North Central Coast Baseline Surveys of Rocky Intertidal Ecosystems: a report prepared for Sea Grant

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Project Goals and Objectives

The objective of the rocky intertidal surveys and analyses for the North Central Coast Baseline Surveys are to (1) produce a quantitative baseline characterization of the structure of rocky intertidal ecosystems in all of the Marine Protected Areas (MPAs) that have rocky intertidal habitats established by the Marine Life Protection Act (MLPA) Initiative in the North Central Coast Study Region (NCCSR), (2) provide a quantitative comparison between the rocky intertidal ecosystems in these MPAs and associated reference areas in the NCCSR, (3) analytically explore the baseline characterizations for potential indicators of the state of the rocky intertidal ecosystems using newly collected data along with our existing datasets from the region, and (4) integrate these assessments with other components of the baseline survey to inform the role and design of those programs for a future monitoring and evaluation program.

The goal of this report and the associated survey data (uploaded to Oceanspaces.org) is to provide a baseline characterization summary of the Rocky Intertidal Ecosystems in the NCCSR (1 and 2 above). These data can then be used for future synthesis and integration efforts across the other projects associated with the North Central Coast Baseline Program (3 and 4 above).

Methodology

Our rocky intertidal monitoring program is a product of over three decades of research at more than 200 monitoring sites ranging from Southeast Alaska to Mexico. Our approach for the NCCSR involves a replication of this ongoing intertidal sampling program, coordinated with Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) and Multi-Agency Rocky Intertidal Network (MARINe). We use two separate survey types to characterize the ecosystem – Long-Term Monitoring Surveys and Biodiversity Surveys. This is the same approach we used to generate baseline characterizations of rocky intertidal ecosystems in the Central Coast Study Region (CCSR) and the network of marine reserves in the Northern Channel Islands (NCI).

Long-Term Monitoring Surveys use fixed plots to document changes in percent cover, or abundance of targeted species or species assemblages. This fixed-plot approach allows the dynamics of rocky intertidal species to be monitored with reasonable sampling effort and provides sufficient statistical power to detect changes over space or time.

The Biodiversity Surveys provide detailed information about biodiversity and community structure. These surveys were designed to measure diversity and abundance of algae and invertebrates found within rocky intertidal communities on the western coast of temperate North America.

Long-Term Monitoring sites are typically established in areas where the coastline consists of contiguous rocky reef. These rocky reefs are usually quite broad (typical width between 30-50 m) and long (typical length between 50-500 m). Contiguous rocky reefs are the most stable of rocky intertidal habitats, and

targeting a specific habitat type results in higher consistency among sites, which allows for better comparisons among sites and regions. This basic level of consistency in site selection is important, because targeted reefs vary immensely by rock type, shape, rugosity, exposure, surrounding habitat, human visitation levels and other factors, which all contribute to explaining patterns in long-term community dynamics.

Biodiversity Survey sites are located in the same areas as Long-Term sites, or in areas of special interest (e.g. Areas of Special Biological Significance, areas where a disturbance has occurred, remote areas). Sites are typically established in areas where there is at least 30 m of contiguous rocky reef (the length of the baseline transect), but a site can be broken into two smaller sections, or adapted as necessary to fit within the constraints of smaller rocky reefs.

In combination, the long-term, targeted species approach and the biodiversity surveys provide a wealth of information about the structure and dynamics of rocky intertidal communities along the Pacific Coast of North America.

For the purposes of this baseline characterization report, only Biodiversity Survey data were used for the biological summaries at each study site. Detailed information on our intertidal surveys, including full survey protocols, trend graphs, and an interactive map and graphing tool, can be found on our website at www.pacificrockyintertidal.org.

Baseline Characterization

North Central Coast Rocky Intertidal Ecosystems

The North Central Coast region of California ranges from Point Arena to Pigeon Point. Highway 1/101 hugs the coast along much of this stretch of coastline, and spectacular views and abundant recreational activities bring visitors from around the world. Coastal habitat within this region includes estuaries, bays, mudflats, rocky headlands/reefs, and boulder/cobble/sandy beaches.

Historically, commercial fishing has been an important part of the economy in this region, but recent declines in commercially harvested species have led to less profitable returns and even fishery closures during some years, making this an unreliable income source. Sport fishing, including harvesting of red abalone, is a major attractor of visitors to the region and continues to be an important source of income for coastal communities. In summer 2011, a massive die-off of red abalone and other invertebrates, possibly caused by the effects of a red-tide bloom/low-oxygen event, led to the emergency closure of the sport fishery in Sonoma County.

Threats to the rocky intertidal in North Central California include overuse and overharvesting issues discussed above, as well as land use issues that can impact water quality and sedimentation levels. Increased coastal development in this region has led to concerns about elevated levels of sediment and urban runoff. This region is also an important agricultural area, and the impact of runoff containing pesticides and increased nutrients on marine communities is a concern.

The region includes ten State Marine Reserves (SMR), in which all fishing is prohibited, and twelve State Marine Conservation Areas (SMCA), in which limited commercial or recreational take is allowed. The southern portion of this region is included in the Gulf of the Farallones National Marine Sanctuary (Bodega Head to southern Marin Co.) and the Monterey Bay National Marine Sanctuary (Marin Co. to Pigeon Pt.).

Biodiversity Surveys have been done in this region since 2001 and Long-Term Monitoring Surveys since 2004. Baseline monitoring for the newly established Marine Protected Areas began in 2010.

Description and Location of Sites

We have established a total of 22 rocky intertidal sites within the NCCSR (Figure 1). 14 of these sites are located within MPAs, and 8 are located outside of MPAs. Of these 22 sites, 12 of them were established before implementation of the NCC MPAs, and 10 sites were established as part of the Baseline Program (Table 1).

intertidal_sitename	MPA_name	MPA_designation	Year Established
Point Arena	Point Arena SMR	SMR	2010
Stornetta	Sea Lion Cove SMCA	SMCA	2005
Moat Creek		reference	2010
Saunders Reef	Saunders Reef SMCA	SMCA	2010
Del Mar Landing	Del Mar Landing SMR	SMR	2010
Sea Ranch		reference	2001
Phillips Gulch	Salt Point SMCA	SMCA	2010
Gerstle Cove	Gerstle Cove SMR	SMR	2010
Windermere Point		reference	2010
North Jenner Beach	Russian River SMCA	SMCA	2010
Bodega	Bodega Head SMR	SMR	2001
Bodega Head		reference	2010
Santa Maria Creek		reference	2002
Chimney Rock	Point Reyes SMR	SMR	2010
Bolinas Point	Duxbury Reef SMCA	SMCA	2002
Bolinas Point Wreck	Duxbury Reef SMCA	SMCA	2005
Alder Creek/Duxbury	Duxbury Reef SMCA	SMCA	2008
Slide Ranch		reference	2006
Point Bonita		reference	2006
Mussel Flat Farallones	Southeast Farallon Island SMR	SMR	2004
Fitzgerald Marine Reserve	Montara SMR	SMR	2002
Pebble Beach		reference	2004

Table 1. Rocky intertidal sites located within the NCCSR.

Long-Term Monitoring Surveys were done at 17 of these sites, which use fixed plots to document changes in percent cover, or abundance of targeted species or species assemblages.

Biodiversity Surveys were done at 19 of these sites, which provide detailed information about biodiversity and community structure. By evaluating the percent cover of the intertidal space occupied by algae, surfgrass, invertebrates, as well as rock and sand, these biodiversity sites can be grouped into eight different community types (Figure 2).

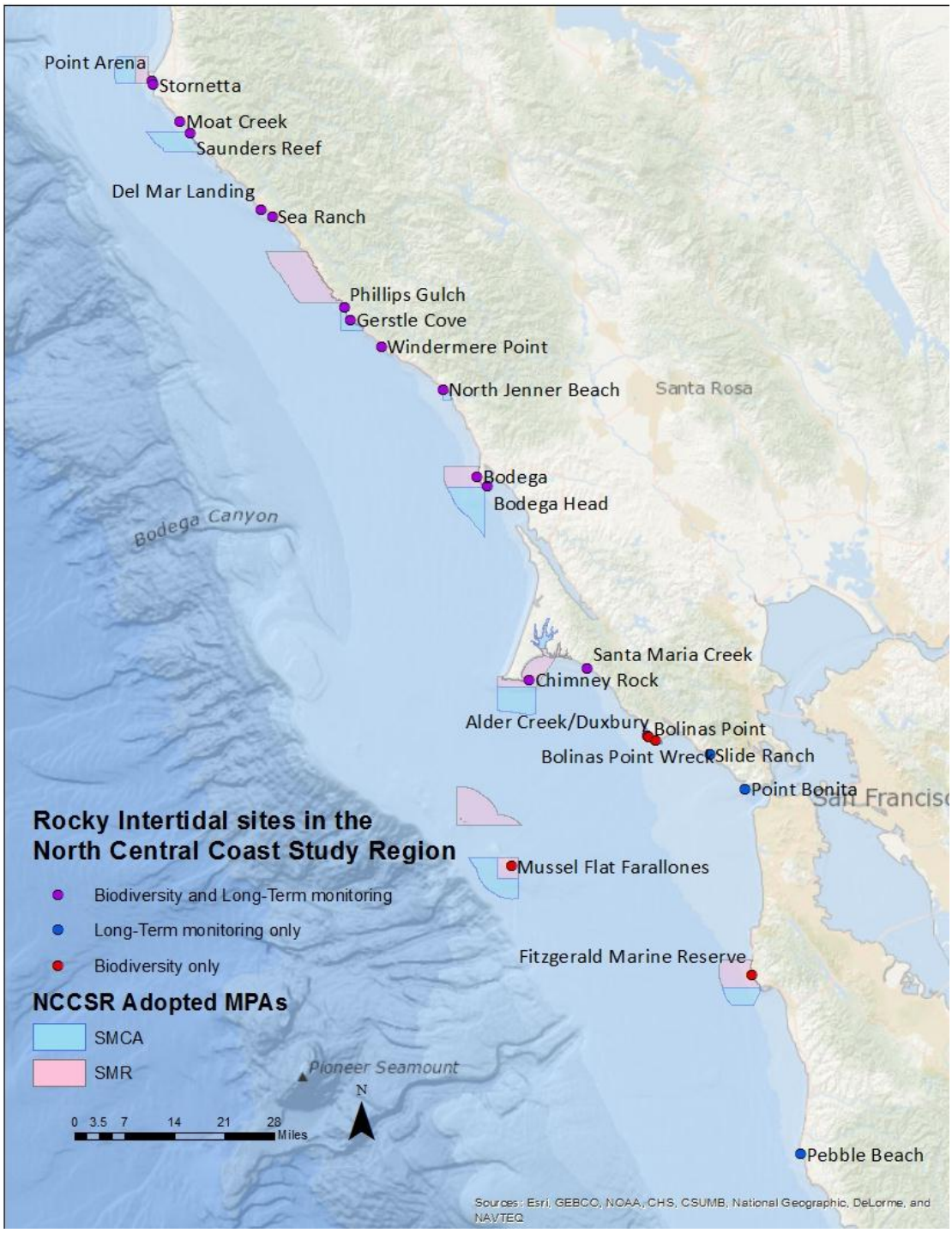

Figure 1. Map of Rocky Intertidal sites in the NCCSR

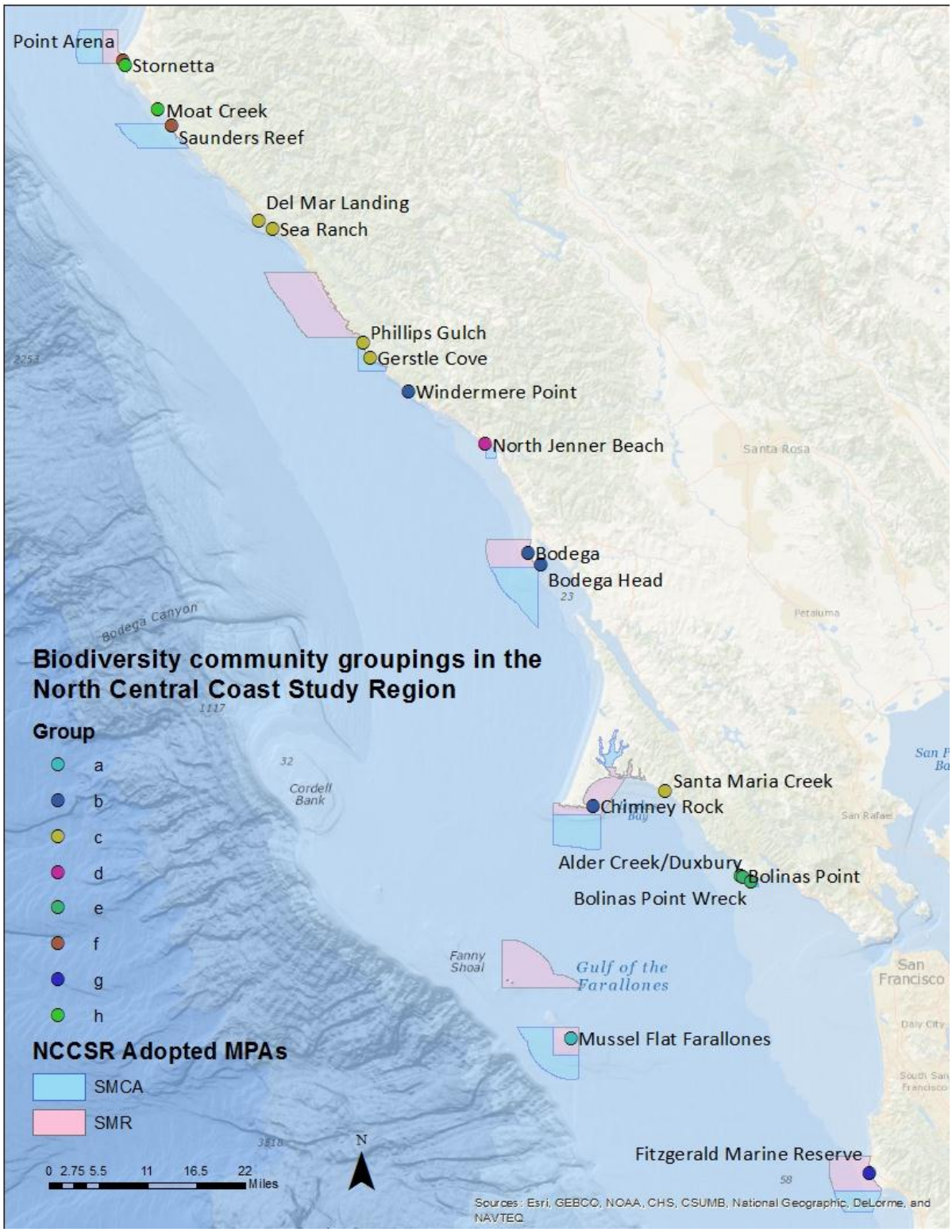

Figure 2. Map of Biodiversity community groupings in the NCCSR

Physical Site Attributes

The physical characteristics of the rocky intertidal habitat in the NCCSR are highly variable, from the dominant geology type to the slope and rugosity of the coastline. The physical attributes of each of our intertidal sites are summarized in Table 2. The associated metadata descriptions for these attributes are below:

1. **Primary Bench Type:** describes the dominant geology of the site
    a. **bedrock:** the primary bench type is consolidated bedrock at this site
    b. **bedrock/boulders:** the primary bench type is a mixture of consolidated bedrock and boulder fields at this site
    c. **bedrock/boulders/cobble:** the primary bench type is a mixture of consolidated bedrock, boulder fields, and cobble beach at this site
    d. **bedrock/boulders/sand:** the primary bench type is a mixture of consolidated bedrock, boulder fields, and sandy beach at this site
    e. **bedrock/sand:** the primary bench type is a mixture of consolidated bedrock and sandy beach at this site
    f. **boulders:** the primary bench type is boulder fields at this site
2. **Slope:** describes the slope of the coastline at the site
    a. **gentle:** the slope of this site is between 0-5 degrees
    b. **moderate:** the slope of this site is between 5-15 degrees
3. **Relief:** describes the rugosity of the site
    a. **high:** the relief of the site consists of extremely uneven terrain, containing many deep cracks and folds, such as in some mixed consolidated bedrock and boulder fields
    b. **moderate:** the relief of the site consists of moderately uneven terrain, containing few cracks and folds, such as in boulder or cobble fields and some consolidated bedrock
    c. **low:** the relief of the site consists of flat terrain, such as a sandy beach
4. **Surrounding Coast:** describes the geology of the area surrounding the site
    a. **bedrock:** the surrounding coast is consolidated bedrock at this site
    b. **bedrock/boulders/cobble:** the surrounding coast is a mixture of consolidated bedrock, boulder fields, and cobble beach at this site
    c. **bedrock/boulders/cobble/sand:** the surrounding coast is a mixture of consolidated bedrock, boulder fields, and cobble and sandy beach at this site
    d. **bedrock/boulders/sand:** the surrounding coast is a mixture of consolidated bedrock, boulder fields, and sandy beach at this site
    e. **bedrock/sand:** the surrounding coast is a mixture of consolidated bedrock and sandy beach at this site
    f. **boulders/sand:** the surrounding coast is a mixture of boulder fields and sandy beach at this site
    g. **sand:** the surrounding coast is sandy beach at this site

intertidal_sitename	Primary Bench Type	Slope	Relief	Surrounding Coast
Point Arena	bedrock	gentle	moderate	bedrock/ boulders/cobble
Stornetta	bedrock	gentle	moderate	bedrock/sand
Moat Creek	bedrock/ boulders	gentle	moderate	bedrock/ boulders/cobble
Saunders Reef	bedrock/ boulders	gentle	moderate	bedrock/ boulders/sand
Del Mar Landing	bedrock	moderate	high	bedrock/ boulders/sand
Sea Ranch	bedrock	gentle	moderate	bedrock/sand
Phillips Gulch	bedrock	gentle	high	bedrock/ boulders/cobble
Gerstle Cove	bedrock / boulders	gentle	moderate	bedrock/ boulders/cobble
Windermere Point	bedrock/boulders	moderate	high	bedrock/ boulders/cobble
North Jenner Beach	bedrock/ boulders/cobble	gentle	moderate	bedrock/ boulders/sand
Bodega	bedrock/ boulders/cobble	moderate	moderate	bedrock/ boulders/cobble/sand
Bodega Head	bedrock/ boulders/sand	moderate	moderate	bedrock/ boulders/sand
Santa Maria Creek	bedrock/sand	gentle	moderate	bedrock/ sand
Chimney Rock	bedrock/ boulders/sand	gentle	moderate	bedrock/ boulders/sand
Bolinas Point	bedrock/ boulders	gentle	low	bedrock/ boulders/sand
Bolinas Point Wreck	bedrock/ boulders	gentle	low	bedrock/ boulders/sand
Alder Creek/Duxbury	bedrock	gentle	low	sand
Slide Ranch	boulders	moderate	high	boulders/ sand
Point Bonita	bedrock/ boulders/sand	moderate	high	bedrock/ boulders/sand
Mussel Flat Farallones	bedrock	moderate	moderate	bedrock
Fitzgerald Marine Reserve	bedrock	gentle	low	bedrock/ sand
Pebble Beach	bedrock/ boulders/sand	gentle	moderate	bedrock/ boulders/sand

Table 2. Physical attributes of intertidal sites

Site Descriptions

Included in the following pages are descriptions, photos, and biological characteristics of each of the rocky intertidal sites located in the NCCSR. For sites where only Long-Term Monitoring has been done, no biological summary has been provided. In addition, species of concern have not been included in these summaries.

Point Arena (Point Arena SMR)

Physical Description

Point Arena is located in the North Central Coast region of California, within the Point Arena State Marine Reserve. This site is near the Point Arena Lighthouse Mussel Watch site. This site receives low visitation. Harbor seals are often hauled out near this site. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds (Figure 3).

Figure 3. Biodiversity Survey overview at Point Arena

Point Arena is dominated by consolidated bedrock (mudstone), and the area surrounding the site is comprised of a mixture of consolidated bedrock (mudstone), boulder fields, and cobble beach. The primary coastal orientation of this site is southwest.

Long-Term Monitoring Surveys at Point Arena were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 100 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Point Arena (> 2% cover or > 1 per m^2) are displayed in Table 3.

intertidal_sitename	year	species_name	category	general_taxa_name
Point Arena	2010	Non Coralline crust	algae/plant	brown algal crust
Point Arena	2010	Fucus spp	algae/plant	brown algal fucoid
Point Arena	2010	Pelvetiopsis arborescens/limitata	algae/plant	brown algal fucoid
Point Arena	2010	Silvetia compressa	algae/plant	brown algal fucoid
Point Arena	2010	Corallina spp	algae/plant	coralline algae
Point Arena	2010	Encrusting coralline	algae/plant	coralline algae
Point Arena	2010	Mastocarpus spp	algae/plant	corticated red algae
Point Arena	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Point Arena	2010	Odonthalia floccosa	algae/plant	corticated red algae
Point Arena	2010	Ulva spp	algae/plant	filamentous green algae
Point Arena	2010	Endocladia muricata	algae/plant	red algal turf
Point Arena	2010	Cyanoplax spp	invertebrate	chiton
Point Arena	2010	Katharina tunicata	invertebrate	chiton
Point Arena	2010	Nuttallina spp	invertebrate	chiton
Point Arena	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Point Arena	2010	Lottia limatula	invertebrate	limpet
Point Arena	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Point Arena	2010	Lottia pelta	invertebrate	limpet
Point Arena	2010	Lottia scabra/conus	invertebrate	limpet
Point Arena	2010	Onchidella borealis	invertebrate	limpet
Point Arena	2010	Leptasterias spp	invertebrate	seastar
Point Arena	2010	Littorina plena/scutulata	invertebrate	snail
Point Arena	2010	Tegula funebralis	invertebrate	snail
Point Arena	2010	Strongylocentrotus purpuratus	invertebrate	urchin

Table 3. Common intertidal species observed at Point Arena

Stornetta (Sea Lion Cove SMCA)

Physical Description

Stornetta is located in the North Central Coast region of California, within the Sea Lion Cove State Marine Conservation Area. This site currently receives low visitation by tidepoolers. While open between 2005 and 2010, the site received moderate to high visitation during low tides by abalone divers, fisherman, and tidepoolers. Portions of this site are only accessible during low tides. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 4).

Figure 4. Biodiversity Survey overview at Stornetta

Stornetta is dominated by consolidated bedrock (mudstone), and the area surrounding the site is comprised of a mixture of consolidated bedrock (mudstone) and sandy beach. The primary coastal orientation of this site is southwest.

Long-Term Monitoring Surveys at Stornetta were established in 2005 and Biodiversity Surveys were done in 2004 and 2007. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 33 meters (seaward).

Biological Summary

The most common species observed during the 2007 Biodiversity Survey done at Stornetta (> 2% cover or > 1 per m^2) are displayed in Table 4.

intertidal_sitename	year	species_name	category	general_taxa_name
Stornetta	2007	Non Coralline crust	algae/plant	brown algal crust
Stornetta	2007	Silvetia compressa	algae/plant	brown algal fucoid
Stornetta	2007	Egregia menziesii	algae/plant	brown algal kelp
Stornetta	2007	Bossiella spp	algae/plant	coralline algae
Stornetta	2007	Corallina spp	algae/plant	coralline algae
Stornetta	2007	Encrusting coralline	algae/plant	coralline algae
Stornetta	2007	Chondracanthus canaliculatus	algae/plant	corticated red algae
Stornetta	2007	Halosaccion glandiforme	algae/plant	corticated red algae
Stornetta	2007	Mastocarpus spp	algae/plant	corticated red algae
Stornetta	2007	Mazzaella cordata/splendens	algae/plant	corticated red algae
Stornetta	2007	Mazzaella oregona	algae/plant	corticated red algae
Stornetta	2007	Odonthalia floccosa	algae/plant	corticated red algae
Stornetta	2007	Endocladia muricata	algae/plant	red algal turf
Stornetta	2007	Gelidium spp	algae/plant	red algal turf
Stornetta	2007	Phyllospadix scouleri	algae/plant	surfgrass
Stornetta	2007	Cyanoplax spp	invertebrate	chiton
Stornetta	2007	Pagurus hirsutiusculus	invertebrate	crab
Stornetta	2007	Lottia paradigitalis/strigatella	invertebrate	limpet
Stornetta	2007	Lottia pelta	invertebrate	limpet
Stornetta	2007	Lottia scabra/conus	invertebrate	limpet
Stornetta	2007	Leptasterias spp	invertebrate	seastar
Stornetta	2007	Littorina keenae	invertebrate	snail
Stornetta	2007	Littorina plena/scutulata	invertebrate	snail
Stornetta	2007	Tegula funebralis	invertebrate	snail

Table 4. Common intertidal species observed at Stornetta

Moat Creek

Physical Description

Moat Creek is located in the North Central Coast region of California. This site receives high visitation during low tides by abalone divers, fisherman, surfers, and tidepoolers. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 5).

Figure 5. Biodiversity Survey overview at Moat Creek

Moat Creek is dominated by a mixture of consolidated bedrock (mudstone) and boulder fields, and the area surrounding the site is comprised of a mixture of consolidated bedrock (mudstone), boulder fields, and cobble beach. The primary coastal orientation of this site is south/southwest.

Long-Term Monitoring Surveys at Moat Creek were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 100 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Moat Creek (> 2% cover or > 1 per m^2) are displayed in Table 5.

intertidal_sitename	year	species_name	category	general_taxa_name
Moat Creek	2010	Non Coralline crust	algae/plant	brown algal crust
Moat Creek	2010	Fucus spp	algae/plant	brown algal fucoid
Moat Creek	2010	Egregia menziesii	algae/plant	brown algal kelp
Moat Creek	2010	Corallina spp	algae/plant	coralline algae
Moat Creek	2010	Encrusting coralline	algae/plant	coralline algae
Moat Creek	2010	Halosaccion glandiforme	algae/plant	corticated red algae
Moat Creek	2010	Mastocarpus spp	algae/plant	corticated red algae
Moat Creek	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Moat Creek	2010	Mazzaella oregona	algae/plant	corticated red algae
Moat Creek	2010	Endocladia muricata	algae/plant	red algal turf
Moat Creek	2010	Phyllospadix scouleri	algae/plant	surfgrass
Moat Creek	2010	Cyanoplax spp	invertebrate	chiton
Moat Creek	2010	Pagurus granosimanus	invertebrate	crab
Moat Creek	2010	Pagurus hirsutiusculus	invertebrate	crab
Moat Creek	2010	Pugettia producta	invertebrate	crab
Moat Creek	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Moat Creek	2010	Lottia scabra/conus	invertebrate	limpet
Moat Creek	2010	Henricia spp	invertebrate	seastar
Moat Creek	2010	Leptasterias spp	invertebrate	seastar
Moat Creek	2010	Alia spp	invertebrate	snail
Moat Creek	2010	Bittium eschrichtii	invertebrate	snail
Moat Creek	2010	Lacuna spp	invertebrate	snail
Moat Creek	2010	Tegula brunnea	invertebrate	snail
Moat Creek	2010	Tegula funebralis	invertebrate	snail
Moat Creek	2010	Ocenebra interfossa	invertebrate	whelk

Table 5. Common intertidal species observed at Moat Creek

Saunders Reef (Saunders Reef SMCA)

Physical Description

Saunders Reef is located in the North Central Coast region of California, within the Saunders Reef State Marine Conservation Area. This site receives low visitation by abalone divers, fisherman, and tidepoolers. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 6).

Figure 6. Biodiversity Survey overview at Saunders Reef

Saunders Reef is dominated by a mixture of consolidated bedrock (mudstone) and boulder fields, and the area surrounding the site is comprised of a mixture of consolidated bedrock (mudstone), boulder fields, and sandy beach. The primary coastal orientation of this site is west.

Long-Term Monitoring Surveys at Saunders Reef were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 80 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Saunders Reef (> 2% cover or > 1 per m^2) are displayed in Table 6.

intertidal_sitename	year	species_name	category	general_taxa_name
Saunders Reef	2010	Non Coralline crust	algae/plant	brown algal crust
Saunders Reef	2010	Fucus spp	algae/plant	brown algal fucoid
Saunders Reef	2010	Corallina spp	algae/plant	coralline algae
Saunders Reef	2010	Encrusting coralline	algae/plant	coralline algae
Saunders Reef	2010	Mastocarpus spp	algae/plant	corticated red algae
Saunders Reef	2010	Odonthalia floccosa	algae/plant	corticated red algae
Saunders Reef	2010	Endocladia muricata	algae/plant	red algal turf
Saunders Reef	2010	Phyllospadix scouleri	algae/plant	surfgrass
Saunders Reef	2010	Cyanoplax spp	invertebrate	chiton
Saunders Reef	2010	Katharina tunicata	invertebrate	chiton
Saunders Reef	2010	Nuttallina spp	invertebrate	chiton
Saunders Reef	2010	Tonicella lineata/lokii	invertebrate	chiton
Saunders Reef	2010	Idotea spp	invertebrate	isopod
Saunders Reef	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Saunders Reef	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Saunders Reef	2010	Lottia pelta	invertebrate	limpet
Saunders Reef	2010	Lottia scabra/conus	invertebrate	limpet
Saunders Reef	2010	Onchidella borealis	invertebrate	limpet
Saunders Reef	2010	Leptasterias spp	invertebrate	seastar
Saunders Reef	2010	Littorina plena/scutulata	invertebrate	snail
Saunders Reef	2010	Tegula funebralis	invertebrate	snail
Saunders Reef	2010	Strongylocentrotus purpuratus	invertebrate	urchin
Saunders Reef	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 6. Common intertidal species observed at Saunders Reef

Del Mar Landing (Del Mar Landing SMR)

Physical Description

Del Mar Landing is located in the North Central Coast region of California, within the Del Mar Landing State Marine Reserve. This site is also located in an Area of Special Biological Significance (Del Mar Landing Ecological Reserve ASBS). This site receives low visitation by tidepoolers. This moderately sloping site consists of extremely uneven terrain, containing many deep cracks and folds. (Figure 7).

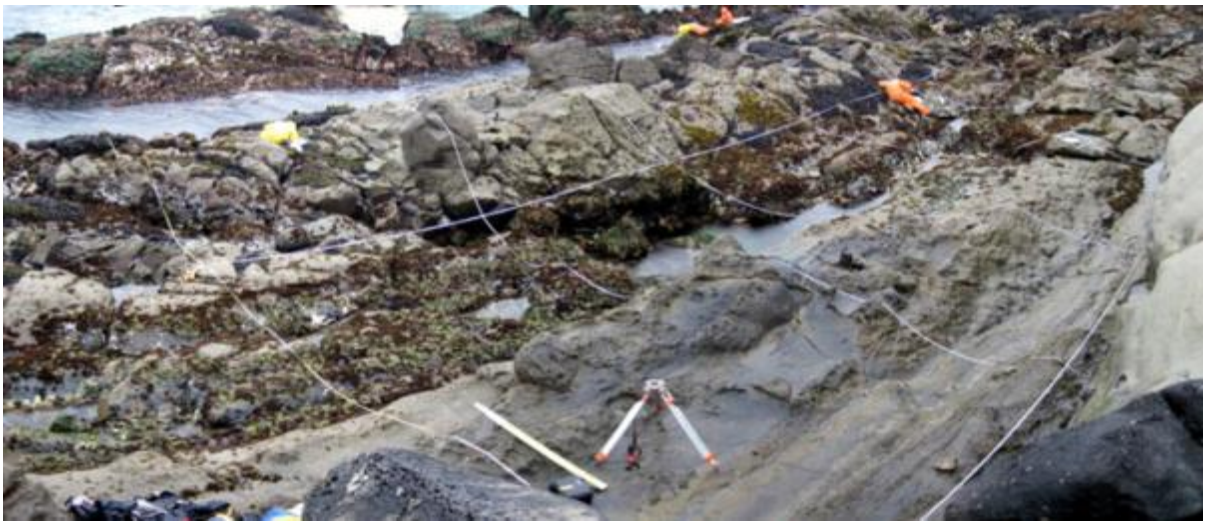

Figure 7. Biodiversity Survey overview at Del Mar Landing

Del Mar Landing is dominated by consolidated bedrock, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and sandy beach. The primary coastal orientation of this site is south.

Long-Term Monitoring Surveys at Del Mar Landing were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 20 meters (along shore) x 20 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Del Mar Landing (> 2% cover or > 1 per m^2) are displayed in Table 7.

intertidal_sitename	year	species_name	category	general_taxa_name
Del Mar Landing	2010	Non Coralline crust	algae/plant	brown algal crust
Del Mar Landing	2010	Pelvetiopsis arborescens/limitata	algae/plant	brown algal fucoid
Del Mar Landing	2010	Corallina spp	algae/plant	coralline algae
Del Mar Landing	2010	Encrusting coralline	algae/plant	coralline algae
Del Mar Landing	2010	Mastocarpus spp	algae/plant	corticated red algae
Del Mar Landing	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Del Mar Landing	2010	Odonthalia floccosa	algae/plant	corticated red algae
Del Mar Landing	2010	Endocladia muricata	algae/plant	red algal turf
Del Mar Landing	2010	Balanus glandula	invertebrate	barnacle
Del Mar Landing	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Del Mar Landing	2010	Cyanoplax spp	invertebrate	chiton
Del Mar Landing	2010	Katharina tunicata	invertebrate	chiton
Del Mar Landing	2010	Nuttallina spp	invertebrate	chiton
Del Mar Landing	2010	Tonicella lineata/lokii	invertebrate	chiton
Del Mar Landing	2010	Cucumaria/Pseudocnus spp	invertebrate	cucumber
Del Mar Landing	2010	Idotea spp	invertebrate	isopod
Del Mar Landing	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Del Mar Landing	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Del Mar Landing	2010	Lottia pelta	invertebrate	limpet
Del Mar Landing	2010	Lottia scabra/conus	invertebrate	limpet
Del Mar Landing	2010	Onchidella borealis	invertebrate	limpet
Del Mar Landing	2010	Mytilus californianus	invertebrate	mussel
Del Mar Landing	2010	Leptasterias spp	invertebrate	seastar
Del Mar Landing	2010	Littorina keenae	invertebrate	snail
Del Mar Landing	2010	Littorina plena/scutulata	invertebrate	snail
Del Mar Landing	2010	Littorina spp	invertebrate	snail
Del Mar Landing	2010	Tegula funebralis	invertebrate	snail
Del Mar Landing	2010	Strongylocentrotus purpuratus	invertebrate	urchin

Table 7. Common intertidal species observed at Del Mar Landing

Sea Ranch

Physical Description

Sea Ranch is located in the North Central Coast region of California. Sea Ranch is one of 6 sites where Kinnetic Laboratories did experimental clearings (1m x 2m) in 1985 in the *Endocladia*/*Mastocarpus* and *Mytilus* zones to look at recovery rates within these species assemblages. This site receives low visitation by tidepoolers and abalone divers, and is accessed through The Sea Ranch community (private property). This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 8).

Figure 8. Biodiversity Survey overview at Sea Ranch

Sea Ranch is dominated by consolidated bedrock, and the area surrounding the site is comprised of a mixture of consolidated bedrock and sandy beach. The primary coastal orientation of this site is southwest.

Long-Term Monitoring Surveys at Sea Ranch were established in 2004 and Biodiversity Surveys were done in 2001, 2005, and 2010. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 50 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Sea Ranch (> 2% cover or > 1 per m^2) are displayed in Table 8.

intertidal_sitename	year	species_name	category	general_taxa_name
Sea Ranch	2010	Non Coralline crust	algae/plant	brown algal crust
Sea Ranch	2010	Fucus spp	algae/plant	brown algal fucoid
Sea Ranch	2010	Egregia menziesii	algae/plant	brown algal kelp
Sea Ranch	2010	Corallina spp	algae/plant	coralline algae
Sea Ranch	2010	Cryptopleura/Hymenena spp	algae/plant	corticated red algae
Sea Ranch	2010	Mastocarpus spp	algae/plant	corticated red algae
Sea Ranch	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Sea Ranch	2010	Neorhodomela larix	algae/plant	corticated red algae
Sea Ranch	2010	Odonthalia floccosa	algae/plant	corticated red algae
Sea Ranch	2010	Endocladia muricata	algae/plant	red algal turf
Sea Ranch	2010	Anthopleura elegantissima	invertebrate	anemone
Sea Ranch	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Sea Ranch	2010	Cyanoplax spp	invertebrate	chiton
Sea Ranch	2010	Katharina tunicata	invertebrate	chiton
Sea Ranch	2010	Pagurus hirsutiusculus	invertebrate	crab
Sea Ranch	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Sea Ranch	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Sea Ranch	2010	Lottia pelta	invertebrate	limpet
Sea Ranch	2010	Lottia scabra/conus	invertebrate	limpet
Sea Ranch	2010	Onchidella borealis	invertebrate	limpet
Sea Ranch	2010	Mytilus californianus	invertebrate	mussel
Sea Ranch	2010	Calliostoma ligatum	invertebrate	snail
Sea Ranch	2010	Lirularia/Margarites spp	invertebrate	snail
Sea Ranch	2010	Littorina plena/scutulata	invertebrate	snail
Sea Ranch	2010	Tegula funebralis	invertebrate	snail
Sea Ranch	2010	Strongylocentrotus purpuratus	invertebrate	urchin

Table 8. Common intertidal species observed at Sea Ranch

Phillips Gulch (Salt Point SMCA)

Physical Description

Phillips Gulch is located in the North Central Coast region of California, within the Salt Point State Marine Conservation Area. This site receives moderate visitation during low tides by abalone divers and tidepoolers. This gently sloping site consists of extremely uneven terrain, containing many deep cracks and folds. (Figure 9).

Figure 9. Biodiversity Survey overview at Phillips Gulch

Phillips Gulch is dominated by consolidated bedrock (conglomerate), and the area surrounding the site is comprised of a mixture of consolidated bedrock (conglomerate), boulder fields, and cobble beach. The primary coastal orientation of this site is southwest

Long-Term Monitoring Surveys at Phillips Gulch were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 20 meters (along shore) x 15 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Phillips Gulch (> 2% cover or > 1 per m^2) are displayed in Table 9.

intertidal_sitename	year	species_name	category	general_taxa_name
Phillips Gulch	2010	Alaria marginata	algae/plant	brown algal kelp
Phillips Gulch	2010	Hedophyllum sessile	algae/plant	brown algal kelp
Phillips Gulch	2010	Bossiella spp	algae/plant	coralline algae
Phillips Gulch	2010	Corallina spp	algae/plant	coralline algae
Phillips Gulch	2010	Cryptopleura/Hymenena spp	algae/plant	corticated red algae
Phillips Gulch	2010	Odonthalia floccosa	algae/plant	corticated red algae
Phillips Gulch	2010	Endocladia muricata	algae/plant	red algal turf
Phillips Gulch	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Phillips Gulch	2010	Pollicipes polymerus	invertebrate	barnacle
Phillips Gulch	2010	Cyanoplax spp	invertebrate	chiton
Phillips Gulch	2010	Katharina tunicata	invertebrate	chiton
Phillips Gulch	2010	Nuttallina spp	invertebrate	chiton
Phillips Gulch	2010	Petrolisthes spp	invertebrate	crab
Phillips Gulch	2010	Idotea spp	invertebrate	isopod
Phillips Gulch	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Phillips Gulch	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Phillips Gulch	2010	Lottia pelta	invertebrate	limpet
Phillips Gulch	2010	Lottia scabra/conus	invertebrate	limpet
Phillips Gulch	2010	Lottia scutum	invertebrate	limpet
Phillips Gulch	2010	Mytilus californianus	invertebrate	mussel
Phillips Gulch	2010	Leptasterias spp	invertebrate	seastar
Phillips Gulch	2010	Littorina keenae	invertebrate	snail
Phillips Gulch	2010	Littorina plena/scutulata	invertebrate	snail
Phillips Gulch	2010	Littorina spp	invertebrate	snail
Phillips Gulch	2010	Strongylocentrotus purpuratus	invertebrate	urchin
Phillips Gulch	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 9. Common intertidal species observed at Phillips Gulch

Gerstle Cove (Gerstle Cove SMR)

Physical Description

Gerstle Cove is located in the North Central Coast region of California, within the Gerstle Cove State Marine Reserve. This site is also located in an Area of Special Biological Significance (Gerstle Cove ASBS). This site receives high visitation during low tides by tidepoolers and high visitation by abalone divers and fisherman just outside the reserve. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 10).

Figure 10. Biodiversity Survey overview at Gerstle Cove

Gerstle Cove is dominated by a mixture of consolidated bedrock and boulder fields, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and cobble beach. The primary coastal orientation of this site is west/southwest.

Long-Term Monitoring Surveys at Gerstle Cove were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 5 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Gerstle Cove (> 2% cover or > 1 per m^2) are displayed in Table 10.

intertidal_sitename	year	species_name	category	general_taxa_name
Gerstle Cove	2010	Non Coralline crust	algae/plant	brown algal crust
Gerstle Cove	2010	Alaria marginata	algae/plant	brown algal kelp
Gerstle Cove	2010	Egregia menziesii	algae/plant	brown algal kelp
Gerstle Cove	2010	Hedophyllum sessile	algae/plant	brown algal kelp
Gerstle Cove	2010	Corallina spp	algae/plant	coralline algae
Gerstle Cove	2010	Encrusting coralline	algae/plant	coralline algae
Gerstle Cove	2010	Cryptopleura/Hymenena spp	algae/plant	corticated red algae
Gerstle Cove	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Gerstle Cove	2010	Odonthalia floccosa	algae/plant	corticated red algae
Gerstle Cove	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Gerstle Cove	2010	Cyanoplax spp	invertebrate	chiton
Gerstle Cove	2010	Katharina tunicata	invertebrate	chiton
Gerstle Cove	2010	Mopalia spp	invertebrate	chiton
Gerstle Cove	2010	Tonicella lineata/lokii	invertebrate	chiton
Gerstle Cove	2010	Petrolisthes spp	invertebrate	crab
Gerstle Cove	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Gerstle Cove	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Gerstle Cove	2010	Lottia pelta	invertebrate	limpet
Gerstle Cove	2010	Lottia scabra/conus	invertebrate	limpet
Gerstle Cove	2010	Lottia scutum	invertebrate	limpet
Gerstle Cove	2010	Onchidella borealis	invertebrate	limpet
Gerstle Cove	2010	Mytilus californianus	invertebrate	mussel
Gerstle Cove	2010	Leptasterias spp	invertebrate	seastar
Gerstle Cove	2010	Littorina keenae	invertebrate	snail
Gerstle Cove	2010	Littorina plena/scutulata	invertebrate	snail
Gerstle Cove	2010	Littorina spp	invertebrate	snail
Gerstle Cove	2010	Strongylocentrotus purpuratus	invertebrate	urchin

Table 10. Common intertidal species observed at Gerstle Cove

Windermere Point

Physical Description

Windermere Point is located in the North Central Coast region of California. This site receives moderate visitation during low tides by abalone divers and tidepoolers. This moderately sloping site consists of extremely uneven terrain, containing many deep cracks and folds. (Figure 11).

Figure 11. Biodiversity Survey overview at Windermere Point

Windermere Point is dominated by a mixture of consolidated bedrock (sandstone) and boulder fields, and the area surrounding the site is comprised of a mixture of consolidated bedrock (sandstone), boulder fields, and cobble beach. The primary coastal orientation of this site is southwest.

Long-Term Monitoring Surveys at Windermere Point were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 20 meters (along shore) x 33 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Windermere Point (> 2% cover or > 1 per m^2) are displayed in Table 11.

intertidal_sitename	year	species_name	category	general_taxa_name
North Jenner Beach	2010	Non Coralline crust	algae/plant	brown algal crust
North Jenner Beach	2010	Fucus spp	algae/plant	brown algal fucoid
North Jenner Beach	2010	Egregia menziesii	algae/plant	brown algal kelp
North Jenner Beach	2010	Chondracanthus canaliculatus	algae/plant	corticated red algae
North Jenner Beach	2010	Grateloupia californica	algae/plant	corticated red algae
North Jenner Beach	2010	Mastocarpus spp	algae/plant	corticated red algae
North Jenner Beach	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
North Jenner Beach	2010	Mazzaella oregona	algae/plant	corticated red algae
North Jenner Beach	2010	Odonthalia floccosa	algae/plant	corticated red algae
North Jenner Beach	2010	Endocladia muricata	algae/plant	red algal turf
North Jenner Beach	2010	Phyllospadix torreyi	algae/plant	surfgrass
North Jenner Beach	2010	Chthamalus dalli/fissus	invertebrate	barnacle
North Jenner Beach	2010	Cyanoplax spp	invertebrate	chiton
North Jenner Beach	2010	Hemigrapsus nudus	invertebrate	crab
North Jenner Beach	2010	Pagurus granosimanus	invertebrate	crab
North Jenner Beach	2010	Pagurus hirsutiusculus	invertebrate	crab
North Jenner Beach	2010	Idotea spp	invertebrate	isopod
North Jenner Beach	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
North Jenner Beach	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
North Jenner Beach	2010	Lottia pelta	invertebrate	limpet
North Jenner Beach	2010	Lottia scabra/conus	invertebrate	limpet
North Jenner Beach	2010	Bittium eschrichtii	invertebrate	snail
North Jenner Beach	2010	Lacuna spp	invertebrate	snail
North Jenner Beach	2010	Lirularia/Margarites spp	invertebrate	snail
North Jenner Beach	2010	Littorina plena/scutulata	invertebrate	snail
North Jenner Beach	2010	Littorina spp	invertebrate	snail
North Jenner Beach	2010	Tegula funebralis	invertebrate	snail
North Jenner Beach	2010	Lirabuccinum dirum	invertebrate	whelk
North Jenner Beach	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 11. Common intertidal species observed at Windermere Point

North Jenner Beach (Russian River SMCA)

Physical Description

North Jenner Beach is located in the North Central Coast region of California, within the Russian River State Marine Conservation Area. This site receives low visitation by fisherman and tidepoolers. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 12).

Figure 12. Biodiversity Survey overview at North Jenner Beach

North Jenner Beach is dominated by a mixture of consolidated bedrock, boulder fields, and cobble beach, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and sandy beach. The primary coastal orientation of this site is south/southwest.

Long-Term Monitoring Surveys at North Jenner Beach were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 80 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at North Jenner Beach (> 2% cover or > 1 per m^2) are displayed in Table 12.

intertidal_sitename	year	species_name	category	general_taxa_name
North Jenner Beach	2010	Non Coralline crust	algae/plant	brown algal crust
North Jenner Beach	2010	Fucus spp	algae/plant	brown algal fucoid
North Jenner Beach	2010	Egregia menziesii	algae/plant	brown algal kelp
North Jenner Beach	2010	Chondracanthus canaliculatus	algae/plant	corticated red algae
North Jenner Beach	2010	Grateloupia californica	algae/plant	corticated red algae
North Jenner Beach	2010	Mastocarpus spp	algae/plant	corticated red algae
North Jenner Beach	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
North Jenner Beach	2010	Mazzaella oregona	algae/plant	corticated red algae
North Jenner Beach	2010	Odonthalia floccosa	algae/plant	corticated red algae
North Jenner Beach	2010	Endocladia muricata	algae/plant	red algal turf
North Jenner Beach	2010	Phyllospadix torreyi	algae/plant	surfgrass
North Jenner Beach	2010	Chthamalus dalli/fissus	invertebrate	barnacle
North Jenner Beach	2010	Cyanoplax spp	invertebrate	chiton
North Jenner Beach	2010	Hemigrapsus nudus	invertebrate	crab
North Jenner Beach	2010	Pagurus granosimanus	invertebrate	crab
North Jenner Beach	2010	Pagurus hirsutiusculus	invertebrate	crab
North Jenner Beach	2010	Idotea spp	invertebrate	isopod
North Jenner Beach	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
North Jenner Beach	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
North Jenner Beach	2010	Lottia pelta	invertebrate	limpet
North Jenner Beach	2010	Lottia scabra/conus	invertebrate	limpet
North Jenner Beach	2010	Bittium eschrichtii	invertebrate	snail
North Jenner Beach	2010	Lacuna spp	invertebrate	snail
North Jenner Beach	2010	Lirularia/Margarites spp	invertebrate	snail
North Jenner Beach	2010	Littorina plena/scutulata	invertebrate	snail
North Jenner Beach	2010	Littorina spp	invertebrate	snail
North Jenner Beach	2010	Tegula funebralis	invertebrate	snail
North Jenner Beach	2010	Lirabuccinum dirum	invertebrate	whelk
North Jenner Beach	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 12. Common intertidal species observed at North Jenner Beach

Bodega (Bodega Head SMR)

Physical Description

Bodega is located in the North Central Coast region of California. This site is located in an Area of Special Biological Significance (Bodega Marine Life Refuge ASBS), within the Bodega Head State Marine Reserve. This site is within the University of California Bodega Marine Reserve, and there is an abundance of historical and ongoing research surrounding and throughout the site. This site is accessed through Bodega Marine Lab, and receives high visitation by researchers. This moderately sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 13).

Figure 13. Biodiversity Survey overview at Bodega

Bodega is dominated by a mixture of consolidated granite (Salinian Block), boulder fields, and cobble beach, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, cobble beach, and sandy beach. The primary coastal orientation of this site is west/southwest.

Long-Term Monitoring Surveys at Bodega were established in 2001 and Biodiversity Surveys were done in 2001, 2003, 2004, 2010, and 2012. The Biodiversity Survey grid encompasses two sections that are approximately 14 meters (along shore) x 20 meters (seaward), and 12 meters (along shore) x 40 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Bodega (> 2% cover or > 1 per m^2) are displayed in Table 13.

intertidal_sitename	year	species_name	category	general_taxa_name
Bodega	2010	Pelvetiopsis arborescens/limitata	algae/plant	brown algal fucoid
Bodega	2010	Egregia menziesii	algae/plant	brown algal kelp
Bodega	2010	Mastocarpus spp	algae/plant	corticated red algae
Bodega	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Bodega	2010	Odonthalia floccosa	algae/plant	corticated red algae
Bodega	2010	Porphyra spp	algae/plant	corticated red algae
Bodega	2010	Endocladia muricata	algae/plant	red algal turf
Bodega	2010	Balanus glandula	invertebrate	barnacle
Bodega	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Bodega	2010	Pollicipes polymerus	invertebrate	barnacle
Bodega	2010	Cyanoplax spp	invertebrate	chiton
Bodega	2010	Nuttallina spp	invertebrate	chiton
Bodega	2010	Pagurus hirsutiusculus	invertebrate	crab
Bodega	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Bodega	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Bodega	2010	Lottia pelta	invertebrate	limpet
Bodega	2010	Lottia scabra/conus	invertebrate	limpet
Bodega	2010	Onchidella borealis	invertebrate	limpet
Bodega	2010	Mytilus californianus	invertebrate	mussel
Bodega	2010	Leptasterias spp	invertebrate	seastar
Bodega	2010	Littorina plena/scutulata	invertebrate	snail
Bodega	2010	Tegula funebralis	invertebrate	snail
Bodega	2010	Strongylocentrotus purpuratus	invertebrate	urchin
Bodega	2010	Nucella canaliculata	invertebrate	whelk
Bodega	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 13. Common intertidal species observed at Bodega

Bodega Head

Physical Description

Bodega Head is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary. This site receives low visitation. This moderately sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 14).

Figure 14. Biodiversity Survey overview at Bodega Head

Bodega Head is dominated by a mixture of consolidated bedrock, boulder fields, and sandy beach, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and sandy beach. The primary coastal orientation of this site is northeast.

Long-Term Monitoring Surveys at Bodega Head were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 18 meters (along shore) x 15 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Bodega Head (> 2% cover or > 1 per m^2) are displayed in Table 14.

intertidal_sitename	year	species_name	category	general_taxa_name
Bodega Head	2010	Pelvetiopsis arborescens/limitata	algae/plant	brown algal fucoid
Bodega Head	2010	Egregia menziesii	algae/plant	brown algal kelp
Bodega Head	2010	Corallina spp	algae/plant	coralline algae
Bodega Head	2010	Chondracanthus canaliculatus	algae/plant	corticated red algae
Bodega Head	2010	Mastocarpus spp	algae/plant	corticated red algae
Bodega Head	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Bodega Head	2010	Odonthalia floccosa	algae/plant	corticated red algae
Bodega Head	2010	Balanus glandula	invertebrate	barnacle
Bodega Head	2010	Cyanoplax spp	invertebrate	chiton
Bodega Head	2010	Mopalia spp	invertebrate	chiton
Bodega Head	2010	Pugettia producta	invertebrate	crab
Bodega Head	2010	Idotea spp	invertebrate	isopod
Bodega Head	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Bodega Head	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Bodega Head	2010	Lottia pelta	invertebrate	limpet
Bodega Head	2010	Lottia scabra/conus	invertebrate	limpet
Bodega Head	2010	Onchidella borealis	invertebrate	limpet
Bodega Head	2010	Mytilus californianus	invertebrate	mussel
Bodega Head	2010	Leptasterias spp	invertebrate	seastar
Bodega Head	2010	Littorina plena/scutulata	invertebrate	snail
Bodega Head	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 14. Common intertidal species observed at Bodega Head

Santa Maria Creek

Physical Description

Santa Maria Creek is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary and Point Reyes National Seashore. The site is located along the shores of Drake's Bay approximately ¼ mile southeast of the mouth of Santa Maria Creek. Point Reyes Peninsula offers this site some protection from the predominantly northwesterly winds and seas. This site receives low visitation by tidepoolers. This gently sloping site consists of moderately uneven terrain and is on a sedimentary rock platform which has numerous crevices and gullies. (Figure 15).

Figure 15. Biodiversity Survey overview at Santa Maria Creek

Long-Term Monitoring Surveys at Santa Maria Creek were established in 2006 and are done by the San Francisco Bay Area Network of the National Park Service's Inventory and Monitoring Program.

Biodiversity Surveys were done in 2002, 2005, and 2010. The Biodiversity Survey grid encompasses two sections that are approximately 4 meters (along shore) x 40 meters (seaward), and 21 meters (along shore) x 33 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Santa Maria Creek (> 2% cover or > 1 per m^2) are displayed in Table 15.

intertidal_sitename	year	species_name	category	general_taxa_name
Santa Maria Creek	2010	Non Coralline crust	algae/plant	brown algal crust
Santa Maria Creek	2010	Fucus spp	algae/plant	brown algal fucoid
Santa Maria Creek	2010	Pelvetiopsis arborescens/limitata	algae/plant	brown algal fucoid
Santa Maria Creek	2010	Egregia menziesii	algae/plant	brown algal kelp
Santa Maria Creek	2010	Mastocarpus spp	algae/plant	corticated red algae
Santa Maria Creek	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Santa Maria Creek	2010	Anthopleura elegantissima	invertebrate	anemone
Santa Maria Creek	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Santa Maria Creek	2010	Cyanoplax spp	invertebrate	chiton
Santa Maria Creek	2010	Pachygrapsus crassipes	invertebrate	crab
Santa Maria Creek	2010	Idotea spp	invertebrate	isopod
Santa Maria Creek	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Santa Maria Creek	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Santa Maria Creek	2010	Lottia pelta	invertebrate	limpet
Santa Maria Creek	2010	Lottia scabra/conus	invertebrate	limpet
Santa Maria Creek	2010	Mytilus californianus	invertebrate	mussel
Santa Maria Creek	2010	Pisaster ochraceus	invertebrate	seastar
Santa Maria Creek	2010	Lacuna spp	invertebrate	snail
Santa Maria Creek	2010	Littorina plena/scutulata	invertebrate	snail
Santa Maria Creek	2010	Tegula funebralis	invertebrate	snail
Santa Maria Creek	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 15. Common intertidal species observed at Santa Maria Creek

Chimney Rock (Point Reyes SMR)

Physical Description

Chimney Rock is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary. This site is located within the Point Reyes State Marine Reserve. This site receives low visitation and has limited access due to bird and mammal restrictions. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 16).

Figure 16. Biodiversity Survey overview at Chimney Rock

Chimney Rock is dominated by a mixture of consolidated bedrock, boulder fields, and sandy beach, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and sandy beach. The primary coastal orientation of this site is north.

Long-Term Monitoring Surveys at Chimney Rock were established in 2010 and Biodiversity Surveys were done in 2010. The Biodiversity Survey grid encompasses one section that is approximately 12 meters (along shore) x 10 meters (seaward).

Biological Summary

The most common species observed during the 2010 Biodiversity Survey done at Chimney Rock (> 2% cover or > 1 per m^2) are displayed in Table 16.

intertidal_sitename	year	species_name	category	general_taxa_name
Chimney Rock	2010	Non Coralline crust	algae/plant	brown algal crust
Chimney Rock	2010	Egregia menziesii	algae/plant	brown algal kelp
Chimney Rock	2010	Chondracanthus canaliculatus	algae/plant	corticated red algae
Chimney Rock	2010	Mastocarpus spp	algae/plant	corticated red algae
Chimney Rock	2010	Mazzaella cordata/splendens	algae/plant	corticated red algae
Chimney Rock	2010	Odonthalia floccosa	algae/plant	corticated red algae
Chimney Rock	2010	Acrosiphonia spp	algae/plant	filamentous green algae
Chimney Rock	2010	Ulva spp	algae/plant	filamentous green algae
Chimney Rock	2010	Chthamalus dalli/fissus	invertebrate	barnacle
Chimney Rock	2010	Cyanoplax spp	invertebrate	chiton
Chimney Rock	2010	Mopalia spp	invertebrate	chiton
Chimney Rock	2010	Lottia austrodigitalis/digitalis	invertebrate	limpet
Chimney Rock	2010	Lottia paradigitalis/strigatella	invertebrate	limpet
Chimney Rock	2010	Lottia pelta	invertebrate	limpet
Chimney Rock	2010	Lottia scabra/conus	invertebrate	limpet
Chimney Rock	2010	Leptasterias spp	invertebrate	seastar
Chimney Rock	2010	Alia spp	invertebrate	snail
Chimney Rock	2010	Littorina keenae	invertebrate	snail
Chimney Rock	2010	Littorina plena/scutulata	invertebrate	snail
Chimney Rock	2010	Nucella emarginata/ostrina	invertebrate	whelk

Table 16. Common intertidal species observed at Chimney Rock

Bolinas Point (Duxbury Reef SMCA)

Physical Description

Bolinas Point is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary and Point Reyes National Seashore. This site is located in an Area of Special Biological Significance (Duxbury Reef Reserve and Extension ASBS), within the Duxbury Reef State Marine Conservation Area established by the State of California. The site is northwest of the town of Bolinas. This gently sloping site consists of relatively flat terrain (Figure 17).

Figure 17. Biodiversity Survey overview at Bolinas Point

The Long-Term survey plots are located on the outermost intertidal bench and consist primarily of sedimentary rock outcrops with folded layers oriented in a NW-SE direction. This site receives low visitation by tidepoolers.

Long-Term Monitoring Surveys at Bolinas Point were established in 2005, and are done by the San Francisco Bay Area Network of the National Park Service's Inventory and Monitoring Program. Biodiversity Surveys were done in 2002, 2005, and 2008. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 150 meters (seaward).

This site was also sampled in 2009 as part of a Natural Resource Damage Assessment (NRDA).

Biological Summary

The most common species observed during the 2008 Biodiversity Survey done at Bolinas Point (> 2% cover or > 1 per m^2) are displayed in Table 17.

intertidal_sitename	year	species_name	category	general_taxa_name
Bolinas Point	2008	Non Coralline crust	algae/plant	brown algal crust
Bolinas Point	2008	Fucus spp	algae/plant	brown algal fucoid
Bolinas Point	2008	Corallina spp	algae/plant	coralline algae
Bolinas Point	2008	Mastocarpus spp	algae/plant	corticated red algae
Bolinas Point	2008	Cryptosiphonia woodii	algae/plant	red algal turf
Bolinas Point	2008	Phyllospadix scouleri	algae/plant	surfgrass
Bolinas Point	2008	Phyllospadix torreyi	algae/plant	surfgrass
Bolinas Point	2008	Anthopleura elegantissima	invertebrate	anemone
Bolinas Point	2008	Lottia austrodigitalis/digitalis	invertebrate	limpet
Bolinas Point	2008	Lottia paradigitalis/strigatella	invertebrate	limpet
Bolinas Point	2008	Lottia pelta	invertebrate	limpet
Bolinas Point	2008	Lottia scabra/conus	invertebrate	limpet
Bolinas Point	2008	Mytilus californianus	invertebrate	mussel
Bolinas Point	2008	Alia spp	invertebrate	snail
Bolinas Point	2008	Bittium eschrichtii	invertebrate	snail
Bolinas Point	2008	Lacuna spp	invertebrate	snail
Bolinas Point	2008	Littorina plena/scutulata	invertebrate	snail
Bolinas Point	2008	Tegula funebralis	invertebrate	snail
Bolinas Point	2008	Strongylocentrotus purpuratus	invertebrate	urchin
Bolinas Point	2008	Acanthinucella spp	invertebrate	whelk
Bolinas Point	2008	Lirabuccinum dirum	invertebrate	whelk
Bolinas Point	2008	Nucella emarginata/ostrina	invertebrate	whelk

Table 17. Common intertidal species observed at Bolinas Point

Bolinas Point Wreck (Duxbury Reef SMCA)

Physical Description

Bolinas Point Wreck is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary. This site is located within the Duxbury Reef State Marine Conservation Area. This site is also located in an Area of Special Biological Significance (Duxbury Reef Point ASBS). This site was established to assess the impact resulting from a boat wreck that occurred 500 meters south of Bolinas Point. This gently sloping site consists of relatively flat terrain. (Figure 18).

Figure 18. Biodiversity Survey overview at Bolinas Point Wreck

Bolinas Point Wreck is dominated by a mixture of consolidated bedrock, boulder fields, and sandy beach, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and sandy beach. The primary coastal orientation of this site is south/southwest.

Biodiversity Surveys were done in 2005. The Biodiversity Survey grid encompasses one section that is approximately 50 meters (along shore) x 100 meters (seaward).

Biological Summary

The most common species observed during the 2005 Biodiversity Survey done at Bolinas Point Wreck (> 2% cover or > 1 per m^2) are displayed in Table 18.

intertidal_sitename	year	species_name	category	general_taxa_name
Bolinas Point Wreck	2005	Non Coralline crust	algae/plant	brown algal crust
Bolinas Point Wreck	2005	Fucus spp	algae/plant	brown algal fucoid
Bolinas Point Wreck	2005	Corallina spp	algae/plant	coralline algae
Bolinas Point Wreck	2005	Encrusting coralline	algae/plant	coralline algae
Bolinas Point Wreck	2005	Mastocarpus spp	algae/plant	corticated red algae
Bolinas Point Wreck	2005	Mazzaella cordata/splendens	algae/plant	corticated red algae
Bolinas Point Wreck	2005	Cryptosiphonia woodii	algae/plant	red algal turf
Bolinas Point Wreck	2005	Gelidium spp	algae/plant	red algal turf
Bolinas Point Wreck	2005	Microcladia borealis	algae/plant	red algal turf
Bolinas Point Wreck	2005	Phyllospadix scouleri	algae/plant	surfgrass
Bolinas Point Wreck	2005	Phyllospadix torreyi	algae/plant	surfgrass
Bolinas Point Wreck	2005	Anthopleura elegantissima	invertebrate	anemone
Bolinas Point Wreck	2005	Pachygrapsus crassipes	invertebrate	crab
Bolinas Point Wreck	2005	Lottia austrodigitalis/digitalis	invertebrate	limpet
Bolinas Point Wreck	2005	Lottia paradigitalis/strigatella	invertebrate	limpet
Bolinas Point Wreck	2005	Lottia pelta	invertebrate	limpet
Bolinas Point Wreck	2005	Lottia scabra/conus	invertebrate	limpet
Bolinas Point Wreck	2005	Lottia scutum	invertebrate	limpet
Bolinas Point Wreck	2005	Littorina plena/scutulata	invertebrate	snail
Bolinas Point Wreck	2005	Tegula funebralis	invertebrate	snail
Bolinas Point Wreck	2005	Nucella emarginata/ostrina	invertebrate	whelk

Table 18. Common intertidal species observed at Bolinas Point Wreck

Alder Creek/Duxbury (Duxbury Reef SMCA)

Physical Description

Alder Creek/Duxbury is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary. This site is located within the Duxbury Reef State Marine Conservation Area and Agate Beach County Park. This site is also located in an Area of Special Biological Significance (Duxbury Reef Point ASBS). This gently sloping site consists of relatively flat terrain. (Figure 19).

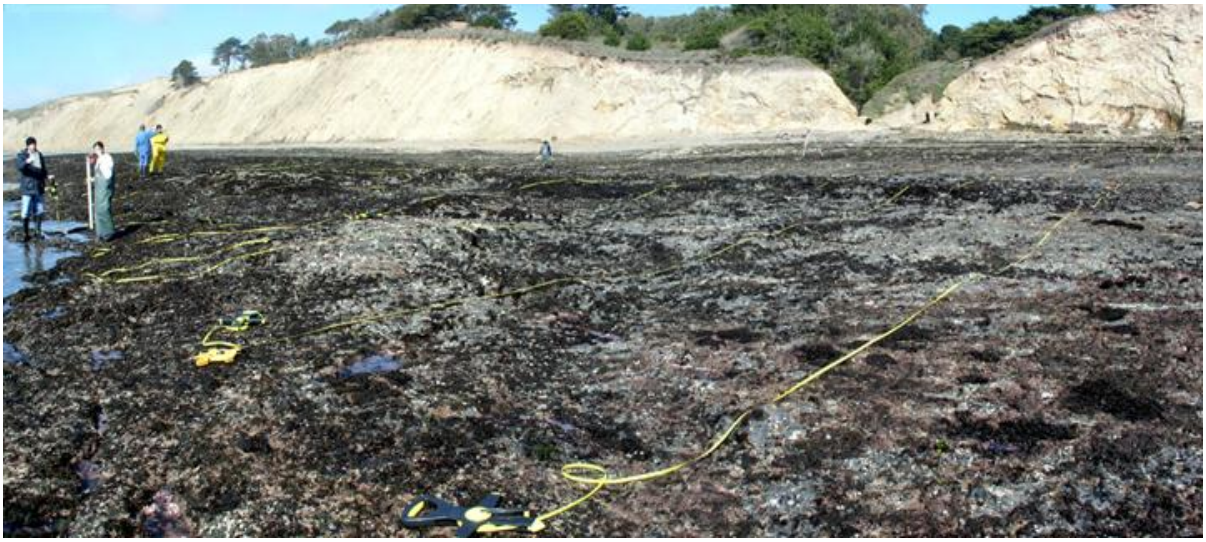

Figure 19. Biodiversity Survey overview at Alder Creek/Duxbury

Alder Creek/Duxbury is dominated by sand and the area surrounding the site is comprised of sandy beach. The primary coastal orientation of this site is southwest.

Biodiversity Surveys were done in 2008. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 80 meters (seaward).

Alder Creek/Duxbury was also sampled in 2007 as part of a Natural Resource Damage Assessment (NRDA).

Biological Summary

The most common species observed during the 2008 Biodiversity Survey done at Alder Creek/Duxbury (> 2% cover or > 1 per m^2) are displayed in Table 19.

intertidal_sitename	year	species_name	category	general_taxa_name
Alder Creek/Duxbury	2008	Non Coralline crust	algae/plant	brown algal crust
Alder Creek/Duxbury	2008	Fucus spp	algae/plant	brown algal fucoid
Alder Creek/Duxbury	2008	Bossiella spp	algae/plant	coralline algae
Alder Creek/Duxbury	2008	Corallina spp	algae/plant	coralline algae
Alder Creek/Duxbury	2008	Mastocarpus spp	algae/plant	corticated red algae
Alder Creek/Duxbury	2008	Diatoms	algae/plant	diatom
Alder Creek/Duxbury	2008	Cryptosiphonia woodii	algae/plant	red algal turf
Alder Creek/Duxbury	2008	Gelidium spp	algae/plant	red algal turf
Alder Creek/Duxbury	2008	Phyllospadix torreyi	algae/plant	surfgrass
Alder Creek/Duxbury	2008	Chthamalus dalli/fissus	invertebrate	barnacle
Alder Creek/Duxbury	2008	Cyanoplax spp	invertebrate	chiton
Alder Creek/Duxbury	2008	Lottia austrodigitalis/digitalis	invertebrate	limpet
Alder Creek/Duxbury	2008	Lottia paradigitalis/strigatella	invertebrate	limpet
Alder Creek/Duxbury	2008	Lottia pelta	invertebrate	limpet
Alder Creek/Duxbury	2008	Lottia scabra/conus	invertebrate	limpet
Alder Creek/Duxbury	2008	Alia spp	invertebrate	snail
Alder Creek/Duxbury	2008	Lacuna spp	invertebrate	snail
Alder Creek/Duxbury	2008	Littorina plena/scutulata	invertebrate	snail
Alder Creek/Duxbury	2008	Tegula funebralis	invertebrate	snail
Alder Creek/Duxbury	2008	Lirabuccinum dirum	invertebrate	whelk

Table 19. Common intertidal species observed at Alder Creek/Duxbury

Slide Ranch

Physical Description

Slide Ranch is located in the North Central Coast region of California, within the Gulf of the Farallones National Marine Sanctuary and Golden Gate National Recreation Area. (Figure 20).

Figure 20. Long-Term Monitoring Survey overview at Slide Ranch

The site is located at the base of a steeply sloped cliff that opens onto a cobble beach. Large boulders are scattered throughout the intertidal zone and into the deep water. Transects and plots are arrayed along the boulder beach. The site receives high wave action but there are many semi-protected areas among the large serpentine and greywacke boulders in the area.

Long-Term Monitoring Surveys at Slide Ranch were established in 2006, and are done by the San Francisco Bay Area Network of the National Park Service's Inventory and Monitoring Program.

This site was also sampled in 2007 as part of a Natural Resource Damage Assessment (NRDA).

Point Bonita

Physical Description

Point Bonita is located in the North Central Coast region of California, near the Golden Gate and within the Gulf of the Farallones National Marine Sanctuary and Golden Gate National Recreation Area. (Figure 21).

Figure 21. Long-Term Monitoring Survey overview at Point Bonita

The site is located at the base of a steeply sloped cliff that opens onto a cobble beach. Large boulders are scattered throughout the intertidal zone and into the deep water. Transects and plots are arrayed along the boulder beach. The site receives high wave action but there are many semi-protected areas among the large serpentine and greywacke boulders in the area.

Long-Term Monitoring Surveys at Point Bonita were established in 2006, and are done by the San Francisco Bay Area Network of the National Park Service's Inventory and Monitoring Program.

This site was also sampled in 2007 as part of a Natural Resource Damage Assessment (NRDA).

Mussel Flat Farallones (Southeast Farallon Island SMR)

Physical Description

Mussel Flat Farallones is located in the North Central Coast region of California on Southeast Farallon Island, within the Gulf of the Farallones National Marine Sanctuary. This site is located within the Southeast Farallon Island State Marine Reserve and Special Closure. This site is also located in an Area of Special Biological Significance (Farallon Islands ASBS). This moderately sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 22).

Figure 22. Biodiversity Survey overview at Mussel Flat Farallones

Mussel Flat Farallones is dominated by bedrock and the area surrounding the site is comprised of consolidated bedrock. The primary coastal orientation of this site is southwest.

Biodiversity Surveys were done in 2005. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 15 meters (seaward).

Biological Summary

The most common species observed during the 2005 Biodiversity Survey done at Mussel Flat Farallones (> 2% cover or > 1 per m^2) are displayed in Table 20.

intertidal_sitename	year	species_name	category	general_taxa_name
Mussel Flat Farallones	2005	Egregia menziesii	algae/plant	brown algal kelp
Mussel Flat Farallones	2005	Corallina spp	algae/plant	coralline algae
Mussel Flat Farallones	2005	Encrusting coralline	algae/plant	coralline algae
Mussel Flat Farallones	2005	Cryptopleura/Hymenena spp	algae/plant	corticated red algae
Mussel Flat Farallones	2005	Mastocarpus spp	algae/plant	corticated red algae
Mussel Flat Farallones	2005	Mazzaella cordata/splendens	algae/plant	corticated red algae
Mussel Flat Farallones	2005	Prionitis lanceolata	algae/plant	corticated red algae
Mussel Flat Farallones	2005	Diatoms	algae/plant	diatom
Mussel Flat Farallones	2005	Ulva spp	algae/plant	filamentous green algae
Mussel Flat Farallones	2005	Endocladia muricata	algae/plant	red algal turf
Mussel Flat Farallones	2005	Chthamalus dalli/fissus	invertebrate	barnacle
Mussel Flat Farallones	2005	Tetraclita rubescens	invertebrate	barnacle
Mussel Flat Farallones	2005	Pachygrapsus crassipes	invertebrate	crab
Mussel Flat Farallones	2005	Lottia austrodigitalis/digitalis	invertebrate	limpet
Mussel Flat Farallones	2005	Lottia pelta	invertebrate	limpet
Mussel Flat Farallones	2005	Lottia scabra/conus	invertebrate	limpet
Mussel Flat Farallones	2005	Mytilus californianus	invertebrate	mussel
Mussel Flat Farallones	2005	Leptasterias spp	invertebrate	seastar
Mussel Flat Farallones	2005	Littorina keenae	invertebrate	snail
Mussel Flat Farallones	2005	Littorina plena/scutulata	invertebrate	snail
Mussel Flat Farallones	2005	Strongylocentrotus purpuratus	invertebrate	urchin
Mussel Flat Farallones	2005	Nucella emarginata/ostrina	invertebrate	whelk

Table 20. Common intertidal species observed at Mussel Flat Farallones

Fitzgerald Marine Reserve (Montara SMR)

Physical Description

Fitzgerald Marine Reserve is located in the North Central Coast region of California, within the Monterey Bay National Marine Sanctuary. This site is located within the Montara State Marine Reserve and San Mateo County Park. This site is also located in an Area of Special Biological Significance (James V. Fitzgerald Marine Reserve ASBS). This gently sloping site consists of relatively flat terrain. (Figure 23).

Figure 23. Biodiversity Survey overview at Fitzgerald Marine Reserve

Fitzgerald Marine Reserve is dominated by a mixture of consolidated bedrock and sandy beach and the area surrounding the site is sandy beach. The primary coastal orientation of this site is west/southwest.

Biodiversity Surveys were done in 2002, 2006, and 2011. The Biodiversity Survey grid encompasses one section that is approximately 30 meters (along shore) x 40 meters (seaward).

Biological Summary

The most common species observed during the 2011 Biodiversity Survey done at Fitzgerald Marine Reserve (> 2% cover or > 1 per m^2) are displayed in Table 21.

intertidal_sitename	year	species_name	category	general_taxa_name
Fitzgerald Marine Reserve	2011	Non Coralline crust	algae/plant	brown algal crust
Fitzgerald Marine Reserve	2011	Encrusting coralline	algae/plant	coralline algae
Fitzgerald Marine Reserve	2011	Cryptopleura/Hymenena spp	algae/plant	corticated red algae
Fitzgerald Marine Reserve	2011	Mastocarpus spp	algae/plant	corticated red algae
Fitzgerald Marine Reserve	2011	Mazzaella cordata/splendens	algae/plant	corticated red algae
Fitzgerald Marine Reserve	2011	Neorhodomela larix	algae/plant	corticated red algae
Fitzgerald Marine Reserve	2011	Endocladia muricata	algae/plant	red algal turf
Fitzgerald Marine Reserve	2011	Gelidium spp	algae/plant	red algal turf
Fitzgerald Marine Reserve	2011	Phyllospadix scouleri	algae/plant	surfgrass
Fitzgerald Marine Reserve	2011	Cyanoplax spp	invertebrate	chiton
Fitzgerald Marine Reserve	2011	Pagurus hirsutiusculus	invertebrate	crab
Fitzgerald Marine Reserve	2011	Pagurus samuelis	invertebrate	crab
Fitzgerald Marine Reserve	2011	Lottia austrodigitalis/digitalis	invertebrate	limpet
Fitzgerald Marine Reserve	2011	Lottia paradigitalis/strigatella	invertebrate	limpet
Fitzgerald Marine Reserve	2011	Lottia scabra/conus	invertebrate	limpet
Fitzgerald Marine Reserve	2011	Alia spp	invertebrate	snail
Fitzgerald Marine Reserve	2011	Homalopoma baculum/luridum	invertebrate	snail
Fitzgerald Marine Reserve	2011	Lacuna spp	invertebrate	snail
Fitzgerald Marine Reserve	2011	Littorina plena/scutulata	invertebrate	snail
Fitzgerald Marine Reserve	2011	Littorina spp	invertebrate	snail
Fitzgerald Marine Reserve	2011	Tegula brunnea	invertebrate	snail
Fitzgerald Marine Reserve	2011	Tegula funebralis	invertebrate	snail

Table 21. Common intertidal species observed at Fitzgerald Marine Reserve

Pebble Beach

Pebble Beach is located in the North Central Coast region of California within the Monterey Bay National Marine Sanctuary. This site is located within Bean Hollow State Beach. This site receives moderate visitation by tidepoolers and is often visited by school groups. This gently sloping site consists of moderately uneven terrain, containing few cracks and folds. (Figure 24).

Figure 24 Long-Term Monitoring Survey overview at Pebble Beach

Pebble Beach is dominated by a mixture of consolidated bedrock, boulder fields, and sandy beach, and the area surrounding the site is comprised of a mixture of consolidated bedrock, boulder fields, and sandy beach. The primary coastal orientation of this site is southwest.

Long-Term Monitoring Surveys at Point Bonita were established in 2004.

Financial Report

The report below includes the invoice period from 10/01/12-12/31/12 as well as the invoice period from 01/01/13-03/31/13.

Salary and benefits - $1,173.68 sal. and $308.84 ben. spent in last invoice period (10/01/12-12/31/12), $5,111.09 sal. and $1,792.25 ben. spent in current invoice period (01/01/13-03/31/13), cumulative: $263,013.26 sal. and $89,716.79 ben. Salaries were paid to research specialists during the invoice period(s) for data entry, QA/QC, and other activities related to the data processing for the baseline surveys that were conducted in the North Coast study region to characterize the structure of rocky intertidal ecosystems in all of the MPA's that have rocky intertidal habitats.

Supplies & Expenses - $183.69 spent in last invoice period (10/01/12-12/31/12), $121.35 spent in current invoice period (01/01/13-03/31/13) cumulative: $17,952.32. Expenses during the invoice period(s) include telephone charges, and office supplies related to data entry and QA/QC.

Tuition Remission - $0 spent in the last invoice period(s) (10/01/12-12/31/12 and 01/01/13-03/31/13), cumulative: $0 - no stipend and tuition expenses were paid to date.

Travel - $0 spent in the last invoice periods (10/01/12-12/31/12 and 01/01/13-03/31/13), cumulative: $24,298.52.

FINANCIAL REPORT

Project Title: Baseline Monitoring of Ecosystem and Socioeconomic Indicators for MPAs along the North Central Coast of California – Project Oversight Management

Project # R/MPA-10

Salary and benefits - $6,000.75 sal. and $2,617.71 ben. spent in last invoice period (08/01/12-09/30/12), $3,072.48 sal. and $910.83 ben. spent in current invoice period (10/01/12-03/31/13), cumulative: $66,617.43 sal. and $30,116.48 ben. Salaries were paid to provide administrative oversight of the consortium of groups; including integrated data management and data analysis, and preparation for data submission.

Supplies & Expenses - $0 spent in the last invoice period(s) (08/01/12-09/30/12 and 10/01/12-03/31/13), cumulative: $1799.89.

Tuition Remission - $0 spent in the last invoice period(s) (08/01/12-09/30/12 and 10/01/12-03/31/13), cumulative: $0 - no stipend and tuition expenses were paid during to date.

Travel - $0 spent in the last invoice period(s) (08/01/12-09/30/12 and 10/01/12-03/31/13), cumulative: $0 – no travel funds were spent to date.

North Central Coast Baseline Surveys of Rocky Intertidal Ecosystems

Rani Gaddam, Pete Raimondi, Melissa Miner
University of California Santa Cruz

May 3, 2013

Executive Summary

The North Central Coast Study Region (NCCSR) of California ranges from Point Arena to Pigeon Point. The region includes ten State Marine Reserves (SMR), in which all fishing is prohibited, and twelve State Marine Conservation Areas (SMCA), in which limited commercial or recreational take is allowed. The southern portion of this region is included in the Gulf of the Farallones National Marine Sanctuary (Bodega Head to southern Marin Co.) and the Monterey Bay National Marine Sanctuary (Marin Co. to Pigeon Pt.).

Our rocky intertidal monitoring program is a product of over three decades of research at more than 200 rocky intertidal monitoring sites ranging from Southeast Alaska to Mexico. Our approach for the NCCSR involves a replication of this ongoing intertidal sampling program, coordinated with Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) and Multi-Agency Rocky Intertidal Network (MARINe). We use two separate survey types to characterize the ecosystem – Long-Term Monitoring Surveys and Biodiversity Surveys. This is the same approach we used to generate baseline characterizations of rocky intertidal ecosystems in the Central Coast Study Region (CCSR) and the network of marine reserves in the Northern Channel Islands (NCI).

Baseline monitoring for the newly established Marine Protected Areas (MPAs) began in 2010, and we have established a total of 22 rocky intertidal sites within the NCCSR (Figure 1). Long-Term Monitoring Surveys were done at 17 of these sites, which use fixed plots to document changes in percent cover, or abundance of targeted species or species assemblages. Biodiversity Surveys were done at 19 of these sites, which provide detailed information about biodiversity and community structure. By evaluating the percent cover of the intertidal space occupied by algae, surfgrass, invertebrates, as well as rock and sand, these biodiversity sites can be grouped into eight different community types (Figure 2).

The goal of this report and the associated data (uploaded to Oceanspaces.org) is to provide a baseline characterization summary of the Rocky Intertidal Ecosystems in the NCCSR. These data can then be used for future synthesis and integration efforts across the other projects associated with the North Central Coast Baseline Program.

Included in this report are descriptions, photos, and biological characteristics of each of the rocky intertidal sites located in the NCCSR. For sites where only Long-Term Monitoring has been done, no biological summary has been provided. In addition, species of concern have not been included in these summaries. Detailed information on these surveys, including full survey protocols, trend graphs, and an interactive map and graphing tool, can be found on our website at www.pacificrockyintertidal.org.

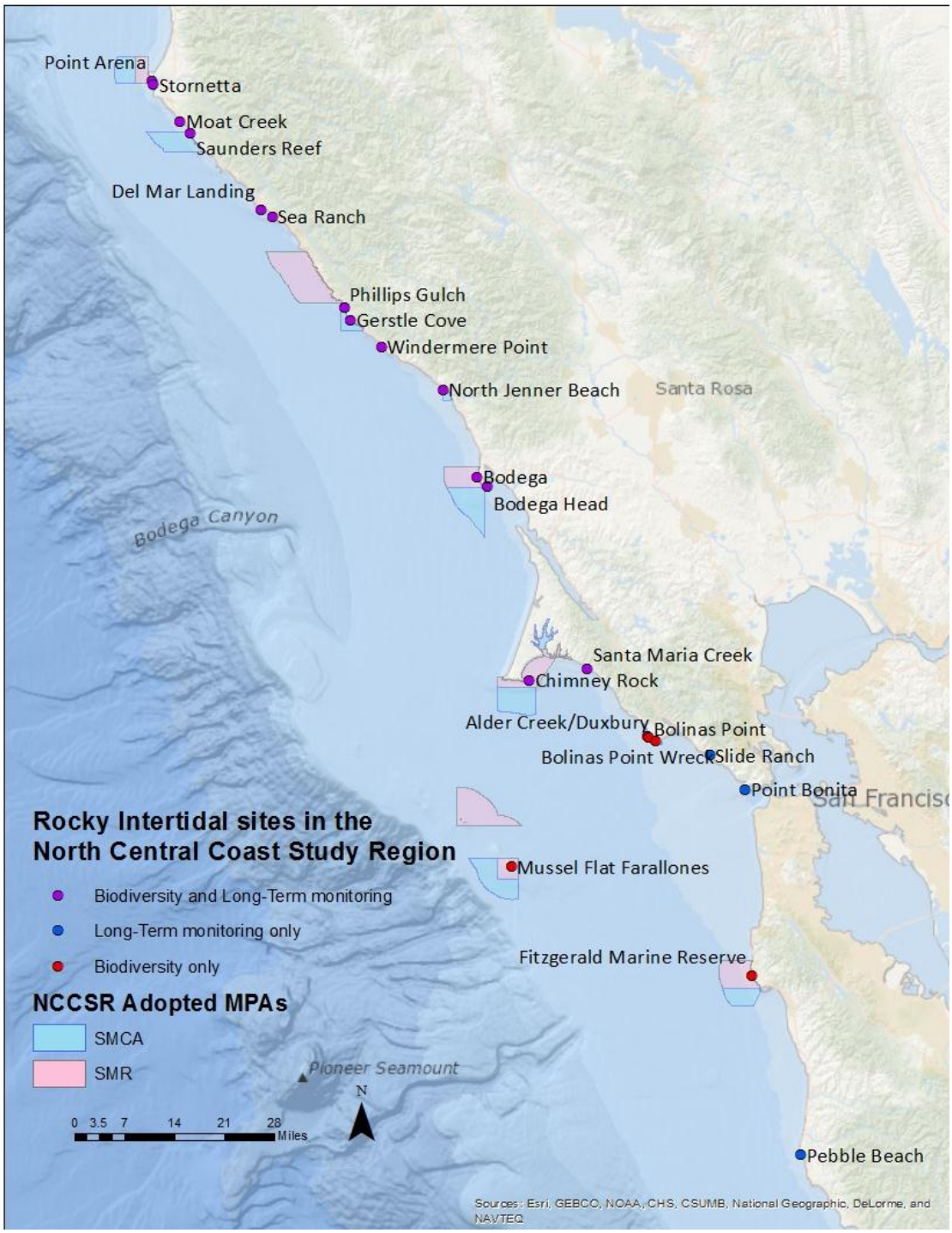

Figure 1. Map of Rocky Intertidal sites in the NCCSR

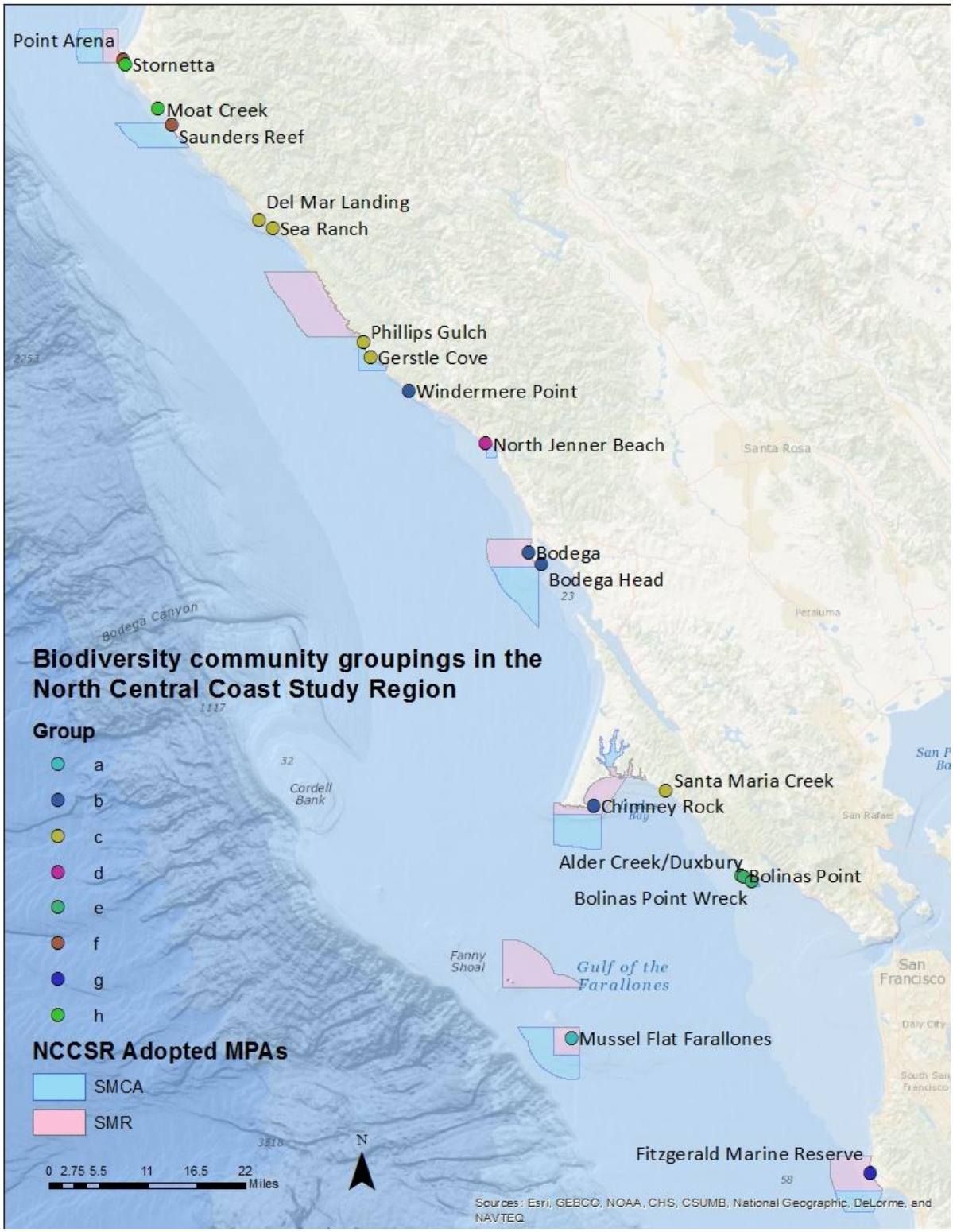

Figure 2. Map of Biodiversity community groupings in the NCCSR