the *Mytilus* plots by Stephen. Only 5/9 plots had mussels present; all of which formed a monolayer.

The site appeared similar to previous visits with no major disturbances observed aside from the markedly lower number of *Pisaster ochraceus* counted throughout the site. *Mytilus* appeared healthy and a fair amount of recruitment was observed particularly in the *Phragmatopoma*. The sand level at the site, particularly between the two monitoring reefs, was very high. A lobster trap with at least one dead lobster inside was seen in the upper intertidal near the center of the site.

3/15/2014. Fossil Reef.

Low tide 0.02 ft at 1604 hrs. The conditions were excellent due to minimal (3–5') swell and wind allowing us to work the entire site for several hours. Swell did build throughout the afternoon and wind picked up to 15–20 kt. There were 12 western gulls, 12 cormorants and 4 black oystercatchers along with 1 elephant seal and 8 harbor seals (7 adults and 1 pup) at the site upon arrival. The elephant seal was seen hauled out near the *Lottia* plots. One dead elephant seal was seen washed up against the cliff in the vicinity of the *Lottia* plots. The site was monitored from 1215 to 1730.

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

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Sean. N=30 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 38–175 mm, most individuals were either 1–10cm apart or >5m apart from one-another). A flashlight was not 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 Faye and Sean. Note that search effort was effectively doubled in comparison to most surveys in the past. N=18 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 40–120 mm, mode = 60 mm). Most sea stars were observed to be healthy, but one *P. ochraceus* was categorized as stage 1 and another was stage 2 meaning that they had one and two lesions present, respectively. Two other *P. ochraceus* were classified as stage 4 since they had severe tissue deterioration. Note that N=227 *P. ochraceus* were observed at this site last season (November 2013). During the search, N=2 *Patiria* were observed. The sea star transect between *Mytilus* plots 620 and 624 was sampled; N=5 *P. ochraceus* were observed.

The *Lottia gigantea* plots were not sampled this season. The field log was completed by Stephen. No plot repairs were conducted during this visit. However, several of the upper plots still require bolts. *Mytilus* plot 623 needs a LL bolt.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 21.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 37.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*, but *Silvetia* was also relatively abundant (mean= 31.8%). The rockweed plots had 86.6% 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= 48%), *Tetraclita* (mean= 8.6%) and articulated corallines (13.2%).

Mussels were not measured in the *Mytilus* plots since there were no mussels present.

The following was written for an earlier trip report but still applies to this visit: *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.

3/16/2014, East Point.

Low tide 0.17 ft at 1628 hrs. The conditions were excellent for sampling with the exception of the moderately-low tide which was not low enough for us to sample the surfgrass transects (note that surfgrass cover was estimated on transect-1). All other protocols were conducted successfully. The sky was clear with moderate (10–15 kt) wind. There were approx. 45 cormorants 1 western gull and 1 harbor seal at the site upon arrival. Two black oystercatchers were seen on the reef north of the site. The site was monitored from 1330 to 1730.

Plots were photographed by Sean. Site panoramas were photographed by Sean. All 25 photoplots were scored in the field by Stephen. A sixty-minute search was conducted for black abalone (*Haliotis*

cracherodii) presence by Sean and Faye. N=41 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. 38–177 mm, most individuals were spaced 1–10 cm apart from one another). The fixed abalone transect was 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 Faye. N=3 ochre stars were observed site-wide (all three were 60 mm). Two of the *P. ochraceus* were healthy, but one had a lesion on its epidermis. Overall, the number of *P. ochraceus* has decreased significantly at the site from N=109 seen here last fall. One *Patiria* was seen.

Surfgrass transects were not sampled due to the relatively-high low tide combined with moderately-high waves. However, lulls between the sets of waves allowed for qualitative observations revealing that *Phyllospadix* in the transects appeared to be healthy and abundant (T-1 appeared to have approx. 100% cover; surfgrass cover was estimated to be 90% and 75% on T-2 and T-3, respectively). A low abundance of surfgrass was bleached/ browned and abraded. The field log was completed by Stephen.

Three bolts including an etched bolt in the upper-left corner were added to plots 575, 576, 578, 579, 570–572. Two bolts (lower-left and upper-right) were added to plots 581–583 and 586. For plot 593, one bolt was installed in the lower-left corner.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 45.6% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 43% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots had 18.4% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was occupied by *Chthamalus* spp./ *Balanus* spp. (mean=24.4%). The *Hesperophycus* plots had 57.4% mean *Hesperophycus* cover which is approximately twice the cover seen for this species last year. Most of the cover within the *Hesperophycus* zone was dominated by *Hesperophycus*. Mussel (*Mytilus californianus*) plots had 36.6% 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= 59.6%).

Mussels were measured in the *Mytilus* plots by Stephen. Only two plots had mussels present; both of which formed a monolayer.

The following was written for an earlier trip report but still applies to this visit: The mussel bed on the north side of the reef is still dominated by *Phragmatopoma* and only solitary mussels were seen scattered throughout. Mussel recruitment was observed within the *Phragmatopoma*. Sea star abundances appear to be lower compared to previous visits. 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.

San Miguel Island, March 25–29, 2014

(Database event #2014-B)

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at San Miguel Island.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Dan Richards, VIP, Channel Islands National Park (retired)
- Jessie Altstatt, VIP

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, except only 9/20 plots were scored at Otter Harbor (see below for details). Sea stars and black abalone were counted during 30-minute site-wide searches at all four sampling sites except black abalone were not searched for at Otter Harbor. *Lottia gigantea* were not 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 measured at Harris Point and Cuyler Harbor. Channel Islands Aviation provided transportation off the island on Saturday, March 29th.

3/25/2014. Otter Harbor.

Low tide -0.2 ft at 1300 hrs. The conditions were decent for sampling despite the moderate wind (15–20kt) and swell (3–4'). However, we arrived late to the site since the flight was delayed until the early afternoon and had very little time to work due to the incoming tide. We flew directly to the west end of the island (lake bed) for quicker access to the site. There were 9 western gulls, 4 black oystercatchers and 1 American oystercatcher along with 22 harbor seals and 1 elephant seal at the site upon arrival. It appeared that 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. The site was monitored from 1500 to 1730.

Plots were photographed by Dan. Site panoramas were photographed by Jessie. Some (9/20) photoplots were scored in the field by Stephen. Black abalone (*Haliotis cracherodii*) were not sampled this visit due to incoming tide and lack of time.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen. N=2 ochre stars were observed site-wide from R2 to the east end near the surge channel (sizes were 110

and 120mm). Both individuals appeared to be healthy. However, another *P. ochraceus* was seen west of the monitoring site that was categorized as #2 on the disease form since it had lesions on two arms. No other sea stars including *P. ochraceus* or other species were seen. For reference, N=96 *P. ochraceus* were seen at this site two months earlier in January 2014. The wasting disease apparently worked its way through the sea star population at this site in the interim.

The field log was completed by Jessie.

No plot repairs were conducted during this visit. Mussel measurements were not conducted during this visit due to lack of time and the incoming tide.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 42.4% 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 32.4% mean *Endocladia* cover. The majority of cover in the five plots was bare rock. The rockweed plots had 3.6% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean=37.6%) and *Endocladia* (mean=29.8%). Mussel (*Mytilus californianus*) plots had 77.6% mean cover; a marked increase from 47% measured in March, 2013. 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 moderate amount of recruitment was observed for *Mytilus* and *Silvetia* and *Hesperophycus*, to a lesser degree. Black abalone abundances appeared to be comparable to that of previous visits, although a timed-search was not conducted.

3/26/2014. Crook Point.

Low tide -0.45 ft at 1349 hrs. The conditions were mediocre due to a relatively large (6'+) ground swell. Sky was clear and wind was 10–15 kt. There were 28 cormorants, 2 black oystercatchers and 1 black turnstone at the site upon arrival. One female elephant seal was seen near the bluff at the entry to the site and one elephant seal was lounging in the surge channel when we arrived at the site. N=12 elephant seals and one mother harbor seal and pup were observed on the beach east of the site. The site was monitored from 1145 to 1630.

Plots were photographed by Dan. Site panoramas were photographed by Stephen. All photoplots were scored in the field by Stephen. A 30-minute search was not conducted for black abalone (*Haliotis cracherodii*) presence due to the large swell that hampered searching conditions. For reference, in January, 2014, 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 Dan. N=10 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 70–120 mm). All individuals appeared to be healthy. Note that

conditions were not perfect for conducting sea star or black abalone searches, but the search was considered thorough. For reference, in January, 2014, 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).

Mobile invertebrates were not sampled. The field log was completed by Stephen. Mussel measurements were not conducted during this visit due to lack of time and the large swell hampering conditions.

Plot repairs were conducted by all three samplers. Bolts were installed in three corners (upper-left, lower-left and upper-right) of plots 148, 150, 383, 389, 390, 396 and 398. Last season, 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 33% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 16.2% 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 3.2% mean *Hesperophycus* and no *Silvetia* cover. Most of the cover within the rockweed zone was dominated by mussels (mean=28.8%). Mussel (*Mytilus californianus*) plots had 82.4% mean mussel cover. The majority of cover in the five plots was occupied by mussels.

Three *Patiria miniata* were observed drifting in the surge channel between the two monitoring reefs. All three sea stars appeared damaged and perhaps diseased; pictures were taken. Overall, the condition of the site appeared similar to that of previous visits. A relatively high diversity of algae, particularly ephemerals (*Porphyra*, *Ulva*, etc.) were observed. *Analipus japonica* was common around plots 391–392. It appeared that a moderate amount of disturbance may have taken place on the inshore reef whereby the *Phragmatopoma* was damaged. The central channel appears to be regularly scoured by sand. *Mytilus* is common to abundant throughout the site on both reefs; very little recruitment was observed however. Rockweeds (mostly small *Hesperophycus*) were common. *Endocladia*, *Mastocarpus* and *Mazzaella* were common and occurred in roughly equal abundances. Several *Siphonaria* were collected for Dr. Douglas Eernisse at CSUF.

3/27/2014. Cuyler Harbor.

Low tide –0.58 ft at 1431 hrs. The conditions were acceptable despite the moderate (10–15 kt) wind and fairly large (6–7') swell. There were 2 western gulls, 2 black oystercatchers and 2 black turnstones at the site upon arrival. Along the beach the following were observed: Approx. 90 elephant seal weiners, 1 western gull with a broken wing, 2 black oystercatchers and approx. 50–60 surf scoters in water west of Nidever Canyon; approx. 10 elephant seal weiners, approximately 50 western gulls and 2 black oystercatchers between Nidever Canyon and the surge channel; approx. 64 weiners, 10 adult elephant seals between the surge channel and monitoring site. In addition, two dead elephant seal wieners, one broken surfboard and two fishing floats were seen on the beach. The sand level on the beach was quite a bit lower than it was during our visit in January, 2014 whereby it was

perhaps the highest I've ever observed it, and Ian Williams confirmed that it is higher than usual. We were still able to cross the surge channel at mid tide.

The site was monitored from 1305 to 1700.

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

A twenty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Dan. Zero black abalone were observed site-wide.

A twenty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Dan. N=3 *P. ochraceus* were seen site-wide. All three individuals appeared to be healthy. For reference, in January, 2014, 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 Jessie and Stephen. Plot repairs were conducted by Dan. Two bolts were installed in plot 401 and three bolts were installed in plots 402 and 403.

Mussels were measured in the *Mytilus* plots by Stephen. There were multilayered mussels in all plots. Mussels ranged in size from 20–150 mm. Mussel bed depths ranged 20–140 mm.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 59% mean barnacle cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 17.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots only had 1.8% mean *Silvetia* cover. The majority of point contacts in the five plots were bare rock, but *Chthamalus* spp./ *Balanus* spp. occupied 25.8% mean cover. Mussel (*Mytilus californianus*) plots had 85.4% 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 medium level of newly-recruited individuals particularly within the areas dominated by *Phragmatopoma*). Mussel cover along with that of *Balanus* and *Chthamalus* appeared to be higher than observed during previous visits. Rockweeds present were primarily *Silvetia*, but a small patch of *Hesperophycus* was present. The small bed of *Silvetia* that resides between plots 419 and 413 does not appear to be expanding. *Endocladia* was relatively abundant and robust.

3/28/2014, Harris Point.

Low tide –0.56 ft at 1509 hrs. The conditions were good despite the moderate (10–15 kt) wind and fairly large (6–8') swell. The powerful ground swell made it tricky to score all the plots and conduct thorough searches for black abalone and sea stars, but we were able to successfully and safely monitor between the larger sets of waves.

There were 2 black oystercatchers and 1 western gull along with 8 harbor seals and juvenile sea lion at the site upon arrival. No pups were present. Six black oystercatchers were observed flying over the site throughout the day. The site was monitored from 1250 to 1715.

Plots were photographed by Jessie. Site panoramas were photographed by Jessie. 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 Dan. N=20 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 40–155 mm, most individuals were spaced >5 m apart from one another).

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Dan. N=2 ochre stars were observed site-wide (from R2 at the west end within the boulder field to the crack east of plot 430) (sizes were 110 and 120 mm). One individual appeared to be healthy and the other one had at least one lesion on an arm. Additionally, N=4 *Patiria miniata* and 1 *Leptasterias* were seen throughout the site.

Mobile invertebrates and *Lottia gigantea* were not sampled. The field log was completed by Stephen.

Mussels were measured in the *Mytilus* plots by Stephen. There were single-layered mussels in all plots except plots 427 and 428 which had no mussels present. Mussels ranged in size from 30–90 mm. Mussel bed depths ranged 20–80 mm.

Plot repairs were conducted by Dan. Bolts were installed in the upper-right and lower-left corners of abalone plot #1 which shares corners with ab plot #2. Bolts were added to the two lower corners of abalone plots #4 and #5. Last visit, 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.) had 61.8% mean barnacle cover. The majority of cover in the five plots was occupied by barnacles. *Endocladia* plots had 41.8% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 30% mean *Hesperophycus* cover. Most of the cover within the rockweed zone was dominated by *Hesperophycus*. Mussel (*Mytilus californianus*) plots had 25.2% mean cover (nearly double the percentage of mussels measured last spring). The majority of point contacts in the five plots were bare rock (mean= 20.8%) or occupied by non-coralline crust (mean=20.4%). The *Tetraclita* zone had 18.2% mean *Tetraclita* cover and was dominated by non-coralline crust (mean=21.8%).

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. Most target species with the exception of *Mytilus* occurred in medium densities. *Balanus*, and to a lesser degree, *Chthamalus*, were particularly abundant and appeared healthy and robust. *Littorina* were also very abundant throughout the entire site. *Mazzaella* and *Mastocarpus* appear to have declined in recent years particularly in the vicinity of the abalone plots. Nearly equal abundances of *Tegula galena* and *T. funebris* were observed near black abalone plot 445.

Santa Cruz Island, April 7–12, 2014

(Database event #2014-C)

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at Santa Cruz Island.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Kari Eckdahl, 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 Trailer but not at Fraser Cove due to moderate wave surge coupled with a moderately-low tide. *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 measured at all sites. Island Packers provided transportation off the island on 4/12.

4/8/2014. Trailer.

Low tide 0.58 ft at 1247 hrs. The conditions were excellent with clear sky, light wind (5–10 kt) and relatively small (2–3') swell. Despite the relatively high low tide, we were able to complete all monitoring protocols including the surfgrass transects and searches for black abalone and sea stars with minimal interruptions from incoming waves/surge. There was a mother/pup (the pup was relatively large indicating that it was older) pair of harbor seals in the water and 8 black oystercatchers present at the site upon arrival. An urchin fishing vessel (#35393) worked an area approx. 50 meters offshore of the site. The site was monitored from 1045 to 1500.

Plots were photographed by Connie. Site panoramas were photographed by Connie. All photoplots were scored in the field by Stephen. The field log was completed by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=75 black abalone were observed site-wide within 30 minutes from the surge channel at the east end just passed surfgrass transect-3 to the *Mytilus* plots at the west end (sizes ranged 20–200 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=9 additional black abalone. For reference, last spring, 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 Kari and Connie. Only one *P. ochraceus* (appeared healthy) was seen at the site. For reference, last spring, 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 = 68, 61 and 26%, respectively. *Phyllospadix* was lightly fouled by *Smithora* and a low percentage of the beds appeared bleached and/or abraded. For reference, last spring, transects 1–3 had *Phyllospadix* cover = 92, 60 and 13%, respectively. *Phyllospadix* was moderately fouled by *Smithora*.

Mussels were measured in the *Mytilus* plots by Stephen. There were multilayered mussels in plot #3; all other plots had a single-layer of mussels. Mussels ranged in size from 10–100 mm. Mussel bed depths ranged 10–100 mm.

The following bolts were installed: plot 919 (UL and UR), 926 (LL), 927 (LL), 928 (UR), 929 (UR). Plot 951 still needs bolts installed in UL, UR and LL.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 67.8% mean barnacle cover which is nearly double the percentage of barnacle cover measured last spring. The majority of point contacts in the five plots were bare rock. The *Silvetia* plots had 51.2% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Silvetia*. The *Hesperophycus* plots had 7.2% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was *Silvetia* (mean= 33.2%). Mussel (*Mytilus californianus*) plots had 41.2% mean cover. The majority of cover in the five plots was dominated by mussels, though *Phragmatopoma* (mean= 26.4%) was also dominant particularly in three plots.

The following description of the site written last spring still applies to this recent visit: 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.

4/9/2014. Fraser Cove.

Low tide 0.49 ft at 1327 hrs. The conditions were mediocre with moderate wind (10–15 kt) and moderate-sized (2–3') swell/surge. The short period nature of the swell/surge combined with the relatively high low tide made for difficult sampling conditions particularly for the surfgrass transects. All three transects remained inundated with seawater during the entire day including low tide which resulted in our inability to sample them.

Two black oystercatchers were seen at the site throughout the day. The site was monitored from 1120 to 1500.

Plots were photographed by Connie. Site panoramas were photographed by Connie. All 35 photoplots were scored in the field by Stephen. The 10 rockweed photoplots were scored in the field the day before (4/8) following the completion of monitoring at Trailer.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=1 black abalone (125 mm) was observed site-wide from plot 891 to plot 905.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Connie. Only four *P. ochraceus* were observed site-wide from plot 891 to plot 905 (sizes ranged 80–100 mm). Three individuals appeared to be healthy but one had a lesion on one arm and was missing another arm. For reference, last spring, 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 not sampled due to the poor conditions generated by short-period wind swell in combination with a moderately-high low tide. All three transects were inundated with seawater making it nearly impossible to sample them or even estimate cover of surfgrass.

Mussels were measured in the *Mytilus* plots by Stephen. There were multilayered mussels in plots #2,4,5; other plots had a single-layer of mussels. Mussels ranged in size from 10–90 mm. Mussel bed depths ranged 20–90 mm.

No plot repairs were made, but plots 884, 893, and 895 need bolts installed in LL corners. Plot 909 requires an UR bolt.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 46.2% mean barnacle cover. The majority of cover in the five plots was *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 18.4% mean *Endocladia* cover which declined markedly from 45% cover measured last spring. The majority of point contacts in the five plots were bare rock. The *Silvetia* plots had 14% mean *Silvetia* cover (only three plots had *Silvetia* present). Most of the point contacts within the *Silvetia* zone were bare rock. The *Hesperophycus* plots had 25.2% mean *Hesperophycus* cover. Most of the point contacts within the *Hesperophycus* zone were bare rock. Mussel (*Mytilus californianus*) plots had 63.6% mean mussel cover. The majority of cover in the five plots was occupied by *Mytilus californianus*. *Pollicipes* plots had 19.4% mean *Pollicipes* cover. The majority of cover in the five plots was occupied by *Mytilus californianus* (mean= 49.2%). Tar plots had 38.8% mean tar present.

Gastroclonium (species likely *parvum*) was common around surfgrass transect #2. Sand cover at Fraser appeared to be abnormally high throughout the site particularly around the coralline flats. Otherwise, the site appeared similar to previous visits. *Mytilus* recruitment was noticeable at several locations, especially those dominated by *Phragmatopoma*. Barnacle (primarily *Balanus*) cover was high throughout the site. *Endocladia* cover appeared to have decreased slightly compared to previous recent visits. At Forney's Cove, both species of rockweeds were abundant and appeared healthy.

4/10/2014. Willows Anchorage.

Low tide 0.44 ft at 1359 hrs. The conditions were decent for sampling despite the relatively-high low tide. The wind (<5 kt) and swell (1–2') were light. No shorebirds were seen at the site throughout the

day. However, five black oystercatchers were seen at Ship Rock. Three peregrine falcons were observed flying above the site before we departed. The site was monitored from 1250 to 1630.

Plots were photographed by Stephen. Site panoramas were photographed by Connie. All of the photoplots were scored in the field by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=241 black abalone were observed in the area of the site between plots 936 and 950 (sizes ranged 21–124 mm, most individuals were observed to be 1–10cm apart from one another). For reference, last spring, 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 to be touching one another). It is possible that the search for black abalone during this visit may have been compromised slightly by the poor low tide conditions. Several black abalone were observed to be half-buried in sand.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Connie. Zero *P. ochraceus* were seen at the site. For reference, last spring, 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 sea stars may have been compromised by the moderately-low tide. Several black abalone were observed to be half-buried in sand.

The field log was completed by Stephen. The temperature logger was not downloaded or replaced.

No plot repairs were conducted this visit, but several of the mussel plots could use new bolts to mark the locations of corners even though they are all present. Nearly all the bolts in the *Mytilus* plots are bent over and are incredibly cryptic. *Lottia* plot #5 also may require a new bolt since we have had trouble locating during recent visits.

Mussels were measured in the *Mytilus* plots by Stephen. All five plots had a single-layer of mussels. Mussels ranged in size from 20–110 mm. Mussel bed depths ranged 40–120 mm.

Endocladia plots had 38.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots only had 4.8% mean *Silvetia* cover (only plot 949 had *Silvetia* present). Most point contacts within the *Silvetia* zone were bare rock. The *Hesperophycus* plots had 0.4% mean *Hesperophycus* cover (only plot 940 had *Hesperophycus* present). Most point contacts within the *Hesperophycus* zone were bare rock. Mussel (*Mytilus californianus*) plots had 64.4% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

Unlike most other sites sampled this season, barnacle cover at Willows appeared to be low and a very high percentage of empty tests were observed. The site appeared somewhat scoured near the entrance perhaps due to the high sand level. *Endocladia* appeared tattered and approx. 25% of it was bleached. As observed in recent years, rockweeds only have spotty occurrences and appear to be tattered. *Hesperophycus* was observed to be reproductive, however.

4/11/2014, Prisoners Harbor.

Low tide 0.42 ft at 1427 hrs. The conditions were excellent despite only a moderately-low tide. The wind was light (5–10 kt) and swell was small (<1'). The water in the harbor was markedly clearer compared to when we arrived several days prior. There were no birds or pinnipeds at the site upon arrival, but a large school of sea lions and dolphins along with approx. 10 pelicans and 10 western gulls were feeding on baitfish between the pier and the site. Two bald eagles were observed flying above the site and perching on the eucalyptus trees nearby. The site was monitored from 1245 to 1615.

Plots were photographed by Stephen. Site panoramas were photographed by Connie. All 25 photoplots were scored in the field by Stephen. The field log was completed by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=9 + 6 additional black abalone seen after the 30-minute search were observed site-wide (sizes ranged 25–130 mm, most individuals were close enough to be touching one another). For reference, last spring, 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 Connie. Only one *P. ochraceus* was located throughout the entire site. The sea star appeared to have at least one lesion on its body. For reference, last spring, N=31 ochre stars were observed site-wide (sizes ranged 90–140 mm, mode = 100 mm).

No plot repairs were conducted during the visit. However, plots 838 and 840 require UR and LL corner markers; 839 needs a LL bolt.

Mussels were measured in the *Mytilus* plots by Stephen. All five plots had a single-layer of mussels. Mussels ranged in size from 10–30 mm. Mussel bed depths ranged 0–20 mm.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 22.2% mean barnacle cover. The majority of cover in the five plots was occupied by *Endocladia* (mean= 36.4%). *Endocladia* plots had 46.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots had 0.8% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean=22.6%). The *Hesperophycus* plots had 6.8% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean= 44%). Mussel (*Mytilus californianus*) plots only had 0.8% mean cover. The majority of cover in the five plots was occupied by *Chondracanthus canaliculatus* (mean= 32%) and *Phragmatopoma* (mean= 14.8%).

The site appears to be unchanged from the condition we observed it several months ago. The plots on the west reef are composed of a diverse matrix of species from both upper and lower intertidal making them virtually unrecognizable as barnacle, *Silvetia* and *Mytilus* plots. Barnacles (*Chthamalus* spp./ *Balanus* spp.) were common, but not nearly as abundant as we've observed at other sites this season. Rockweeds (both species) were present in small quantities and appeared to be in fair condition. Only *Silvetia* was reproductive. *Mytilus* was rare at the site particularly in the

representative plots. Some small (approx. 10–30mm) mussels were observed in spots, but recruitment overall was low. *Septifer* was very common in relatively large patches on the west reef; at least in relationship to that of other sites. *Mytilus galloprovincialis* was seen in moderate abundances on the west reef, but not quite as abundant as it was during our last visit.

Santa Cruz Island, April 23, 2014

(Database event #2014-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, Marine Ecologist, 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 Scorpion Rock. Sea stars and black abalone were counted during a 30-minute site-wide search at Site A but not 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 because there were no mussels present in the plots. Island Packers provided transportation off the island at the end of the day.

4/23/2013. Scorpion Rock.

Low tide –0.0 ft at 1203 hrs. The conditions were poor with high (20–25 kt) wind and moderate-sized (2–3') swell. There was one western gull at Site A upon arrival. Pigeon guillemots were seen and observed around both Sites A and B. Several black oystercatchers were seen on the reef adjacent to Site A. The sites were monitored from 1145 to 1530.

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 in the office by Stephen. The field log was completed by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence at Site A by Josh. N=22 black abalone were observed site-wide at Site A (sizes ranged 35–121 mm, most individuals were either touching or located 1–10 cm apart from one another). Note that no search for black abalone was conducted at Site B due to the poor conditions and lack of time. For reference, last spring, 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).

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence at Site A by Josh. Zero *P. ochraceus* were seen. For reference, last spring, N=162 ochre stars were observed site-wide (sizes ranged 70–150 mm, mode = 100 mm).

Mussel sizes and mussel bed depth were not measured at Scorpion Rock because there were no mussels present in the plots.

No repairs were made to the plots. However, plot 822 was missing a LL bolt and R2 is missing completely since the rock broke loose sometime last spring.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 36.8% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 56.6% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Hesperophycus* plots had 25.8% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Endocladia* (mean= 35.2%). Mussel (*Mytilus californianus*) plots only had 0.4% mean mussel cover. The majority of cover in the five plots was occupied by *Tetraclita* (mean= 31.2%), *Mazzaella* (mean= 19.2%) and articulated corallines (mean= 20%). The *Tetraclita* plots had 51.2% mean *Tetraclita* cover, which was the most dominant taxon in the five plots.

Chthamalus/Balanus and particularly *Tetraclita* were very abundant at Site A. *Endocladia* appears to be healthy and abundant at the small site (Site A). As in recent years, *Mytilus* was rare although both *M. californianus* and *M. galloprovincialis* were seen in very low abundances. *Nemalion* was surprisingly common and some specimens were quite large (20–40 cm). The high cover of diatoms observed here last fall was no longer present. I did not personally observe Site B due to lack of time. However, based on photos and Josh's observations, the site appeared similar to the condition it has been in recent visits.

Anacapa Island, May 20, 2014

(Database event #2014-E)

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at Anacapa Island.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Jessie Altstatt, VIP, Channel Islands National Marine Sanctuary
- Kari Eckdahl, VIP, Cal State University, Fullerton

Procedure and General Observations:

We utilized the R/V Shearwater to access the island. Standard procedures were used for monitoring the rocky intertidal site, South Frenchy's Cove. The trip was originally scheduled for late last month, but the threat of high wind caused us to reschedule. Therefore, we were forced to sample three sites in two days. To accomplish this, we planned to work in two teams as we did last spring to sample Cat Rock and Frenchy's Cove on the same day, and then sample Middle West Anacapa on a separate day. Unfortunately, the weather did not cooperate and we were only able to use the Shearwater on 5/20. As a result, South Frenchy's Cove was the only site on Anacapa Island that was monitored in spring, 2014.

At South Frenchy's Cove, photographs of plots were taken but not all plots were scored in the field due to lack of time and poor conditions. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Timed-searches for black abalone and sea stars were conducted. *Lottia gigantea* were not sampled this season. Motile invertebrates were not sampled this season. The maximum number of shorebirds and pinnipeds observed was recorded. The Hobotemp Tidbit temperature logger was not downloaded since the waves/surge made it difficult to safely access. Mussel sizes and mussel bed depth were measured.

5/20/2014. South Frenchy's Cove.

Low tide -0.2 ft at 1145 hrs. The conditions were not ideal due to the frequent wetting of the reefs due to the short period wind swell. The sky was mostly clear and wind was 20-25 kt. The swell was fairly large (3-4') for the south side of the island. We were not able to score all the photoplots, but we were able to adequately search for black abalone and sea stars. Three black oystercatchers were observed at the site upon arrival. The site was monitored from 0915 to 1145.

Plots were photographed by Jessie. Note that we had intended to sample the site at Middle Anacapa, and changed our minds after determining that it was unsafe to skiff to and from the site. As a result, the maps and site info for South Frenchy's were accidentally left on the boat. Despite not having a map, we were able to locate all photoplots except *Silvetia* plot 263. Site panoramas were photographed by Jessie. Thirteen photoplots were scored in the field by Stephen. There was not enough time to score the remaining plots.

A twenty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Kari. N=0 black abalone were observed site-wide.

A twenty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Kari. N=0 ochre stars were observed site-wide. The field log was completed by Stephen and Jessie.

Mussels were measured in the *Mytilus* plots by Stephen. All plots had a single-layer of mussels. Mussels ranged in size from 10-70 mm. Mussel bed depths ranged 10-40 mm.

No plot repairs were conducted during this visit. However, many plots are in desperate need of bolts.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 17.6% mean barnacle cover. For reference, last fall, mean barnacle cover was 8.4%. The majority of point contacts in the five plots were bare rock.

Endocladia plots had 43.4% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 46.75% mean *Silvetia* cover. However, note that plot 263 was not included in the mean. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 34.2% mean cover. The majority of cover in the five plots was occupied by *Mytilus*. For reference, last fall, mean mussel cover was 60.8%.

Sand level at the site was much lower than usual. All plots were clear of sand in contrast to recent years. Target species such as *Endocladia*, *Silvetia* and *Mytilus* were relatively abundant and appeared to be healthy. *Hesperophycus* and *Balanus/ Chthamalus* were less common. *Ulva* was relatively common on the tops of the inshore and middle reefs. *Phragmatopoma* appeared to be damaged in several locations. A moderate level of recruitment for *Silvetia* was observed.

Anacapa Middle West. Not sampled this spring.

Cat Rock. Not sampled this spring.

Santa Rosa Island, June 13–15, 2014

(Database event #2014-F)

Prepared by Stephen Whitaker

Purpose:

To monitor snowy plovers at Santa Rosa Island as part of the breeding survey window.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Dan Richards, VIP, Retired CHIS Marine Biologist
- Stacey Whitaker, VIP

General observations: The weather was good overall with light to moderate wind and swell. Temperatures reached into the 70's each day. Sky was mostly clear in the afternoons and marine layer was present in the mornings and early evenings. Island Packers was used to travel to and from the island.

6/13/2014 – Soledad Canyon Beach.

No snowy plovers were observed.

We walked Soledad Canyon beaches, but did not have time to survey Arlington or Tecolote beaches. Approx. 30 western gulls, 1 black oystercatcher, 1 American oystercatcher, 3 barn swallows, 2 black phoebes and 1 peregrine falcon were observed during the survey. The peregrine falcon followed us along the entire length of the beach and continuously vocalized. Dead organisms observed included: 1 elephant seal (juvenile), 3 California sea lions (1 juvenile and 2 premature), 1 double-crested cormorant, 1 cormorant (immature), 1 raven.

The following marine debris items were observed during the survey of the beach that we routinely sample and conduct sand beach invertebrate surveys: fragments of lobster traps (8), plastic fragments

(36), pop-buoy (1), fishing floats (22), other floats (4), balls (7), glass bottles (1), rope fragments (11), foam fragments (16), shoes (2), plastic containers (4), fishing lures (1), cable from a long-liner (1 [approx. 100m]), bait containers (7), lumber (1), plastic caps (13), plastic wrappers (2), lighters (3), pens (2), plastic toys (3), plastic bags (1), balloons (13), straws (2), plastic bottles (8).

6/14/2014 Bee Rock and China Camp.

No snowy plovers were observed.

Stephen and Stacey surveyed the beaches from China Camp to Bee Rock beach. Dan surveyed all beach habitat considered part of Bee Rock. There were numerous (approx. 500) elephant seals observed on the beach east of Cluster Point with the majority located near the point. Several large male elephant seals were seen. At Cluster Point, the following were observed: California sea lions (2 [one was a large adult male]), cormorants (approx. 75), western gulls (approx. 100), brown pelicans (6).

The following marine debris items were observed during the survey of the beach located between Cluster Point and Whetstone Canyon: wetsuit (1), plastic fragments (1), pop-buoy (1), fishing floats (5), duffel bag (1), glass bottles (1), rope fragments (11), plastic containers (1), bait containers (3), plastic caps (1), plastic bottles (2).

Along the beach between Whetstone Canyon and the point east of Bee Rock beach, the following were observed: live black oystercatcher (1), dead California sea lion (1), dead harbor seal (1).

Along the Bee Rock beaches, Dan observed: elephant seals (25 on west beach, 30 on middle beach), harbor seal (1 on west beach), California sea lion (1), black oystercatchers (2). The following dead organisms were seen: brown pelicans (2), California sea lions (2 adult female, 1 immature female), elephant seal (1), Mola (1 – missing fins), Rhinoceros auklet (1).

The following marine debris items were observed during the survey of Bee Rock beach that we routinely sample and conduct sand beach invertebrate surveys: fishing floats (14), rope fragments (1), shoes (1), plastic containers (4), bait containers (5), plastic fragments (20), pens (1), tire (1), balloons (4), plastic bottles (2), instrument buoy (1).

In the morning, Dan and I met with Cause Hannah (SRI Research Station Manager) and several CSUCI students to discuss the possibility of setting up several rocky intertidal sites for future monitoring conducted by CSUCI students. The most ideal sites were identified to be Bechers (just east of the pier), the rocky reefs located west of Skunk Point and Abalone Rocks. This is just the initial step in setting up long-term monitoring sites. More thought and research needs to be placed into monitoring goals and questions before we can move forward with the sampling design.

6/15 Skunk Point and adjacent beaches.

At least 13 snowy plover adults and at least 3 snowy plover chicks.

We surveyed the beaches from Southeast Anchorage to the lagoons. All snowy plovers were seen south of Skunk Point. A pair was observed immediately south of the point and the male behaved as

though it was protecting a nest. After a few minutes of observation, we noticed at least one chick in the vicinity. As we walked further south along the beach, we encountered eight more adult plovers (roughly equal representation of both genders). At least two of the males displayed territorial behavior which prompted us to look closer. At least two plover chicks were seen nearby. At Oat Point and the beach between Oat and Abalone Rocks, three more plovers (one male and one pair) were observed. Nearly all plovers including the chicks were observed near or within the dune vegetation at the upper edge of the beaches.

Most of the beach north and south of Skunk Point was flooded with a very large lagoon in the center. The lagoons were quite small with most of the area dry. Fox tracks were common on the beach. Other shorebirds observed included: Black oystercatchers (5), western gulls (approx. 140), common ravens (2), royal terns (approx. 50), brown pelicans (5), cormorants (approx. 700), black phoebe (1), horned larks (2).

The following dead organisms were seen: brown pelicans (2), California sea lions (5 [3 immature and 2 premature]), cormorants (5), unidentified pinniped (1), elephant seal (1 juvenile). One of the dead juvenile sea lions had tar covering approx. 10% of its body.

A cursory survey for marine debris was conducted at Skunk Point. The following items were observed: food wrapper (1), bait container (1), fishing floats (6), rope fragments (1), plastic containers (6), pop buoy (1), plastic fragments (4).

Note: the following beaches at Santa Rosa Island were not surveyed for presence of snowy plovers: Arlington, Tecolote, Dry, Officer's Beach and La Jolla Canyon.

Anacapa Island, November 3–5, 2014

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at Anacapa Island.

Personnel:

Stephen Whitaker, Marine Ecologist, Channel Islands National Park; Josh Sprague, CHIS; Cori Hume-Flannery, Contractor, UCSC; Emily Tucker, Contractor, UCSC; Ryan Newkirk, student, CSUCI; Alexis Wallengren, student, CSUCI; Robert Evans, Park Ranger, CHIS; Connie Jenkins, VIP; Tracy Hart, VIP; Geoff Dilly, Professor, CSUCI; Julia Dorish, student, CSUCI; Paul Spaur, student, CSUCI; Jon Harting, VIP; Kari Eckdahl, student, CSUF; Doug Eernisse, Professor, CSUF; David Gottesman, VIP, CDFW

Procedure and General Observations:

We utilized the R/V Shearwater to access the island. Standard procedures were used for monitoring all three rocky intertidal sites. Photographs of plots were taken at all sites, but not all plots were scored in the field at Cat Rock due to lack of time. Plots and site overviews were photographed with an Olympus Stylus 1030SW digital camera. Timed-searches for black abalone and sea stars were conducted. *Lottia gigantea* were sampled this season at all three sites. Motile invertebrates were not

sampled this season. The maximum number of shorebirds and pinnipeds observed was recorded. The Hobotemp Tidbit temperature logger was replaced at South Frenchy's Cove. Mussel sizes and mussel bed depth were not measured.

11/3/2014. South Frenchy's Cove.

Low tide 0.4 ft at 1316 hrs. The conditions were not ideal due to the frequent wetting of the outer reefs due to the short period wind swell. The sky was mostly clear and wind was 20–25 kt. Wind faded to 5–10 kt by mid-afternoon. The swell was moderate-sized (2–3') for the south side of the island. Stephen scored all photoplots except *Mytilus* #1 (201) because it was constantly wetted by swell. The periodic nature of the swell allowed us to complete adequate surveys for black abalone and seastars. One cormorant was observed at the site upon arrival; it was clinging to the cliff above the site and appeared to be sick. The site was monitored from 1030 to 1515. Personnel for the day consisted of: Stephen Whitaker, Josh Sprague, Emily Tucker, Cori Flannery, Ryan Newkirk, Robert Evans, Alexis Wallengren. Note that Emily and Cori were funded by NPS to collect sea star data and tissue samples from the west coast NPS units to document effects driven by SSWD.

Plots were photographed by Emily Tucker. Site panoramas were photographed by Josh. Photoplots were scored in the field by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Emily and Cori. N=0 black abalone were observed site-wide.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. N=0 ochre stars were observed site-wide. The field log was completed by Stephen.

Lottia gigantea were measured within the fixed plots by Emily and Cori. Abundances ranged N=1–9 in plots 1–3, respectively. Sizes ranged 20–51 mm.

Numerous plot repairs were conducted during this visit. Three bolts (upper-left, upper-right and lower-left corners) were installed in all plots. Note that mussel plots already had bolts present, but a couple needed one bolt each. The bolt installed in the upper-left corner was etched to indicate the number (e.g. 1–5) of the plot in each target zone. Plot repairs were made by Josh, Ryan, Alexis and Robert.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 17.8% mean barnacle cover which was nearly exactly the same as measured in spring. For reference, last fall, mean barnacle cover was 8.4%. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 37.8% mean *Endocladia* cover (in spring 2014, mean *Endocladia* cover = 43.4%). The majority of cover in the five plots was occupied by *Endocladia*. The rockweed plots had 60.8% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by *Silvetia*. Mussel (*Mytilus californianus*) plots had 35.4% mean cover. The majority of cover in the five plots was occupied by *Mytilus*. For reference, last fall, mean mussel cover was 60.8%.

Sand level at the site was relatively high. All plots were exposed, but small amounts of sand were present in some plots located on the inshore reef. Target species such as *Endocladia*, *Silvetia* and

Mytilus were relatively abundant and appeared to be healthy. *Hesperophycus* and *Balanus*/*Chthamalus* were less common. Most algae (*Endocladia*, *Chondracanthus canaliculata*, *Ulva* and *Mazzaella affinis*) were bleached which made some specimens difficult to identify. Note that the majority of *Silvetia* at the site appears to be *Silvetia compressa deliquescens*; most thalli were reproductive this visit. In contrast, only a few *Hesperophycus* thalli were observed to be reproductive. *Jania crassa* was still relatively abundant within the tidepools. *Ulva* was relatively common on the tops of the reefs. At Frenchy's Cove beach, located on the north side of the island, numerous (approx. 20–50) *Sargassum horneri* plants were seen washed up.

11/4/2014. Cat Rock.

Low tide –0.1 ft at 1401 hrs. The conditions were excellent for sampling with minimal swell and moderate wind. The sky was clear and wind was 10–20 kt. Wind faded to 5–10 kt by mid-afternoon. The swell was 1–2'. The tide was not extremely low, but it remained relatively low for a long period of time. All plots were workable and site searches for black abalone and sea stars were unobstructed by waves.

No shorebirds were observed at the site, but one adult harbor seal was observed in the water near the site upon arrival. The site was monitored from 1100 to 1600. Personnel for the day consisted of Stephen Whitaker, Josh Sprague, Emily Tucker, Cori Flannery, Connie Jenkins, Tracy Hart, Geoff Dilly, Julia Dorish, Paul Spaur, Jon Harting.

Plots and site panoramas were photographed by Josh. Note that plots 38, 212, 54 and 52 were not photographed. This mistake was not realized until we returned to the office. We are currently attempting to revisit the site during the first week of February 2015 to locate and photograph the plots we missed. Most (26) photoplots were scored in the field by Stephen. Others were not scored in the field due to lack of time, and were scored from the photographs in the field (all except the plots aforementioned that were not photographed).

UPDATE: On 2/22/2015, Stephen Whitaker and Josh Sprague hitched a ride on one of the ranger vessels piloted by Mike Morales and Lulis Cuevas out to Cat Rock to photograph and score the plots we missed on 11/4. We also reshot the photo for plot 204 since it appeared that we photographed it in the incorrect orientation originally. We experienced excellent conditions with minimal swell and wind which allowed us to safely paddle a small inflatable to the site and access all plots with ease. Three western gulls and three black oystercatchers were present when we arrived; no pinnipeds were seen. The site was sampled from 1300 to 1430. Overall, the condition of the site was similar to that in November, except ephemerals (primarily *Endarachne*) were notably less abundant. Josh placed some new epoxy markers on several plots to make them more visible.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Emily and Cori. N=22 black abalone were observed site-wide. Most individuals were located 1–10 cm apart. Sizes ranged 50–143 mm. Flashlight used on survey.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. N=1 (130 mm) ochre star was observed site-wide; it appeared to be healthy and free of lesions. The field log was not completed due to lack of time.

Lottia gigantea were measured within the fixed plots by Emily and Cori. Abundances ranged N=6–34 in the three plots. Sizes ranged 18–61 mm.

Numerous plot repairs were conducted during this visit. Three bolts (upper-left, upper-right and lower-left corners) were installed in nearly all (with exception of plot 52) the control plots for each zone. The bolt installed in the upper-left corner was etched to indicate the number (e.g. 1–5) of the plot in each target zone. Plot repairs were made by Josh, Geoff, Paul, and Julia.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 28.7% mean barnacle cover which was close to the same as measured in fall 2013. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 14.2% mean *Endocladia* cover (in fall 2013, mean *Endocladia* cover = 29.9%). The majority of space in the five plots was bare rock. The rockweed plots had 4.1% mean *Silvetia* cover and 13.8% *Hesperophycus* cover; almost exactly what was measured in fall 2013. Most of the space within the rockweed zone was bare rock. Mussel (*Mytilus californianus*) plots had 29.1% mean cover. The majority of cover in the five plots was occupied by *Mytilus*. For reference, last fall, mean mussel cover was 36.6%.

Many plots (particularly on the outer reefs) were incredibly difficult to locate. Hopefully, most of these will be easier to find during future visits now that we have installed bolts in many of them. *Endarachne* was conspicuously more abundant this visit compared to previous years. Many algal species (primarily *Endocladia*) were bleached. *Mazzaella affinis* at this site primarily consists of the narrow-bladed morph which made it problematic at times for identification. Diatoms were extremely common particularly in the smaller tide pools. *Silvetia* was less common than *Hesperophycus*. *Mytilus* and *Endocladia* were relatively abundant. Overall, this site lacks distinct species assemblages likely because elevation change is mild.

11/5/2014. Middle West.

Low tide –0.5 ft at 1445 hrs. The conditions were not ideal when we arrived in the late morning due to sloppy wind swell generated from Santa Ana wind. However, the east wind decreased to 5–10 kt by early afternoon along with the wind-generated swell leaving us with excellent sampling conditions. The sky was clear and swell was 1–2'. No shorebirds or pinnipeds were observed at the site all day. One unidentified whale was seen approx. 100 m offshore however. The site was monitored from 1045 to 1545. Personnel for the day consisted of: Stephen Whitaker, Josh Sprague, Emily Tucker, Cori Flannery, Kari Eckdahl, Doug Eernisse and David Gottesman.

Plots were photographed by Josh. Site panoramas were photographed by Stephen. Photoplots were scored in the field by Stephen.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Emily and Cori. N=34 black abalone were observed site-wide. Most individuals were located 1–10 cm apart. Sizes ranged 15–131 mm. Black abalone were also counted and measured at Harbor Seal Arch

by Emily, Cori, Josh and Kari. N=64 were seen. All fixed plots were searched for presence of black abalone; plot 304 had N=1 (95 mm). Sizes at the site ranged 29–120 mm.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. N=2 ochre stars (5 mm and 90 mm) were observed site-wide. Both individuals appeared to be healthy and free of lesions. The field log was completed by Stephen.

Lottia gigantea were measured within the fixed plots by Emily and Cori. Abundances ranged N=4–29 in the three plots. Sizes ranged 15–67 mm.

No plot repairs were necessary during this visit.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 19.2% mean barnacle cover. For reference, last fall, mean barnacle cover was 15.8%. The majority of point contacts in the five plots were bare rock, though the plots were relatively diverse for the barnacle zone. *Caulacanthus* comprised 4% of plot 450. *Endocladia* plots had 12.6% mean *Endocladia* cover (in fall 2013, mean *Endocladia* cover = 19.2%). The majority of cover in the five plots was bare rock. However, the *Endocladia* plots were fairly diverse with moderate amounts of articulated corallines, *Mazzaella* and non-coralline crust. *Caulacanthus* comprised 1% of plot 458. The rockweed plots had 0% mean *Silvetia* cover. In fact, similar to observations in recent years, no *Silvetia* was seen throughout the entire site. Rather, most of the space within the rockweed plots was bare rock. *Mazzaella*, *Chondracanthus*, articulated corallines, non-coralline crust and *Tetraclita* all occurred in moderate abundance within the *Silvetia* plots. *Caulacanthus* comprised 4% of plot 455. *Sargassum horneri* comprised 2% of plot 454. Mussel (*Mytilus californianus*) plots only had 0.4% mean cover (two plots had 1%). The majority of cover in the five plots was occupied by *Mazzaella*, *Gelidium*, *Chondracanthus* and articulated corallines. For reference, last fall, mean mussel cover was 0%.

The site overall appeared similar to previous visits. Algae were not as bleached compared to what we observed on the backside of Anacapa. Some articulated corallines were slightly bleached however. *Caulacanthus* is still quite prevalent throughout the site perhaps even more abundant than previous years. *Sargassum horneri* has moved further up into the intertidal whereby it has taken up residence in several tidepools near the west end of the site, and now comprises 2% of plot 454. *Sargassum muticum* is also quite common and robust. *Mytilus* is still relatively scarce although the new recruits from last year have persisted and grown. Rockweeds were once again absent. *Endocladia* appeared thick and healthy. *Mazaella* (wide-blade form) was common.

Santa Cruz Island, November 18–22, 2014

(Database event #2014-H)

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at Santa Cruz Island.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Emily Tucker, Technician, UCSC
- Cori Hume-Flannery, Technician, UCSC

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 site-wide searches. Surfgrass transects were read at Trailer but and Fraser Cove. *Lottia gigantea* were sampled this season at all sites where fixed plots have been established. 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 not downloaded at Willows Anchorage since the housing could not be opened. Mussel sizes and mussel bed depth were not measured at any sites. Island Packers provided transportation off the island on 11/23.

11/18/2014, Prisoner's Harbor.

Low tide 0.84 ft at 1315 hrs. The conditions were excellent despite the tide being only moderately-low. The wind was light (5–10 kt) and swell was small (<1'). There was one black oystercatcher on the reef adjacent (west) to the site. One harbor seal was observed in the water nearby the site. The site was monitored from 1200 to 1600. Jessica Weinberg (cooperator from Golden Gate) came out on IPCO today to photograph us doing work at the site in an effort to expand the CHIS NRM web pages.

Plots were photographed by Emily. Site panoramas were photographed by Emily. All 25 photoplots were scored in the field by Stephen. The field log was completed by Stephen.

A 25 minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Emily and Cori. N=16 black abalone were observed site-wide (sizes ranged 41–99 mm, most individuals were spaced 1–5m from one another). For reference, last spring, N=15 black abalone were observed site-wide, and only four individuals were located in spring 2013. Note that several black abalone were observed on the reef adjacent to the west end of the site and some were exceptionally large and out in the open.

A twenty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. Zero *P. ochraceus* were located throughout the entire site. For reference, last spring, one sea star was found; it appeared to have at least one lesion on its body. In spring 2013, N=31 ochre stars were observed site-wide (sizes ranged 90–140 mm, mode = 100 mm).

Bolts (lower-left and upper-right) were installed in plots 838 and 840. A bolt was placed in the lower-left corner of plot 839.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 32.2% mean barnacle cover; barnacle species were the most dominant taxa. *Endocladia* plots had 24.2% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Chthamalus* spp./ *Balanus* spp. (mean=40%). The *Silvetia* plots had 0.4% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean=17.8%), *Mazzaella* (mean=15.4%), *Mytilus* (8.4%) and non-coralline crust (mean=12.2%). The *Hesperophycus* plots had 8.8% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was dominated by *Chthamalus* spp./ *Balanus* spp. (mean= 47.4%). Mussel (*Mytilus californianus*) plots only had 0.8% mean cover. The majority of cover in the five plots was occupied by *Chondracanthus canaliculatus* (mean= 31.8%) and *Phragmatopoma* (mean= 11.6%).

The site condition appeared relatively unchanged from our recent past visits except that recruitment of *Chthamalus* spp./ *Balanus* spp. appeared to be high. The plots on the west reef are still composed of a diverse matrix of species from both upper and lower intertidal making them virtually unrecognizable as barnacle, *Silvetia* and *Mytilus* plots. As mentioned, barnacles (*Chthamalus* spp./ *Balanus* spp.) were common to abundant, and recruitment for both species appeared to be high. Rockweeds (both species) were present in small quantities and appeared to be in fair condition. *Mytilus californianus* was rare at the site particularly in the representative plots, but recruitment was moderate as there was a fair number of smaller *Mytilus* observed. *Septifer* was very common in relatively large patches on the west reef; at least in relationship to that of other sites. *Mytilus galloprovincialis* was seen in moderate abundances on the west reef, but not quite as abundant as it was during our last visit. Ephemeral algae not as common as seen in past years.

11/19/2014. Orizaba Cove.

Low tide 0.34 ft at 1348 hrs. The conditions were excellent for sampling and kayaking to the site. The wind (5–10 kt) and swell (1–2') were light. No shorebirds were seen at the site throughout the day. However, 12 black oystercatchers were seen on islet in front of the *Mytilus* plots. Two harbor seals were spotted in the water nearby. The site was monitored from 1015 to 1530. This was the first time we sampled this site since fall 2011.

Plots were photographed by Emily. Site panoramas were photographed by Emily. All of the photoplots were scored in the field by Stephen. The field log was completed by Stephen.

A site-wide search lasting approximately 90 minutes was conducted for black abalone (*Haliotis cracherodii*) presence by Cori and Emily. N=130 black abalone were observed in the area of the site from plot Hes 1 to Myt 5 (sizes ranged 12–124 mm, most individuals were observed to be 1–5m apart from one another). For reference, the last time this site was monitored in fall 2011, 66 individuals were found and measured throughout the entire site [48 black abalone were seen in 30 minutes], sizes ranged 23–123mm).

A 57-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Cori and Emily. N=3 *P. ochraceus* were seen at the site; all appeared to be healthy (sizes ranged 20–80 mm).

Remarkably, after a 3-year hiatus, no plot repairs were necessary except plot 862 was missing a lower-left bolt. No repairs made.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 54.2% mean barnacle cover; barnacle species were the most dominant taxa. The *Silvetia* plots only had 8.4% mean *Silvetia* cover (only three plots had *Silvetia* present). Most cover within the *Silvetia* zone was occupied by *Mytilus* (mean=30%). The *Hesperophycus* plots had 18.4% mean *Hesperophycus* cover; *Endocladia* (mean=16.8%) and *Chthamalus* spp./ *Balanus* spp. (mean=20.8%) also relatively abundant. Mussel (*Mytilus californianus*) plots had 67.4% mean cover. The majority of cover in the five plots was occupied by *Mytilus*. *Tetraclita* plots had 43.4% mean cover of the representative species which was also the most common species encountered.

Most plots still retain relatively high abundances of target species. *Chthamalus* spp./ *Balanus* spp., *Mytilus* and *Tetraclita* were quite abundant and recruitment for each was noticeably high. Other target species such as *Endocladia*, *Hesperophycus* and *Silvetia* were only considered common. A low level of recruitment was observed for both of the rockweed species. *Acanthina* was considerably abundant. *Serpulorbis* was more common at this site than perhaps any other site. Ephemerals (*Scytosiphon*, *Ulva* and *Endarachne*) were present in low abundances.

11/20/2014. Willows Anchorage.

Low tide -0.1 ft at 1422 hrs. The conditions were decent for sampling despite the cloudy sky as a storm front moved through the region. The wind (10–20 kt) was moderate and swell (1–3') was light. It sprinkled for several minutes during the day. A large (6–8') ground swell out of west-northwest was predicted, but apparently the direction that Willows faces was enough to remain protected from the angle of the swell. Two black oystercatchers were seen at the site throughout the day. No pinnipeds were seen. The site was monitored from 1030 to 1700.

Plots were photographed by Stephen. Site panoramas were photographed by Stephen. All of the photoplots were scored in the field by Stephen. The field log was completed by Stephen. The temperature logger was not downloaded or replaced since we could not open the PVC housing.

A search lasting approx. 120 minutes was conducted for black abalone (*Haliotis cracherodii*) presence by Cori and Emily. N=444 black abalone were observed in the area of the site between the first *Hesperophycus* plot and the *Endocladia* plots (sizes ranged 20–140 mm, most individuals were observed to be touching one another). N=35 empty, clean shells were located and measured. Three abalone appeared slightly withered; one was collected and placed in the annex freezer.

For reference, last spring, N=241 black abalone were observed in the area of the site between plots 936 and 950 (sizes ranged 21–124 mm, most individuals were observed to be 1–10cm apart from one another). For reference, in spring 2013, 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 to be touching one another). It is possible that the search for black abalone during this visit may have been compromised slightly by the poor low tide conditions. Several black abalone were observed to be half-buried in sand.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Stephen, Cori and Emily. Zero *P. ochraceus* were seen at the site. For reference, no sea stars were located again last spring, and N=175 ochre stars were observed site-wide in spring 2013 (sizes ranged 50–140 mm, mode = 100 mm).

No plot repairs were conducted this visit, but several of the mussel plots could use new bolts to mark the locations of corners even though they are all present. Nearly all the bolts in the *Mytilus* and *Lottia* plots are bent over and are incredibly cryptic. *Mytilus* plot 943 was missing upper left and upper right bolts.

The fixed owl limpet plots were sampled by Cori and Emily. Plots 1–5 had N= 61, 34, 48, 26 and 3 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged <15–54 mm.

Endocladia plots had 29.4% mean *Endocladia* cover. The majority of cover in the five plots was occupied by *Endocladia*. The *Silvetia* plots only had 6% mean *Silvetia* cover (only plot 949 had *Silvetia* present). Most point contacts within the *Silvetia* zone were crustose corallines (mean=25.4%). The *Hesperophycus* plots had 0% mean *Hesperophycus* cover. Most point contacts within the *Hesperophycus* zone were bare rock. Mussel (*Mytilus californianus*) plots had 60.6% mean cover. The majority of cover in the five plots was occupied by *Mytilus*.

Similar to last season, barnacle cover at Willows appeared to be low compared to that of other sites. *Endocladia* appeared tattered and nearly all was bleached. As observed in recent years, rockweeds only have spotty occurrences and appear to be tattered. Some rockweed recruits were observed however. There appeared to be dozens and perhaps hundreds of sea urchin (*S. purpuratus*) tests washed up on the beach. N=20–30 *Aplysia* were seen washed up on the beach along with a fresh, nearly dead ratfish.

11/21/2014. Fraser Cove.

Low tide –0.45 ft at 1457 hrs. The conditions were mediocre with moderate wind (15–20 kt) and moderate-sized (3–4') swell/surge out of the NW. However the tide dropped low enough to allow us to work the entire site including the surfgrass transects and searches for black abalone and sea stars.

One black oystercatcher and two ravens were seen at the site throughout the day. A red-tail hawk was observed soaring east of the site. At Forney Cove, approximately 250 western gulls and 35 black-bellied plovers were roosting on the reef. One dead female CA sealion was found on the beach near our plots at Forney. The site was monitored from 1130 to 1730. All plots at Fraser and Forney were scored during the same day.

Plots were photographed by Stephen. Site panoramas were photographed by Emily. All 35 photoplots were scored in the field by Stephen.

A search lasting 80 minutes was conducted for black abalone (*Haliotis cracherodii*) presence by Cori and Emily. N=3 black abalone (54, 101, 120 mm) were observed site-wide from plot 891 to plot 905. All were >5m apart from one another.

A search lasting 80 minutes was conducted for ochre star (*Pisaster ochraceus*) presence by Cori and Emily. Only one *P. ochraceus* was observed site-wide from plot 891 to plot 905 (120 mm). The individual appeared to be healthy. For reference, last spring, N=3 ochre stars were observed site-wide, and N=56 were seen in spring 2013.

Surfgrass transects were sampled by Stephen. Transects 1–3 had *Phyllospadix* cover = 72, 70 and 90%, respectively. Most of the surfgrass appeared to be in good shape overall with minimal bleaching and only minor fouling from *Melobesia*. For reference, last fall, transects 1–3 had *Phyllospadix* cover = 71, 46 and 86%, respectively.

The fixed owl limpet plots were sampled by Cori and Emily. Plots 1–5 had N= 12, 2, 11, 17 and 8 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged <15–67 mm. For reference, last fall, plots 1–5 had N= 12, 2, 15, 9 and 6 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged 15–76 mm.

No plot repairs were made, but plots 884, 893, and 895 need bolts installed in LL corners. Plot 909 requires an UR bolt. Still, all plots were easily located.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 33.4% mean barnacle cover. The majority of cover in the five plots was *Chthamalus* spp./ *Balanus* spp. *Endocladia* plots had 34.6% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The *Silvetia* plots had 20% mean *Silvetia* cover which was roughly equivalent to the percentage of *Silvetia* measured last fall. Most of the point contacts within the *Silvetia* zone were bare rock. The *Hesperophycus* plots had 26.6% mean *Hesperophycus* cover. Most of the point contacts within the *Hesperophycus* zone were bare rock. Mussel (*Mytilus californianus*) plots had 67.6% mean mussel cover. The majority of cover in the five plots was occupied by *Mytilus californianus*. *Pollicipes* plots had 18.4% mean *Pollicipes* cover. The majority of cover in the five plots was occupied by *Mytilus californianus* (mean= 45.2%). Tar plots had 46.6% mean tar present. Overall, in comparison to data collected for the all the photoplots at this site during the past two years, the target taxa appear to have remained relatively unchanged.

The tidepool near plot 880 was filled with 20–30 zebra perch. This is the second site this season that we have observed zebra perch; the other site was Anacapa Middle West. *Endocladia* was mostly bleached. Plots appeared similar to past visits with the exception of perhaps fewer barnacles; many had been scraped off in places. *Mytilus* was common to abundant and a moderate level of recruitment was observed. *Hesperophycus* and *Silvetia* appeared robust and common particularly at Forney's. *Silvetia* was reproductive.

11/22/2014. Trailer.

Low tide –0.68 ft at 1535 hrs. The conditions were mediocre with clear sky, high wind (20–25 kt) and moderate-sized (3–4') swell. Despite the less than optimal conditions, we were able to complete all monitoring protocols including the surfgrass transects and searches for black abalone and sea stars with minimal interruptions from incoming waves/surge. There was one western gull present at the site upon arrival. Several dozen gulls were seen flying over the site towards Forney's at the end of

the day. One black oystercatcher was observed east of the site. No pinnipeds were seen. The site was monitored from 1215 to 1700.

Plots were photographed by Cori. Site panoramas were photographed by Cori. All photoplots were scored in the field by Stephen. The field log was completed by Stephen.

A 60-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Cori and Emily. N=61 black abalone were observed site-wide from the surge channel at the east end just passed surfgrass transect-3 to the *Lottia* plots at the west end (sizes ranged 27–141 mm, most individuals were located 1–10 cm apart from one another). For reference, last spring, N=75 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. In spring 2013, 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 Cori and Emily. Only one small (20mm) *P. ochraceus* (appeared healthy) was seen at the site. For reference, last spring, only one *P. ochraceus* (appeared healthy) was also seen. In spring 2013, 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 = 95, 69 and 28%, respectively. *Phyllospadix* was light to moderately fouled by *Smithora* and *Melobeisa*, and a low percentage of the beds appeared bleached and/or abraded. For reference, last spring, transects 1–3 had *Phyllospadix* cover = 68, 61 and 26%, respectively. In spring 2013, transects 1–3 had *Phyllospadix* cover = 92, 60 and 13%, respectively. *Phyllospadix* was moderately fouled by *Smithora*.

The fixed owl limpet plots were sampled by Cori and Emily. Plots 1–5 had N= 19, 21, 2, 6 and 0 *Lottia gigantea*, respectively. Throughout the five plots, sizes ranged <15–99 mm. For reference, last fall, plots 1–5 had N= 15, 22, 0, 6 and 0 *Lottia gigantea*, respectively.

A few plots were missing bolts, but no repairs were made due to lack of time. All plots were still easily located.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 70.6% mean barnacle cover. The majority of point contacts in the five plots were *Chthamalus* spp./ *Balanus* spp. The *Silvetia* plots had 44.6% mean *Silvetia* cover. Most of the cover within the *Silvetia* zone was dominated by *Silvetia*. The *Hesperophycus* plots had 7.4% mean *Hesperophycus* cover. Most of the cover within the *Hesperophycus* zone was *Silvetia* (mean= 36.2%). Mussel (*Mytilus californianus*) plots had 46.4% mean cover. The majority of cover in the five plots was dominated by mussels, though *Phragmatopoma* (mean= 28.2%) was also particularly dominant. Overall, in comparison to data collected for the all the photoplots at this site during the past two years, the target taxa appear to have remained relatively unchanged.

All target species for photoplots appeared healthy and moderately abundant. *Silvetia* was approx. three times more abundant than *Hesperophycus*. However, as many or more small (presumably recent recruits) *Hesperophycus* plants were seen relative to *Silvetia*. *Silvetia* was the only rockweed that was reproductive. Emily and Cori collected rockweed branch tips from both species for a genetic study conducted by Ester Serrão. *Balanus* and *Chthamalus* appeared abundant and healthy. A moderate level was observed for *Chthamalus*. Some areas (particularly in the surge channels) had barnacle loss where they had been scoured. *Phyllospadix* was lush and abundant with very little fouling or abrasion. No flowers were observed, but one was seen washed up on the site. *Mytilus* appeared healthy and common (there were very few dead mussels observed). *Mytilus* recruitment was moderate.

San Miguel Island, December 1–8, 2014

(Database event #2014-I)

Prepared by Stephen Whitaker

Purpose:

To monitor rocky intertidal sites at San Miguel Island.

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- Emily Tucker, Technician, UCSC
- Cori Hume-Flannery, Technician, UCSC

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 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. The logger at Crook Point was not located. 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 Monday, December 8th.

12/1/2014. Arrived on the island in the late afternoon. We flew out a day earlier than the usual travel day to beat the storm predicted for 12/2. We stayed in the bunkhouse since Emily and Cori still needed to get UXO trained and subsequent permission from Ian Williams to walk on the island. Stephen worked on computer.

12/2/2014. The rain fell steadily nearly the entire day and most of the night. Over 3" were recorded in the rain gauge. Stephen worked on reports and did some mandatory training on the computer.

12/3/2014. Cuyler Harbor.

Low tide -0.4 ft at 1358 hrs. The conditions were excellent with overcast sky, light (5–10 kt) wind and incredibly-small (<1') swell. There were 2 black oystercatchers, 1 western gull and 7 black turnstones at the site upon arrival. There was also one juvenile sealion in the water near the site. Along the beach the following were observed: 2 female elephant seals (ELSE), 1 small male ELSE, 1 bull ELSE, 2 black phoebes, 2 black oystercatchers, approx. 150 cormorants, 3 brown pelicans west of Nidever Canyon; approx. 40 western gulls, approx. 100 cormorants, 10 brown pelicans and 1 black phoebe between Nidever Canyon and the surge channel; approx. 75 surf scoters, 2 black phoebes, 4 female ELSE, 4 immature male ELSE, 3 male seals including bulls, 6 snowy plovers, and 1 killdeer between the surge channel and monitoring site. The sand level on the beach was 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 1115 to 1530.

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 Emily and Cori. Zero black abalone were observed site-wide.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. N=8 ochre stars were observed site-wide (sizes ranged 90–150 mm, mode = 100 mm). All sea stars appeared to be healthy with no visible lesions. One *Patiria miniata* was seen at the site. An additional N=6 *P. ochraceus* were seen during a survey of the reef adjacent to the site on the northeast side. The additional survey covered an area approx. the same size as the monitoring site. For reference, last spring, N=3 *P. ochraceus* were seen site-wide; all three individuals appeared to be healthy. In January, 2014, 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.

The field log was completed by Stephen. No plot repairs were made during this visit. All plots were relatively easy to locate since they all have at least one bolt and multiple epoxy patches. However, nearly all plots could use more bolts to replace the epoxy.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 47.4% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Chthamalus* spp./ *Balanus* spp. cover has been gradually declining during the past year from 62.4% in January 2014. *Endocladia* plots had 17.4% mean *Endocladia* cover which is approx. the same to that measured a year ago. The majority of point contacts in the five plots were bare rock. The rockweed plots only had 0.4% mean *Silvetia* cover (*Silvetia* only comprised 2% of plot 407 and was not present in any of the other plots). The majority of point contacts in the five plots were bare rock. Mussel (*Mytilus californianus*) plots had 76.8% mean cover. The majority of cover in the five plots was occupied by mussels. For reference, in January 2014, mussel plots had 83.8% mean cover.

At the site, one freshly-dead black abalone (body in shell approx. 50 mm) was seen in an upper intertidal tidepool. The foot appeared shrunken, but that may have been caused by scavenging. Overall, the site condition appeared similar to previous visits with no obvious disturbances. Consistent with recent surveys of the site, *Mytilus* was again conspicuously abundant; all sizes of mussels were seen (extremely large mussels along with a moderate level of newly-recruited individuals). The barnacle zone was dominated by *Balanus*. Rockweeds present consisted primarily of *Silvetia* (mainly around plot 413), but a small patch (approx. 9 thalli) of *Hesperophycus* was present. One *Hesperophycus* plant had receptacles and 1–2 small (possibly newly recruited) plants were seen. *Endocladia* was not particularly abundant with most occurring around plot 420. *Chthamalus* was present in relatively low abundances. *Phyllospadix* appeared healthy with only minimal bleaching. Red algal zone (primarily *Chondracanthus canaliculatus*) had very minor bleaching. *Phragmatopoma* still most common in center of site and appeared healthy.

12/4/2014. Otter Harbor.

Low tide –0.7 ft at 1440 hrs. The conditions were excellent for sampling with partly cloudy sky, light (5–10kt) breeze and very small (1–2') swell. There were 3 western gulls, 4 black oystercatchers, 2 cormorants along with 38 harbor seals, 1 California sea lion and 7 elephant seals at the site upon arrival. The charismatic harbor seal that we typically encounter at the site remained on the site the entire day. No harbor seal pups were observed at the site. The site was monitored from 1050 to 1645.

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

A 120-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Emily and Cori. The entire site was searched from R1 at the east end of the site near the surge channel to R2. N=211 black abalone were observed site-wide (sizes ranged 27–145 mm, most individuals were either touching or were located 1–10 cm apart from one another). All five abalone plots were sampled; zero abalone were seen in any of the plots.

A 60-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. N=6 ochre stars were observed site-wide from R2 to the east end near the surge channel (sizes ranged 70–120 mm, mode = 90 mm). No other sea star species were seen. No signs of sea star wasting disease were observed. For reference, in January 2014, 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). By March 2014, only two *P. ochraceus* were seen throughout the entire site.

Owl limpets (*Lottia gigantea*) were counted and measured in the fixed plots by Emily and Cori. Plots 1–5 had N= 48, 65, 44, 58 and 37 owl limpets, respectively. Sizes throughout all five plots ranged <15–64 mm. For reference, in January 2014, plots 1–5 had N= 33, 36, 37, 32, and 40 owl limpets, respectively. Sizes throughout all five plots ranged 12–68 mm.

The field log was completed by Stephen. No plot repairs were conducted during this visit, but virtually all plots need bolts. All plots were however located with relative ease.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 28.8% mean barnacle cover. The majority of point contacts in the five plots were bare rock. Note that *Chthamalus* spp./ *Balanus* spp. cover was approx. 45% a year ago. Plot 374 remains dominated by red algae comprised primarily of *Chondracanthus* and *Mazzaella*/ *Mastocarpus*. *Endocladia* plots had 32.8% (comparable to recent measurements) mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots only had 0.8% mean *Silvetia* cover; the rockweed only occupied 4% of one plot). Most of the point contacts within the rockweed zone were bare rock. Mussel (*Mytilus californianus*) plots had 67.8% mean cover; a marked increase from 47% measured in March 2013. 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), which may have been slightly more abundant than *Silvetia* with several recruits observed. A moderate level of recruitment was observed for *Mytilus* but not for other species. *Endocladia* was abundant and lush with no apparent bleaching. In fact, bleaching was not observed for any algal species. *Mastocarpus* was nearly as common as *Mazzaella*. *Chthamalus* was much more common than *Balanus*. *Tetraclita* and *Pollicipes* were distributed fairly evenly in low quantities throughout the mussel beds. Other than a thin layer of *Ulva* observed at various locations throughout the site, ephemeral algae were largely absent. Black abalone abundances appeared to be comparable to that of previous visits.

12/5/2014. Crook Point.

Low tide -0.9 ft at 1522 hrs. The conditions were good overall with relatively small (2-3') ground swell, light (10-15kt) wind out of southeast and overcast sky. Still, the larger sets made for wet conditions when conducting surveys for black abalone and sea stars. Conspicuously, there was no sand in the surge channel splitting the site. There were approx. 40 cormorants, 2 western gulls and 2 black oystercatchers at the site upon arrival. Four elephant seals including one bull were observed sleeping on the upper intertidal rocks or lounging in the surge channel at various times throughout the day. Five elephant seals were observed on the beach east of the site. N=17 elephant seals were on the beach west of the site. Approx. 50 surf scoters and approx. 50 grebes were seen in the water 100m offshore. The site was monitored from 1025 to 1630.

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

A 120-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Emily and Cori. N= 55 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 33-155 mm, most individuals were located 1-10cm apart from one another). Abalone plots 1-5 had N=0 black abalone present. The area encompassing the Biodiversity transects was surveyed separately for black abalone; N=35 observed. For reference, in January 2014, N= 26 black abalone were observed site-wide and sizes ranged 65-148 mm.

A 120-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Emily and Cori. N=23 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 20–130 mm, mode = 40 mm); all individuals appeared to be healthy. This was the greatest number of *P. ochraceus* that we had seen at any site surveyed thus far this season. For reference, in January 2014, N=10 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 70–120 mm). All individuals appeared to be healthy.

Mobile invertebrates were not sampled. The field log was completed by Stephen. No plot repairs were conducted this visit. All the plots were relatively easy to locate. However, numerous plots still would benefit from the installation of three locator bolts.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 27% mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 22.8% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plot 389 had 49% mussels present. The rockweed plots had 0% mean *Hesperophycus* and 0.6% mean *Silvetia* cover. Most of the cover within the rockweed zone was dominated by mussels (mean=31.4%). Mussel (*Mytilus californianus*) plots had 82.4% mean mussel cover. The majority of cover in the five plots was occupied by mussels. Overall, in comparison to data collected for the all the photoplots at this site during the past two years, the target taxa appear to have remained relatively unchanged.

The beaches west of the site and east of the bombing poles were surveyed for snowy plovers; N=0. At the site, exceptionally-high numbers of littorine snails were seen on the inshore reef. The overall condition of the site appeared unchanged from recent past visits. *Mytilus*, *Balanus* and *Endocladia* were abundant and appeared to be healthy. Low to moderate level of recruitment was observed for *Mytilus* particularly in the *Phragmatopoma*. Some minor bleaching of the coralline algae, *Endocladia* and *Prionites* was apparent. *Phragmatopoma* was particularly abundant around abalone plots 1–3 and the surge channel. Ephemeral algae (*Ulva*, *Endarchne*, *Scytosiphon*) were relatively common. *Analipus japonica* still occupies a significant amount of space along the walls of the surge channel.

12/6/2014. Harris Point.

Low tide –0.9 ft at 1600 hrs. The conditions were excellent with clear sky, warm temperature, light (5–10 kt) wind and minimal (1–2') swell. There were not any shore birds observed at the site, but one black oystercatcher was seen flying overhead. Three harbor seals were seen at the site upon arrival; only one was hauled out when we arrived. The site was monitored from 1215 to 1645. We surveyed Simonton Beach for marine debris for approx. two hours prior to sampling Harris Point.

Plots were photographed by Stephen. Site panoramas were photographed by Stephen. All 25 photoplots at the site were scored in the field by Stephen.

A 90-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Cori and Emily. N=30 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 42–180 mm, most individuals were spaced 1–10cm apart from one another). The fixed abalone plots 441, 442, 444 and 445 had zero abalone; 443 had

one black abalone (120mm). For reference, last spring, N=20 black abalone were observed site-wide and sizes ranged 40–155mm.

A 60-minute search was conducted for ochre star (*Pisaster ochraceus*) presence by Cori and Emily. N=3 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 100–160 mm). Additionally, N=8 *Patiria miniata* were seen throughout the site. For reference, last spring, N=2 ochre stars were observed site-wide. The number of *P. ochraceus* at this site expectantly low since wasting disease devastated sea stars at all our sites and others along the entire west coast. However, historically, the number of sea stars at Harris Point has always been low compared to that of other sites for reasons unknown.

Owl limpets (*Lottia gigantea*) were measured in the fixed plots by Cori and Emily. Plots 1–5 had N= 2, 11, 28, 41 and 13 owl limpets, respectively. Sizes of *L. gigantea* lumped across the five plots ranged <15–71mm, mode= 27mm). For reference, in January 2014, 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 not made during this visit. However, nearly all plots need bolts and some are even missing epoxy corners.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) plots had 40.8% (down from 59.8% measured in January 2014) mean barnacle cover. The majority of point contacts in the five plots were bare rock. *Endocladia* plots had 29.2% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. The rockweed plots only had 2.2% mean *Hesperophycus* cover. This was significantly lower than what was measured in January 2014 (mean=24.4%) and March 2014 (mean=30%). Most of the point contacts within the rockweed zone were instead bare rock. Mussel (*Mytilus californianus*) plots had 26.2% 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=18.4%). The *Tetraclita* zone had 16% mean *Tetraclita* cover and was dominated by bare rock (mean= 34.4%) or non-coralline crust (mean=18%).

Overall the biological condition of the site appears similar to that of previous visits with the exception of the marked decline in the abundance of *Hesperophycus*, particularly within the representative fixed plots. The few *Hesperophycus* plants that were observed appeared to be tattered; there was a minor amount of recruitment observed for the rockweed. Even though *Mytilus* was relatively abundant, recruitment was not readily observed. *Endocladia* and *Balanus* were relatively abundant throughout the site. No bleaching was observed for any algal species.

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.

12/7/2014. The low tide occurred late in the afternoon and we completed all field protocols for each of the four monitoring sites, so Stephen stayed in housing and worked on reports.

12/8/2014. Flew off the island at approx. 09:00.

Santa Cruz Island, December 19, 2014

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

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 were scored in the office. Sea stars and black abalone were counted during 30-minute site-wide searches at Site A only. 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.

12/19/2014. Scorpion Rock.

Low tide -0.4 ft at 1408 hrs. The conditions were excellent with clear sky, light (<5 kt) wind and minimal (approx. 1') swell. No precipitation had been detected for more than a week. There were no shore birds or pinnipeds at Site A upon arrival. However, approx. 100 surf scoters were seen about 100m offshore. The sites were monitored from 1130 to 1500.

Plots were photographed by Josh. Site panoramas were photographed by Josh. Note that plots 803–805, 807–810, 822–825 were lost since they were not downloaded properly. Fortunately, all the aforementioned plots were scored in the field.

The 20 photoplots at Site A were scored in the field by Stephen, and the five rockweed plots at Site B were scored by Stephen in the office.

A 45-minute search was conducted for black abalone (*Haliotis cracherodii*) presence at Site A by Josh. N=41 black abalone were observed site-wide at Site A (sizes ranged 25–108 mm, most individuals were located 11–50 cm apart from one another). For reference, last fall, 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). Note that Site B was not sampled for black abalone due to lack of time.

A thirty-minute search was conducted for ochre star (*Pisaster ochraceus*) presence at Site A by Josh. N=4 ochre stars were observed site-wide (sizes ranged 30–105 mm); all appeared to be healthy. For reference, last spring, zero *P. ochraceus* were seen, and spring 2013, N=162 ochre stars were observed site-wide (sizes ranged 70–150 mm, mode = 100 mm).

The field log was completed by Stephen. Plot 822 was missing a lower-left bolt (bolt was found loose at the site). A slab of rock at R2 was broken loose last year. Epoxy was placed at both of these locations, but no bolts were installed.

The barnacle (*Chthamalus* spp./ *Balanus* spp.) had 33.4% mean barnacle cover. The majority of point contacts in the five plots were bare rock (mean= 53.2%). *Endocladia* plots had 15.4% mean *Endocladia* cover. The majority of point contacts in the five plots were bare rock. For reference, last fall, *Endocladia* plots had 56.6% mean *Endocladia* cover. The *Hesperophycus* plots had ~15% mean *Hesperophycus* cover (note that percent cover could only be estimated since data for plot 813 is missing-plots were scored from photos and plot 813 was poorly photographed). Most of the cover within the *Hesperophycus* zone was bare rock. Mussel (*Mytilus californianus*) plots had 5% mean mussel cover. The majority of cover in the five plots was occupied by articulated corallines (mean= 35.2%) and *Tetraclita* (mean=32%). The *Tetraclita* plots had 47.2% mean *Tetraclita* cover. The majority of cover in the five plots was occupied by *Tetraclita*.

Site appeared to be in good shape with no obvious disturbances. *Chthamalus/Balanus* and particularly *Tetraclita* were very abundant at Site A. Recruitment was observed for all three species on nearly all the bolts. *Endocladia* appears to be healthy and abundant at the small site (Site A) with no bleaching. *Mytilus* is still scarce throughout the reef as only small patches of mussels were observed. Some small patches of *M. californianus* recruitment were observed. *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. Several *S. purpuratus* were observed exhibiting signs of wasting disease.

Santa Barbara Island, January 28–29, 2015

(Database event #2014-K)

Prepared by Stephen Whitaker

Personnel:

- Stephen Whitaker, Marine Ecologist, Channel Islands National Park
- David Kushner, Marine Biologist, CHIS
- Emily Tucker, Technician, UCSC
- Tayler Tharaldson, Technician, UCSC
- Liam Zarri, VIP

Procedure and General Observations:

Standard procedures were used for monitoring rocky intertidal sites. All plots (except for the red turf algal plots at Landing Cove) and site overviews were photographed with an Olympus 1030 digital camera. All photoplots were scored in the field (except for the *Mytilus* plots at Sea Lion Rookery). Counts were not made of motile invertebrates inside the photoplots. 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. We came out to the island on the Sea Ranger II in combination with a specially-scheduled Kelp Forest Monitoring trip to swap wave sensors.

28 January 2015. Landing Cove.

Low tide 0.39 ft at 1132 hrs. Note that this monitoring trip has been rescheduled three times since the originally-scheduled trip in October 2014. A combination of poor conditions (high swell), boat or captain availability have made it challenging to sample the sites at Santa Barbara Island.

Unfortunately, the conditions during this trip were poor for sampling due to the relatively large swell (for SBI) and the poor low tide series. The swell was estimated to be 3–5'. However, it is always difficult to estimate swell at SBI since the waves come inshore from deep water and roll in as surge rather than break as a standing wave. SBI is unique in the sense that it receives swell from all angles, and its small size results in swell wrapping around the entire island regardless of originating direction. Wind was 5–10kt.

There were 2 black oystercatchers, 7 western gulls and 4 black turnstones on the reef south of the pier. Within the cove, approx. 17 sea lions (mostly juveniles) were observed. Three juvenile sea lions appearing extremely emaciated were lounging on the upper level of the pier. We were onsite from 1045–1600 hrs. Personnel for the day included Stephen Whitaker, Emily Tucker, Tayler Tharaldson and Liam Zarri.

Stephen and Liam worked together to photograph the plots on the south side of the site. It was challenging just photographing the plots due to the constant and frequent sets of waves impacting the entire site nearly up to the cliff. The surge negated the low tide resulting in standing water throughout most of the site even at the peak of low tide.

Stephen managed to score all the plots south of the pier despite the poor conditions. North of the pier, only the *Silvetia* plots were photographed and scored. The red algal turf plots were not exposed during the day long enough to facilitate sampling them.

Emily and Tayler searched for sea stars throughout the reef located south of the pier. However, Emily sprained her ankle approx. 10 minutes into the search. Stephen took over for Emily. Only three *Pisaster ochraceus* were seen throughout the site. Sizes were estimated to be 100–120mm. The poor conditions hampered our ability to thoroughly search the entire site, and we could not even get a solid look at the sea stars that we found to determine whether they were diseased. However, we feel fairly confident that we located most, if not all, of the sea stars at the site and those were not diseased. The permanent transect used for sampling sea stars was not surveyed due to the poor conditions. For reference, in October 2013, Dan counted N=182 sea stars throughout the reef located south of the pier.

A thirty-minute search was conducted for black abalone (*Haliotis cracherodii*) presence by Stephen and Tayler. One black abalone (126mm) was observed hanging onto the edge of the reef near plot 315. Surprisingly, no other abalone were seen at the site. During the past several years, we usually see 1–2 individuals in the crevice near the sea star transect, but we did not encounter them this year.

The poor conditions may have hampered our ability to thoroughly search the entire site. For reference, in October 2013, Dan Richards located N=3 black abalone.

Most of the photo plots were located with ease with the exceptions of 326 and 329. Numerous plots were missing corner markers: 326 has a brass bolt in UR that needs to be replaced, 328 is missing LL, 329 missing LL. Plots 310–314 and 319 only have epoxy corners. Liam and Tayler managed to install bolts in the UL, UR and LL for plots 315–318 and the UR bolt in plot 325.

After completely monitoring the south side of the site, Stephen crossed the chasm to the 10 remaining plots on the north side of the cove. Stephen photographed and scored the five *Silvetia* plots. The red algal turf plots were not exposed during the day long enough to facilitate sampling them.

Barnacle plots were again 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 5–24% (mean=15.2%), *Mytilus* mean cover was 25.2% and noncoralline crust averaged 15.4% among other less abundant taxa. *Silvetia* plots were devoid of *Silvetia* except for plot 314 that had 6% cover. The *Silvetia* plots were instead dominated by *Mytilus* (mean=25.2%), *Mazzaella* (mean=28.6%) and *Chondracanthus* (mean=14.2%). Mussel cover in *Mytilus* plots ranged 42–79% and averaged 58.2%. The next most abundant species in mussel plots was articulated corallines (mean=27.2%). Red turf plots were not sampled this year; we attempted to access the plots on 1/30, but the ocean conditions never improved enough to safely conduct the work.

29 January 2015. Sea Lion Rookery.

Low tide –0.04 at 1231 hrs. We experienced poor conditions due to relatively large (4–5') swell/surge. Sky was clear and wind was light. We attempted to skiff into the site, but the waves were too large to safely access the site. We decided to get dropped off at the pier and hike to the site instead. All of the sampling protocols, particularly the searches for black abalone and sea stars, were impaired by the high surf since a high proportion of the site was immersed most of the time. Still, we have relatively high confidence that zero black abalone and *Pisaster ochraceus* were present.

Upon arrival, approximately 75 or more sea lions (mostly mothers and pups with several large males present) were seen in the vicinity of the monitoring site. In addition, there were 5 black turnstones and 1 black oystercatcher at the site. We were on site from 1200–1600 hrs. Personnel for the day included Stephen Whitaker, David Kushner, Tayler Tharaldson and Liam Zarri.

Stephen photographed the plots. Most of the plots were located with relative ease since a significant amount of time was dedicated to installing at least one bolt into nearly all plots last year. However, it took an exorbitant amount of time to identify the correct orientation for several of the *Mytilus* plots due since many were missing bolts or had extra bolts that were likely installed during periods of high mussel cover. Unlike recent past years whereby the *Mytilus* plots had nearly 100% mussel cover, this year, the *Mytilus* plots were nearly devoid of mussels likely due to a wave disturbance event. Site panoramas were photographed by David.

Stephen scored all plots in the field except most of the *Mytilus* plots (swell impaired our ability to score outer plots). As in past years, 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*.

David counted/measured *Pisaster ochraceus* (N=0) and searched for abalone (N=0) for 30 minutes. One *Pisaster giganteus* was located near *Mytilus* plot 354. For reference, in fall 2013, N=144 *P. ochraceus* and zero abalone were observed. In fall 2012, N=143 *P. ochraceus* were counted and N=0 black abalone were seen.

The field log was not completed due to lack of time and poor overall conditions. Only two bolts were installed; both in 354 (UL and UR) during this visit since the drill got doused by a wave and shorted out. All plots were relatively easy to locate since they all have at least one bolt and multiple epoxy patches. However, nearly all plots could use more bolts to replace the epoxy. Epoxy was placed in two corners of 353. The photolog completed during this survey should be consulted the next time we sample this site.

Barnacle plots only averaged 5.8% *Balanus/Chthamalus* cover. The majority of point contacts in the five plots were *Ulva* (mean=18.6%). *Endocladia* plots had 17% mean *Endocladia* cover along with 26.8% *Ulva*, 23.6% *Mazzaella*, 4% *Tetracrita* cover and 2.8% *Mytilus* among other less common taxa. Rockweed plots averaged 27% *Silvetia*, 21.8% *Mazzaella*, 7.2% *Gelidium/Pterocladia* and 6.6% *Chondracanthus canaliculatus* along with scarce amounts of several other taxa. Mussel (*Mytilus californianus*) plots had 39.4% mean cover. The majority of cover in the five plots was occupied by mussels. For reference, last year, *Mytilus* plots were composed only of mussels (mean=100%).

At the site, *Sargassum horneri* (approx. 15–20 plants) were seen near the southern boundary. Plants were approx. 18–24" long and several were reproductive. There was apparently a large disturbance in the vicinity of the mussel plots since they were largely devoid of *Mytilus*; this was in sharp contrast to last year when mussel cover was nearly 100% in all plots. *Silvetia* was common in vicinity of rockweed plots. *Chthamalus* and *Balanus* were relatively rare. *Endocladia* was common and appeared unbleached throughout the site. The same can be said for *Mazzaella* and *Mastocarpus*. Ephemeral algae (primarily *Ulva*) were abundant in the upper intertidal. *Gelidium coulteri* was also highly abundant. Sea lion abundances were quite lower than typically seen at this site, but we usually sample during fall when numbers of sea lions are likely higher. The sea lion scat was filled primarily with squid pens and pelagic red crabs (*Pleuroncodes planipes*). Several of the red crabs were seen in the water column during dive surveys around Santa Barbara Island. The last time that *P. planipes* was observed at the Channel Islands was more than 10 years ago according to conversations with David Kushner, Dan Richards and Jack Engle.

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