

**Marine Mammal Protection Act  
Incidental Harassment Authorization**

**Monitoring Report**

**Submitted by:**

**Partnership for Interdisciplinary Studies of Coastal Oceans  
University of California Santa Cruz  
Center for Ocean Health  
100 Shaffer Road  
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**UNIVERSITY OF CALIFORNIA  
SANTA CRUZ**

**To:**

**Permits, Conservation, and Education Division  
National Marine Fisheries Service (NMFS)  
Office of Protected Resources  
1315 East-West Highway  
Silver Spring, MD 20910**

**September 5, 2014**

This monitoring report covers research activities related to rocky intertidal monitoring along the Oregon and California coasts for the period of December 17, 2013 to August 31, 2014.

### **Summary of Research Activities:**

Our research group at UC Santa Cruz operates in collaboration with two large-scale marine research programs: the Multi-Agency Rocky Intertidal Network (MARINE, [www.marine.gov](http://www.marine.gov), [www.pacificrockyintertidal.org](http://www.pacificrockyintertidal.org)) and the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO, [www.piscoweb.org](http://www.piscoweb.org)).

MARINE is a consortium of multiple agencies, universities, and private organizations conducting long-term rocky intertidal monitoring at more than 200 sites along the west coast of North America. This program uses a set of standardized monitoring protocols that allows for comparisons of data over space and time. MARINE is committed to making its findings accessible to the public.

The PISCO project is comprised of researchers from the University of California Santa Cruz and Santa Barbara campuses, Oregon State University, and Stanford University Hopkins Marine Station. The program focuses on understanding the near-shore ecosystems of the U.S. West Coast through a number of interdisciplinary collaborations. PISCO integrates long-term monitoring of ecological and oceanographic processes at dozens of sites with experimental work in the lab and field. Information from PISCO's research is used to inform marine policy and is also made available to the public through outreach and educational programs.

Our research group at UC Santa Cruz is responsible for much of these programs' ongoing rocky intertidal monitoring along the Pacific coast of North America. Monitoring occurs at rocky intertidal sites, often large bedrock benches, from the high intertidal to the water's edge. Our long-term monitoring projects, carried out under the direction of principal investigator Dr. Pete Raimondi, include the following:

### **Community Structure Monitoring:**

Community structure monitoring involves the use of permanent photoplot quadrats which target specific algal and invertebrate assemblages (e.g. mussels, rockweeds, barnacles). Each photoplot is photographed and scored for percent cover. Mobile invertebrates are also sampled within each photoplot. Additional permanent plots and transects are sampled to determine patterns of abundance of targeted species including ochre sea stars (*Pisaster ochraceus*), owl limpets (*Lottia gigantea*), abalone (*Haliotis* spp.), surfgrass (*Phyllospadix* spp.), and sea palms (*Postelsia palmaeformis*). Barnacle recruitment and sea surface temperature data are also collected. Community structure monitoring follows the established protocols of MARINE. For more information please visit [www.marine.gov](http://www.marine.gov) and [www.pacificrockyintertidal.org](http://www.pacificrockyintertidal.org).

The community structure monitoring approach is based largely on surveys that quantify the percent cover and distribution of algae and invertebrates that constitute these communities. This approach allows us to quantify both the patterns of abundance of targeted species as well as

characterize changes in the communities in which they are found. Such information provides managers with insight into the causes and consequences of changes in species abundance and forms the basis of "ecosystem-based management" of rocky intertidal communities.

Each community structure site is surveyed over a one day period during a low tide series one to two times a year. Sites, location, number of times sampled per year, and typical sampling months for each site are presented in Table 1.

### **Biodiversity Surveys:**

Biodiversity surveys involve point contact identification along permanent transects, mobile invertebrate quadrat counts, sea star band counts, and tidal height topographic measurements. These surveys are complimentary with the community structure monitoring approach and provide greater information on species richness at a site. Biodiversity surveys are conducted every 3-5 years at established sites. Table 2 lists established biodiversity sites in Oregon and California. For more information on sites and protocols please visit: [www.pacificrockyintertidal.org](http://www.pacificrockyintertidal.org).

| Site                       | Latitude (dd) | Longitude (dd) | Samples/year | Sampling months               |
|----------------------------|---------------|----------------|--------------|-------------------------------|
| Ecola (Oregon)             | 45.91809      | -123.98031     | 1            | July/August                   |
| Fogarty Creek (Oregon)     | 44.83684      | -124.05875     | 1            | July/August                   |
| Bob Creek (Oregon)         | 44.24456      | -124.11443     | 1            | July/August                   |
| Cape Arago (Oregon)        | 43.30894      | -124.40077     | 1            | June/July/August              |
| Burnt Hill (Oregon)        | 42.22814      | -124.38786     | 1            | May/June/July/August          |
| Enderts                    | 41.69         | -124.14257     | 2            | May/June, November/December   |
| Damnation Creek            | 41.65249      | -124.12784     | 2            | May/June, November/December   |
| False Klamath Cove         | 41.59476      | -124.10643     | 2            | May/June, November/December   |
| Cape Mendocino             | 40.341        | -124.36317     | 1            | June/July                     |
| Shelter Cove               | 40.02254      | -124.07366     | 1            | June/July                     |
| Kibesillah Hill            | 39.60412      | -123.78887     | 1            | June/July                     |
| Stornetta                  | 38.93787      | -123.7288      | 1            | June/July                     |
| Sea Ranch                  | 38.7305       | -123.48864     | 1            | June/July                     |
| Bodega                     | 38.3182       | -123.07365     | 1            | June/July                     |
| Pebble Beach               | 37.23263      | -122.41607     | 1            | May/June                      |
| Pigeon Point               | 37.18361      | -122.39529     | 1            | May/June                      |
| Franklin Point             | 37.1495       | -122.36101     | 1            | May/June                      |
| Scott Creek                | 37.04425      | -122.23493     | 2            | March/April, October/November |
| Sandhill Bluff             | 36.98017      | -122.15503     | 2            | March/April, October/November |
| Terrace Point              | 36.94841      | -122.06457     | 2            | March/April, October/November |
| Hopkins                    | 36.6212       | -121.9073      | 2            | March/April, October/November |
| Point Piños                | 36.63796      | -121.93758     | 1            | May                           |
| China Rocks                | 36.60616      | -121.95939     | 1            | May                           |
| Pescadero Point            | 36.56109      | -121.95436     | 1            | May                           |
| Stillwater                 | 36.56087      | -121.94053     | 2            | March/April, October/November |
| Carmel Point               | 36.54376      | -121.93412     | 1            | May/June                      |
| Point Lobos                | 36.51366      | -121.94688     | 2            | March/April, October/November |
| Mal Paso                   | 36.47994      | -121.93913     | 2            | March/April, October/November |
| Garrapata                  | 36.46904      | -121.93444     | 1            | May                           |
| Soberanes                  | 36.44787      | -121.92874     | 1            | May/June                      |
| Andrew Molera              | 36.28061      | -121.86317     | 2            | March/April, October/November |
| Partington Cove            | 36.17376      | -121.69653     | 1            | May/June                      |
| Mill Creek                 | 35.97965      | -121.49034     | 2            | March/April, October/November |
| Pacific Valley             | 35.94705      | -121.48053     | 1            | May/June                      |
| Point Sierra Nevada        | 35.72883      | -121.31866     | 2            | March/April, October/November |
| Piedras Blancas Lighthouse | 35.66493      | -121.28699     | 2            | March/April, October/November |
| Vista Del Mar              | 35.60414      | -121.14232     | 2            | March/April, October/November |
| Rancho Marino Reserve      | 35.52244      | -121.073       | 2            | March/April, October/November |
| Harmony Headlands          | 35.47448      | -121.01707     | 1            | October/November              |
| Cayucos                    | 35.44739      | -120.94982     | 2            | March/April, October/November |
| Hazard's                   | 35.28966      | -120.88325     | 2            | March/April, October/November |
| Shell Beach                | 35.16881      | -120.69668     | 2            | March/April, October/November |
| Occulto                    | 34.88122      | -120.63954     | 2            | March/April, October/November |
| Purisima                   | 34.7556       | -120.64076     | 2            | February, October/November    |
| Stairs                     | 34.73038      | -120.61546     | 2            | March/April, October/November |
| Boathouse                  | 34.55388      | -120.61167     | 2            | March/April, October/November |
| Government Point           | 34.44334      | -120.45655     | 2            | March/April, October/November |

Table 1. UCSC Community Structure monitoring sites

| Site                      | Latitude (dd) | Longitude (dd) | Site                        | Latitude (dd) | Longitude (dd) |
|---------------------------|---------------|----------------|-----------------------------|---------------|----------------|
| Ecola (Oregon)            | 45.91809      | -123.98031     | Shell Beach                 | 35.169167     | -120.69639     |
| Cape Meares (Oregon)      | 45.471788     | -123.972036    | Stairs                      | 34.730556     | -120.61528     |
| Fogarty Creek (Oregon)    | 44.83684      | -124.05875     | Lompoc Landing              | 34.7188       | -120.6088      |
| Seal Rock (Oregon)        | 44.499939     | -124.08437     | Boat House                  | 34.554167     | -120.61139     |
| Bob Creek (Oregon)        | 44.24456      | -124.11443     | Government Point            | 34.44334      | -120.45655     |
| Cape Arago (Oregon)       | 43.30894      | -124.40077     | Alegria                     | 34.467222     | -120.27806     |
| Coquille Point (Oregon)   | 43.114718     | -124.43851     | Arroyo Hondo                | 34.473611     | -120.14444     |
| Burnt Hill (Oregon)       | 42.22814      | -124.38786     | Ellwood                     | 34.4347       | -119.949       |
| Enderts (new)             | 41.6956814    | -124.143617    | Coal Oil Point              | 34.406667     | -119.8775      |
| Damnation Creek           | 41.653        | -124.12983     | Carpinteria                 | 34.38703      | -119.51407     |
| False Klamath Cove (new)  | 41.594265     | -124.105328    | Mussel Shoals               | 34.355278     | -119.44028     |
| Launcher Beach (new)      | 41.0571545    | -124.145319    | Old Stairs                  | 34.06626      | -118.99805     |
| Old Home Beach (new)      | 41.0552732    | -124.13683     | Deer Creek                  | 34.060685     | -118.98221     |
| Cape Mendocino            | 40.340833     | -124.36306     | Sequit Point                | 34.043235     | -118.937       |
| Shelter Cove              | 40.030556     | -124.07917     | Lechuza Point               | 34.034458     | -118.86179     |
| Mal Coombs (new)          | 40.021697     | -124.06825     | Point Dume                  | 34.000357     | -118.80703     |
| Kibesillah                | 39.604014     | -123.78871     | Paradise Cove               | 34.012222     | -118.7925      |
| Point Arena               | 38.943371     | -123.73301     | Point Vicente               | 33.741        | -118.4115      |
| Stornetta Ranch           | 38.937867     | -123.72888     | Abalone Cove                | 33.7379       | -118.3758      |
| Moat Creek                | 38.880915     | -123.67475     | Whites Point                | 33.71578      | -118.31993     |
| Saunders Reef             | 38.86138      | -123.65361     | Point Fermin                | 33.706944     | -118.28611     |
| Del Mar Landing           | 38.740513     | -123.51086     | Buck Gully South            | 33.588246     | -117.86736     |
| Sea Ranch                 | 38.730278     | -123.4875      | Crystal Cove                | 33.570833     | -117.83778     |
| Phillips Gulch            | 38.585852     | -123.34147     | Muddy Canyon                | 33.565763     | -117.83314     |
| Gerstle Cove              | 38.566136     | -123.32919     | Shaw's Cove                 | 33.544722     | -117.79944     |
| Windermere Point          | 38.523943     | -123.26747     | Heisler Park                | 33.542594     | -117.78928     |
| North Jenner Beach        | 38.456176     | -123.14244     | Dana Point                  | 33.46         | -117.71417     |
| Bodega                    | 38.3175       | -123.07278     | Cardiff Reef                | 32.8476       | -117.279       |
| Horseshoe Cove            | 56.986613     | -135.37755     | Scripps                     | 32.871389     | -117.25306     |
| Bodega Head               | 38.303158     | -123.05261     | La Jolla Caves              | 32.848614     | -117.26535     |
| Chimney Rock              | 37.99383      | -122.96729     | Wind and Sea                | 32.8142       | -117.2733      |
| Santa Maria Creek         | 38.012222     | -122.84889     | Sea Ridge                   | 32.6829       | -117.2496      |
| Bolinas Point             | 37.90453      | -122.72733     | Navy North                  | 32.6829       | -117.2496      |
| Bolinas Point Wreck       | 37.902617     | -122.7242      | Cabrillo Zone I             | 32.669167     | -117.24528     |
| Alder Creek               | 37.89758      | -122.71071     | Cabrillo Zone III           | 32.665833     | -117.24417     |
| Mussel Flat Farallones    | 37.6959       | -123.0029      | Cuyler Harbor SMI           | 34.048333     | -120.33556     |
| Alcatraz Island           | 37.82515      | -122.42197     | Crook Point SMI             | 34.021944     | -120.37889     |
| Fitzgerald Marine Reserve | 37.521667     | -122.51667     | Fossil Reef SRI             | 33.993333     | -120.23806     |
| Pigeon Point              | 37.185278     | -122.39694     | NW Talcott SRI              | 34.008056     | -120.21361     |
| Año Nuevo                 | 37.1126       | -122.32957     | East Point SRI              | 33.9417       | -119.9679      |
| Scott Creek               | 37.045278     | -122.23694     | Ford Point SRI              | 33.914722     | -120.05056     |
| Davenport Landing         | 37.0223       | -122.21537     | Johnsons Lee SRI            | 33.908889     | -120.08667     |
| Sandhill Bluff            | 36.980556     | -122.155       | Trailer SCI                 | 34.051944     | -119.90306     |
| Wilder Ranch              | 36.956083     | -122.10405     | Fraser SCI                  | 34.0625       | -119.91944     |
| Terrace Point             | 36.947778     | -122.06472     | Forney SCI                  | 34.056389     | -119.92222     |
| Natural Bridges           | 36.949033     | -122.06113     | Prisoners SCI               | 34.02         | -119.68694     |
| Hopkins                   | 36.621111     | -121.90694     | Willows SCI                 | 33.961944     | -119.755       |
| Point Piños               | 36.63796      | -121.93758     | Valley SCI                  | 33.983889     | -119.66583     |
| Asilomar                  | 36.6296       | -121.93852     | Cat Rock AI                 | 34.01         | -119.4187      |
| China Rocks               | 36.60567      | -121.95975     | Middle AI                   | 34.00593      | -119.39648     |
| Stillwater Cove           | 36.561111     | -121.94028     | Frenchys Cove AI            | 34.0066       | -119.4109      |
| Point Lobos               | 36.5132       | -121.94433     | Thousand Springs SNI        | 33.28505      | -119.52983     |
| Garrapata                 | 36.4689       | -121.93434     | Tranquility Beach SNI       | 33.265668     | -119.4921      |
| Andrew Molera             | 36.280556     | -121.86306     | Marker Poles SNI            | 33.218683     | -119.49562     |
| Partington Cove           | 36.173833     | -121.6966      | Landing Cove SBI            | 33.481667     | -119.02944     |
| Lucia                     | 36.014383     | -121.5405      | Sea Lion Rookery SBI        | 33.471944     | -119.03083     |
| Mill Creek                | 35.979722     | -121.49056     | Bird Rock CI                | 33.451667     | -118.4875      |
| Duck Pond                 | 35.85942      | -121.42263     | Big Fisherman Cove CI       | 33.446447     | -118.48526     |
| Point Sierra Nevada       | 35.730833     | -121.32389     | Goat Harbor CI              | 33.416797     | -118.39407     |
| Piedras Blancas           | 35.66568      | -121.28653     | Little Harbor CI            | 33.385        | -118.47528     |
| San Simeon Point          | 35.63485      | -121.19577     | North Head SCLI (new)       | 33.032866     | -118.600574    |
| Vista del Mar             | 35.60434      | -121.14227     | Graduation Point SCLI (new) | 33.033274     | -118.575597    |
| Rancho Marino             | 35.540283     | -121.09283     | Boy Scout Camp SCLI         | 33.00112      | -118.54832     |
| Cayucos                   | 35.44748      | -120.9501      | Eel Point SCLI              | 32.918007     | -118.54668     |
| Hazards                   | 35.28966      | -120.88325     | West Cove, SCLI             | 33.014938     | -118.60614     |
| Diablo                    | 35.22665      | -120.87367     |                             |               |                |

Table 2. UCSC Biodiversity Survey sites in Oregon and California

## Marine Protected Area Baseline Monitoring

In September 2007, the state of California began establishing a network of Marine Protected Areas along the California coast as part of the Marine Life Protection Act (MLPA). Under baseline monitoring programs funded by Sea Grant and the Ocean Protection Council, additional intertidal monitoring sites were established within the Central Coast, North Central Coast, and South Coast study regions. Six additional sites will be established and sampled in the North Coast study region in 2014-2015 (Table 3). Baseline characterization of MPAs involves sampling of sites both within and outside of MPAs. These sites are sampled using existing community structure and biodiversity survey protocols for consistency. Resampling of these sites may take place as part of future MPA evaluation.

| Site                       | Latitude (dd) | Longitude (dd) |
|----------------------------|---------------|----------------|
| Pyramid Point (new 2014)   | 41.98984      | -124.20930     |
| Point St George (new 2014) | 41.78464      | -124.25513     |
| Palmer's Point*            | 41.1309       | -124.1635      |
| Ten Mile*                  | 39.5924       | -123.7859      |
| MacKerricher (inside)*     | 39.4703       | -123.8084      |
| MacKerricher (outside)*    | 39.4389       | -123.8183      |

Table 3. North Coast MPA Baseline Monitoring Program sites

\*Proposed 2015 site location

## Wave Energy Conversion Device Baseline Project:

During the summer of 2014 our research group sampled eight sites along the Oregon coast using a combination of community structure and biodiversity survey methods. This sampling will be used to establish a biological baseline prior to the proposed installation of several Wave Energy Conversion Device (WECD) arrays along the Oregon coastline. This baseline will be used to assess the effects of WECDs on near-shore communities. Sampling occurred at five existing Oregon sites and at three additional sites established in summer 2013 (Table 4).

| Site                      | Latitude (dd) | Longitude (dd) |
|---------------------------|---------------|----------------|
| Ecola                     | 45.91810194   | -123.9805046   |
| Cape Meares (new 2013)    | 45.47177      | -123.97214     |
| Fogarty Creek             | 44.83708449   | -124.0577834   |
| Seal Rock (new 2013)      | 44.49944      | -124.08438     |
| Bob Creek                 | 44.2446404    | -124.1143035   |
| Cape Arago                | 43.30891446   | -124.4005323   |
| Coquille Point (new 2013) | 43.11492      | -124.43859     |
| Burnt Hill                | 42.22819108   | -124.3879989   |

Table 4. Oregon Wave Energy Conversion Device baseline monitoring sites

### **Intertidal Recruitment Monitoring:**

Intertidal recruitment monitoring collects data on invertebrate larval recruitment. Mussel and other bivalve recruits are collected in Tuffies (mesh pot-scrubbers) bolted into the substrate. Barnacle recruits and cyprids are collected on PVC plates covered in Safetywalk (non-slip tape) and bolted to the substrate. Both Tuffies and barnacle plates are collected once a month and processed in the lab. Recruitment monitoring helps to quantify larval input into the intertidal environment. Long-term quantification of recruitment allows us to distinguish long-term trends from natural annual and seasonal variability. Intertidal recruitment monitoring is currently conducted on a monthly basis at two central California sites, Terrace Point and Hopkins (Table 5).

### **Ocean Acidification:**

The Ocean Margin Ecosystems Group for Acidification Studies (OMEGAS) involves research at eight sites along the California Current Upwelling System. Our group is responsible for research at three sites located in the Monterey Bay region of mainland California (Table 5). The intention of this project is to monitor oceanic pH on large spatial and temporal scales and to determine whether any relationships exist between changing ocean chemistry and the state of intertidal calcifying organisms. The field components entail intertidal and moored pH sensors, dissolved oxygen readings, temperature, bi-monthly water samples (nutrients, chlorophyll a, dissolved inorganic carbon, salinity, and alkalinity), and mussel growth plots.

| <b>Site</b>   | <b>Latitude (dd)</b> | <b>Longitude (dd)</b> |
|---------------|----------------------|-----------------------|
| Terrace Point | 36.94841             | -122.06457            |
| Hopkins       | 36.6212              | -121.9073             |
| Soberanes     | 36.44787             | -121.92874            |

*Table 5. Intertidal Recruitment and Ocean Acidification monitoring sites and locations*

Both intertidal recruitment monitoring and the OMEGAS project were discontinued in fall 2013, prior to the beginning of this reporting period.

### **Summary of Incidental Take Authorization**

Research activities take place in the rocky intertidal throughout the year. Most sampling occurs over a one day (2-6 hours) period during a low tide series. Sites range from northern Oregon to the California/Mexico border. Within this area the following marine mammals may be found hauled-out at or adjacent to research sites:

- California sea lion (*Zalophus californianus*), U.S. stock
- Pacific harbor seal (*Phoca vitulina richardii*), California and Oregon/Washington stocks
- Northern elephant seal (*Mirounga angustirostris*), California stock
- Steller sea lion (*Eumetopias jubatus*), Eastern U.S. stock

### **California sea lion (*Zalophus californianus*)**

California sea lions are distributed along the west coast of North America from British Columbia to Baja California and throughout the Gulf of California. Breeding occurs on offshore islands along the west coast of Baja California and the Gulf of California as well as on the California Channel Islands. There are three recognized California sea lion stocks (U.S. stock, Western Baja stock, and the Gulf of California stock) with the U.S. stock ranging from the U.S./Mexico border into Canada. Although there is some movement between stocks, U.S. rookeries are considered to be isolated from rookeries off of Baja California (Barlow et. al. 1995).

California sea lions were hunted for several thousand years by indigenous peoples and early hunters. In the early 1900s sea lions were killed to reduce competition with commercial fisheries and were also hunted commercially from the 1920-1940s. Following the passage of the Marine Mammal Protection Act (MMPA) in 1972, as well as limits on killing and harassment in Mexico, the population has rapidly increased (Reeves et. al. 2002).

The most recent census of California sea lions occurred between Pt. Reyes, CA and Point Conception, CA and in the California Channel Islands during July 2007. The census found 153,337 individuals (Carretta et. al. 2013). According to the 2012 Pacific Marine Mammal Stock Assessment, California sea lions estimated population size is 296,750 individuals. The population is growing at a maximum annual rate of 9.2% and has reached carrying capacity (Carretta et. al. 2013). This species is not listed under the Endangered Species Act (ESA) and is not a strategic species nor considered depleted under the MMPA.

### **Harbor seal (*Phoca vitulina richardii*)**

Harbor seals range widely along coastal areas of the North Pacific and North Atlantic. There are five subspecies based on geographic ranges, with *Phoca vitulina richardii* ranging along the west coast of North America from the Aleutian Islands to Baja California. For management purposes there are three recognized harbor seal stocks along the west coast of the continental United States: California, Oregon and Washington outer coast, and Washington inland coast.

This species was hunted by indigenous peoples and early hunters for several thousand years. In the 1800s and early 1900s, harbor seals were killed during commercial hunting and in attempts to decrease competition with commercial fisheries. The population was eventually reduced to a few hundred individuals (Bonnet 1928). Since the passage of the MMPA the population has increased dramatically (Carretta et. al. 2010).

The most recent census of the California stock of harbor seals occurred in May and June of 2009. This census found 16,608 hauled-out harbor seals (Carretta et. al. 2013). A 1999 census of the Oregon/Washington harbor seal stock found 16,165 individuals, of which 5,735 were in Oregon (Carretta et. al. 2013). According to the 2012 Pacific Marine Mammal Stock Assessment, the minimum population size of the California stock is 26,667 with an estimated population size of 30,196 (Carretta et. al. 2013). The Oregon/Washington outer coast stock has an estimated population size of 24,732. The stock is growing at a maximum annual rate of 12% (Carretta et.

al. 2010). Neither stock is listed under the ESA nor is it a strategic species or considered depleted under the MMPA.

### **Northern elephant seal (*Mirounga angustirostris*)**

Northern elephant seals range widely throughout the eastern Pacific for most of the year to forage. They return to haul-out locations along the west coast of the continental United States including the Channel Islands, the central California coast, and the islands off of Baja California to breed and molt. Breeding occurs from December through early spring, with males returning to haul-out locations earlier than females to establish dominance hierarchies. Molting occurs from late April to August, with juveniles and adult females returning earlier than adult males (Reeves et. al. 2002). Due to very little movement between colonies in Mexico and those in California, the California population is considered to be a separate stock (Carretta et. al. 2010).

This species was hunted by indigenous peoples for several thousand years and by commercial sealers in the 1800s. By the late 1800s the species was thought to be extinct, although several were seen on Guadalupe Island in the 1880s and a few dozen to several hundred survived off of Mexico (Stewart et al. 1994). The population began increasing in the early 1900s and progressively colonized southern and central California through the 1980s (Reeves et. al. 2002).

The minimum population size of northern elephant seals along the California coast is estimated to be 74,913 individuals, which is largely based on 2005 pup-counts (Carretta et. al. 2013). The estimated population size is 124,000 individuals. The stock is growing at an annual rate of 11.7% (Carretta et. al. 2013). This species is not listed under the ESA and is not a strategic species nor considered depleted under the MMPA.

### **Steller sea lion (*Eumetopias jubatus*)**

Steller sea lions range throughout the north Pacific from Japan to the Kamchatka Peninsula, along the Aleutian Islands, into the Gulf Alaska, and down the west coast of North America to central California. Based on distribution, population dynamics, and genotypic data, the species occurring in United States waters has been divided into two stocks, the eastern U.S. stock (east of Cape Suckling, AK) and the western U.S. stock (west of Cape Sucking, AK) (Loughlin 1997). Breeding of the eastern stock occurs in rookeries in Alaska, British Columbia, Oregon, and California.

This species was hunted by indigenous peoples for several thousand years throughout its range and as recently as the 1990s in the Aleutian Islands. Individuals from British Columbia to California were also killed in the early 1900s to reduce competition with commercial fisheries. The species dramatically declined from the 1970s to 1990s due to competition with commercial fishing and long-term environmental changes (Reeves et. al. 2002). There has also been a continued decrease in population numbers along the southern and central California coast possibly due to a northward shift, and subsequent southern contraction, in breeding locations (Pitcher et al. 2007). In 1990, due to accelerating declines across its range, the species was listed as threatened under the ESA. In 2013 the eastern U.S. stock was determined to be recovered and was delisted from the ESA (NMFS 2013).

Counts at rookery and haul-out sites in 2011 found a total of 2,781 Steller sea lions (673 pups and 2,108 adults) in California. Counts in Oregon in 2008 and 2009 found 4,090 adults and 1,418 pups (Allen and Angliss 2013). According to the 2013 Alaska Marine Mammal Stock Assessment, the minimum population size of the eastern Steller sea lion stock is 57,966 with an estimated population size of 63,160 to 78,198 individuals (Allen and Angliss 2013).

**Incidental Harassment Authorization:**

For the period of December 17, 2013 to December 16, 2014 UCSC-PISCO was issued Incidental Harassment Authorization under Section 101(a)(5)(D) of the Marine Mammal Protection Act for take, by level B harassment only, of a small number of pinnipeds incidental to rocky intertidal monitoring and research. The issued IHA allows for the following take:

| Species   | Authorized Take |
|---|-----------------|
| California sea lion ( <i>Zalophus californianus</i> )     | 60              |
| Pacific harbor seal ( <i>Phoca vitulina richardii</i> )   | 337             |
| Northern elephant seal ( <i>Mirounga angustirostris</i> ) | 36              |

Although rare, hauled-out pinnipeds are occasionally encountered by researchers accessing and sampling monitoring sites. In some occasions pinnipeds may need to be flushed in order for researchers to gain access to a site or conduct sampling.

**Monitoring Methods**

Prior to approaching research sites, researchers observed the site from a distance and recorded any pinnipeds by species, and sex/age when possible, present at or near the site. Any pinnipeds observed during sampling were also recorded. Number of disturbances from researchers accessing the site or conducting sampling were recorded by species, and sex/age when possible.

Observations and disturbances were recorded on a four-point scale:

- 0 = observation by researchers from a distance, no reaction by pinniped
- 1 = pinniped reacted to presence of researchers with movement <1 meter
- 2 = pinniped reacted to presence of researchers with short movement of 1-3 meters
- 3 = pinniped flushed to the water or moved >3 meters in retreat

**Monitoring Results**

For the period of December 17, 2013 to August 31, 2014 our research group conducted rocky intertidal sampling at 65 sites over 50 days (Table 6). Marine mammal observations and disturbances are detailed in Table 7 (harbor seals), Table 8 (California sea lions), and Table 9 (northern elephant seals).

All takes were Level B harassment only.

Actual take of harbor seals was well below authorized limits. This was in part due to an alternative access route at Hopkins which has allowed researchers to access the site downcoast of

a beach where a large group of harbor seals (~20 adults and pups) is regularly hauled-out. This access point was established in fall 2012 and has considerably reduced the number of anticipated takes at this site. Additionally, our visitation to the site at Hopkins has been reduced from several times per month to 2-3 times per year due to the discontinuation of the OMEGAS and recruitment projects. The largest number of takes occurred on January 15, 2014 at Fitzgerald Marine Reserve. A group of about 40 adult harbor seals was hauled-out on the beach upcoast of the site. The site is accessed along the beach and researchers walked quietly and high up on the shore in order to give the group plenty space. Roughly 15 seals flushed to the water as researchers walked by. Fifteen additional seals made short movements toward the water but did not flush, while the remaining 10 seals observed researchers but made minimal movements. Additional takes occurred at Point Pinos, Pebble Beach, Bodega, Shelter Cove, and Fogarty Creek when harbor seals were hauled-out on or adjacent to the site (Table 7).

During this period there were no takes of California sea lions. Sea lions were observed in the water at Stornetta, Bodega, Enderts, and False Klamath Cove (Table 8).

All take of northern elephant seals occurred at Piedras Blancas. These takes were Level 1 and 2 with elephant seals observing researchers but not flushing. One pup also was observed hauled-out on the beach upcoast of Mill Creek (Table 9).

During this time period no injured, stranded, or dead pinnipeds were observed, nor were there any unusual behaviors prior to or following any takes. Surrounding waters were scanned for predators prior to any intentional flushing and no predators were ever observed. There were no observations or takes of Steller sea lions.

| Date      | Site                | Time      | Swell | Wind | Rain | Date      | Site               | Time      | Swell | Wind | Rain |
|-----------|---------------------|-----------|-------|------|------|-----------|--------------------|-----------|-------|------|------|
| 1/13/2014 | Point Lobos         | 1215-1700 | ND    | ND   | ND   | 5/2/2014  | Carmel Point       | 0630-0945 | L     | L    | 0    |
| 1/14/2014 | Stillwater          | 1230-1700 | ND    | ND   | ND   | 5/2/2014  | Partington Cove    | 0615-0820 | L     | L    | 0    |
| 1/15/2014 | Fitzgerald          | 1300-1645 | ND    | ND   | ND   | 5/14/2014 | Enderts            | 0515-0900 | M     | L    | 0    |
| 2/12/2014 | Lechuza             | 1345-1545 | ND    | ND   | ND   | 5/15/2014 | Point Pinos        | 0500-0930 | L     | L    | 0    |
| 2/12/2014 | Sequit              | 1130-1250 | ND    | ND   | ND   | 5/15/2014 | Dammation          | 0600-1000 | L     | L    | 0    |
| 2/13/2014 | Abalone Cove        | 1515-1615 | ND    | ND   | ND   | 5/16/2014 | China Rocks        | 0445-0615 | L     | L    | 0    |
| 2/13/2014 | Point Vicente       | 1230-1415 | ND    | ND   | ND   | 5/16/2014 | Pescadero Point    | 0635-0745 | L     | L    | 0    |
| 2/14/2014 | Shaws Cove          | 1630-1800 | ND    | ND   | ND   | 5/16/2014 | False Klamath Cove | 0530-1100 | L     | L    | 0    |
| 2/14/2014 | Crystal Cove        | 1400-1500 | ND    | ND   | ND   | 5/17/2014 | False Klamath Cove | 0530-1130 | L     | L    | 0    |
| 2/26/2014 | Purisima            | 1215-1345 | H     | M    | L    | 5/18/2014 | Pyramid Point      | 0615-1200 | L     | L    | L    |
| 2/26/2014 | West Cove           | 1400-1530 | M     | L    | 0    | 5/19/2014 | Pyramid Point      | 0715-1045 | L     | L    | 0    |
| 2/26/2014 | Eel Point           | 1100-1300 | M     | L    | 0    | 5/20/2014 | Point Saint George | 0815-1430 | L     | H    | 0    |
| 2/27/2014 | Graduation Point    | 1130-1715 | ND    | ND   | ND   | 5/21/2014 | Point Saint George | 0915-1045 | L     | M    | 0    |
| 2/28/2014 | Graduation Point    | 1330-1630 | ND    | ND   | ND   | 5/30/2014 | Pigeon Point       | 0545-0800 | M     | L    | 0    |
| 3/2/2014  | North Head          | 1230-1730 | H     | L    | 0    | 5/30/2014 | Scott Creek        | 0630-0815 | L     | L    | 0    |
| 3/3/2014  | Scripps             | 1500-1700 | ND    | ND   | ND   | 6/12/2014 | Sea Ranch          | 0430-0920 | L     | L    | 0    |
| 3/25/2014 | Sand Hill           | 1200-1300 | M     | M    | L    | 6/12/2014 | Bodega             | 0420-0815 | M     | M    | 0    |
| 3/25/2014 | Pigeon Point        | 1330-1400 | M     | M    | L    | 6/13/2014 | Stornetta          | 0415-0815 | M     | M    | 0    |
| 3/25/2014 | Boathouse           | 1100-1530 | M     | L    | 0    | 6/14/2014 | Kibesillah Hill    | 0445-1200 | ND    | ND   | ND   |
| 3/26/2014 | Scott Creek         | 1150-1430 | M     | L    | L    | 6/15/2014 | Kibesillah Hill    | 0445-0900 | M     | M    | 0    |
| 3/26/2014 | Stairs              | 1200-1420 | H     | L    | L    | 6/16/2014 | Shelter Cove       | 0520-1220 | L     | M    | 0    |
| 3/27/2014 | Terrace Point       | 1315-1530 | L     | L    | 0    | 6/17/2014 | Shelter Cove       | 0640-1000 | L     | M    | 0    |
| 3/27/2014 | Oculto              | 1100-1345 | M     | L    | 0    | 6/18/2014 | Cape Mendocino     | 0700-1000 | L     | M    | L    |
| 3/27/2014 | Stairs              | 1430-1645 | H     | L    | 0    | 7/10/2014 | Bob Creek          | 0430-1015 | M     | M    | 0    |
| 3/28/2014 | Scott Creek         | 1500-1430 | M     | L    | 0    | 7/10/2014 | Enderts            | 0600-0800 | ND    | ND   | ND   |
| 3/28/2014 | Shell Beach         | 1145-1545 | M     | L    | 0    | 7/11/2014 | Fogarty Creek      | 0345-1045 | M     | L    | 0    |
| 4/17/2014 | Stillwater          | 0600-0820 | M     | L    | 0    | 7/11/2014 | Enderts            | 0530-0845 | ND    | ND   | ND   |
| 4/17/2014 | Point Siarra Nevada | 0500-0945 | H     | M    | 0    | 7/12/2014 | Ecola              | 0500-1000 | L     | L    | 0    |
| 4/18/2014 | Pacific Valley      | 0640-0800 | H     | L    | 0    | 7/12/2014 | Enderts            | 0530-0930 | ND    | ND   | ND   |
| 4/18/2014 | Hazards             | 0630-0945 | M     | L    | 0    | 7/13/2014 | Ecola              | 0535-1025 | L     | L    | 0    |
| 4/19/2014 | Mill Creek          | 0700-0945 | M     | L    | 0    | 7/13/2014 | Enderts            | 0530-0800 | ND    | ND   | ND   |
| 4/19/2014 | Rancho Marino       | 0930-1045 | L     | L    | 0    | 7/14/2014 | Cape Arago         | 0530-1100 | L     | M    | 0    |
| 4/19/2014 | Cayucos             | 0515-0835 | M     | L    | 0    | 7/14/2014 | Mal Coombs         | 0515-1115 | ND    | ND   | ND   |
| 4/20/2014 | Andrew Molera       | 0730-0945 | M     | L    | 0    | 7/15/2014 | Burnt Hill         | 0615-1235 | M     | L    | 0    |
| 4/20/2014 | Piedra Blancas      | 0600-0805 | M     | 0    | 0    | 7/15/2014 | Saunders Reef      | 0530-1045 | ND    | ND   | ND   |
| 4/20/2014 | Vista Del Mar       | 0845-0945 | L     | L    | 0    | 8/9/2014  | Seal Rock          | 0430-0930 | L     | L    | 0    |
| 4/22/2014 | Frankling Point     | 0900-1150 | M     | M    | 0    | 8/10/2014 | Launcher Beach     | 0600-1000 | ND    | ND   | ND   |
| 4/30/2014 | Hopkins             | 0615-0845 | L     | L    | 0    | 8/10/2014 | Cape Meares        | 0500-1020 | L     | L    | 0    |
| 4/30/2014 | Pebble Beach        | 0600-0815 | M     | L    | 0    | 8/11/2014 | Launcher Beach     | 0615-0930 | ND    | ND   | ND   |
| 5/1/2014  | Point Lobos         | 0615-0815 | L     | L    | 0    | 8/11/2014 | Coquille Point     | 0430-0945 | L     | L    | 0    |
| 5/1/2014  | Garrapata           | 0640-0835 | L     | 0    | 0    | 8/12/2014 | Old Home           | 0630-1100 | L     | L    | 0    |
| 5/1/2014  | Soberanes           | 0500-0610 | L     | L    | 0    | 8/13/2014 | Old Home           | 0615-1100 | L     | L    | 0    |

**Table 6.** Field sampling dates, sites, and times as well as physical conditions noted during sampling (0-none, L-low, M-moderate, H-high, ND-no data) for the period of Dec. 17, 2013 to Aug. 31, 2014

| Date      | Site                | Time | harbor seal |   |   |   |       |    |    | Comments |  |
|-----------|---------------------|------|-------------|---|---|---|-------|----|----|----------|--|
|           |                     |      | pup         |   |   |   | adult |    |    |          |  |
|           |                     |      | 0           | 1 | 2 | 3 | 1     | 2  | 3  |          |  |
| 1/15/2014 | Fitzgerald          | 1300 | 0           | 1 |   |   |       | 10 | 15 | 15       | Adults on beach north of the site were disturbed by researchers accessing the site     |
| 3/25/2014 | Boathouse           | 1100 | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 3/26/2014 | Scott Creek         | 1200 | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 4/17/2014 | Stillwater          | 600  | 30          |   |   |   |       |    |    |          | 20 adults and 10 pups on reef downcoast of site  |
| 4/17/2014 | Point Siarra Nevada | 800  | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 4/20/2014 | Andrew Molera       | 730  | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 4/22/2014 | Frankling Point     | 900  | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 4/30/2014 | Hopkins             | 700  |             | 1 |   |   |       | 2  |    |          | Adults and 1 pup swimming offshore observed researchers from the water                 |
| 4/30/2014 | Pebble Beach        | 600  |             |   |   | 2 |       |    |    | 6        | Adults and 2 pups hauled-out on site, flushed to water as researchers approached       |
| 5/14/2014 | Enderts             | 900  | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 5/15/2014 | Point Pinos         | 715  |             | 1 |   |   |       | 2  |    |          | Adults and pup hauled-out ~25m from site observed researchers but did not flush        |
| 5/16/2014 | False Klamath Cove  | 1100 | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 5/30/2014 | Scott Creek         | 800  | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 6/12/2014 | Bodega              | 430  |             |   |   |   |       | 2  |    |          | Adults hauled-out on reef downcoast of site observed researchers but did not flush     |
| 6/13/2014 | Stornetta           | 415  | 2           |   |   |   |       |    |    |          | Adults swimming offshore   |
| 6/15/2014 | Kibesillah Hill     | 500  | 1           |   |   |   |       |    |    |          | Adult swimming offshore  |
| 6/16/2014 | Shelter Cove        | 530  |             |   |   |   |       |    |    | 3        | Hauled-out on site, flushed to water as researchers approached                         |
| 6/17/2014 | Shelter Cove        | 645  |             |   |   |   | 2     |    |    |          | Hauled-out near site, observed researchers but did not flush                           |
| 7/11/2014 | Fogarty Creek       | 400  |             |   |   |   | 1     |    | 2  |          | One adult hauled-out upcoast of site observed researchers. Two adults flushed to water |
| 7/11/2014 | Fogarty Creek       | 700  |             |   |   |   |       | 2  |    |          | Two adults in water observed and reacted to researchers                                |
| 8/10/2014 | Launcher Beach      | 600  | 10          |   |   |   |       |    |    |          | Adults and pups hauled-out on offshore rocks   |
| 8/11/2014 | Launcher Beach      | 630  | 10          |   |   |   |       |    |    |          | Adults and pups hauled-out on offshore rocks   |
| 8/12/2014 | Old Home            | 630  | 10          |   |   |   |       |    |    |          | Adults and pups hauled-out on offshore rocks   |
| 8/13/2014 | Old Home            | 630  | 10          |   |   |   |       |    |    |          | Adults and pups hauled-out on offshore rocks   |
|           | Totals              |      | 81          | 2 | 0 | 2 | 19    | 17 | 26 |          |  |
|           | <b>Total Takes</b>  |      | <b>66</b>   |   |   |   |       |    |    |          |  |

**Table 7.** Observations and takes of harbor seals (0-observation by researchers only, 1- reacted to presence of researchers with movement <1m, 2- reacted to presence of researchers with short movement of 1-3m, 3- flushed to the water or moved >3m in retreat)

| Date      | Site               | Time | California sea lion |   |   |   |       |   |   |   |  | Comments                 |
|-----------|--------------------|------|---------------------|---|---|---|-------|---|---|---|--|--------------------------|
|           |                    |      | pup                 |   |   |   | adult |   |   |   |  |                          |
|           |                    |      | 0                   | 1 | 2 | 3 | 1     | 2 | 3 |   |  |                          |
| 6/13/2014 | Stornetta          | 800  | 2                   |   |   |   |       |   |   |   |  | Adults swimming offshore |
| 6/12/2014 | Bodega             | 800  | 1                   |   |   |   |       |   |   |   |  | Adult swimming offshore  |
| 5/14/2014 | Enderts            | 900  | 3                   |   |   |   |       |   |   |   |  | Adults swimming offshore |
| 5/16/2014 | False Klamath Cove | 1100 | 5                   |   |   |   |       |   |   |   |  | Adults swimming offshore |
|           | Totals             |      | 11                  | 0 | 0 | 0 | 0     | 0 | 0 | 0 |  |                          |
|           | <b>Total Takes</b> |      | <b>0</b>            |   |   |   |       |   |   |   |  |                          |

**Table 8.** Observations and takes of California sea lions (0-observation by researchers only, 1- reacted to presence of researchers with movement <1m, 2- reacted to presence of researchers with short movement of 1-3m, 3- flushed to the water or moved >3m in retreat)

|           |                    |      | northern elephant seal |   |   |       |   |   |   |
|-----------|--------------------|------|------------------------|---|---|-------|---|---|---|
| Date      | Site               | Time | pup                    |   |   | adult |   |   | Comments  |
|           |                    |      | 0                      | 1 | 2 | 3     | 1 | 2 |   |
| 4/19/2014 | Mill Creek         | 945  | 1                      |   |   |       |   |   | Pup hauled-out upcoast of site                                  |
| 4/20/2014 | Piedra Blancas     | 700  |                        | 1 |   |       | 5 |   | 1 weaned pup* and 5 sub-adults* observed researchers from water |
| 4/20/2014 | Piedra Blancas     | 730  |                        |   |   |       |   | 1 | Sub-adult* observed from water and then approached researchers  |
|           | Totals             |      | 1                      | 1 | 0 | 0     | 5 | 1 | 0   |
|           | <b>Total Takes</b> |      | <b>7</b>               |   |   |       |   |   |   |

**Table 9.** Observations and takes of northern elephant seals (0-observation by researchers only, 1- reacted to presence of researchers with movement <1m, 2- reacted to presence of researchers with short movement of 1-3m, 3- flushed to the water or moved >3m in retreat)  
 \* weaned pups = 2-3 months old, sub-adults = 1-2 years old

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