Pacific Outer Continental Shelf Region

OCS Study
MMS-2005-071

Monitoring of Rocky Intertidal Resources Along the Central and Southern California Mainland

Comprehensive Report (1992-2003) for San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Orange Counties

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Minerals Management Service
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Monitoring of Rocky Intertidal Resources Along the Central and Southern California Mainland

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DISCLAIMER

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Technical Summary

Study Title: Inventory of Rocky Intertidal Resources in San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Orange Counties.

Report Title: Monitoring of Rocky Intertidal Resources Along the Central and Southern California Mainland. Comprehensive Report for San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Orange Counties (1992-2003)

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Principal Investigators: Peter T. Raimondi, Richard F. Ambrose, John M. Engle, Steven N. Murray

Key Words: Intertidal, Monitoring, California, Marine Algae, Marine Invertebrates, Seasonal Trend, Temporal Trend, Baseline Data, Withering Syndrome, Abalone, Surfgrass, Mussel, Barnacle, Limpet, Seastar, Anemone, Rockweed, Turfweed, Whelk, Snail, Chiton.

Background and Objectives:

This report presents the results of nine years of monitoring rocky intertidal resources at six sites in San Luis Obispo County, twelve years at nine sites in Santa Barbara County, ten years at five sites in Ventura and Los Angeles Counties, and eight years at four sites in Orange County. Data for ten years from two additional sites on Catalina Island are summarized in appendix A. These sites are part of MARINe (Multi-Agency Rocky Intertidal Network), a regional intertidal monitoring network sponsored by the Minerals Management Service (MMS), with additional funding and support from local and state governments, universities, and private organizations (see www.marine.gov). The MARINe group includes sites in San Diego, Northern California, Oregon, and the Channel Islands in addition to those presented in this report. This work developed out of concerns for the protection of rocky intertidal resources and the need to evaluate impacts on rocky intertidal resources following an oil spill. Surveys began in Spring 1992 in

Santa Barbara County, Fall 1994 in Ventura and Los Angeles Counties, Fall 1995 in San Luis Obispo County, and Fall 1996 in Orange County and were conducted through Fall 2003. This work will continue indefinitely provided funding remains available. Goals of the monitoring program include:

- Assessing the temporal dynamics of target species across multiple sites spanning a broad geographic region.
- Providing information to assess impacts of an oil spill or other anthropogenic activities in the context of natural changes in intertidal populations and communities.
- Determining morphological aspects (e.g. color ratios) and key parameters describing population status (e.g. size structure) of selected target species.
- Detecting and documenting invasions, changes in species ranges, disease spread, and other events important to developing an understanding of the structure and function of rocky intertidal populations and communities.

Description:

Long-term monitoring sites were sampled using fixed plots in target community assemblages; this approach is similar to that used by the Channel Islands National Park and MMS-funded intertidal studies by Kinnetics and Littler. Fixed plots allow the dynamics of rocky intertidal species to be monitored with reasonable sampling effort. Targeting key species or assemblages allows the sampling effort to focus on ecologically important components of the assemblage, and provides greater statistical power to detect changes over space or time.

Permanent plots for long-term monitoring were established at twenty-four sites, stretching from Point Sierra Nevada in the north to Dana Point in the south. Sites are located approximately 10-30 kilometers apart and span nearly 600 kilometers of California coastline.

Monitoring surveys targeted thirteen key species or species groups: rockweed (*Silvetia compressa*), rockweed (*Hesperophycus harveyanus*), turfweed (*Endocladia muricata*), red algae *Mastocarpus papillatus* and *Mazzaella* spp., anemones (*Anthopleura elegantissima/sola*), barnacles (*Chthamalus* spp. and *Balanus glandula*), goose barnacles (*Pollicipes polymerus*), mussels (*Mytilus californianus*), surfgrass (*Phyllospadix scouleri/torreyi*), seastars (*Pisaster ochraceus* and *Asterina miniata*), owl limpets (*Lottia gigantea*), and black abalone (*Haliotis cracherodii*). Not all target species were sampled at each site. Some species were sampled in the field by counts or point-contact procedures, but most sampling was accomplished by photographing quadrats. The resulting digital images could then be scored in the lab for percent cover of both the target species and other general taxa included in the plots using a point contact method.

Significant Results:

The following is a brief summary of individual species trends. Species dynamics are discussed in more detail in the Results section.

Silvetia declined slightly in cover at San Luis Obispo County (SLO) sites but remained stable in most other areas. *Silvetia* cover tended to be slightly higher in fall than in spring at many sites. At both sites where *Hesperophycus* was sampled, cover decreased substantially over time. Cover of *Endocladia* varied seasonally at most sites and inversely with *Silvetia* cover, with higher cover in spring than in fall. Barnacles and *Silvetia* were common in most *Endocladia* plots, and fluctuations in cover of each of these three species were inversely correlated with cover of the other two. *Mastocarpus* experienced a general decline while *Mazzaella* cover remained relatively stable over time at both sites where these algae were sampled. *Anthopleura* cover was relatively stable over time at all sites where this species was sampled. Extreme fluctuations in sand cover occurred at three sites in the low-lying fixed plots used for monitoring *Anthopleura* abundance. Barnacle cover varied over time and among sites, which was not surprising for these relatively short-lived species. Barnacles declined substantially at Occulto, where plots experienced increases in algae and mussel cover, and at Stairs, where barnacle recruitment has not occurred since the 1997/98 El Niño. *Pollicipes* cover was constant over time at two sites, but showed both a decreasing over-time trend and a seasonal trend (with higher cover in fall) at Carpinteria. Mussel cover was relatively stable over time at nine of the nineteen sites where it is sampled. Four sites showed a decreasing trend in mussel cover over time. Recovery plots were largely dominated by bare rock and non-coralline crusts, but several other algal species and a few acorn barnacles were also present.

Surfgrass cover was highly seasonal, with higher cover in fall than in spring at all sites except Cayucos, where transects are located in pools. Sand cover in surfgrass plots was an important factor at several sites, particularly at Coal Oil Pt., where plants were frequently partially covered and, on one occasion, completely buried by sand. Surfgrass cover along transects declined over time at Stairs and Carpinteria although recovery was observed at both sites.

Seastar counts were variable from sample to sample at all sites but the color ratio of purple/brown to orange *Pisaster* (3:1) has remained relatively constant. On average, orange individuals tended to be larger than purple/brown individuals. Both *Lottia* abundance and mean size were relatively constant over time at most sites. Dramatic declines in black abalone numbers continued at the Santa Barbara County sites and spread north to the San Luis Obispo County sites. These declines were coupled with a near-absence of abalone recruitment, indicating that recovery, if it occurs, will be slow. Although abalone numbers at Piedras Blancas and Pt. Sierra Nevada (the northernmost SLO abalone sites) had not decreased substantially by the end of this study period, these sites have since been re-visited, and the numbers of black abalone appear to be on the decline.

A new addition to our sampling protocol was the counting of motile invertebrates in selected photoplots. Limpets and littorines were the most abundant motile invertebrates, present mostly in barnacle and *Endocladia* plots. The turban snail, *Tegula funebralis,* was common in *Silvetia*, *Endocladia,* and mussel plots. Mussel plots also contained the whelk, *Nucella* spp. and the chiton *Nuttallina* spp. *Lepidochitona hartwegii* was found nearly exclusively in *Silvetia* plots.

Study Products:

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INTRODUCTION

The central/southern California coast possesses an exceptional diversity of valuable rocky intertidal resources. Major factors contributing to the richness of coastal marine life in this region include its location along the boundary of two major biogeographic provinces (cold-temperate Oregonian and warm-temperate Californian), a high diversity of habitat types, and exposure to varying local oceanographic conditions. Oil and gas activities, especially the transport of oil along the California coast, raise the possibility of an oil spill or other impact to coastal resources. Population monitoring of coastal biota in central and southern California provides baseline information in case an event such as a spill were to damage these resources. This baseline information is essential for scientific studies investigating the short- and long-term effects of a spill and for natural resource damage assessment. In addition, well-designed monitoring studies yield important data on population dynamics on local and regional scales, which can be utilized for more effective resource management, as well as provide fundamental ecological knowledge about the dynamics of the systems. Moreover, quantitative data describing the dynamics of key intertidal populations over a broad, geographic scale are essential for robust testing of impacts of oil spills or other major disturbance events.

Data from this study have thus far been used as the bases for advancing scientific understanding of rocky intertidal populations in the region as evidenced by more than 125 presentations and publications. Of particular significance to MMS was the successful use of monitoring data in damage assessment, when a small oil spill occurred off the coastline of northern Santa Barbara County in 1997 (see Raimondi et al. 1999). Additionally, we have documented disease in black abalone and the resulting massive declines in population sizes at Santa Barbara and San Luis Obispo County sites. In Orange County, the red alga *Caulacanthus ustulatus* has become increasingly abundant. This species is thought to be a non-native invader and is rapidly becoming the dominant species in the mid-upper algal turf community. These are just a few examples of how long-term monitoring data obtained from the MARINe program are proving to be valuable to MMS and other regional constituents.

REPORT ORGANIZATION

This report is organized into four sections consisting of the main data summary section plus three appendices. The first section summarizes our findings from surveys done in San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Orange Counties from 1992-2003 (surveys in some areas began after 1992). Appendix A is a summary of findings from surveys done at two sites on Catalina Island from 1994-2003. Appendix B contains natural history information about the target species sampled in this study. It is an updated version of the natural history section from a previous report (Raimondi et al. 1999), containing additional information from recent literature, and from our own field observations. Appendix C contains tables of summary data (mean percent covers and standard errors) for target and other common species in permanent plots at all sites.

SAMPLING METHODS

Only brief descriptions of key elements of the sampling program will be included here, including changes in procedures adopted since our last report (Raimondi et al. 1999). Specific methods for carrying out the MARINe monitoring program and site-specific information for the Santa Barbara County sites is given in the rocky intertidal monitoring handbook for Santa Barbara County (Engle et al. 1994). Sampling protocols can also be found on the MARINe website (www.marine.gov), and will be published in a revised intertidal monitoring handbook in 2005. Additional discussions of sampling issues crucial to the design of MARINe and other intertidal monitoring programs can be found in Murray et al. (2004).

Criteria used in site selection include:

- Areas previously surveyed or monitored that provide historical data
- Unsurveyed areas representing major data gaps
- Areas of concern with regard to human impacts, including potential oil spills
- Areas with relatively pristine habitats
- Areas which provide habitat for sensitive or rare intertidal species
- Areas with optimum conditions for long-term monitoring

Optimum conditions for monitoring include reasonable and safe site access, adequate bedrock surfaces for establishing permanent plots, sufficient abundance of key species, and minimal disturbance to sensitive resources (e.g., seabirds, marine mammals).

Sampling of the 26 rocky intertidal sites in San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Orange Counties (Figure 1) follows the protocol described in Ambrose et al. (1992), which is modeled after methods used by the National Park Service intertidal monitoring program (Richards and Davis 1988), and focuses on target species or assemblages. Permanent photoplots were established in assemblages such as barnacles, mussels, anemones, turfweed, and rockweed. Cover of the major taxa within these photoplots was determined by point-contact analysis from photographs, except for barnacle plots in San Luis Obispo and Northern Santa Barbara Counties (see below). Permanent plots also were established for large motile species such as owl limpets, black abalone, and sea stars. Permanent line transects are used to estimate the cover of surfgrass. A series of photographic pans along with field notes are used to describe general conditions at the site and to document the distribution and abundance of organisms not found within the photoplots.

Several changes have been made to our protocols since the 1998 report (Raimondi et al 1999). First, in 2002 we switched from using slide film to taking digital images of our photoplot assemblages. This change significantly reduces the likelihood of getting unscorable images, because we are able to view images in the field. Now, instead of projecting a slide onto a grid to score percent cover of species in photoplots, we score plots on a computer monitor. We also use digital images for site pans, which have replaced the video footage previously taken at all sites. Starting in Spring 2001, we began scoring barnacle plots in the field at the eight northernmost sites. This allows us to distinguish *Chthamalus* spp. from *Balanus glandula*, and dead barnacles from live ones. At one site, Stairs, we added “recovery” plots, in which we are following natural recruitment and succession processes in areas where large sections of the layered rock were removed by the 1997/98 El Niño storms. Our seastar sampling protocol was modified slightly in 1996 (later at some sites), when we began measuring *Pisaster ochraceus* and recording color information. Pisaster colors can be quite variable, so for simplicity, we used two color categories: orange and other. An individual was classified as “orange” if it was bright orange, with little brown or purple pigment. *Pisaster* classified as “other” included all purple and brown individuals, and everything in between. Finally, we began counting and measuring small motile invertebrates in the photoplots at each site. Species targeted in these plots include *Tegula funebralis*, *Acanthina* spp., *Nucella emarginata*, *N. canaliculata*, *Ocenebra circumtexta*, *Lepidochitona harwegii*, *Nuttallina* spp., *Mopalia* spp., three species of *Pagurus*, *Littorina* spp., and various limpets.

Another new development to the methods used by MARINe groups involves the way in which data are entered. In the past, each group kept separate spreadsheets, and although these were quite similar in structure, it was difficult to combine datasets due to differences in the use of species codes, or the way in which the data were organized. In 2002-2003, the Southern California Coastal Water Research Project (SCCWRP), developed an Access database (Microsoft ™) for us, which contains all previous data, and is used for data entry by all MARINe groups. This has fully standardized our data entry methods, and makes it possible to easily extract data from the entire network of MARINe sites. In the near future, this database will also contain intertidal monitoring data from sites north of San Luis Obispo County, which are funded by PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans).

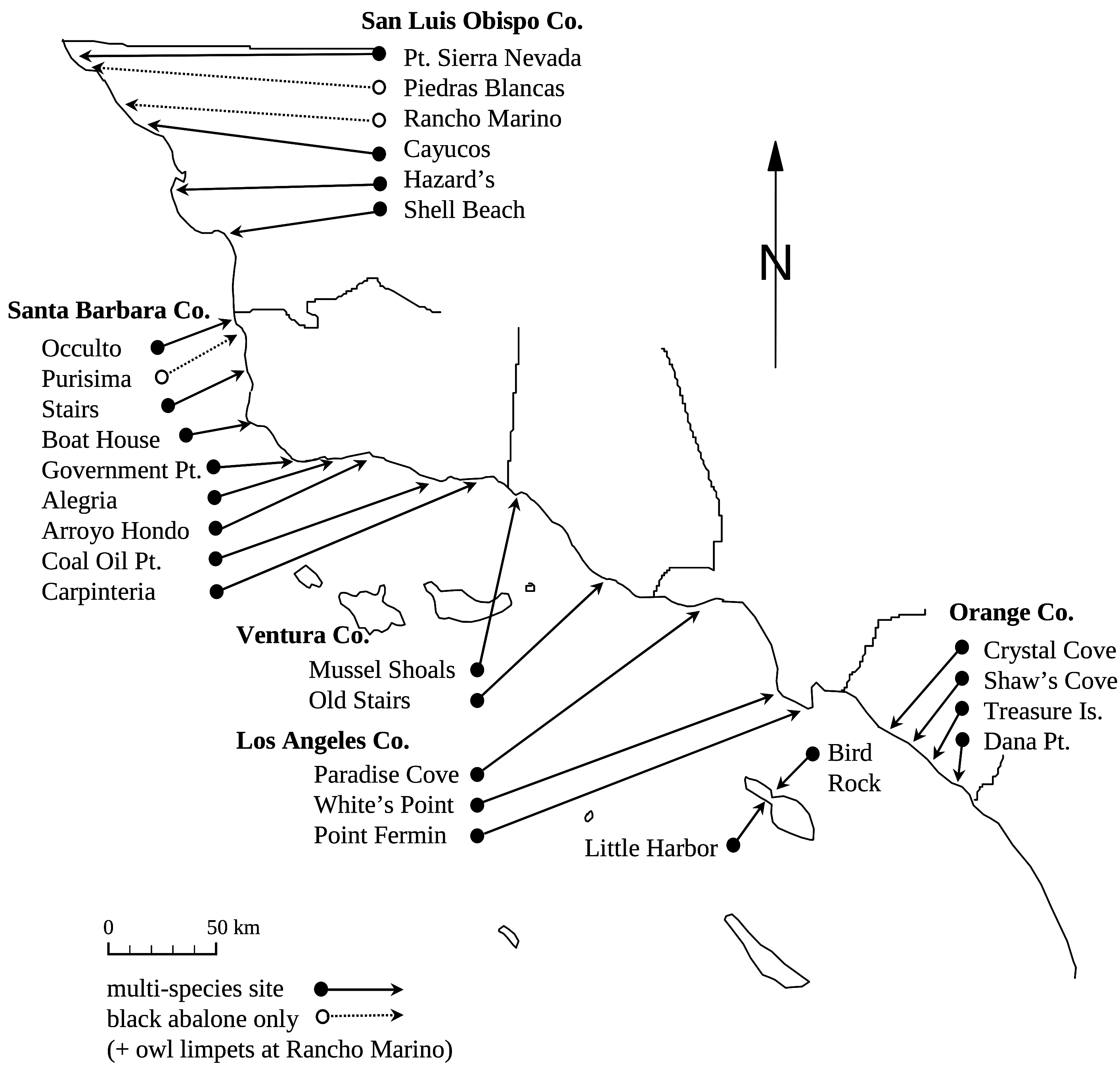


Figure 1. Location of rocky intertidal monitoring sites along the central and southern California Coast.

DESCRIPTION OF REGIONS

San Luis Obispo County

Rocky intertidal communities in San Luis Obispo County (SLO) are well known for their diverse and relatively pristine biota. The majority of the 150 kilometer-long coast is privately-owned and undeveloped. The natural beauty and coastal resources of SLO County make it a popular tourist destination, as evidenced by more than 10 state and county parks and beaches. Fifty-eight percent of the shore consists of rugged rocky reefs that are fully or partially exposed to prevailing oceanic swells. Situated at the southern end of the cold-temperate Oregonian province, SLO intertidal habitats contain a unique mix of species, with warm-temperate species more characteristic of the southern (Californian) biogeographic province absent or declining and cold-temperate forms increasing in abundance compared with counties to the south. For example, warm-water sea palms (*Eisenia arborea*), rockweed (*Hesperophycus harveyanus*), barnacles (*Tetraclita rubescens*, *Chthamalus fissus*), and horse mussels (*Brachidontes adamsianus*) are less common or absent, while cold-water sea palms (*Postelsia palmaeformis*), rockweed (*Fucus distichus*, *Pelvetiopsis limitata*), barnacles (*Balanus glandula*, *Chthamalus dalli*), and horse mussels (*Septifer bifurcata*) appear or increase in abundance in SLO County.

The rich rocky shore communities of SLO County are vulnerable to oil spills or impacts from other oil and gas operations, primarily from major coastal tanker traffic, but also from terminal operations at Estero Bay, onshore pipeline breaks, and future oil exploration leases. In recent years there have been spills affecting marine resources from onshore operations at Avila (in 1992) and Guadalupe (in 1994), but data on impacts remain confidential. Natural oil seeps also exist, resulting in the presence of tar on many rocky shores in the region (Kinnetics 1992). Prior to the MARINe study, population dynamics of rocky coast flora and fauna in SLO County were largely unstudied except for impact surveys associated with the Diablo Canyon Nuclear Power Plant located north of Avila Beach (North et al. 1989, Pacific Gas and Electric 1988, 1994, Schiel et al. 2004), and research on seasonal and successional variation in intertidal community structure conducted at two sites (Point Sierra Nevada and Diablo Canyon, Kinnetics 1992). The ongoing Diablo Canyon surveys, initiated in the 1970's, represent an excellent time series for this area. The seasonal and successional studies at Point Sierra Nevada and Diablo Canyon were conducted for the Minerals Management Service during 1985-1991; MMS biologists continued to monitor mussel recovery plots at Point Sierra Nevada until 1998.

Santa Barbara County

The Santa Barbara County (SBC) coastline is an important biogeographical transition area for rocky intertidal organisms because the west-facing shore north of Point Conception is subject to largely different oceanographic influences than the south-facing shore down coast of the Point. Although there is considerable overlap, there are distinct differences between the organisms north and south of Point Conception (Murray and Littler 1981, Ambrose 1992, Blanchette et al. 2002). For example, seaweed communities north of Point Conception are characterized by cold-water species such as laminarialean brown algae and large, fleshy red algae, and by greater biomass, whereas communities south of the Point are characterized by warm water fucalean brown algae and shorter, more densely branched red algae (Abbott and Hollenberg 1976, Murray and Bray 1993).

Concerns about impact of oil spills in SBC stem from transport by offshore tanker and onshore pipeline, production platforms, and terminal operations. Natural oil seeps are prominent features, especially at Point Conception, Coal Oil Point, and Carpinteria State Beach. Previous studies in SBC include work by Littler and colleagues at Coal Oil Point and Government Point (Littler 1979) and Kinnetics at Government Point and some sites north of Point Conception (Kinnetics 1985); other studies are summarized in Chambers (1993).

Los Angeles and Ventura Counties

Occurring within the southern California bight, the oceanographic conditions along the Los Angeles and Ventura County (LA/VEN) coast are influenced by the presence of Point Conception and the Channel Islands offshore. South of Point Conception, the California current proceeds offshore and the orientation of the northern Channel Islands serves to shelter the bight from the prevailing northwesterly winds and swells, especially those that develop during fierce pacific winter storms. This results in relatively benign oceanographic conditions most of the time, though periodic southern storms can have a devastating impact on south facing stretches of the coast. A large gyre that exists within the bight creates sea surface temperatures that are warmer, on average, than coastal sections to the north and (to a certain extent) to the south. Sea conditions are especially warm on Santa Catalina and San Clemente Islands, in the center of the gyre, which are frequently inhabited by subtropical species normally found far to the south.

In southern California, sandy habitats comprise a much greater proportion of the shoreline than they do in central and northern California. This is especially true in the Santa Monica Bay where rocky intertidal habitats are uncommon and patchy. Most of the monitoring sites are located on isolated rocky habitats that are flanked by wide stretches of beach, except for those sites on the Palos Verdes Penninsula, which has more continuous rocky intertidal habitat. In addition, several of the sites are subject to widely fluctuating sand levels and many of the plots experience frequent periods of burial and scour. This, along with abundant sunshine and the predominance of warmer coastal air temperatures create harsh conditions for species that are intolerant to desiccation. Thus, the rocky intertidal communities are largely devoid of larger foliose algae such as the fleshy reds that are so common to the north. These are replaced by abundant turf forming species such as *Corallina vancouveriensis*, *Gelidium coulteri*, *Endocladia muricata*, and numerous species of filamentous algae. Macroalgal diversity may be just as high, or higher than at the more northern sites, but algal biomass is substantially lower.

The LA/VEN coastline is heavily urbanized and subject to multiple anthropogenic influences. At monitoring sites that are closer to urban centers, the direct influence of people on the rocky intertidal community is substantial. White’s Point may be one of the most heavily impacted sites on the California coast because public use is high, and regulation and enforcement are low to non-existent. Point Fermin also has high public use, but is a marine reserve with increased public and legal enforcement over human actions. However, a large number of school groups visit this site and like White’s Point, the impacts of human trampling are likely very high. At other LA/VEN sites, public access and/or direct use of the rocky intertidal resources are lower. The Port of Long Beach is a major shipping hub, and numerous oil refineries and oil extraction platforms exist locally. The threat of an oil spill from a transiting tanker ship is substantial, though no major spills have occurred along the LA/VEN coast in many years.

Orange County

The Orange County (OC) coastline is dominated by sandy beaches, particularly in the north, and rocky shores account for only a small percentage of the shore habitat. Much of the OC coastline south of Newport Bay consists of a composite of rocky headlands and pocket beaches backed by eroded bluffs and is semi-protected from predominant wave patterns by offshore islands (Hickey 1993). It is along this stretch of coastline where our MARINe sites are located. Because of the proximity of rocky habitats to sandy beaches and the movement of sand with longshore currents, most OC rocky shores are characterized by periodic sand deposition and scour. Although the region encompasses thirteen Marine Protected Areas with varying degrees of protection, OC shores are readily accessible to the public and are heavily used for recreational purposes throughout the year. Evidence indicates that OC rocky shores are strongly influenced by human activities, including the unlawful collecting of shore organisms in Marine Life Refuges and Ecological Reserves (Murray 1998, Murray et al. 1999). All OC MARINe sites except Treasure Island have had Marine Life Refuge status since 1969-71; the Laguna Beach Marine Life Refuge was extended to include the Treasure Island site in January 1995.

Prior to the MARINe project and related ecological studies initiated by Murray and colleagues over the past several years, little scientific research had been performed on OC rocky intertidal populations and communities. Historical knowledge is best developed for seaweeds based on surveys performed in the late 1950's through the 1960's by Dawson (1959, 1965), Widdowson (1971), Nicholson and Cimberg (1971), and Thom and Widdowson (1978). Previous quantitative studies in OC include research by Littler and colleagues at Dana Point and Little Corona del Mar (Littler 1979).

The four OC sites are located in a region near production platforms and offshore tanker traffic servicing Los Angeles/Long Beach Harbors. Because of common southerly flowing nearshore currents, oil spills in coastal waters near LA/LB Harbors or from production platforms off Seal Beach near the Los Angeles and Orange County border will likely impact OC rocky intertidal populations and communities located at one or more of our MARINe sites.

Temporal Coverage of Report

Rocky intertidal monitoring sites were established in Santa Barbara County (SBC) in Spring 1992 (Ambrose et al. 1992). Sites in Los Angeles (LA) and Ventura (VEN) Counties were established in Fall 1994 (Engle et al. 1994b, 1995). San Luis Obispo County (SLO) sites were established in Fall 1995 and Orange County (OC) sites in Fall 1996 (Engle et al. 1998). This combination of surveys has resulted in twelve years of data for SBC sites, ten years for LA and VEN sites, nine for SLO sites, and eight for OC sites. Survey results from Spring 1992 through Spring 1995 were reported in Ambrose et al. (1995) and were updated through Spring 1998 in Raimondi et al (1999). This report updates the monitoring results from Fall 1998 through Fall 2003. Trends discussed in this report apply to the entire monitoring period unless otherwise noted. A summary of the species monitored and methods used at each site is given in Table 1.

Table 1. Summary of key species monitored at all sites, including survey methods and number of replicate plots.

SPECIES	PSN	PB	RM	CAY	HAZ	SB	OCC	PUR	ST	BH	GP	AL	AH	COP	CAR	MS	OS	PC	WP	PF	CC	SC	TI	DP	Total Sites
Silvetia	5 PP			5 PP	5 PP	5 PP			5 PP	5 PP	5 PP									5 PP	5 PP	5 PP	5 PP	5 PP	12
Hesperophycus	5 PP			5 PP																					2
Endocladia				5 PP	5 PP	5 PP	5 PP		5 PP	5 PP	5 PP						5 PP	5 PP	5 PP			5 PP			11
Mastocarpus	5 PP					5 PP																			2
Mazzaella	5 PP				5 PP																				2
Phyllospadix	3 PT			3 PT	3 PT	3 PT			3 PT		3 PT	3 PT	2 PT	3 PT	3 PT	3 PT		3 PT		3 PT	3 PT				14
Anthopleura										5 PP		5 PP		5 PP	5 PP	5 PP	5 PP								6
Barnacles	5 PP			5 PP	5 PP	5 PP	5 PP		5 PP	5 PP	5 PP	5 PP	5 PP		5 PP	5 PP	5 PP	5 PP	5 PP	5 PP	5 PP	5 PP	5 PP	5 PP	20
Pollicipes											5 PP	5 PP			5 PP										3
Mussels	5 PP			5 PP	5 PP	5 PP	5 PP		5 PP	5 PP	5 PP	5 PP	5 PP		5 PP	5 PP	5 PP	5 PP	5 PP		5 PP	5 PP	5 PP	5 PP	19
"Recovery"									7 PP																
Lottia			5 CP	5 CP	5 RP				5 CP	6 CP	5 CP	5 CP													7
Haliotis	5 IP	4 IP	3 IP	3 IP				3 IP	4 BT	3 IP	3 IP														8
Seastars	3 IP			3 IP	3 IP	3 IP	1 IP		3 IP	3 IP	3 IP		3 BT		3 BT										10
Total Species Per Site	9	1	2	9	8	7	4	1	9	8	9	6	4	2	6	4	4	4	3	3	4	4	3	3	

Key to survey techniques: **PP**=Photoplot **IP**=Irregular Plot **PT**=Point-intercept Transect **CP**=Circular Plot **RP**=Rectangular Plot **BT**=Band Transect

Key to site codes: **PSN**=Pt. Sierra Nevada **PB**=Piedras Blancas **RM**=Rancho Marino **CAY**=Cayucos **HAZ**=Hazards **SB**=Shell Beach **OCC**=Occulto **PUR**=Purisima **ST**=Stairs **BH**=Boat House **GP**=Government Pt. **AL**=Alegria **AH**=Arroyo Hondo **COP**=Coal Oil Pt. **CAR**=Carpinteria **MS**=Mussel Shoals **OS**=Old Stairs **PC**=Paradise Cove **WP**=White's Pt. **PF**=Pt. Fermin **CC**=Crystal Cove **SC**=Shaw's Cove **TI**=Treasure Island **DP**=Dana Pt.

RESULTS

Below are brief summaries of the major trends in target species abundances to accompany the figures that follow. Species that are shown in the figures were chosen because they were most abundant overall, however, additional species important to particular sites are also mentioned in the results. Values for means and standard errors are given in Appendix C.

Silvetia compressa ssp. compressa (Rockweed, formally called *Pelvetia compressa* and *P. fastigiata)*

The distribution of the rockweed *Silvetia compressa* is interesting because there is a large gap between Pt. Conception (near Government Pt.), and Los Angeles where the alga is either absent or too rare to target with photoplots (Figures 2a-c). The reasons for this gap in the distribution are unclear. Gradual declines in *Silvetia* cover were observed at all of the San Luis Obispo (SLO) sites over time, while cover at most other sites remained relatively stable and high (around 80%). One exception was Stairs, where the 1997/98 El Niño storms reduced cover of the alga and it has not yet recovered.

Many sites showed a seasonal pattern in *Silvetia* cover, with lower values in spring vs. fall samples. This lower cover in spring may be due to a combination of factors including seasonal growth cycles, physical removal by winter storms and desiccation from extreme low tides that occur in the middle of the day in the spring. In southern California, *Silvetia* grows rapidly in the summer resulting in peak cover in late summer/fall. It then reproduces November-February and receptacles are shed or deteriorate leaving lower cover in spring. This pattern may also hold for central California sites, although to our knowledge, no growth measurements have been done in this region. In the fall, *Silvetia* was often described in the field notes as “dense in cover and very healthy”, whereas spring observations indicate that the alga was “dried out, ragged, and sparse.”

Silvetia is an important species to monitor not only because it, like other rockweeds, may be particularly sensitive to oiling (see appendix B), but also because it is adversely affected by human trampling (Murray and Denis 1997). This may be a factor influencing *Silvetia* abundance at urban southern California sites, where the alga appears to have undergone a significant decline since the 1950s (Murray, unpublished data).

Hesperophycus californicus (Rockweed)

Decline of the upper-shore rockweed, *Hesperophycus harveyanus*, was striking at the two SLO sites where it is monitored (Figure 3). Although cover of *Endocladia muricata* and barnacles increased slightly over time, *Hesperophycus* plots consisted mostly of open space (bare rock) after the rockweed declined. Although some reduction in *Hesperophycus* abundance occurred site-wide at both SLO sites, declines were more severe within permanent plots. Thus the plots did not necessarily reflect the sites overall.

Endocladia muricata (Turfweed)

The turfweed, *Endocladia muricata*, has a similar distribution to *Silvetia compressa*, with a large gap between areas where it is abundant from Pt. Conception and Pt. Mugu (near Old Stairs, Figures 4a-c). *Endocladia* cover varied seasonally at many sites where it is monitored, with up to 40% greater cover in spring than in fall. At some sites where *Endocladia* cover declined, a subsequent increase in barnacle cover occurred (e.g. Hazards, Shell Beach, Old Stairs, and Shaw's Cove). *Endocladia* facilitates recruitment of *Silvetia*, and three photoplots have been nearly taken over by this rockweed at Boat House, with *Endocladia* showing a strong reduction in a fourth plot. This decline in cover of *Endocladia* in permanent plots at Boat House does not reflect the abundance at the site overall, where the turf weed is still qualitatively described as "common to abundant". At Occulto, *Mytilus* has steadily recruited into the *Endocladia* plots and is now a dominant part of what used to be a turf weed dominated community. Presence of *Mytilus* does not necessarily exclude *Endocladia*, as the alga can grow on top of mussels. Indeed, *Endocladia* abundance at the site overall is described as "common to abundant".

Mastocarpus papillatus

The red alga, *Mastocarpus papillatus*, is sampled at just two SLO sites, and is generally mixed with *Endocladia*, rather than occurring in pure stands (Figure 5). These two species appeared to have an inverse relationship in cover at both Pt. Sierra Nevada and Shell Beach. *Mastocarpus* experienced a general decline in cover in permanent plots over time at both sites, although in site-wide field notes the alga was qualitatively described at "common" at both sites.

Mazzaella spp. (formally called *Iridaea* spp.)

Mean cover of *Mazzaella* remained relatively constant over time at both SLO sites where it is sampled, although periodic fluctuations occured (Figure 6). Declines in *Mazzaella* cover often were associated with increases in cover of articulated corallines, suggesting that coralline algae persisted as a stable understory below *Mazzaella*, and reduced canopy cover of *Mazzaella* simply exposed more corallines. The dominant species in the "other red algae" category quantified along with *Mazzaella spp.* included *Chondracanthus canaliculatus* (formerly *Gigartina canaliculata*), and *Callithamnion pikeanum.* These and the other red algae included in this category appeared to show a slight seasonal trend, with higher cover in fall than in spring.

Anthopleura elegantissima/sola (Green Anemone, formally lumped as *Anthopleura elegantissima*)

Anthopleura spp. plots were quite variable in anemone cover, although cover at individual sites was fairly constant over time (Figures 7a-b). The primary reason for the variation in anemone cover was that plots at some sites (Boat House, Coal Oil Pt., and Carpinteria) contained the medium-sized solitary *Anthopleura sola*, while remaining sites (Alegria, Mussel Shoals, and Old Stairs) contained the small, densely aggregated, clonal

Anthopleura elegantissima. Red algae, mainly consisting of small filamentous turf-forming species that trap sand to form a dense "sand-turf" mixture, were abundant in anemone plots at Boat House, Coal Oil Pt., and Carpinteria. At Coal Oil Pt. and Carpinteria, red algal cover varied inversely with sand cover. Anemone plots at these sites are located on large, flat reefs where sand levels are constantly changing and red algae were likely buried and unburied by sand.

Chthamalus fissus/dalli **and** ***Balanus glandula*** (White Barnacles)

Barnacle cover varied substantially over time and among sites, which is not surprising since the monitored species of barnacles are relatively short-lived (Figures 8a-e). At three of the eight sites where individual barnacle species were distinguished (Hazards, Occulto, and Government Pt.), a mixture of *Chthamalus* and *Balanus* was present. The remaining five sites (Pt. Sierra Nevada, Cayucos, Shell Beach, Stairs, and Boat House) contained nearly pure stands of *Chthamalus*.

At many sites, barnacle cover experienced periodic declines followed by recovery resulting from recruitment events. Some exceptions to this include five sites where barnacle abundance continued to decline after possible ENSO-induced declines (Pt. Sierra Nevada, Cayucos, and Stairs), or values stabilized at levels lower than pre-El Niño values (Hazards and Government Pt.). At Stairs, barnacles have nearly disappeared within the plots, and are uncommon at the sites overall, presumably due to mortality of adults and a near-complete lack of recruitment to the area. At Boat House the turfweed, *Endocladia,* was abundant in the barnacle plots for several years, but eventually the barnacles recovered and once again became the dominant space-occupiers. Barnacles within plots at Occulto have declined with little outlook for recovery, due to encroachment by mussels and several algal species, including *Endocladia, Silvetia* and *Cladophora*, in what once were barnacle-dominated plots. Barnacles recruiting into this site tended to settle above the barnacle plots, in an area that is at a higher tidal elevation than barnacles were commonly found when monitoring began at Occulto thirteen years ago. Thus, although barnacles in the plots have declined substantially, they are still common at the site overall. Barnacle cover at Arroyo Hondo declined substantially during the 1997/98 ENSO period, presumably due to impact from large swells and scouring, and then fell to near-zero in Fall 1998. Ephemeral algae were common in the plots in the seasons following this decline, but barnacles eventually recruited back in pulses, with all plots recovering by Fall 2000.

One interesting note is that we have found "bent" *Chthamalus* at several sites, a condition previously only seen in the Gulf of California species *Chthamalus anisopoma.* We have been collecting bent individuals in order to identify them to species (requires examination of their calcareous plates) and thus far have found all collected individuals to be the southern species *C. fissus.*

Pollicipes polymerus (Goose Barnacle)

Goose barnacles were sampled at Government Pt., Alegria, and Carpinteria (Figure 9). Cover was fairly constant over time at Government Pt. and Alegria. At Carpinteria however, *Pollicipes* showed a seasonal trend with lower cover in spring than in fall; *Pollicipes* cover also showed a decreasing trend over time at this site. At all sites, there was a slight increase in mussel cover within the *Pollicipes* plots over time. This trend was most pronounced at Carpinteria.

Mytilus californianus (California Mussel)

Mussels were sampled through Fall 2003 at every site except Coal Oil Pt. (Figures 10a-e). Mussel plots recently have been established at Coal Oil Pt. but had only been sampled once (Fall 2003) at the time of this report, and thus were not included. Mussel cover was relatively stable over time at seven of the nineteen sites (Pt. Sierra Nevada, Hazards, Occulto, Government Pt., Mussel Shoals, Paradise Cove, and White's Pt.). Four sites showed a decreasing trend in mussel cover over time. Mussels declined severely at Shell Beach, Stairs, and Pt. Fermin, and to a lesser degree at Alegria. The decline in mussel abundance was less severe, but still present at the site-wide scale at all sites except Alegria. At both Shell Beach and Alegria mussels appear to be recovering, while at Stairs cover has steadily declined since the initial sharp decline that occurred during the 1997/98 El Niño storms. Mussels at Pt. Fermin also have declined substantially since being initially sampled in Fall 1999. Mussels at this site are relatively small, patchy in distribution, and tend to be restricted to fissure lines along horizontal rock surfaces. The owl limpet, *Lottia gigantea*, increased in abundance over time in the open spaces between mussel patches in the plots, and may have contributed to the continued decline of mussel cover by "bulldozing" newly recruited mussels off the rock.

A decline in mussel cover was followed by recovery at nine sites. At seven sites, (Cayucos, Boat House, Arroyo Hondo, Crystal Cove, Shaw's Cove, Treasure Island, and Dana Point), recovery was at or near initial levels by Fall 2003. Recovery was not complete at Old Stairs, and cover fluctuated substantially over time at Carpinteria. While the dynamics in mussel cover did not appear to be correlated among neighboring sites in most regions, mussels in plots at Orange County sites showed similar patterns of fluctuation (Figure 10e). Mussel cover declined at all four sites in Spring 1998, probably as a result of El Niño storms and perhaps stress due to warmer water temperatures. Mussels at these sites experienced varying degrees of recovery over the next five-year period, and then all sites exhibited a pulse of increased cover, likely due to a recruitment event, and possibly increased growth rates of established mussels, in Fall 2003.

At sites where *Pollicipes* cover generally exceeded 20% (Cayucos, Hazards, Shell Beach, Stairs, Boat House, Arroyo Hondo, Old Stairs, Pt. Fermin, Shaw's Cove, Treasure Island, Dana Pt.) decreases in mussel cover were associated with increases in *Pollicipes* cover. These two species have similar habitat requirements, and likely compete for space in some areas.

Recovery Plots

Recovery plots were established at Stairs in Spring 1998 after powerful El Niño storms removed upper layers of the sedimentary reef in some areas, exposing the underlying clean, bare rock. To monitor natural recovery of these bare areas, we established seven 50 x 75 cm photoplots in which we could monitor recruitment and persistence of species.

Data from these plots were graphed differently than other plot types in order to show the diversity of species that have settled into these previously bare areas over the six-year period that they have been monitored (Figure 11). The first species to settle in the recovery plots were *Ulva/Enteromorpha* in Spring 1998. *Ulva* and *Enteromorpha* are short-lived "weedy" species, which are good colonizers of freshly disturbed substrata. Bare (unoccupied) rock declined in cover over time, but was still abundant in Fall 2003, and thus *Ulva/Enteromorpha* continued to move into and out of recovery plots throughout the six-year period. Non-coralline crusts settled into the plots in Fall 1998, along with *Cladophora* spp. Non-coralline crusts consist mostly of *Ralfsia* spp., with some *Petrospongium rugosum* and a small amount of the crustose form of *Mastocarpus* (formerly called "Petrocelis"). While the amount of non-coralline crusts increased slightly over time, *Cladophora* spp. became quite rare. *Endocladia* and other red algae, which included species such as *Cryptosiphonia woodii*, *Cumagloia andersonii*, *Ceramium* spp., and *Polysiphonia* spp., were present in small amounts beginning in Fall 2000. Barnacles recruited into the plots in Fall 1999 and grew larger during successive years, resulting in an increase in percent cover. No species has yet dominated these plots, and a large amount of bare rock is still present, so it is likely that full their return to a stable state will take several more years.

Phyllospadix scouleri/torreyi (Surfgrass)

Phyllospadix showed a strong seasonal pattern, with higher cover in the fall than in the spring for all sites except Cayucos (Figures 12a-d). This seasonal pattern was likely due in part to the effects of winter storms, which abrade and shorten surfgrass blades, and thus reduce cover. In the southern sites, where sand is present in higher abundance as compared to northern sites, lower surfgrass cover in the spring was often associated with higher sand cover. Thus, the seasonal pattern in surfgrass cover may also be a result of sand movement, leading to partial burial of surfgrass. The lack of a seasonal pattern in surfgrass cover at Cayucos is likely due to the unique location of the surfgrass transects at this site. Unlike other sites, where surfgrass transects were established in areas that drain during low tide, transects at Cayucos are located in large pools, which reduces the amount of stress experienced by the plants due to air exposure, and perhaps also abrasion.

Although many sites experienced extreme seasonal fluctuations in surfgrass cover, only two sites, Stairs and Carpinteria, showed substantial lasting reductions. Transects at Stairs were decimated by the 1997/98 El Niño storms, which ripped out whole sections of reef, as well as a large numbers of surfgrass plants. The decline at Carpinteria was associated with a sharp increase in *Egregia* cover. Surfgrass cover has been slowly recovering at both sites, and in Fall 2003 was at about 50% of 1992 cover values.

Pisaster ochraceus & Asterina miniata (Seastars)

Species of seastars counted in plots included *Pisaster ochraceus, Asterina miniata, Pisaster giganteus,* and *Pycnopodia helianthoides*. *Pisaster ochraceus* was the only species found at every site where seastars were sampled. At Boat House, *Asterina miniata* was also consistently present. *Pisaster ochraceus* numbers have fluctuated at most sites over time, but the color ratio of "other" (colors other than orange) to orange has remained fairly consistent at 3:1 for most sites (Figures 13a-e). There appears to have been slight increases in *P. ochraceus* populations at Pt. Sierra Nevada and Cayucos (Figure 13a), and also at Old Stairs (Figure 13d). Numbers of *Asterina* in the plots at Boat House have declined slightly over time (Figure 13b).

The fluctuations in seastar numbers over time likely reflect movement into and out of our permanent plots in response to factors such as water temperature, tidal height and food availability, and may not indicate true increases or decreases in site populations. Although we do not have much data for *P. ochraceus* populations at Orange County sites prior to the 1997/98 ENSO event, seastar numbers were low during this period and then spiked when water temperatures cooled in 1999. It is thought that *P. ochraceus* may move into deeper, subtidal areas during periods of elevated water temperatures, which would be reflected in lower counts for our intertidal plots. At Occulto, seastar counts may be influenced by sampling conditions because much of the plot consists of steep reef edges that can be difficult to sample when the swell is large. At Arroyo Hondo and Old Stairs, seastars were sampled within narrow 2m x 5m swaths, which did not appear to accurately represent the site-wide abundance dynamics. Larger, irregular plots were set up at these sites in Spring 2004 in an attempt to address this issue. Despite potentially being too small, the original "swath" plots did capture major fluctuations in *P. ochraceus* numbers at the sites overall. Qualitative observations note population expansions of *P. ochraceus* in 2001, which are reflected in the trend lines for plots at these sites.

At most sites, orange *P. ochraceus* are slightly larger on average than individuals of other colors (Figures 14a-b). Indeed, we found very few small orange individuals, and we hypothesize that some purple or brown individuals may change to orange as they grow larger. Figures 15a-c display size structure for the two color groups. From these figures it is evident that at most sites, the highest proportion of small individuals fall in the "other" category. Exceptions are at Shell Beach, Carpinteria, Mussel Shoals, and Old Stairs. Seastar numbers are low at all of these sites, and thus color ratio and size structure patterns would be expected to be more variable than at sites with large numbers of seastars because just a few individuals can skew the pattern. Sites with consistently high proportions of juvenile *P. ochraceus*. included Hazards, Stairs, and Boat House (Figures 15a-b).

Lottia gigantea (Owl Limpet)

Numbers of the owl limpet, *Lottia gigantea*, were relatively stable at most sites over time (Figures 16a-c). Three exceptions were Cayucos, where *L. gigantea* numbers declined slightly over time, and Government Pt. and Alegria, where numbers increased over time. At Crystal Cove, numbers of *L. gigantea* declined between Fall 1999 and Fall 2000 so a sixth plot was added in Spring 2001, resulting in an increase in numbers at this site. At Cayucos *L. gigantea* gradually declined from Spring 1996-Spring 1998. A recruitment event in Fall 1998, indicated by a decrease in the mean shell length (Figure 17a) and a positively skewed population distribution (Figure 18a) resulted in an increase in limpet numbers at Cayucos; however, *L. gigantea* numbers in the plots have slowly declined since Fall 1998. Some of this decline may be a result of habitat loss within the plots due to encroachment by surrounding mussels. At Government Pt., an increase in mussel cover within the *L. gigantea* plots appears to have had a different effect, with increased numbers of small owl limpets occurring on and amongst the mussels. This trend is reflected by an increase in the mean number of *L. gigantea* (Figure 16b), and a positively skewed population distribution over the past 5 ½ years. Numbers of *L. gigantea* at Alegria also have increased over time, but at this site the increase appears to be due to a combination of recruitment and an influx of moderate-sized individuals from areas outside the plots because population size structure plots are not positively skewed. At Old Stairs and Paradise Cove there was a large recruitment event in Spring 2000 that resulted in substantially higher numbers of *L. gigantea* than previously recorded. Gradual declines in recent years at these sites and also at Mussel Shoals can be attributed to habitat loss due to encroachment by mussels and *Pollicipes*. The reverse trend occurred at Shaw's Cove between Fall 1996-Spring 1998, where a decline in mussel cover within *L. gigantea* plots opened up more bare rock habitat for the limpets. A decrease in the average *L. gigantea* size was also noted during this period, suggesting that smaller limpets either recruited to the plots or migrated in from surrounding mussel shells. Then, in Fall 1998 mussel cover began to increase, and *L. gigantea* numbers gradually declined.

Large *L. gigantea* were consistently common at Stairs, Boat House, and Alegria (Figure 18a-b). All of these sites have restricted human access, a condition that correlates with the presence of large *L. gigantea* likely because the limpets are harvested for food (Sagarin et al. in prep). However, these are not the only sites that are protected from the public, so other factors must influence *L. gigantea* size structure. Rancho Marino, for example, has extremely limited public access, but owl limpets are generally quite small (Figure 18a). In addition, sites that have high levels of human use (e.g. Crystal Cove and Shaw's Cove) have very different population size structures (Figure 18c). Thus, it seems likely that a combination of factors, including human use, recruitment levels, and habitat structure are important parameters for determining population size structure in *L. gigantea*.

Haliotis cracherodii (Black Abalone)

At the sites presented in this report, black abalone typically occurred within rocky crevices. These crevices are more susceptible to wave damage than the surrounding flat reef areas and thus the number or location of plots in which black abalone were counted changed at several sites due to destruction of plots during large wave events. At Piedras Blancas, most of plot 1 broke away in Spring 2000, and a fourth plot was added as a replacement. We continued to count abalone in the undamaged sections of plot 1, but the newly added plot enabled us to get a more accurate representation of the abalone population at Piedras Blancas. Similarly, a fourth plot was added at Stairs in Spring 1998, after El Niño storms completely destroyed plot 1 and most of plot 3. At Pt. Sierra Nevada, we noted substantial black abalone numbers in two of our seastar plots, and began counting these as two additional abalone plots in Spring 1997. The addition of these plots at Pt. Sierra Nevada explains the jump in the number of abalone counted in Spring 1997 (Figure 19a).

The fatal condition termed “withering syndrome” has caused drastic declines in black abalone populations as far north as Cayucos (Figures 19a-b). Evidence of withering syndrome was seen at Rancho Marino, Piedras Blancas, and Pt. Sierra Nevada although numbers have not yet declined substantially. The northward movement of withering syndrome has prompted PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans) researchers at UC Santa Cruz to set up additional black abalone sites (in collaboration with the Monterey Bay Sanctuary) north of Pt. Sierra Nevada in Monterey, Santa Cruz, and San Mateo Counties.

Recovery of black abalone populations to pre-withering syndrome levels is unlikely in the near term because recruitment is thought to be localized and the remaining individuals at these sites are probably too sparsely distributed to allow for successful spawning. This idea is substantiated by the lack of juvenile black abalone at all sites that have experienced WS-induced declines (Figures 19a-b, Figures 21a-b). Black abalone recruitment and survival may be further limited by habitat changes that occur after the animals disappear from an area, which we have observed in a separate study (see discussion for details).

Motile Invertebrates

A new addition to our monitoring program allowed us to capture abundance and size estimates for some of the common small motile invertebrates at our sites. Motile invertebrates were counted, and a subset of species measured, within select photoplot types. Abundances for the two or three most abundant motile species present in mussel, barnacle, *Endocladia*, and *Silvetia* plots are shown in Figures 22-25. Counts also were done in *Hesperophycus*, *Mastocarpus*, and *Balanus* plots, but only data for the four most common plot types are presented in this report. Motile invertebrate counts are currently done at all sites included in this report, but counts did not begin at Orange County sites until Fall 2003 and thus are not presented.

Nearly all *Silvetia* plots contained high numbers of *Tegula funebralis* and limpets (Figure 22). *Lepidochitona hartwegii* was consistently present in low levels at four sites, and was abundant at Pt. Fermin (Figure 22). This chiton is frequently associated with *Silvetia*, which it uses for protection from desiccation.

Limpets and littorines were common in *Endocladia* plots at most sites (Figure 23), although littorines were most abundant in barnacle plots (see below). Interestingly, peaks in limpet or littorine abundance did not appear to be correlated with changes in percent cover of sessile species (Figures 4a-c), although we may not have a long enough time series for motile species to determine such temporal trends. *Tegula funebralis* was common at three sites, Hazards, Shell Beach, and Boat House.

Limpets and littorines were the only motile organisms consistently abundant in barnacle plots (Figure 24). Littorines were typically present in very high numbers, often upwards of 1000 individuals per plot, while limpets tended to be an order of magnitude less common. Only one site, Stairs, had fewer littorines than limpets in the barnacle plots.

Tegula funebralis was the most common motile species in mussel plots at seven of the seventeen sites (Pt. Sierra Nevada, Hazards, Shell Beach, Stairs, Alegria, Arroyo Hondo, and Paradise Cove, Figure 25). The mean number of *T. funebralis* per plot varied greatly from site to site, with highest turban snail densities occurring at Shell Beach and Alegria, and zero or near zero values at Cayucos, Occulto, Old Stairs, White's Pt., and Pt. Fermin. *Nucella* spp. (mostly *N. emarginata/ostrina*) also was common in mussel plots, with highest mean abundance at Mussel Shoals and Old Stairs (Figure 25). *Nucella* spp. is a predator on *Mytilus* spp., and lives amongst the often tightly packed mussels, so counts for these whelks may be underestimates of the true population sizes. The third species commonly found in mussel plots was *Nuttallina* spp. These chitons were present at most sites, but were abundant only at Pt. Fermin (Figure 25).

Large *Nucella* ($\geq$25mm) were consistently common in mussel plots at Pt. Sierra Nevada, Occulto, Government Pt., Alegria, and Arroyo Hondo (Figures 26a-b). The highest proportions of small size classes (<10mm) were present at Pt. Sierra Nevada and Alegria.

Tegula sizes are presented for both mussel and *Silvetia* plots (Figures 27a-c). In general, size distributions were similar between the two plot types at sites where both were monitored, although small individuals (<10mm) tended to be more abundant in mussel plots than in *Silvetia* plots. This trend was especially apparent at Pt. Sierra Nevada, where mussel plots are located directly below *Silvetia* plots on the reef. A high proportion of small *Tegula* were present in mussel plots at Pt. Sierra Nevada, Shell Beach, Alegria, Arroyo Hondo, Coal Oil Pt., Carpinteria, Mussel Shoals, and Paradise Cove. Only four sites had high proportions of small individuals in *Silvetia* plots: Hazards, Shell Beach, Stairs, and Boat House. High proportions of large *Tegula* (>20mm) were present in mussel plots at Stairs, Alegria, Arroyo Hondo, and Mussel Shoals. *Silvetia* plots contained high proportions of large snails at Stairs, Government Pt., and Pt. Fermin.

DISCUSSION

The MARINe consortium, encompassing sites in San Diego, Northern California, Oregon, and the Channel Islands, as well as those presented in this report, is the longest-running, large scale rocky intertidal monitoring program on the west coast of North America. The data resulting from this collaborative monitoring program allow us to determine temporal and spatial community dynamics over both short and long temporal scales. This information is essential for assessing impact due to natural (e.g. ENSO event) or human induced (e.g. oil spill) disturbance (see Raimondi et al. 1999 for examples of both) as well as understanding biological community response to important physical phenomena, such as inter-decadal changes in sea surface temperature (McGowan et al. 1998).

Assessing Long-term Impacts of the 1997/98 ENSO Event

The 1997/98 ENSO event was one of the most powerful on record. The combination of warmer water temperatures and powerful storms associated with this oceanographic phenomenon resulted in significant declines in many species targeted by the MARINe monitoring program. These effects were presented in detail in our previous report (Raimondi et al. 1999) for the eleven northernmost MARINe sites (for which we had sufficient data prior to the ENSO event), but we revisit them here to examine whether the ENSO event may have had a lasting impact on the abundance of some target species. In the 1999 report we determined that five of the six most ubiquitous target species (barnacles, mussels, *Endocladia*, *Silvetia*, and *Phyllospadix*) appeared to be negatively impacted by the ENSO event. While declines in *Endocladia* did not persist for the long term, the ENSO event may have had a lasting impact on the four other species or species complexes in some areas.

Perhaps the most widespread lasting effects were to barnacle and mussel communities. At five sites, barnacle declines that began in 1997/98 either continued through Fall 2003 (Pt. Sierra Nevada, Cayucos, and Stairs), or values stabilized at levels lower than pre-El Niño values (Hazards and Government Pt.), suggesting a long-term effect of the ENSO event on barnacle populations in these areas. For mussel communities, lasting negative impacts from the ENSO event may have occurred at Shell Beach and Stairs. In addition, although Orange County sites were not included in the original analysis of ENSO effects (Raimondi et al. 1999), mussel communities at three of the sites in this region experienced depressions in abundance following the ENSO event that persisted for several years.

Another species that suffered extensive and lasting impacts from the ENSO event is the black abalone, *Haliotis cracherodii*. Declines in the population sizes of this species due to withering syndrome (see below) appear to be accelerated by the warm water associated with ENSO conditions. During warm water periods the disease moves up the coast more rapidly, and the rate of population decline increases once die-offs begin at a site (Raimondi et al. 2002).

Species for which long-term effects of the ENSO event are not so clear include *Phyllospadix* and *Silvetia*. At many sites, abundances of both of these species were in decline prior to the 1997/98 ENSO event, although declines may have intensified during this period (e.g. surfgrass at Carpinteria, Mussel Shoals, and Paradise Cove). One exception is Stairs, where abundances of both species were severely depressed, and had not recovered by Fall 2003.

In addition to documenting impacts to target species in established plots, the El Niño induced storm damage at Stairs created natural clearings on the reef by removing large sections of rock, and provided us with a unique opportunity to document community succession in the mid-intertidal. Nearly all succession studies are done in artificially cleared patches, which are small relative to the reef size and often recover via encroachment by surrounding species. Newly exposed sections of reef at Stairs were large (several square meters in size), and were likely to “recover” via colonization by propagules. Thus, the areas had the potential to develop into communities quite different from surrounding, undisturbed areas. We have been monitoring photoplots in these cleared areas for six years, and they continue to be dominated by bare rock and weedy, opportunistic species; thus, it will likely be several more years before the plots reach a more stable equilibrium state, where longer-lived mid-zone species such as *Silvetia* and mussels, dominate plot cover.

The MARINe monitoring project now encompasses enough data, temporally and spatially, that we can begin to understand how major phenomena, such as the 1997/98 ENSO event, impact rocky intertidal communities in both the short and long term. It is clear that the lasting effects of a disturbance event can be site specific and depend on the severity of the initial disturbance as well as local physical conditions that influence recruitment, growth and survivorship of organisms.

Documenting Disease and Invasion

While arguably one of the greatest benefits of long term monitoring is documenting community response to known natural or human induced phenomena, such as the 1997/98 ENSO event, additional value comes from having researchers consistently present in the field so that we may opportunistically capture events that would otherwise be missed. The most important example of this for the MARINe intertidal monitoring is the ongoing decline of black abalone populations due to the disease called withering syndrome. Withering syndrome (WS) is caused by the bacterium *Candidatus Xenohaliotis californiensis*, which attacks the lining of the digestive track and results in reduced body mass, weakness, and eventual withering of the abalone's foot until it can no longer cling to the substratum (Friedman et al. 2000). It was first discovered on the Channel Islands, but was not expected to progress north along the mainland due to prevailing southward currents and cooler temperatures north of Pt. Conception (Lafferty and Kuris 1993, Richards and Davis 1993). In 1993, one year after the first long-term monitoring sites were established on the mainland, we documented a severe decline of black abalone at Government Pt., near Pt. Conception, and have seen subsequent declines in populations as far north as Piedras Blancas (Altstatt et al 1996, Raimondi et al. 2002). Currently, we are the only group tracking the northward progression of this devastating disease on a large scale. Recovery is hindered by a near lack of recruitment into areas affected by WS, and perhaps also by habitat changes occurring to the crevice communities where black abalone were once abundant (Miner et al. in prep.) Declines have been so severe across all regions in southern California that the species is now a candidate for protection under the USA Endangered Species Act.

An additional benefit of long-term monitoring work is that researchers become familiar with the composition and abundance of species at a site, and are thus more likely to notice if a new species invades, or if particular species increase or decrease in abundance. General site notes are an integral part of our monitoring work, and researchers working at sites from San Diego to northern Oregon have an identical list of species for which relative abundance (including absence) and condition (e.g. reproductive, bleached) is recorded. This standard species list allows us to consistently make general observations about species that are not targeted in our plots. One species included on this list is the turf alga, *Caulacanthus ustulatus. Caulacanthus ustulatus* is believed to be a non-native invasive alga that was first documented in southern California in 1999 (Murray personal observation). The alga also occurs in Washington and British Columbia where it was first recorded in the 1960's and 1980's respectively. In these northern regions there is some debate over whether it is truly non-native or simply a cryptic native that was previously overlooked (Gabrielson pers. com.). Genetic analysis aligns southern California specimens with an Asian population introduced to France but the particular markers utilized cannot definitively determine whether the southern California material also represents an introduction. Alternatively, the presence of *C. ustulatus* in southern California might represent a recent and substantial range extension along the coast, because thorough floristic studies by Hollenberg and Dawson in the 1950's and 1960's and extensive floristic work by Littler and colleagues in the 1970's did not record the presence of *C. ustulatus.*

The CSUF group has documented a significant increase in *C. ustulatus* cover at several southern California sites south of Santa Monica Bay over the last few years, including abundant growths at Dana Pt., Shaw's Cove and Crystal Cove (Whiteside and Murray, unpublished data). This species now grows extensively in upper-mid shore habitat occupied previously by other red algal species such as *Gelidium* spp. and *Endocladia muricata*, where it now exceeds the cover of these other taxa at these study sites. *Caulacanthus ustulatus* also grows on mussel shells and *Silvetia* holdfasts and fronds suggesting a potential interaction with these key species. Observations such as this are important in light of recent evidence suggesting that species ranges may be shifting due to global warming (Barry et al. 1995, Sagarin et al. 1999) and also that introductions of non-native species into the marine environment are rapidly increasing (Carlton 1993).

Additional Work Resulting from Monitoring Observations

Observations resulting from the MARINe long-term monitoring surveys serve an important function as the basis for more in-depth surveys, or experimental research, in which the processes that cause community change are more closely examined. One study, done by Mark Readdie, a PhD student at UCSC, was inspired by the observation at several sites that over time, barnacle plots became inundated with *Endocladia*, and plots that initially contained high cover of *Endocladia* became partially or wholly covered by *Silvetia*. Further investigation showed that the barnacle zone at these sites had shifted upward, into areas that were previously bare rock. It has long been assumed that the upper limits of species' zones are set by physical factors such as temperature and emersion time, and are thus stable, while the lower limits are set by biological interactions (e.g. competition and predation). However, the upward shifts of species zones documented in this study suggest that facilitation, a biological factor, is important for establishing species' upper limits. In this case, barnacles are facilitating the upward movement of *Endocladia*, and *Endocladia* is providing suitable habitat for *Silvetia*, above the zone where it previously occurred.

Another study resulting from observations by MARINe researchers focused on changes that occurred in crevice communities after black abalone disappeared. Researchers working at sites on the Channel Islands and on the mainland noticed that after black abalone populations had been severely depressed by withering syndrome, the biological communities in the crevices in which they had lived began to change, with increasing cover of encrusting invertebrates. A detailed study comparing abalone crevice communities pre- and post-withering syndrome indicated that these areas were indeed changing from being dominated by bare rock and crustose algae, to having increased cover of encrusting invertebrates (Miner et al. in prep.) This change from "good" abalone habitat, to habitat less favorable for abalone recruitment and survival may hinder black abalone recovery.

New Additions to Protocol

Several new additions have been made to our sampling procedures since the last report (see Methods). Two of these, field scoring of barnacle plots, and counts of motile invertebrates in photoplots, were added in the hope that they would increase our understanding of observed patterns of community change in the photoplots. Field scoring of barnacles allows us to distinguish between *Chthamalus* spp. and *Balanus glandula*, which have very different life spans and recruitment dynamics. In addition, we can separate live barnacles from dead, and can potentially link cover of empty barnacle tests to the presence of other species that use these structures for protection from desiccation or predation (e.g. *Endocladia*, *Silvetia*, littorines). Counts of motile invertebrates may help to explain the presence or absence of certain sessile species in the photoplots, although these relationships have yet to be rigorously examined.

Another new addition to our sampling protocol is recording size and color information for *Pisaster ochraceus*, rather than just counts of seastar numbers. Measuring *P. ochraceus* gives us an indication of population size structure at our sites and enables us to determine which sites receive the highest levels of recruitment, and contain the largest individuals. *P. ochraceus* color data has proved to be interesting and we have identified a consistent ratio of approximately 3 purple/brown stars for every orange star in larger size classes at most sites. This ratio changes in smaller size classes, where orange *P. ochraceus* appear to be less common.

Conclusions

Long term monitoring of MARINe sites allows for assessment of change within intertidal communities on many levels. We have documented naturally occurring seasonal variation, as well as longer-term fluctuations in the abundance of species. This record of species dynamics within sites has enabled us to assess damage and document recovery following human induced impacts (e.g. oil spill), and natural disturbances (e.g. El Niño storms). One of the most interesting findings of this study is that within-site species dynamics can be very different among neighboring sites, but overall community structure within regional areas tends to be quite similar. In other words, neighboring sites tend to be more similar to one another than more distant sites, even though individual species dynamics may be quite different. In the future, we plan to investigate the large-scale processes that likely drive regional grouping patterns and link them to observed intertidal community dynamics.

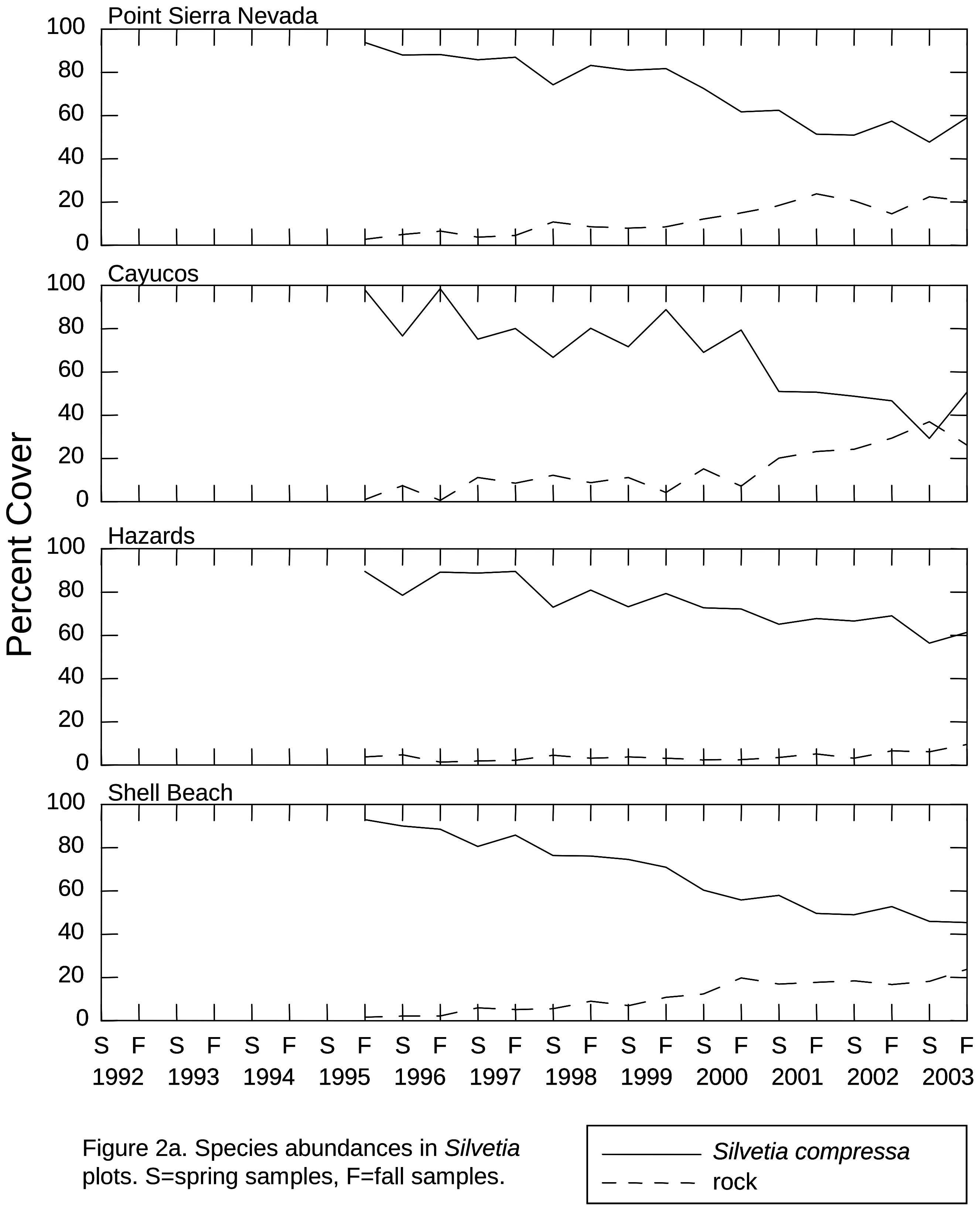


Figure 2a. Species abundances in *Silvetia* plots. S=spring samples, F=fall samples.

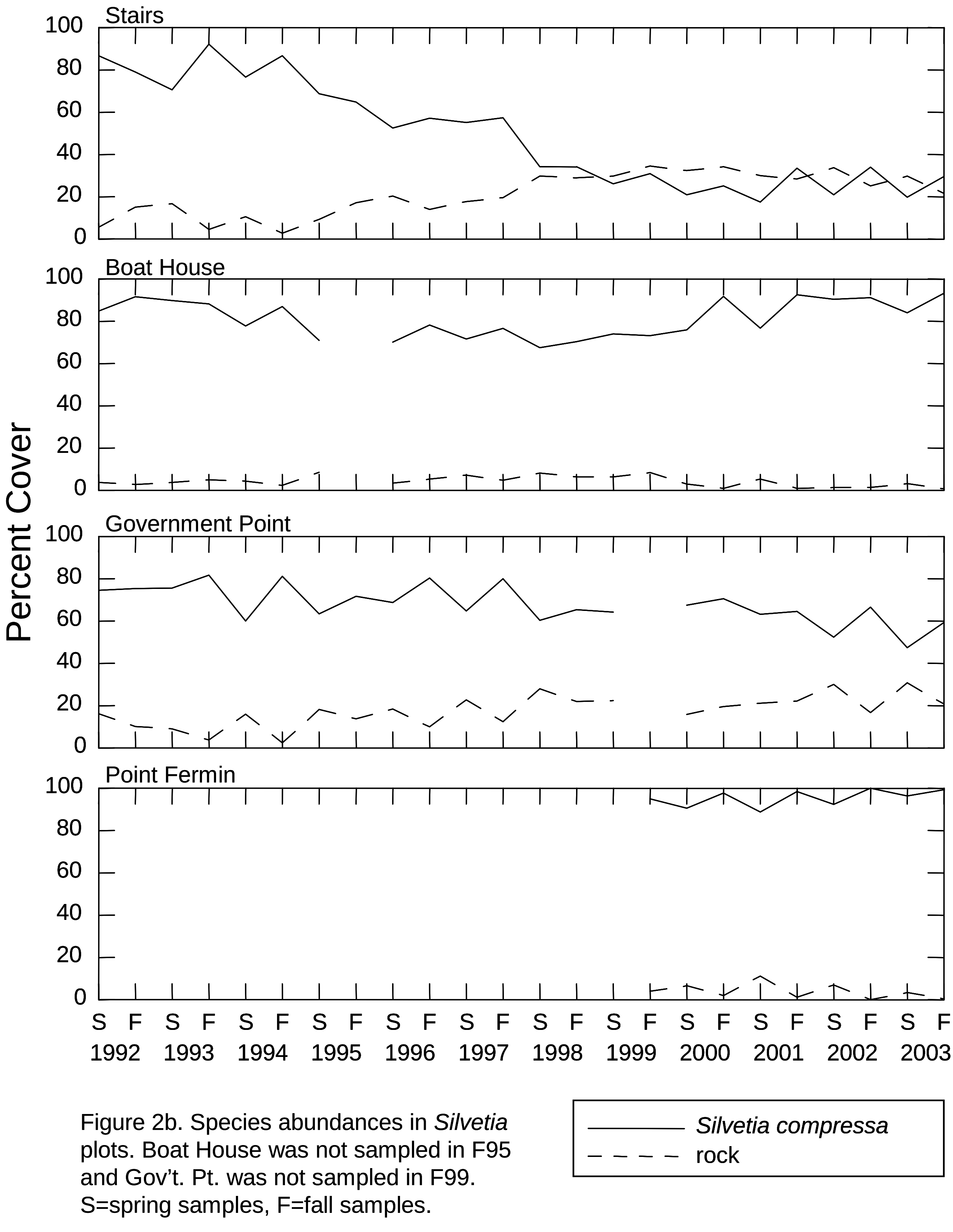


Figure 2b. Species abundances in *Silvetia* plots. Boat House was not sampled in F95 and Gov't. Pt. was not sampled in F99. S=spring samples, F=fall samples.

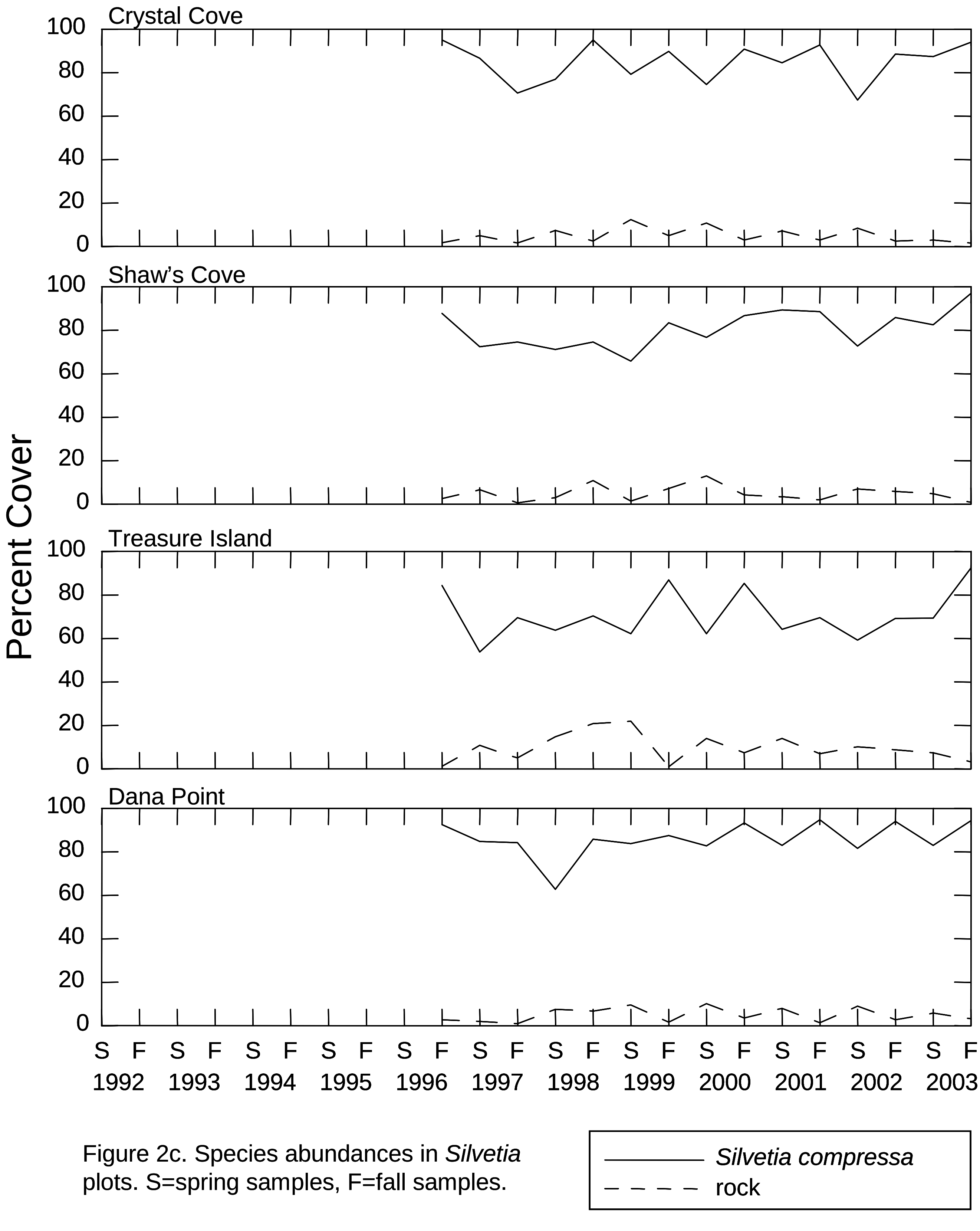


Figure 2c. Species abundances in *Silvetia* plots. S=spring samples, F=fall samples.

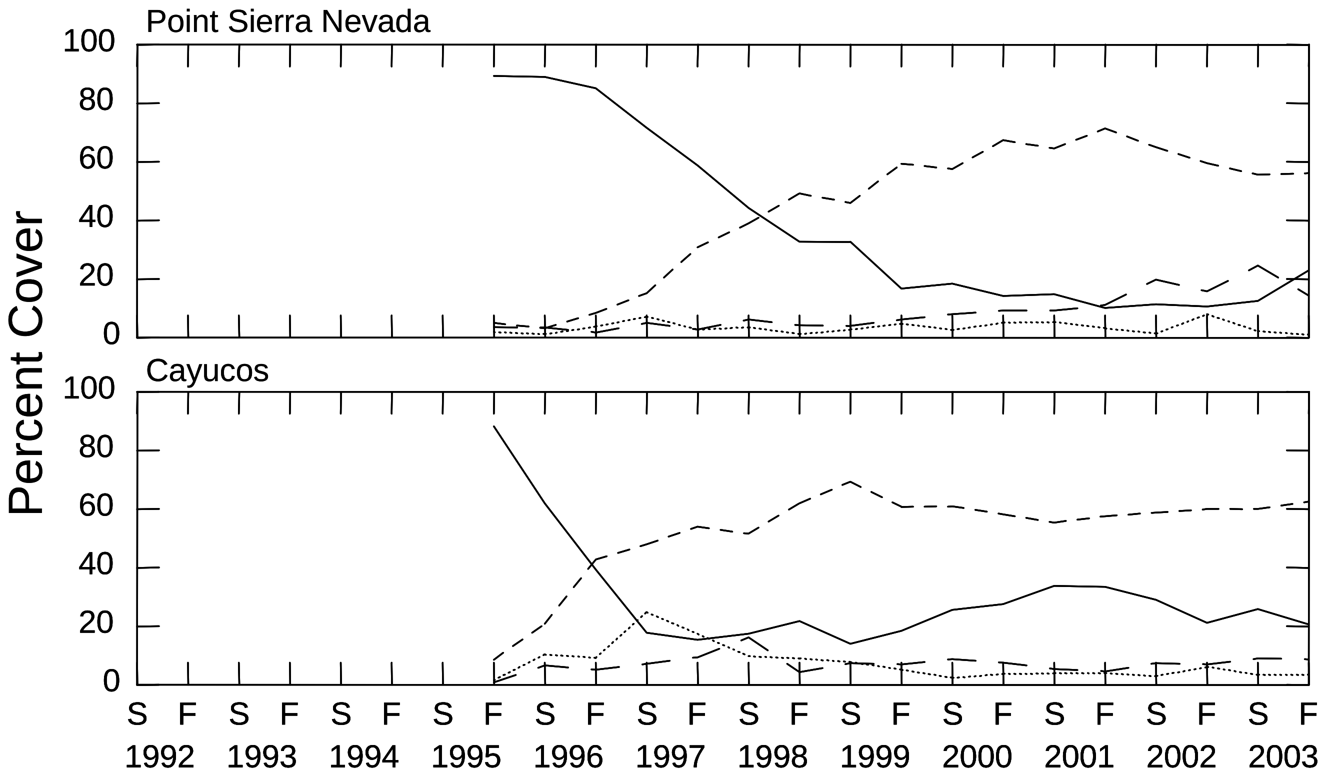


Figure 3. Species abundances in *Hesperophycus* plots. S=spring samples, F=fall samples.

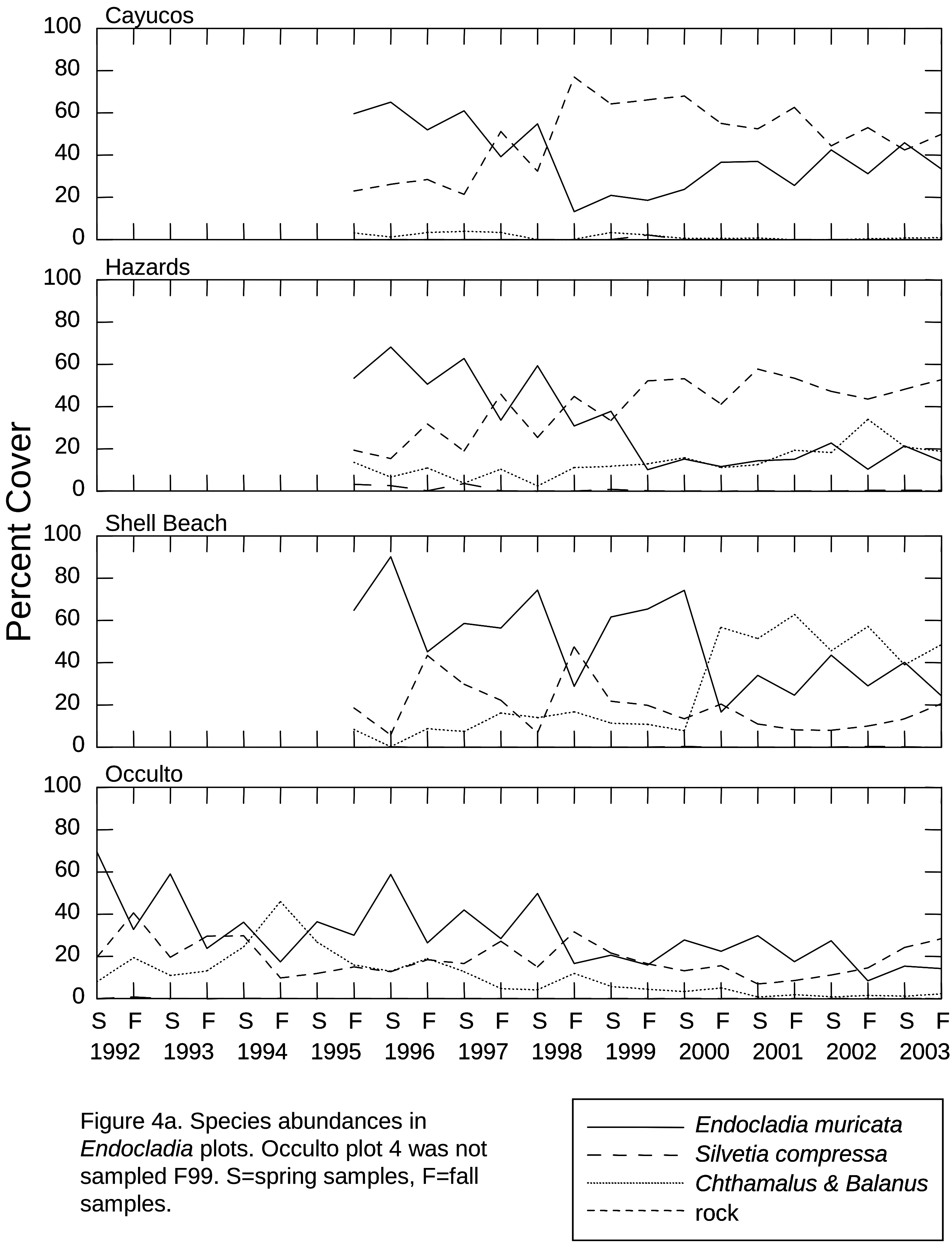


Figure 4a. Species abundances in *Endocladia* plots. Occulto plot 4 was not sampled F99. S=spring samples, F=fall samples.

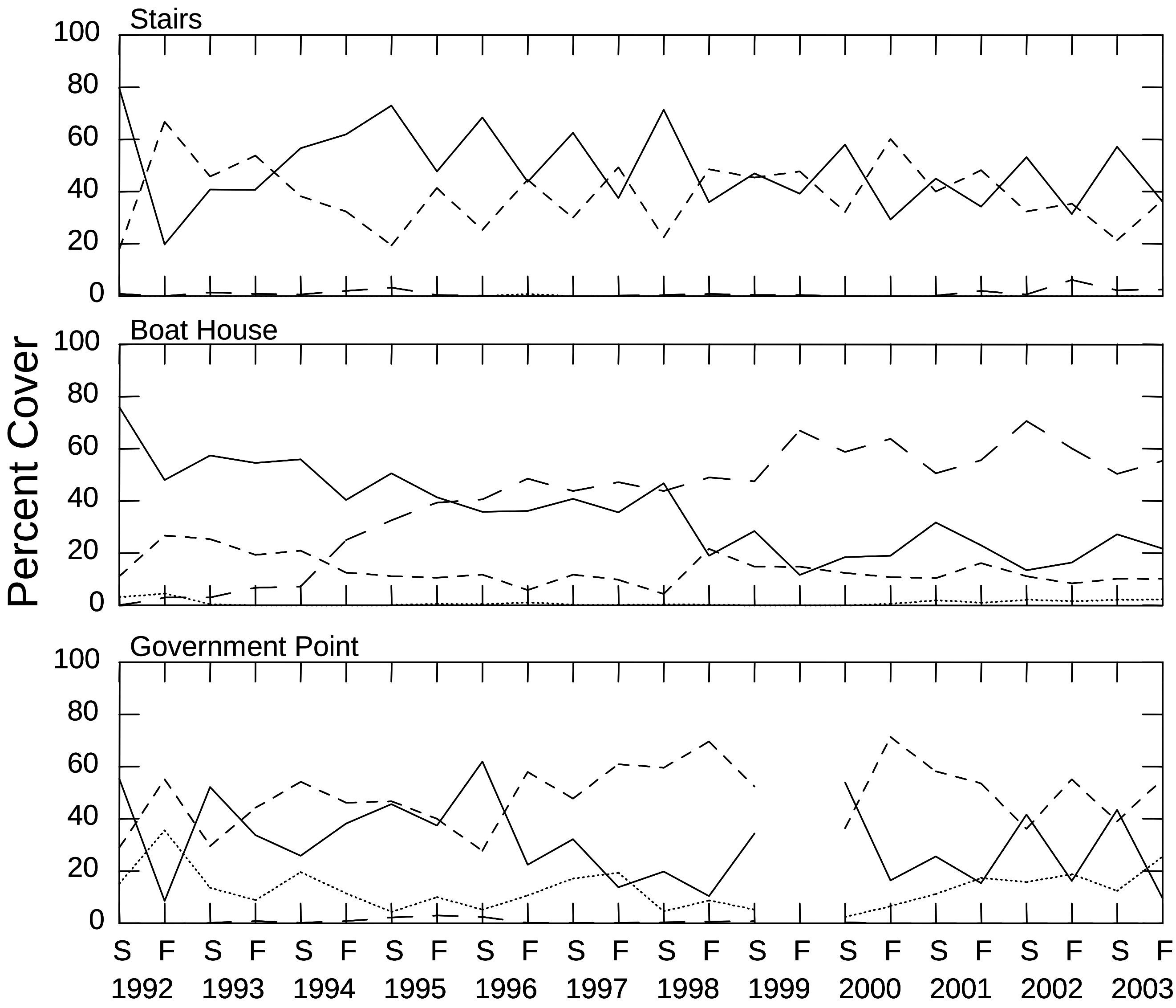


Figure 4b. Species abundances in *Endocladia* plots. Gov't. Pt. was not sampled in F99. S=spring samples, F=fall samples.

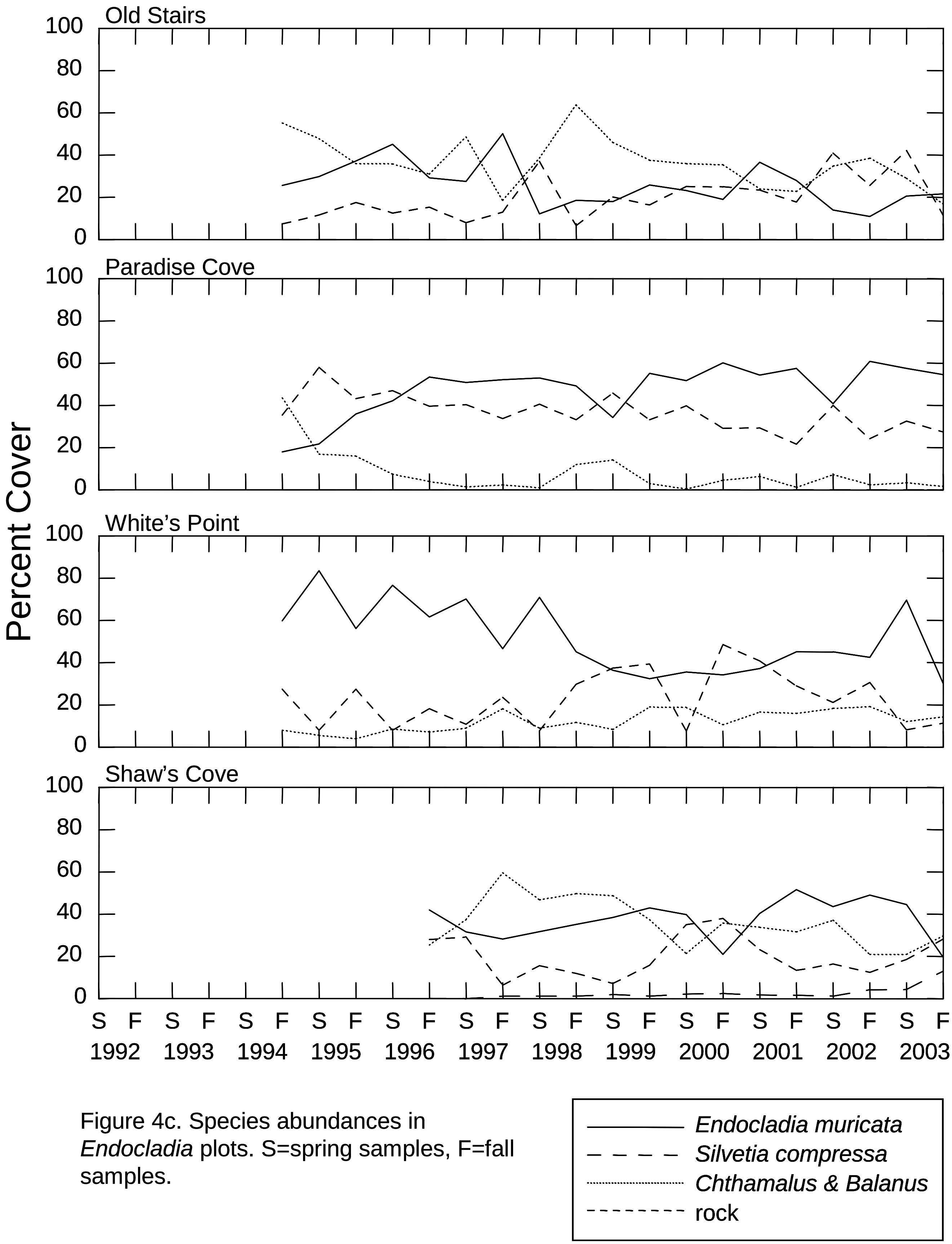


Figure 4c. Species abundances in *Endocladia* plots. S=spring samples, F=fall samples.

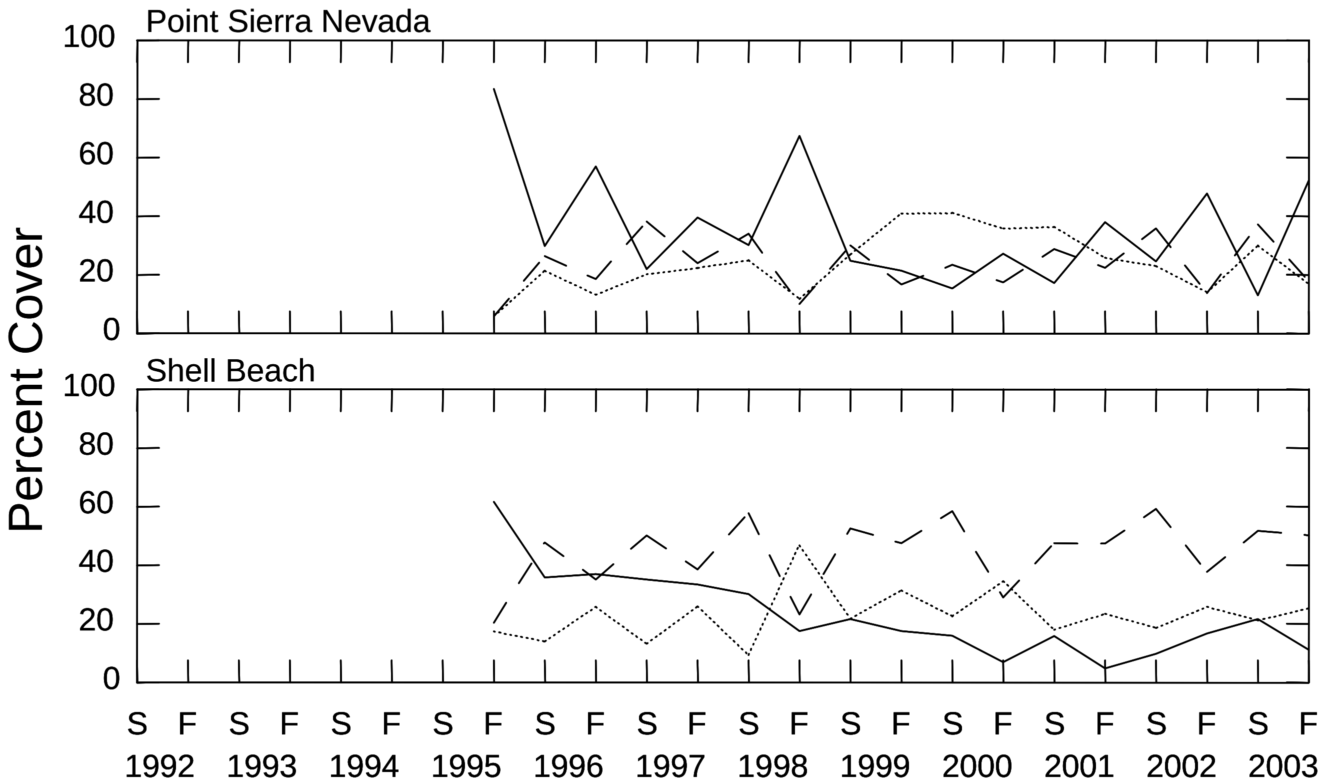


Figure 5. Species abundances in *Mastocarpus* plots. S=spring samples, F=fall samples.

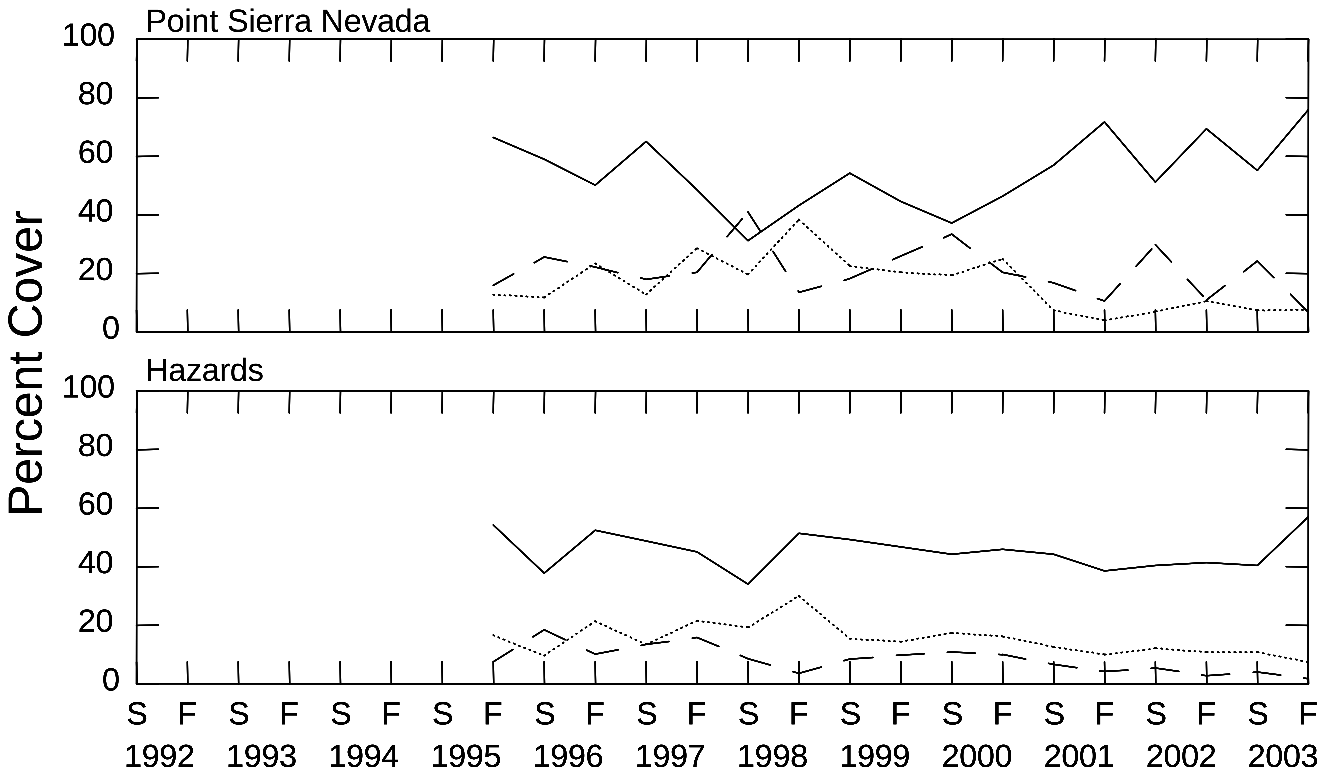
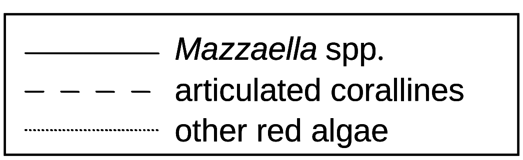


Figure 6. Species abundances in *Mazzaella* plots. S=spring samples, F=fall samples.



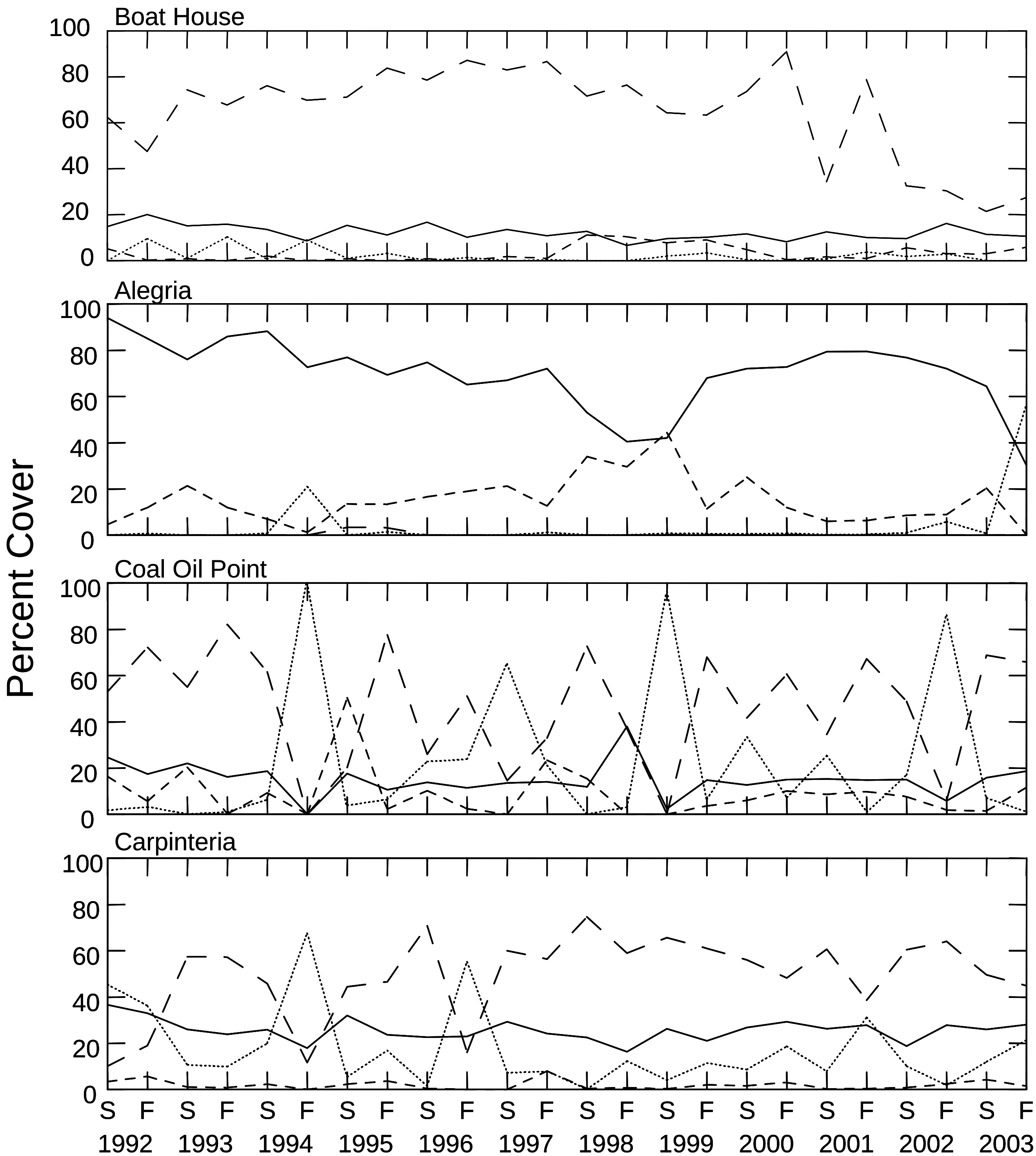


Figure 7a. Species abundances in *Anthopleura* plots. Carpinteria plot 2 was not sampled F98. S=spring samples, F=fall samples.

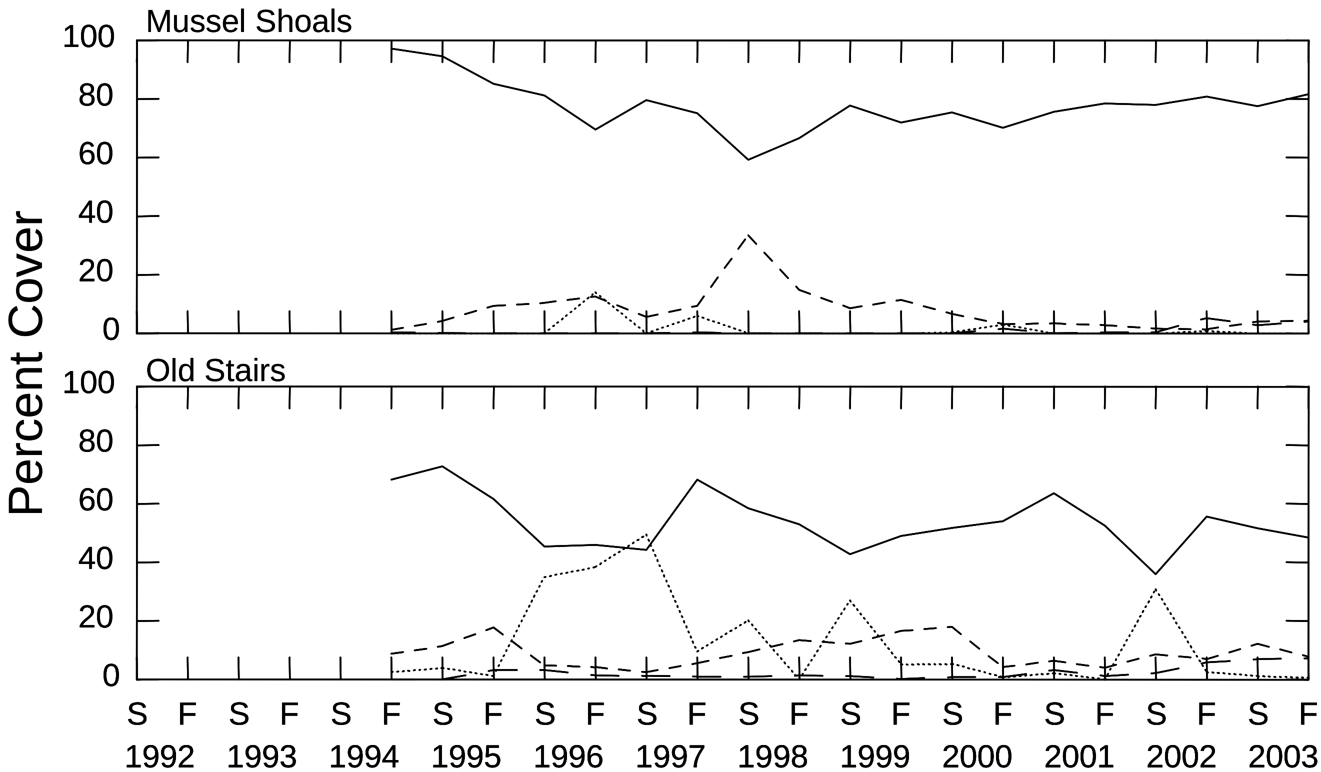
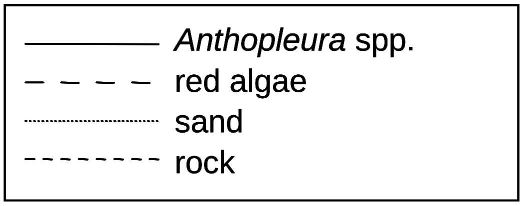


Figure 7b. Species abundances in *Anthopleura* plots. Old Stairs plot 5 was not sampled S97. S=spring samples, F=fall samples.



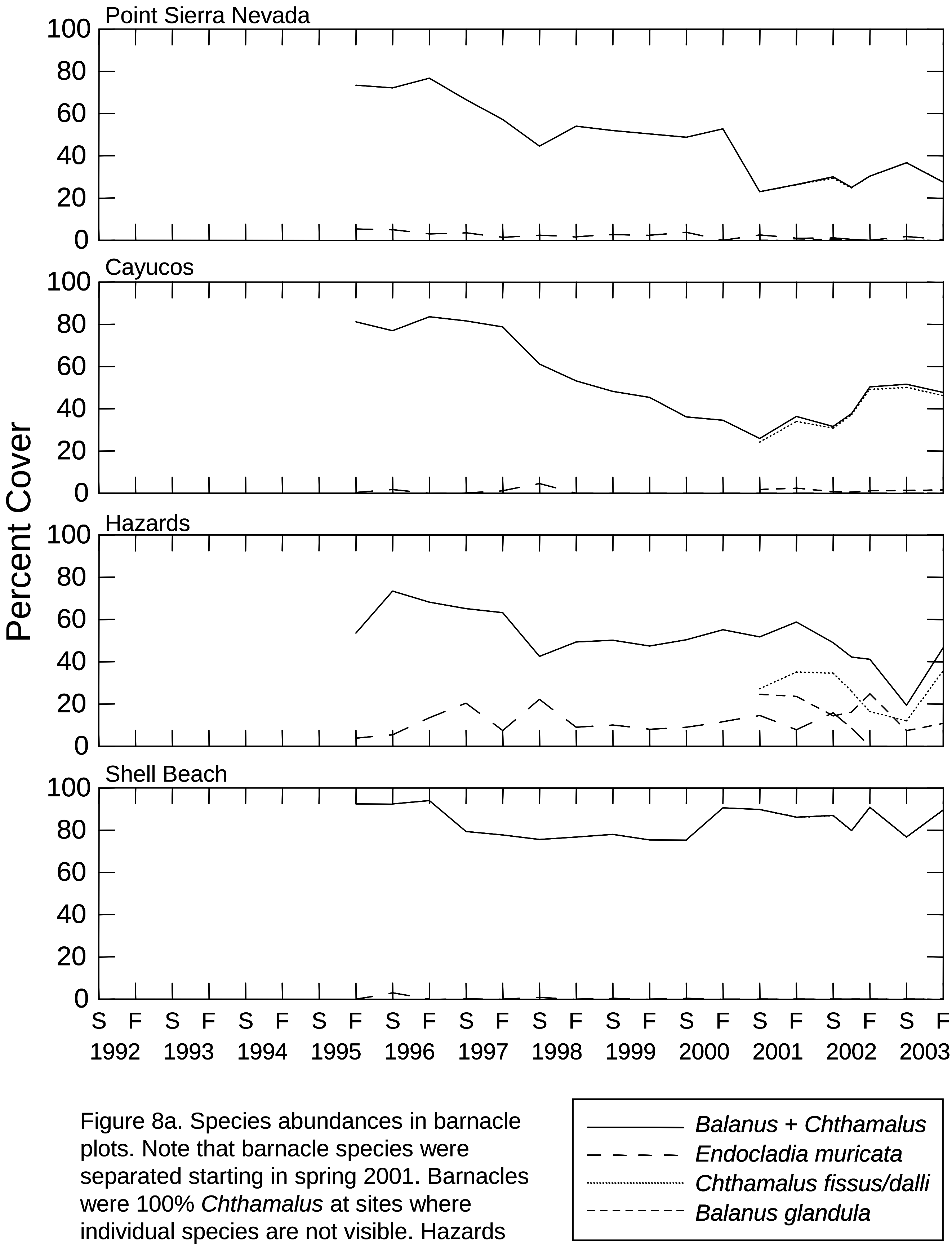


Figure 8a. Species abundances in barnacle plots. Note that barnacle species were separated starting in spring 2001. Barnacles were 100% *Chthamalus* at sites where individual species are not visible. Hazards plot 5 was not sampled F95. S=spring samples, F=fall samples.

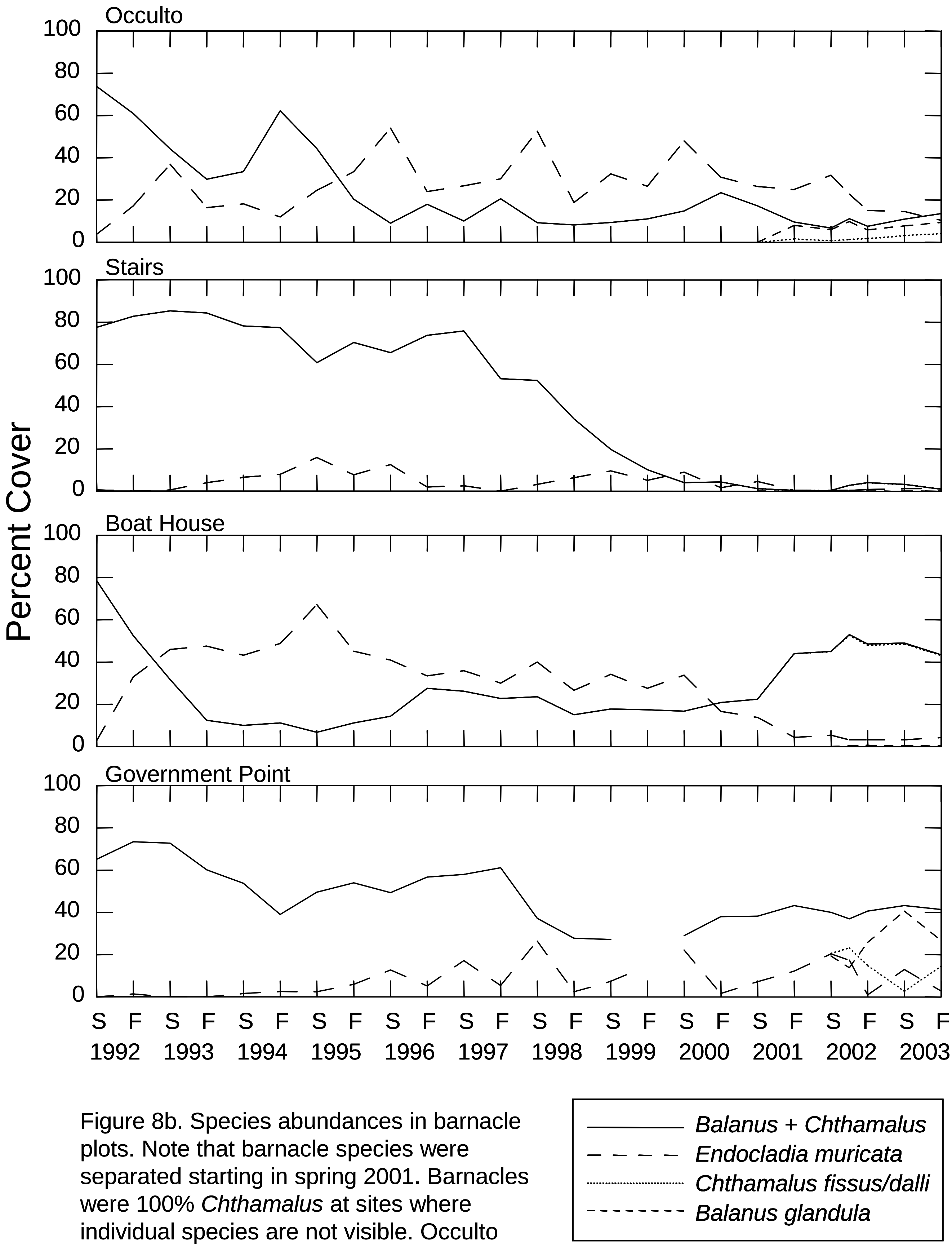


Figure 8b. Species abundances in barnacle plots. Note that barnacle species were separated starting in spring 2001. Barnacles were 100% *Chthamalus* at sites where individual species are not visible. Occulto plot 4 was not sampled F98. Gov't. Pt. was not sampled F99. S=spring samples, F=fall samples.

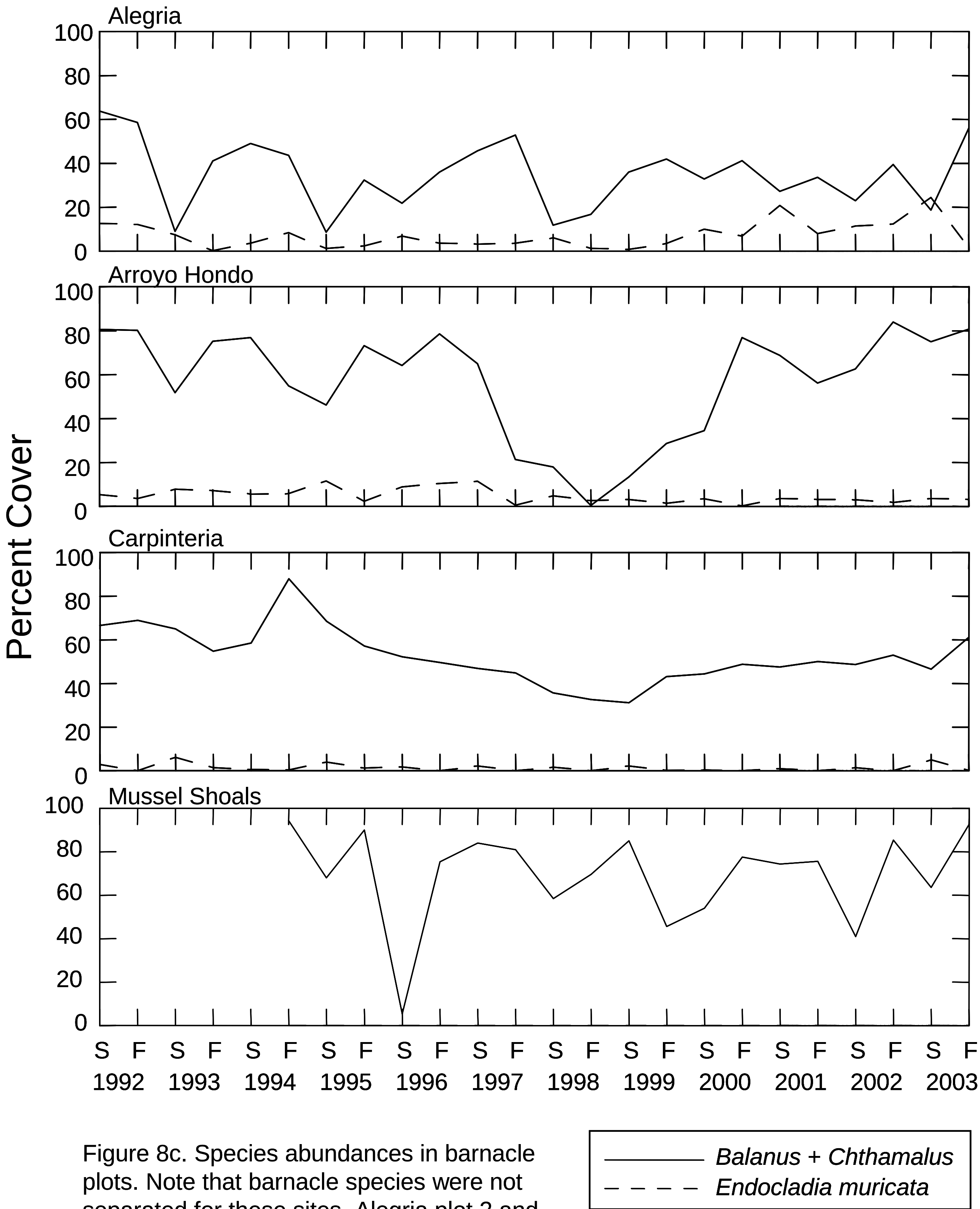


Figure 8c. Species abundances in barnacle plots. Note that barnacle species were not separated for these sites. Alegria plot 2 and Mussel Shoals plot 5 were not sampled F98. Arroyo Hondo plot 1 was not sampled S00. S=spring samples, F=fall samples.

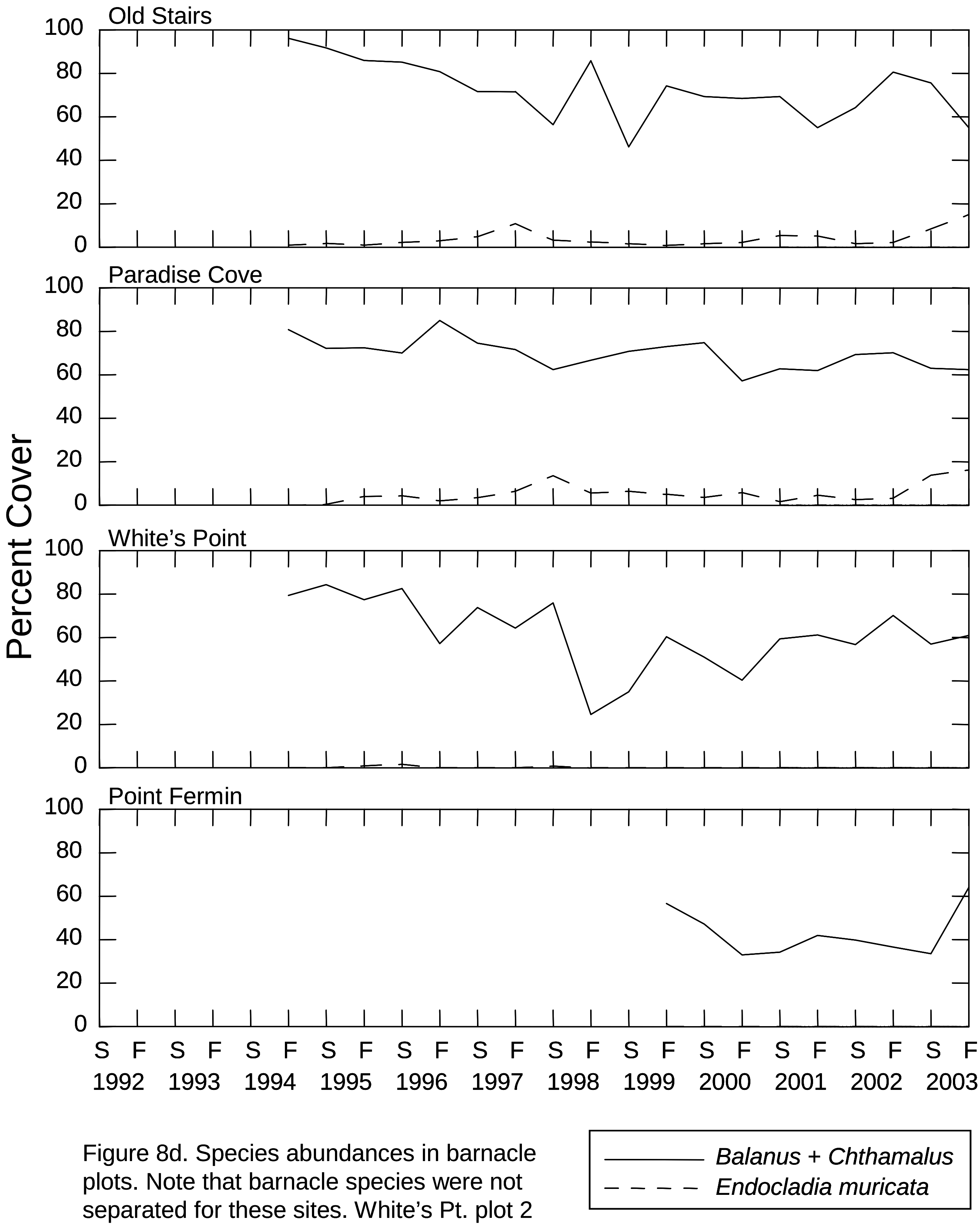


Figure 8d. Species abundances in barnacle plots. Note that barnacle species were not separated for these sites. White's Pt. plot 2 was not sampled F96. S=spring samples, F=fall samples.

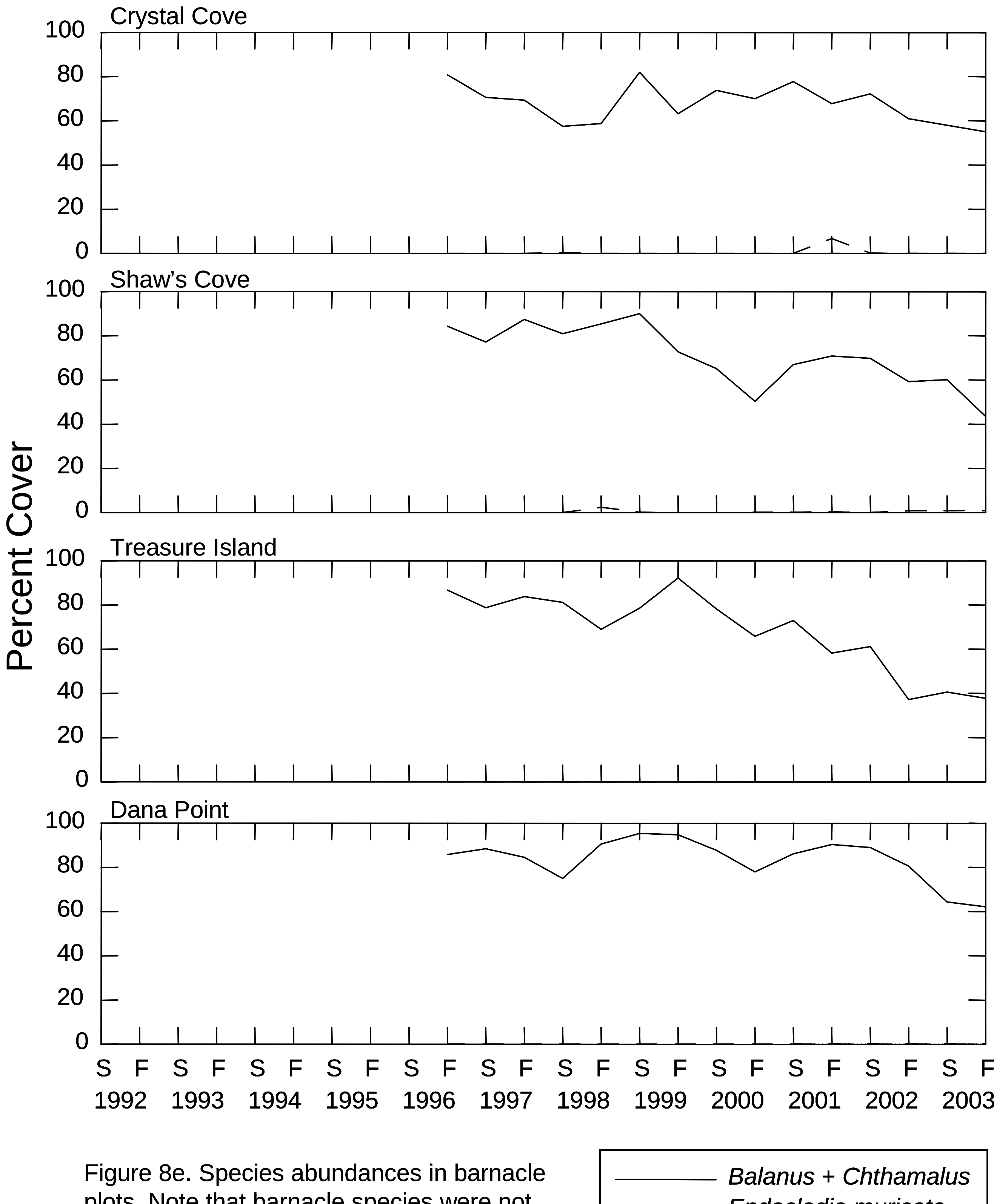


Figure 8e. Species abundances in barnacle plots. Note that barnacle species were not separated for these sites. S=spring samples, F=fall samples.

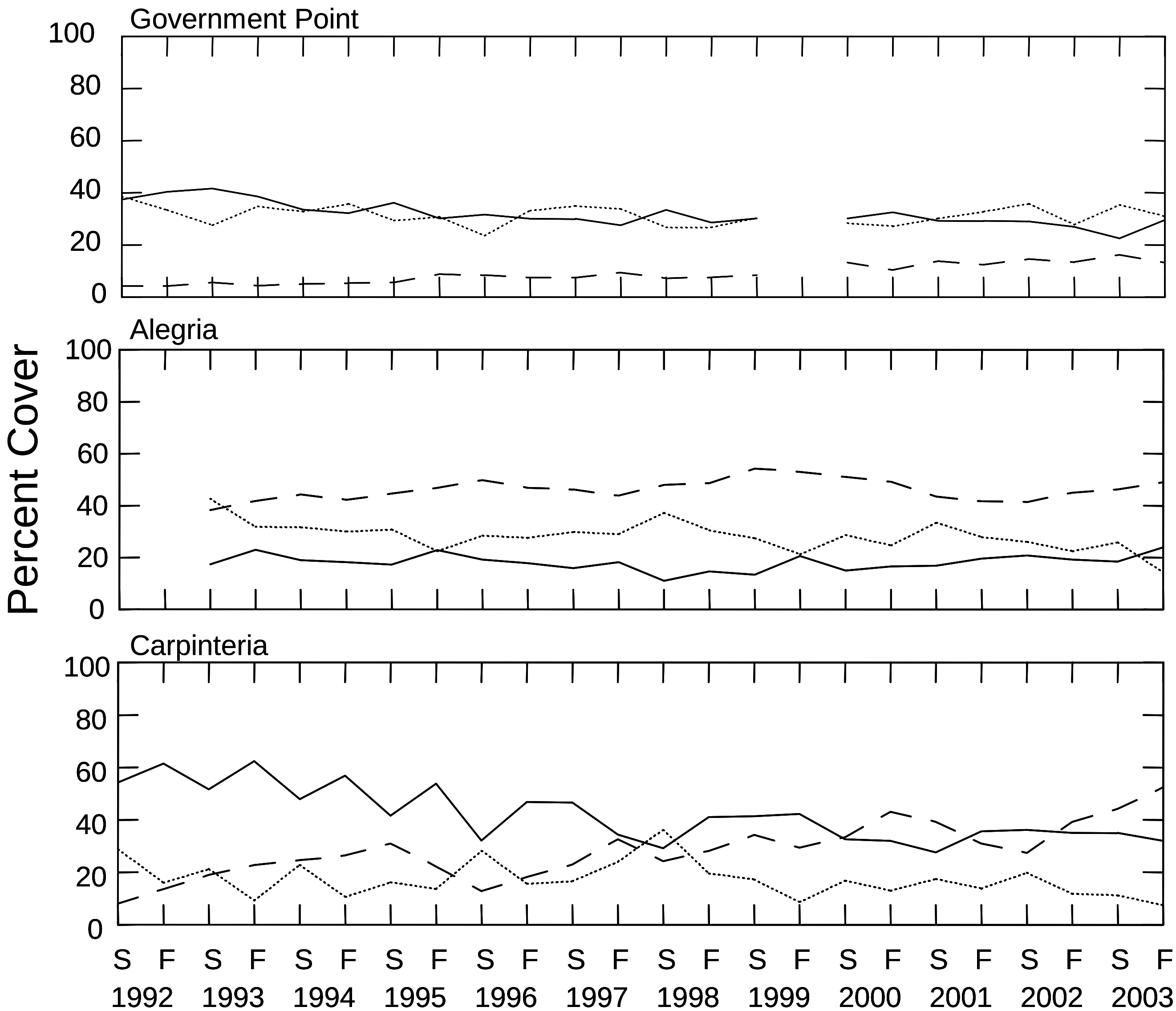


Figure 9. Species abundances in *Pollicipes* plots. Gov't. Pt. was not sampled in F99. S=spring samples, F=fall samples.

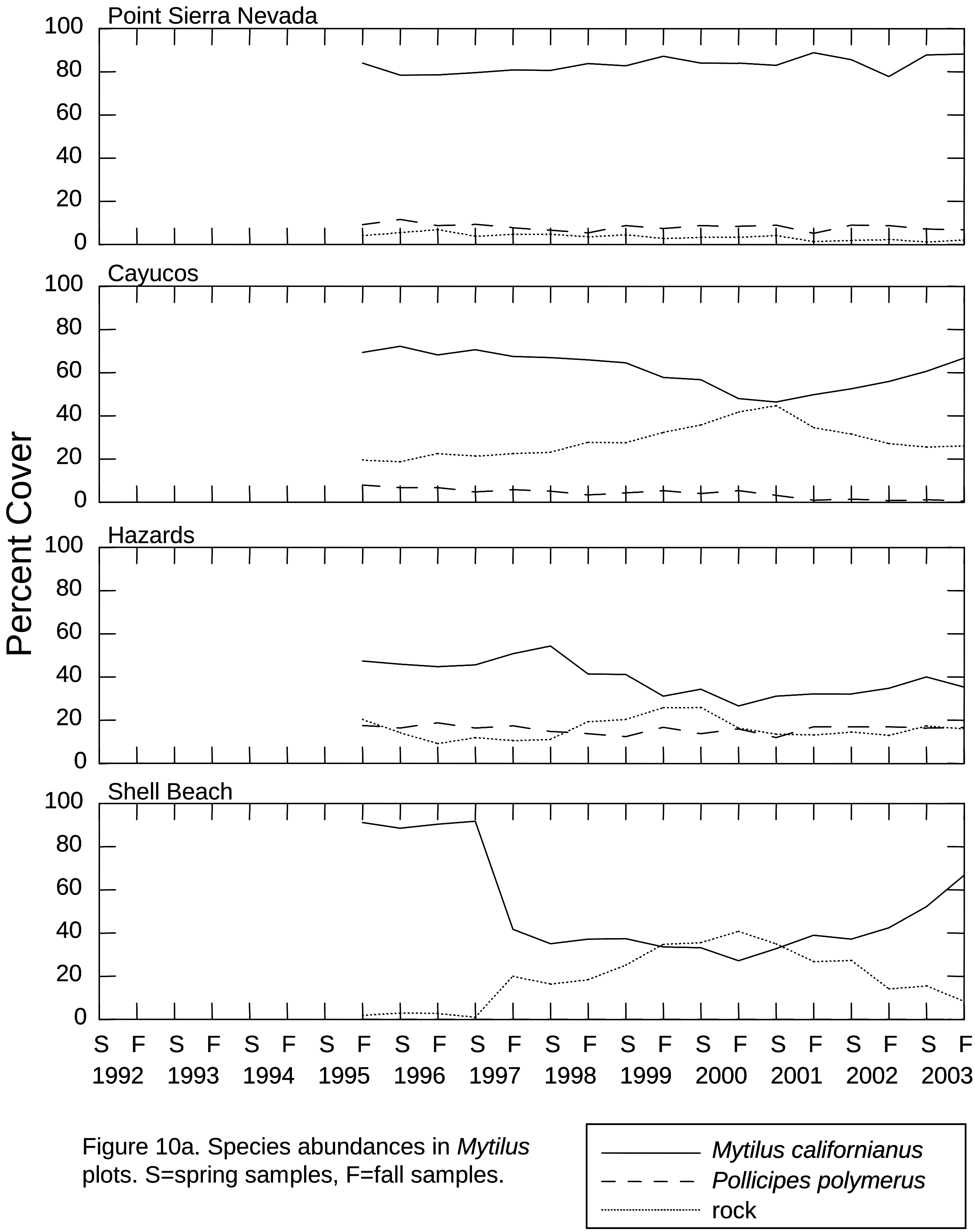


Figure 10a. Species abundances in *Mytilus* plots. S=spring samples, F=fall samples.

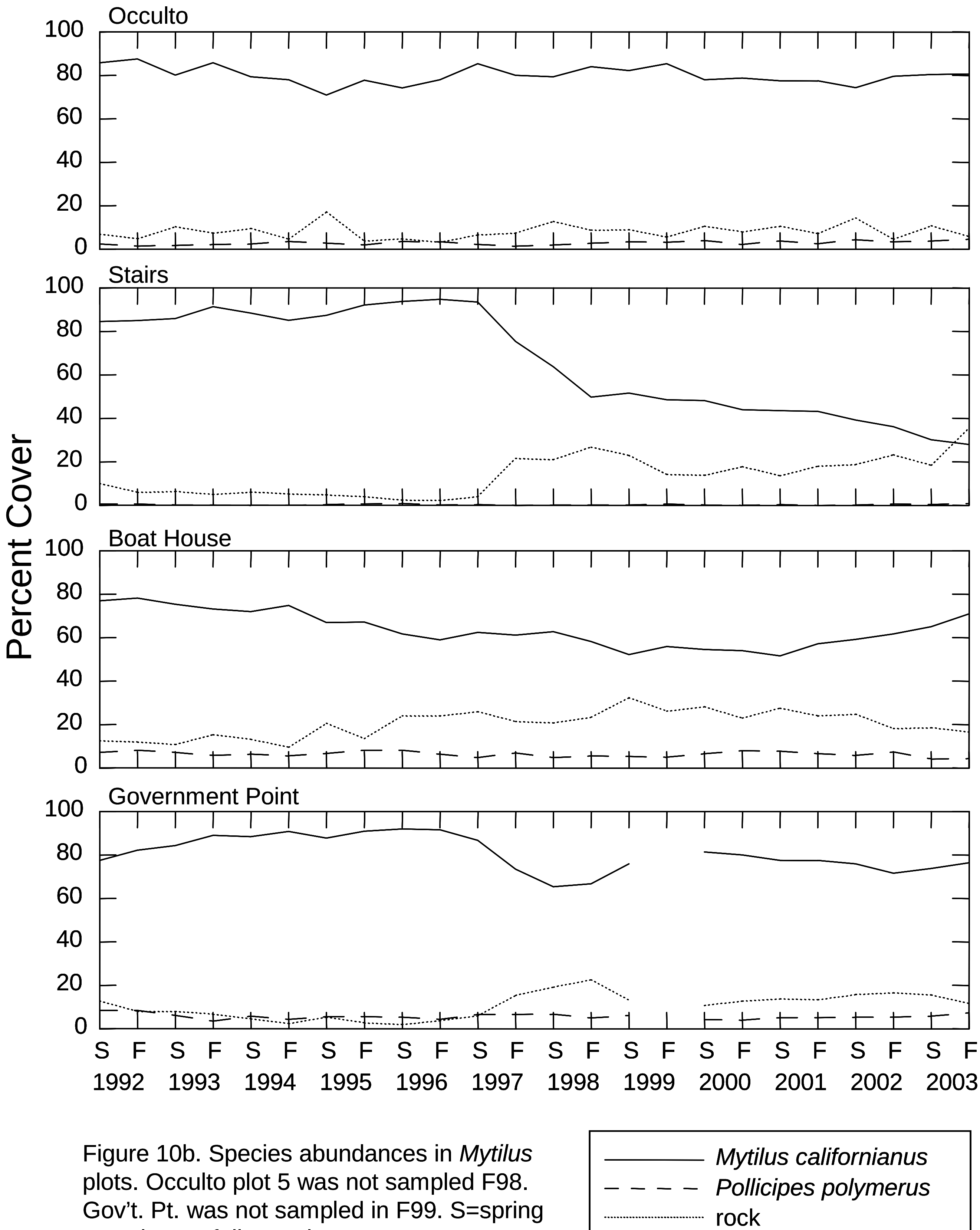


Figure 10b. Species abundances in *Mytilus* plots. Occulto plot 5 was not sampled F98. Gov't. Pt. was not sampled in F99. S=spring samples, F=fall samples.

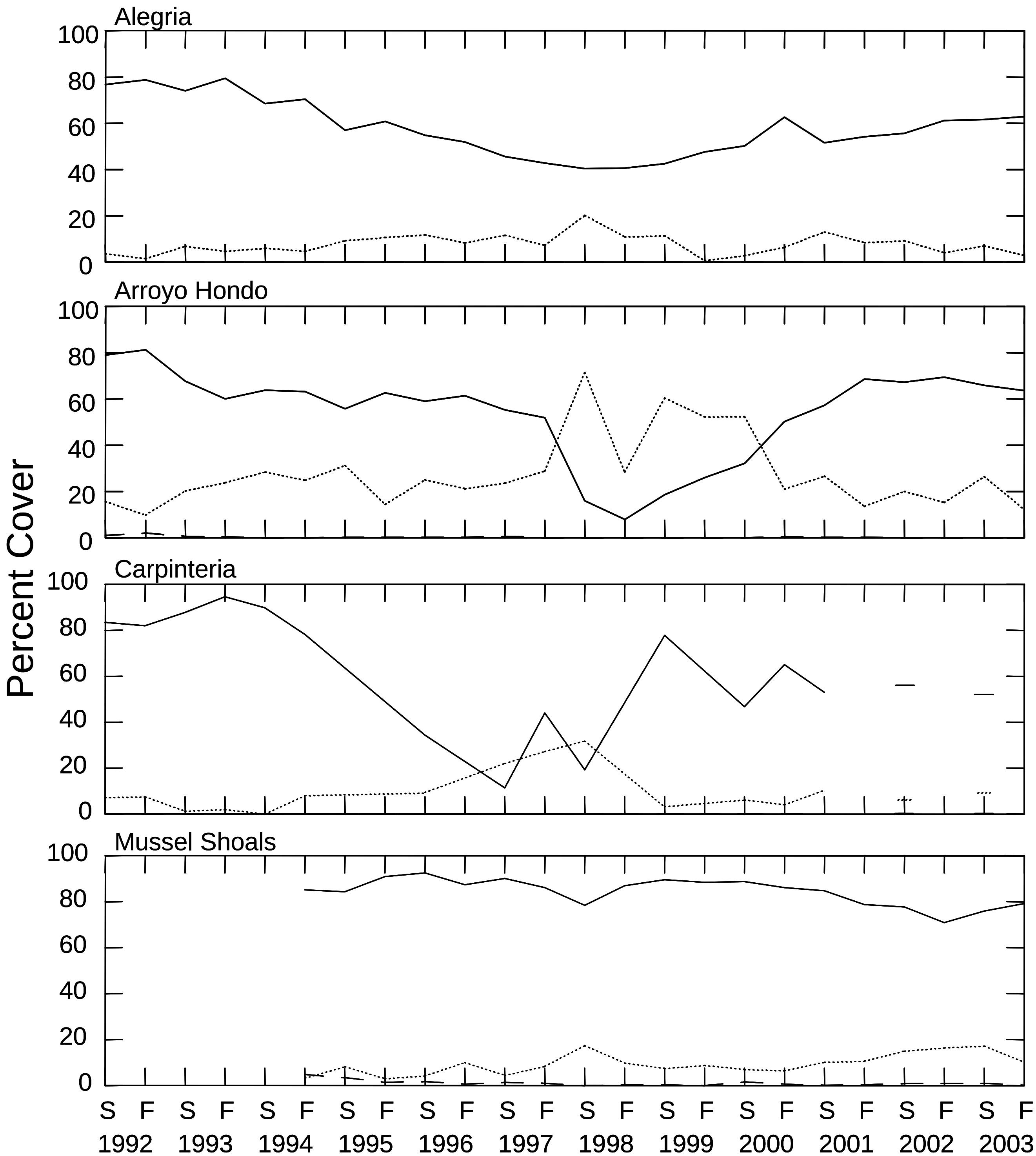
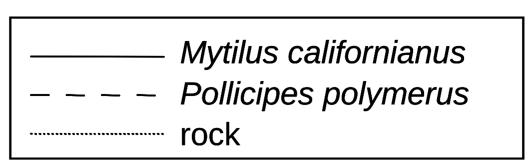


Figure 10c. Species abundances in *Mytilus* plots. The following plots were not sampled at Carpinteria: 3 F92, 1 S93, all F01, all F02. S=spring samples, F=fall samples.



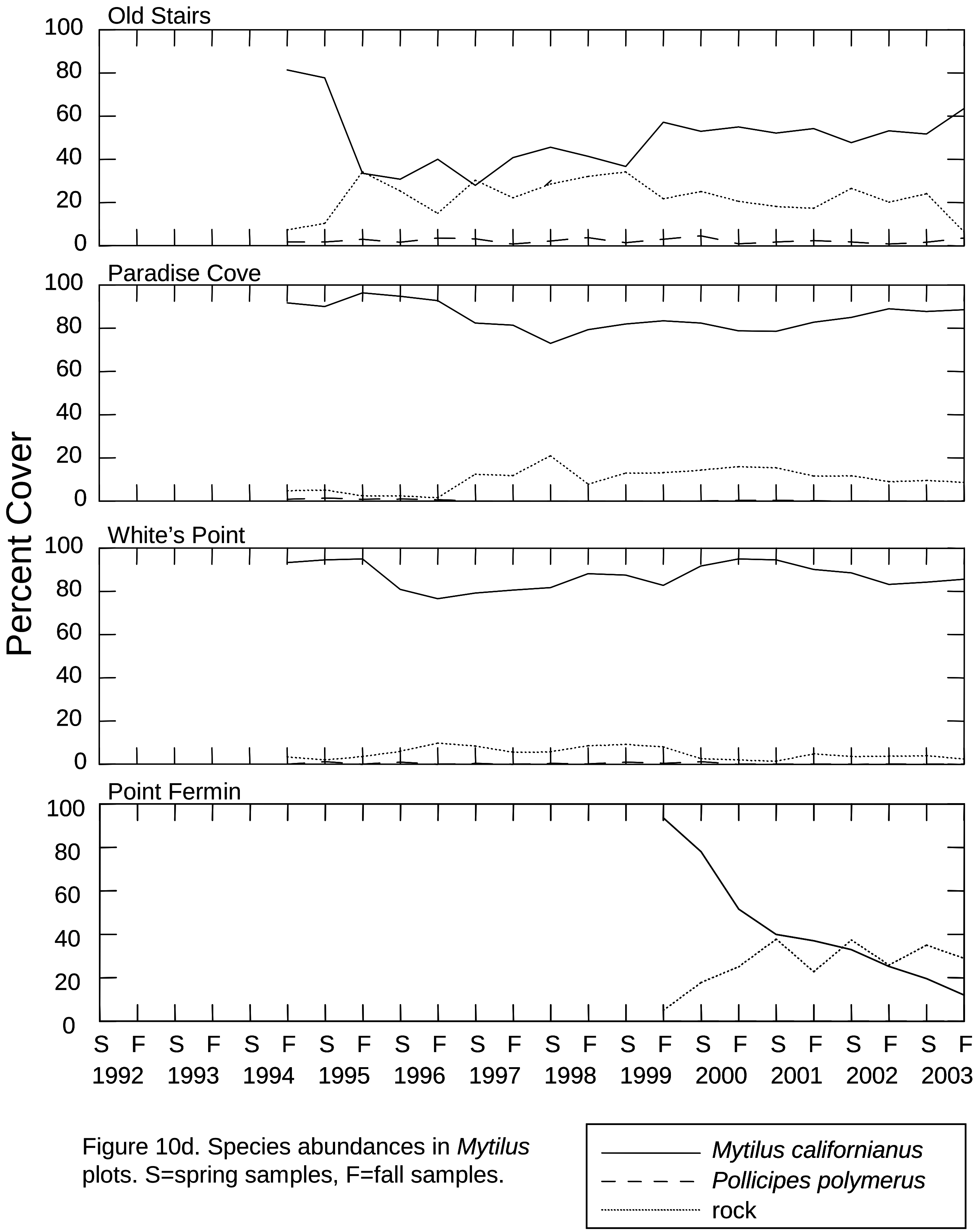


Figure 10d. Species abundances in *Mytilus* plots. S=spring samples, F=fall samples.

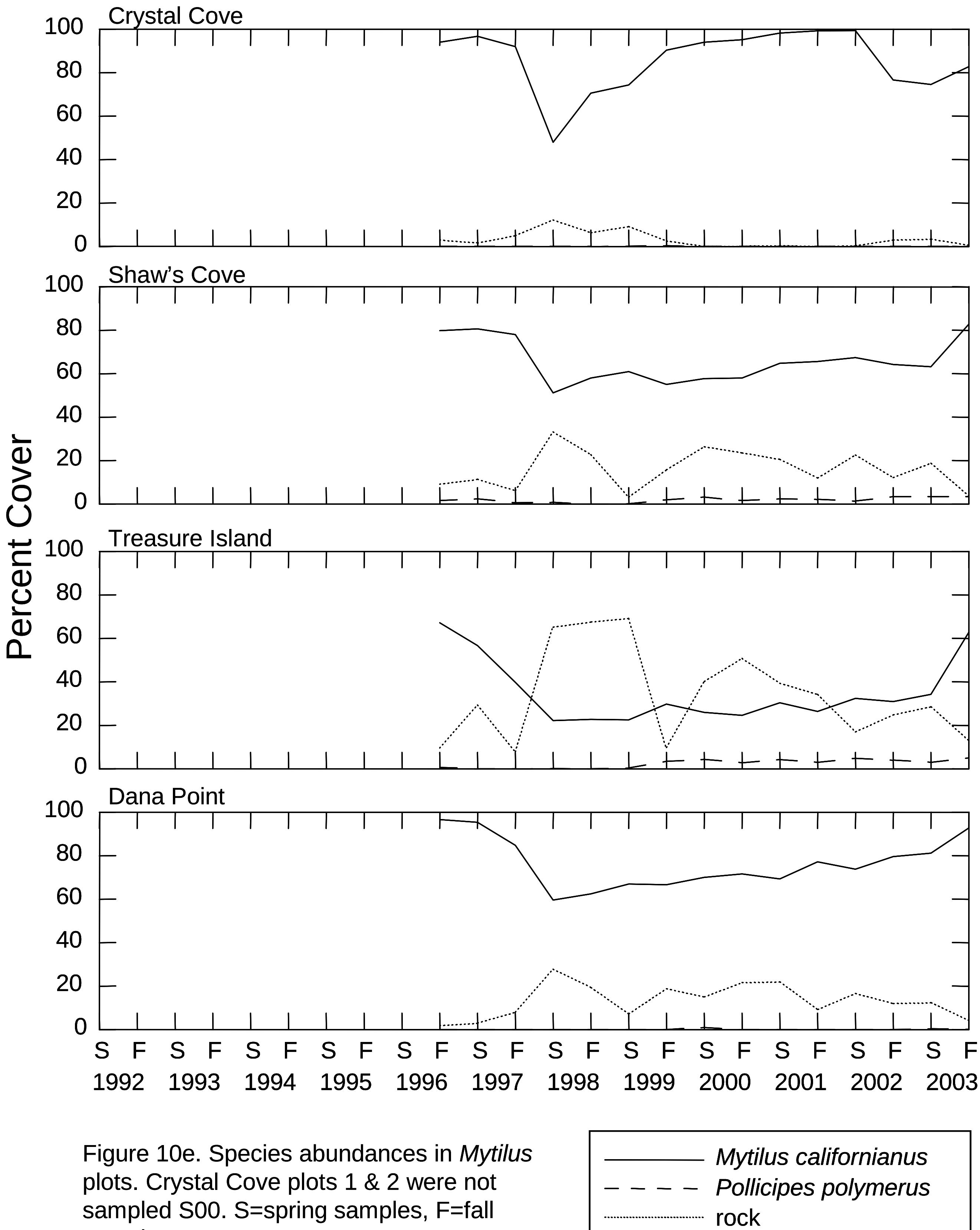


Figure 10e. Species abundances in *Mytilus* plots. Crystal Cove plots 1 & 2 were not sampled S00. S=spring samples, F=fall samples.

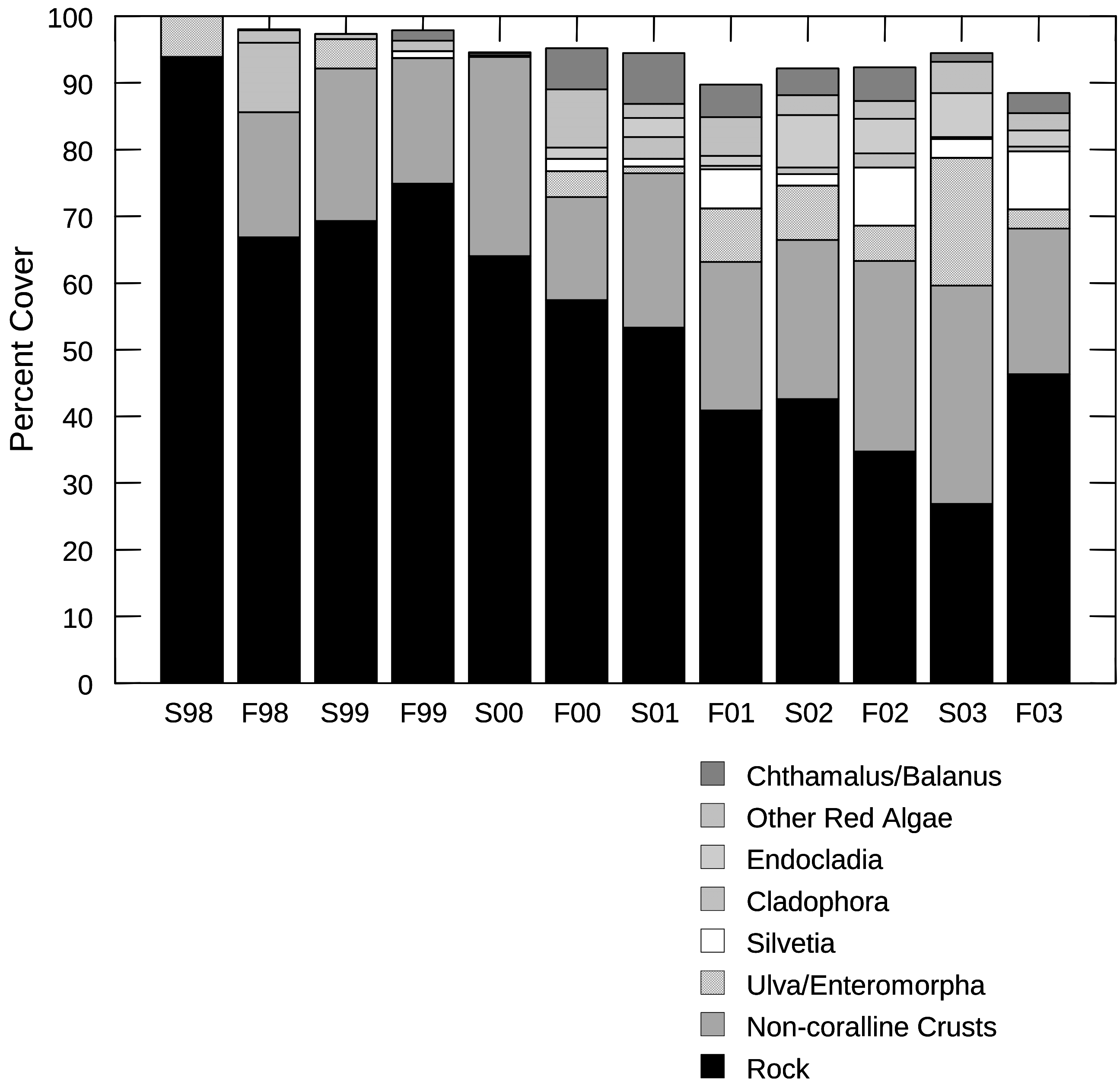


Figure 11. Species abundances in Recovery plots at Stairs. S=spring samples, F=fall samples.

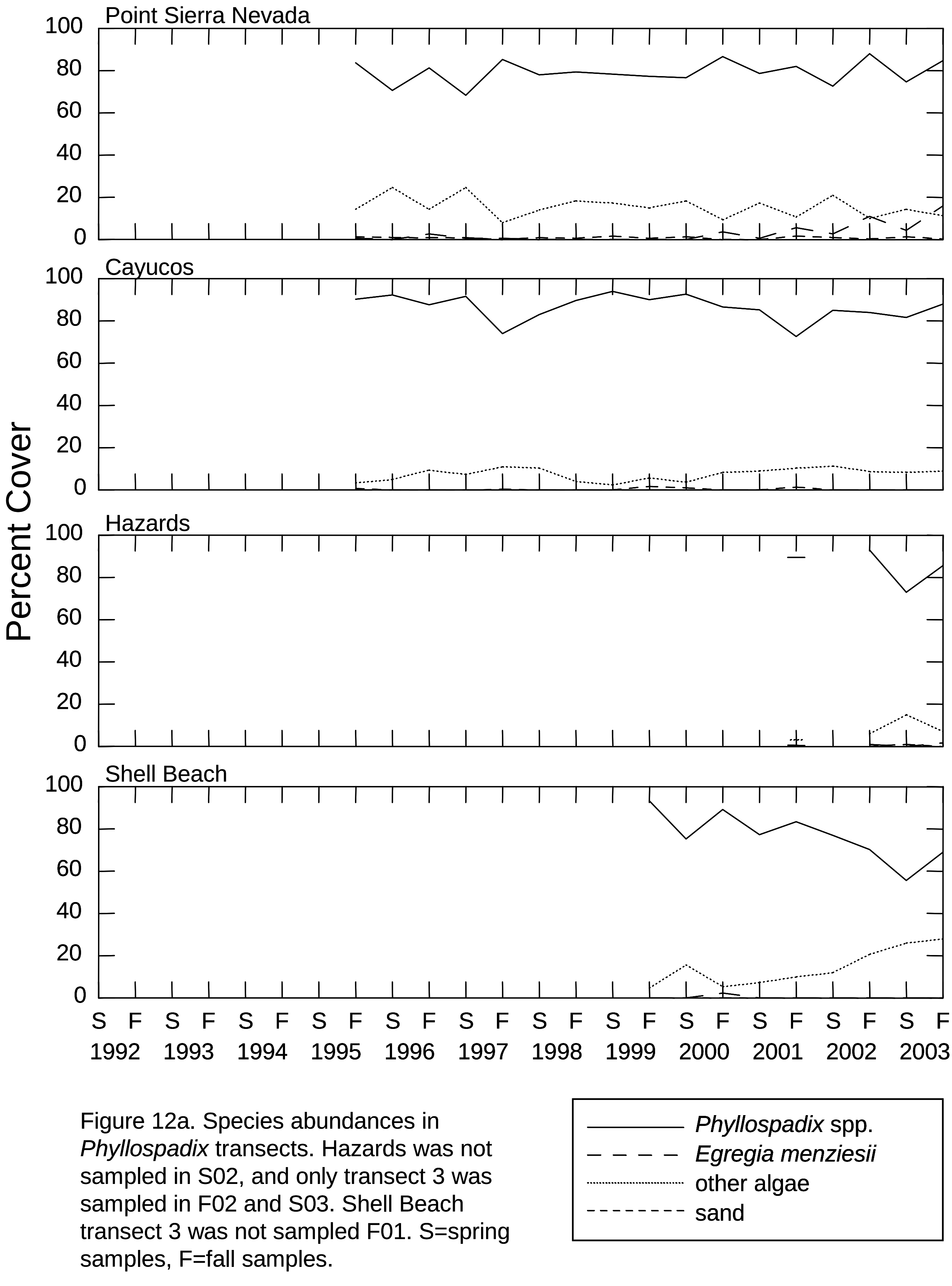


Figure 12a. Species abundances in *Phyllospadix* transects. Hazards was not sampled in S02, and only transect 3 was sampled in F02 and S03. Shell Beach transect 3 was not sampled F01. S=spring samples, F=fall samples.

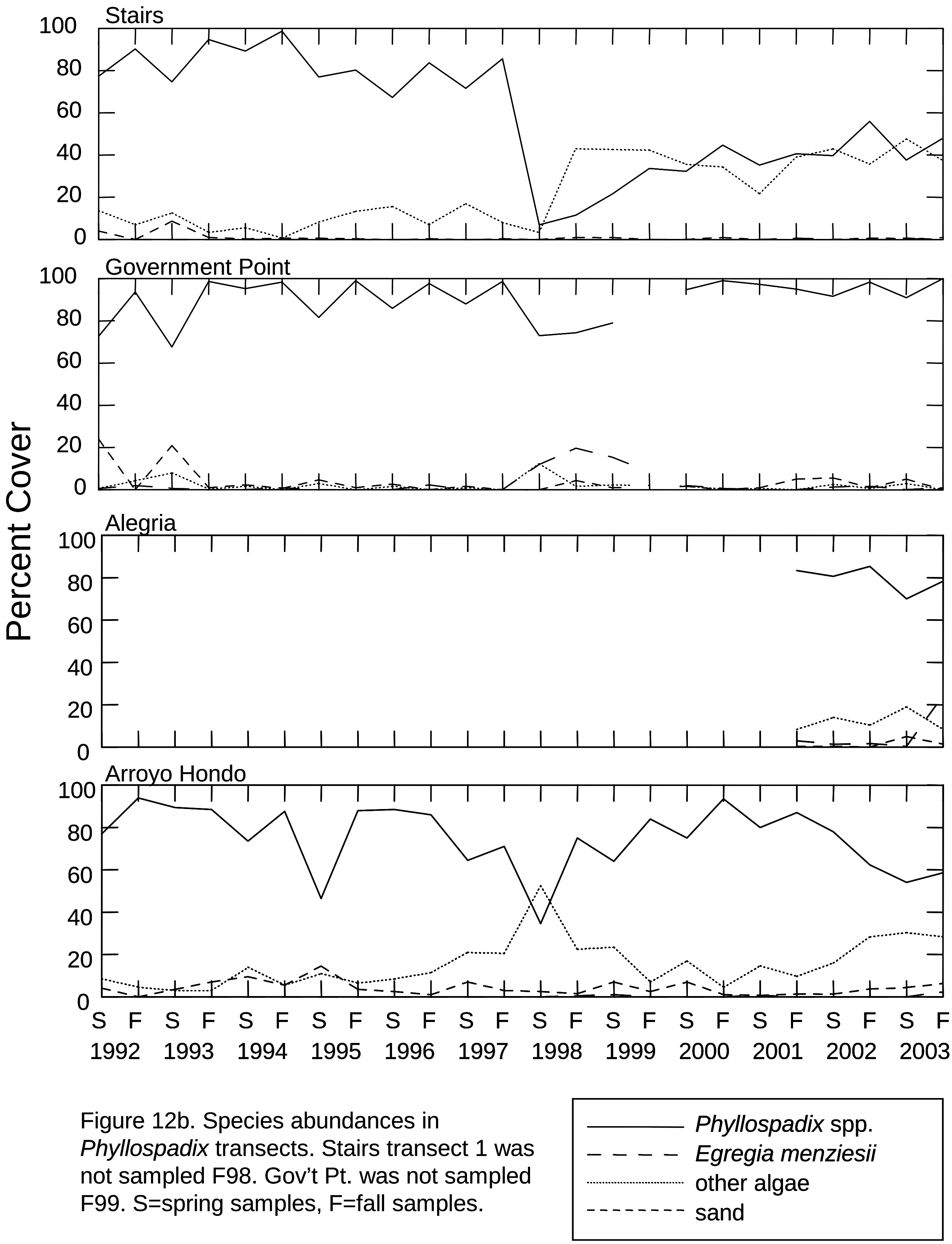


Figure 12b. Species abundances in *Phyllospadix* transects. Stairs transect 1 was not sampled F98. Gov't Pt. was not sampled F99. S=spring samples, F=fall samples.

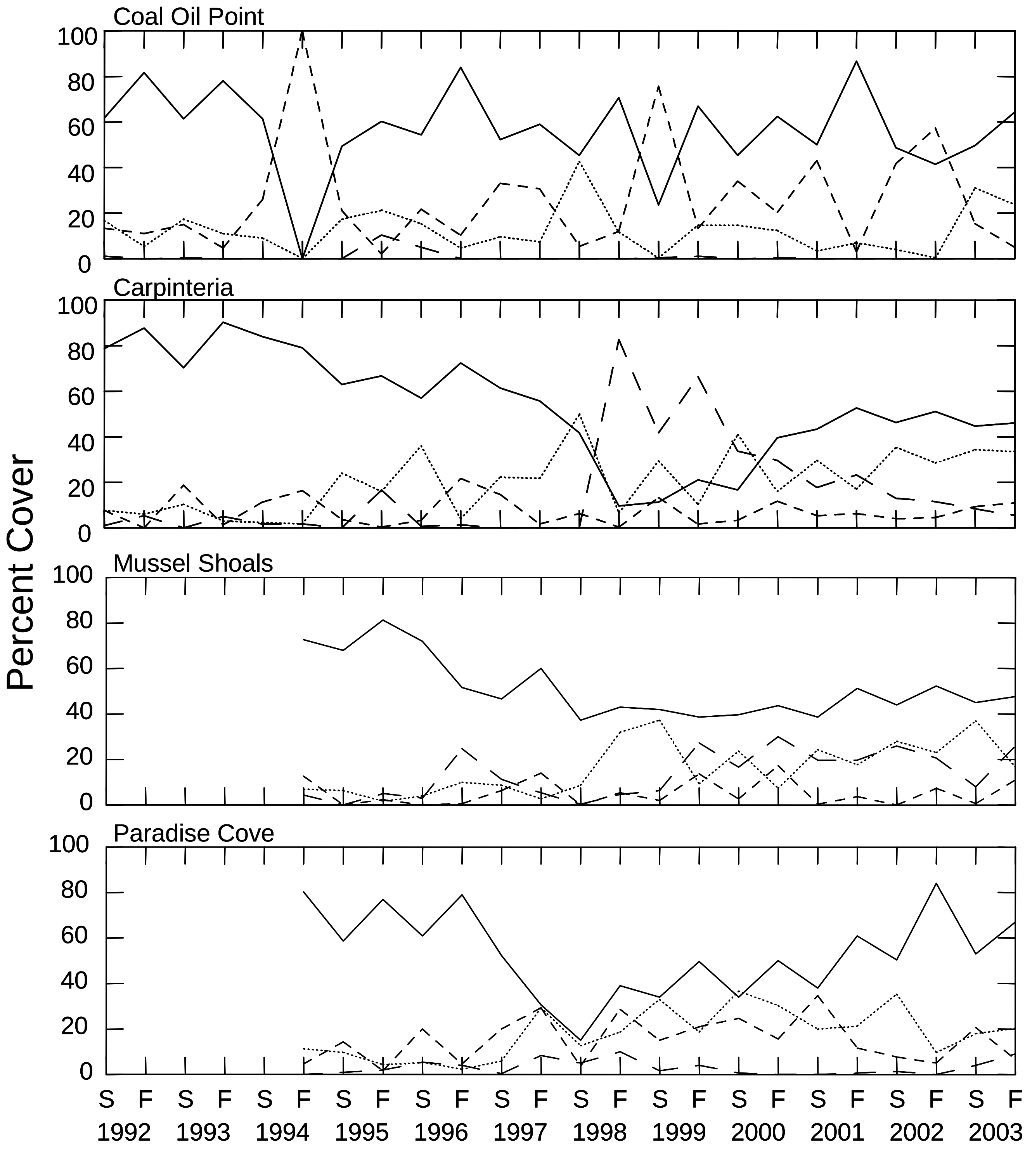


Figure 12c. Species abundances in *Phyllospadix* transects. S=spring samples, F=fall samples.

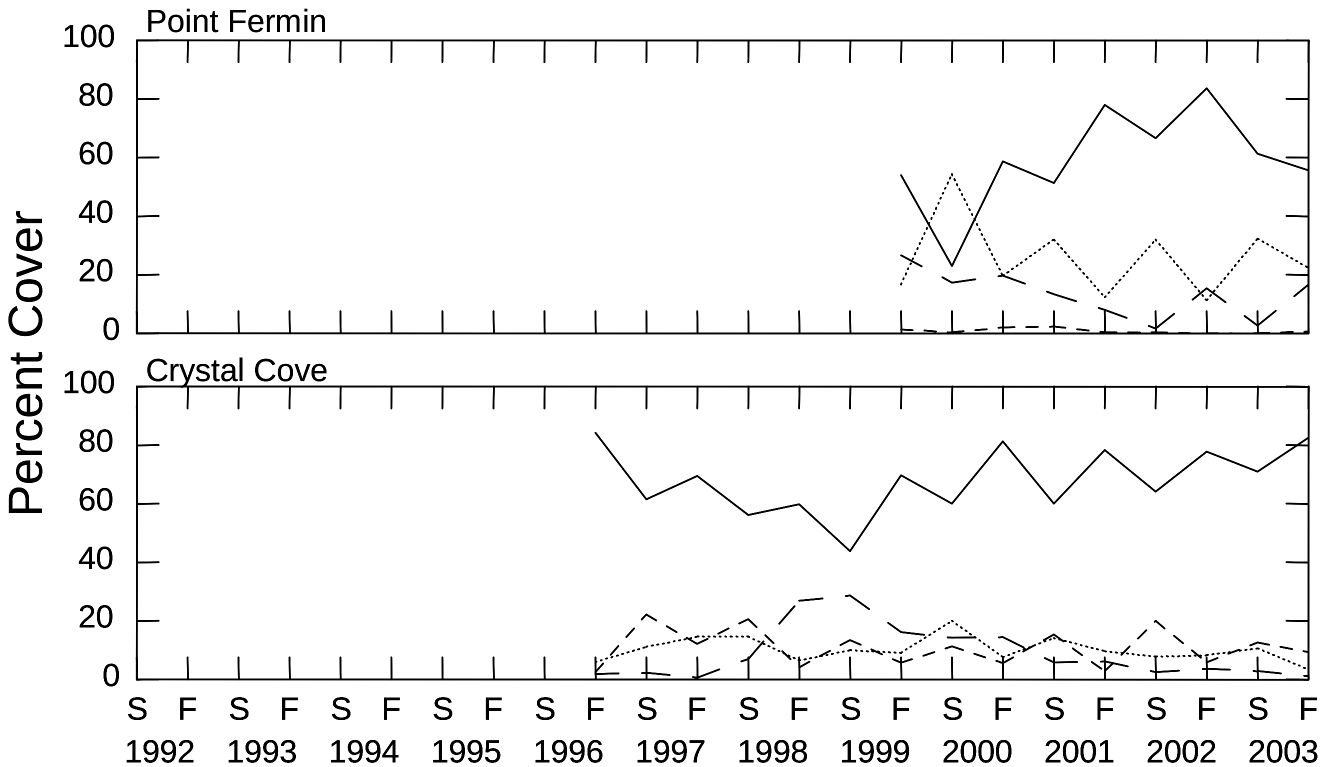


Figure 12d. Species abundances in *Phyllospadix* transects. S=spring samples, F=fall samples.

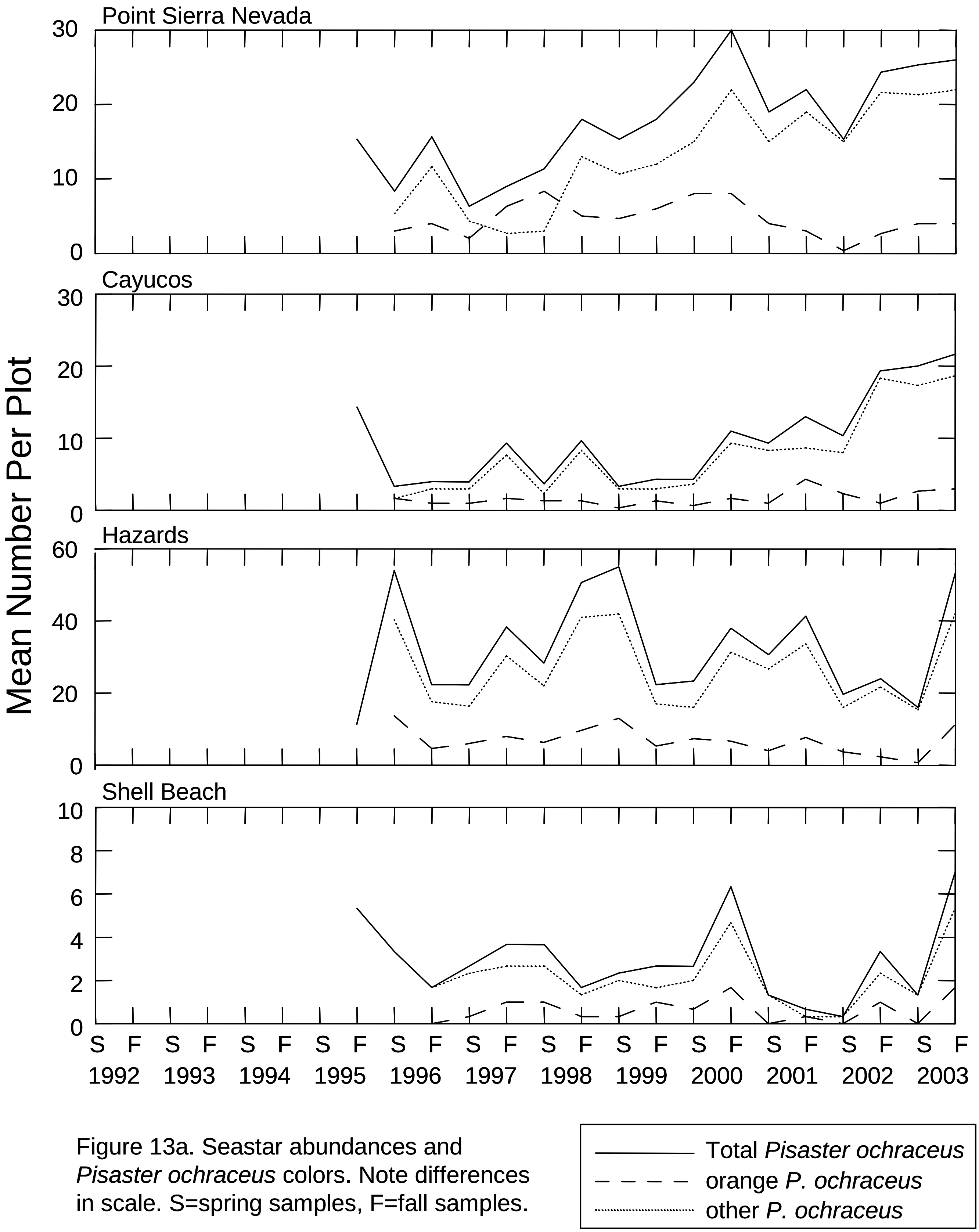


Figure 13a. Seastar abundances and *Pisaster ochraceus* colors. Note differences in scale. S=spring samples, F=fall samples.

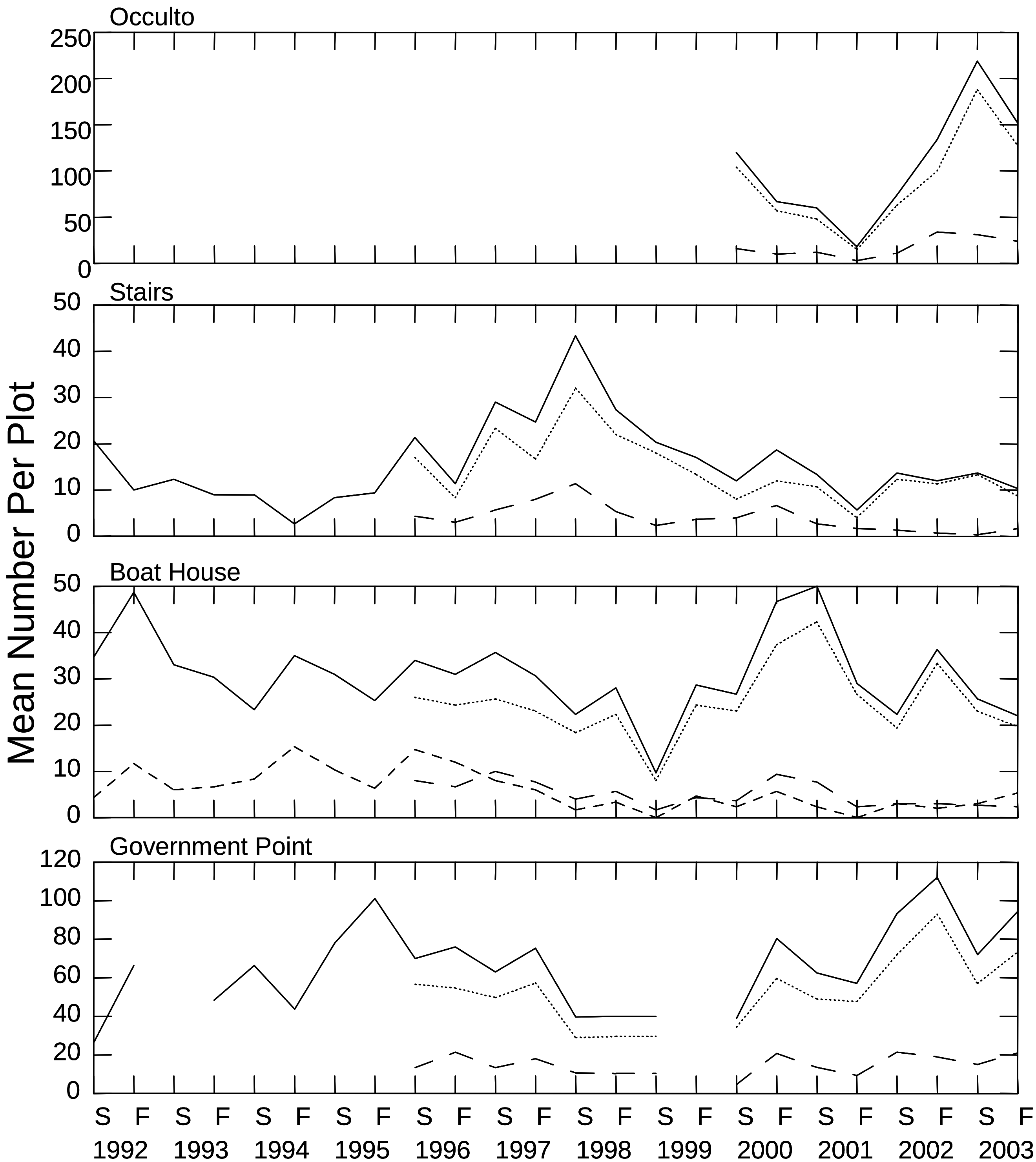
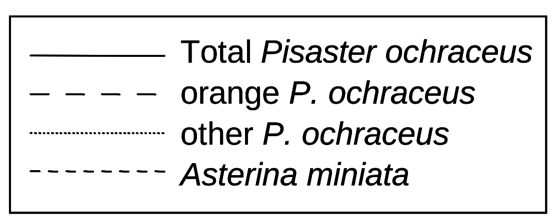


Figure 13b. Seastar abundances and *Pisaster ochraceus* colors. Note differences in scale. Gov't. Pt. plot #1 was not sampled S92 or S01 and no plots were sampled S93 or F99. S=spring samples, F=fall samples.



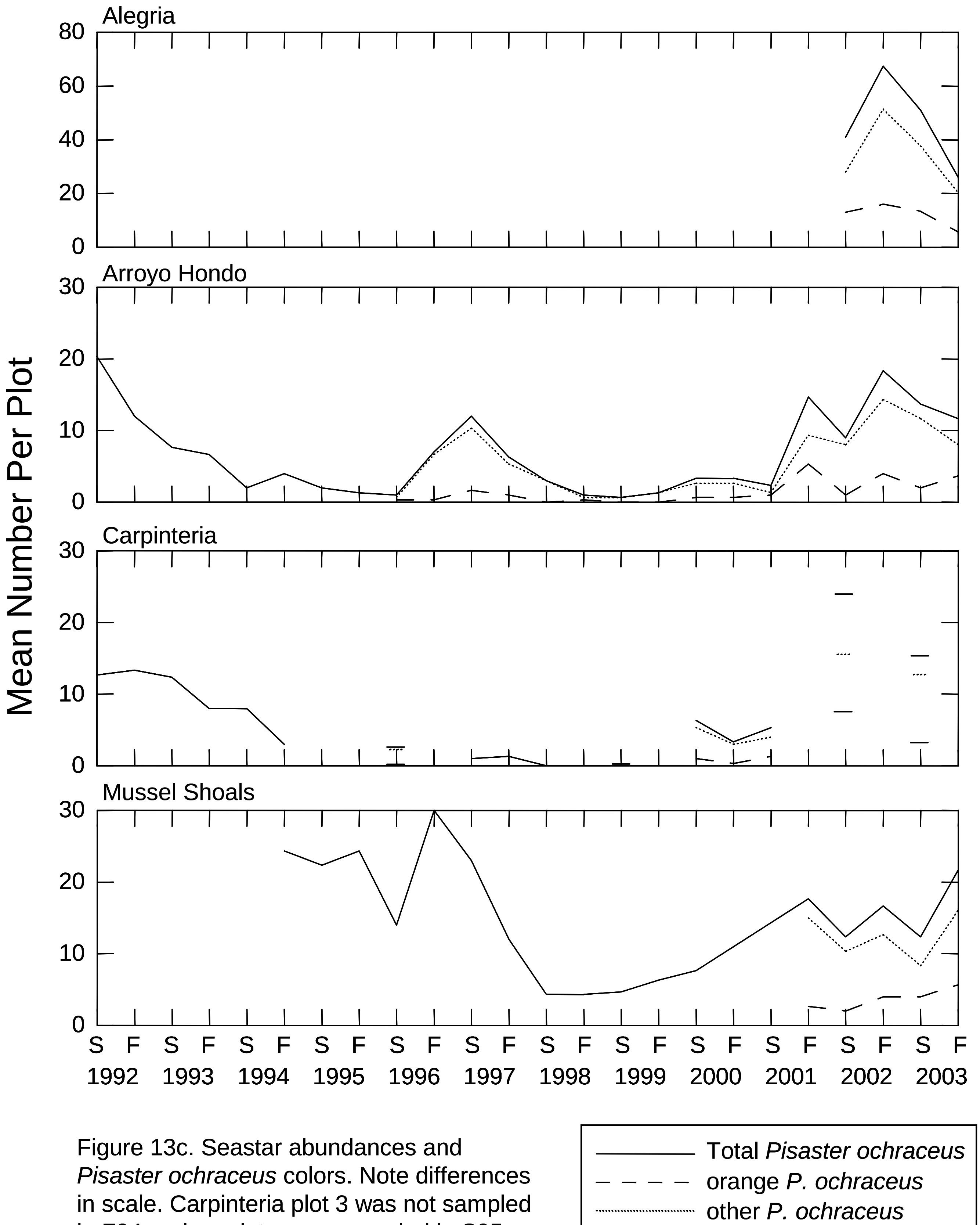


Figure 13c. Seastar abundances and *Pisaster ochraceus* colors. Note differences in scale. Carpinteria plot 3 was not sampled in F94 and no plots were sampled in S95, F95, F96, F98, F99, F01, F02 or F03. S=spring samples, F=fall samples.

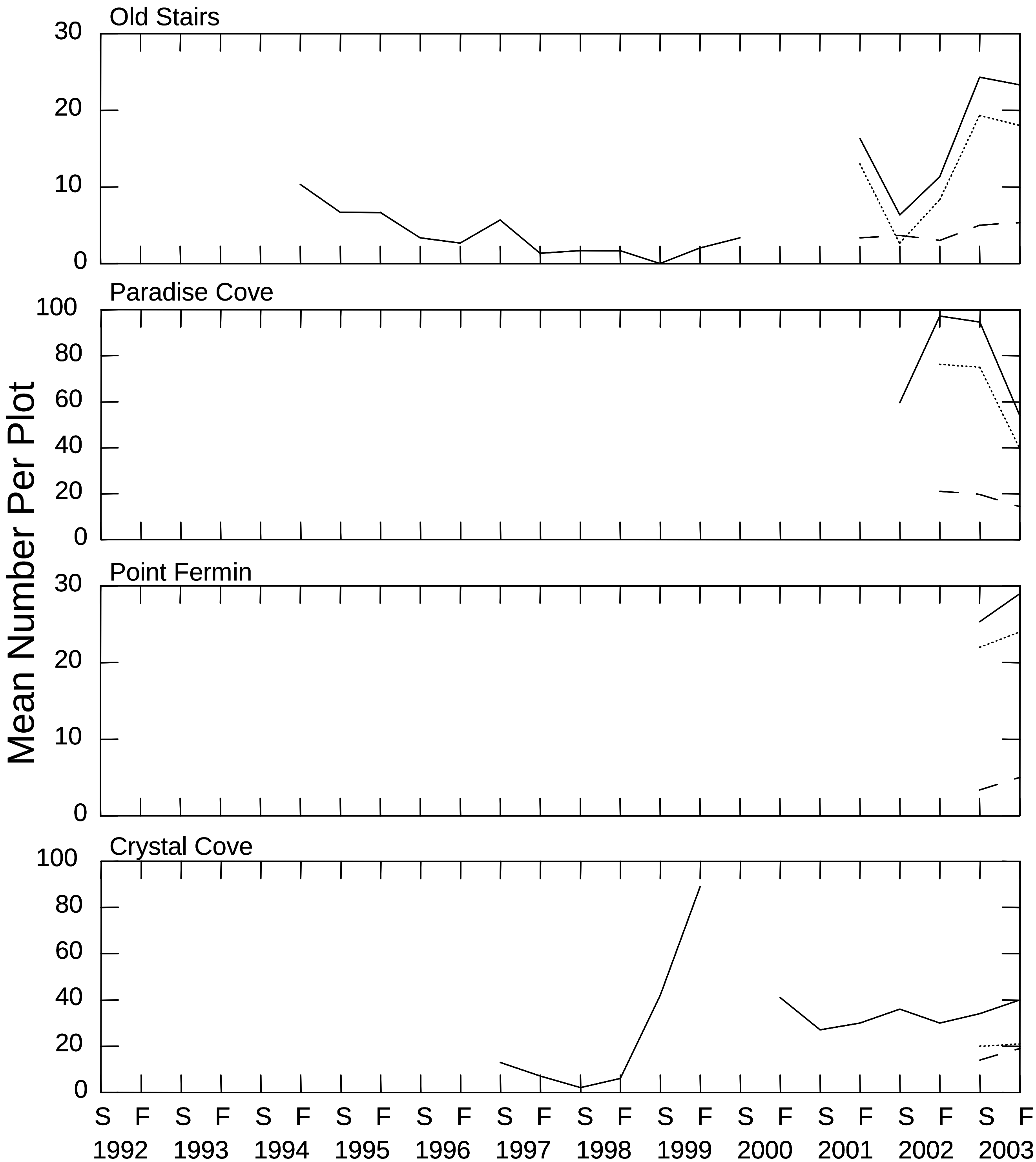


Figure 13d. Seastar abundances and *Pisaster ochraceus* colors. Old Stairs was not sampled in F00 or S01. Crystal Cove was not sampled in S00. Note differences in scale. S=spring samples, F=fall samples.

Total *Pisaster ochraceus*
orange *P. ochraceus*
other *P. ochraceus*

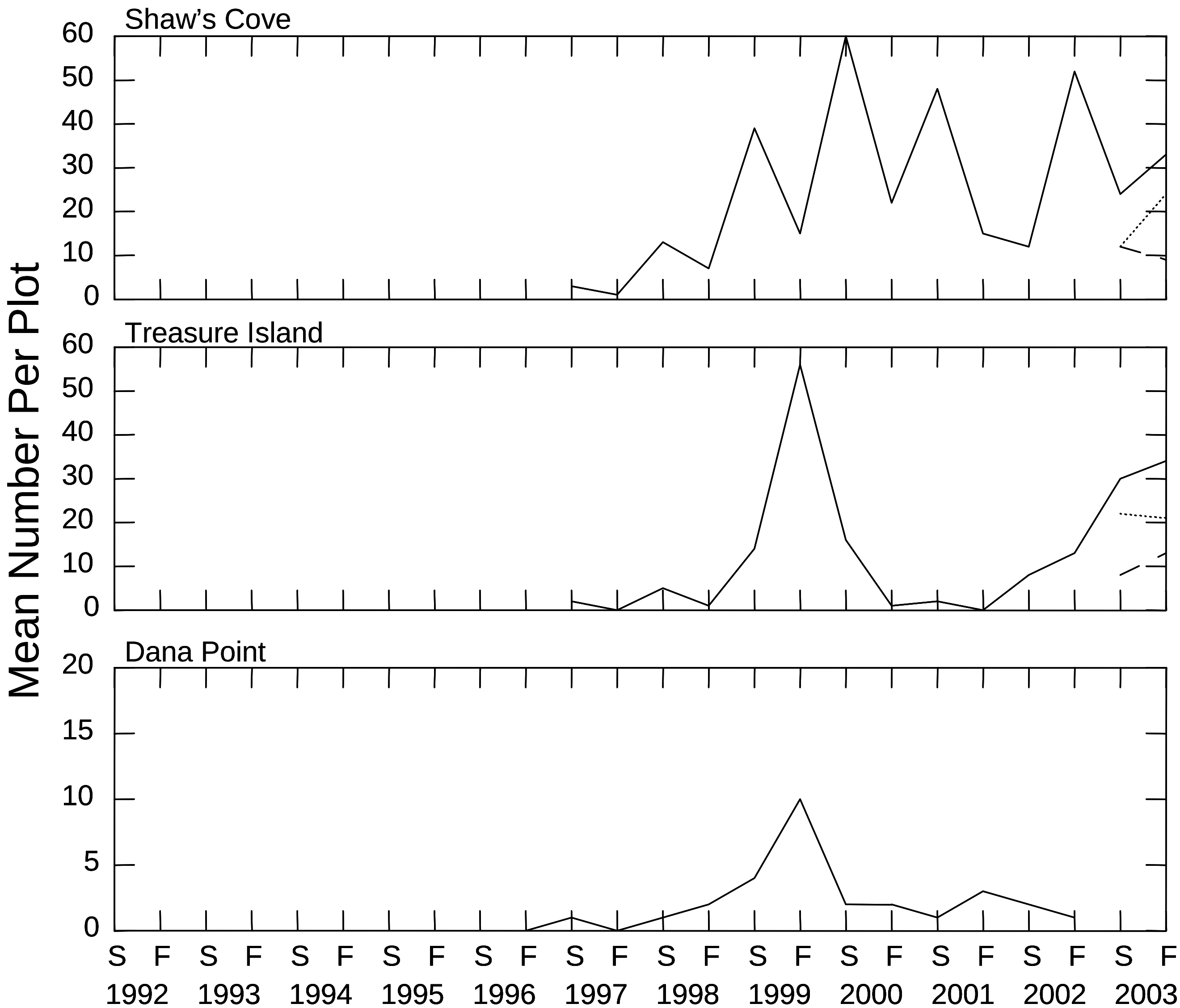
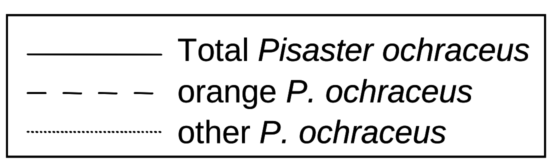


Figure 13e. Seastar abundances and *Pisaster ochraceus* colors. Note differences in scale. S=spring samples, F=fall samples.



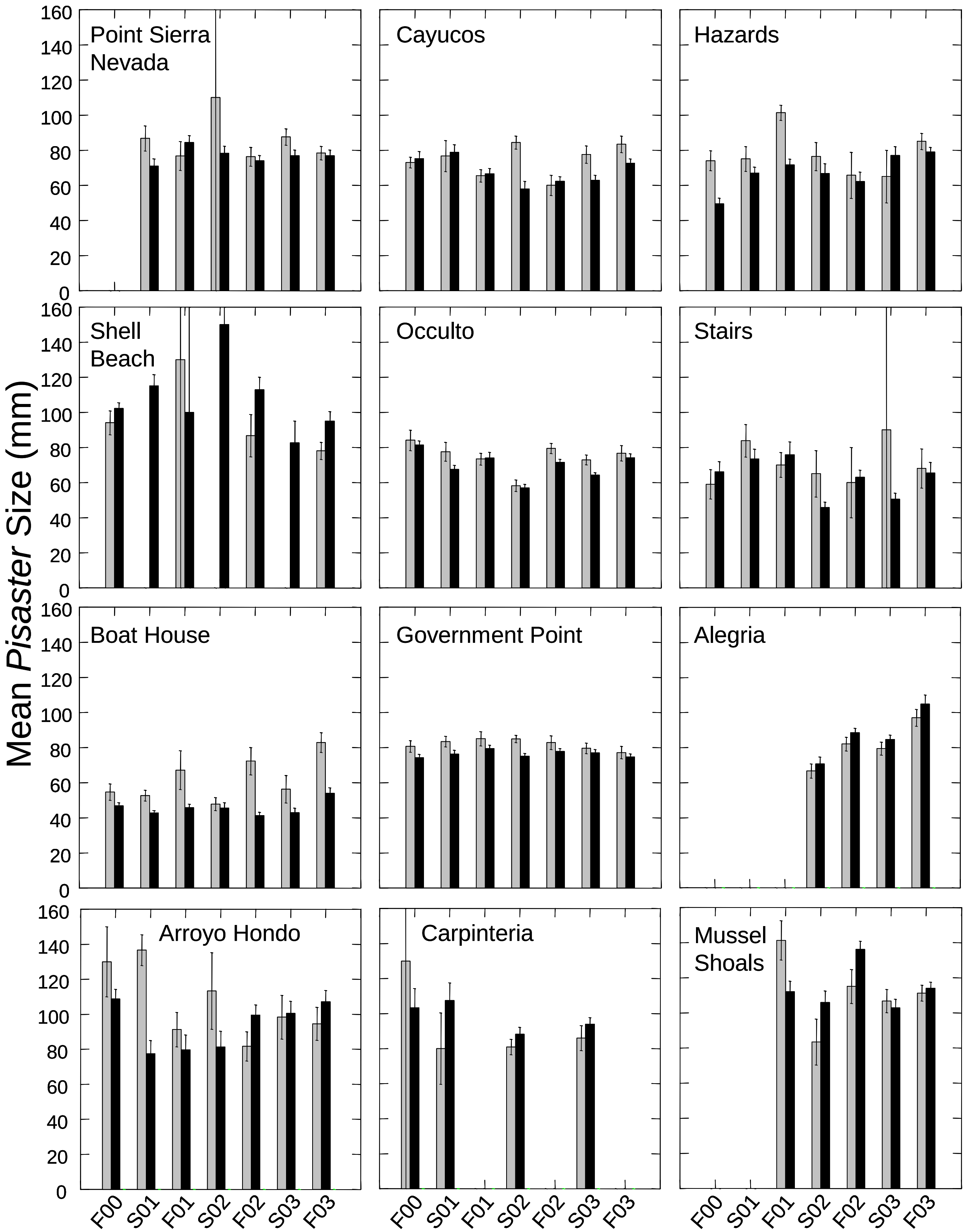


Figure 14a. *Pisaster ochraceus* mean size. Carpinteria was not sampled in F01, F02, or F03. S=spring samples, F=fall samples.

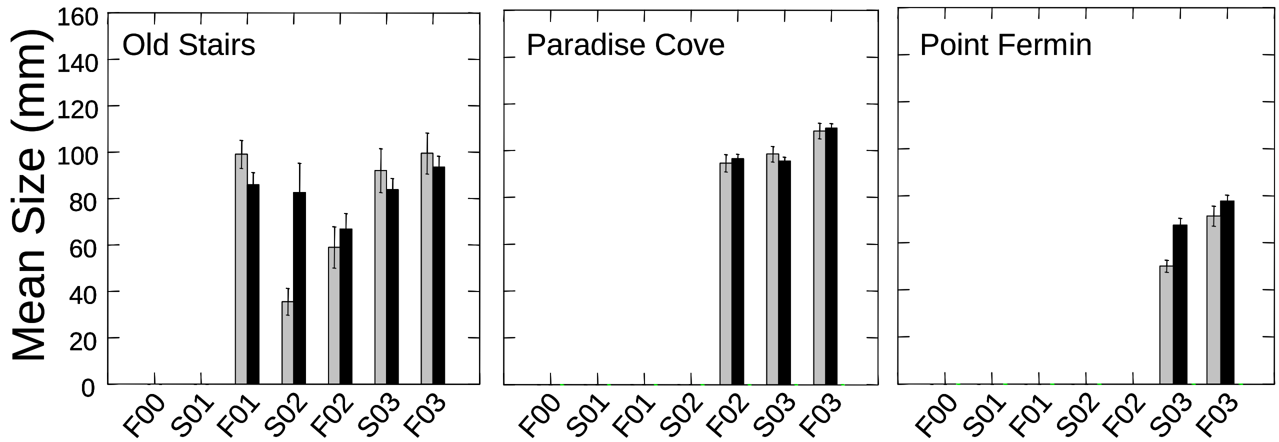
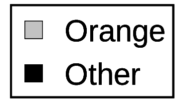


Figure 14b. *Pisaster ochraceus* mean size. S=spring samples, F=fall samples.



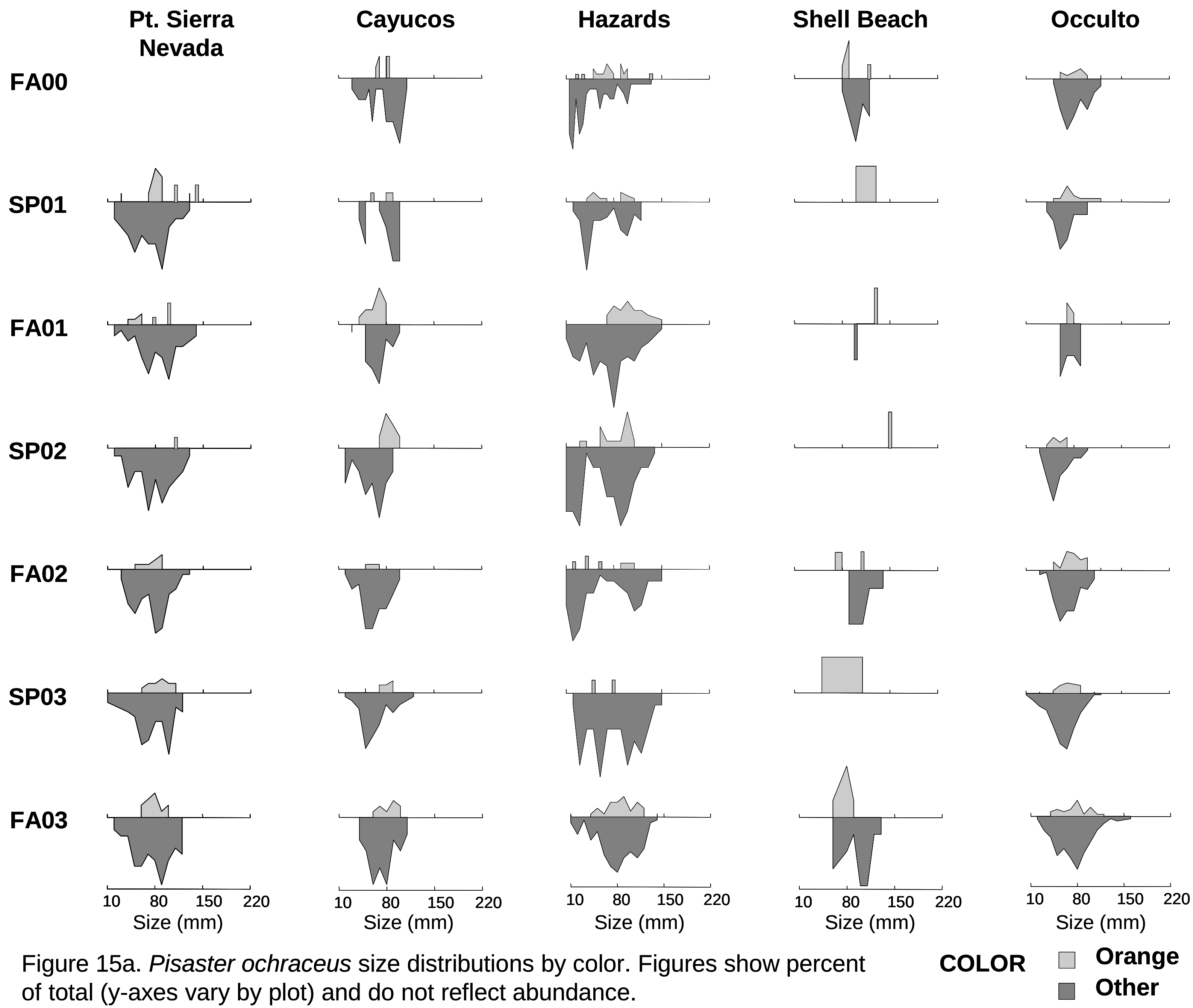


Figure 15a. *Pisaster ochraceus* size distributions by color. Figures show percent of total (y-axes vary by plot) and do not reflect abundance.

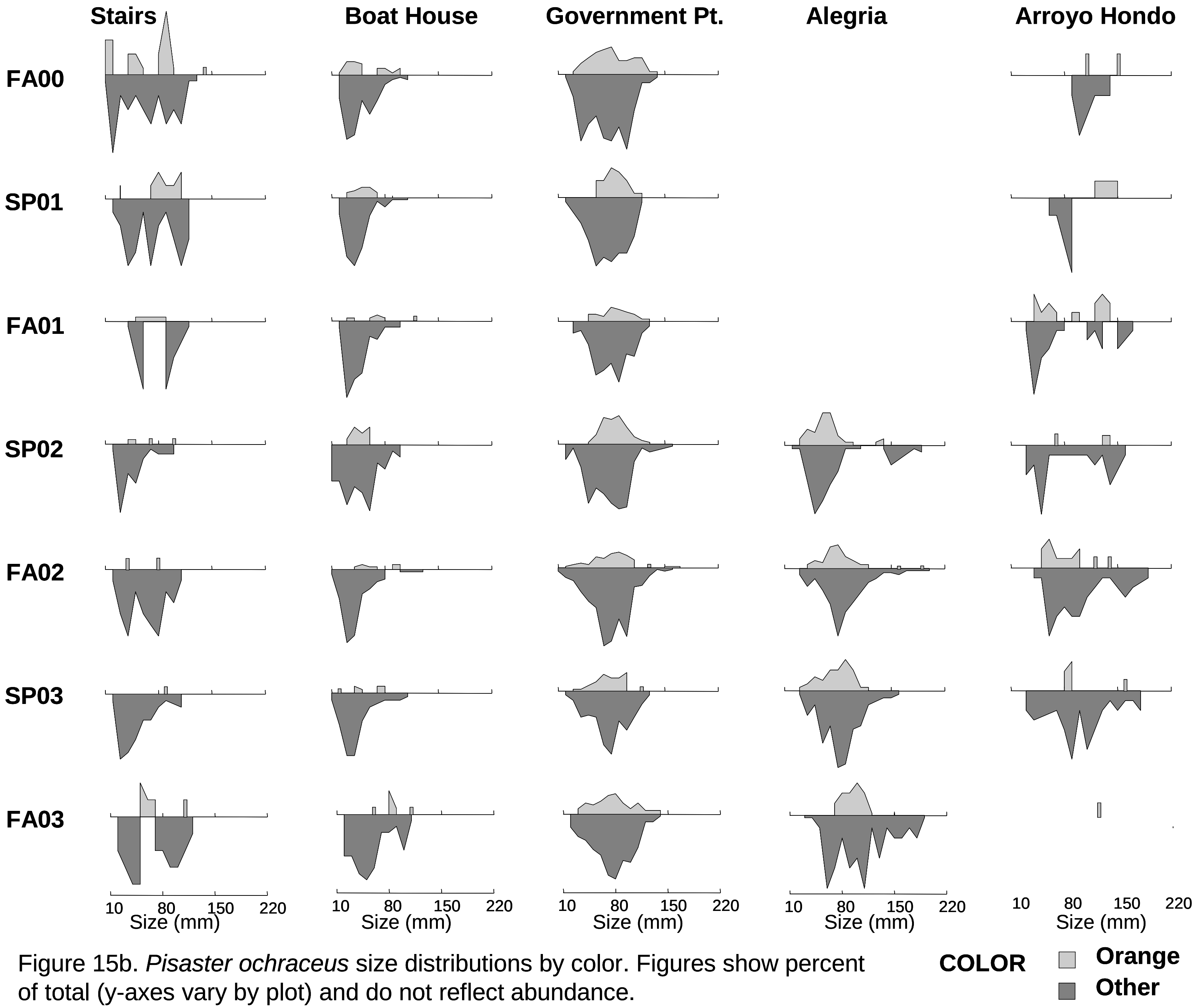


Figure 15b. *Pisaster ochraceus* size distributions by color. Figures show percent of total (y-axes vary by plot) and do not reflect abundance.

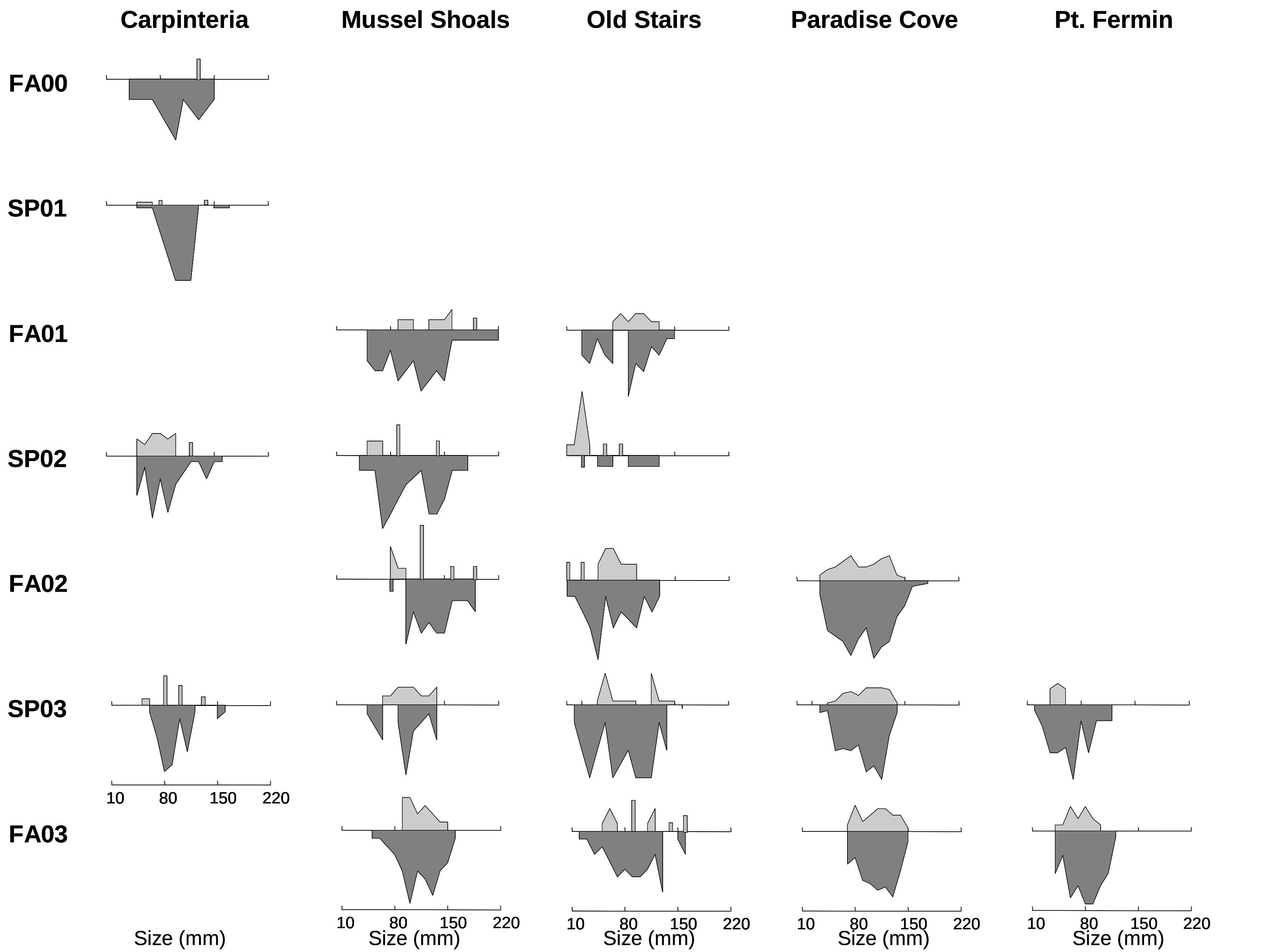


Figure 15c. *Pisaster ochraceus* size distributions by color. Figures show percent of total (y-axes vary by plot) and do not reflect abundance. Carpinteria was not sampled FA01, FA02, or FA03.

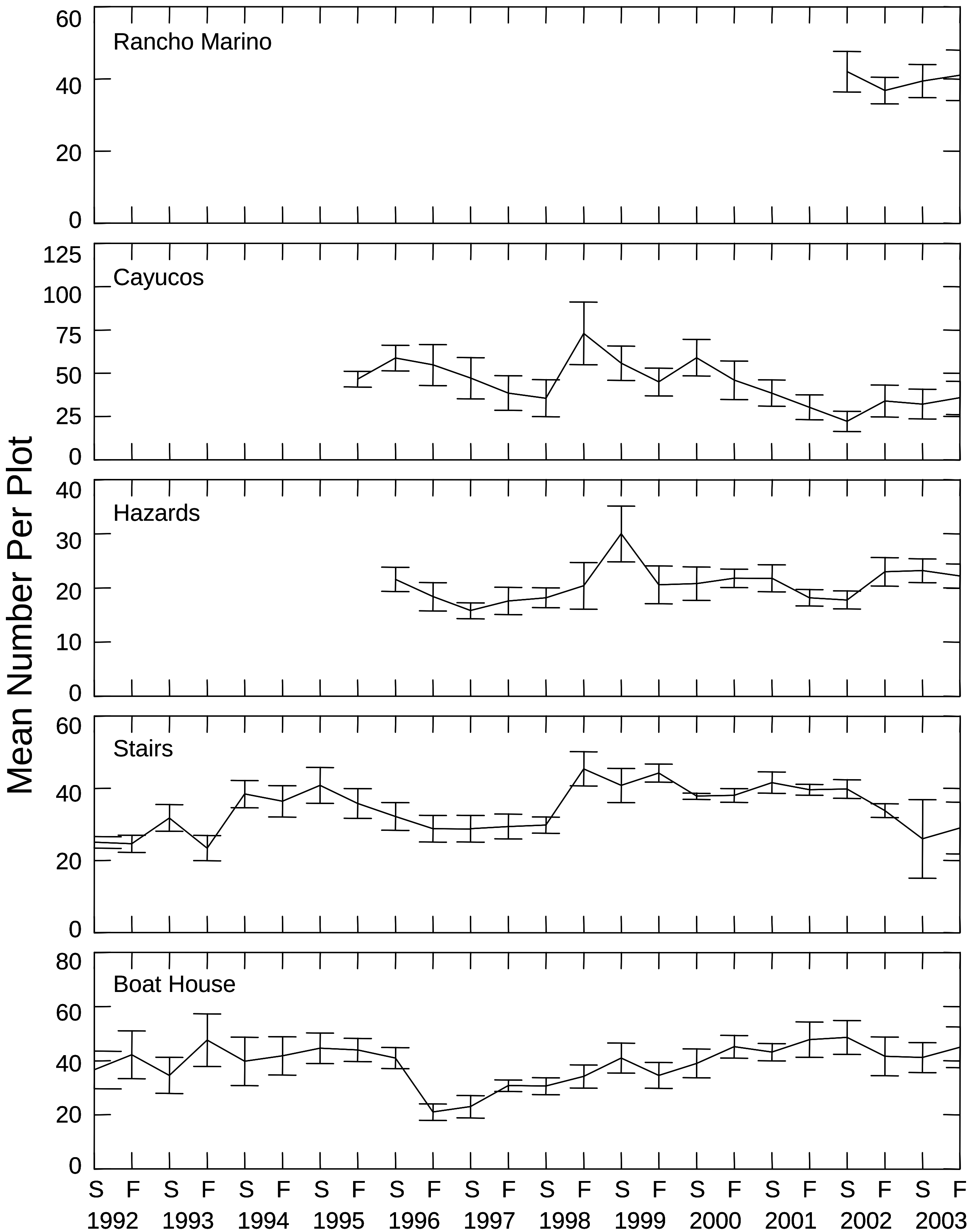


Figure 16a. *Lottia gigantea* abundances. Note differences in scale. S=spring samples, F=fall samples.

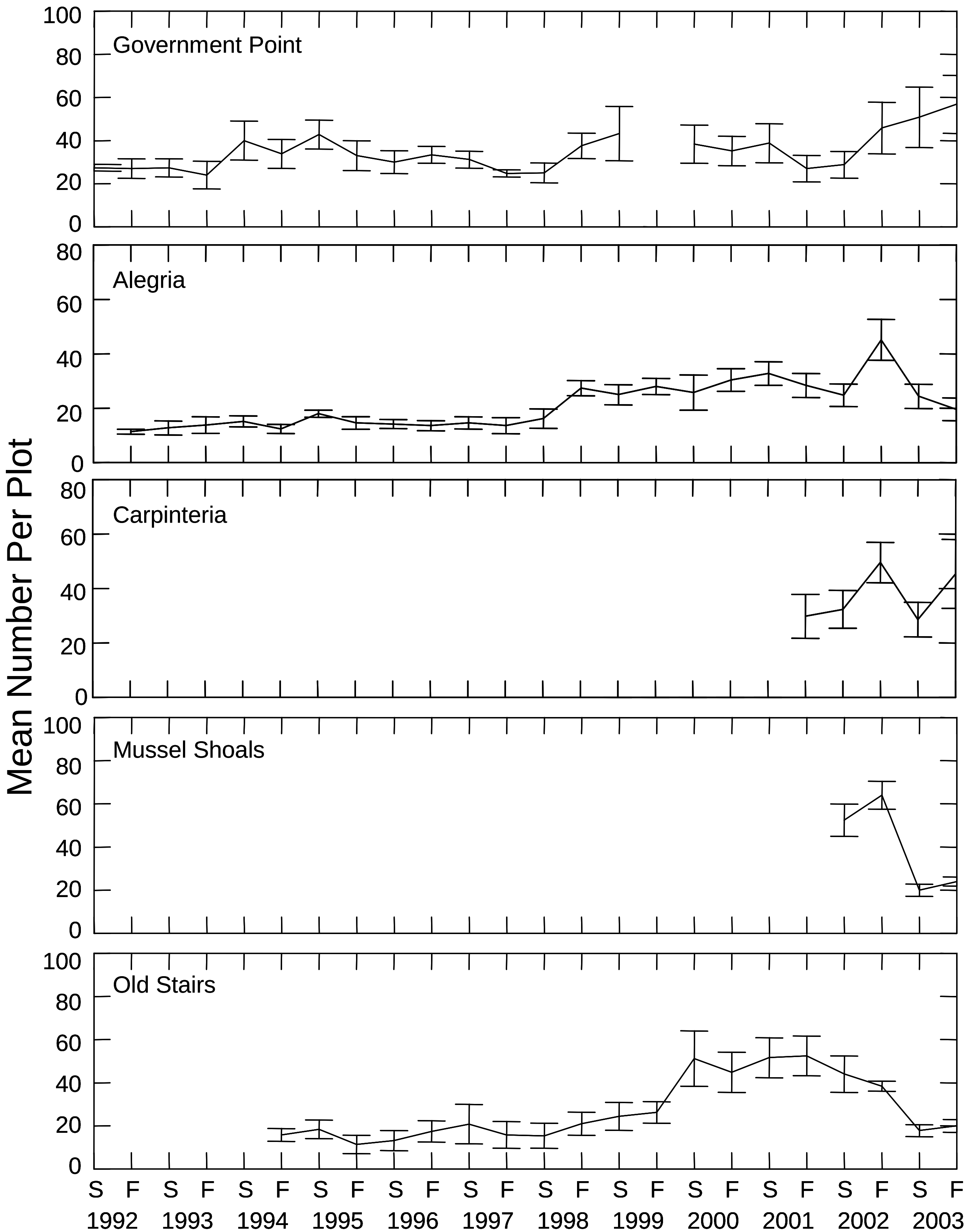


Figure 16b. *Lottia gigantea* abundances. Gov't. Pt. was not sampled in F99. Note differences in scale. S=spring samples, F=fall samples.

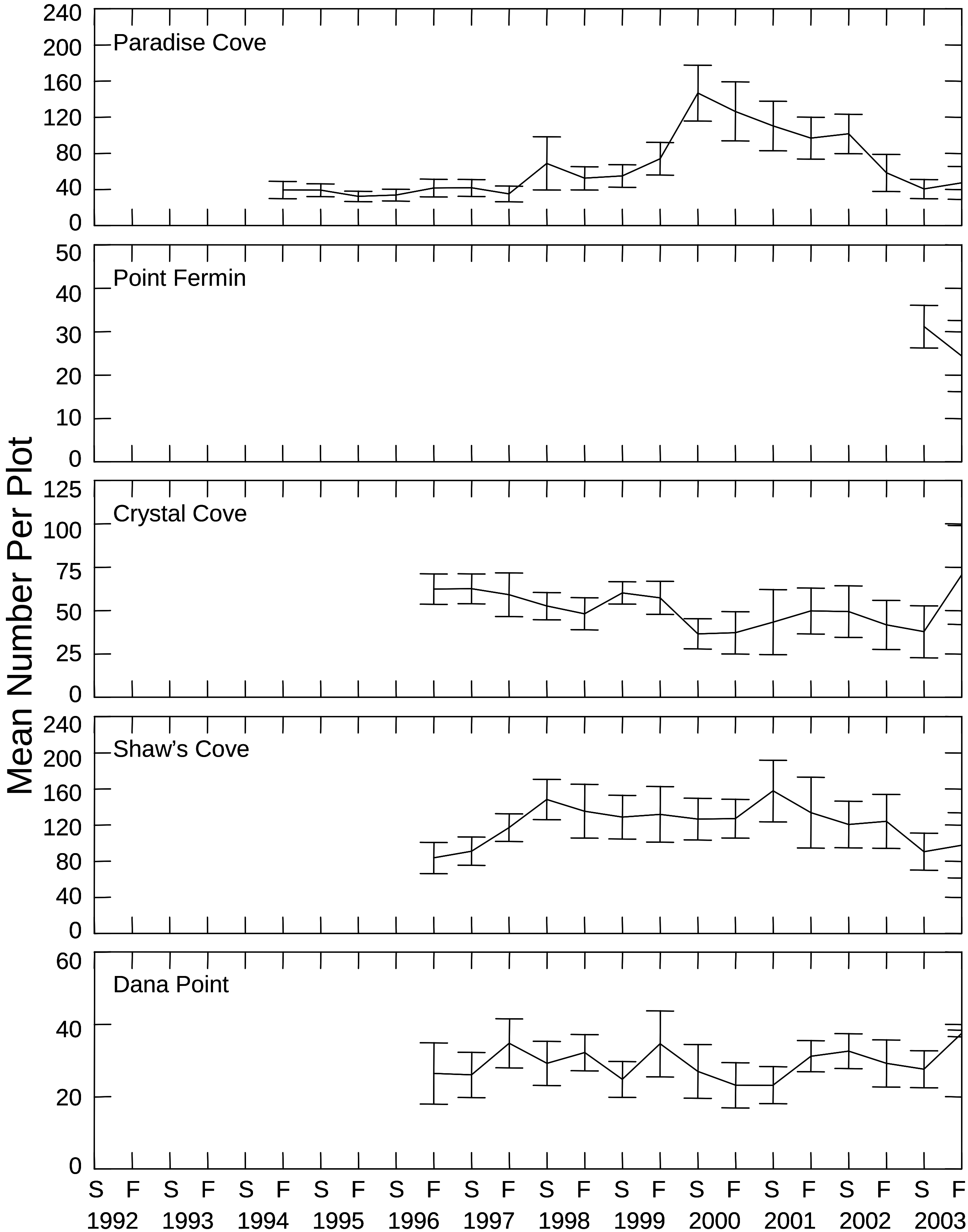


Figure 16c. *Lottia gigantea* abundances. One additional plot was added at Crystal Cove in S01. See text for details. Note differences in scale. S=spring samples, F=fall samples.

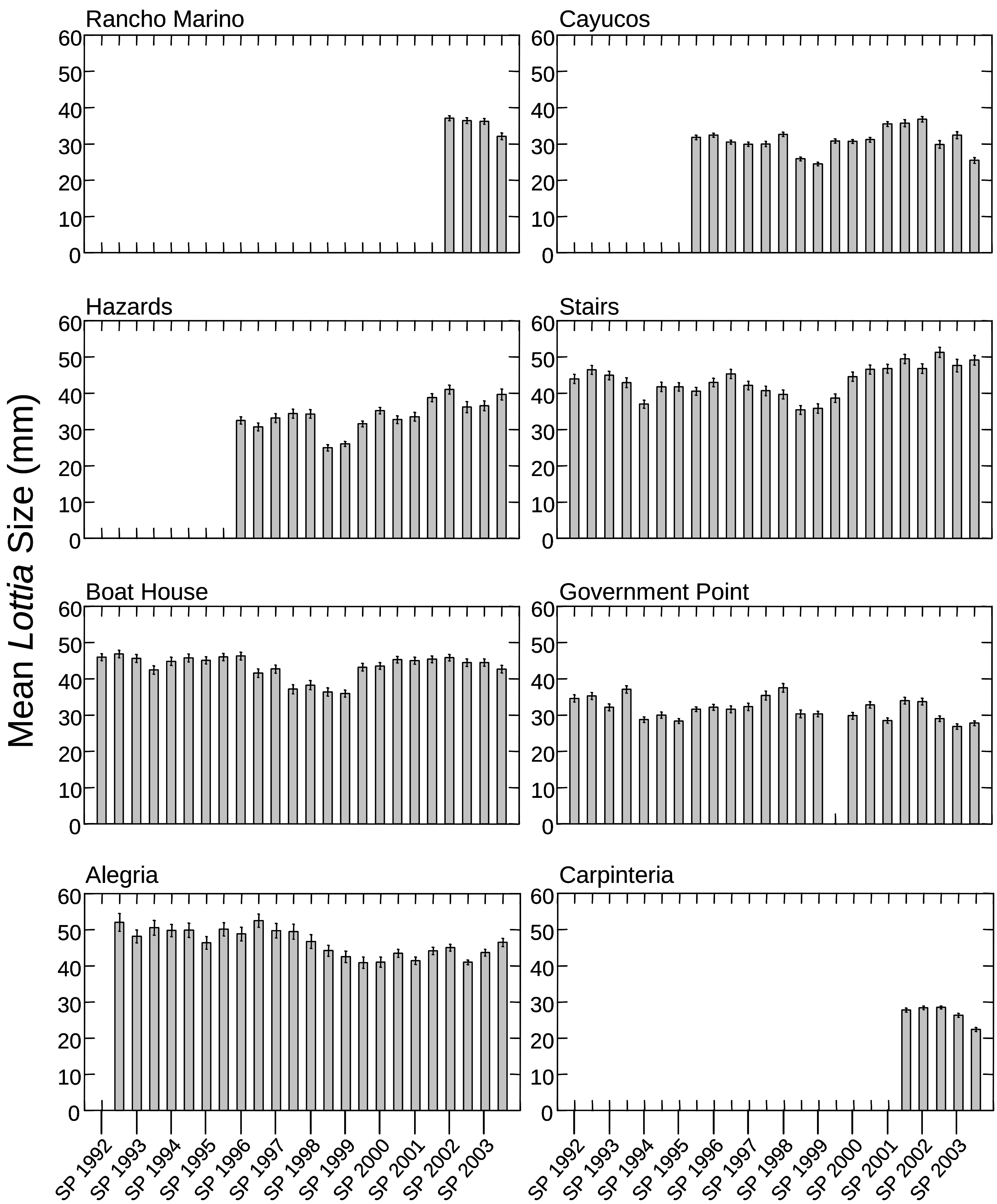


Figure 17a. *Lottia gigantea* mean size. Only spring samples are labeled. Unlabeled bars represent fall samples. Gov't. Pt. was not sampled in FA99.

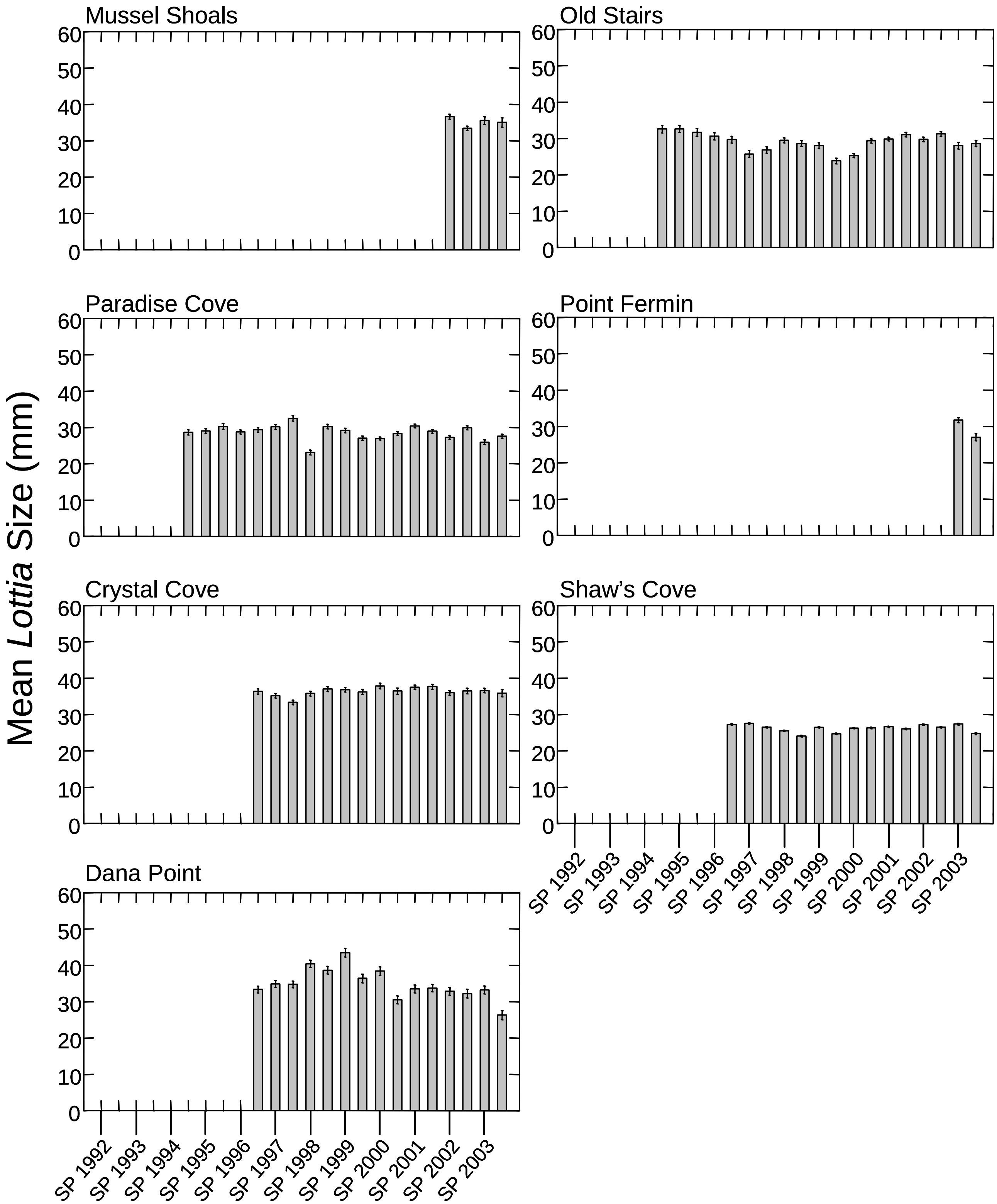


Figure 17b. *Lottia gigantea* mean size. Only spring samples are labeled. Unlabeled bars represent fall samples.

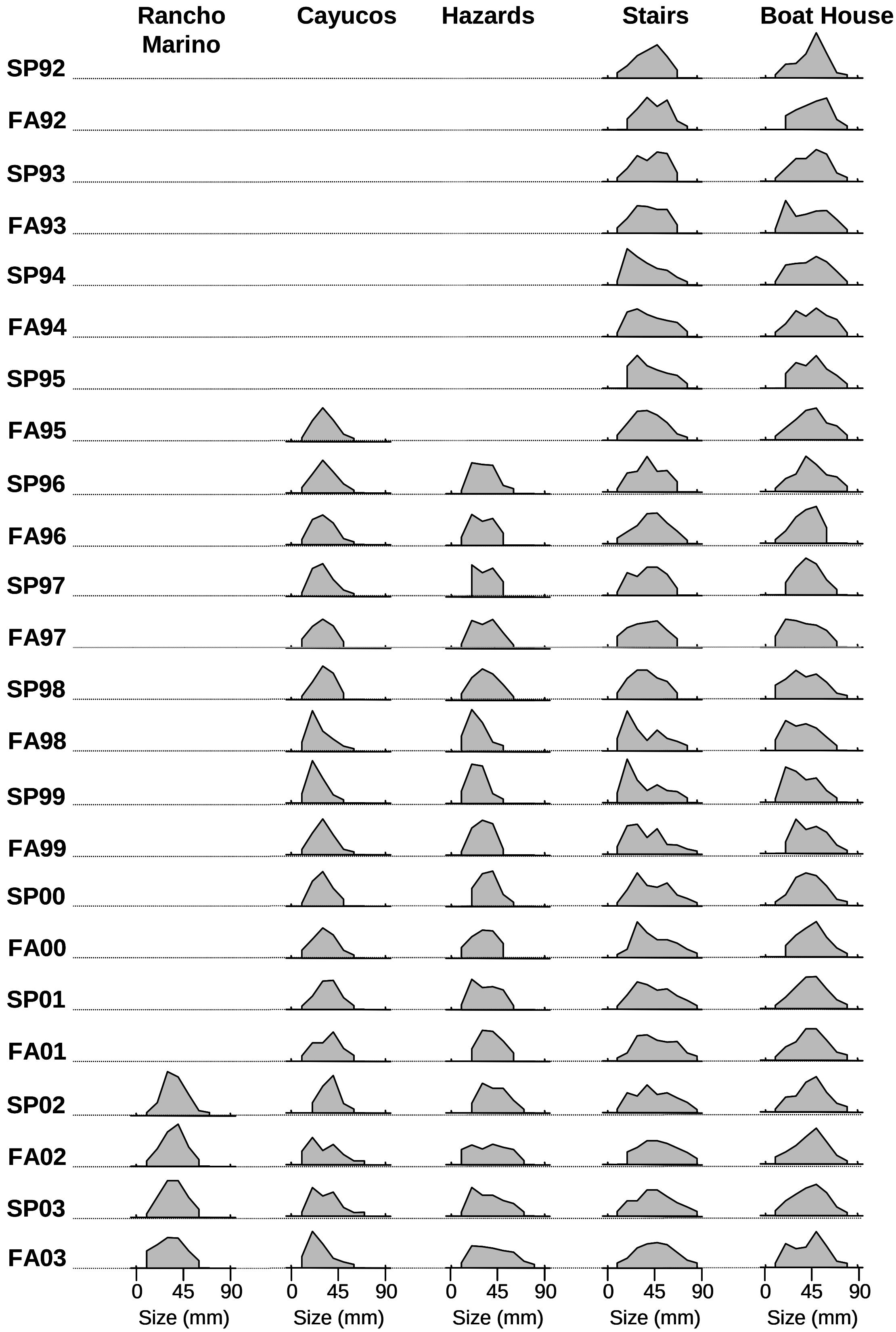


Figure 18a. *Lottia gigantea* size distributions. SP=spring sample, FA=fall sample.

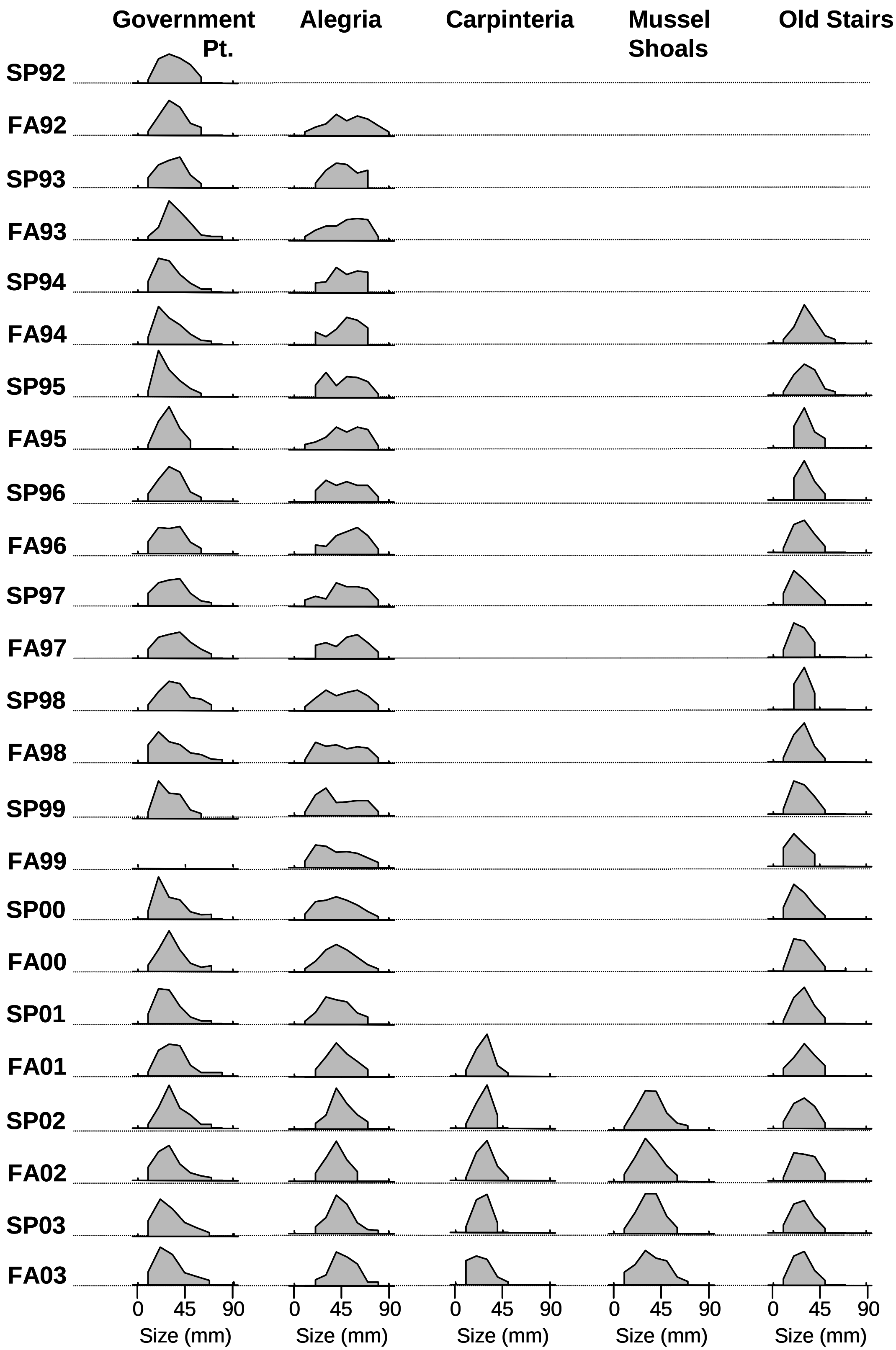


Figure 18b. *Lottia gigantea* size distributions. Government Pt. was not sampled FA99

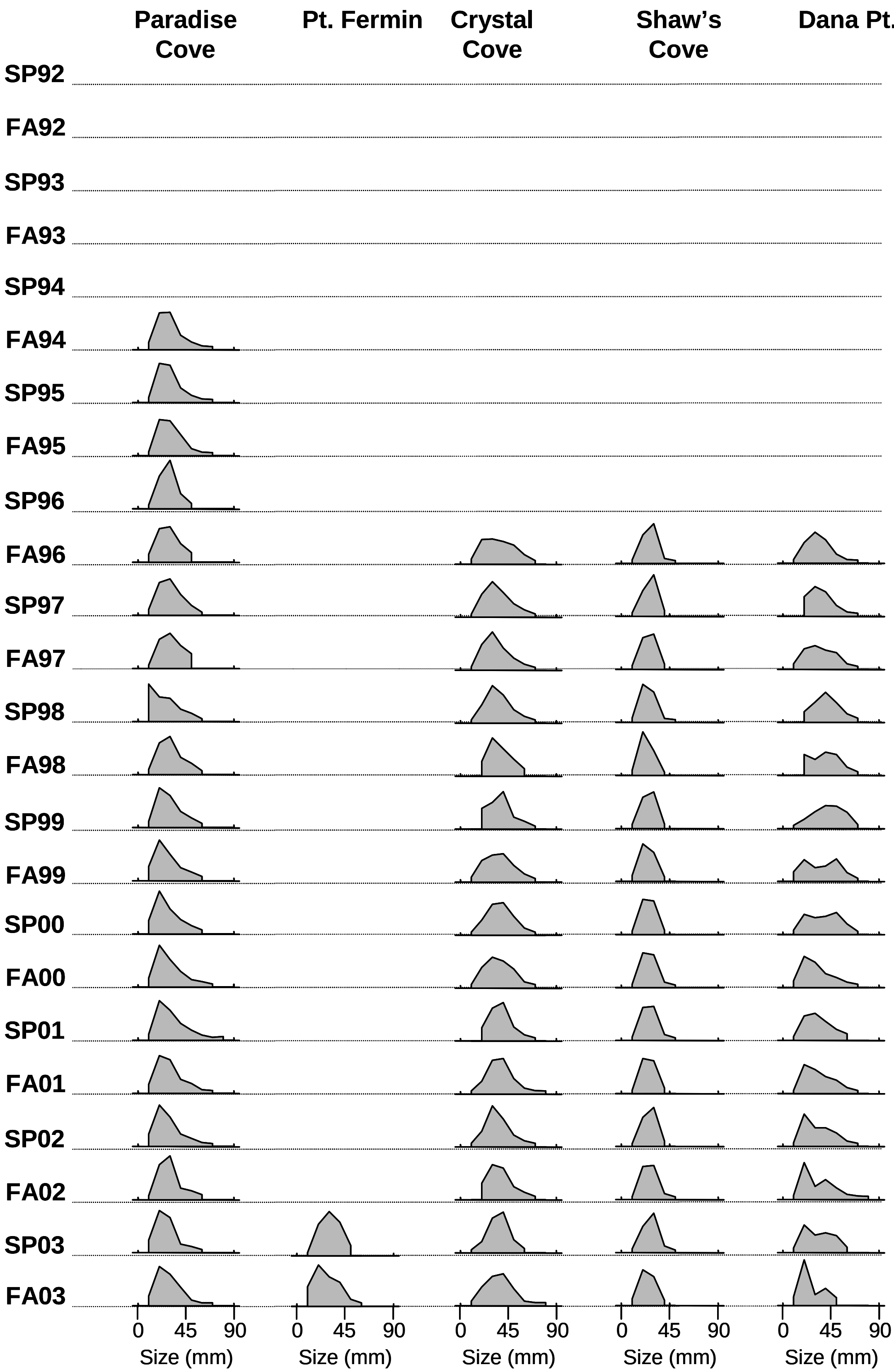


Figure 18c. *Lottia gigantea* size distributions. SP=spring sample, FA=fall sample.

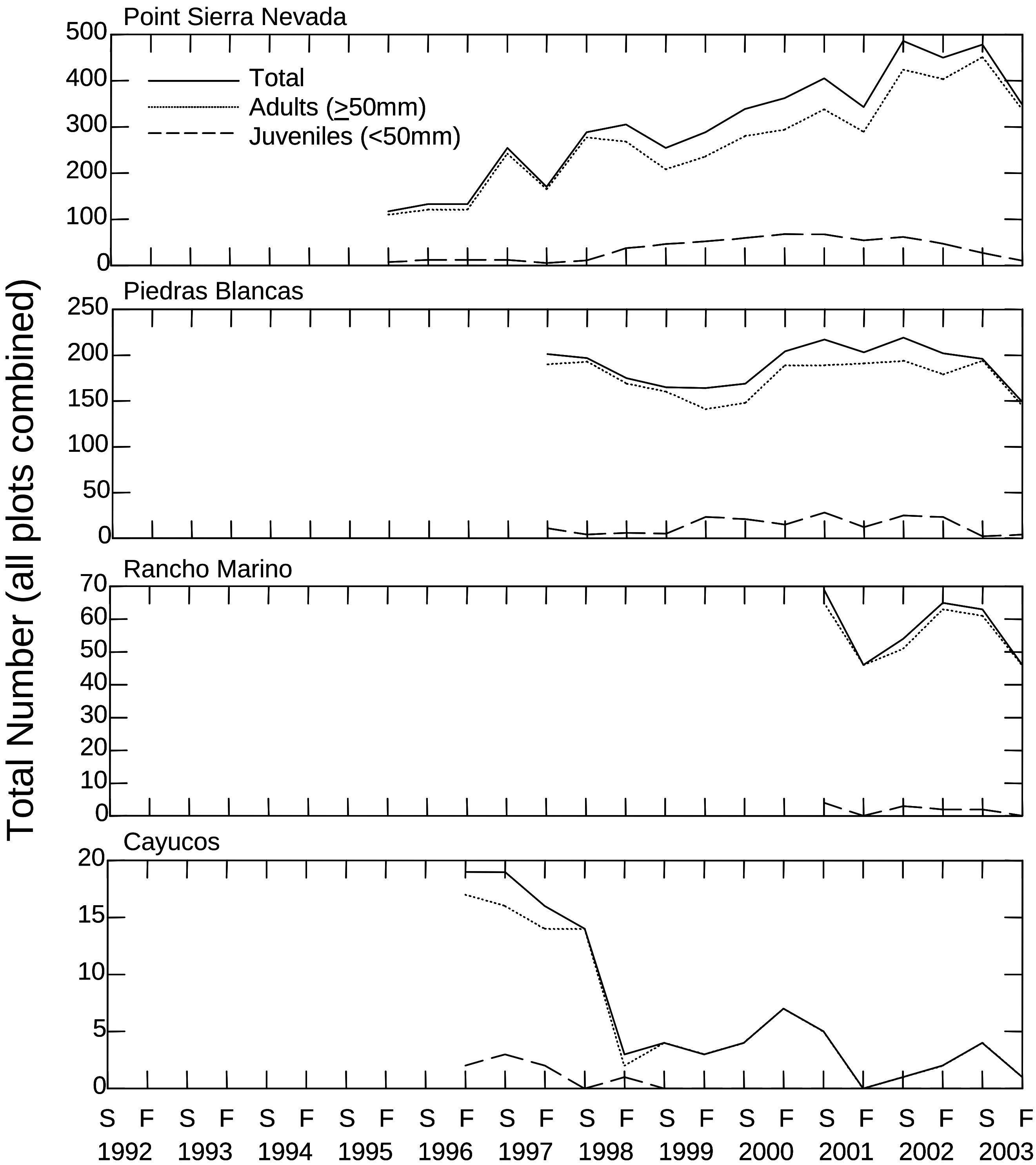


Figure 19a. Black abalone abundances. Note differences in scale. Two additional plots were added at PSN in S97. One plot was added at Piedras in S00. See text for details. Plot 4 was not sampled at PSN F97. S=spring samples, F=fall samples.

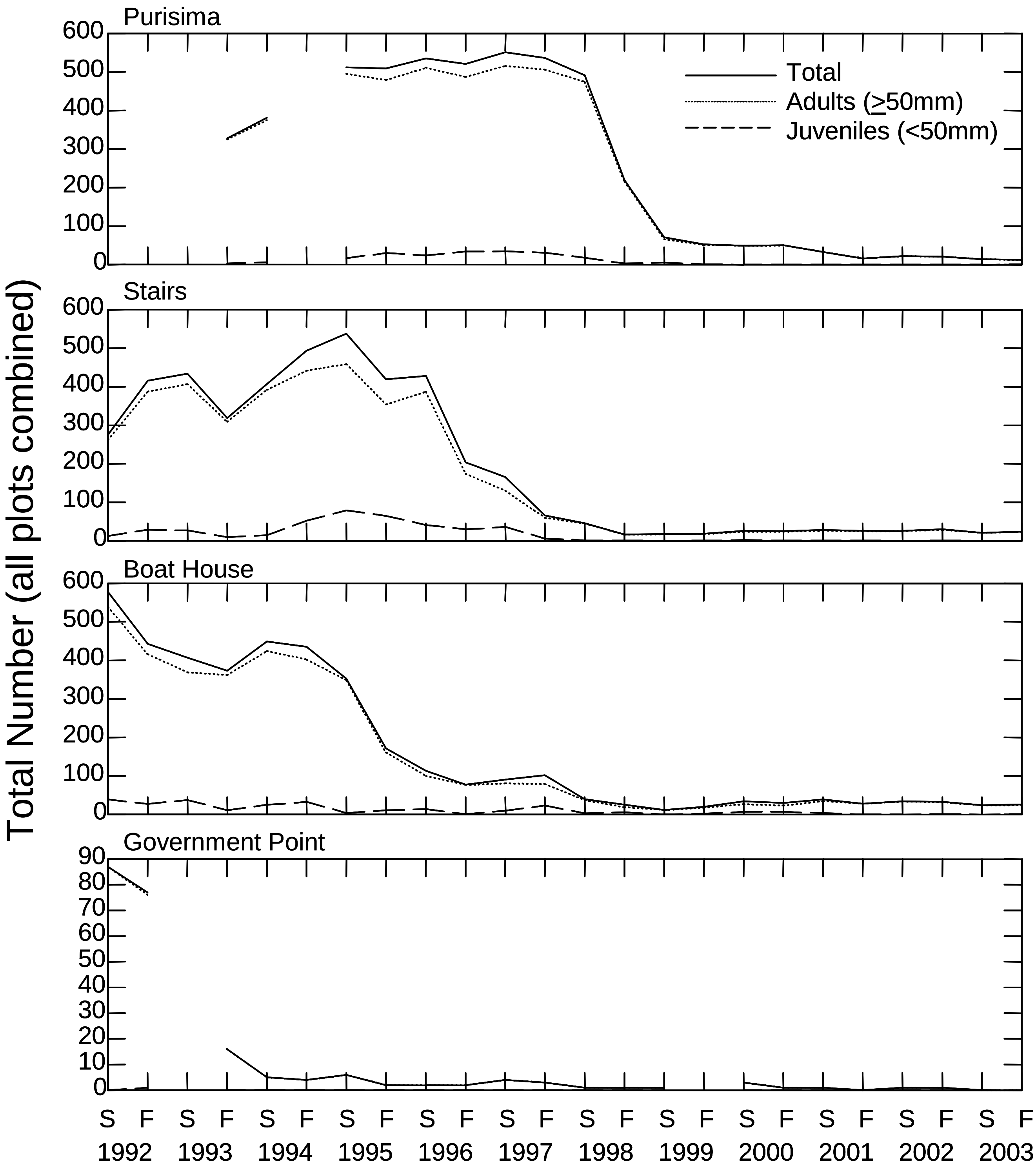


Figure 19b. Black abalone abundances. Note differences in scale. One additional plot was added at Stairs in S98. See text for details. Purisima was not sampled F94, and Gov't. Pt. was not sampled S93 or F99. Plot 1 was not sampled at Gov't. Pt. S92. S=spring samples, F=fall samples.

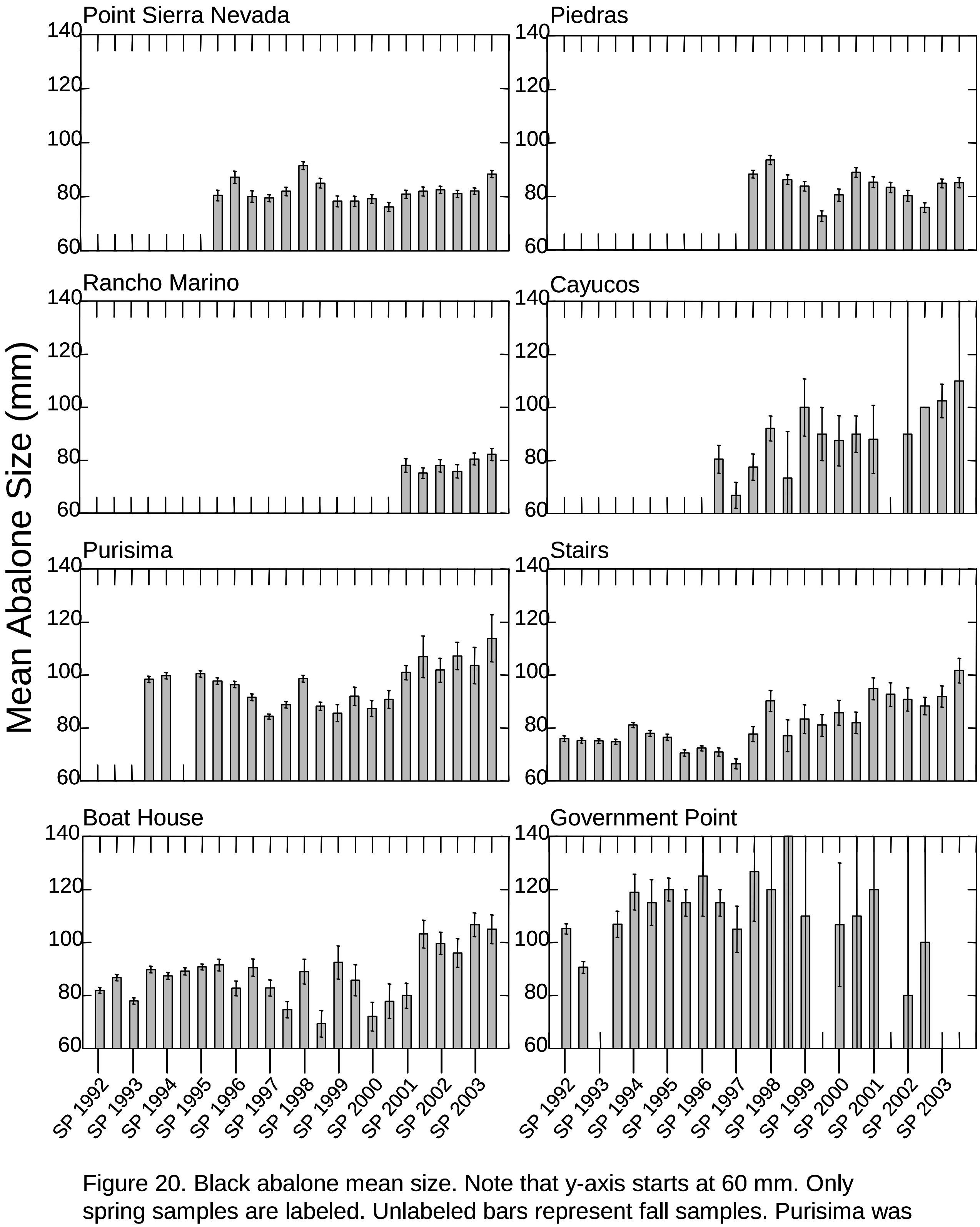


Figure 20. Black abalone mean size. Note that y-axis starts at 60 mm. Only spring samples are labeled. Unlabeled bars represent fall samples. Purisima was not sampled FA94, and Gov't. Pt. was not sampled SP93 or FA99.

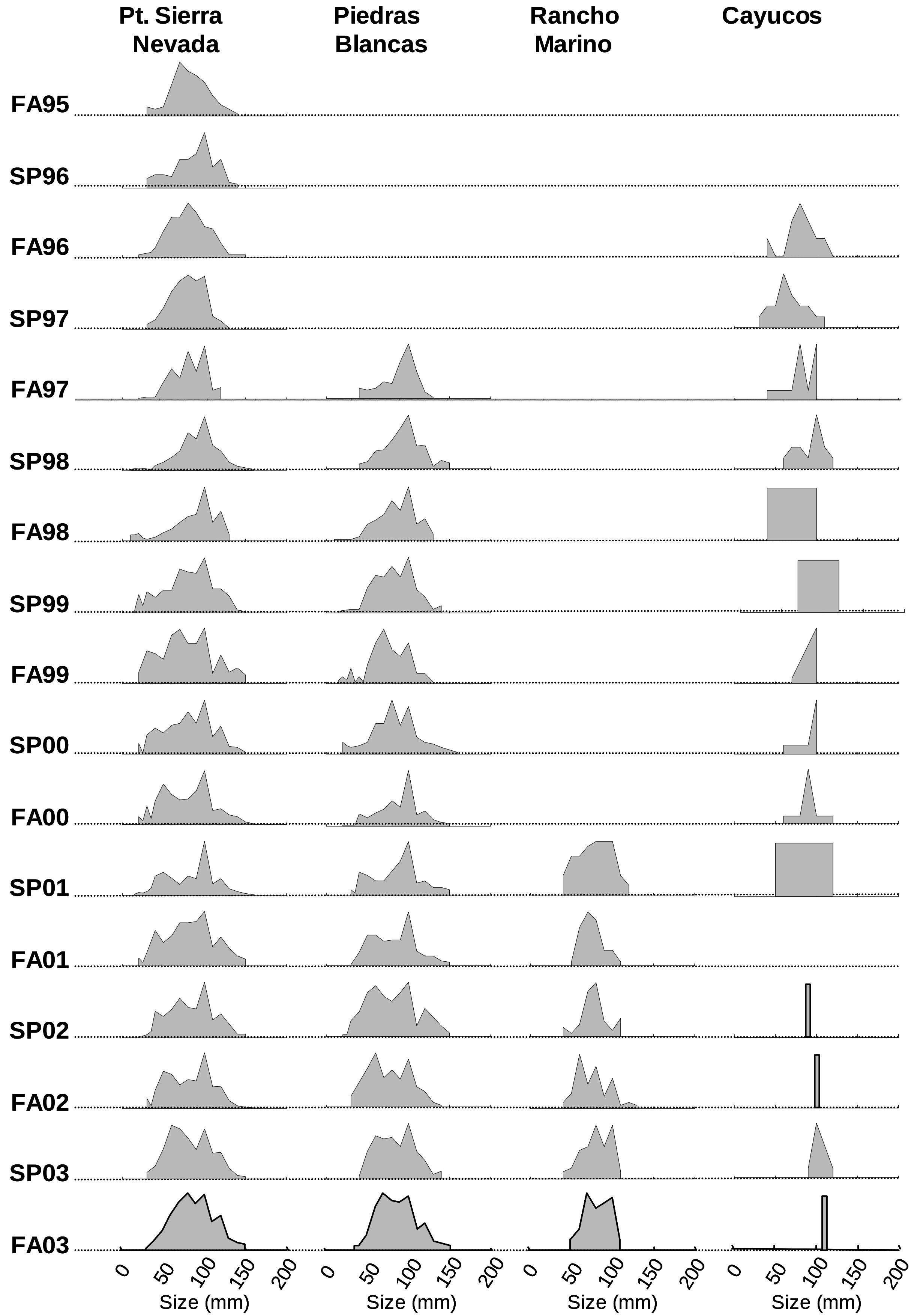


Figure 21a. Black abalone size distributions. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. See text for changes in sampling over time.

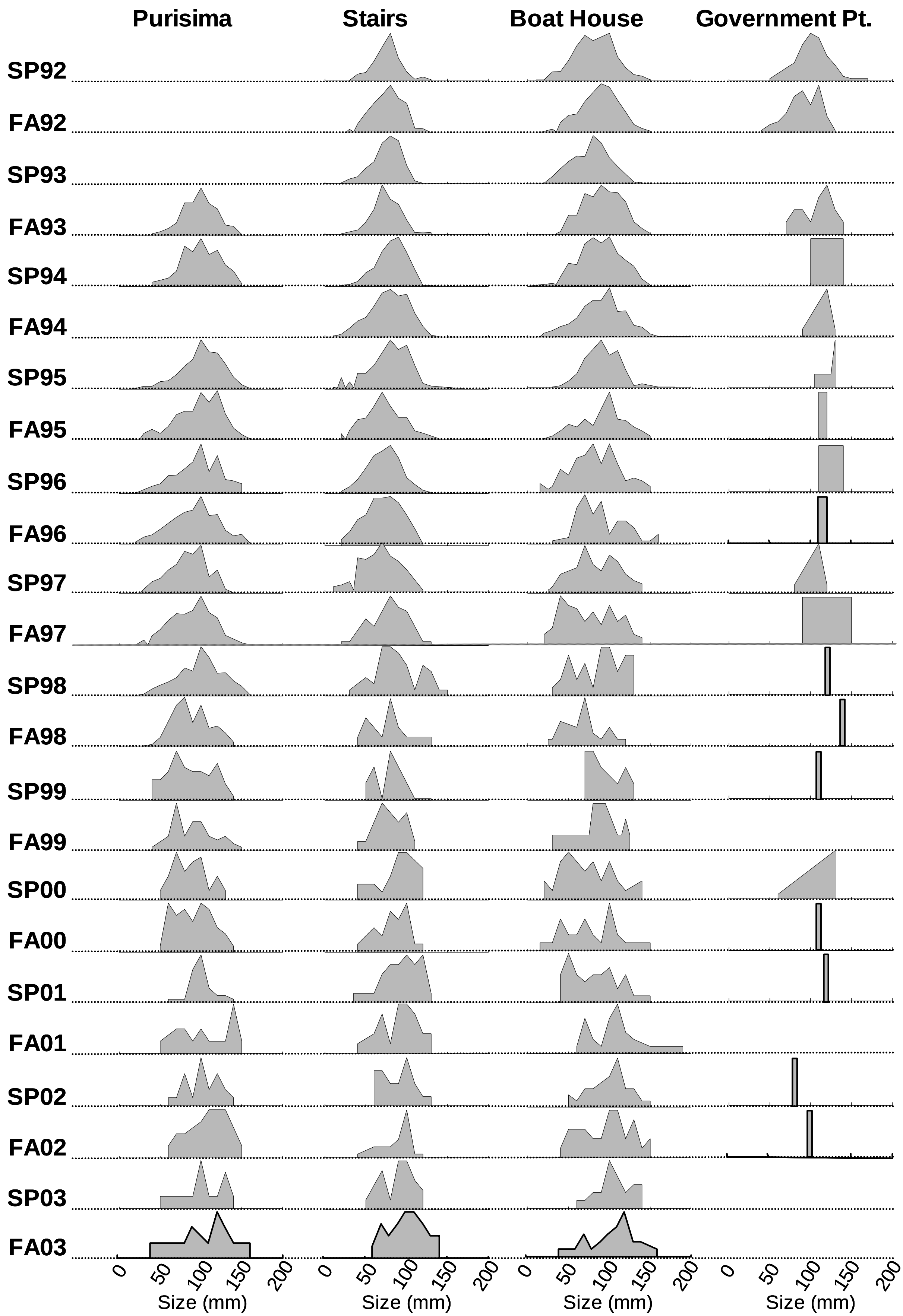


Figure 21b. Black abalone size distributions. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. See text for changes in sampling over time.

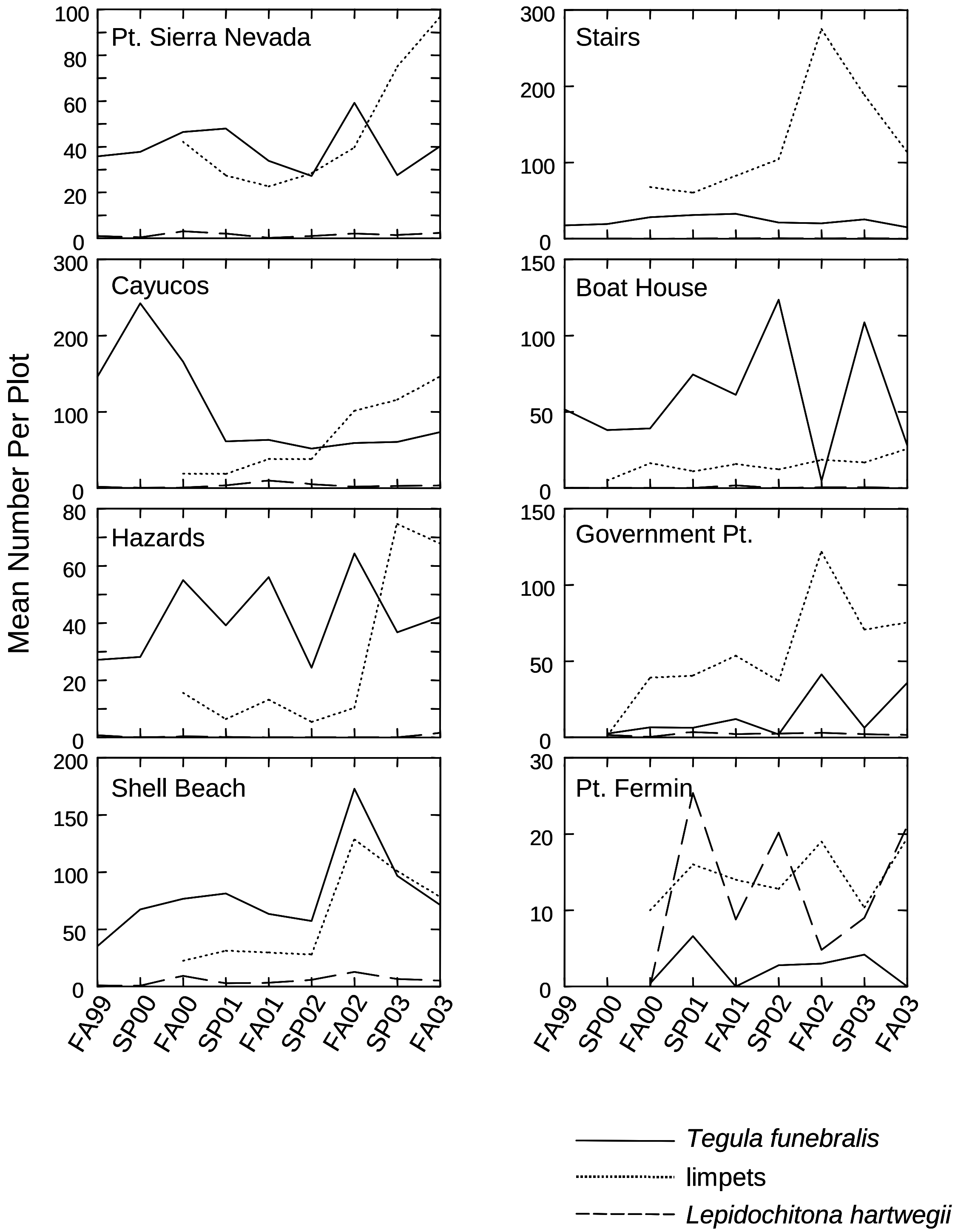


Figure 22. Common motile invertebrates in *Silvetia* plots. Note differences in scale.

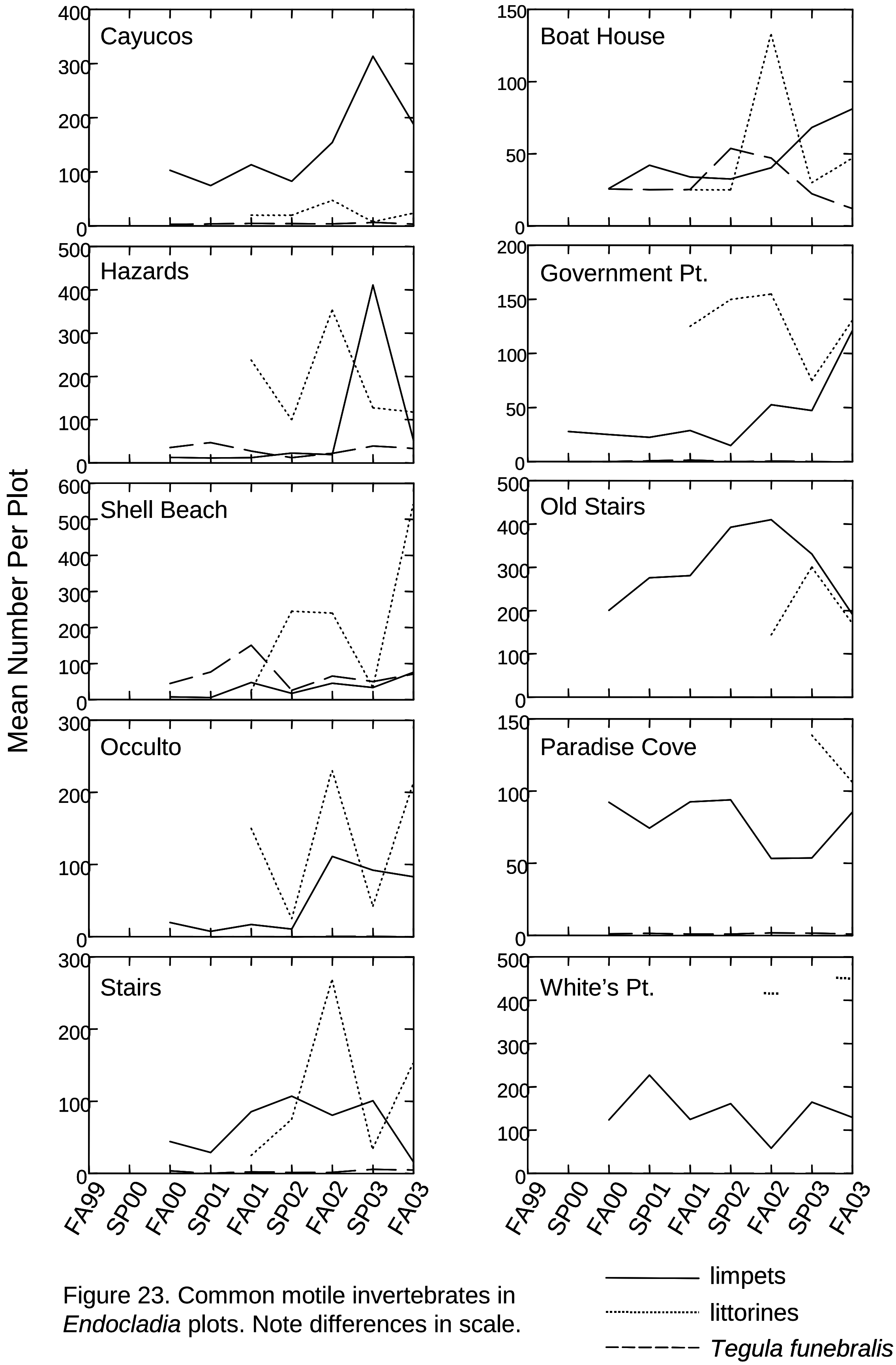


Figure 23. Common motile invertebrates in *Endocladia* plots. Note differences in scale.

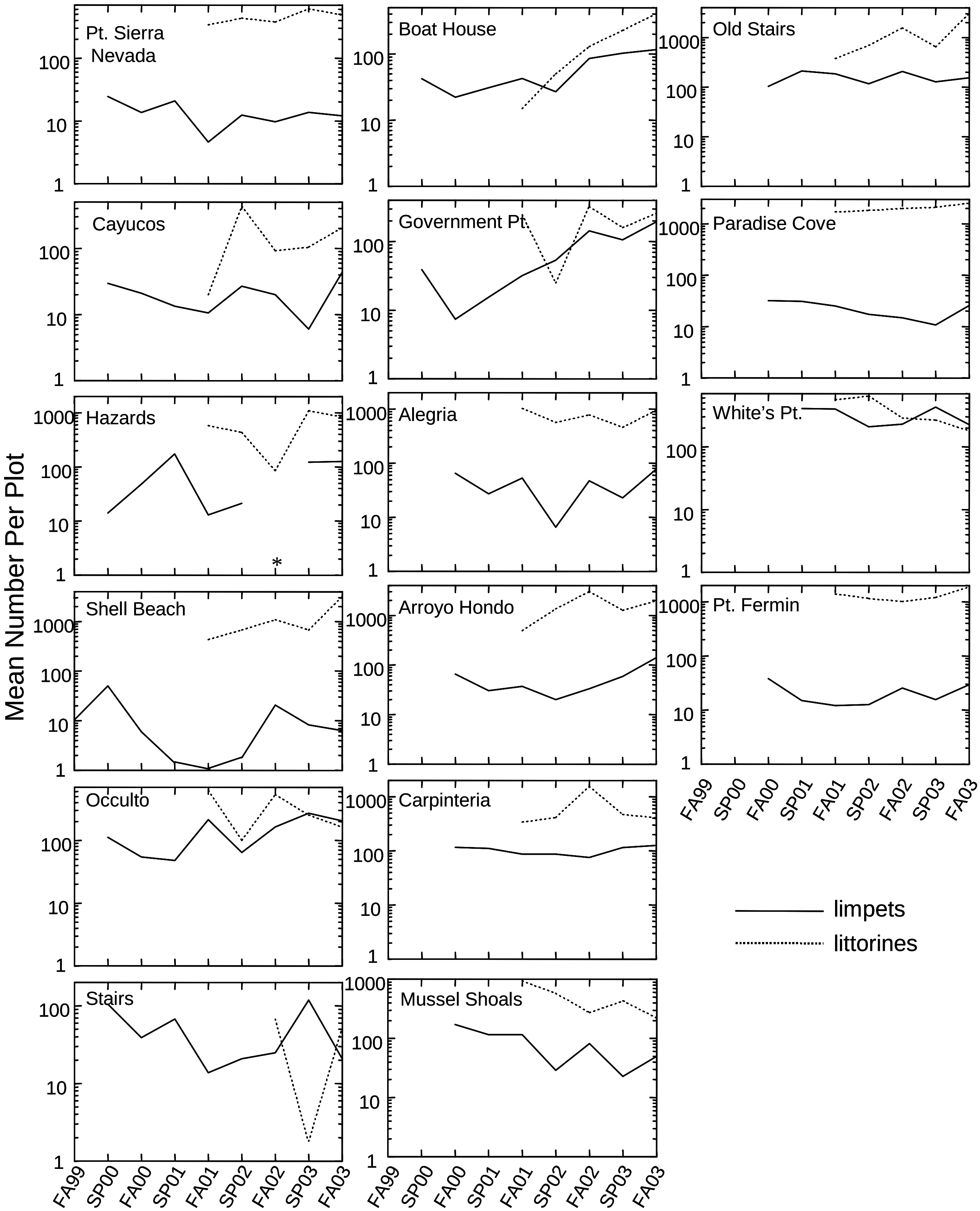


Figure 24. Common motile invertebrates in barnacle plots. Note log scale and variation in scale among plots.
* Indicates 0 limpets were found

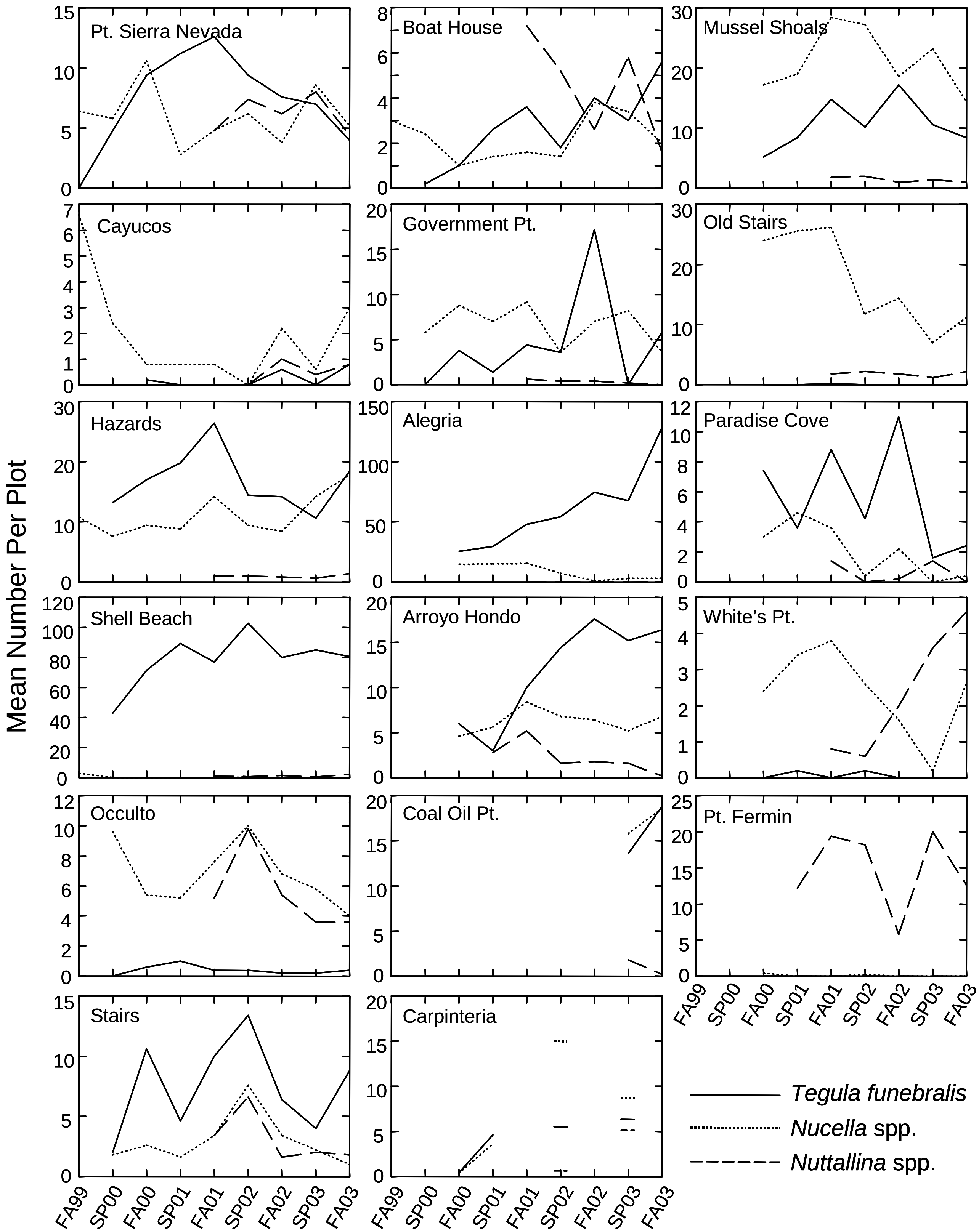


Figure 25. Common motile invertebrates in *Mytilus* plots. Note differences in scale.

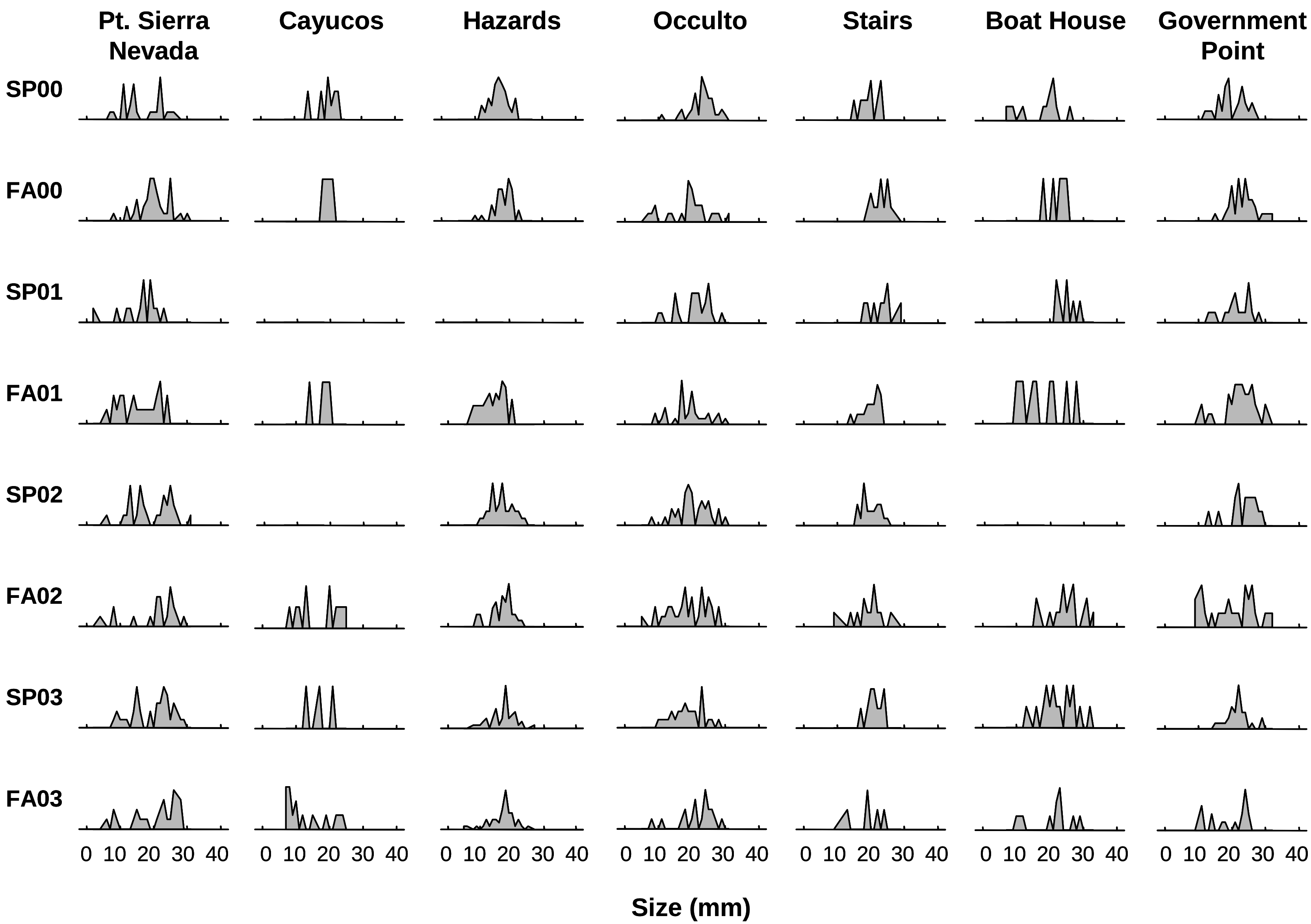


Figure 26a. *Nucella emarginata/ostrina* size distributions in mussel plots. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. Sites not shown had insufficient numbers of *Nucella* for plotting size distributions.

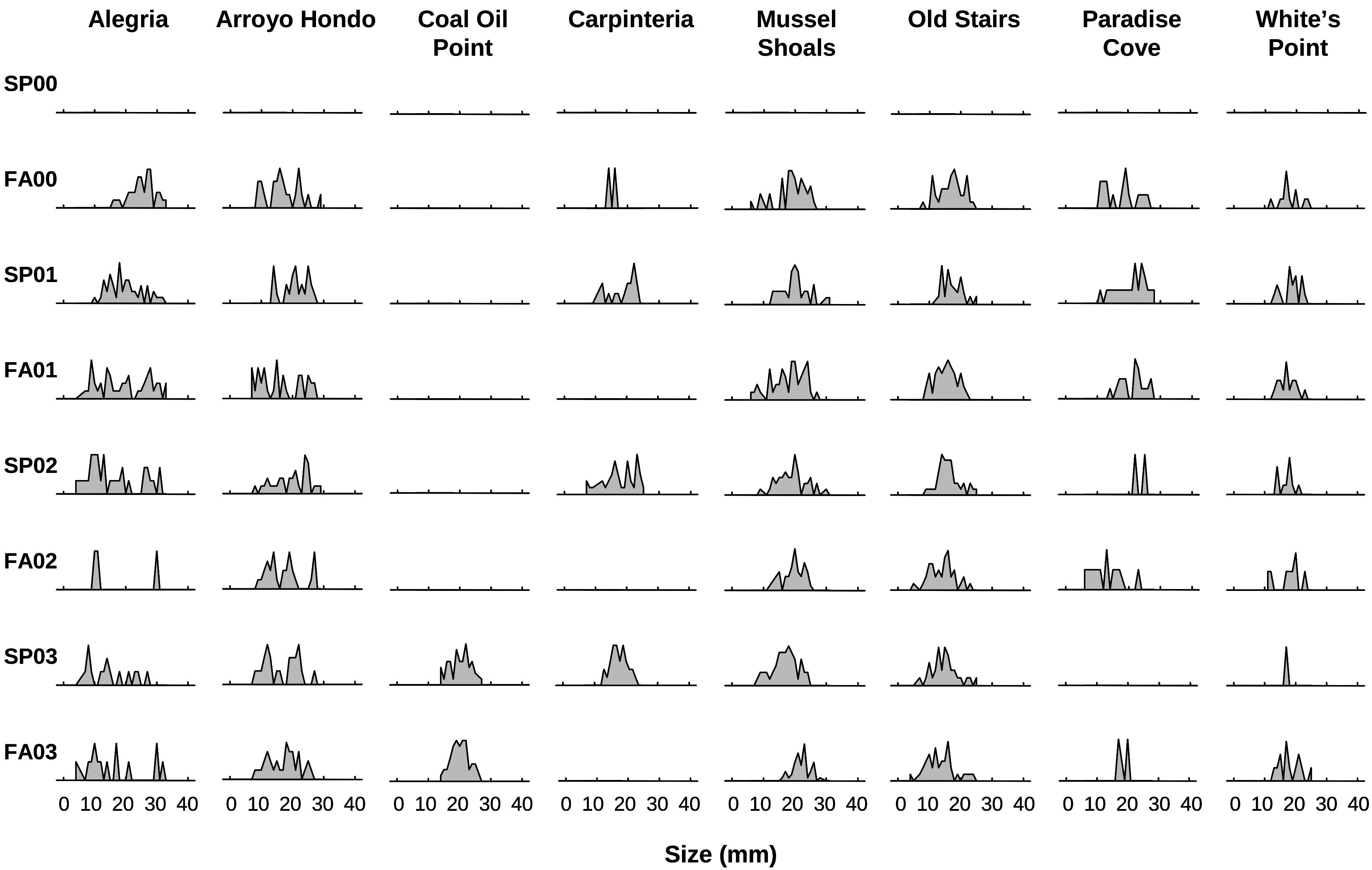


Figure 26b. *Nucella emarginata/ostrina* size distributions in mussel plots. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. Sites not shown had insufficient numbers of *Nucella* for plotting size distributions.

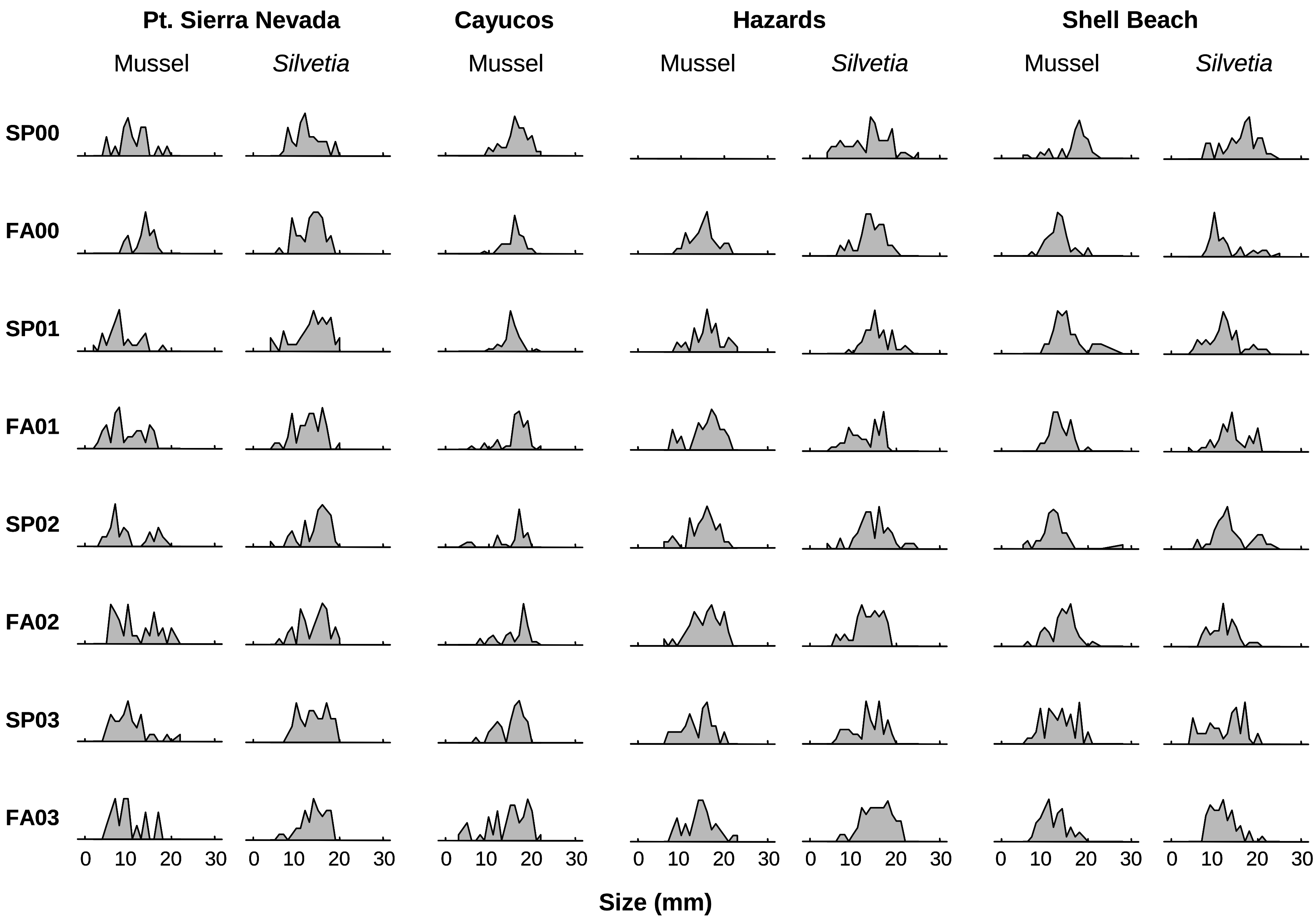


Figure 27a. *Tegula funebralis* size distributions in mussel and *Silvetia* plots. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. Sites not shown had insufficient numbers of *Tegula* for plotting size distributions.

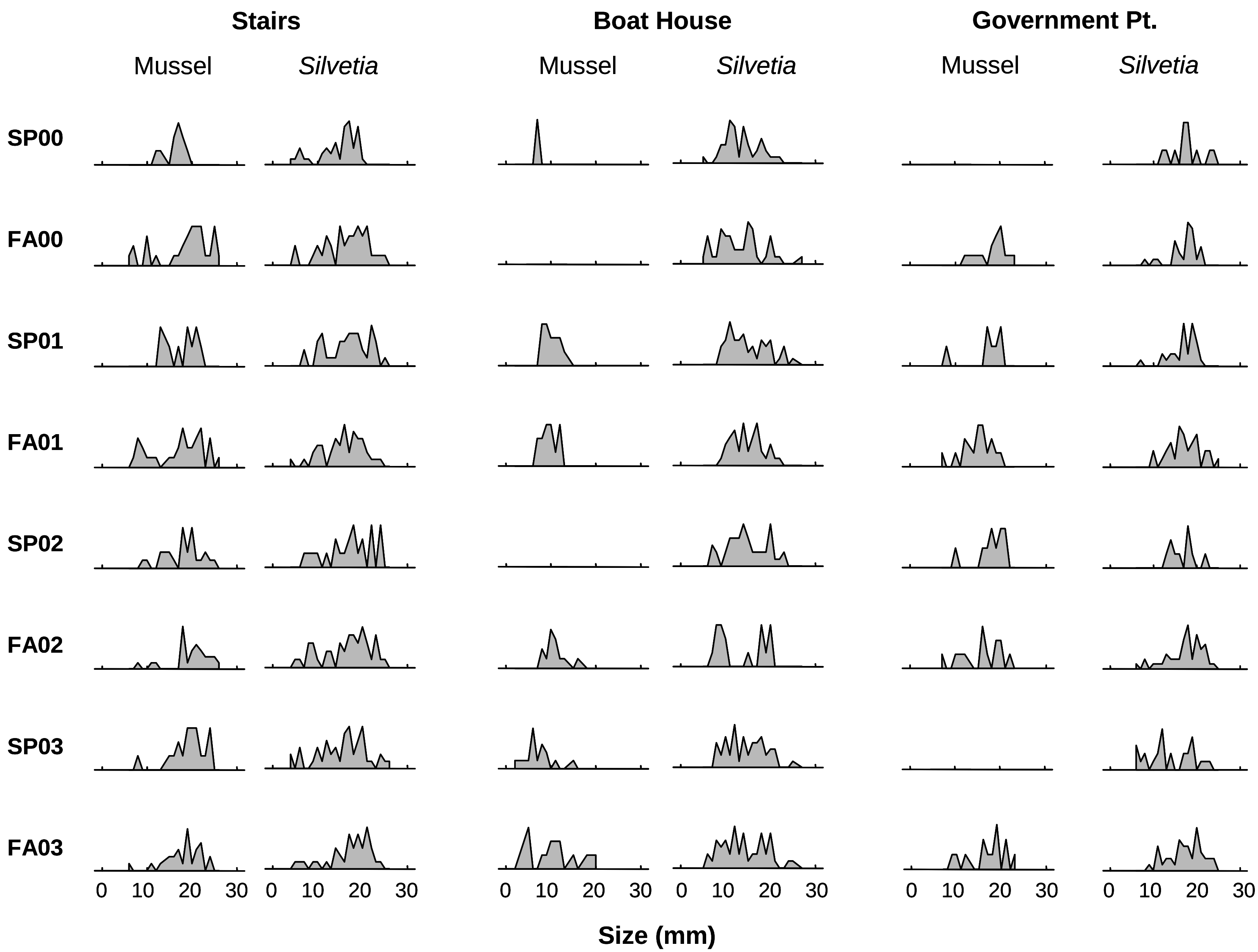


Figure 27b. *Tegula funebralis* size distributions in mussel and *Silvetia* plots. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. Sites not shown had insufficient numbers of *Tegula* for plotting size distributions.

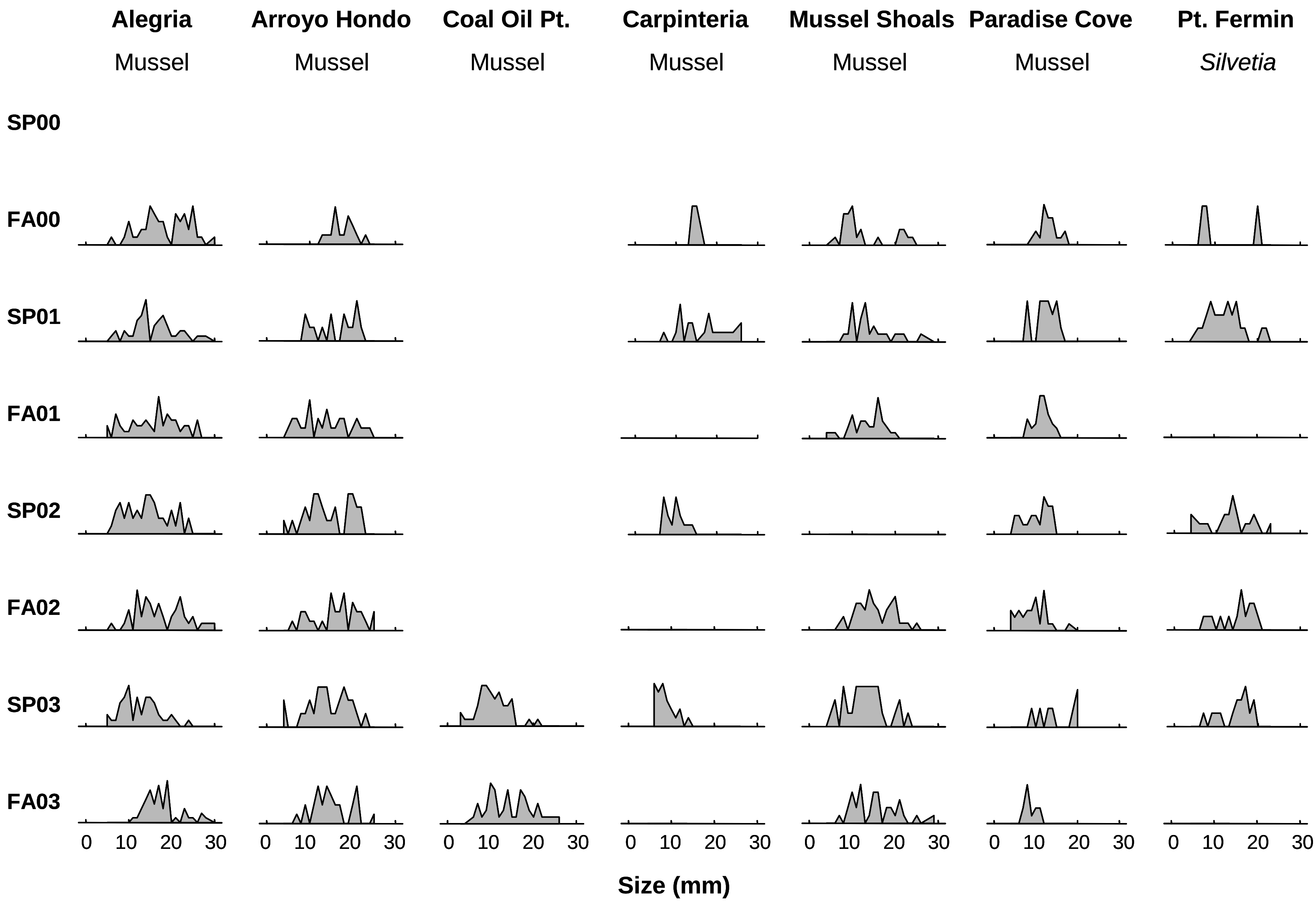


Figure 27c. *Tegula funebralis* size distributions in mussel and *Silvetia* plots. Figures show proportion of total (y-axes vary by plot) and do not reflect abundance. Sites not shown had insufficient numbers of *Tegula* for plotting size distributions.

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Appendix A: Catalina Island Sites

DESCRIPTION OF REGION

Santa Catalina Island, southeastern-most of the eight Channel Islands, lies 35 km southwest of Los Angeles. The island coast is rugged, with steep volcanic or metamorphic cliffs backing narrow intertidal shores. Rocky intertidal habitats encompass 85% of Catalina Island; of these, 58% are boulder habitats and 42% are narrow bedrock benches (Littler and Littler 1979). 15% of island shores are pocket sand or gravel beaches. Mainland-facing shores typically are sheltered from prevailing oceanic swells, while windward shores are exposed to open-ocean waves, except where headlands protect various coves.

Intertidal communities at Catalina Island, as well as at San Clemente Island to the south, are composed of warm-temperate biota, with fewer cold-water species than the northwestern Channel Islands and mainland shores north of Point Conception (Dykzeul and Given 1979, Coyer and Engle 1981). Rocky intertidal monitoring surveys include the U.S Bureau of Land Management surveys conducted in the 1970's (Littler 1980) and studies associated with the University of Southern California's Wrigley Marine Laboratory (e.g., Given and Lees 1967). Target species monitoring has taken place at Bird Rock, a small, lee-side, volcanic islet near the marine lab, since 1982, when the site was established to test Channel Islands National Park Service long-term monitoring protocols (VTN Oregon 1983). In 1994, the Bird Rock monitoring protocol was modified to fully conform to the MARINe protocol and a second island monitoring site was established on the windward side at Little Harbor. This site is located on a narrow, metamorphic promontory between two coves, with partial protection from prevailing swells afforded by headlands and subtidal reefs.

SAMPLING METHODS

Methods used for sampling the Catalina Island sites are identical to those used in other areas (see Sampling Methods p.16)

RESULTS

Below are summaries of the major trends in target species abundances at the two Catalina Island sites. Values for means and standard errors are given in Appendix C.

Silvetia compressa subsp. deliquescens (Rockweed, formally called *Pelvetia compressa* and *P. fastigiata.* The Channel Islands subspecies of *Silvetia* is differentiated from the mainland form by narrower thalli that are more regularly and more densely branched). *Silvetia* cover remained relatively high at both Catalina Island sites over time (Fig. A1). Cover at Little Harbor increased slightly from Fall 1994 to Spring 2003 (from 65% to 86%), while Bird Rock cover declined slightly during the same period (from 95% to 77%). Cover at both sites declined during 1997-1998, coincident with El Niño conditions. Rockweed at Little Harbor has since exhibited greater recovery than that at Bird Rock. Both sites showed a slight trend for higher *Silvetia* cover in fall compared to spring.

Chthamalus fissus/dalli* and *Balanus glandula (Barnacles, nearly all white barnacles at the Catalina sites were *Chthamalus*).
Barnacle cover fluctuated over time at Little Harbor, ending slightly lower in Spring 2003 (61%) compared to Fall 1994 (81%) (Fig. A2). At Bird Rock barnacle cover was relatively stable (53-66% cover range) until Spring 1999, followed by nearly continuous declines to a low of 28% cover by Spring 2003.

Pollicipes polymerus (Goose Barnacle)
Although *Pollicipes* cover was fairly stable over time at Bird Rock, there was a clear inverse relationship between cover of goose barnacles and mussels in these plots (Fig. A3). Declines in mussel cover were associated with increases in *Pollicipes* cover and increases in mussels were correlated with goose barnacle declines.
Pollicipes was not targeted for monitoring at Little Harbor.

Mytilus californianus (Mussel)
Mussel cover was highest at Little Harbor and Bird Rock between Fall 1995 and Spring 1997 (Fig. A4). Declines at both sites began in Fall 1997 and stabilized at around 20% cover over the following years. The peak period of mussel cover was the same as for mussels in the goose barnacle plots at Bird Rock (see above); however, subsequent mussel declines were less in these higher zone *Pollicipes* plots.

DISCUSSION

Declines of rockweed and mussels at Little Harbor and Bird Rock during 1997-1998 coincided with a severe El Niño oceanographic anomaly in which storms were more frequent, water temperatures increased substantially, and seawater nutrients declined (McPhaden 1999). These trends were apparent despite the separation (opposite sides of Catalina Island) and variation in exposure and substrate between the two sites (Little Harbor: windward exposure, metamorphic rock; Bird Rock: leeward exposure, volcanic rock). A similar decline occurred in the acorn barnacles at Little Harbor, but not at Bird Rock. Goose barnacles increased slightly during the 1997-1998 El Niño period. Perhaps mussels are better competitors for space in the higher zone goose barnacle/mussel plots at Bird Rock, but goose barnacles are more resistant to El Niño environmental changes.

The target species trends at the two Santa Catalina Island sites provide good representation for population dynamics patterns under warm temperate conditions. Comparison of these long-term datasets with those of other regional sites in the Multi-Agency Rocky Intertidal Network will provide valuable insight into the effects of the 1997-1998 El Niño, as well as other latitudinal and island/mainland oceanographic environmental differences. The data also highlight the importance of long-term periodic surveys, illustrating that some species dynamics may be predictable on a regional scale, but complex interactions unique at local scales operate as well. Therefore, the prudent plan for determining the effects of unforeseen human impacts such as oil spills is to maintain a program of periodic intertidal community dynamics assessments at representative regional sites.

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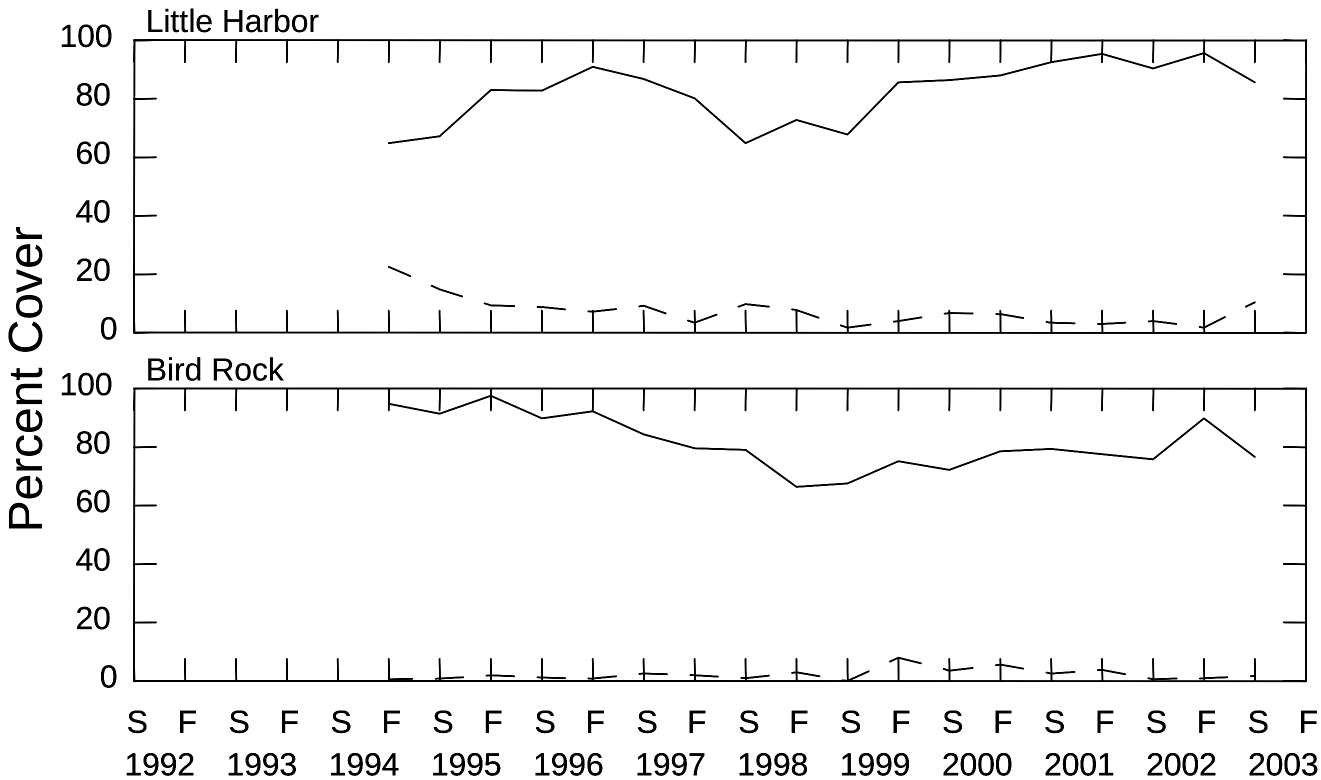

Figure A1. Species abundances in *Silvetia* plots. S=spring samples, F=fall samples.

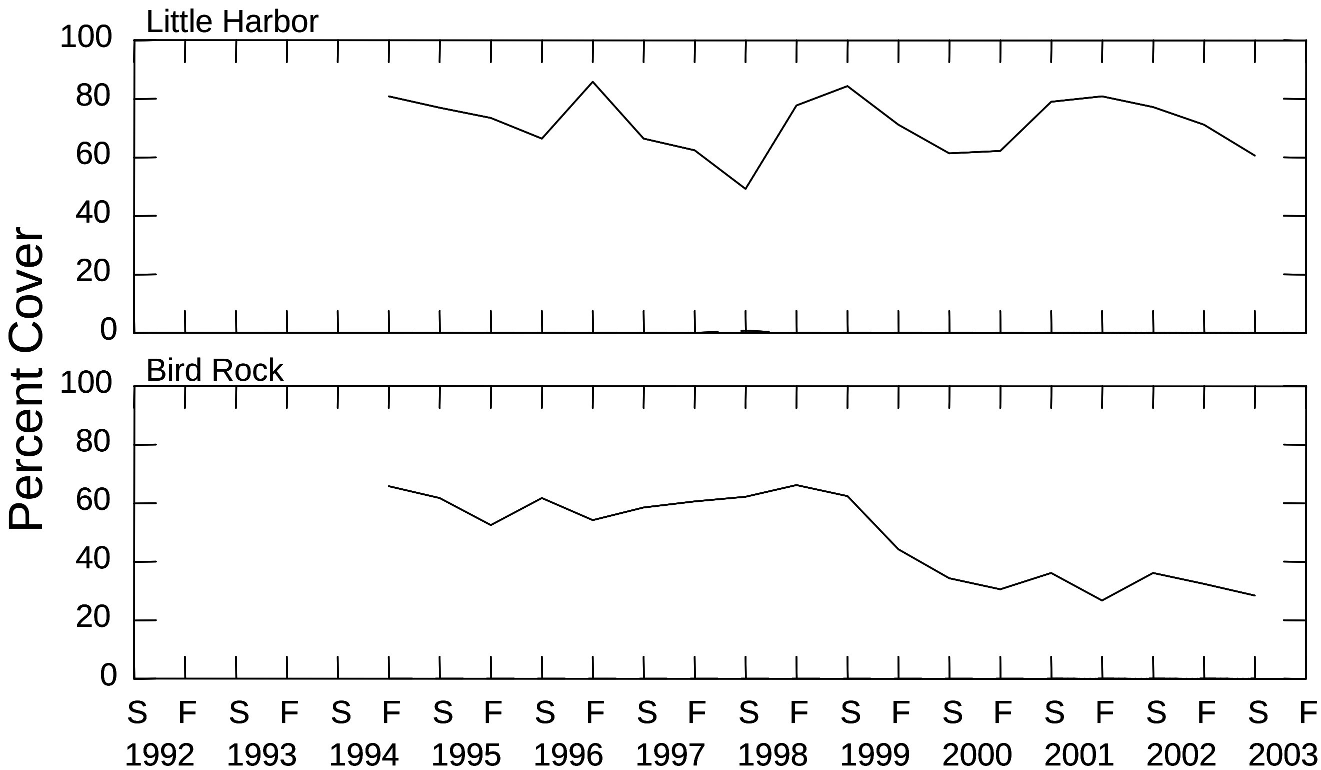

Figure A2. Species abundances in barnacle plots. S=spring samples, F=fall samples.

Balanus + *Chthamalus*
Endocladia muricata

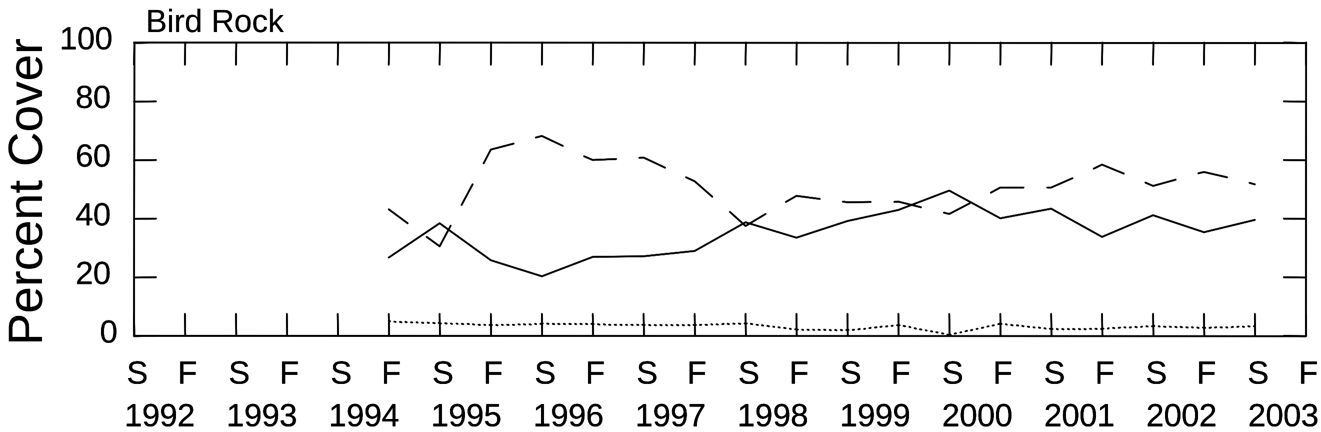

Figure A3. Species abundances in *Pollicipes* plots. Little Harbor was not sampled in F01. S=spring samples, F=fall samples.

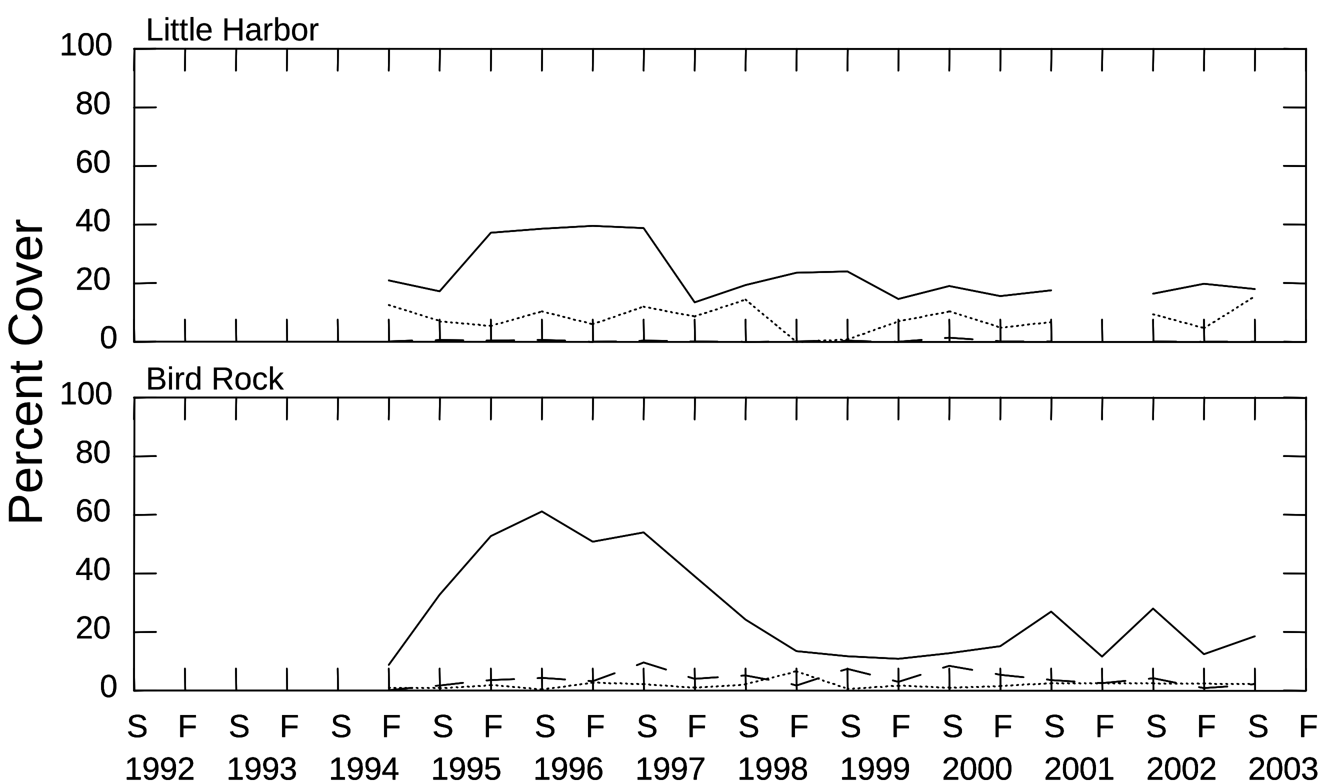

Figure A4. Species abundances in *Mytilus* plots. Little Harbor was not sampled F01. S=spring samples, F=fall samples.

Appendix B: Natural History of Target Species

In this section, we summarize the natural history of the target species used in this study. These brief discussions provide context for the selection of these species by including information on life history, ecological importance, and sensitivity to anthropogenic activities. Additional information and photographs can be found on the MARINe website (http://www.marine.gov/species.htm).

Silvetia compressa ssp. compressa (formerly *Pelvetia compressa* and *P. fastigiata*)

The rockweed *Silvetia compressa ssp. compressa*, a conspicuous fucoid alga, can be locally abundant in dense patches in upper mid-tidal regions of southern California rocky shores that are partially protected from open surf. The typical mainland form is an olive green or yellowish brown plant about 30 cm long, composed of thick, narrow, dichotomous branches. A finer-branched, lighter-colored form (*S. compressa f. gracilis*) is more typical of the Channel Islands (Abbott and Hollenberg 1976; Silva et al. 2004). *Silvetia* plants are tough, resilient, and long-lived; however, recruitment is irregular, survivorship low, and individuals slow-growing (Gunnill 1980).

Silvetia is a dominant perennial whose thick clumps provide shelter and protection from desiccation for many animals that otherwise could not exist so high up on the shore (Hill 1980; Gunnill 1983; Ricketts et al. 1985; Sapper and Murray 2003). Rockweeds are vulnerable to trampling impacts (Murray and Denis 1997) and oil spills because of their location fairly high on the shore. Specific sensitivity of *Silvetia* to oiling is unclear, but other fucoids are known to be adversely affected (see Foster et al. 1988). Recovery from impacts could take several years or more (Hill 1980; Vesco & Gillard 1980; Engle unpub.).

Hesperophycus californicus (formerly *H. harveyanus*)

Hesperophycus is a common fucoid alga along the central coast of California, found in the upper-mid tidal regions sometimes mixed with *Silvetia, Pelvetiopsis,* or *Fucus*. *Fucus* is replaced by *Hesperophycus* south of Pt. Conception. Plants are typically about 30 cm long and greenish-olive to yellowish-brown with dichotomously branched blades. *Hesperophycus* can be distinguished from *Fucus* by the tiny tufts of white hairs, called cryptostomata, that grow in two parallel rows on either side of the midrib. Observations made during the Santa Barbara oil spill indicate that *Hesperophycus* is particularly susceptible to damage caused by oil pollution (Dawson and Foster 1982).

Endocladia muricata

Distinctive dark bands of the low-growing, red turfweed *Endocladia muricata* are characteristic of nearly all high rocky intertidal shores of the Pacific Coast north of Point Conception. *Endocladia* abundance fades in warmer waters to the south, being largely replaced in lower portions of its zone by other turfweeds (*Gelidium* spp.).

Endocladia forms dense 4-8 cm tall, dark red to blackish-brown perennial tufts made up of tiny spine-covered branchlets (Abbott & Hollenberg 1976). Together with spiny-bladed *Mastocarpus papillatus*, the *Endocladia*/*Mastocarpus* carpet traps sediment and seawater, thus providing a sheltered microhabitat for a host of small organisms, including other algae, worms, crustaceans, and mollusks. Glynn (1965) found over 90 species associated with *Endocladia* clumps in Monterey. *Endocladia* has been shown to facilitate recruitment of *Silvetia compressa*, possibly by providing propagules protection from dislodgement, grazing, and/or desiccation (Johnson and Brawley 1998). Turfweed also can provide habitat for attachment of young mussels. Expanding mussel patches may displace *Endocladia*, but it can then grow on the mussel shells, creating a layered assemblage.

Some *Endocladia* clumps appear donut- or crescent-shaped; this condition may be caused by storms tearing out center areas possibly weakened by accumulated anoxic sediment. At Diablo Canyon, *Endocladia* monitored quarterly for over 15 years tended to cycle between peak cover in summer and low abundance in winter (PG&E 1992). However, Kinnetics (1992) found few consistent seasonal patterns at 6 central California sites monitored in Spring and Fall for 6 years.

Like *Silvetia*, *Endocladia* is hardy and quite resistant to desiccation, yet vulnerable to oiling from spills. Recovery from natural or human disturbances may vary from 1 to more than 6 years (see Kinnetics 1992).

Mastocarpus papillatus

Mastocarpus is an abundant dark reddish-black species which, along with *Endocladia*, forms a high-mid intertidal algal band that traps moisture and sediment, thus providing a refuge for a host of other intertidal organisms including snails, crustaceans, worms, and beach fly larvae (Dawson and Foster 1982). Plants rarely grow more than 15 cm tall and can be highly variable in form. Blade surfaces are covered with papillae that vary in density and size among growth forms (Carrington 1990). Papillae are typically 1-2 mm in diameter, 1-3 mm long and are found on both sides of a thallus. No apparent correlation exists between density of papillae and any morphological trait of a thallus (Carrington 1990). Cystocarps, the female reproductive structures, are located on the papillae of female gametophytes (Zupan & West, 1988).

Stress tests performed by Carrington (1990) revealed that mechanical failure most often occurred at the base of the stipe, leaving behind a small basal disc of tissue from which additional thalli could grow. Thus, perennial basal discs may give rise to many shorter-lived thalli year after year.

Mastocarpus exhibits heteromorphic alternation of generations. The blade form described above is the gametophytic stage. The sporophyte is a thick, black crust, which is commonly found in association with gametophytic blades, and was formerly classified in the genus *Petrocelis*.

***Mazzaella* spp.** (formally *Iridaea* spp.)

Mazzaella forms a distinctive iridescent band in the mid to low intertidal of the central California rocky coast. Plants usually consist of several large (up to 1 m long), smooth, tapering blades that arise from a small crustose holdfast, although blade morphology varies with habitat and wave exposure (Mondragon and Mondragon 2003). Blades usually live less than one year, while basal crusts are longer lived (Dyck 1995). Frond regrowth from these basal crusts has been demonstrated in *M. laminarioides*, a species of *Mazzaella* common in southern Chile (Gomez 1991). Blade color can range from a greenish-olive to a deep purple. Several species of *Mazzaella* occur in SLO County, including *M. splendens*, *M. flaccida* and *M. Heterocarpa*; however, distinguishing these different species can be challenging, so they have been treated as a species group for this study.

Mazzaella spp. have isomorphic sporangial and gametangial stages in life history. Seasonality in *M. splendens* abundance may be attributed to different strategies employed by the sporangial and gametangial stages (Dyck 1995). *M. splendens* gametophytes appear to exploit favorable spring and summer conditions, reaching high densities which help to compensate for greater loss in winter, while sporophytes maintain a generally lower, but somewhat more stable density throughout the year.

The blades of *Mazzaella* are consumed by numerous grazers, including the snail *Lacuna*, the isopod *Idotea*, the chiton *Katharina tunicata*, the limpet *Lottia pelta*, and the sea urchin *Strongylocentrotus purpuratus* (Gaines 1985).

***Phyllospadix* spp.**

Surfgrass (*Phyllospadix* spp.) is one of only two types of marine flowering plants on the West Coast. Unlike the eelgrass *Zostera* (often confused with surfgrass) that grows in quiet-water mud or sand habitats, surfgrass attaches by short roots to rock on surf-swept shores from the low intertidal down to 10-15 m depths. The 0.5-2 m tall, emerald green grass commonly occurs in dense perennial beds formed primarily by vegetative growth from spreading rhizomes. Two species (*P. torreyi* & *P. scouleri*) overlap in geographical distribution and morphological characteristics (see Dawson and Foster 1982). *P. torreyi* generally has longer (1-2 m), narrower (1-2 mm) leaves, longer flower stems with several spadices, and occurs more in semi-protected habitats as well as at deeper depths. *P. scouleri* tends to have shorter (<50 cm), broader (2-4 mm) leaves, shorter flower stems with 1-2 spadices, and is found more often in wave-swept intertidal areas.

Surfgrass meadows are highly productive ecosystems, providing structurally complex microhabitats for a rich variety of epiphytes, epibenthos, and infauna. Stewart and Myers (1980) identified 71 species of algae and 90 species of invertebrates associated with surfgrass habitats in San Diego. Some organisms, such as the red algae *Smithora naiadum* and *Melobesia mediocris*, are exclusive epiphytes on surfgrass (or eelgrass) (Abbott & Hollenberg 1976). Other species, such as the crabs *Pugettia producta* and *Pachygrapsus crassipes* are heavy consumers of *Phyllospadix* seeds (Holbrook et al. 2000). *Phyllospadix* beds provide nursery habitat for various fishes and invertebrates, including the California spiny lobster *Panulirus interruptus* (Engle 1979). Green lobster juveniles shelter in the thicket of leaves and forage on a variety of tiny gastropods and bivalves.

Surfgrass cannot tolerate much heat or drying; the leaves will bleach quickly when midday low tides occur during hot, calm-water periods. Surfgrass can be particularly sensitive to sewage discharge (Littler and Murray 1975) and oil pollution (see Foster et al. 1988). Recovery can be relatively rapid if the rhizome systems remain functional, but might take many years if entire beds are lost, because recruitment is irregular and must be facilitated by the presence of perennial turf algae to which surfgrass seeds attach (Turner 1983, 1985). Transplant projects undertaken to speed recovery of *Phyllospadix* beds destroyed by shoreline construction have been largely unsuccessful.

Anthopleura elegantissima/sola (Anemone, formally lumped as *Anthopleura elegantissima*)

Previously thought to be a single species, *Anthopleura elegantissima* and *Anthopleura sola* were described as genetically, ecologically, and developmentally distinct by Pearse and Francis (2000). The two species are similar in appearance; however, *A. sola* grows larger (to 25 cm) and is solitary compared to the smaller (to 8 cm), aggregating *A. elegantissima*. *Anthopleura elegantissima* is able to persist practically indefinitely under normal conditions because genetically-identical individuals are periodically produced by longitudinal fission (Sebens 1982). *A. sola* does not divide and can be confused with *A. xanthogrammica*, a relative uncommon south of Point Conception. The green color of all of *Anthopleura* comes from symbiotic unicellular plants.

Both *A. sola* and *A. elegantissima* are abundant throughout semi-protected rocky shores of the Pacific Coast. *A. sola* is common in tidepools and subtidally, and *A. elegantissima* often occurs as small densely aggregated clones in middle intertidal zones, especially sand-influenced habitats (Morris et al. 1980). Extensive carpets of these clones may occur, but often go unrecognized under low tide conditions because the anemones contract to small sand or shell-covered blobs that provide protection from desiccation. Anemone mats create a moist microenvironment that allows the development of some other species, such as coralline algae and sand tube worms (*Phragmatopoma californica*) at higher intertidal levels than they would normally occur (Taylor and Littler 1982). Adjacent anemone clones are separated by a narrow bare corridor caused by the withdrawal of non-clonemates following aggressive stinging encounters.

Anthopleura species are quite resistant to disturbances from shifting sands. They not only withstand moderate sand abrasion, but also resist shallow sand burial by extending their columns to re-expose the tentacles and oral disk. If buried deeper, they can survive for at least 3 months by metabolizing body tissue (Sebens 1980). *Anthopleura* spp. are not known to be unusually sensitive to oiling. Recovery from major disturbances may take 1-2 years or more (see Vesco & Gillard 1980).

Chthamalus fissus/dalli* and *Balanus glandula

White acorn barnacles, *Chthamalus fissus/dalli* and *Balanus glandula*, typically dominate high intertidal zones along the West Coast. *Chthamalus dalli* and *Balanus* are most common in the colder waters north of Point Conception, but all three species overlap in southern California. Acorn barnacle species can be difficult to distinguish, especially in photographic monitoring. Tiny (to 8 mm) *C. fissus* and *C. dalli* require dissection and microscopic examination of scutal plates. *Balanus glandula* can be field identified in most cases by its larger size (to 22 mm), whiter color, and differing shell plate arrangements. Acorn barnacles spawn often, at variable times throughout the year (Hines 1978), and settle in incredible densities (to 70,000/m^2), forming distinct white bands along the upper intertidal that contain few other invertebrates except littorines and the hardiest limpets. *Balanus* can out compete *Chthamalus* by crowding or smothering, but *Chthamalus* can occupy higher tide levels than *Balanus*, because it is more resistant to desiccation. Slightly lower down, acorn barnacles mix in with the *Endocladia* assemblage, and are common on mussel shells. *Chthamalus* species grow rapidly, but only survive a few months to a few years. *Balanus* can live longer (to 10 years), but its larger size and lower tidal position subject it to higher levels of mortality from predatory gastropods and ochre sea stars.

Acorn barnacles (particularly *Balanus* spp.) facilitate recruitment of *Endocladia* and fucoid algae to the upper intertial by reducing grazing pressure by limpets (Farrell 1991). We have observed this facilitation at several sites, where barnacle plots become slowly inundated by *Endocladia*, *Pelvetiopsis*, and *Silvetia*.

White acorn barnacles are highly vulnerable to smothering from oil spills because floating oil often sticks along the uppermost tidal levels. Significant, widespread barnacle impacts were reported after the 1969 Santa Barbara oil platform blow-out (Foster et al.(1971) and the 1971 collision of two tankers off San Francisco (Chan 1973). However, high recruitment rates may promote relatively rapid recovery of acorn barnacles; disturbance recovery times ranging from several months to several years have been reported (see Vesco & Gillard 1980).

One interesting note is that we have found “bent” *Chthamalus* at several sites, a condition previously only seen in the Gulf of California species *Chthamalus anisopoma*. We have been collecting bent individuals in order to identify them to species (requires examination of their calcareous plates) and thus far have found them all to be the southern species *C. fissus*.

Pollicipes polymerus

Goose barnacles, *Pollicipes polymerus*, are conspicuous in high to middle intertidal zones on surf-swept rocky shores all along the US Pacific Coast. Young goose barnacles settle preferentially among other *Pollicipes*, forming tight clusters on exposed outcrops, ridges, and walls, just above or intermixed with mussel beds. This distinctive black and white barnacle is firmly attached to the rock by a muscular (edible) stalk that holds the cirral net up to 8 cm high to filter-feed, primarily from wave backwash. Unlike white acorn barnacles, goose barnacles are slow-growing. Sexual maturity is reached in approximately 5 years, and large adults may be 20 years old (Morris et al. 1980). *Pollicipes* is very resistant to desiccation and can tolerate all but the highest wave exposures. Mortality has been reported from oil spills (Foster et al. 1971; Chan 1973), and recovery could be slow. Populations have been reduced in accessible areas where goose barnacles are collected for food.

Mytilus californianus

The California mussel, *Mytilus californianus,* is abundant at middle to low levels of exposed rocky shores along the entire Pacific Coast. These 10-20 cm black/blue/gray mussels firmly attach to rocks or other mussels by tough byssal threads, forming dense patches or beds. The literature on *Mytilus californianus* is extensive, including key ecological studies on the effects of predation, grazing, and disturbance on succession and community structure (see for discussion Morris et al. 1980; Ricketts et al. 1985; Kinnetics 1992). Bay mussels (*M. trossulus*, or *M. galloprovincialis*) can co-occur with *M. californianus*, but are most common in sheltered habitats. Thick (≥ 20 cm) beds of California mussels trap water, sediment, and detritus that provide food and shelter for an incredible diversity of plants and animals, including cryptic forms inhabiting spaces between mussels as well as biota attached to mussel shells (Paine 1966; MacGinitie & MacGinitie 1968; Suchanek 1979; Kanter 1980, Lohse 1993). For example, MacGinitie & MacGinitie (1968) counted 625 mussels and 4,096 other invertebrates in a single 25 cm^2 clump, and Kanter (1980) identified 610 species of animals and 141 species of algae from mussel beds at the Channel Islands. Kinnetics (1992) documented locational differences in the composition and abundance of mussel bed species. Northern sites had densely packed, multi-layered beds, but the more open southern sites had higher species diversity. Mussels feed on suspended detritus and plankton. Young mussels settle preferentially into existing beds at irregular intervals, grow at variable rates depending on environmental conditions, and eventually reach ages of 8 years or more (see Morris et al. 1980, Ricketts et al. 1985). Mussels can tolerate typical rigors of intertidal life quite successfully. However, desiccation likely limits the upper extent of mussel beds, storms tear out various-sized mussel patches, and sea stars prey especially on lower zone mussels. *Mytilus* are adversely affected by oil spills (Chan 1973; Foster et al. 1971). Recovery from disturbance varies from fairly rapid (if clearings are small and surrounded by mussels that can move in) to periods greater than 10 years (if clearings are large and recruitment is necessary for recolonization)(see Vesco & Gillard 1980; Kinnetics 1992).

Pisaster ochraceus

The ochre seastar, *Pisaster ochraceus*, is found on middle and low tide levels of wave-swept rocky coasts from Alaska to Baja California, but is much less common south of Point Conception. Its relatively large size (to 45 cm diameter), variety of colors (yellow, orange, purple, brown), and ability to withstand air exposure (at least 8 hours) attract considerable attention from visitors exploring the shore at low tide. The ochre seastar typically is associated with mussels, which constitute its chief food, but barnacles, limpets, snails, and chitons also may be taken (Morris et al. 1980). Predator-prey interactions involving ochre seastars have been intensely studied, especially the role of *P. ochraceus* in determining the lower limit of northern mussel beds (Paine 1966, 1974: Dayton 1971). Like black abalone, ochre sea stars are relatively slow-growing, long-lived, and apparently variable in recruitment success. They are tolerant of high surf, using their numerous tube feet to remain firmly in place, often in cracks and crevices. They have few predators, except for curious tidepool visitors. However, in southern California, *P. ochraceus* populations have been decimated by a widespread wasting disease caused by a warm-water bacterium of the genus *Vibrio* (Schroeter & Dixon pers. comm.). Sensitivity to oil spills is not well known; Chan (1973) saw no obvious effects from a San Francisco oil spill. Recovery time from any major population loss likely would be very long.

Lottia gigantea

The owl limpet, *Lottia gigantea*, is common in high and middle tide zones of exposed rocky shores from Washington south to Baja California. Adult *Lottia* are relatively easy to identify because of their large size (up to >100 mm), oval shape with low rounded profile, and color patterns of brown, white, and black on the often eroded shell. Accessory gills on the mantle increase surface area for aerial respiration during low tide periods. Owl limpet habitats extend from the barnacle and *Endocladia* zones down to the mussel beds.

Lottia can either be territorial, maintaining and defending clearings of thick algal film, or nonterritorial, intruding on other limpets' algal farms to graze (Shanks 2002). Territorial behavior is determined by previous agnostic experience, although large limpets tend to be territorial and smaller ones are more often intruders (Shanks 2002). Territorial individuals maintain feeding territories on relatively smooth rock surfaces which they keep free (by rasping and bulldozing) of most macroalgae and invertebrates, including turfweed, sea anemones, barnacles, mussels, and other limpets (Stimpson 1970). By removing most competitors for space and grazers, they promote the growth of algal films upon which they systematically graze. These "clearings" vary in appearance with *Lottia* size and structural features of the substrate, creating a patchwork of differing microhabitats. *Lottia* tend to occupy one or more characteristic "home scars" within their territories. Here the shell margin conforms to the rock surface, making a tight seal to hold moisture during low tides. The limpets also may tuck into crevices and under mussels for protection from heat, desiccation, and high surf.

Lottia grow slowly, taking up to 10-15 years to reach maximum size (Morris et al. 1980). As an ecological dominant, any change in *Lottia* populations greatly affects abundances of other species. Lindberg et al. (1998) have shown that if *Lottia* are removed from an area, cover of erect, fleshy algae increases, followed by increases in the number of small limpets.

The limpets and their feeding territories are vulnerable to oiling, but oil impacts are unclear. For example, they were not obviously affected by the 1971 San Francisco oil spill (Chan 1973). Recovery from any major disturbance likely would be lengthy. Larger owl limpets are collected for food, tasting much like abalone. Mean *Lottia* shell length has been negatively correlated with collecting pressure in southern California (Kido &

Murray 2003; Roy et al. 2003). Because *Lottia* are protandrous hermaphrodites, the largest individuals are nearly always female (Ricketts et al. 1985), and collecting may impair reproductive capabilities within owl limpet populations.

Haliotis cracherodii

Black abalone (*Haliotis cracherodii*) inhabit mid-low intertidal levels down to shallow subtidal depths (to 6 m) from Oregon to Southern Baja California (Morris et al. 1980). They are readily identified by dark, bluish-black coloration, a smooth shell with 5-7 open respiratory holes, and relatively small size (5-20 cm as adults). Black abalone are relatively sedentary, and are typically found clustered in wet crevices, under boulders, or on the walls of surge channels along exposed shores. Juveniles graze on diatom films and coralline algae, while adults primarily eat drift algae, especially brown kelps. *H. cracherodii* compete with sea urchins and other crevice-dwellers for space and food. Before recent catastrophic declines (see below), abalone could occasionally be seen stacked on top of each other, reaching densities of more than 100/m² (Douros 1987; Richards & Davis 1993). Black abalone are slow-growing and long-lived, with recruitment apparently being low and variable (Morris et al. 1980; VanBlaricom 1993). Growth rates depend on animal size, location, food availability, reproductive condition, and other factors. Absolute longevity has not been determined, but ages greater than 30 years appear likely based on tagging and other population studies (e.g., VanBlaricom 1993).

Although once an important human resource, both sport and commercial black abalone fisheries have been closed due to recent precarious declines. Mortality is associated with “withering syndrome” (WS), in which the foot shrinks and weakened individuals lose their grip on rock surfaces. *H. cracherodii* populations in Southern California suffered catastrophic declines in the mid-1980’s that resulted in near-complete disappearance of black abalone along mainland shores south of Point Conception, as well as on the Channel Islands (Lafferty & Kuris 1993; Richards & Davis 1993). In 1993 WS caused massive declines in mainland populations near Point Conception. Since then, WS has slowly spread up the coast, decimating some of the largest remaining black abalone populations (Altstatt et al. 1996; Raimondi et al. 2002).

Other sources of mortality include: smothering by sand burial, dislodgment by storm waves, and predation by octopus, sea stars, fishes, and sea otters (Morris et al. 1980; VanBlaricom 1993). Impacts from oil are little known, but North et al. (1965) reported black abalone mortality following a spill in Baja California. Because of low recruitment, slow growth, and already decimated reproductive populations, additional mortality from oil spills would be devastating, and recovery prospects long-term at best.

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Appendix C: Means and Standard Errors for All Target Species

This appendix contains means and standard errors for all key species and for species that are abundant in target species plots. Mean percent cover or mean number across all plots is given for all species except black abalone. Total number for all plots combined is given for abalone. Abbreviations for sites used in the tables are as follows:

PSN	Pt. Sierra Nevada
PBL	Piedras Blancas
RM	Rancho Marino
CAY	Cayucos
HAZ	Hazards
SHB	Shell Beach
OCC	Occulto
PUR	Purisima Pt.
STA	Stairs
BOA	Boat House
GPT	Government Pt.
ALEG	Alegria
ARHO	Arroyo Hondo
COPT	Coal Oil Pt.
CARP	Carpinteria
MUSH	Mussel Shoals
OLDS	Old Stairs
PCOV	Paradise Cove
WHPT	White's Pt.
PTFM	Pt. Fermin
SHCO	Shaw's Cove
CRCO	Crystal Cove
TRIS	Treasure Island
DAPT	Dana Pt.
CTBR	Catalina Island, Bird Rock
CTLH	Catalina Island, Little Harbor

SILVETIA

		Silvetia		Rock				*Silvetia*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**Sample**	**Site**	**mean**	**se**	**mean**	**se**
FA95	PSN	93.8	1.5	2.8	0.7	FA99	HAZ	79.4	5.3	3.2	0.7
SP96	PSN	88.0	1.9	5.0	1.8	SP00	HAZ	72.8	5.8	2.4	0.9
FA96	PSN	88.2	4.6	6.6	1.7	FA00	HAZ	72.2	4.5	2.6	0.7
SP97	PSN	85.8	4.2	3.8	1.0	SP01	HAZ	65.2	7.4	3.6	1.1
FA97	PSN	87.0	4.1	4.6	1.8	FA01	HAZ	67.8	4.2	5.2	1.1
SP98	PSN	74.2	6.0	10.8	3.6	SP02	HAZ	66.6	6.2	3.2	0.9
FA98	PSN	83.2	6.9	8.6	4.6	FA02	HAZ	69.0	5.0	6.6	2.6
SP99	PSN	81.0	6.4	8.0	3.1	SP03	HAZ	56.4	7.7	6.2	2.1
FA99	PSN	81.8	6.6	8.6	4.0	FA03	HAZ	61.4	11.5	9.6	4.3
SP00	PSN	72.6	8.9	12.2	5.1						
FA00	PSN	61.8	14.1	15.0	6.9	FA95	SHB	93.0	2.2	1.6	0.5
SP01	PSN	62.4	11.7	18.4	7.5	SP96	SHB	90.0	3.7	2.2	1.1
FA01	PSN	51.4	12.7	23.8	7.8	FA96	SHB	88.6	1.9	2.2	0.4
SP02	PSN	51.0	11.8	20.6	6.9	SP97	SHB	80.6	2.4	6.0	2.1
FA02	PSN	57.4	12.8	14.6	5.1	FA97	SHB	85.8	3.4	5.2	2.5
SP03	PSN	47.8	12.9	22.4	6.8	SP98	SHB	76.4	6.0	5.6	3.0
FA03	PSN	59.0	9.2	20.6	4.5	FA98	SHB	76.2	7.4	9.0	2.3
						SP99	SHB	74.6	9.7	7.0	1.9
FA95	CAY	98.0	1.3	1.0	1.0	FA99	SHB	71.0	6.3	10.8	3.3
SP96	CAY	76.6	4.6	7.4	2.3	SP00	SHB	60.4	11.0	12.4	5.2
FA96	CAY	98.4	0.5	0.6	0.2	FA00	SHB	55.8	13.1	19.8	8.3
SP97	CAY	75.2	2.2	11.2	2.4	SP01	SHB	58.0	12.9	17.0	6.8
FA97	CAY	80.0	4.5	8.6	2.1	FA01	SHB	49.6	11.8	17.8	6.5
SP98	CAY	66.8	6.1	12.2	2.3	SP02	SHB	49.0	11.8	18.4	5.0
FA98	CAY	80.2	11.1	8.8	5.6	FA02	SHB	52.8	10.6	16.8	5.7
SP99	CAY	71.6	8.9	11.2	3.5	SP03	SHB	46.0	9.6	18.2	3.9
FA99	CAY	88.8	4.8	4.2	1.3	FA03	SHB	45.4	10.4	23.8	3.5
SP00	CAY	69.0	5.8	15.2	4.2						
FA00	CAY	79.4	11.6	7.2	3.3	SP92	STA	86.8	3.1	5.6	0.7
SP01	CAY	51.0	13.2	20.2	5.3	FA92	STA	79.0	8.7	15.2	6.9
FA01	CAY	50.6	13.3	23.2	6.8	SP93	STA	70.6	8.4	16.8	6.3
SP02	CAY	48.8	4.2	24.2	6.0	FA93	STA	92.2	2.7	4.6	2.3
FA02	CAY	46.6	8.8	29.4	8.1	SP94	STA	76.6	6.7	10.6	6.0
SP03	CAY	29.2	9.3	37.0	10.0	FA94	STA	86.8	1.7	2.8	1.2
FA03	CAY	50.6	9.8	26.2	9.5	SP95	STA	68.8	9.4	9.4	3.7
						FA95	STA	64.8	5.8	17.2	7.3
FA95	HAZ	89.6	2.2	3.8	0.4	SP96	STA	52.6	7.9	20.4	7.6
SP96	HAZ	78.6	1.5	4.8	1.0	FA96	STA	57.2	11.8	14.0	6.9
FA96	HAZ	89.2	2.4	1.4	0.7	SP97	STA	55.2	11.2	17.8	6.9
SP97	HAZ	88.8	4.7	2.0	0.8	FA97	STA	57.4	9.8	19.6	7.4
FA97	HAZ	89.6	1.9	2.2	0.6	SP98	STA	34.2	7.8	29.8	10.1
SP98	HAZ	73.0	4.9	4.6	1.8	FA98	STA	34.2	9.5	29.0	7.2
FA98	HAZ	81.0	3.9	3.2	2.0	SP99	STA	26.2	8.1	29.8	8.6
SP99	HAZ	73.2	7.5	3.8	1.9	FA99	STA	31.0	7.0	34.6	10.5

		Silvetia		Rock	
Sample	Site	mean	se	mean	se
SP00	STA	21.0	7.1	32.4	7.7
FA00	STA	25.2	12.1	34.2	10.6
SP01	STA	17.6	8.4	30.0	8.5
FA01	STA	33.6	9.0	28.4	6.7
SP02	STA	21.0	8.1	33.8	6.2
FA02	STA	34.0	10.1	25.2	6.5
SP03	STA	19.8	7.9	29.8	2.9
FA03	STA	29.6	11.0	21.6	2.2
SP92	BOA	84.8	5.3	3.8	0.9
FA92	BOA	91.6	4.0	2.8	1.2
SP93	BOA	89.8	2.7	3.8	2.0
FA93	BOA	88.2	5.1	5.0	1.9
SP94	BOA	77.8	8.4	4.4	1.7
FA94	BOA	87.0	7.8	2.4	1.3
SP95	BOA	71.0	5.0	8.6	2.7
FA95	BOA	.	.	.	.
SP96	BOA	70.2	8.6	3.4	0.7
FA96	BOA	78.2	12.9	5.4	1.5
SP97	BOA	71.6	12.9	7.2	1.2
FA97	BOA	76.6	12.0	4.8	2.0
SP98	BOA	67.6	9.7	8.2	2.0
FA98	BOA	70.4	11.0	6.4	3.5
SP99	BOA	74.0	6.6	6.4	1.9
FA99	BOA	73.2	9.0	8.4	3.2
SP00	BOA	76.0	6.5	3.0	2.0
FA00	BOA	91.8	3.6	1.0	0.8
SP01	BOA	76.8	4.3	5.4	1.6
FA01	BOA	92.6	6.2	1.0	0.6
SP02	BOA	90.4	5.4	1.4	0.5
FA02	BOA	91.2	4.1	1.4	1.0
SP03	BOA	84.0	6.7	3.2	1.6
FA03	BOA	93.2	4.7	0.8	0.5
SP92	GPT	74.6	4.0	16.2	2.5
FA92	GPT	75.4	8.0	10.2	4.0
SP93	GPT	75.6	3.5	9.0	4.5
FA93	GPT	81.8	8.0	3.8	1.3
SP94	GPT	60.0	10.8	16.0	3.3
FA94	GPT	81.2	6.6	2.4	1.5
SP95	GPT	63.4	7.5	18.2	4.7
FA95	GPT	71.8	5.6	13.8	2.9
SP96	GPT	68.8	4.9	18.4	3.9
FA96	GPT	80.4	4.7	10.0	4.8
SP97	GPT	64.8	7.0	22.8	5.1

		Silvetia		Rock	
Sample	Site	mean	se	mean	se
FA97	GPT	80.0	3.1	12.4	2.6
SP98	GPT	60.4	11.2	28.0	8.8
FA98	GPT	65.4	9.7	22.0	7.3
SP99	GPT	64.2	11.2	22.4	8.6
FA99	GPT	.	.	.	.
SP00	GPT	67.6	13.3	15.8	7.2
FA00	GPT	70.6	9.8	19.6	7.9
SP01	GPT	63.2	11.5	21.2	7.1
FA01	GPT	64.6	8.1	22.2	6.5
SP02	GPT	52.4	9.7	30.0	5.4
FA02	GPT	66.6	7.7	16.8	4.3
SP03	GPT	47.4	9.9	30.8	5.8
FA03	GPT	59.4	7.9	20.8	2.6
FA99	PTFM	95.0	1.5	4.0	1.4
SP00	PTFM	90.6	2.1	6.6	1.1
FA00	PTFM	97.8	2.0	2.0	2.0
SP01	PTFM	88.8	3.4	11.2	3.4
FA01	PTFM	98.4	0.9	1.2	1.0
SP02	PTFM	92.4	2.2	7.0	2.3
FA02	PTFM	100.0	0.0	0.0	0.0
SP03	PTFM	96.4	1.4	3.4	1.2
FA03	PTFM	99.4	0.4	0.4	0.2
FA96	CRCO	95.0	1.1	1.8	0.6
SP97	CRCO	86.6	3.0	5.0	2.5
FA97	CRCO	70.6	3.0	1.6	1.0
SP98	CRCO	77.0	4.5	7.4	3.4
FA98	CRCO	95.0	2.3	2.6	1.7
SP99	CRCO	79.2	4.7	12.4	3.2
FA99	CRCO	89.8	3.0	5.0	1.6
SP00	CRCO	74.6	2.3	10.8	2.5
FA00	CRCO	90.8	2.9	3.0	1.5
SP01	CRCO	84.6	5.1	7.2	3.9
FA01	CRCO	92.8	2.2	3.0	1.0
SP02	CRCO	67.4	4.1	8.4	1.7
FA02	CRCO	88.6	1.5	2.6	1.6
SP03	CRCO	87.4	2.2	3.0	0.6
FA03	CRCO	94.0	1.8	1.6	0.4
FA96	SHCO	87.8	1.1	2.6	1.1
SP97	SHCO	72.4	4.5	6.6	4.0
FA97	SHCO	74.6	2.4	0.6	0.4
SP98	SHCO	71.2	6.2	3.0	1.1
FA98	SHCO	74.6	8.6	10.8	3.9

		Silvetia		Rock				*Silvetia*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**Sample**	**Site**	**mean**	**se**	**mean**	**se**
SP99	SHCO	65.8	9.3	1.4	1.2	FA94	CTBR	94.8	0.6	0.6	0.4
FA99	SHCO	83.4	7.2	7.2	3.6	SP95	CTBR	91.4	1.8	0.8	0.6
SP00	SHCO	76.8	7.9	13.0	6.8	FA95	CTBR	97.6	1.0	2.0	0.7
FA00	SHCO	86.8	4.5	4.2	2.5	SP96	CTBR	89.8	3.1	1.2	0.7
SP01	SHCO	89.4	0.9	3.4	1.2	FA96	CTBR	92.2	3.5	0.8	0.2
FA01	SHCO	88.6	3.5	2.0	1.0	SP97	CTBR	84.4	5.2	2.6	1.9
SP02	SHCO	72.8	5.6	7.0	2.7	FA97	CTBR	79.6	4.6	2.0	0.9
FA02	SHCO	85.8	4.9	5.8	3.1	SP98	CTBR	79.0	5.4	1.0	0.5
SP03	SHCO	82.6	2.1	4.8	2.2	FA98	CTBR	66.4	17.4	3.0	1.6
FA03	SHCO	97.0	1.3	0.8	0.4	SP99	CTBR	67.6	13.9	0.0	0.0
						FA99	CTBR	75.2	13.3	8.0	5.9
FA96	TRIS	84.4	2.1	1.2	0.6	SP00	CTBR	72.2	12.6	3.6	2.5
SP97	TRIS	53.8	7.4	10.8	4.3	FA00	CTBR	78.6	10.5	5.6	3.5
FA97	TRIS	69.6	5.3	5.0	2.3	SP01	CTBR	79.4	9.6	2.6	1.5
SP98	TRIS	63.8	4.7	14.8	6.9	FA01	CTBR	77.6	9.3	3.8	2.1
FA98	TRIS	70.4	5.2	20.8	6.8	SP02	CTBR	75.8	10.1	0.6	0.6
SP99	TRIS	62.2	8.7	22.0	8.8	FA02	CTBR	89.8	7.0	1.0	0.8
FA99	TRIS	87.0	4.7	1.0	0.6	SP03	CTBR	76.6	8.5	1.8	0.6
SP00	TRIS	62.2	2.7	14.0	2.0						
FA00	TRIS	85.4	5.0	7.4	3.8	FA94	CTLH	64.8	2.3	22.6	2.5
SP01	TRIS	64.2	8.3	14.0	5.7	SP95	CTLH	67.2	3.8	14.8	2.1
FA01	TRIS	69.6	6.0	7.0	1.9	FA95	CTLH	83.0	1.5	9.4	2.6
SP02	TRIS	59.2	7.1	10.2	2.3	SP96	CTLH	82.8	1.2	8.8	2.7
FA02	TRIS	69.2	6.5	8.8	3.1	FA96	CTLH	91.0	1.0	7.2	0.9
SP03	TRIS	69.4	5.9	7.4	1.4	SP97	CTLH	86.8	1.6	9.2	2.3
FA03	TRIS	92.4	1.7	3.2	1.4	FA97	CTLH	80.2	6.4	3.4	1.8
						SP98	CTLH	64.8	11.2	9.8	3.8
FA96	DAPT	92.6	1.5	2.8	1.2	FA98	CTLH	72.8	11.4	7.8	4.5
SP97	DAPT	84.8	0.8	2.0	0.8	SP99	CTLH	67.8	10.2	1.8	1.2
FA97	DAPT	84.2	3.8	1.0	0.6	FA99	CTLH	85.6	5.7	4.0	2.8
SP98	DAPT	62.8	7.8	7.6	2.8	SP00	CTLH	86.4	3.1	6.8	2.5
FA98	DAPT	85.8	3.9	6.8	2.5	FA00	CTLH	88.0	5.4	6.4	3.8
SP99	DAPT	83.8	1.8	9.6	1.2	SP01	CTLH	92.6	2.7	3.4	1.5
FA99	DAPT	87.6	2.6	1.6	1.1	FA01	CTLH	95.4	1.6	3.0	1.3
SP00	DAPT	82.8	2.7	10.2	3.1	SP02	CTLH	90.4	1.9	4.0	2.1
FA00	DAPT	93.4	0.8	3.6	1.1	FA02	CTLH	95.6	2.4	1.8	0.9
SP01	DAPT	83.0	2.2	8.0	3.1	SP03	CTLH	85.6	3.9	10.4	2.5
FA01	DAPT	94.8	1.8	1.4	0.9						
SP02	DAPT	81.6	3.2	9.0	1.9						
FA02	DAPT	94.0	1.5	2.8	1.0						
SP03	DAPT	83.0	1.4	5.8	1.4						
FA03	DAPT	94.4	1.9	3.2	1.7						

Hesperophycus

		Hesperophycus		*Endocladia*		Barnacles		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA95	PSN	89.4	2.0	3.6	1.4	2.0	1.0	5.0	1.7
SP96	PSN	89.0	2.3	3.4	1.2	1.2	1.0	3.2	0.7
FA96	PSN	85.2	3.2	1.8	0.7	3.8	3.1	8.4	1.5
SP97	PSN	71.6	10.3	5.0	2.9	7.2	5.5	15.2	5.3
FA97	PSN	58.8	12.1	2.8	0.7	2.8	2.6	30.8	9.0
SP98	PSN	44.2	11.5	6.2	1.3	3.6	1.2	39.0	11.4
FA98	PSN	32.8	8.4	4.2	1.2	1.2	0.5	49.2	10.6
SP99	PSN	32.8	7.8	4.0	1.6	2.8	0.4	46.0	9.8
FA99	PSN	16.8	7.7	6.2	2.0	4.8	2.4	59.4	8.8
SP00	PSN	18.4	7.5	8.0	2.4	2.6	1.2	57.6	7.6
FA00	PSN	14.2	9.4	9.2	3.3	5.2	2.6	67.4	9.8
SP01	PSN	14.8	9.5	9.2	1.9	5.4	1.0	64.6	11.7
FA01	PSN	10.2	6.5	11.2	3.8	3.2	1.5	71.4	7.0
SP02	PSN	11.4	6.4	19.8	5.0	1.4	0.7	65.0	7.1
FA02	PSN	10.6	5.0	15.8	4.6	8.0	2.8	59.6	8.0
SP03	PSN	12.6	5.8	24.6	7.2	2.2	0.6	55.6	7.4
FA03	PSN	23.0	11.2	14.4	5.1	1.0	0.3	56.2	8.4
FA95	CAY	88.2	3.3	0.8	0.6	1.6	1.0	8.6	2.0
SP96	CAY	62.0	2.8	6.6	1.6	10.4	3.3	20.8	3.2
FA96	CAY	39.4	8.8	5.2	0.7	9.2	3.8	42.8	6.0
SP97	CAY	17.8	5.6	7.2	1.2	24.8	6.3	48.0	1.8
FA97	CAY	15.4	4.4	9.4	3.4	17.4	5.4	54.0	4.1
SP98	CAY	17.4	5.7	16.2	8.7	9.8	2.5	51.6	9.8
FA98	CAY	21.8	6.8	4.4	1.3	9.0	1.4	62.0	6.9
SP99	CAY	14.0	4.5	7.4	2.6	7.8	3.1	69.4	6.8
FA99	CAY	18.4	4.9	7.0	1.7	5.2	2.6	60.8	9.1
SP00	CAY	25.6	6.9	8.8	2.7	2.4	1.9	61.0	9.2
FA00	CAY	27.6	9.9	7.6	1.8	3.8	2.2	58.2	10.6
SP01	CAY	33.8	13.4	5.4	2.6	4.0	2.5	55.4	13.5
FA01	CAY	33.4	13.8	4.6	2.3	4.0	2.2	57.6	12.7
SP02	CAY	29.0	12.3	7.4	1.9	3.0	1.8	58.8	11.9
FA02	CAY	21.2	9.9	7.0	2.3	6.2	2.1	60.0	10.0
SP03	CAY	25.8	11.3	9.0	3.3	3.4	1.9	60.0	11.9
FA03	CAY	20.6	7.9	8.8	3.8	3.6	1.7	62.6	10.3

Endocladia

		Endocladia		*Silvetia*		Barnacles		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA95	CAY	59.6	2.5	0.0	0.0	3.2	1.0	23.0	1.8
SP96	CAY	65.0	8.1	0.0	0.0	1.2	0.7	26.2	6.1
FA96	CAY	52.0	5.4	0.0	0.0	3.4	1.8	28.4	8.0
SP97	CAY	61.0	8.2	0.0	0.0	4.0	1.7	21.4	5.8
FA97	CAY	39.2	13.4	0.0	0.0	3.4	1.6	51.2	14.0
SP98	CAY	54.8	9.9	0.0	0.0	0.0	0.0	32.4	8.9
FA98	CAY	13.2	2.8	0.0	0.0	0.2	0.2	77.0	3.6
SP99	CAY	21.0	2.7	0.0	0.0	3.4	2.9	64.2	5.5
FA99	CAY	18.6	3.0	2.2	1.0	2.2	2.2	66.2	6.1
SP00	CAY	23.8	4.7	0.0	0.0	0.6	0.6	68.0	6.6
FA00	CAY	36.6	6.5	0.0	0.0	0.6	0.4	55.0	7.9
SP01	CAY	37.0	8.4	0.0	0.0	0.8	0.4	52.4	10.0
FA01	CAY	25.6	4.3	0.0	0.0	0.0	0.0	62.6	7.3
SP02	CAY	42.4	6.6	0.0	0.0	0.0	0.0	44.4	9.6
FA02	CAY	31.2	7.6	0.0	0.0	0.4	0.2	53.0	7.7
SP03	CAY	45.8	9.5	0.0	0.0	0.8	0.4	42.4	10.1
FA03	CAY	33.4	11.1	0.0	0.0	1.0	0.6	49.8	11.8
FA95	HAZ	53.4	5.5	3.2	1.3	13.6	4.2	19.4	3.9
SP96	HAZ	68.2	5.9	2.6	1.9	6.6	3.5	15.4	3.4
FA96	HAZ	50.6	3.1	0.2	0.2	11.0	5.4	31.8	6.3
SP97	HAZ	62.8	6.0	3.6	1.6	3.8	1.5	19.0	3.6
FA97	HAZ	33.6	4.8	0.2	0.2	10.4	5.0	45.8	7.7
SP98	HAZ	59.4	9.5	0.0	0.0	2.4	1.2	25.4	6.3
FA98	HAZ	30.8	4.5	0.0	0.0	11.2	5.3	44.8	6.5
SP99	HAZ	37.8	2.1	0.8	0.4	11.8	7.7	33.4	5.4
FA99	HAZ	10.2	4.1	0.2	0.2	13.0	8.3	52.2	7.5
SP00	HAZ	15.2	5.0	0.0	0.0	15.8	8.0	53.2	8.9
FA00	HAZ	11.6	3.5	0.0	0.0	11.2	7.1	41.2	8.4
SP01	HAZ	14.4	4.3	0.2	0.2	12.6	6.1	57.8	10.4
FA01	HAZ	15.0	4.5	0.0	0.0	19.4	6.0	53.4	5.1
SP02	HAZ	22.8	5.8	0.0	0.0	18.2	6.6	47.2	8.0
FA02	HAZ	10.4	2.8	0.4	0.2	34.0	9.6	43.6	5.5
SP03	HAZ	21.4	5.5	0.4	0.2	21.0	8.3	48.2	6.4
FA03	HAZ	14.2	4.5	0.4	0.4	18.8	5.5	52.8	6.1
FA95	SHB	64.8	4.8	0.0	0.0	8.4	8.4	18.6	3.5
SP96	SHB	90.2	1.4	0.2	0.2	0.2	0.2	5.8	1.3
FA96	SHB	45.2	10.1	0.0	0.0	8.8	6.2	43.4	5.8
SP97	SHB	58.6	10.8	0.0	0.0	7.4	7.4	29.8	5.2
FA97	SHB	56.4	13.7	0.0	0.0	16.2	16.2	22.2	3.1
SP98	SHB	74.4	13.1	0.0	0.0	14.0	14.0	6.8	2.0
FA98	SHB	28.8	4.4	0.0	0.0	16.8	15.1	47.4	9.7
SP99	SHB	61.6	7.7	0.0	0.0	11.4	11.4	21.8	4.8
FA99	SHB	65.4	7.2	0.0	0.0	10.8	10.8	19.8	4.5

		Endocladia		*Silvetia*		Barnacles		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP00	SHB	74.2	5.3	0.4	0.4	7.8	7.8	13.4	1.9
FA00	SHB	16.6	4.3	0.0	0.0	56.8	6.9	20.4	3.1
SP01	SHB	34.0	7.7	0.0	0.0	51.4	9.6	11.0	2.5
FA01	SHB	24.6	6.3	0.0	0.0	62.8	8.3	8.2	4.0
SP02	SHB	43.6	10.8	0.0	0.0	45.6	11.3	8.0	3.1
FA02	SHB	29.0	6.4	0.4	0.4	57.2	10.4	10.0	3.5
SP03	SHB	40.2	9.8	0.2	0.2	39.0	11.6	13.4	3.6
FA03	SHB	24.4	9.5	0.0	0.0	48.6	10.7	20.6	3.7
SP92	OCC	69.6	6.4	0.0	0.0	8.0	2.4	19.6	5.3
FA92	OCC	32.8	7.1	0.8	0.6	19.4	2.4	40.6	6.5
SP93	OCC	59.0	6.3	0.0	0.0	11.0	2.1	19.6	4.5
FA93	OCC	23.8	7.5	0.0	0.0	13.2	5.1	29.6	9.7
SP94	OCC	36.2	9.9	0.2	0.2	24.6	2.4	29.8	7.8
FA94	OCC	17.4	5.8	0.2	0.2	46.0	4.9	9.8	4.9
SP95	OCC	36.4	9.9	0.0	0.0	26.8	6.1	12.0	6.8
FA95	OCC	30.0	5.9	0.0	0.0	16.0	5.5	15.0	6.0
SP96	OCC	58.8	7.8	0.0	0.0	13.0	3.9	12.8	4.0
FA96	OCC	26.4	8.7	0.0	0.0	19.0	2.7	18.4	2.5
SP97	OCC	42.0	9.8	0.0	0.0	12.8	1.4	16.6	4.6
FA97	OCC	28.4	4.5	0.0	0.0	4.8	1.5	27.2	7.1
SP98	OCC	49.8	8.5	0.0	0.0	4.2	1.0	15.0	2.3
FA98	OCC	16.6	2.4	0.0	0.0	12.0	3.3	31.6	4.3
SP99	OCC	20.6	5.0	0.0	0.0	5.8	3.4	21.6	4.1
FA99	OCC	16.0	6.0	0.0	0.0	4.5	2.7	16.5	4.9
SP00	OCC	27.8	6.5	0.2	0.2	3.4	2.7	13.2	3.7
FA00	OCC	22.4	8.4	0.0	0.0	5.2	2.9	15.6	4.8
SP01	OCC	29.8	9.1	0.0	0.0	0.8	0.6	7.0	2.4
FA01	OCC	17.6	6.9	0.0	0.0	2.0	1.5	8.6	2.9
SP02	OCC	27.4	7.4	0.0	0.0	0.8	0.4	11.2	2.7
FA02	OCC	8.4	5.8	0.0	0.0	1.6	1.4	14.6	3.9
SP03	OCC	15.4	7.7	0.2	0.2	1.2	0.5	24.2	4.6
FA03	OCC	14.2	6.0	0.0	0.0	2.4	0.9	28.4	7.5
SP92	STA	79.6	2.5	0.8	0.2	0.0	0.0	18.0	1.6
FA92	STA	19.8	6.7	0.0	0.0	0.0	0.0	66.8	5.0
SP93	STA	40.8	8.1	1.4	0.7	0.0	0.0	45.8	7.9
FA93	STA	40.8	5.1	0.8	0.6	0.0	0.0	53.8	4.4
SP94	STA	56.6	3.0	0.6	0.6	0.0	0.0	38.2	3.6
FA94	STA	62.0	6.2	2.0	1.0	0.0	0.0	32.4	4.9
SP95	STA	73.0	3.3	3.2	1.0	0.0	0.0	19.4	4.3
FA95	STA	47.8	5.8	0.4	0.2	0.0	0.0	41.4	5.2
SP96	STA	68.4	3.5	0.2	0.2	0.0	0.0	25.4	3.3
FA96	STA	43.8	6.2	0.0	0.0	0.8	0.5	44.6	7.0
SP97	STA	62.6	4.6	0.0	0.0	0.0	0.0	30.0	4.6
FA97	STA	37.6	3.5	0.2	0.2	0.0	0.0	49.4	6.9

		Endocladia		*Silvetia*		Barnacles		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP98	STA	71.4	4.6	0.4	0.2	0.0	0.0	22.6	5.2
FA98	STA	36.0	3.0	0.8	0.6	0.0	0.0	48.6	4.1
SP99	STA	47.0	3.3	0.4	0.4	0.0	0.0	45.4	2.7
FA99	STA	39.2	1.8	0.4	0.2	0.0	0.0	47.8	3.7
SP00	STA	58.0	1.4	0.0	0.0	0.0	0.0	32.2	2.2
FA00	STA	29.4	4.4	0.0	0.0	0.0	0.0	60.2	5.5
SP01	STA	45.0	5.4	0.2	0.2	0.0	0.0	40.0	3.8
FA01	STA	34.2	8.6	2.0	1.0	0.2	0.2	48.2	10.4
SP02	STA	53.2	13.9	0.6	0.2	0.0	0.0	32.4	8.4
FA02	STA	31.4	8.2	6.2	1.6	0.0	0.0	35.4	2.9
SP03	STA	57.2	14.4	2.2	1.0	0.2	0.2	21.4	7.7
FA03	STA	36.2	10.2	2.6	1.3	0.0	0.0	36.8	8.8
SP92	BOA	76.0	2.6	0.0	0.0	3.2	1.0	11.2	1.8
FA92	BOA	48.0	7.6	3.0	1.3	4.6	2.0	26.8	10.4
SP93	BOA	57.4	8.7	3.0	1.3	0.4	0.4	25.4	10.9
FA93	BOA	54.6	8.0	6.8	3.3	0.0	0.0	19.4	6.1
SP94	BOA	56.0	3.7	7.2	3.7	0.0	0.0	21.0	6.4
FA94	BOA	40.4	10.1	25.0	11.3	0.0	0.0	12.6	5.7
SP95	BOA	50.6	10.0	32.6	13.1	0.2	0.2	11.2	4.6
FA95	BOA	41.4	14.5	39.4	19.4	0.6	0.6	10.6	5.6
SP96	BOA	35.8	14.4	40.6	20.5	0.4	0.2	11.8	5.5
FA96	BOA	36.2	15.2	48.6	21.4	1.2	0.5	5.8	2.4
SP97	BOA	40.8	16.6	43.8	22.7	0.2	0.2	11.8	6.3
FA97	BOA	35.6	15.4	47.2	21.6	0.2	0.2	9.8	5.0
SP98	BOA	46.8	19.2	43.8	22.7	0.4	0.4	4.4	2.2
FA98	BOA	19.0	9.3	49.0	21.5	0.2	0.2	21.6	10.8
SP99	BOA	28.4	12.4	47.6	21.3	0.0	0.0	14.8	6.6
FA99	BOA	11.6	7.3	67.0	12.6	0.0	0.0	14.8	7.9
SP00	BOA	18.4	8.5	58.8	17.7	0.0	0.0	12.4	5.6
FA00	BOA	19.0	12.9	63.8	18.3	0.6	0.4	10.8	5.9
SP01	BOA	31.8	14.6	50.6	19.8	2.0	1.2	10.4	5.0
FA01	BOA	23.0	11.2	55.6	16.9	1.0	1.0	16.2	5.2
SP02	BOA	13.4	9.9	70.6	13.7	2.2	2.2	11.2	4.3
FA02	BOA	16.4	7.3	60.2	18.4	1.6	1.6	8.4	3.7
SP03	BOA	27.2	12.2	50.4	18.6	2.2	2.2	10.2	3.1
FA03	BOA	21.8	10.4	55.4	18.0	2.4	1.9	10.2	3.8
SP92	GPT	55.4	5.8	0.0	0.0	15.2	3.8	29.0	5.6
FA92	GPT	8.6	0.9	0.0	0.0	35.6	6.7	55.2	6.2
SP93	GPT	52.2	4.3	0.2	0.2	13.6	4.8	29.6	3.0
FA93	GPT	33.8	2.7	0.8	0.8	8.8	3.6	44.2	1.9
SP94	GPT	25.8	4.1	0.2	0.2	19.6	5.3	54.2	1.8
FA94	GPT	38.2	5.9	0.8	0.8	11.4	3.1	46.2	5.8
SP95	GPT	45.6	3.2	2.2	1.7	4.4	1.7	46.8	3.0
FA95	GPT	37.4	3.3	3.0	2.8	10.0	3.5	40.0	4.8

		Endocladia		*Silvetia*		Barnacles		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP96	GPT	62.0	3.5	2.4	2.4	5.2	1.5	27.8	5.6
FA96	GPT	22.4	3.0	0.2	0.2	10.6	3.6	58.0	3.9
SP97	GPT	32.2	4.5	0.2	0.2	17.2	3.5	47.8	2.4
FA97	GPT	13.8	1.6	0.2	0.2	19.4	5.8	61.0	6.1
SP98	GPT	19.8	8.1	0.4	0.4	4.6	2.7	59.6	7.7
FA98	GPT	10.4	2.2	0.6	0.4	8.8	3.9	69.6	6.1
SP99	GPT	34.4	5.4	0.8	0.4	5.2	2.6	52.4	7.9
FA99	GPT	.	.	.	.	.	.	.	.
SP00	GPT	54.0	5.5	0.4	0.4	2.4	1.5	36.4	7.3
FA00	GPT	16.4	3.9	0.0	0.0	6.6	4.5	71.4	5.5
SP01	GPT	25.6	7.4	0.0	0.0	11.2	5.0	58.2	3.8
FA01	GPT	15.4	5.5	0.0	0.0	17.4	7.5	53.6	2.6
SP02	GPT	41.6	8.5	0.0	0.0	15.8	7.0	36.2	4.0
FA02	GPT	16.2	4.3	0.0	0.0	18.8	8.9	55.2	5.6
SP03	GPT	43.4	8.9	0.0	0.0	12.4	7.7	39.0	4.8
FA03	GPT	9.6	4.0	0.0	0.0	25.6	12.0	55.2	7.7
FA94	OLDS	25.6	6.2	0.0	0.0	55.2	7.4	7.4	2.4
SP95	OLDS	29.8	4.1	0.0	0.0	47.8	6.3	11.6	4.9
FA95	OLDS	37.2	6.6	0.0	0.0	36.0	5.2	17.6	5.7
SP96	OLDS	45.2	6.8	0.0	0.0	35.8	3.4	12.6	3.2
FA96	OLDS	29.2	7.8	0.0	0.0	31.0	7.9	15.4	4.6
SP97	OLDS	27.6	5.8	0.0	0.0	48.6	6.6	8.0	2.1
FA97	OLDS	50.2	2.2	0.0	0.0	18.6	6.1	13.0	5.0
SP98	OLDS	12.2	4.0	0.0	0.0	38.6	8.2	37.0	7.1
FA98	OLDS	18.6	4.0	0.0	0.0	63.8	3.0	6.6	2.2
SP99	OLDS	18.0	3.7	0.0	0.0	46.0	6.1	20.2	3.8
FA99	OLDS	25.8	3.2	0.0	0.0	37.6	3.8	16.4	2.8
SP00	OLDS	23.2	3.0	0.0	0.0	36.0	7.1	25.2	5.7
FA00	OLDS	19.0	3.1	0.0	0.0	35.4	3.7	25.0	4.6
SP01	OLDS	36.6	4.0	0.0	0.0	24.0	2.4	23.4	3.6
FA01	OLDS	28.0	2.7	0.0	0.0	22.8	2.0	17.8	3.9
SP02	OLDS	14.0	3.3	0.0	0.0	34.8	3.3	41.0	4.3
FA02	OLDS	11.0	3.7	0.0	0.0	38.6	8.3	25.6	5.5
SP03	OLDS	20.6	4.0	0.0	0.0	29.0	6.8	42.2	8.4
FA03	OLDS	21.6	5.6	0.0	0.0	16.8	3.5	11.4	2.6
FA94	PCOV	18.0	2.1	0.0	0.0	43.6	6.6	35.4	4.8
SP95	PCOV	21.8	3.1	0.0	0.0	17.0	5.4	58.0	5.1
FA95	PCOV	36.0	6.5	0.0	0.0	16.0	4.6	43.2	4.8
SP96	PCOV	42.2	5.6	0.0	0.0	7.4	3.1	47.0	5.6
FA96	PCOV	53.4	6.5	0.0	0.0	4.0	1.2	39.6	6.8
SP97	PCOV	50.8	6.9	0.0	0.0	1.4	0.6	40.4	6.6
FA97	PCOV	52.2	8.3	0.0	0.0	2.4	1.9	33.8	7.1
SP98	PCOV	53.0	9.1	0.0	0.0	1.0	0.3	40.6	9.3
FA98	PCOV	49.2	5.3	0.0	0.0	12.0	4.1	33.2	5.1

		Endocladia		*Silvetia*		Barnacles		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP99	PCOV	34.2	6.3	0.0	0.0	14.2	4.6	45.8	3.6
FA99	PCOV	55.2	7.5	0.0	0.0	3.0	1.4	33.2	7.9
SP00	PCOV	51.8	9.4	0.0	0.0	0.4	0.2	39.8	8.8
FA00	PCOV	60.2	10.5	0.0	0.0	4.6	3.6	29.2	5.7
SP01	PCOV	54.4	9.8	0.0	0.0	6.4	3.7	29.4	6.2
FA01	PCOV	57.6	8.0	0.0	0.0	1.2	0.7	21.6	6.5
SP02	PCOV	40.8	5.7	0.0	0.0	7.2	2.9	40.0	8.1
FA02	PCOV	60.8	6.9	0.0	0.0	2.4	1.0	24.2	5.0
SP03	PCOV	57.6	12.5	0.0	0.0	3.4	1.2	32.6	10.9
FA03	PCOV	54.6	9.1	0.0	0.0	1.6	0.5	27.4	9.3
FA94	WHPT	59.8	2.7	0.0	0.0	8.0	1.9	27.4	2.9
SP95	WHPT	83.6	4.2	0.0	0.0	5.6	2.5	8.0	1.1
FA95	WHPT	56.2	2.2	0.0	0.0	4.0	2.4	27.4	2.5
SP96	WHPT	76.6	4.7	0.0	0.0	8.6	2.2	8.0	1.5
FA96	WHPT	61.6	1.8	0.0	0.0	7.2	0.9	18.2	4.0
SP97	WHPT	70.2	4.4	0.0	0.0	9.0	2.4	10.8	2.8
FA97	WHPT	46.6	7.1	0.0	0.0	18.2	2.1	23.6	5.5
SP98	WHPT	71.0	4.1	0.0	0.0	9.0	2.7	7.8	2.1
FA98	WHPT	45.2	5.9	0.0	0.0	11.8	3.1	29.8	2.9
SP99	WHPT	36.4	4.2	0.0	0.0	8.4	3.5	37.4	3.1
FA99	WHPT	32.4	3.6	0.0	0.0	19.0	3.4	39.4	0.7
SP00	WHPT	35.6	2.3	0.0	0.0	18.8	1.8	7.6	1.4
FA00	WHPT	34.2	4.5	0.0	0.0	10.6	1.9	48.6	2.6
SP01	WHPT	37.2	4.9	0.0	0.0	16.6	1.6	40.8	4.0
FA01	WHPT	45.2	3.5	0.0	0.0	16.0	2.1	29.0	1.9
SP02	WHPT	45.2	12.6	0.0	0.0	18.4	1.8	21.2	3.8
FA02	WHPT	42.6	3.3	0.0	0.0	19.2	3.6	30.6	1.7
SP03	WHPT	69.6	3.2	0.0	0.0	12.2	2.2	8.2	1.8
FA03	WHPT	30.2	4.4	0.0	0.0	14.4	2.2	11.4	1.1
FA96	SHCO	42.0	4.8	0.2	0.2	25.4	4.8	28.0	3.1
SP97	SHCO	31.6	6.7	0.0	0.0	37.4	6.5	29.2	2.8
FA97	SHCO	28.2	3.9	1.2	1.2	59.6	4.7	6.4	1.8
SP98	SHCO	31.8	5.5	1.2	1.2	46.8	6.2	15.6	3.0
FA98	SHCO	35.2	4.9	1.2	1.0	49.8	4.8	12.0	2.0
SP99	SHCO	38.4	5.8	2.0	1.8	48.8	4.9	7.2	1.8
FA99	SHCO	43.0	3.9	1.2	0.8	37.4	4.5	15.8	4.3
SP00	SHCO	39.8	5.6	2.2	2.0	21.4	3.6	35.0	6.9
FA00	SHCO	21.0	3.4	2.4	2.4	35.8	5.9	38.0	4.6
SP01	SHCO	40.4	7.3	1.8	0.8	33.8	4.7	23.2	3.2
FA01	SHCO	51.6	4.0	1.6	0.8	31.6	4.7	13.4	1.3
SP02	SHCO	43.6	8.3	1.2	1.0	37.2	6.8	16.4	3.2
FA02	SHCO	49.0	2.4	4.2	3.1	21.0	4.2	12.4	2.0
SP03	SHCO	44.6	6.5	4.4	3.1	21.0	5.3	18.6	3.1
FA03	SHCO	19.6	4.1	13.0	8.4	29.8	4.9	28.2	2.5

Mastocarpus

Sample	Site	*Mastocarpus* mean	*Mastocarpus* se	*Endocladia* mean	*Endocladia* se	Rock mean	Rock se
FA95	PSN	83.4	3.2	5.8	0.7	5.8	2.1
SP96	PSN	29.8	5.7	26.4	2.8	21.4	6.8
FA96	PSN	57.0	6.6	18.6	4.8	13.2	6.0
SP97	PSN	22.0	8.0	38.2	5.3	20.2	4.6
FA97	PSN	39.6	8.4	24.0	4.1	22.4	3.7
SP98	PSN	30.2	6.2	34.0	7.6	25.0	5.8
FA98	PSN	67.4	7.5	10.0	4.7	11.8	2.4
SP99	PSN	24.8	6.1	30.0	7.0	27.0	6.5
FA99	PSN	21.4	6.4	16.8	3.0	41.0	10.8
SP00	PSN	15.4	3.2	23.4	5.2	41.2	9.4
FA00	PSN	27.2	6.3	17.4	4.4	35.8	7.1
SP01	PSN	17.2	3.2	28.8	5.4	36.4	9.4
FA01	PSN	38.0	5.7	22.4	5.4	25.8	9.9
SP02	PSN	24.6	4.1	35.8	4.7	23.0	8.1
FA02	PSN	47.8	6.6	13.8	3.8	14.0	7.9
SP03	PSN	13.0	2.8	37.2	7.1	30.0	9.8
FA03	PSN	52.2	8.1	17.8	2.0	16.8	6.7
FA95	SHB	61.6	5.2	20.4	5.0	17.4	2.6
SP96	SHB	35.8	6.7	47.8	6.7	14.0	2.6
FA96	SHB	37.0	4.2	35.2	6.5	25.8	4.3
SP97	SHB	35.2	6.5	50.2	5.8	13.2	3.3
FA97	SHB	33.4	4.9	38.6	4.1	26.0	1.0
SP98	SHB	30.2	3.7	57.8	5.5	9.4	1.4
FA98	SHB	17.6	1.7	23.2	4.0	46.8	4.8
SP99	SHB	21.6	5.2	52.6	3.9	21.8	4.7
FA99	SHB	17.6	4.8	47.6	4.7	31.4	3.4
SP00	SHB	16.0	5.0	58.4	6.9	22.6	2.4
FA00	SHB	7.0	2.1	29.0	6.4	34.6	4.7
SP01	SHB	15.8	5.5	47.6	7.7	18.0	3.0
FA01	SHB	4.8	2.0	47.4	7.0	23.4	10.4
SP02	SHB	9.8	3.7	59.2	6.0	18.6	8.1
FA02	SHB	16.8	4.5	37.8	6.2	25.8	6.4
SP03	SHB	21.6	5.3	51.8	5.4	21.2	6.1
FA03	SHB	11.2	2.4	50.2	6.5	25.4	5.4

Mazzaella

		Mazzaella		Artic. Coralline		Other red	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA95	PSN	66.4	4.4	16.0	1.1	12.8	2.3
SP96	PSN	59.0	6.2	25.6	6.9	11.8	4.4
FA96	PSN	50.2	6.9	22.2	4.5	23.4	3.4
SP97	PSN	65.0	4.7	18.0	6.6	12.8	3.0
FA97	PSN	48.6	5.8	20.4	3.6	28.6	5.5
SP98	PSN	31.2	7.1	41.0	7.8	19.6	5.8
FA98	PSN	43.2	3.9	13.6	2.0	38.4	4.8
SP99	PSN	54.2	3.2	18.2	3.1	22.6	3.3
FA99	PSN	44.6	3.4	26.0	4.9	20.4	3.3
SP00	PSN	37.2	2.8	33.4	6.6	19.4	3.3
FA00	PSN	46.4	6.1	20.4	6.2	25.0	3.4
SP01	PSN	57.0	4.2	16.8	4.2	7.4	2.5
FA01	PSN	71.8	3.3	10.6	2.0	4.0	1.8
SP02	PSN	51.2	3.7	29.8	3.1	7.0	2.3
FA02	PSN	69.4	6.6	11.0	1.2	10.6	5.5
SP03	PSN	55.2	2.2	24.2	5.2	7.4	1.9
FA03	PSN	75.8	6.4	6.8	0.7	7.8	2.8
FA95	HAZ	54.2	3.2	7.6	1.6	16.6	3.9
SP96	HAZ	37.8	6.3	18.4	1.9	9.6	2.8
FA96	HAZ	52.4	6.4	10.2	2.9	21.4	5.1
SP97	HAZ	48.8	4.7	13.4	3.1	13.4	3.0
FA97	HAZ	45.0	5.1	15.8	3.7	21.6	3.6
SP98	HAZ	34.0	6.4	8.6	2.9	19.2	4.4
FA98	HAZ	51.4	3.9	3.6	1.4	30.0	6.3
SP99	HAZ	49.2	8.3	8.4	2.7	15.4	5.1
FA99	HAZ	46.8	6.7	9.8	2.7	14.4	4.7
SP00	HAZ	44.2	5.2	10.8	1.7	17.4	4.7
FA00	HAZ	46.0	6.0	10.0	0.8	16.2	5.1
SP01	HAZ	44.2	4.5	6.6	1.4	12.6	3.1
FA01	HAZ	38.6	8.4	4.2	1.2	10.0	2.4
SP02	HAZ	40.4	6.7	5.4	0.9	12.2	2.4
FA02	HAZ	41.4	5.0	2.8	0.9	10.8	1.9
SP03	HAZ	40.4	7.7	4.0	0.8	10.8	1.7
FA03	HAZ	57.0	9.8	1.8	0.7	7.4	2.0

Anthopleura

		Anthopleura		Other red		Sand		Rock	
Sample	Site	mean	se	mean	se	mean	se	mean	se
SP92	BOA	14.8	0.9	62.4	10.2	0.0	0.0	5.2	1.7
FA92	BOA	20.0	1.6	47.6	8.3	9.6	3.9	0.2	0.2
SP93	BOA	15.2	1.5	74.4	3.6	1.0	1.0	0.8	0.6
FA93	BOA	15.8	2.7	67.8	5.5	10.4	8.2	0.0	0.0
SP94	BOA	13.6	1.9	76.2	3.5	0.6	0.6	2.0	1.0
FA94	BOA	8.6	2.0	69.8	5.5	9.0	3.4	0.0	0.0
SP95	BOA	15.4	2.2	71.2	2.6	1.0	0.5	0.8	0.5
FA95	BOA	11.2	1.7	83.8	1.6	3.2	1.9	0.0	0.0
SP96	BOA	16.8	3.3	78.6	3.8	0.0	0.0	0.8	0.5
FA96	BOA	10.2	2.2	87.2	2.1	1.4	0.9	0.0	0.0
SP97	BOA	13.6	1.5	83.0	2.3	0.0	0.0	1.8	1.4
FA97	BOA	10.8	1.7	86.6	2.5	0.4	0.2	1.0	1.0
SP98	BOA	12.8	1.4	71.6	5.5	0.0	0.0	11.2	5.9
FA98	BOA	6.6	2.4	76.4	8.5	0.0	0.0	10.4	10.4
SP99	BOA	9.6	1.3	64.4	5.5	2.0	0.7	7.8	5.9
FA99	BOA	10.2	2.5	63.4	9.1	3.4	1.2	9.0	8.0
SP00	BOA	11.6	1.9	73.6	4.5	0.4	0.2	4.8	4.1
FA00	BOA	8.2	1.5	91.0	1.7	0.0	0.0	0.4	0.4
SP01	BOA	12.6	2.0	34.4	4.3	0.8	0.8	1.6	1.1
FA01	BOA	10.0	2.8	78.8	3.5	3.8	1.2	1.0	0.8
SP02	BOA	9.6	2.3	32.6	3.7	1.8	1.6	5.6	3.5
FA02	BOA	16.2	4.2	30.4	6.7	3.0	1.5	3.0	1.4
SP03	BOA	11.4	2.0	21.4	4.5	0.0	0.0	3.0	1.0
FA03	BOA	10.6	2.8	27.4	5.5	0.0	0.0	5.8	2.1
SP92	ALEG	94.0	2.4	0.0	0.0	0.0	0.0	4.6	2.2
FA92	ALEG	85.0	1.9	0.0	0.0	0.8	0.6	12.0	2.1
SP93	ALEG	76.0	3.9	0.0	0.0	0.0	0.0	21.4	4.7
FA93	ALEG	86.0	3.0	0.0	0.0	0.0	0.0	12.0	2.3
SP94	ALEG	88.2	4.6	0.0	0.0	0.8	0.6	7.0	1.5
FA94	ALEG	72.6	10.3	0.0	0.0	21.0	11.1	1.2	0.6
SP95	ALEG	77.0	4.0	3.4	2.3	0.0	0.0	13.6	4.1
FA95	ALEG	69.4	6.3	3.2	2.0	1.4	0.6	13.4	3.4
SP96	ALEG	74.8	8.4	0.0	0.0	0.0	0.0	16.6	3.7
FA96	ALEG	65.2	8.5	0.0	0.0	0.0	0.0	19.0	6.0
SP97	ALEG	67.0	9.8	0.0	0.0	0.0	0.0	21.2	7.3
FA97	ALEG	72.0	10.1	0.0	0.0	1.2	1.0	12.6	4.8
SP98	ALEG	53.0	8.7	0.0	0.0	0.0	0.0	34.0	10.2
FA98	ALEG	40.4	7.1	0.0	0.0	0.0	0.0	29.6	4.3
SP99	ALEG	42.0	7.2	0.2	0.2	0.8	0.4	44.4	9.4
FA99	ALEG	68.0	10.0	0.2	0.2	0.6	0.6	11.4	4.2
SP00	ALEG	72.0	8.8	0.0	0.0	0.6	0.4	25.0	9.3
FA00	ALEG	72.8	8.5	0.2	0.2	0.8	0.4	12.0	6.0
SP01	ALEG	79.4	10.5	0.0	0.0	0.2	0.2	6.0	3.1
FA01	ALEG	79.6	10.1	0.2	0.2	0.4	0.2	6.4	2.8

		Anthopleura		Other red		Sand		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP02	ALEG	76.8	10.4	0.0	0.0	1.0	0.8	8.6	3.9
FA02	ALEG	72.0	8.7	0.0	0.0	5.8	2.4	9.0	4.5
SP03	ALEG	64.4	11.5	0.0	0.0	0.6	0.4	20.4	8.3
FA03	ALEG	30.2	9.8	0.2	0.2	56.2	16.8	0.2	0.2
SP92	COPT	24.6	2.0	53.0	7.0	1.8	1.3	16.4	4.5
FA92	COPT	17.4	2.2	72.2	3.4	3.2	1.3	5.6	1.6
SP93	COPT	22.0	2.1	55.0	9.6	0.0	0.0	20.4	10.6
FA93	COPT	16.2	3.4	82.2	2.7	1.0	1.0	0.2	0.2
SP94	COPT	18.6	2.1	61.6	9.0	6.2	4.0	9.2	5.6
FA94	COPT	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
SP95	COPT	17.6	4.1	20.2	4.6	3.8	2.3	50.4	8.7
FA95	COPT	10.6	2.2	77.6	3.1	6.4	1.3	2.2	0.4
SP96	COPT	13.8	3.2	26.0	4.9	22.8	4.6	10.2	5.0
FA96	COPT	11.4	3.3	51.2	7.6	23.8	11.2	2.4	0.9
SP97	COPT	13.6	5.1	14.6	4.2	65.0	10.0	0.0	0.0
FA97	COPT	14.0	3.6	33.0	4.4	21.0	9.2	23.4	11.0
SP98	COPT	11.8	1.6	72.6	10.3	0.0	0.0	15.4	8.9
FA98	COPT	38.0	7.5	37.0	6.6	3.0	3.0	0.0	0.0
SP99	COPT	2.4	2.4	0.2	0.2	96.4	3.6	0.0	0.0
FA99	COPT	14.8	2.9	68.0	2.6	6.4	2.0	3.6	1.5
SP00	COPT	12.6	2.7	41.6	8.3	33.4	9.7	6.0	3.0
FA00	COPT	15.0	1.9	60.6	3.1	7.2	1.4	10.0	2.3
SP01	COPT	15.2	2.2	34.6	5.2	25.4	7.5	8.6	4.9
FA01	COPT	14.8	2.0	67.2	3.1	0.8	0.4	9.8	2.1
SP02	COPT	15.0	1.8	48.8	4.5	17.0	6.2	7.6	2.3
FA02	COPT	5.8	5.8	6.0	5.0	86.2	12.8	1.8	1.8
SP03	COPT	15.8	2.6	68.8	3.4	7.0	1.4	1.4	0.5
FA03	COPT	18.6	3.6	65.8	3.8	1.0	0.4	11.6	2.9
SP92	CARP	36.6	4.0	10.0	5.8	45.4	11.4	3.4	1.5
FA92	CARP	33.0	3.7	19.0	4.4	36.2	5.3	5.6	1.9
SP93	CARP	26.0	1.0	57.4	1.5	10.6	2.2	1.0	0.8
FA93	CARP	23.8	3.6	57.2	7.6	9.8	4.3	0.8	0.5
SP94	CARP	25.8	2.2	45.8	7.7	20.0	7.2	2.2	1.3
FA94	CARP	17.8	3.8	11.6	6.3	67.6	7.7	0.0	0.0
SP95	CARP	32.0	3.6	44.4	10.6	5.4	3.4	2.2	1.4
FA95	CARP	23.6	1.7	46.6	9.1	16.8	6.8	3.6	3.6
SP96	CARP	22.6	2.2	70.8	4.5	1.4	0.5	0.4	0.4
FA96	CARP	23.0	5.8	16.0	6.9	55.2	11.8	0.0	0.0
SP97	CARP	29.2	2.0	60.0	3.4	7.2	2.5	0.0	0.0
FA97	CARP	24.2	3.3	56.4	5.7	7.8	2.0	7.8	3.0
SP98	CARP	22.4	2.5	74.6	4.2	0.0	0.0	0.4	0.4
FA98	CARP	16.3	2.1	59.0	4.4	12.3	3.2	0.8	0.8
SP99	CARP	26.2	1.9	65.6	3.3	4.0	2.3	0.2	0.2
FA99	CARP	21.0	1.8	61.0	4.5	11.4	3.6	2.0	0.9

		Anthopleura		Other red		Sand		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP00	CARP	26.8	1.6	56.0	3.1	8.6	1.5	1.6	0.6
FA00	CARP	29.2	2.6	48.2	6.3	18.6	3.2	3.0	0.7
SP01	CARP	26.2	3.4	60.6	4.8	7.8	0.9	0.2	0.2
FA01	CARP	27.8	2.6	38.6	7.3	31.2	5.9	0.4	0.2
SP02	CARP	18.8	1.0	60.4	3.7	10.0	3.5	0.8	0.8
FA02	CARP	27.8	1.9	64.0	4.3	1.8	0.6	2.4	1.9
SP03	CARP	26.0	3.2	49.6	6.0	12.0	7.9	4.2	2.5
FA03	CARP	28.0	3.2	44.8	5.3	21.4	5.1	1.4	0.7
FA94	MUSH	97.2	1.3	0.4	0.2	0.0	0.0	1.2	0.7
SP95	MUSH	94.6	1.7	0.2	0.2	0.0	0.0	4.2	1.7
FA95	MUSH	85.2	9.3	0.0	0.0	0.0	0.0	9.4	7.7
SP96	MUSH	81.2	8.2	0.0	0.0	0.0	0.0	10.4	4.3
FA96	MUSH	69.6	14.8	0.0	0.0	14.0	10.4	12.6	5.6
SP97	MUSH	79.6	5.8	0.0	0.0	0.0	0.0	5.6	2.6
FA97	MUSH	75.2	9.5	0.4	0.2	6.0	6.0	9.4	2.5
SP98	MUSH	59.2	4.9	0.0	0.0	0.0	0.0	33.4	4.4
FA98	MUSH	66.6	5.5	0.0	0.0	0.0	0.0	14.8	3.3
SP99	MUSH	77.8	4.2	0.0	0.0	0.0	0.0	8.6	3.1
FA99	MUSH	72.0	7.6	0.0	0.0	0.0	0.0	11.4	2.8
SP00	MUSH	75.4	11.5	0.0	0.0	0.4	0.4	6.6	2.3
FA00	MUSH	70.2	15.7	1.6	0.9	3.0	1.7	3.2	1.7
SP01	MUSH	75.6	16.6	0.0	0.0	0.0	0.0	3.4	1.9
FA01	MUSH	78.4	15.9	0.4	0.4	0.0	0.0	2.8	0.7
SP02	MUSH	78.0	17.0	0.4	0.2	0.0	0.0	1.6	0.9
FA02	MUSH	80.8	17.0	5.2	4.7	0.8	0.6	1.4	0.9
SP03	MUSH	77.6	17.7	2.8	2.8	0.0	0.0	4.0	1.3
FA03	MUSH	81.6	15.9	4.0	2.9	0.0	0.0	4.4	3.4

		Anthopleura		Other red		Sand		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA94	OLDS	68.2	10.3	0.0	0.0	2.6	2.6	8.8	4.4
SP95	OLDS	72.8	10.6	0.0	0.0	4.0	3.5	11.4	10.7
FA95	OLDS	61.6	8.5	3.2	2.3	1.2	1.2	17.8	3.9
SP96	OLDS	45.4	13.8	3.2	2.0	35.0	17.3	4.8	2.4
FA96	OLDS	46.0	14.4	1.4	0.9	38.4	19.2	4.2	2.1
SP97	OLDS	44.3	21.7	1.3	0.8	49.5	23.4	2.5	2.5
FA97	OLDS	68.2	5.6	1.0	1.0	9.6	8.9	5.6	2.2
SP98	OLDS	58.4	10.5	1.0	1.0	20.2	13.0	9.4	6.0
FA98	OLDS	53.0	8.9	1.4	0.9	0.0	0.0	13.4	7.7
SP99	OLDS	42.8	14.4	1.2	1.2	27.0	14.6	12.2	5.8
FA99	OLDS	49.0	12.7	0.2	0.2	5.2	4.7	16.6	12.9
SP00	OLDS	51.8	13.7	0.8	0.8	5.4	4.3	18.0	10.7
FA00	OLDS	54.0	6.3	0.8	0.5	0.8	0.8	4.2	1.1
SP01	OLDS	63.6	6.5	3.2	0.7	2.2	2.2	6.4	1.8
FA01	OLDS	52.6	10.1	1.2	0.7	0.0	0.0	4.0	1.2
SP02	OLDS	36.0	12.2	2.2	1.7	30.8	18.6	8.6	4.0
FA02	OLDS	55.6	12.5	5.8	2.5	2.6	2.6	7.0	3.1
SP03	OLDS	51.6	10.3	7.0	5.1	1.2	1.2	12.2	4.6
FA03	OLDS	48.4	9.8	7.2	1.9	0.6	0.6	7.8	2.7

Barnacles

		Barnacles		*Endocladia*		*Chthamalus*		*Balanus*	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA95	PSN	73.4	4.6	5.4	1.2	.	.	.	.
SP96	PSN	72.2	6.4	5.0	1.4	.	.	.	.
FA96	PSN	76.8	8.8	3.0	2.0	.	.	.	.
SP97	PSN	66.6	5.1	3.6	2.0	.	.	.	.
FA97	PSN	57.2	4.1	1.4	1.2	.	.	.	.
SP98	PSN	44.6	5.8	2.4	1.6	.	.	.	.
FA98	PSN	54.0	5.6	1.6	1.0	.	.	.	.
SP99	PSN	52.0	10.4	2.8	1.7	.	.	.	.
FA99	PSN	50.4	8.9	2.4	1.9	.	.	.	.
SP00	PSN	48.8	9.1	3.8	2.5	.	.	.	.
FA00	PSN	52.8	5.2	0.0	0.0	.	.	.	.
SP01	PSN	23.0	4.6	2.6	1.4	23.0	4.6	0.0	0.0
FA01	PSN	26.4	5.1	1.0	0.8	26.4	5.1	0.0	0.0
SP02	PSN	30.0	4.0	1.2	1.2	29.4	3.8	0.6	0.4
SU02	PSN	25.0	3.8	0.4	0.2	24.8	3.9	0.2	0.2
FA02	PSN	30.4	3.2	0.0	0.0	30.4	3.2	0.0	0.0
SP03	PSN	36.8	3.7	1.8	1.1	36.8	3.7	0.0	0.0
FA03	PSN	27.6	4.2	0.4	0.4	27.6	4.2	0.0	0.0
FA95	CAY	81.2	2.6	0.4	0.4	.	.	.	.
SP96	CAY	77.0	2.7	1.8	1.8	.	.	.	.
FA96	CAY	83.6	1.4	0.0	0.0	.	.	.	.
SP97	CAY	81.6	2.9	0.2	0.2	.	.	.	.
FA97	CAY	78.8	4.1	1.2	1.2	.	.	.	.
SP98	CAY	61.2	7.2	4.6	4.6	.	.	.	.
FA98	CAY	53.2	4.5	0.0	0.0	.	.	.	.
SP99	CAY	48.2	6.3	0.0	0.0	.	.	.	.
FA99	CAY	45.4	5.2	0.0	0.0	.	.	.	.
SP00	CAY	36.2	5.1	0.0	0.0	.	.	.	.
FA00	CAY	34.6	6.4	0.0	0.0	.	.	.	.
SP01	CAY	26.0	3.3	0.0	0.0	24.2	3.5	1.8	1.1
FA01	CAY	36.4	3.7	0.0	0.0	34.0	4.3	2.4	1.0
SP02	CAY	31.6	5.4	0.0	0.0	30.8	5.5	0.8	0.2
SU02	CAY	37.8	6.5	0.0	0.0	37.2	6.7	0.6	0.6
FA02	CAY	50.4	5.4	0.0	0.0	49.2	5.2	1.2	1.2
SP03	CAY	51.6	3.8	0.0	0.0	50.2	4.3	1.4	1.0
FA03	CAY	47.8	4.3	0.0	0.0	46.2	4.1	1.6	0.7
FA95	HAZ	67.0	3.6	4.8	3.8	.	.	.	.
SP96	HAZ	73.4	3.5	5.4	2.9	.	.	.	.
FA96	HAZ	68.2	7.2	13.4	7.5	.	.	.	.
SP97	HAZ	65.2	11.4	20.4	11.4	.	.	.	.
FA97	HAZ	63.2	10.9	7.4	5.6	.	.	.	.
SP98	HAZ	42.6	8.4	22.2	11.7	.	.	.	.
FA98	HAZ	49.4	9.9	9.0	4.2	.	.	.	.
SP99	HAZ	50.2	10.6	10.0	5.1	.	.	.	.

		Barnacles		*Endocladia*		*Chthamalus*		*Balanus*	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA99	HAZ	47.4	8.6	8.0	3.9	.	.	.	.
SP00	HAZ	50.4	4.4	9.0	3.9	.	.	.	.
FA00	HAZ	55.2	7.7	11.6	6.5	.	.	.	.
SP01	HAZ	51.8	7.1	14.6	8.8	27.2	11.1	24.6	10.6
FA01	HAZ	58.8	4.1	7.8	5.0	35.2	13.1	23.6	10.1
SP02	HAZ	49.0	9.9	15.8	10.2	34.6	13.1	14.4	5.1
SU02	HAZ	42.2	9.8	8.4	5.1	26.0	12.8	16.2	6.2
FA02	HAZ	41.2	10.1	0.0	0.0	16.4	7.4	24.8	11.2
SP03	HAZ	19.4	7.4	0.0	0.0	12.0	7.4	7.4	2.5
FA03	HAZ	46.6	7.8	0.0	0.0	35.8	9.8	10.8	4.6
FA95	SHB	92.4	2.1	0.0	0.0	.	.	.	.
SP96	SHB	92.4	1.8	3.0	1.3	.	.	.	.
FA96	SHB	94.0	3.6	0.0	0.0	.	.	.	.
SP97	SHB	79.4	19.1	0.2	0.2	.	.	.	.
FA97	SHB	77.8	19.5	0.0	0.0	.	.	.	.
SP98	SHB	75.6	18.9	0.8	0.6	.	.	.	.
FA98	SHB	76.8	19.0	0.0	0.0	.	.	.	.
SP99	SHB	78.0	19.5	0.4	0.4	.	.	.	.
FA99	SHB	75.4	17.6	0.0	0.0	.	.	.	.
SP00	SHB	75.4	16.2	0.4	0.4	.	.	.	.
FA00	SHB	90.6	5.7	0.0	0.0	.	.	.	.
SP01	SHB	89.8	7.0	0.0	0.0	89.8	7.0	0.0	0.0
FA01	SHB	86.2	1.7	0.0	0.0	86.2	1.7	0.0	0.0
SP02	SHB	87.0	2.1	0.0	0.0	87.0	2.1	0.0	0.0
SU02	SHB	79.8	2.9	0.0	0.0	79.8	2.9	0.0	0.0
FA02	SHB	90.8	1.7	0.0	0.0	90.8	1.7	0.0	0.0
SP03	SHB	76.8	1.4	0.0	0.0	76.8	1.4	0.0	0.0
FA03	SHB	89.6	3.4	0.0	0.0	89.6	3.4	0.0	0.0
SP92	OCC	73.8	3.8	3.8	1.4	.	.	.	.
FA92	OCC	61.0	11.8	17.2	7.4	.	.	.	.
SP93	OCC	44.2	12.8	37.0	13.3	.	.	.	.
FA93	OCC	29.8	6.7	16.4	3.4	.	.	.	.
SP94	OCC	33.4	4.2	18.2	5.5	.	.	.	.
FA94	OCC	62.2	5.3	12.0	5.8	.	.	.	.
SP95	OCC	44.4	12.8	24.6	11.7	.	.	.	.
FA95	OCC	20.4	7.0	33.4	6.1	.	.	.	.
SP96	OCC	9.0	1.9	54.0	8.2	.	.	.	.
FA96	OCC	18.0	2.6	24.0	7.4	.	.	.	.
SP97	OCC	10.0	2.8	26.8	5.2	.	.	.	.
FA97	OCC	20.6	6.1	30.0	6.5	.	.	.	.
SP98	OCC	9.2	4.4	52.6	6.5	.	.	.	.
FA98	OCC	8.3	1.7	18.8	3.7	.	.	.	.
SP99	OCC	9.4	1.8	32.4	4.3	.	.	.	.
FA99	OCC	11.1	1.3	26.6	6.2	.	.	.	.

		Barnacles		*Endocladia*		*Chthamalus*		*Balanus*	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP00	OCC	14.8	1.9	48.0	9.9	.	.	.	.
FA00	OCC	23.4	2.8	30.8	7.2	.	.	.	.
SP01	OCC	17.2	3.2	26.4	7.2				
FA01	OCC	9.6	1.6	25.0	3.4	1.6	0.7	8.0	2.0
SP02	OCC	6.8	2.0	31.8	4.5	0.8	0.8	6.0	1.8
SU02	OCC	11.2	2.7	22.8	2.1	1.4	0.7	9.8	2.5
FA02	OCC	7.6	1.6	15.0	2.3	1.8	0.6	5.8	1.6
SP03	OCC	11.0	3.1	14.6	3.8	3.2	1.1	7.8	2.7
FA03	OCC	13.6	2.7	10.4	3.2	4.2	1.5	9.4	2.0
SP92	STA	77.6	2.9	0.6	0.4	.	.	.	.
FA92	STA	82.8	4.9	0.0	0.0	.	.	.	.
SP93	STA	85.4	2.3	0.6	0.4	.	.	.	.
FA93	STA	84.4	3.1	4.0	1.7	.	.	.	.
SP94	STA	78.2	3.6	6.6	2.6	.	.	.	.
FA94	STA	77.4	6.5	8.0	3.7	.	.	.	.
SP95	STA	60.8	4.3	16.0	5.3	.	.	.	.
FA95	STA	70.4	6.5	7.8	3.4	.	.	.	.
SP96	STA	65.6	6.2	12.6	5.1	.	.	.	.
FA96	STA	73.8	6.3	2.0	1.3	.	.	.	.
SP97	STA	75.8	6.8	2.6	1.5	.	.	.	.
FA97	STA	53.2	5.2	0.0	0.0	.	.	.	.
SP98	STA	52.4	7.9	3.2	1.6	.	.	.	.
FA98	STA	34.2	10.0	6.4	2.9	.	.	.	.
SP99	STA	19.8	9.9	9.6	5.1	.	.	.	.
FA99	STA	10.2	7.8	5.2	3.6	.	.	.	.
SP00	STA	4.0	2.5	9.0	6.0	.	.	.	.
FA00	STA	4.4	1.2	1.6	1.6	.	.	.	.
SP01	STA	1.2	0.7	4.6	4.1	1.2	0.7	0.0	0.0
FA01	STA	0.4	0.2	0.4	0.2	0.4	0.2	0.0	0.0
SP02	STA	0.4	0.2	0.4	0.4	0.2	0.2	0.2	0.2
SU02	STA	2.8	0.6	0.4	0.4	2.8	0.6	0.0	0.0
FA02	STA	4.0	1.4	0.8	0.8	4.0	1.4	0.0	0.0
SP03	STA	3.2	1.3	1.2	1.0	3.2	1.3	0.0	0.0
FA03	STA	1.0	0.6	1.2	1.0	1.0	0.6	0.0	0.0
SP92	BOA	78.6	3.5	2.8	1.2	.	.	.	.
FA92	BOA	52.6	8.6	33.0	8.9	.	.	.	.
SP93	BOA	31.8	12.2	46.0	11.1	.	.	.	.
FA93	BOA	12.4	10.2	47.6	5.4	.	.	.	.
SP94	BOA	10.0	9.0	43.2	3.8	.	.	.	.
FA94	BOA	11.2	7.8	48.8	6.2	.	.	.	.
SP95	BOA	6.8	4.3	67.2	7.5	.	.	.	.
FA95	BOA	11.2	5.2	45.2	8.9	.	.	.	.
SP96	BOA	14.4	8.1	41.0	12.6	.	.	.	.
FA96	BOA	27.6	14.8	33.4	14.3	.	.	.	.

		Barnacles		*Endocladia*		*Chthamalus*		*Balanus*	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP97	BOA	26.2	14.6	36.0	15.0	.	.	.	.
FA97	BOA	22.8	15.0	30.0	7.6	.	.	.	.
SP98	BOA	23.6	14.6	40.0	10.4	.	.	.	.
FA98	BOA	15.0	8.8	26.6	9.7	.	.	.	.
SP99	BOA	17.8	11.2	34.2	11.1	.	.	.	.
FA99	BOA	17.4	11.4	27.6	7.7	.	.	.	.
SP00	BOA	16.8	12.1	33.8	12.8	.	.	.	.
FA00	BOA	20.8	11.9	16.6	8.3	.	.	.	.
SP01	BOA	22.4	12.6	13.8	7.0	22.4	12.6	0.0	0.0
FA01	BOA	44.0	9.9	4.4	1.8	44.0	9.9	0.0	0.0
SP02	BOA	45.0	11.7	5.4	2.2	45.0	11.7	0.0	0.0
SU02	BOA	53.0	11.3	3.2	1.5	52.6	11.4	0.4	0.4
FA02	BOA	48.6	11.7	3.2	1.8	48.0	11.7	0.6	0.4
SP03	BOA	49.0	13.7	3.2	2.2	48.6	13.9	0.4	0.4
FA03	BOA	43.4	12.0	4.2	3.5	43.0	11.9	0.4	0.2
SP92	GPT	65.2	3.3	0.0	0.0	.	.	.	.
FA92	GPT	73.4	3.3	1.4	0.9	.	.	.	.
SP93	GPT	72.8	3.6	0.0	0.0	.	.	.	.
FA93	GPT	60.2	3.3	0.0	0.0	.	.	.	.
SP94	GPT	53.8	4.3	1.6	1.1	.	.	.	.
FA94	GPT	39.0	3.8	2.6	1.1	.	.	.	.
SP95	GPT	49.6	4.3	2.4	1.9	.	.	.	.
FA95	GPT	54.0	2.8	6.0	1.8	.	.	.	.
SP96	GPT	49.4	5.4	12.8	3.7	.	.	.	.
FA96	GPT	56.8	4.4	5.2	3.0	.	.	.	.
SP97	GPT	58.0	7.8	17.2	5.0	.	.	.	.
FA97	GPT	61.2	5.5	5.4	2.2	.	.	.	.
SP98	GPT	37.2	10.6	26.4	8.8	.	.	.	.
FA98	GPT	27.8	9.8	2.4	1.6	.	.	.	.
SP99	GPT	27.2	11.8	7.4	2.9	.	.	.	.
FA99	GPT	.	.	.	.	.	.	.	.
SP00	GPT	29.0	10.3	22.2	4.9	.	.	.	.
FA00	GPT	38.0	11.8	1.6	0.8	.	.	.	.
SP01	GPT	38.2	10.5	7.2	2.1	19.2	7.4	19.0	3.2
FA01	GPT	43.2	10.1	12.2	3.6	.	.	.	.
SP02	GPT	40.0	8.3	20.4	4.3	20.6	4.5	19.4	4.1
SU02	GPT	37.0	6.1	17.4	4.4	23.2	4.9	13.8	2.6
FA02	GPT	40.6	4.9	1.0	0.5	14.8	1.5	25.8	4.4
SP03	GPT	43.2	9.3	13.0	4.4	2.6	0.9	40.6	8.4
FA03	GPT	41.4	6.4	2.8	1.5	14.6	2.2	26.8	5.2

Sample	Site	Barnacles mean	Barnacles se	*Endocladia* mean	*Endocladia* se
SP92	ALEG	63.8	4.5	12.6	4.3
FA92	ALEG	58.6	8.3	12.2	5.4
SP93	ALEG	9.0	5.3	7.4	2.3
FA93	ALEG	41.0	12.3	0.2	0.2
SP94	ALEG	49.0	10.2	3.6	1.1
FA94	ALEG	43.6	6.1	8.4	3.0
SP95	ALEG	8.6	2.9	1.2	0.6
FA95	ALEG	32.4	2.5	2.4	0.9
SP96	ALEG	21.8	5.2	6.8	2.0
FA96	ALEG	36.0	9.6	3.6	1.3
SP97	ALEG	45.6	11.4	3.2	1.2
FA97	ALEG	52.8	11.2	3.6	1.1
SP98	ALEG	11.8	6.5	6.0	2.3
FA98	ALEG	16.8	8.4	1.3	0.8
SP99	ALEG	36.0	9.0	0.8	0.5
FA99	ALEG	42.0	9.3	3.4	1.8
SP00	ALEG	32.8	8.7	10.0	2.9
FA00	ALEG	41.2	9.4	6.8	2.4
SP01	ALEG	27.2	6.5	20.8	7.3
FA01	ALEG	33.6	7.2	8.0	2.8
SP02	ALEG	23.0	6.5	11.4	3.1
FA02	ALEG	39.4	10.0	12.4	5.5
SP03	ALEG	18.6	5.1	24.4	11.0
FA03	ALEG	56.0	8.3	1.6	1.4
SP92	ARHO	80.6	5.0	5.4	2.4
FA92	ARHO	80.2	4.6	3.6	2.3
SP93	ARHO	51.8	7.3	7.8	4.0
FA93	ARHO	75.2	3.1	7.2	3.6
SP94	ARHO	77.0	7.5	5.6	3.7
FA94	ARHO	54.8	3.2	5.8	2.7
SP95	ARHO	46.2	7.5	11.6	4.8
FA95	ARHO	73.2	2.9	2.4	1.5
SP96	ARHO	64.2	4.7	8.8	4.1
FA96	ARHO	78.6	5.5	10.4	4.4
SP97	ARHO	65.0	12.5	11.4	5.6
FA97	ARHO	21.4	5.0	0.6	0.4
SP98	ARHO	18.0	6.1	4.8	2.4
FA98	ARHO	0.4	0.2	2.6	1.7
SP99	ARHO	13.4	6.0	3.2	1.6
FA99	ARHO	28.6	10.5	1.4	0.7
SP00	ARHO	34.5	12.8	3.5	1.9
FA00	ARHO	77.0	4.0	0.2	0.2
SP01	ARHO	68.8	4.9	3.6	2.0
FA01	ARHO	56.2	7.7	3.2	1.4
SP02	ARHO	62.6	11.8	3.0	1.4

Sample	Site	Barnacles mean	Barnacles se	*Endocladia* mean	*Endocladia* se
FA02	ARHO	84.0	6.4	1.8	1.0
SP03	ARHO	75.0	7.4	3.6	2.0
FA03	ARHO	80.8	8.3	3.2	1.2
SP92	CARP	66.6	8.1	2.8	1.2
FA92	CARP	69.0	7.1	0.0	0.0
SP93	CARP	65.0	3.4	6.2	3.7
FA93	CARP	54.8	9.9	1.4	0.7
SP94	CARP	58.6	10.1	0.6	0.6
FA94	CARP	88.0	2.7	0.4	0.2
SP95	CARP	68.4	5.5	4.0	2.5
FA95	CARP	57.2	13.2	1.2	0.8
SP96	CARP	52.2	8.4	1.8	1.1
FA96	CARP	49.6	9.0	0.0	0.0
SP97	CARP	46.8	5.1	2.2	1.7
FA97	CARP	44.8	5.7	0.0	0.0
SP98	CARP	35.6	4.9	1.6	0.7
FA98	CARP	32.6	4.6	0.0	0.0
SP99	CARP	31.2	9.8	2.2	1.7
FA99	CARP	43.2	9.8	0.2	0.2
SP00	CARP	44.4	9.9	0.4	0.2
FA00	CARP	48.8	11.0	0.0	0.0
SP01	CARP	47.6	11.1	1.0	0.5
FA01	CARP	50.0	8.8	0.0	0.0
SP02	CARP	48.6	9.8	1.4	0.6
FA02	CARP	53.0	11.5	0.0	0.0
SP03	CARP	46.6	7.5	5.0	2.4
FA03	CARP	61.2	13.5	0.2	0.2
FA94	MUSH	94.4	3.9	0.0	0.0
SP95	MUSH	68.0	5.6	0.0	0.0
FA95	MUSH	90.0	2.9	0.0	0.0
SP96	MUSH	5.4	3.2	0.0	0.0
FA96	MUSH	75.4	10.2	0.0	0.0
SP97	MUSH	84.0	4.8	0.0	0.0
FA97	MUSH	81.0	3.8	0.0	0.0
SP98	MUSH	58.4	4.2	0.0	0.0
FA98	MUSH	87.0	2.5	0.0	0.0
SP99	MUSH	85.0	1.3	0.0	0.0
FA99	MUSH	45.6	6.7	0.0	0.0
SP00	MUSH	54.0	9.3	0.0	0.0
FA00	MUSH	77.6	4.1	0.0	0.0
SP01	MUSH	74.4	14.5	0.0	0.0
FA01	MUSH	75.6	2.6	0.0	0.0
SP02	MUSH	41.0	6.6	0.0	0.0
FA02	MUSH	85.4	2.6	0.0	0.0

		Barnacles		*Endocladia*				Barnacles		*Endocladia*	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**Sample**	**Site**	**mean**	**se**	**mean**	**se**
SP03	MUSH	63.6	9.9	0.0	0.0	SP96	WHPT	82.6	4.1	1.6	1.6
FA03	MUSH	92.6	4.1	0.0	0.0	FA96	WHPT	71.5	14.7	0.0	0.0
						SP97	WHPT	73.8	6.0	0.0	0.0
FA94	OLDS	96.2	2.0	1.0	0.8	FA97	WHPT	64.4	10.7	0.0	0.0
SP95	OLDS	91.8	2.0	1.8	1.1	SP98	WHPT	76.0	3.4	0.8	0.6
FA95	OLDS	86.0	4.3	1.0	0.8	FA98	WHPT	24.6	2.7	0.0	0.0
SP96	OLDS	85.2	3.4	2.2	1.4	SP99	WHPT	35.0	2.2	0.0	0.0
FA96	OLDS	80.8	5.5	3.0	1.8	FA99	WHPT	60.4	4.0	0.0	0.0
SP97	OLDS	71.6	6.3	4.8	3.0	SP00	WHPT	51.0	8.1	0.0	0.0
FA97	OLDS	71.6	10.9	10.8	6.6	FA00	WHPT	40.4	5.7	0.0	0.0
SP98	OLDS	56.4	11.0	3.2	2.0	SP01	WHPT	59.4	7.4	0.0	0.0
FA98	OLDS	85.8	2.6	2.4	1.5	FA01	WHPT	61.2	2.3	0.0	0.0
SP99	OLDS	46.2	10.5	1.6	1.0	SP02	WHPT	56.8	2.0	0.0	0.0
FA99	OLDS	74.2	5.2	0.8	0.4	FA02	WHPT	70.2	4.0	0.0	0.0
SP00	OLDS	69.4	4.4	1.6	1.0	SP03	WHPT	57.0	5.1	0.0	0.0
FA00	OLDS	68.4	6.9	2.2	1.5	FA03	WHPT	61.0	5.3	0.0	0.0
SP01	OLDS	69.4	8.4	5.4	3.0						
FA01	OLDS	55.0	9.4	5.2	2.0	FA99	PTFM	56.6	3.2	0.0	0.0
SP02	OLDS	64.2	8.6	1.6	0.8	SP00	PTFM	47.2	4.0	0.0	0.0
FA02	OLDS	80.6	6.6	2.2	0.7	FA00	PTFM	33.0	2.8	0.0	0.0
SP03	OLDS	75.6	6.6	8.4	3.4	SP01	PTFM	34.2	2.7	0.0	0.0
FA03	OLDS	55.0	11.0	15.0	3.6	FA01	PTFM	42.0	2.7	0.0	0.0
						SP02	PTFM	39.8	5.3	0.0	0.0
FA94	PCOV	80.8	3.8	0.0	0.0	FA02	PTFM	36.6	5.5	0.0	0.0
SP95	PCOV	72.2	5.1	0.4	0.4	SP03	PTFM	33.6	6.7	0.0	0.0
FA95	PCOV	72.4	6.5	4.0	4.0	FA03	PTFM	64.0	8.1	0.0	0.0
SP96	PCOV	70.0	4.0	4.4	2.8						
FA96	PCOV	85.0	3.6	2.0	2.0	FA96	CRCO	80.8	1.7	0.0	0.0
SP97	PCOV	74.6	5.4	3.4	3.4	SP97	CRCO	70.6	3.8	0.0	0.0
FA97	PCOV	71.6	5.0	6.4	4.2	FA97	CRCO	69.4	2.6	0.0	0.0
SP98	PCOV	62.4	7.2	13.6	9.8	SP98	CRCO	57.6	11.0	0.4	0.4
FA98	PCOV	66.8	4.7	5.6	4.1	FA98	CRCO	58.8	15.1	0.0	0.0
SP99	PCOV	70.8	8.1	6.4	4.1	SP99	CRCO	82.0	10.5	0.0	0.0
FA99	PCOV	73.0	6.8	5.0	4.5	FA99	CRCO	63.2	7.2	0.0	0.0
SP00	PCOV	74.8	3.6	3.6	2.7	SP00	CRCO	73.8	4.7	0.0	0.0
FA00	PCOV	57.2	5.2	5.8	5.3	FA00	CRCO	70.0	4.9	0.0	0.0
SP01	PCOV	62.8	3.2	1.6	1.2	SP01	CRCO	77.8	3.5	0.0	0.0
FA01	PCOV	62.0	4.6	4.6	3.1	FA01	CRCO	67.8	4.2	6.8	1.7
SP02	PCOV	69.4	3.8	2.6	1.7	SP02	CRCO	72.2	2.9	0.2	0.2
FA02	PCOV	70.2	4.3	3.2	1.8	FA02	CRCO	61.0	6.3	0.0	0.0
SP03	PCOV	63.0	5.8	13.8	8.3	SP03	CRCO	58.0	6.8	0.0	0.0
FA03	PCOV	62.4	9.2	16.2	12.1	FA03	CRCO	55.0	7.4	0.0	0.0
FA94	WHPT	79.4	5.4	0.0	0.0	FA96	SHCO	84.4	1.4	0.0	0.0
SP95	WHPT	84.4	4.6	0.0	0.0	SP97	SHCO	77.2	1.0	0.0	0.0
FA95	WHPT	77.4	5.8	1.0	1.0	FA97	SHCO	87.4	1.1	0.0	0.0

		Barnacles		*Endocladia*	
Sample	**Site**	**mean**	**se**	**mean**	**se**
SP98	SHCO	81.0	2.2	0.0	0.0
FA98	SHCO	85.4	2.8	2.4	2.4
SP99	SHCO	90.0	1.7	0.2	0.2
FA99	SHCO	72.8	3.3	0.0	0.0
SP00	SHCO	65.2	3.4	0.0	0.0
FA00	SHCO	50.4	6.0	0.2	0.2
SP01	SHCO	67.0	1.4	0.2	0.2
FA01	SHCO	70.8	4.5	0.4	0.4
SP02	SHCO	69.8	1.6	0.0	0.0
FA02	SHCO	59.2	0.4	0.8	0.6
SP03	SHCO	60.2	3.1	0.8	0.6
FA03	SHCO	43.6	3.7	1.0	0.8
FA96	TRIS	86.8	0.9	0.0	0.0
SP97	TRIS	78.8	3.7	0.0	0.0
FA97	TRIS	83.8	1.2	0.0	0.0
SP98	TRIS	81.2	3.6	0.0	0.0
FA98	TRIS	69.0	5.3	0.0	0.0
SP99	TRIS	78.6	2.9	0.0	0.0
FA99	TRIS	92.2	1.3	0.0	0.0
SP00	TRIS	78.2	4.2	0.0	0.0
FA00	TRIS	65.8	5.9	0.0	0.0
SP01	TRIS	73.0	5.5	0.0	0.0
FA01	TRIS	58.2	5.8	0.0	0.0
SP02	TRIS	61.2	5.1	0.0	0.0
FA02	TRIS	37.2	6.3	0.0	0.0
SP03	TRIS	40.6	8.9	0.0	0.0
FA03	TRIS	37.8	6.7	0.0	0.0
FA96	DAPT	85.8	1.6	0.0	0.0
SP97	DAPT	88.4	2.4	0.0	0.0
FA97	DAPT	84.6	3.1	0.0	0.0
SP98	DAPT	75.0	1.8	0.0	0.0
FA98	DAPT	90.6	1.8	0.0	0.0
SP99	DAPT	95.4	2.0	0.0	0.0
FA99	DAPT	94.8	2.5	0.0	0.0
SP00	DAPT	87.8	2.1	0.0	0.0
FA00	DAPT	78.0	1.8	0.0	0.0
SP01	DAPT	86.2	1.6	0.0	0.0
FA01	DAPT	90.4	1.4	0.0	0.0
SP02	DAPT	89.0	2.0	0.0	0.0
FA02	DAPT	80.6	1.2	0.0	0.0
SP03	DAPT	64.4	1.1	0.0	0.0
FA03	DAPT	62.2	3.5	0.0	0.0

		Barnacles		*Endocladia*	
Sample	**Site**	**mean**	**se**	**mean**	**se**
FA94	CTBR	65.8	3.0	0.0	0.0
SP95	CTBR	61.8	5.4	0.0	0.0
FA95	CTBR	52.6	6.4	0.0	0.0
SP96	CTBR	61.8	3.3	0.0	0.0
FA96	CTBR	54.2	4.9	0.0	0.0
SP97	CTBR	58.6	3.1	0.0	0.0
FA97	CTBR	60.6	3.2	0.0	0.0
SP98	CTBR	62.2	3.9	0.0	0.0
FA98	CTBR	66.2	3.3	0.0	0.0
SP99	CTBR	62.4	5.1	0.0	0.0
FA99	CTBR	44.2	2.8	0.0	0.0
SP00	CTBR	34.4	4.5	0.0	0.0
FA00	CTBR	30.6	5.5	0.0	0.0
SP01	CTBR	36.2	4.9	0.0	0.0
FA01	CTBR	26.8	2.3	0.0	0.0
SP02	CTBR	36.2	3.6	0.0	0.0
FA02	CTBR	32.4	3.0	0.0	0.0
SP03	CTBR	28.4	4.0	0.0	0.0
FA94	CTLH	80.8	2.1	0.0	0.0
SP95	CTLH	77.0	3.1	0.0	0.0
FA95	CTLH	73.4	10.9	0.0	0.0
SP96	CTLH	66.4	12.6	0.0	0.0
FA96	CTLH	85.8	3.3	0.0	0.0
SP97	CTLH	66.4	4.2	0.0	0.0
FA97	CTLH	62.4	4.1	0.0	0.0
SP98	CTLH	49.2	9.9	0.8	0.6
FA98	CTLH	77.8	3.9	0.0	0.0
SP99	CTLH	84.4	1.9	0.0	0.0
FA99	CTLH	71.2	5.1	0.0	0.0
SP00	CTLH	61.4	5.4	0.0	0.0
FA00	CTLH	62.2	3.0	0.0	0.0
SP01	CTLH	79.0	4.9	0.0	0.0
FA01	CTLH	80.8	1.9	0.0	0.0
SP02	CTLH	77.2	3.1	0.0	0.0
FA02	CTLH	71.2	4.3	0.0	0.0
SP03	CTLH	60.6	6.6	0.0	

Pollicipes

		Pollicipes		*Mytilus*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP92	GPT	37.4	4.0	4.2	2.6	38.6	3.7
FA92	GPT	40.4	5.6	4.2	1.7	33.4	5.9
SP93	GPT	41.6	6.7	5.6	2.7	27.6	4.0
FA93	GPT	38.6	8.4	4.4	2.6	34.8	8.6
SP94	GPT	33.6	5.8	5.0	2.0	32.8	8.1
FA94	GPT	32.2	5.5	5.4	2.0	35.8	8.4
SP95	GPT	36.2	7.7	5.6	2.7	29.4	3.9
FA95	GPT	30.2	6.2	8.8	3.8	30.8	7.1
SP96	GPT	31.6	7.1	8.4	3.7	23.6	6.3
FA96	GPT	30.0	8.2	7.4	2.8	33.2	8.7
SP97	GPT	30.0	8.0	7.4	2.9	35.0	7.3
FA97	GPT	27.6	7.9	9.4	3.9	33.8	6.5
SP98	GPT	33.4	9.5	7.2	2.9	26.8	6.4
FA98	GPT	28.6	7.9	7.6	3.1	26.8	6.0
SP99	GPT	30.2	7.1	8.4	3.4	30.4	6.4
FA99	GPT	.	.	.	.	.	.
SP00	GPT	30.2	6.8	13.2	5.2	28.4	8.4
FA00	GPT	32.6	6.9	10.4	4.4	27.2	8.0
SP01	GPT	29.2	6.5	13.8	5.2	30.2	5.8
FA01	GPT	29.2	4.9	12.4	5.6	32.8	7.6
SP02	GPT	29.0	6.1	14.6	6.3	35.8	9.5
FA02	GPT	27.0	5.6	13.4	6.6	27.8	7.4
SP03	GPT	22.6	4.4	16.2	6.8	35.4	6.0
FA03	GPT	29.6	5.7	13.2	5.6	31.0	7.7
SP93	ALEG	17.4	4.8	38.2	13.7	42.6	15.1
FA93	ALEG	23.0	7.0	41.8	14.6	31.8	14.4
SP94	ALEG	19.0	5.6	44.2	14.2	31.6	12.3
FA94	ALEG	18.2	6.0	42.2	13.2	30.0	9.4
SP95	ALEG	17.2	5.9	44.6	14.3	30.8	10.7
FA95	ALEG	22.8	6.5	46.8	14.3	22.4	9.8
SP96	ALEG	19.2	5.4	49.8	14.4	28.4	14.1
FA96	ALEG	17.8	5.4	46.8	14.4	27.6	9.7
SP97	ALEG	15.8	5.5	46.2	14.3	29.8	8.5
FA97	ALEG	18.2	6.0	43.8	14.9	29.0	8.9
SP98	ALEG	11.0	3.8	48.0	15.5	37.2	15.1
FA98	ALEG	14.6	4.3	48.6	16.2	30.4	12.0
SP99	ALEG	13.4	4.5	54.2	17.1	27.4	13.1
FA99	ALEG	20.6	6.4	53.0	16.3	21.2	12.5
SP00	ALEG	15.0	5.8	51.0	15.5	28.6	11.0
FA00	ALEG	16.6	6.6	49.2	14.8	24.6	7.5
SP01	ALEG	16.8	4.4	43.4	12.8	33.4	8.9
FA01	ALEG	19.6	6.7	41.6	13.5	27.8	6.1
SP02	ALEG	20.8	6.5	41.4	14.3	26.0	6.0
FA02	ALEG	19.2	7.5	45.0	14.0	22.4	5.0

		Pollicipes		*Mytilus*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP03	ALEG	18.4	5.5	46.2	14.2	25.8	6.2
FA03	ALEG	23.8	7.6	49.0	12.8	14.2	5.1
SP92	CARP	54.2	5.5	8.0	3.2	28.8	4.4
FA92	CARP	61.4	6.7	13.6	4.4	16.0	2.7
SP93	CARP	51.6	5.1	19.0	5.7	21.2	2.9
FA93	CARP	62.4	6.4	22.8	6.4	9.2	3.1
SP94	CARP	48.0	4.8	24.6	5.8	22.8	3.7
FA94	CARP	56.8	8.5	26.4	5.4	10.6	5.8
SP95	CARP	41.6	8.5	31.0	7.6	16.2	7.6
FA95	CARP	53.8	3.0	22.2	4.1	13.6	3.4
SP96	CARP	32.2	8.1	12.8	3.8	28.2	5.7
FA96	CARP	46.8	6.3	18.2	3.7	15.6	4.8
SP97	CARP	46.6	4.8	23.0	3.2	16.6	4.3
FA97	CARP	34.4	1.9	32.6	5.7	24.0	5.6
SP98	CARP	29.2	3.5	24.2	3.5	36.2	6.3
FA98	CARP	41.0	4.4	28.2	3.4	19.6	4.7
SP99	CARP	41.4	4.8	34.2	5.5	17.2	6.7
FA99	CARP	42.2	5.9	29.4	3.4	8.6	3.7
SP00	CARP	32.6	2.9	33.4	3.0	16.8	3.1
FA00	CARP	32.0	4.3	43.0	7.9	13.0	4.2
SP01	CARP	27.6	3.0	39.2	4.5	17.4	1.1
FA01	CARP	35.6	5.8	31.0	8.0	13.8	2.6
SP02	CARP	36.2	2.0	27.4	6.0	19.8	3.9
FA02	CARP	35.0	3.8	39.2	6.7	11.8	2.6
SP03	CARP	35.0	2.9	44.2	7.0	11.2	5.8
FA03	CARP	32.0	5.0	52.4	5.7	7.4	4.2
FA94	CTBR	26.8	3.1	43.2	4.2	5.0	1.9
SP95	CTBR	38.4	3.4	30.6	2.7	4.4	2.2
FA95	CTBR	25.8	3.1	63.6	3.9	3.8	2.0
SP96	CTBR	20.4	2.6	68.2	4.5	4.2	2.4
FA96	CTBR	27.0	2.3	60.0	4.1	4.0	1.3
SP97	CTBR	27.2	3.1	60.8	5.8	3.8	2.1
FA97	CTBR	29.0	2.4	52.8	4.9	3.8	1.9
SP98	CTBR	38.8	3.6	37.6	3.7	4.4	1.5
FA98	CTBR	33.6	2.9	47.8	4.4	2.2	1.3
SP99	CTBR	39.2	3.7	45.6	2.5	2.0	0.9
FA99	CTBR	43.0	4.1	45.8	3.4	3.8	1.7
SP00	CTBR	49.6	3.9	41.6	4.0	0.4	0.2
FA00	CTBR	40.2	3.0	50.6	4.0	4.2	1.7
SP01	CTBR	43.4	4.1	50.6	3.1	2.4	1.7
FA01	CTBR	33.8	2.7	58.4	2.9	2.6	1.2
SP02	CTBR	41.2	2.2	51.2	3.5	3.4	1.8
FA02	CTBR	35.4	4.0	56.0	3.8	2.8	1.6
SP03	CTBR	39.6	2.3	51.8	3.7	3.4	2.1

Mytilus

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA95	PSN	84.0	1.9	9.2	1.7	4.2	2.5
SP96	PSN	78.4	3.8	11.6	2.7	5.6	2.6
FA96	PSN	78.6	3.0	8.8	1.4	7.0	3.5
SP97	PSN	79.6	2.5	9.4	2.1	3.8	1.8
FA97	PSN	80.8	2.5	7.8	1.5	4.8	1.6
SP98	PSN	80.6	5.4	6.6	1.4	4.8	2.1
FA98	PSN	83.8	4.1	5.4	1.5	3.6	1.2
SP99	PSN	82.8	3.4	8.8	1.6	4.6	2.1
FA99	PSN	87.2	3.0	7.4	2.0	2.8	1.4
SP00	PSN	84.0	3.7	8.8	2.7	3.4	1.4
FA00	PSN	84.0	4.1	8.4	1.5	3.4	1.9
SP01	PSN	83.0	2.9	9.0	1.4	4.2	2.0
FA01	PSN	88.8	3.6	5.2	2.0	1.4	0.7
SP02	PSN	85.6	2.5	9.0	1.9	2.0	1.3
FA02	PSN	77.8	5.1	8.8	2.6	2.4	0.9
SP03	PSN	87.8	3.1	7.2	1.5	1.2	1.2
FA03	PSN	88.2	3.1	6.8	1.7	2.2	1.1
FA95	CAY	69.4	4.9	8.0	3.1	19.6	1.8
SP96	CAY	72.2	4.7	6.8	2.6	18.8	3.2
FA96	CAY	68.2	5.5	6.8	3.1	22.6	3.5
SP97	CAY	70.6	5.3	4.8	2.4	21.4	3.1
FA97	CAY	67.6	4.7	5.8	2.0	22.6	3.6
SP98	CAY	67.0	5.0	5.2	2.1	23.2	3.0
FA98	CAY	66.0	5.0	3.4	1.5	27.8	4.7
SP99	CAY	64.6	4.5	4.4	1.9	27.6	3.7
FA99	CAY	57.8	5.6	5.4	2.7	32.4	3.9
SP00	CAY	56.8	3.4	4.0	1.3	35.8	3.8
FA00	CAY	48.0	5.9	5.4	2.6	41.8	5.3
SP01	CAY	46.4	3.7	3.2	1.6	44.8	3.9
FA01	CAY	49.8	6.7	1.0	0.6	34.6	4.9
SP02	CAY	52.6	7.6	1.4	0.9	31.6	5.4
FA02	CAY	56.0	8.4	0.8	0.8	27.2	5.3
SP03	CAY	60.6	7.9	1.2	0.6	25.6	5.4
FA03	CAY	66.8	7.4	0.6	0.6	26.2	6.0
FA95	HAZ	47.4	4.3	17.6	4.2	20.4	1.7
SP96	HAZ	46.0	5.3	16.4	4.8	14.2	1.7
FA96	HAZ	44.8	5.3	18.8	5.5	9.2	0.8
SP97	HAZ	45.6	4.5	16.4	3.9	12.0	2.3
FA97	HAZ	50.8	8.1	17.4	4.0	10.6	2.0
SP98	HAZ	54.4	5.9	14.8	3.3	11.2	2.2
FA98	HAZ	41.4	4.9	13.8	3.9	19.4	2.6
SP99	HAZ	41.2	5.1	12.4	2.9	20.4	2.6
FA99	HAZ	31.2	3.7	16.8	2.9	25.8	2.7

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP00	HAZ	34.4	4.5	13.8	2.9	26.0	2.2
FA00	HAZ	26.6	3.8	16.0	2.1	16.4	2.2
SP01	HAZ	31.2	5.1	12.0	2.4	13.6	1.9
FA01	HAZ	32.2	4.2	17.0	2.7	13.2	3.0
SP02	HAZ	32.2	5.7	17.0	3.1	14.6	2.4
FA02	HAZ	34.8	5.9	17.0	3.9	13.0	3.1
SP03	HAZ	40.0	6.3	16.4	4.2	17.4	1.7
FA03	HAZ	35.4	5.4	16.6	2.7	16.0	1.4
FA95	SHB	91.2	2.5	0.0	0.0	2.0	0.7
SP96	SHB	88.6	3.9	0.0	0.0	3.0	1.2
FA96	SHB	90.4	2.4	0.0	0.0	2.8	0.8
SP97	SHB	91.8	2.6	0.0	0.0	1.0	0.4
FA97	SHB	41.8	8.5	0.0	0.0	20.0	4.4
SP98	SHB	35.0	8.2	0.0	0.0	16.4	3.6
FA98	SHB	37.2	6.7	0.0	0.0	18.4	7.9
SP99	SHB	37.4	7.6	0.0	0.0	25.2	8.8
FA99	SHB	33.6	7.3	0.0	0.0	34.8	11.4
SP00	SHB	33.2	8.1	0.0	0.0	35.6	9.0
FA00	SHB	27.2	6.0	0.0	0.0	40.8	7.8
SP01	SHB	32.8	6.4	0.0	0.0	35.0	6.1
FA01	SHB	39.0	6.1	0.0	0.0	26.8	4.1
SP02	SHB	37.2	6.2	0.0	0.0	27.4	3.9
FA02	SHB	42.4	6.0	0.0	0.0	14.2	2.7
SP03	SHB	52.2	6.3	0.0	0.0	15.6	1.7
FA03	SHB	66.8	2.1	0.0	0.0	8.4	0.9
SP92	OCC	85.8	4.5	2.4	1.9	7.0	2.8
FA92	OCC	87.6	3.4	1.4	1.4	4.8	3.0
SP93	OCC	80.2	5.8	1.8	0.9	10.4	4.7
FA93	OCC	85.8	5.1	2.2	1.0	7.4	4.7
SP94	OCC	79.4	4.9	2.4	1.2	9.6	4.2
FA94	OCC	78.0	4.1	3.6	1.6	4.6	2.6
SP95	OCC	71.0	12.0	2.8	1.7	17.2	9.1
FA95	OCC	77.8	10.7	2.0	1.0	3.8	1.7
SP96	OCC	74.2	11.3	3.6	1.2	4.8	2.4
FA96	OCC	78.0	10.0	3.4	1.8	3.2	1.8
SP97	OCC	85.4	5.2	2.2	1.0	6.6	3.3
FA97	OCC	80.0	4.7	1.4	0.9	7.4	3.7
SP98	OCC	79.4	5.1	2.0	0.9	12.8	4.2
FA98	OCC	84.0	5.9	2.8	1.8	8.8	4.7
SP99	OCC	82.2	3.5	3.4	1.1	9.0	2.6
FA99	OCC	85.4	3.7	3.2	1.6	5.6	1.5
SP00	OCC	78.0	3.8	4.0	1.3	10.6	2.6
FA00	OCC	78.8	2.9	2.2	1.5	8.0	2.8

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP01	OCC	77.6	4.9	3.8	1.9	10.6	4.1
FA01	OCC	77.6	6.3	2.6	1.9	7.2	3.7
SP02	OCC	74.4	6.0	4.4	2.1	14.4	5.5
FA02	OCC	79.6	6.3	3.4	1.5	4.6	1.8
SP03	OCC	80.4	6.6	3.8	1.5	10.8	5.4
FA03	OCC	80.6	5.3	4.6	2.2	5.8	2.8
SP92	STA	84.6	4.0	0.6	0.4	10.0	3.8
FA92	STA	85.0	4.2	0.6	0.4	6.0	1.5
SP93	STA	86.0	4.6	0.2	0.2	6.4	2.5
FA93	STA	91.4	4.1	0.2	0.2	5.0	2.8
SP94	STA	88.4	4.2	0.0	0.0	6.2	2.4
FA94	STA	85.2	4.7	0.0	0.0	5.2	1.9
SP95	STA	87.4	3.8	0.4	0.2	4.8	1.4
FA95	STA	92.2	2.8	0.6	0.2	4.0	2.1
SP96	STA	93.8	2.2	0.8	0.6	2.4	1.0
FA96	STA	94.8	2.1	0.2	0.2	2.2	1.1
SP97	STA	93.6	2.3	0.4	0.2	4.0	1.7
FA97	STA	75.4	7.0	0.0	0.0	21.6	6.0
SP98	STA	63.8	12.5	0.2	0.2	21.0	7.5
FA98	STA	49.8	16.4	0.2	0.2	26.8	6.2
SP99	STA	51.6	17.6	0.2	0.2	23.0	6.4
FA99	STA	48.6	18.0	0.6	0.6	14.2	4.3
SP00	STA	48.2	17.9	0.2	0.2	13.8	6.1
FA00	STA	44.0	18.3	0.0	0.0	17.8	5.0
SP01	STA	43.6	17.4	0.4	0.4	13.6	4.7
FA01	STA	43.2	17.5	0.0	0.0	18.0	5.2
SP02	STA	39.2	16.9	0.2	0.2	18.8	5.2
FA02	STA	36.2	16.0	0.6	0.4	23.2	5.3
SP03	STA	30.2	16.8	0.4	0.4	18.4	4.3
FA03	STA	28.0	17.9	0.8	0.8	35.6	11.6
SP92	BOA	77.0	3.9	7.2	1.4	12.6	4.0
FA92	BOA	78.2	5.0	8.2	2.0	12.0	4.1
SP93	BOA	75.4	3.8	7.2	1.5	10.8	2.8
FA93	BOA	73.2	4.7	5.8	2.4	15.4	4.2
SP94	BOA	72.0	4.6	6.4	1.6	13.2	4.8
FA94	BOA	74.8	4.3	5.6	1.2	9.6	2.8
SP95	BOA	67.0	10.6	6.8	1.6	20.6	10.7
FA95	BOA	67.2	12.3	8.2	3.6	13.6	6.0
SP96	BOA	61.8	14.1	8.2	2.3	24.0	13.3
FA96	BOA	59.0	12.9	6.4	1.7	24.0	11.2
SP97	BOA	62.4	14.0	4.8	1.6	26.0	11.3
FA97	BOA	61.2	12.9	7.0	1.8	21.4	8.9
SP98	BOA	62.8	13.1	4.8	1.1	20.8	9.4

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA98	BOA	58.2	12.7	5.6	1.2	23.4	9.4
SP99	BOA	52.2	11.5	5.4	2.9	32.4	9.5
FA99	BOA	56.0	13.8	5.0	1.8	26.2	11.5
SP00	BOA	54.6	11.5	6.6	2.2	28.2	10.8
FA00	BOA	54.0	12.2	8.0	1.1	23.0	8.8
SP01	BOA	51.6	13.4	7.8	1.4	27.6	10.8
FA01	BOA	57.2	12.5	6.6	1.5	24.0	9.8
SP02	BOA	59.2	11.9	5.8	1.5	24.8	9.5
FA02	BOA	61.8	12.3	7.4	1.5	18.2	8.9
SP03	BOA	65.0	12.4	4.2	0.7	18.6	8.9
FA03	BOA	71.0	12.9	4.4	1.0	16.6	10.8
SP92	GPT	77.6	1.1	8.4	3.0	12.8	3.2
FA92	GPT	82.2	1.4	8.4	2.9	8.0	2.4
SP93	GPT	84.4	1.6	6.2	1.8	8.0	2.4
FA93	GPT	89.0	0.3	3.6	1.6	6.8	1.3
SP94	GPT	88.4	0.9	5.8	2.1	4.6	1.3
FA94	GPT	90.8	1.8	4.4	1.4	2.4	0.8
SP95	GPT	87.8	3.1	5.6	1.4	5.4	2.4
FA95	GPT	91.0	2.1	5.6	1.5	2.8	1.4
SP96	GPT	92.0	1.9	5.4	2.0	2.0	0.7
FA96	GPT	91.6	2.4	4.4	1.9	3.8	1.9
SP97	GPT	86.8	2.4	6.6	2.7	6.0	2.3
FA97	GPT	73.4	3.0	6.6	1.7	15.4	2.1
SP98	GPT	65.4	3.0	6.8	2.2	19.2	2.1
FA98	GPT	66.8	5.3	5.0	1.3	22.6	4.0
SP99	GPT	76.0	1.8	6.2	1.5	13.2	2.4
FA99	GPT	.	.	.	.	.	.
SP00	GPT	81.4	5.2	4.2	0.9	10.8	3.3
FA00	GPT	80.0	4.9	4.0	0.9	12.8	3.2
SP01	GPT	77.6	4.2	5.2	1.1	13.8	3.8
FA01	GPT	77.6	5.6	5.2	1.8	13.4	3.7
SP02	GPT	76.0	6.0	5.4	1.2	15.8	4.5
FA02	GPT	71.6	5.8	5.4	2.4	16.6	4.6
SP03	GPT	73.8	8.0	5.8	1.1	15.6	5.8
FA03	GPT	76.4	5.6	7.4	2.2	11.6	4.4
SP92	ALEG	76.8	2.8	0.0	0.0	3.6	1.3
FA92	ALEG	78.8	1.8	0.0	0.0	1.4	0.7
SP93	ALEG	74.0	1.9	0.0	0.0	6.8	1.6
FA93	ALEG	79.4	3.9	0.0	0.0	4.6	1.6
SP94	ALEG	68.4	7.4	0.0	0.0	6.0	1.7
FA94	ALEG	70.4	8.5	0.0	0.0	4.6	1.3
SP95	ALEG	57.0	7.5	0.0	0.0	9.2	2.3
FA95	ALEG	60.8	9.7	0.0	0.0	10.6	3.3

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP96	ALEG	54.8	9.5	0.0	0.0	11.8	3.0
FA96	ALEG	52.0	10.6	0.0	0.0	8.2	1.3
SP97	ALEG	45.6	11.5	0.0	0.0	11.6	3.3
FA97	ALEG	42.8	11.9	0.0	0.0	7.2	1.4
SP98	ALEG	40.4	10.9	0.0	0.0	20.2	3.2
FA98	ALEG	40.6	11.1	0.0	0.0	10.8	2.6
SP99	ALEG	42.6	10.3	0.0	0.0	11.4	2.6
FA99	ALEG	47.6	9.9	0.0	0.0	0.6	0.4
SP00	ALEG	50.2	11.0	0.0	0.0	2.8	0.9
FA00	ALEG	62.6	6.6	0.0	0.0	6.4	2.3
SP01	ALEG	51.6	4.4	0.0	0.0	13.0	3.5
FA01	ALEG	54.2	2.2	0.0	0.0	8.4	1.6
SP02	ALEG	55.6	1.5	0.0	0.0	9.2	1.8
FA02	ALEG	61.2	1.5	0.0	0.0	4.0	1.8
SP03	ALEG	61.6	2.9	0.0	0.0	7.0	1.7
FA03	ALEG	62.8	2.7	0.0	0.0	2.8	1.0
SP92	ARHO	79.0	5.1	1.0	1.0	15.6	3.4
FA92	ARHO	81.2	5.1	2.0	2.0	9.8	3.6
SP93	ARHO	67.8	6.0	0.6	0.6	20.2	3.9
FA93	ARHO	60.0	14.2	0.4	0.4	23.8	12.0
SP94	ARHO	63.8	16.2	0.0	0.0	28.4	13.3
FA94	ARHO	63.2	16.4	0.0	0.0	24.8	11.8
SP95	ARHO	55.8	14.6	0.2	0.2	31.2	8.3
FA95	ARHO	62.6	15.1	0.2	0.2	14.4	5.6
SP96	ARHO	59.0	14.9	0.2	0.2	25.0	8.8
FA96	ARHO	61.4	15.4	0.2	0.2	21.2	9.4
SP97	ARHO	55.2	13.7	0.6	0.6	23.6	9.9
FA97	ARHO	52.0	13.5	0.0	0.0	28.8	13.2
SP98	ARHO	16.0	4.9	0.0	0.0	71.4	5.3
FA98	ARHO	7.8	4.9	0.0	0.0	28.4	6.1
SP99	ARHO	18.6	3.9	0.0	0.0	60.4	2.4
FA99	ARHO	26.0	6.7	0.0	0.0	52.2	3.9
SP00	ARHO	32.2	8.5	0.0	0.0	52.4	6.6
FA00	ARHO	50.2	11.0	0.4	0.4	21.0	3.5
SP01	ARHO	57.2	5.6	0.2	0.2	26.6	3.1
FA01	ARHO	68.6	3.1	0.2	0.2	13.6	1.2
SP02	ARHO	67.2	7.2	0.0	0.0	20.0	5.4
FA02	ARHO	69.4	6.8	0.0	0.0	15.2	3.6
SP03	ARHO	65.8	6.5	0.0	0.0	26.4	5.3
FA03	ARHO	63.6	15.0	0.0	0.0	12.2	5.4
SP03	COPT	79.8	4.4	0.0	0.0	14.6	4.2

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP92	CARP	83.4	4.5	0.0	0.0	7.2	3.1
FA92	CARP	82.0	7.1	0.0	0.0	7.5	2.5
SP93	CARP	87.8	6.6	0.0	0.0	1.3	1.3
FA93	CARP	94.6	2.8	0.0	0.0	2.0	1.2
SP94	CARP	89.8	9.5	0.0	0.0	0.0	0.0
FA94	CARP	78.2	19.6	0.0	0.0	8.0	6.8
SP96	CARP	34.4	11.0	0.0	0.0	9.4	3.8
FA96	CARP						
SP97	CARP	11.4	5.8	0.0	0.0	22.0	10.7
FA97	CARP	44.0	11.7	0.0	0.0	27.2	13.0
SP98	CARP	19.2	4.5	0.0	0.0	31.8	13.9
FA98	CARP						
SP99	CARP	77.8	7.3	0.0	0.0	3.2	1.3
FA99	CARP						
SP00	CARP	46.8	19.3	0.0	0.0	6.2	2.2
FA00	CARP	65.0	17.8	0.0	0.0	4.0	1.4
SP01	CARP	53.0	15.5	0.0	0.0	10.4	4.4
FA01	CARP	.	.	.	.	.	.
SP02	CARP	56.0	15.1	0.0	0.0	5.8	3.8
FA02	CARP	.	.	.	.	.	.
SP03	CARP	52.0	5.0	0.0	0.0	9.4	2.9
FA03	CARP						
FA94	MUSH	85.2	2.6	4.8	2.7	3.2	0.8
SP95	MUSH	84.4	2.5	3.4	1.4	8.2	2.9
FA95	MUSH	91.0	2.3	1.4	1.4	3.0	1.2
SP96	MUSH	92.6	2.6	1.8	1.6	4.2	2.1
FA96	MUSH	87.4	5.3	0.6	0.6	10.0	5.0
SP97	MUSH	90.2	2.3	1.4	0.7	4.4	1.5
FA97	MUSH	86.2	4.6	1.0	0.5	8.4	4.0
SP98	MUSH	78.4	5.9	0.0	0.0	17.4	5.1
FA98	MUSH	87.0	5.2	0.4	0.4	9.8	4.7
SP99	MUSH	89.6	3.5	0.4	0.4	7.4	3.1
FA99	MUSH	88.4	3.5	0.0	0.0	8.8	2.7
SP00	MUSH	88.8	4.1	1.6	1.6	7.0	2.2
FA00	MUSH	86.2	4.2	0.6	0.6	6.4	2.2
SP01	MUSH	84.8	4.7	0.2	0.2	10.2	3.9
FA01	MUSH	78.8	7.8	0.4	0.4	10.6	4.1
SP02	MUSH	77.8	6.4	0.8	0.8	15.0	5.0
FA02	MUSH	71.0	8.1	1.0	1.0	16.4	4.5
SP03	MUSH	76.0	6.3	1.0	0.8	17.2	5.2
FA03	MUSH	79.2	7.1	0.2	0.2	10.2	4.0
FA94	OLDS	81.4	3.0	1.8	0.9	7.4	2.0
SP95	OLDS	77.8	7.0	1.8	1.0	10.4	6.1

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA95	OLDS	33.6	11.5	3.0	1.8	34.2	8.7
SP96	OLDS	30.8	7.0	1.6	1.0	25.4	5.3
FA96	OLDS	40.0	8.1	3.6	1.2	15.0	7.4
SP97	OLDS	28.0	7.6	3.2	0.7	30.4	4.3
FA97	OLDS	40.8	6.0	0.8	0.6	22.2	7.0
SP98	OLDS	45.6	5.7	2.2	0.5	28.6	6.0
FA98	OLDS	41.4	6.8	3.8	0.9	32.2	7.9
SP99	OLDS	36.8	6.4	1.4	0.7	34.2	8.8
FA99	OLDS	57.2	8.6	3.0	0.6	21.8	7.9
SP00	OLDS	53.0	6.4	4.6	0.5	25.2	5.7
FA00	OLDS	55.0	8.0	1.0	0.3	20.6	5.4
SP01	OLDS	52.2	8.9	1.8	0.9	18.2	4.2
FA01	OLDS	54.2	10.1	2.4	0.9	17.4	3.9
SP02	OLDS	47.8	8.6	1.8	0.6	26.6	3.0
FA02	OLDS	53.2	6.3	0.8	0.5	20.2	5.6
SP03	OLDS	51.8	5.4	1.6	0.7	24.2	6.6
FA03	OLDS	63.6	4.8	3.6	1.5	6.4	2.8
FA94	PCOV	91.8	2.7	0.8	0.8	4.8	1.0
SP95	PCOV	90.0	2.5	1.4	1.2	5.2	1.1
FA95	PCOV	96.4	2.3	0.8	0.8	2.4	1.3
SP96	PCOV	94.8	1.5	1.0	1.0	2.4	1.5
FA96	PCOV	92.8	2.0	0.6	0.6	1.6	1.6
SP97	PCOV	82.4	10.8	0.0	0.0	12.4	10.2
FA97	PCOV	81.4	9.7	0.0	0.0	11.8	7.2
SP98	PCOV	73.0	8.6	0.0	0.0	21.0	7.0
FA98	PCOV	79.4	9.3	0.0	0.0	7.8	5.5
SP99	PCOV	82.0	6.5	0.0	0.0	13.0	5.9
FA99	PCOV	83.4	5.4	0.0	0.0	13.2	5.2
SP00	PCOV	82.4	5.4	0.0	0.0	14.4	5.2
FA00	PCOV	78.8	7.8	0.4	0.2	16.0	6.2
SP01	PCOV	78.6	6.1	0.4	0.2	15.4	5.6
FA01	PCOV	82.8	5.6	0.2	0.2	11.6	4.8
SP02	PCOV	85.0	4.7	0.0	0.0	11.8	4.9
FA02	PCOV	89.0	4.0	0.0	0.0	9.0	3.8
SP03	PCOV	87.8	4.5	0.0	0.0	9.6	3.7
FA03	PCOV	88.6	3.5	0.2	0.2	8.6	2.9
FA94	WHPT	93.4	1.6	0.0	0.0	3.4	1.6
SP95	WHPT	94.6	2.1	1.2	0.5	2.0	1.0
FA95	WHPT	95.0	2.1	0.0	0.0	3.6	1.6
SP96	WHPT	81.0	15.8	1.0	0.8	6.0	5.0
FA96	WHPT	76.6	11.5	0.0	0.0	9.8	4.1
SP97	WHPT	79.2	10.3	0.4	0.2	8.4	2.8
FA97	WHPT	80.6	10.3	0.0	0.0	5.6	3.5

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP98	WHPT	81.8	10.0	0.4	0.4	5.8	2.7
FA98	WHPT	88.2	7.3	0.2	0.2	8.6	5.4
SP99	WHPT	87.6	7.2	1.0	0.4	9.2	6.6
FA99	WHPT	82.8	10.3	0.4	0.2	8.0	5.2
SP00	WHPT	91.8	3.4	1.2	1.0	2.6	1.1
FA00	WHPT	95.0	2.2	0.0	0.0	2.0	0.8
SP01	WHPT	94.6	1.9	0.0	0.0	1.4	0.4
FA01	WHPT	90.2	5.6	0.0	0.0	4.8	2.9
SP02	WHPT	88.6	5.2	0.0	0.0	3.6	1.4
FA02	WHPT	83.2	5.2	0.2	0.2	3.8	1.8
SP03	WHPT	84.2	4.7	0.0	0.0	4.0	1.9
FA03	WHPT	85.6	5.6	0.0	0.0	2.4	1.1
FA99	PTFM	93.6	2.2	0.0	0.0	5.0	1.5
SP00	PTFM	78.0	3.4	0.0	0.0	17.8	2.7
FA00	PTFM	51.6	6.6	0.0	0.0	25.0	2.3
SP01	PTFM	40.0	4.9	0.0	0.0	37.8	3.8
FA01	PTFM	37.0	4.5	0.0	0.0	22.8	3.0
SP02	PTFM	32.8	3.6	0.0	0.0	37.4	3.5
FA02	PTFM	25.2	6.2	0.0	0.0	25.8	3.8
SP03	PTFM	19.6	3.9	0.0	0.0	35.0	2.5
FA03	PTFM	12.0	7.4	0.0	0.0	28.8	1.5
FA96	CRCO	94.0	2.5	0.0	0.0	3.0	1.7
SP97	CRCO	96.8	2.2	0.0	0.0	1.6	1.2
FA97	CRCO	92.0	3.3	0.0	0.0	5.0	2.2
SP98	CRCO	48.0	18.6	0.0	0.0	12.2	5.4
FA98	CRCO	70.6	10.3	0.0	0.0	6.4	3.0
SP99	CRCO	74.4	9.6	0.2	0.2	9.2	1.9
FA99	CRCO	90.4	6.4	0.4	0.2	2.6	1.9
SP00	CRCO	94.0	5.0	0.0	0.0	0.0	0.0
FA00	CRCO	95.2	3.9	0.0	0.0	0.2	0.2
SP01	CRCO	98.2	1.8	0.0	0.0	0.4	0.4
FA01	CRCO	99.2	0.5	0.0	0.0	0.0	0.0
SP02	CRCO	99.4	0.4	0.0	0.0	0.4	0.2
FA02	CRCO	76.6	13.2	0.0	0.0	3.0	1.1
SP03	CRCO	74.6	13.5	0.0	0.0	3.4	1.4
FA03	CRCO	82.8	12.1	0.0	0.0	0.6	0.4
FA96	SHCO	79.8	2.6	1.6	1.0	9.2	1.2
SP97	SHCO	80.6	2.3	2.4	1.0	11.4	2.2
FA97	SHCO	78.0	4.0	0.6	0.4	6.2	1.9
SP98	SHCO	51.2	3.8	0.8	0.6	33.2	4.1
FA98	SHCO	58.0	2.2	0.0	0.0	22.8	5.7
SP99	SHCO	61.0	2.6	0.2	0.2	3.2	1.8

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA99	SHCO	55.0	6.3	2.0	0.4	15.8	3.2
SP00	SHCO	57.8	2.4	3.2	0.7	26.4	2.5
FA00	SHCO	58.0	5.4	1.6	0.4	23.6	3.8
SP01	SHCO	64.8	5.7	2.4	1.0	20.6	4.1
FA01	SHCO	65.6	5.1	2.2	0.9	12.0	2.0
SP02	SHCO	67.4	6.2	1.4	0.9	22.6	5.1
FA02	SHCO	64.2	7.4	3.4	1.2	12.2	3.4
SP03	SHCO	63.2	7.5	3.4	0.7	18.8	5.0
FA03	SHCO	82.8	3.7	3.4	0.9	3.8	1.2
FA96	TRIS	67.2	3.8	0.6	0.4	9.6	2.1
SP97	TRIS	56.8	7.3	0.0	0.0	29.4	4.8
FA97	TRIS	39.8	8.9	0.0	0.0	7.8	3.4
SP98	TRIS	22.2	7.0	0.2	0.2	65.2	7.4
FA98	TRIS	22.8	5.8	0.0	0.0	67.6	5.7
SP99	TRIS	22.6	4.0	0.4	0.4	69.2	3.9
FA99	TRIS	29.8	3.4	3.4	1.5	9.8	2.7
SP00	TRIS	26.0	3.8	4.4	1.4	40.2	4.9
FA00	TRIS	24.6	1.4	2.8	1.0	50.8	4.1
SP01	TRIS	30.4	2.6	4.2	1.4	39.4	4.6
FA01	TRIS	26.4	3.4	3.0	1.4	34.2	6.5
SP02	TRIS	32.4	2.1	4.8	1.6	17.0	1.5
FA02	TRIS	31.0	1.7	4.0	2.3	24.8	4.2
SP03	TRIS	34.2	3.9	3.0	0.9	28.6	5.2
FA03	TRIS	62.8	5.5	5.0	2.2	13.0	3.8
FA96	DAPT	96.6	1.0	0.0	0.0	1.8	0.6
SP97	DAPT	95.4	2.9	0.0	0.0	3.0	2.3
FA97	DAPT	84.8	4.3	0.0	0.0	8.0	2.6
SP98	DAPT	59.6	6.4	0.0	0.0	27.8	5.9
FA98	DAPT	62.4	8.9	0.0	0.0	19.4	2.9
SP99	DAPT	67.0	5.7	0.0	0.0	7.2	3.7
FA99	DAPT	66.6	6.3	0.0	0.0	18.8	5.0
SP00	DAPT	70.0	6.8	1.0	0.6	15.0	3.3
FA00	DAPT	71.6	4.3	0.0	0.0	21.6	2.3
SP01	DAPT	69.4	3.0	0.0	0.0	22.0	3.0
FA01	DAPT	77.2	2.3	0.0	0.0	9.2	1.3
SP02	DAPT	73.8	2.7	0.0	0.0	16.6	2.3
FA02	DAPT	79.6	2.8	0.0	0.0	12.0	2.0
SP03	DAPT	81.2	2.6	0.4	0.2	12.4	1.6
FA03	DAPT	92.8	1.9	0.2	0.2	4.2	1.1

		Mytilus		*Pollicipes*		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA94	CTBR	8.8	3.1	0.2	0.2	1.0	0.5
SP95	CTBR	32.8	8.3	1.8	0.9	0.8	0.5
FA95	CTBR	52.8	6.2	3.6	0.7	2.0	1.0
SP96	CTBR	61.2	6.3	4.4	1.9	0.4	0.4
FA96	CTBR	50.8	6.2	3.2	1.2	2.8	0.8
SP97	CTBR	54.0	6.8	9.6	3.4	2.2	0.8
FA97	CTBR	39.0	10.4	4.0	1.6	1.0	0.6
SP98	CTBR	24.2	6.0	5.2	1.6	2.2	0.6
FA98	CTBR	13.4	7.5	1.8	1.2	6.6	2.1
SP99	CTBR	11.8	3.5	7.4	4.0	0.6	0.2
FA99	CTBR	10.8	6.2	3.0	2.5	1.8	0.7
SP00	CTBR	12.8	3.3	8.4	3.5	1.0	0.4
FA00	CTBR	15.2	5.1	5.4	2.7	1.6	0.5
SP01	CTBR	27.0	9.2	3.6	2.7	2.6	0.9
FA01	CTBR	11.6	4.8	2.6	2.1	2.6	0.8
SP02	CTBR	28.0	4.9	4.2	1.4	2.4	0.9
FA02	CTBR	12.4	3.9	0.8	0.5	2.4	1.7
SP03	CTBR	18.6	3.3	2.2	0.7	2.2	1.0
FA94	CTLH	21.0	4.1	0.2	0.2	12.6	3.3
SP95	CTLH	17.2	2.2	0.6	0.2	7.0	1.8
FA95	CTLH	37.2	6.8	0.4	0.4	5.4	1.7
SP96	CTLH	38.6	4.5	0.6	0.4	10.4	2.2
FA96	CTLH	39.6	4.2	0.0	0.0	6.0	2.3
SP97	CTLH	38.8	5.0	0.4	0.4	12.0	3.8
FA97	CTLH	13.4	2.9	0.2	0.2	8.6	4.4
SP98	CTLH	19.4	1.9	0.0	0.0	14.4	5.5
FA98	CTLH	23.6	2.1	0.2	0.2	0.0	0.0
SP99	CTLH	24.0	3.6	0.4	0.4	0.8	0.8
FA99	CTLH	14.6	4.9	0.0	0.0	7.0	2.1
SP00	CTLH	19.0	7.4	1.4	0.9	10.4	1.2
FA00	CTLH	15.6	7.1	0.2	0.2	4.8	1.7
SP01	CTLH	17.6	8.0	0.2	0.2	6.8	3.0
FA01	CTLH	.	.	.	.	.	.
SP02	CTLH	16.4	7.3	0.2	0.2	9.4	3.5
FA02	CTLH	19.8	9.2	0.0	0.0	4.6	1.9
SP03	CTLH	18.0	8.2	0.0	0.0	15.6	3.5

Recovery

		Barnacles		Other Reds		Endocladia		Cladophora		Silvetia		Ulva		Non-cor. Crust		Rock	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP98	STA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	4.0	0.1	0.1	93.7	4.0
FA98	STA	0.1	0.1	1.9	1.9	0.0	0.0	10.4	5.5	0.0	0.0	0.0	0.0	18.7	10.0	66.9	10.0
SP99	STA	0.0	0.0	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	4.4	3.3	22.9	7.8	69.3	9.5
FA99	STA	1.6	0.8	1.6	1.3	0.0	0.0	0.0	0.0	1.0	0.7	0.0	0.0	18.9	5.7	74.9	5.7
SP00	STA	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.0	0.3	0.2	0.0	0.0	29.9	6.2	64.0	7.0
FA00	STA	6.1	4.4	8.7	4.4	1.7	1.3	0.0	0.0	1.9	1.5	3.9	1.7	15.4	5.5	57.4	7.1
SP01	STA	7.6	6.6	2.1	1.3	2.9	2.1	3.3	1.8	1.1	0.7	1.0	1.0	23.1	5.5	53.3	8.4
FA01	STA	4.9	3.7	5.9	2.6	1.4	0.6	0.6	0.4	5.9	2.8	8.0	2.8	22.3	5.7	40.9	5.4
SP02	STA	4.0	3.5	3.0	2.2	7.9	3.5	1.0	1.0	1.7	1.4	8.1	5.1	23.9	5.9	42.6	8.3
FA02	STA	5.0	3.0	2.7	0.9	5.1	3.1	2.1	0.8	8.7	5.2	5.3	3.2	28.6	5.9	34.7	5.0
SP03	STA	1.3	1.0	4.7	3.1	6.6	4.0	0.3	0.2	2.9	1.5	19.1	2.9	32.7	7.4	26.9	5.8
FA03	STA	3.0	1.5	2.6	1.2	2.4	1.3	0.7	0.2	8.7	3.6	2.9	0.9	21.9	4.8	46.3	3.8

Phyllospadix

Sample	Site	*Phyllospadix* mean	*Phyllospadix* se	*Egregia* mean	*Egregia* se	Other algae mean	Other algae se	Sand mean	Sand se
FA95	PSN	83.7	7.2	0.7	0.7	14.3	6.2	1.3	1.3
SP96	PSN	70.7	8.4	0.0	0.0	24.7	10.3	1.0	0.6
FA96	PSN	81.3	7.2	2.7	2.7	14.3	4.8	1.0	0.6
SP97	PSN	68.3	8.7	0.7	0.7	24.7	10.7	1.0	0.6
FA97	PSN	85.3	7.8	0.7	0.7	8.0	2.5	0.0	0.0
SP98	PSN	78.0	4.5	0.0	0.0	14.0	7.2	1.0	0.6
FA98	PSN	79.3	12.8	0.0	0.0	18.3	12.5	0.7	0.7
SP99	PSN	78.3	6.7	0.0	0.0	17.3	7.4	1.7	1.2
FA99	PSN	77.3	5.2	0.0	0.0	15.0	8.0	0.7	0.7
SP00	PSN	76.7	5.8	0.0	0.0	18.3	4.7	1.3	0.9
FA00	PSN	86.7	7.4	3.7	3.7	9.3	3.9	0.0	0.0
SP01	PSN	78.7	5.6	0.7	0.7	17.3	6.2	0.0	0.0
FA01	PSN	82.0	6.0	5.7	5.2	10.7	4.7	1.7	0.9
SP02	PSN	72.7	9.9	2.7	2.7	21.0	9.6	1.0	0.6
FA02	PSN	88.0	4.0	11.0	7.0	10.0	3.5	0.3	0.3
SP03	PSN	74.7	7.1	4.3	4.3	14.3	3.9	1.3	1.3
FA03	PSN	84.7	7.9	16.0	16.0	11.3	5.3	0.3	0.3
FA95	CAY	90.3	1.2	0.0	0.0	3.3	0.3	0.7	0.7
SP96	CAY	92.3	2.7	0.0	0.0	5.0	0.0	0.0	0.0
FA96	CAY	87.7	3.8	0.0	0.0	9.3	2.3	0.0	0.0
SP97	CAY	91.7	3.0	0.0	0.0	7.3	3.3	0.0	0.0
FA97	CAY	74.0	14.2	0.0	0.0	11.0	2.3	0.3	0.3
SP98	CAY	83.0	4.6	0.0	0.0	10.3	1.8	0.0	0.0
FA98	CAY	89.7	3.8	0.0	0.0	4.0	0.6	0.0	0.0
SP99	CAY	94.0	1.0	0.0	0.0	2.3	1.5	0.0	0.0
FA99	CAY	90.0	1.5	0.0	0.0	5.7	0.9	1.7	0.9
SP00	CAY	92.7	0.7	0.0	0.0	3.7	1.9	1.0	1.0
FA00	CAY	86.7	1.5	0.0	0.0	8.3	1.2	0.0	0.0
SP01	CAY	85.3	2.9	0.0	0.0	9.0	4.2	0.0	0.0
FA01	CAY	72.7	8.4	0.0	0.0	10.3	3.8	1.3	0.7
SP02	CAY	85.0	5.5	0.0	0.0	11.3	5.8	0.0	0.0
FA02	CAY	84.0	1.2	0.0	0.0	8.7	1.5	0.0	0.0
SP03	CAY	81.7	2.9	0.0	0.0	8.3	3.7	0.0	0.0
FA03	CAY	88.0	4.2	0.0	0.0	9.0	4.5	0.0	0.0
FA01	HAZ	89.7	4.1	0.3	0.3	2.7	0.9	0.0	0.0
SP02	HAZ	.	.	.	.	.	.	.	.
FA02	HAZ	93.0	.	1.0	.	6.0	.	0.0	.
SP03	HAZ	73.0	.	0.0	.	15.0	.	1.0	.
FA03	HAZ	85.7	7.5	1.7	0.9	7.0	6.5	0.0	0.0
FA99	SHB	93.3	1.7	0.0	0.0	4.7	1.5	0.0	0.0
SP00	SHB	75.3	2.8	0.0	0.0	15.7	0.7	0.0	0.0
FA00	SHB	89.3	4.8	2.3	1.9	5.3	3.9	0.0	0.0

		Phyllospadix		*Egregia*		Other algae		Sand	
Sample	Site	mean	se	mean	se	mean	se	mean	se
SP01	SHB	77.3	4.8	0.0	0.0	7.3	1.5	0.0	0.0
FA01	SHB	83.5	5.5	0.0	0.0	10.0	3.0	0.0	0.0
SP02	SHB	77.0	3.5	0.0	0.0	12.0	2.6	0.0	0.0
FA02	SHB	70.3	5.8	0.0	0.0	20.7	6.4	0.0	0.0
SP03	SHB	55.7	11.6	0.0	0.0	26.0	8.7	0.0	0.0
FA03	SHB	69.0	6.4	0.0	0.0	28.0	6.8	0.0	0.0
SP92	STA	77.3	3.3	0.0	0.0	13.7	2.3	4.0	1.5
FA92	STA	90.3	0.9	0.0	0.0	7.0	1.2	0.0	0.0
SP93	STA	74.7	2.7	0.0	0.0	12.7	3.7	8.7	3.8
FA93	STA	94.7	1.8	0.0	0.0	3.3	1.3	1.0	0.6
SP94	STA	89.3	2.4	0.0	0.0	5.7	1.8	0.3	0.3
FA94	STA	98.7	0.9	0.0	0.0	0.7	0.7	0.7	0.3
SP95	STA	77.0	11.5	0.0	0.0	8.3	3.8	0.7	0.7
FA95	STA	80.3	8.5	0.0	0.0	13.3	6.2	0.3	0.3
SP96	STA	67.3	9.8	0.0	0.0	15.7	5.8	0.0	0.0
FA96	STA	83.7	4.8	0.0	0.0	7.0	1.2	0.3	0.3
SP97	STA	71.7	3.3	0.0	0.0	17.0	6.0	0.0	0.0
FA97	STA	85.7	4.3	0.0	0.0	8.0	1.5	0.3	0.3
SP98	STA	7.0	3.0	0.0	0.0	3.3	3.3	0.0	0.0
FA98	STA	11.5	8.5	0.0	0.0	43.0	34.0	1.0	0.0
SP99	STA	21.7	8.4	0.0	0.0	42.7	18.4	1.0	0.6
FA99	STA	33.7	13.4	0.0	0.0	42.3	18.5	0.0	0.0
SP00	STA	32.3	15.0	0.0	0.0	35.7	19.4	0.0	0.0
FA00	STA	44.7	12.0	0.0	0.0	34.3	8.1	1.0	1.0
SP01	STA	35.3	15.3	0.0	0.0	21.7	10.8	0.0	0.0
FA01	STA	40.7	18.8	0.7	0.7	39.0	20.1	0.0	0.0
SP02	STA	39.7	18.0	0.0	0.0	43.0	19.5	0.0	0.0
FA02	STA	56.0	21.6	0.0	0.0	35.7	20.9	0.7	0.3
SP03	STA	37.7	18.0	0.0	0.0	47.7	16.2	0.7	0.7
FA03	STA	48.0	21.4	1.0	1.0	37.3	20.8	0.0	0.0
SP92	GPT	72.7	12.2	0.7	0.7	0.7	0.7	24.0	11.5
FA92	GPT	93.7	3.4	2.0	2.0	4.3	1.5	0.0	0.0
SP93	GPT	67.7	10.1	0.7	0.3	8.0	1.7	21.0	9.5
FA93	GPT	98.7	0.9	0.0	0.0	0.3	0.3	1.0	0.6
SP94	GPT	95.3	1.2	0.0	0.0	1.7	0.9	2.3	1.5
FA94	GPT	98.3	0.9	1.0	1.0	0.0	0.0	0.7	0.7
SP95	GPT	81.7	8.4	0.0	0.0	3.0	1.5	4.7	2.7
FA95	GPT	99.0	0.6	0.0	0.0	0.0	0.0	1.0	0.6
SP96	GPT	86.0	6.4	0.0	0.0	1.7	1.7	2.7	2.2
FA96	GPT	97.7	2.3	2.3	2.3	0.0	0.0	0.0	0.0
SP97	GPT	88.0	4.0	0.0	0.0	1.0	0.0	1.7	0.9
FA97	GPT	98.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0
SP98	GPT	73.0	4.7	12.0	3.6	12.3	4.4	0.0	0.0

		Phyllospadix		*Egregia*		Other algae		Sand	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA98	GPT	74.3	18.9	19.7	19.7	1.7	0.3	4.3	3.0
SP99	GPT	79.0	12.1	15.3	12.9	2.3	1.9	1.0	0.6
SP00	GPT	94.7	2.4	2.0	1.2	1.7	1.2	1.7	0.9
FA00	GPT	99.0	0.6	0.7	0.7	0.3	0.3	0.0	0.0
SP01	GPT	97.3	1.2	0.0	0.0	0.7	0.3	1.0	1.0
FA01	GPT	95.0	3.2	0.0	0.0	0.0	0.0	5.0	3.2
SP02	GPT	91.7	1.9	1.3	1.3	2.7	0.7	5.7	1.2
FA02	GPT	98.3	1.7	1.7	1.7	0.7	0.7	1.0	1.0
SP03	GPT	91.0	4.0	0.0	0.0	3.0	2.5	5.0	2.6
FA03	GPT	100.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
FA01	ALEG	83.3	8.6	3.0	3.0	8.3	5.4	0.3	0.3
SP02	ALEG	80.7	12.4	1.3	0.9	14.0	10.0	0.3	0.3
FA02	ALEG	85.3	9.5	1.7	0.3	10.3	7.4	0.0	0.0
SP03	ALEG	70.0	9.3	0.3	0.3	19.0	7.2	5.0	2.1
FA03	ALEG	78.3	8.5	24.3	12.5	8.3	5.4	1.3	0.9
SP92	ARHO	77.0	12.0	0.0	0.0	8.5	2.5	4.0	4.0
FA92	ARHO	94.0	3.0	0.0	0.0	4.5	1.5	0.0	0.0
SP93	ARHO	89.5	7.5	0.0	0.0	3.0	1.0	3.5	3.5
FA93	ARHO	88.5	3.5	0.0	0.0	3.0	0.0	7.0	2.0
SP94	ARHO	73.5	15.5	0.0	0.0	14.0	5.0	9.5	8.5
FA94	ARHO	87.5	4.5	0.0	0.0	5.5	0.5	5.5	4.5
SP95	ARHO	46.5	5.5	0.0	0.0	11.0	3.0	14.5	5.5
FA95	ARHO	88.0	1.0	0.0	0.0	6.5	3.5	3.5	1.5
SP96	ARHO	88.5	3.5	0.0	0.0	8.5	4.5	2.5	0.5
FA96	ARHO	86.0	1.0	0.0	0.0	11.5	0.5	1.0	0.0
SP97	ARHO	64.5	0.5	0.0	0.0	21.0	9.0	7.0	7.0
FA97	ARHO	71.0	1.0	0.0	0.0	20.5	2.5	3.0	2.0
SP98	ARHO	34.5	9.5	0.0	0.0	52.5	8.5	2.5	2.5
FA98	ARHO	75.0	1.0	0.5	0.5	22.5	1.5	1.5	0.5
SP99	ARHO	64.0	2.0	1.0	1.0	23.5	5.5	7.0	4.0
FA99	ARHO	84.0	5.0	0.0	0.0	7.0	1.0	2.5	0.5
SP00	ARHO	75.0	4.0	0.0	0.0	17.0	2.0	7.0	5.0
FA00	ARHO	93.5	4.5	0.0	0.0	4.5	4.5	1.0	1.0
SP01	ARHO	80.0	1.5	0.7	0.7	14.7	0.9	0.7	0.3
FA01	ARHO	87.0	5.2	0.0	0.0	9.7	4.3	1.3	0.7
SP02	ARHO	78.0	3.2	0.0	0.0	16.0	1.0	1.3	1.3
FA02	ARHO	62.3	2.8	0.0	0.0	28.3	1.2	3.7	1.2
SP03	ARHO	54.0	2.1	0.0	0.0	30.3	5.2	4.3	2.0
FA03	ARHO	58.7	7.7	2.3	1.5	28.3	2.6	6.3	1.8
SP92	COPT	61.7	8.7	1.0	1.0	16.7	4.4	13.3	2.6
FA92	COPT	81.7	5.2	0.0	0.0	5.3	1.9	11.0	3.5
SP93	COPT	61.3	9.8	0.3	0.3	17.3	3.8	15.0	4.0
FA93	COPT	78.0	3.2	0.0	0.0	11.0	5.8	4.7	0.3

		Phyllospadix		*Egregia*		Other algae		Sand	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
SP94	COPT	61.3	6.4	0.0	0.0	9.0	2.3	26.0	5.2
FA94	COPT	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
SP95	COPT	49.3	4.3	0.0	0.0	17.3	8.4	21.0	5.9
FA95	COPT	60.3	11.5	10.3	8.0	21.3	7.8	2.0	0.0
SP96	COPT	54.3	9.2	5.0	3.2	15.3	4.3	21.7	4.7
FA96	COPT	84.0	7.5	0.0	0.0	4.7	2.6	10.3	4.3
SP97	COPT	52.3	7.8	0.0	0.0	9.7	7.2	33.0	9.0
FA97	COPT	59.0	6.6	0.0	0.0	7.3	5.4	30.7	10.7
SP98	COPT	45.3	9.7	0.0	0.0	42.7	9.7	5.3	1.5
FA98	COPT	70.7	8.4	0.0	0.0	11.7	4.5	12.0	4.5
SP99	COPT	23.7	9.6	0.3	0.3	0.3	0.3	75.7	9.9
FA99	COPT	67.0	7.2	1.0	1.0	14.7	4.8	13.3	3.8
SP00	COPT	45.3	8.3	0.0	0.0	14.7	4.9	34.0	12.3
FA00	COPT	62.3	11.9	0.3	0.3	12.3	6.4	20.3	8.1
SP01	COPT	50.0	4.5	0.0	0.0	3.3	1.5	43.0	3.5
FA01	COPT	86.7	7.1	0.0	0.0	7.0	3.6	3.0	1.2
SP02	COPT	48.7	6.6	0.0	0.0	4.0	2.6	41.7	10.2
FA02	COPT	41.3	14.9	0.0	0.0	0.3	0.3	57.3	14.5
SP03	COPT	49.7	8.9	0.0	0.0	31.0	3.5	15.3	7.4
FA03	COPT	64.3	9.9	0.0	0.0	23.7	8.2	5.0	2.1
SP92	CARP	78.7	1.2	1.0	0.6	7.7	2.4	7.7	2.3
FA92	CARP	87.7	0.7	5.3	2.7	6.0	2.0	0.0	0.0
SP93	CARP	70.3	4.3	0.0	0.0	10.3	3.5	18.7	0.9
FA93	CARP	90.3	1.7	5.0	1.7	3.0	2.1	1.3	0.9
SP94	CARP	84.0	2.5	1.7	0.9	2.3	1.2	11.3	1.2
FA94	CARP	79.0	5.6	1.7	1.7	1.7	0.9	16.3	4.3
SP95	CARP	63.0	4.0	0.0	0.0	24.0	4.2	3.7	2.2
FA95	CARP	66.7	10.9	16.7	6.4	16.0	4.5	0.3	0.3
SP96	CARP	57.0	2.5	0.7	0.3	36.0	4.6	3.3	1.8
FA96	CARP	72.3	5.0	1.3	1.3	4.0	2.3	21.7	6.9
SP97	CARP	61.3	5.8	0.0	0.0	22.3	1.5	14.7	3.8
FA97	CARP	55.7	5.4	0.0	0.0	21.7	3.8	1.7	0.7
SP98	CARP	41.7	9.9	0.0	0.0	50.0	10.5	6.3	1.2
FA98	CARP	9.7	1.7	82.7	3.7	6.7	2.6	0.3	0.3
SP99	CARP	11.3	6.9	41.7	14.2	29.3	4.9	13.3	6.4
FA99	CARP	21.0	11.5	66.3	10.9	10.3	1.9	1.7	0.7
SP00	CARP	16.7	5.2	33.7	4.4	41.0	4.5	3.3	1.3
FA00	CARP	39.7	3.2	29.7	3.8	16.0	1.5	11.7	3.2
SP01	CARP	43.3	3.8	17.7	6.7	29.7	0.9	5.3	2.8
FA01	CARP	52.7	1.7	23.3	4.4	17.0	4.6	6.3	4.4
SP02	CARP	46.3	5.2	13.0	2.6	35.3	5.6	4.0	1.2
FA02	CARP	51.0	1.0	11.5	5.5	28.5	2.5	4.5	1.5
SP03	CARP	44.7	5.4	8.3	3.0	34.3	2.3	9.3	3.8
FA03	CARP	46.0	4.0	5.5	1.5	33.5	4.5	11.0	2.0

		Phyllospadix		*Egregia*		Other algae		Sand	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA94	MUSH	72.7	5.0	4.3	2.2	7.0	3.6	12.7	1.2
SP95	MUSH	68.0	8.3	0.0	0.0	6.3	3.2	0.0	0.0
FA95	MUSH	81.3	3.2	5.0	2.1	1.7	0.9	2.3	1.5
SP96	MUSH	72.0	7.2	3.0	1.2	4.0	0.6	0.0	0.0
FA96	MUSH	51.7	6.7	24.7	2.8	10.0	1.0	0.7	0.7
SP97	MUSH	46.7	11.2	11.3	6.4	8.7	3.5	6.3	2.3
FA97	MUSH	60.0	3.6	5.3	2.6	2.7	1.2	14.0	5.6
SP98	MUSH	37.3	13.9	0.3	0.3	8.7	4.2	0.0	0.0
FA98	MUSH	43.0	10.0	4.7	3.7	32.0	5.5	5.3	1.3
SP99	MUSH	42.0	4.4	6.3	3.5	37.3	6.2	2.0	2.0
FA99	MUSH	38.7	7.2	27.3	14.3	9.3	4.9	13.7	5.8
SP00	MUSH	39.7	3.5	16.7	0.9	23.7	3.0	2.7	1.7
FA00	MUSH	43.7	10.4	30.0	11.9	7.3	4.9	17.3	7.3
SP01	MUSH	38.7	13.4	19.7	7.4	24.3	2.7	0.3	0.3
FA01	MUSH	51.3	15.0	19.7	10.1	17.7	2.0	3.7	1.8
SP02	MUSH	44.0	17.0	26.0	8.7	28.0	8.1	0.0	0.0
FA02	MUSH	52.3	15.2	20.7	8.8	23.0	6.6	7.3	0.3
SP03	MUSH	45.0	15.7	8.0	6.0	37.0	9.3	0.7	0.7
FA03	MUSH	47.7	15.5	26.0	13.0	16.7	6.5	11.0	0.0
FA94	PCOV	80.3	2.3	0.0	0.0	11.3	1.5	4.7	2.4
SP95	PCOV	58.7	7.6	1.0	0.6	9.7	3.3	14.3	6.1
FA95	PCOV	77.0	4.5	2.0	1.2	4.3	2.0	1.7	0.9
SP96	PCOV	61.0	8.3	5.3	2.7	5.3	2.7	20.0	9.5
FA96	PCOV	79.0	4.4	4.0	2.0	2.3	1.9	4.7	0.3
SP97	PCOV	52.3	9.4	0.3	0.3	6.0	2.5	20.0	8.5
FA97	PCOV	30.7	5.7	8.3	2.3	29.3	5.0	29.3	6.4
SP98	PCOV	15.0	5.0	5.0	2.6	12.7	5.2	3.7	1.5
FA98	PCOV	39.0	12.5	10.0	3.8	18.7	1.3	28.7	9.8
SP99	PCOV	34.0	10.0	1.7	0.7	33.0	4.7	15.0	2.5
FA99	PCOV	49.7	11.2	4.0	1.0	18.7	1.5	21.0	10.2
SP00	PCOV	34.0	9.0	0.7	0.7	36.7	1.5	24.7	7.5
FA00	PCOV	50.0	12.2	0.0	0.0	30.3	5.7	15.7	8.4
SP01	PCOV	38.0	13.3	0.0	0.0	20.0	2.5	34.7	15.6
FA01	PCOV	61.0	10.6	0.7	0.7	21.3	4.3	11.7	8.4
SP02	PCOV	50.3	11.8	1.3	1.3	35.3	9.9	7.7	3.3
FA02	PCOV	84.0	6.6	0.0	0.0	9.7	2.8	5.0	4.0
SP03	PCOV	53.0	10.3	4.0	3.5	18.0	4.5	20.7	9.3
FA03	PCOV	67.0	11.0	9.0	4.5	20.3	7.0	6.7	5.2
FA99	PTFM	54.0	13.5	26.7	15.9	16.7	5.4	1.3	0.7
SP00	PTFM	23.0	3.8	17.3	16.8	54.3	11.7	0.3	0.3
FA00	PTFM	58.7	13.0	19.7	4.4	19.7	9.8	2.0	0.6
SP01	PTFM	51.3	8.0	13.3	1.8	32.0	9.3	2.3	1.9
FA01	PTFM	78.0	10.3	8.0	3.6	12.3	6.8	0.3	0.3
SP02	PTFM	66.7	14.1	1.7	1.7	32.0	13.6	0.3	0.3

		Phyllospadix		*Egregia*		Other algae		Sand	
Sample	**Site**	**mean**	**se**	**mean**	**se**	**mean**	**se**	**mean**	**se**
FA02	PTFM	83.7	7.1	15.3	4.6	11.3	9.4	0.0	0.0
SP03	PTFM	61.3	13.9	2.7	1.8	32.3	15.9	0.0	0.0
FA03	PTFM	55.7	7.1	16.7	3.8	22.3	10.3	0.7	0.3
FA96	CRCO	84.3	3.9	1.8	1.0	6.0	1.1	2.5	0.2
SP97	CRCO	61.5	7.8	2.3	2.1	11.2	3.8	22.2	2.7
FA97	CRCO	69.5	5.2	0.7	0.7	14.7	4.8	12.2	1.8
SP98	CRCO	56.2	7.5	7.0	1.7	14.7	3.1	20.7	5.3
FA98	CRCO	59.8	6.1	26.8	6.1	6.5	2.1	4.2	2.5
SP99	CRCO	43.8	3.7	28.7	4.3	10.0	2.8	13.5	2.6
FA99	CRCO	69.6	3.4	16.2	3.7	9.1	3.2	5.7	1.4
SP00	CRCO	60.0	6.0	14.2	8.4	20.1	3.5	11.3	2.2
FA00	CRCO	81.3	4.3	14.5	11.5	7.7	3.0	5.7	2.4
SP01	CRCO	60.0	3.8	5.8	3.1	14.2	4.4	15.3	2.5
FA01	CRCO	78.3	6.2	6.2	3.6	9.7	4.0	2.8	1.6
SP02	CRCO	64.2	6.5	2.5	0.8	7.8	3.7	20.0	3.0
FA02	CRCO	77.8	6.6	3.7	2.3	8.3	3.7	5.8	2.0
SP03	CRCO	71.0	7.6	2.8	1.3	10.7	4.1	12.7	2.7
FA03	CRCO	82.5	4.7	1.2	0.8	3.3	1.8	9.3	3.0

Seastars

		Pisaster					*Pisaster*	
Sample	**Site**	**mean**	**se**		**Sample**	**Site**	**mean**	**se**
FA95	PSN	15.3	2.3	.	FA00	HAZ	38.0	17.3
SP96	PSN	8.3	2.6	.	SP01	HAZ	30.7	15.4
FA96	PSN	15.7	1.5	.	FA01	HAZ	41.3	18.2
SP97	PSN	6.3	1.9	.	SP02	HAZ	19.7	5.9
FA97	PSN	9.0	0.6	.	FA02	HAZ	24.0	13.5
SP98	PSN	11.3	2.3	.	SP03	HAZ	16.0	7.0
FA98	PSN	18.0	3.5	.	FA03	HAZ	53.3	29.0
SP99	PSN	15.3	3.5	.				
FA99	PSN	18.0	1.5	.	FA95	SHB	5.3	0.3
SP00	PSN	23.0	4.4	.	SP96	SHB	3.3	1.2
FA00	PSN	30.0	8.6	.	FA96	SHB	1.7	0.7
SP01	PSN	19.0	3.2	.	SP97	SHB	2.7	1.2
FA01	PSN	22.0	1.5	.	FA97	SHB	3.7	0.3
SP02	PSN	15.3	2.9	.	SP98	SHB	3.7	0.3
FA02	PSN	24.3	3.4	.	FA98	SHB	1.7	0.9
SP03	PSN	25.3	5.5	.	SP99	SHB	2.3	0.3
FA03	PSN	26.0	2.5	.	FA99	SHB	2.7	1.2
				.	SP00	SHB	2.7	1.2
FA95	CAY	14.3	4.7	.	FA00	SHB	6.3	1.7
SP96	CAY	3.3	1.9	.	SP01	SHB	1.3	0.3
FA96	CAY	4.0	1.2	.	FA01	SHB	0.7	0.3
SP97	CAY	4.0	2.0	.	SP02	SHB	0.3	0.3
FA97	CAY	9.3	1.5	.	FA02	SHB	3.3	0.7
SP98	CAY	3.7	0.9	.	SP03	SHB	1.3	0.3
FA98	CAY	9.7	1.3	.	FA03	SHB	7.0	1.5
SP99	CAY	3.3	1.9	.				
FA99	CAY	4.3	1.5	.	SP00	OCC	120.0	.
SP00	CAY	4.3	1.5	.	FA00	OCC	67.0	.
FA00	CAY	11.0	1.2	.	SP01	OCC	60.0	.
SP01	CAY	9.3	0.9	.	FA01	OCC	18.0	.
FA01	CAY	13.0	2.1	.	SP02	OCC	74.0	
SP02	CAY	10.3	2.4	.	FA02	OCC	134.0	
FA02	CAY	19.3	2.2	.	SP03	OCC	219.0	
SP03	CAY	20.0	4.2	.	FA03	OCC	152.0	
FA03	CAY	21.7	4.4	.				
				.	SP92	STA	20.7	7.5
FA95	HAZ	11.3	4.7	.	FA92	STA	10.0	5.7
SP96	HAZ	54.0	19.9	.	SP93	STA	12.3	7.8
FA96	HAZ	22.3	3.2	.	FA93	STA	9.0	6.2
SP97	HAZ	22.3	10.0	.	SP94	STA	9.0	4.2
FA97	HAZ	38.3	19.8	.	FA94	STA	2.7	1.3
SP98	HAZ	28.3	8.6	.	SP95	STA	8.3	3.5
FA98	HAZ	50.7	16.7	.	FA95	STA	9.3	5.0
SP99	HAZ	55.0	17.5	.	SP96	STA	21.3	8.7
FA99	HAZ	22.3	11.1	.	FA96	STA	11.3	6.6
SP00	HAZ	23.3	6.2	.	SP97	STA	29.0	13.7

		Pisaster		*Asterina*	
Sample	**Site**	**mean**	**se**	**mean**	**se**
FA97	STA	24.7	2.3	.	.
SP98	STA	43.3	18.3	.	.
FA98	STA	27.3	12.4	.	.
SP99	STA	20.3	4.8	.	.
FA99	STA	17.0	6.0	.	.
SP00	STA	12.0	2.1	.	.
FA00	STA	18.7	2.9	.	.
SP01	STA	13.3	2.3	.	.
FA01	STA	5.7	2.9		
SP02	STA	13.7	3.8		
FA02	STA	12.0	5.5		
SP03	STA	13.7	3.0		
FA03	STA	10.3	3.2		
SP92	BOA	34.7	13.2	4.3	2.3
FA92	BOA	48.7	24.9	11.7	5.5
SP93	BOA	33.0	9.1	6.0	2.1
FA93	BOA	30.3	11.4	6.7	3.8
SP94	BOA	23.3	7.1	8.3	4.3
FA94	BOA	35.0	11.0	15.3	6.9
SP95	BOA	31.0	11.0	10.3	5.8
FA95	BOA	25.3	8.8	6.3	3.4
SP96	BOA	34.0	11.0	14.7	3.5
FA96	BOA	31.0	9.1	12.0	5.5
SP97	BOA	35.7	14.5	8.0	1.0
FA97	BOA	30.7	8.5	6.0	1.0
SP98	BOA	22.3	3.7	1.7	0.3
FA98	BOA	28.0	11.9	3.3	1.2
SP99	BOA	9.7	4.9	0.0	0.0
FA99	BOA	28.7	10.1	4.7	3.7
SP00	BOA	26.7	12.4	2.3	2.3
FA00	BOA	46.7	21.2	5.7	2.2
SP01	BOA	50.0	16.0	2.3	1.3
FA01	BOA	29.0	13.7	0.0	0.0
SP02	BOA	22.3	11.9	3.0	1.7
FA02	BOA	36.3	12.7	2.0	0.6
SP03	BOA	25.7	9.2	3.0	2.1
FA03	BOA	22.0	8.5	5.3	1.2
SP92	GPT	26.3	13.9	.	.
FA92	GPT	66.3	11.0	.	.
SP93	GPT	.	.	.	.
FA93	GPT	48.3	14.4	.	.
SP94	GPT	66.3	14.8	.	.
FA94	GPT	43.7	9.3	.	.
SP95	GPT	78.0	18.9	.	.

		Pisaster	
Sample	**Site**	**mean**	**se**
FA95	GPT	101.0	23.5
SP96	GPT	70.0	21.5
FA96	GPT	76.0	17.7
SP97	GPT	63.0	6.6
FA97	GPT	75.3	15.3
SP98	GPT	39.7	20.7
FA98	GPT	40.0	12.2
SP99	GPT	40.0	11.8
FA99	GPT	.	.
SP00	GPT	39.0	14.4
FA00	GPT	80.3	9.0
SP01	GPT	62.5	7.5
FA01	GPT	57.0	9.0
SP02	GPT	93.3	22.0
FA02	GPT	112.0	19.5
SP03	GPT	72.0	16.3
FA03	GPT	94.3	10.8
SP02	ALEG	41.0	10.6
FA02	ALEG	67.3	17.9
SP03	ALEG	51.0	12.8
FA03	ALEG	26.0	11.5
SP92	ARHO	20.3	5.5
FA92	ARHO	12.0	1.2
SP93	ARHO	7.7	5.4
FA93	ARHO	6.7	4.3
SP94	ARHO	2.0	1.5
FA94	ARHO	4.0	1.5
SP95	ARHO	2.0	0.6
FA95	ARHO	1.3	0.3
SP96	ARHO	1.0	0.6
FA96	ARHO	7.0	4.4
SP97	ARHO	12.0	8.5
FA97	ARHO	6.3	4.1
SP98	ARHO	3.0	2.5
FA98	ARHO	1.0	0.6
SP99	ARHO	0.7	0.3
FA99	ARHO	1.3	0.9
SP00	ARHO	3.3	1.2
FA00	ARHO	3.3	1.5
SP01	ARHO	2.3	1.9
FA01	ARHO	14.7	10.3
SP02	ARHO	9.0	5.6
FA02	ARHO	18.3	9.8
SP03	ARHO	13.7	6.8

		Pisaster				*Pisaster*	
Sample	**Site**	**mean**	**se**	**Sample**	**Site**	**mean**	**se**
FA03	ARHO	11.7	6.3	FA94	OLDS	10.3	2.2
				SP95	OLDS	6.7	3.4
SP92	CARP	12.7	5.8	FA95	OLDS	6.7	2.7
FA92	CARP	13.3	4.6	SP96	OLDS	3.3	2.3
SP93	CARP	12.3	0.3	FA96	OLDS	2.7	1.8
FA93	CARP	8.0	3.6	SP97	OLDS	5.7	3.8
SP94	CARP	8.0	4.0	FA97	OLDS	1.3	1.3
FA94	CARP	3.0	3.0	SP98	OLDS	1.7	1.7
SP95	CARP	.	.	FA98	OLDS	1.7	1.7
FA95	CARP	.	.	SP99	OLDS	0.0	0.0
SP96	CARP	2.7	2.7	FA99	OLDS	2.0	1.0
FA96	CARP	.	.	SP00	OLDS	3.3	0.7
SP97	CARP	1.0	0.0	FA00	OLDS	.	.
FA97	CARP	1.3	0.9	SP01	OLDS	.	.
SP98	CARP	0.0	0.0	FA01	OLDS	16.3	5.2
FA98	CARP	.	.	SP02	OLDS	6.3	6.3
SP99	CARP	0.3	0.3	FA02	OLDS	11.3	5.9
FA99	CARP	.	.	SP03	OLDS	24.3	9.3
SP00	CARP	6.3	6.3	FA03	OLDS	23.3	9.7
FA00	CARP	3.3	3.3				
SP01	CARP	5.3	4.8	SP02	PCOV	59.7	28.8
FA01	CARP	.	.	FA02	PCOV	97.3	31.2
SP02	CARP	24.0	15.1	SP03	PCOV	94.7	39.0
FA02	CARP	.	.	FA03	PCOV	54.0	9.0
SP03	CARP	16.0	7.8				
FA03	CARP	.	.	SP03	PTFM	25.3	6.7
				FA03	PTFM	29.0	6.1
FA94	MUSH	24.3	8.0				
SP95	MUSH	22.3	10.7	SP97	CRCO	13.0	
FA95	MUSH	24.3	13.7	FA97	CRCO	7.0	
SP96	MUSH	14.0	8.1	SP98	CRCO	2.0	
FA96	MUSH	30.0	9.6	FA98	CRCO	6.0	
SP97	MUSH	23.0	11.4	SP99	CRCO	42.0	
FA97	MUSH	12.0	7.2	FA99	CRCO	89.0	
SP98	MUSH	4.3	3.8	SP00	CRCO	.	
FA98	MUSH	4.3	2.3	FA00	CRCO	41.0	
SP99	MUSH	4.7	1.5	SP01	CRCO	27.0	
FA99	MUSH	6.3	1.8	FA01	CRCO	30.0	
SP00	MUSH	7.7	2.6	SP02	CRCO	36.0	
FA00	MUSH			FA02	CRCO	30.0	
SP01	MUSH			SP03	CRCO	34.0	
FA01	MUSH	17.7	8.6	FA03	CRCO	40.0	
SP02	MUSH	12.3	5.9				
FA02	MUSH	16.7	6.4	SP97	SHCO	3.0	
SP03	MUSH	12.3	5.2	FA97	SHCO	1.0	
FA03	MUSH	21.7	11.6	SP98	SHCO	13.0	

Sample	Site	*Pisaster* mean
FA98	SHCO	7.0
SP99	SHCO	39.0
FA99	SHCO	15.0
SP00	SHCO	60.0
FA00	SHCO	22.0
SP01	SHCO	48.0
FA01	SHCO	15.0
SP02	SHCO	12.0
FA02	SHCO	52.0
SP03	SHCO	24.0
FA03	SHCO	33.0
SP97	TRIS	2.0
FA97	TRIS	0.0
SP98	TRIS	5.0
FA98	TRIS	1.0
SP99	TRIS	14.0
FA99	TRIS	56.0
SP00	TRIS	16.0
FA00	TRIS	1.0
SP01	TRIS	2.0
FA01	TRIS	0.0
SP02	TRIS	8.0
FA02	TRIS	13.0
SP03	TRIS	30.0
FA03	TRIS	34.0
FA96	DAPT	0.0
SP97	DAPT	1.0
FA97	DAPT	0.0
SP98	DAPT	1.0
FA98	DAPT	2.0
SP99	DAPT	4.0
FA99	DAPT	10.0
SP00	DAPT	2.0
FA00	DAPT	2.0
SP01	DAPT	1.0
FA01	DAPT	3.0
SP02	DAPT	2.0
FA02	DAPT	1.0
SP03	DAPT	.
FA03	DAPT	18.0

Sample	Site	*Pisaster* mean
SP02	CTBR	1.0
FA02	CTBR	.
SP03	CTBR	2.0
FA03	CTBR	0.0
SP02	CTLH	0.0
FA02	CTLH	.
SP03	CTLH	3.0
FA03	CTLH	1.0

Lottia

		Count		Size	
Sample	Site	mean	se	mean	se
SP02	RMR	42.0	4.9	37.1	0.7
FA02	RMR	36.8	3.2	36.4	0.8
SP03	RMR	39.4	4.0	36.2	0.8
FA03	RMR	41.0	6.2	32.1	0.9
FA95	CAY	46.6	4.0	31.8	0.6
SP96	CAY	58.8	6.4	32.4	0.5
FA96	CAY	54.8	10.4	30.5	0.6
SP97	CAY	47.2	10.4	29.9	0.6
FA97	CAY	38.6	8.7	30.0	0.7
SP98	CAY	35.6	9.3	32.6	0.6
FA98	CAY	73.0	15.8	25.9	0.5
SP99	CAY	55.8	8.7	24.5	0.5
FA99	CAY	45.0	7.0	30.8	0.6
SP00	CAY	59.0	9.3	30.7	0.5
FA00	CAY	46.0	9.7	31.2	0.7
SP01	CAY	38.6	6.7	35.5	0.7
FA01	CAY	30.4	6.3	35.7	1.0
SP02	CAY	22.2	5.1	36.8	0.7
FA02	CAY	34.0	8.1	29.8	1.0
SP03	CAY	32.2	7.5	32.4	0.9
FA03	CAY	35.8	8.4	25.5	0.8
SP96	HAZ	21.6	2.0	32.5	1.0
FA96	HAZ	18.4	2.3	30.7	1.1
SP97	HAZ	15.8	1.3	33.2	1.2
FA97	HAZ	17.6	2.2	34.4	1.2
SP98	HAZ	18.2	1.6	34.3	1.2
FA98	HAZ	20.4	3.8	25.0	0.8
SP99	HAZ	30.0	4.5	26.0	0.7
FA99	HAZ	20.6	3.1	31.6	0.8
SP00	HAZ	20.8	2.7	35.2	0.9
FA00	HAZ	21.8	1.5	32.7	1.1
SP01	HAZ	21.8	2.2	33.5	1.2
FA01	HAZ	18.2	1.3	38.8	1.1
SP02	HAZ	17.8	1.5	41.0	1.2
FA02	HAZ	23.0	2.3	36.2	1.5
SP03	HAZ	23.2	1.9	36.6	1.4
FA03	HAZ	22.2	2.0	39.7	1.5
SP92	STA	25.0	1.4	44.0	1.2
FA92	STA	24.6	2.1	46.4	1.2
SP93	STA	31.8	3.2	44.9	1.2
FA93	STA	23.4	3.1	42.9	1.4
SP94	STA	38.4	3.3	37.0	1.1
FA94	STA	36.4	3.8	41.7	1.3

		Count		Size	
Sample	Site	mean	se	mean	se
SP95	STA	40.8	4.4	41.7	1.1
FA95	STA	35.8	3.6	40.5	1.1
SP96	STA	32.2	3.4	43.0	1.1
FA96	STA	28.8	3.2	45.3	1.2
SP97	STA	28.8	3.2	42.2	1.2
FA97	STA	29.4	3.0	40.7	1.3
SP98	STA	29.8	2.0	39.7	1.2
FA98	STA	45.4	4.1	35.4	1.2
SP99	STA	40.8	4.1	35.8	1.3
FA99	STA	44.2	2.2	38.7	1.2
SP00	STA	37.8	0.7	44.6	1.3
FA00	STA	38.0	1.7	46.6	1.3
SP01	STA	41.6	2.6	46.8	1.2
FA01	STA	39.6	1.3	49.5	1.3
SP02	STA	39.8	2.3	46.8	1.3
FA02	STA	33.8	1.7	51.3	1.4
SP03	STA	26.0	9.1	47.6	1.7
FA03	STA	29.0	6.5	49.1	1.3
SP92	BOA	36.6	6.1	46.0	1.0
FA92	BOA	42.2	7.8	46.9	1.0
SP93	BOA	34.6	5.9	45.6	1.1
FA93	BOA	47.6	8.5	42.4	1.1
SP94	BOA	39.8	7.8	44.8	1.1
FA94	BOA	41.8	6.2	45.8	1.1
SP95	BOA	44.6	4.9	45.1	1.0
FA95	BOA	44.0	3.7	46.0	1.0
SP96	BOA	41.0	3.4	46.3	1.0
FA96	BOA	21.0	2.7	41.6	1.2
SP97	BOA	23.0	3.6	42.7	1.1
FA97	BOA	30.8	1.9	37.1	1.3
SP98	BOA	30.6	2.7	38.3	1.3
FA98	BOA	34.2	3.7	36.4	1.1
SP99	BOA	41.0	4.9	35.9	0.9
FA99	BOA	34.6	4.2	43.2	1.0
SP00	BOA	39.0	4.6	43.6	0.9
FA00	BOA	45.2	3.6	45.3	0.9
SP01	BOA	43.2	2.8	45.0	0.9
FA01	BOA	47.8	5.8	45.4	0.9
SP02	BOA	48.6	5.5	45.8	0.9
FA02	BOA	41.6	6.3	44.5	1.0
SP03	BOA	41.2	4.8	44.5	1.0
FA03	BOA	45.0	6.6	42.7	1.0

		Count		Size	
Sample	Site	mean	se	mean	se
SP92	GPT	27.4	1.3	34.6	1.0
FA92	GPT	27.0	4.0	35.3	0.9
SP93	GPT	27.4	3.7	32.2	0.9
FA93	GPT	24.0	5.6	37.1	1.0
SP94	GPT	40.0	7.9	28.7	0.8
FA94	GPT	33.8	5.9	30.0	0.9
SP95	GPT	42.8	5.9	28.4	0.7
FA95	GPT	33.0	6.1	31.6	0.7
SP96	GPT	30.0	4.6	32.2	0.8
FA96	GPT	33.4	3.4	31.6	1.0
SP97	GPT	31.2	3.4	32.3	1.0
FA97	GPT	24.8	1.4	35.4	1.2
SP98	GPT	25.0	4.0	37.5	1.2
FA98	GPT	37.6	5.2	30.3	1.1
SP99	GPT	43.2	11.0	30.3	0.8
FA99	GPT	.	.	.	.
SP00	GPT	38.4	7.7	29.8	0.9
FA00	GPT	35.2	6.0	32.8	0.9
SP01	GPT	38.8	7.9	28.5	0.7
FA01	GPT	27.0	5.3	34.0	0.9
SP02	GPT	28.8	5.4	33.7	0.9
FA02	GPT	45.8	10.5	29.0	0.7
SP03	GPT	50.8	12.3	26.9	0.7
FA03	GPT	56.8	11.8	27.8	0.7
FA92	ALEG	11.4	0.8	52.1	2.5
SP93	ALEG	12.8	2.2	48.2	1.8
FA93	ALEG	13.8	2.6	50.6	2.0
SP94	ALEG	15.2	1.8	49.8	1.7
FA94	ALEG	12.4	1.5	49.9	2.0
SP95	ALEG	18.0	1.1	46.4	1.7
FA95	ALEG	14.6	2.0	50.2	1.9
SP96	ALEG	14.2	1.5	48.8	1.9
FA96	ALEG	13.6	1.6	52.5	1.8
SP97	ALEG	14.6	1.9	49.8	2.0
FA97	ALEG	13.6	2.6	49.5	2.1
SP98	ALEG	16.2	3.1	46.8	1.9
FA98	ALEG	27.4	2.4	44.2	1.5
SP99	ALEG	25.0	3.2	42.5	1.6
FA99	ALEG	28.0	2.6	40.9	1.6
SP00	ALEG	25.8	5.7	41.0	1.4
FA00	ALEG	30.4	3.6	43.5	1.1
SP01	ALEG	32.8	3.8	41.4	1.0
FA01	ALEG	28.4	3.9	44.2	1.0
SP02	ALEG	24.8	3.6	45.0	0.9
FA02	ALEG	45.2	6.6	41.0	0.7

		Count		Size	
Sample	Site	mean	se	mean	se
SP03	ALEG	24.4	3.9	43.7	0.9
FA03	ALEG	19.6	3.7	46.5	1.1
FA01	CARP	29.8	7.1	27.7	0.5
SP02	CARP	32.4	6.1	28.4	0.5
FA02	CARP	49.6	6.5	28.5	0.4
SP03	CARP	28.6	5.6	26.3	0.6
FA03	CARP	45.4	11.1	22.3	0.6
SP02	MUSH	52.4	6.6	36.6	0.7
FA02	MUSH	64.0	5.6	33.4	0.6
SP03	MUSH	20.0	2.5	35.6	1.0
FA03	MUSH	24.0	1.8	35.1	1.3
FA94	OLDS	15.8	2.6	32.6	1.0
SP95	OLDS	18.4	3.8	32.6	0.9
FA95	OLDS	11.4	3.8	31.7	1.1
SP96	OLDS	13.2	4.1	30.6	1.0
FA96	OLDS	17.4	4.3	29.7	0.9
SP97	OLDS	20.8	8.0	25.7	0.9
FA97	OLDS	15.8	5.4	26.9	0.9
SP98	OLDS	15.4	5.1	29.5	0.7
FA98	OLDS	21.0	4.6	28.7	0.7
SP99	OLDS	24.4	5.7	28.1	0.8
FA99	OLDS	26.2	4.4	23.9	0.8
SP00	OLDS	51.2	11.2	25.3	0.5
FA00	OLDS	44.8	8.1	29.3	0.6
SP01	OLDS	51.6	8.1	29.8	0.5
FA01	OLDS	52.4	8.0	31.1	0.6
SP02	OLDS	44.0	7.4	29.8	0.6
FA02	OLDS	38.4	2.0	31.2	0.6
SP03	OLDS	17.8	2.4	28.0	0.9
FA03	OLDS	20.0	2.6	28.7	0.9
FA94	PCOV	39.4	8.4	28.7	0.7
SP95	PCOV	39.2	6.1	29.0	0.7
FA95	PCOV	32.4	5.0	30.3	0.8
SP96	PCOV	33.8	5.7	28.8	0.5
FA96	PCOV	41.6	8.6	29.3	0.7
SP97	PCOV	41.8	8.2	30.1	0.7
FA97	PCOV	35.2	7.6	32.5	0.8
SP98	PCOV	68.8	25.8	23.1	0.6
FA98	PCOV	52.4	11.2	30.2	0.6
SP99	PCOV	55.0	10.8	29.2	0.6
FA99	PCOV	74.0	15.8	27.0	0.6
SP00	PCOV	146.8	27.1	26.9	0.4

		Count		Size	
Sample	Site	mean	se	mean	se
FA00	PCOV	126.4	28.7	28.4	0.5
SP01	PCOV	110.4	24.0	30.4	0.5
FA01	PCOV	96.8	20.3	28.9	0.5
SP02	PCOV	101.6	19.1	27.2	0.5
FA02	PCOV	58.4	18.0	29.9	0.6
SP03	PCOV	40.6	9.2	25.9	0.6
FA03	PCOV	47.4	15.9	27.5	0.6
SP03	PTFM	31.2	4.3	31.8	0.7
FA03	PTFM	24.4	7.2	27.0	1.0
FA96	CRCO	62.4	7.7	36.3	0.8
SP97	CRCO	62.6	7.6	35.2	0.6
FA97	CRCO	59.2	11.1	33.3	0.6
SP98	CRCO	52.6	6.8	35.8	0.6
FA98	CRCO	48.2	8.1	37.0	0.7
SP99	CRCO	60.2	5.6	36.8	0.6
FA99	CRCO	57.4	8.4	36.2	0.7
SP00	CRCO	36.6	7.6	37.9	0.8
FA00	CRCO	37.2	10.7	36.5	0.8
SP01	CRCO	43.3	16.9	37.5	0.6
FA01	CRCO	49.8	11.6	37.7	0.7
SP02	CRCO	49.4	13.0	36.0	0.7
FA02	CRCO	41.8	12.4	36.5	0.7
SP03	CRCO	37.8	13.1	36.6	0.6
FA03	CRCO	70.5	15.5	35.9	1.0
FA96	SHCO	83.6	15.2	27.3	0.2
SP97	SHCO	91.2	13.6	27.6	0.2
FA97	SHCO	117.2	13.5	26.5	0.2
SP98	SHCO	148.4	19.4	25.5	0.2
FA98	SHCO	135.4	26.1	24.1	0.2
SP99	SHCO	128.8	21.1	26.5	0.2
FA99	SHCO	131.8	27.0	24.7	0.2
SP00	SHCO	126.6	20.3	26.3	0.2
FA00	SHCO	127.2	18.8	26.3	0.2
SP01	SHCO	157.8	29.9	26.6	0.2
FA01	SHCO	133.8	34.3	26.1	0.2
SP02	SHCO	120.6	22.6	27.2	0.2
FA02	SHCO	124.2	26.2	26.6	0.2
SP03	SHCO	90.6	17.9	27.4	0.2
FA03	SHCO	97.6	31.7	24.8	0.3

		Count		Size	
Sample	Site	mean	se	mean	se
FA96	DAPT	26.4	7.4	33.3	0.9
SP97	DAPT	26.0	5.5	34.9	1.0
FA97	DAPT	34.8	6.0	34.8	0.9
SP98	DAPT	29.2	5.3	40.5	1.0
FA98	DAPT	32.2	4.4	38.7	1.0
SP99	DAPT	24.8	4.4	43.5	1.1
FA99	DAPT	34.6	8.0	36.4	1.2
SP00	DAPT	27.0	6.5	38.4	1.2
FA00	DAPT	23.2	5.5	30.5	1.1
SP01	DAPT	23.2	4.5	33.5	1.1
FA01	DAPT	31.2	3.8	33.7	1.0
SP02	DAPT	32.6	4.2	32.9	1.0
FA02	DAPT	29.2	5.7	32.2	1.2
SP03	DAPT	27.6	4.5	33.2	1.1
FA03	DAPT	37.5	0.5	26.3	1.3

Abalone

Sample	Site	Total	Size mean	se
F95	PSN	117	80.4	2.0
SP96	PSN	133	87.1	2.3
F96	PSN	128	80.1	2.1
SP97	PSN	254	79.4	1.3
F97	PSN	170	81.9	1.6
SP98	PSN	288	91.5	1.4
F98	PSN	305	85.0	1.8
SP99	PSN	254	78.2	2.0
F99	PSN	288	78.3	1.9
SP00	PSN	339	79.2	1.7
F00	PSN	362	76.2	1.7
SP01	PSN	405	80.9	1.5
F01	PSN	343	81.9	1.7
SP02	PSN	486	82.6	1.3
F02	PSN	450	81.0	1.3
SP03	PSN	478	82.1	1.2
F03	PSN	348	88.4	1.3
F97	Piedras	201	88.3	1.5
SP98	Piedras	197	93.6	1.7
F98	Piedras	175	86.3	1.8
SP99	Piedras	165	83.8	1.9
F99	Piedras	163	72.7	2.0
SP00	Piedras	169	80.5	2.2
F00	Piedras	204	88.9	1.8
SP01	Piedras	217	85.3	2.0
F01	Piedras	203	83.3	1.9
SP02	Piedras	219	80.3	2.0
F02	Piedras	202	75.9	1.8
SP03	Piedras	196	84.9	1.7
F03	Piedras	149	85.2	1.9
SP01	R Marino	69	78.1	2.5
F01	R Marino	46	75.2	2.0
SP02	R Marino	54	78.0	2.3
F02	R Marino	65	75.8	2.5
SP03	R Marino	63	80.5	2.2
F03	R Marino	46	82.2	2.3
F96	Cayucos	19	80.5	5.2
SP97	Cayucos	19	66.8	4.8
F97	Cayucos	16	77.5	5.0
SP98	Cayucos	14	92.1	4.7
F98	Cayucos	3	73.3	17.6
SP99	Cayucos	4	100.0	10.8
F99	Cayucos	3	90.0	10.0

Sample	Site	Total	Size mean	se
SP00	Cayucos	4	87.5	9.5
F00	Cayucos	7	90.0	6.9
SP01	Cayucos	5	88.0	12.8
F01	Cayucos	0	.	.
SP02	Cayucos	1	90.0	.
F02	Cayucos	2	100.0	0.0
SP03	Cayucos	4	102.5	6.3
F03	Cayucos	1	110.0	.
F93	Purisima	394	98.4	1.2
SP94	Purisima	381	99.7	1.2
F94	Purisima	.	.	.
SP95	Purisima	510	100.4	1.1
F95	Purisima	509	97.8	1.2
SP96	Purisima	535	96.4	1.2
F96	Purisima	521	91.6	1.3
SP97	Purisima	551	84.3	1.0
F97	Purisima	537	88.8	1.1
SP98	Purisima	492	98.7	1.3
F98	Purisima	219	88.2	1.5
SP99	Purisima	71	85.6	3.2
F99	Purisima	52	91.9	3.5
SP00	Purisima	49	87.3	3.0
F00	Purisima	50	90.8	3.3
SP01	Purisima	33	100.9	2.7
F01	Purisima	16	106.9	7.8
SP02	Purisima	22	101.8	4.5
F02	Purisima	21	107.1	5.2
SP03	Purisima	14	103.6	6.8
F03	Purisima	13	113.8	9.0
SP92	Stairs	275	76.0	1.0
F92	Stairs	414	75.3	1.0
SP93	Stairs	434	75.2	0.8
F93	Stairs	318	74.8	0.9
SP94	Stairs	407	81.1	0.9
F94	Stairs	494	78.0	1.1
SP95	Stairs	536	76.6	1.1
F95	Stairs	419	70.6	1.2
SP96	Stairs	428	72.4	1.0
F96	Stairs	204	70.9	1.6
SP97	Stairs	164	66.5	1.9
F97	Stairs	66	77.7	2.8
SP98	Stairs	46	90.2	3.9
F98	Stairs	17	77.1	6.0
SP99	Stairs	18	83.3	5.4

			Size	
Sample	Site	Total	mean	se
F99	Stairs	19	81.1	4.1
SP00	Stairs	26	85.8	4.7
F00	Stairs	25	82.0	4.1
SP01	Stairs	28	94.8	4.2
F01	Stairs	26	92.7	4.5
SP02	Stairs	26	90.8	4.3
F02	Stairs	30	88.3	3.3
SP03	Stairs	21	91.9	4.0
F03	Stairs	24	101.7	4.6
SP92	Boathouse	578	81.9	1.0
F92	Boathouse	441	86.8	1.2
SP93	Boathouse	407	78.0	1.2
F93	Boathouse	366	89.8	1.2
SP94	Boathouse	448	87.4	1.2
F94	Boathouse	435	89.1	1.4
SP95	Boathouse	353	90.8	1.1
F95	Boathouse	172	91.5	2.2
SP96	Boathouse	114	82.7	2.8
F96	Boathouse	78	90.5	3.2
SP97	Boathouse	90	82.8	3.0
F97	Boathouse	102	74.7	3.1
SP98	Boathouse	40	89.0	4.7
F98	Boathouse	25	69.4	5.0
SP99	Boathouse	12	92.5	6.3
F99	Boathouse	20	85.7	5.8
SP00	Boathouse	34	72.1	5.4
F00	Boathouse	30	77.8	6.5
SP01	Boathouse	39	80.0	4.7
F01	Boathouse	28	103.2	5.3
SP02	Boathouse	34	99.7	4.2
F02	Boathouse	33	96.1	5.4
SP03	Boathouse	24	106.7	4.5
F03	Boathouse	26	105.0	5.4

			Size	
Sample	Site	Total	mean	se
SP92	Govpt	87	105.2	1.9
F92	Govpt	77	90.6	2.2
SP93	Govpt	.	.	.
F93	Govpt	16	106.9	5.0
SP94	Govpt	5	119.0	6.8
F94	Govpt	4	115.0	8.7
SP95	Govpt	6	120.0	4.3
F95	Govpt	2	115.0	5.0
SP96	Govpt	2	125.0	15.0
F96	Govpt	2	115.0	5.0
SP97	Govpt	4	105.0	8.7
F97	Govpt	3	126.7	18.6
SP98	Govpt	1	120.0	.
F98	Govpt	1	140.0	.
SP99	Govpt	1	110.0	.
F99	Govpt	.	.	.
SP00	Govpt	3	106.7	23.3
F00	Govpt	1	110.0	.
SP01	Govpt	1	120.0	.
F01	Govpt	0	.	.
SP02	Govpt	1	80.0	.
F02	Govpt	1	100.0	.
SP03	Govpt	0	.	.
F03	Govpt	0	.	.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.