

**Marine Mammal Protection Act  
Incidental Harassment Authorization**

**Draft Monitoring Report**

**Submitted by:**

**Partnership for Interdisciplinary Studies of Coastal Oceans  
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**To:**

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

**November 2017**

This draft monitoring report covers research activities related to rocky intertidal monitoring along the Oregon and California coasts for the period of February 21, 2017 to November 30, 2017.

### **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.

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. This 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.

Data from these long-term research programs have been used to inform marine policy including the design and evaluation of marine protected areas (MPAs), natural resource damage assessments (NRDA), and critical habitat designations. Research findings are also made available to the public through websites, 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. 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**

The community structure monitoring approach is based largely on surveys that quantify the cover and distribution of algae and invertebrates in intertidal communities. This approach allows us to quantify the patterns of abundance of targeted species and characterize changes within the communities in which they reside. Such information provides resource managers with insight into the causes and consequences of changes in community structure and forms the basis of "ecosystem-based management" of rocky intertidal communities.

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. In addition, 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).

Community structure surveys are conducted over a one day period during a low tide series one to two times each year. Site locations, survey frequency, and survey seasons are shown in Table 1.

### **Biodiversity Surveys**

Biodiversity surveys are complimentary with the community structure monitoring approach and provide greater information on species richness at a site and biogeographic patterns across regions. These surveys involve point contact identification along permanent transects, mobile invertebrate quadrat counts, sea star band counts, and tidal height topographic measurements. Biodiversity surveys typically require one to two days to complete and are usually conducted every 3-5 years at established sites. Current funding programs supporting biodiversity surveys include marine protected area (MPA) evaluation and MARINe. Table 1 lists biodiversity survey sites in Oregon and California and indicates those sites sampled in 2017. Note that many biodiversity sites are also community structure sites. For more information on sites and protocols please visit [www.eeb.ucsc.edu/pacificrockyintertidal/methods/index.html](http://www.eeb.ucsc.edu/pacificrockyintertidal/methods/index.html)

Three new biodiversity sites were established and sampled during this period: Stewarts Point, South Point, and Carrington Point (Table 1).

| Site                      | Latitude  | Longitude  | Community Structure (CS) Survey | CS Surveys/Year | CS Survey Season | Biodiversity Survey | Biodiversity Survey in 2017 |
|---------------------------|-----------|------------|---------------------------------|-----------------|------------------|---------------------|-----------------------------|
| Ecola                     | 45.91809  | -123.98031 | X                               | 1               | SU               | X                   |                             |
| Cape Meares               | 45.471788 | -123.97204 |                                 |                 |                  | X                   |                             |
| Roads End                 | 45.025747 | -124.01265 |                                 |                 |                  | X                   |                             |
| Fogarty Creek             | 44.83864  | -124.05875 | X                               | 1               | SU               | X                   |                             |
| Otter Rock                | 44.752715 | -124.06606 |                                 |                 |                  | X                   |                             |
| Seal Rock                 | 44.499939 | -124.08437 |                                 |                 |                  | X                   |                             |
| Bob Creek                 | 44.24456  | -124.11443 | X                               | 1               | SU               | X                   |                             |
| Cape Arago                | 43.30894  | -124.40077 | X                               | 1               | SU               | X                   |                             |
| Coquille Point            | 43.114718 | -124.43851 |                                 |                 |                  | X                   |                             |
| Burnt Hill                | 42.22814  | -124.38786 | X                               | 1               | SU               | X                   |                             |
| Pyramid Point             | 41.989841 | -124.2093  |                                 |                 |                  | X                   |                             |
| Point Saint George        | 41.784644 | -124.25513 |                                 |                 |                  | X                   |                             |
| Enderts                   | 41.69     | -124.14257 | X                               | 2               | SP,FA            | X                   |                             |
| Damnation Creek           | 41.65249  | -124.12784 | X                               | 2               | SP,FA            | X                   | X                           |
| False Klamath Cove        | 41.594264 | -124.10533 | X                               | 2               | SP,FA            | X                   | X                           |
| Launcher Beach            | 41.057155 | -124.14532 |                                 |                 |                  | X                   |                             |
| Old Home Beach            | 41.055273 | -124.13683 |                                 |                 |                  | X                   |                             |
| Cape Mendocino            | 40.341    | -124.36317 | X                               | 1               | SU               | X                   |                             |
| Shelter Cove              | 40.02254  | -124.07366 | X                               | 1               | SU               | X                   |                             |
| Mal Coombs                | 40.021697 | -124.06825 |                                 |                 |                  | X                   |                             |
| Kibesillah Hill           | 39.60412  | -123.78887 | X                               | 1               | SU               | X                   |                             |
| Abalobadiah Creek         | 39.56906  | -123.77182 |                                 |                 |                  | X                   |                             |
| MacKerricher              | 39.4826   | -123.80359 |                                 |                 |                  | X                   |                             |
| Fort Bragg                | 39.4392   | -123.81841 |                                 |                 |                  | X                   |                             |
| Stornetta                 | 38.93787  | -123.7288  | X                               | 1               | SU               | X                   |                             |
| Moat Creek                | 38.880915 | -123.67475 |                                 |                 |                  | X                   |                             |
| Saunders Reef             | 38.86138  | -123.65361 |                                 |                 |                  | X                   |                             |
| Del Mar Landing           | 38.740513 | -123.51086 |                                 |                 |                  | X                   |                             |
| Sea Ranch                 | 38.7305   | -123.48864 | X                               | 1               | SU               | X                   |                             |
| Phillips Gulch            | 38.585852 | -123.34147 |                                 |                 |                  | X                   |                             |
| Stewarts Point            | 38.61364  | -123.36753 |                                 |                 |                  | X                   | X                           |
| Gerstle Cove              | 38.566136 | -123.32919 |                                 |                 |                  | X                   | X                           |
| Windermere Point          | 38.523943 | -123.26747 |                                 |                 |                  | X                   |                             |
| North Jenner Beach        | 38.456176 | -123.14244 |                                 |                 |                  | X                   |                             |
| Bodega                    | 38.3182   | -123.07365 | X                               | 1               | SU               | X                   | X                           |
| Horseshoe Cove            | 38.316439 | -123.0721  |                                 |                 |                  | X                   |                             |
| Bodega Head               | 38.3104   | -123.0824  |                                 |                 |                  | X                   |                             |
| Santa Maria Creek         | 38.012429 | -122.84915 |                                 |                 |                  | X                   |                             |
| Chimney Rock              | 37.99383  | -122.96729 |                                 |                 |                  | X                   | X                           |
| Bolinas Point             | 37.903537 | -122.72721 |                                 |                 |                  | X                   |                             |
| Bolinas Point Wreck       | 37.902617 | -122.7242  |                                 |                 |                  | X                   |                             |
| Alder Creek; Duxbury      | 37.897426 | -122.71069 |                                 |                 |                  | X                   |                             |
| Slide Ranch               | 37.874061 | -122.60094 |                                 |                 |                  | X                   |                             |
| Alcatraz                  | 37.825    | -122.42194 |                                 |                 |                  | X                   |                             |
| Mussel Flat Farallones    | 37.6959   | -123.0029  |                                 |                 |                  | X                   |                             |
| Fitzgerald Marine Reserve | 37.521647 | -122.51679 |                                 |                 |                  | X                   | X                           |
| Pebble Beach              | 37.23263  | -122.41607 | X                               | 1               | SP               |                     |                             |
| Pigeon Point              | 37.18361  | -122.39529 | X                               | 1               | SP               | X                   |                             |
| Franklin Point            | 37.1495   | -122.36101 | X                               | 1               | SP               |                     |                             |
| Ano Nuevo                 | 37.11257  | -122.32956 |                                 |                 |                  | X                   | X                           |
| Scott Creek               | 37.04425  | -122.23493 | X                               | 2               | SP, FA           | X                   | X                           |
| Davenport Landing         | 37.02208  | -122.21538 |                                 |                 |                  | X                   |                             |
| Sandhill Bluff            | 36.98017  | -122.15503 | X                               | 2               | SP, FA           | X                   | X                           |
| Wilder Ranch              | 36.94915  | -122.10383 |                                 |                 |                  | X                   |                             |
| Terrace Point             | 36.94841  | -122.06457 | X                               | 2               | SP, FA           | X                   |                             |
| Natural Bridges           | 36.94915  | -122.06107 |                                 |                 |                  | X                   |                             |
| Hopkins                   | 36.6212   | -121.9073  | X                               | 2               | SP, FA           | X                   | X                           |

|                     |           |            |   |   |        |   |   |
|---------------------|-----------|------------|---|---|--------|---|---|
| Point Pinos         | 36.63796  | -121.93758 | X | 2 | SP, FA | X | X |
| Asilomar            | 36.6296   | -121.93852 | X | 1 | SP     | X |   |
| China Rocks         | 36.60616  | -121.95939 | X | 1 | SP     | X |   |
| Pescadero Point     | 36.56109  | -121.95436 | X | 1 | SP     |   |   |
| Stillwater          | 36.56087  | -121.94053 | X | 2 | SP, FA | X | X |
| Carmel Point        | 36.54376  | -121.93412 | X | 1 | SP     |   |   |
| Point Lobos         | 36.51366  | -121.94688 | X | 2 | SP, FA | X | X |
| Mal Paso            | 36.47994  | -121.93913 | X | 2 | SP, FA |   |   |
| Garrapata           | 36.46904  | -121.93444 | X | 1 | SP     | X |   |
| Soberanes           | 36.44787  | -121.92874 | X | 1 | SP     |   |   |
| Andrew Molera       | 36.28061  | -121.86317 | X | 2 | SP, FA | X | X |
| Partington Cove     | 36.17376  | -121.69653 | X | 1 | SP     | X |   |
| Lucia               | 36.014383 | -121.5405  |   |   |        | X |   |
| Mill Creek          | 35.97965  | -121.49034 | X | 2 | SP, FA | X |   |
| Pacific Valley      | 35.94705  | -121.48053 | X | 1 | SP     |   |   |
| Duck Pond           | 35.85918  | -121.42249 |   |   |        | X |   |
| Point Sierra Nevada | 35.72883  | -121.31866 | X | 2 | SP, FA | X |   |
| Piedras Blancas     | 35.66493  | -121.28699 | X | 2 | SP, FA | X | X |
| San Simeon Point    | 35.63455  | -121.19562 |   |   |        | X |   |
| Vista del Mar       | 35.60414  | -121.14232 | X | 2 | SP, FA | X |   |
| Rancho Marino       | 35.52244  | -121.073   | X | 2 | SP, FA | X |   |
| Harmony Headlands   | 35.47448  | -121.01707 | X | 1 | FA     |   |   |
| Cayucos             | 35.44739  | -120.94982 | X | 2 | SP, FA | X |   |
| Hazards             | 35.28966  | -120.88325 | X | 2 | SP, FA | X |   |
| Diablo              | 35.22691  | -120.87428 |   |   |        | X | X |
| Shell Beach         | 35.16881  | -120.69668 | X | 2 | SP, FA | X |   |
| Occulto             | 34.88122  | -120.63954 | X | 2 | SP, FA |   |   |
| Purisima            | 34.7556   | -120.64076 | X | 2 | SP, FA |   |   |
| Stairs              | 34.73038  | -120.61546 | X | 2 | SP, FA | X |   |
| Lompoc Landing      | 34.719057 | -120.6088  |   |   |        | X |   |
| Boat House          | 34.55388  | -120.61167 | X | 2 | SP, FA | X |   |
| Government Point    | 34.44334  | -120.45655 | X | 2 | SP, FA | X |   |
| Alegria             | 34.467137 | -120.27818 |   |   |        | X |   |
| Arroyo Hondo        | 34.473308 | -120.14539 |   |   |        | X |   |
| Ellwood             | 34.435194 | -119.93078 |   |   |        | X |   |
| Coal Oil Point      | 34.40686  | -119.87829 |   |   |        | X |   |
| Carpinteria         | 34.387037 | -119.51408 |   |   |        | X |   |
| Mussel Shoals       | 34.355565 | -119.44074 |   |   |        | X |   |
| Old Stairs          | 34.066224 | -118.9981  |   |   |        | X |   |
| Deer Creek          | 34.060685 | -118.98221 |   |   |        | X |   |
| Sequit Point        | 34.043235 | -118.937   |   |   |        | X |   |
| Lechuza Point       | 34.034458 | -118.86179 |   |   |        | X |   |
| Point Dume          | 34.000357 | -118.80703 |   |   |        | X |   |
| Paradise Cove       | 34.012005 | -118.79214 |   |   |        | X |   |
| Point Vicente       | 33.741014 | -118.40947 |   |   |        | X |   |
| Abalone Cove        | 33.737777 | -118.37612 |   |   |        | X |   |
| White Point         | 33.71573  | -118.31999 |   |   |        | X |   |
| Point Fermin        | 33.70679  | -118.28614 |   |   |        | X |   |
| Buck Gully South    | 33.588246 | -117.86736 |   |   |        | X |   |
| Crystal Cove        | 33.570864 | -117.83785 |   |   |        | X |   |
| Muddy Canyon        | 33.565763 | -117.83314 |   |   |        | X |   |
| Shaws Cove          | 33.54473  | -117.79974 |   |   |        | X |   |
| Heisler Park        | 33.542594 | -117.78928 |   |   |        | X |   |
| Treasure Island     | 33.51335  | -117.75793 |   |   |        | X |   |
| Dana Point          | 33.459941 | -117.71461 |   |   |        | X |   |
| Cardiff Reef        | 32.99984  | -117.27867 |   |   |        | X |   |
| Scripps Reef        | 32.871395 | -117.25321 |   |   |        | X |   |
| La Jolla Caves      | 32.848614 | -117.26535 |   |   |        | X |   |
| Wind and Sea        | 32.832849 | -117.28231 |   |   |        | X |   |
| Sea Ridge           | 32.807987 | -117.26793 |   |   |        | X |   |
| Navy North          | 32.692784 | -117.25306 |   |   |        | X |   |
| Cabrillo I          | 32.669434 | -117.24541 |   |   |        | X |   |

|                    |           |            |  |  |  |   |   |
|--------------------|-----------|------------|--|--|--|---|---|
| Cabrillo III       | 32.664899 | -117.24282 |  |  |  | X |   |
| Cuyler Harbor      | 34.048612 | -120.33642 |  |  |  | X |   |
| Crook Point        | 34.022067 | -120.37924 |  |  |  | X |   |
| Fossil Reef        | 33.993295 | -120.23813 |  |  |  | X |   |
| NW Talcott         | 34.008386 | -120.21368 |  |  |  | X |   |
| East Point         | 33.9427   | -119.96793 |  |  |  | X |   |
| Ford Point         | 33.91457  | -120.0506  |  |  |  | X | X |
| Johnsons Lee       | 33.90883  | -120.08691 |  |  |  | X | X |
| Carrington Point   | 34.03358  | -120.0439  |  |  |  | X | X |
| South Point        | 33.91162  | -120.15104 |  |  |  | X | X |
| Trailer            | 34.051821 | -119.90344 |  |  |  | X |   |
| Forney             | 34.056485 | -119.92204 |  |  |  | X |   |
| Fraser Cove        | 34.062645 | -119.91905 |  |  |  | X |   |
| Prisoners Harbor   | 34.020197 | -119.68663 |  |  |  | X |   |
| Valley             | 33.983724 | -119.66588 |  |  |  | X |   |
| Willows Anchorage  | 33.961885 | -119.75493 |  |  |  | X |   |
| Cat Rock           | 34.005599 | -119.41941 |  |  |  | X |   |
| Middle West        | 34.005841 | -119.39643 |  |  |  | X |   |
| S Frenchys Cove    | 34.006553 | -119.41104 |  |  |  | X |   |
| Landing Cove       | 33.481366 | -119.0292  |  |  |  | X |   |
| Sea Lion Rookery   | 33.471738 | -119.03075 |  |  |  | X |   |
| Thousand Springs   | 33.28491  | -119.52972 |  |  |  | X |   |
| Tranquility Beach  | 33.265668 | -119.4921  |  |  |  | X |   |
| Marker Poles       | 33.2187   | -119.49575 |  |  |  | X |   |
| Two Harbors        | 33.444353 | -118.49888 |  |  |  | X |   |
| Bird Rock          | 33.451665 | -118.48761 |  |  |  | X |   |
| Big Fisherman Cove | 33.446447 | -118.48526 |  |  |  | X |   |
| Goat Harbor        | 33.416797 | -118.39407 |  |  |  | X |   |
| Avalon Quarry      | 33.322    | -118.3052  |  |  |  | X |   |
| Little Harbor      | 33.385025 | -118.47524 |  |  |  | X |   |
| West Cove          | 33.014938 | -118.60614 |  |  |  | X |   |
| North Head         | 33.032867 | -118.60057 |  |  |  | X |   |
| Graduation Point   | 33.033274 | -118.5756  |  |  |  | X |   |
| Boy Scout Camp     | 33.00112  | -118.54832 |  |  |  | X |   |
| Eel Point          | 32.918007 | -118.54668 |  |  |  | X |   |

**Table 1. UCSC rocky intertidal monitoring sites in Oregon and California. (Sample Season: SP=March, April, May; SU=June, July, August; FA= October, November, December)**

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

Research activities take place in the rocky intertidal throughout the year. 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

### **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. Only the California and the Oregon/Washington outer coast stocks are found in the activity area considered under this application.

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 reduce 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).

According to the 2015 Pacific Marine Mammal Stock Assessment, the minimum population size of the California stock is 27,348 individuals and the population is estimated to number 30,968. Based on 1999 aerial surveys, the Oregon/Washington outer coast stock is estimated to number 24,732 (Carretta et al. 2016). Due to outdated survey data, there is no current minimum population size available for the Oregon/Washington stock (Carretta et al. 2016). This species is not listed under the ESA and is not a strategic species or considered depleted under the MMPA.

### **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 in an effort to reduce competition with commercial fisheries. They 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). Declines in pup production did occur during the 1983-84, 1992-93, 1997-98, and 2003 El Niño events, but production returned to pre- El Niño levels within 2-5 years (Carretta et al. 2016). In 2013, NOAA declared an Unusual Mortality Event (UME) due to the elevated number of sea lion pup strandings in southern California. The cause of this event is thought to be nutritional stress related to declines in prey availability. This UME has continued through 2016 (NMFS 2016).

According to the 2015 Pacific Marine Mammal Stock Assessment, California sea lions have a minimum population size of 153,337 individuals and the population is estimated to number 296,750 (Carretta et al. 2016). This species is not listed under the Endangered Species Act (ESA) and is not a strategic species nor 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 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).

According to the 2015 Pacific Marine Mammal Stock Assessment, the minimum population size of the California stock is 81,368 individuals and the estimated population size is 179,000 (Carretta et al. 2016, Lowry et al. 2014). This species has grown at 3.8% annually since 1988 (Lowry et al. 2014). Northern elephant seals are not listed under the ESA and are 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 of 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.

According to the 2015 Alaska Marine Mammal Stock Assessment, the minimum population size of the eastern U.S stock is 59,968 and the estimated population size is between 60,131 and 74,480 individuals (Muto et al. 2016). In 2013, the eastern U.S. stock was determined to be recovered and was delisted from the ESA (NMFS 2013) and is therefore no longer a strategic species under the MMPA.

**Incidental Harassment Authorization:**

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.

For the period of February 21, 2017 to February 20, 2018 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> )     | 90              |
| Pacific harbor seal ( <i>Phoca vitulina richardii</i> )   | 233             |
| Northern elephant seal ( <i>Mirounga angustirostris</i> ) | 60              |

**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

Categories 2 and 3 are considered Take.

**Monitoring Results**

For the period of February 21, 2017 to November 30, 2017 our research group conducted rocky intertidal surveys at 55 sites over 52 days (Table 2). During this period there were 63 takes of harbor seals. Another 119 harbor seals were observed at research sites with 11 of those exhibiting minor reactions to researchers (Table 3).

During this period there were three takes of California sea lions. Another 106 sea lions were observed at research sites with two of those exhibiting minor reactions to researchers (Table 4).

During this period, there were no takes of northern elephant seals. Six elephant seal were observed at research sites with four of those exhibiting minor reactions to researchers (Table 5).

All takes were Level B harassment only. 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 observed. Several Steller sea lions were observed on offshore rocks at Cape Arago, OR. These were far offshore and were not disturbed by researchers.

| Date      | Site               | Time      | Swell | Wind | Rain | Date       | Site                | Time      | Swell | Wind | Rain |
|-----------|--------------------|-----------|-------|------|------|------------|---------------------|-----------|-------|------|------|
| 3/7/2017  | Pigeon Point       | 1300-1330 | L     | L    | 0    | 6/24/2017  | Del Mar Landing     | 0430-0830 | M     | L    | 0    |
| 3/7/2017  | Sandhill Bluff     | 1145-1230 | L     | L    | 0    | 6/25/2017  | Stornetta           | 0500-0900 | L     | L    | 0    |
| 3/7/2017  | Diablo             | 1100-1500 | M     | M    | 0    | 6/27/2017  | Gerstle Cove        | 0700-1000 | M     | L    | 0    |
| 3/8/2017  | Scott Creek        | 1145-1600 | L     | L    | 0    | 6/27/2017  | Stewarts            | 0930-1215 | L     | L    | 0    |
| 3/9/2017  | Hopkins            | 1200-1600 | L     | L    | L    | 6/28/2017  | Stewarts            | 0630-1045 | L     | L    | 0    |
| 3/9/2017  | Piedras Blancas    | 1100-1730 | L     | M    | 0    | 7/9/2017   | Bob Creek           | 0530-1000 | L     | L    | 0    |
| 3/10/2017 | Terrace Point      | 1245-1645 | L     | L    | 0    | 7/10/2017  | Fogarty Creek       | 0615-1030 | L     | L    | 0    |
| 3/10/2017 | Rancho Marino      | 1330-1415 | M     | L    | 0    | 7/11/2017  | Cape Arago          | 0600-1000 | L     | M    | 0    |
| 4/4/2017  | Point Lobos        | 0945-1345 | M     | L    | 0    | 7/11/2017  | Eel Point           | 0600-0800 | L     | L    | 0    |
| 4/5/2017  | Stillwater Cove    | 1045-1445 | M     | L    | 0    | 7/12/2017  | West Cove           | 0615-0800 | L     | L    | 0    |
| 4/27/2017 | Carmel Point       | 0545-0830 | M     | L    | 0    | 7/24/2017  | Bodega              | 0600-0700 | L     | L    | 0    |
| 4/28/2017 | China Rocks        | 0615-0845 | M     | L    | 0    | 7/24/2017  | Chimney Rock        | 0545-0845 | L     | L    | 0    |
| 4/28/2017 | Asilomar           | 0630-0830 | M     | L    | 0    | 7/25/2017  | Bodega              | 0600-1200 | L     | L    | 0    |
| 4/29/2017 | Andrew Molera      | 0615-1245 | M     | L    | 0    | 7/26/2017  | Bodega              | 0645-0900 | L     | L    | 0    |
| 4/29/2017 | Boathouse          | 0515-0625 | M     | M    | 0    | 10/19/2017 | Pigeon Point        | 1620-1630 | M     | L    | 0    |
| 4/30/2017 | Scott Creek        | 0645-0920 | M     | L    | 0    | 10/19/2017 | Sanhill Bluff       | 1430-1800 | M     | L    | 0    |
| 5/1/2017  | Point Pinos        | 0630-1130 | M     | L    | 0    | 10/20/2017 | Terrace Point       | 1500-1730 | M     | L    | 0    |
| 5/2/2017  | Garrapata          | 0930-1230 | M     | M    | 0    | 10/21/2017 | Scott Creek         | 1400-1615 | M     | M    | 0    |
| 5/2/2017  | Soberanes          | 0945-1145 | M     | M    | 0    | 11/2/2017  | Point Lobos         | 1330-1800 | L     | L    | 0    |
| 5/3/2017  | Pebble Beach       | 1130-1255 | M     | L    | 0    | 11/3/2017  | Boathouse           | 1400-1500 | L     | L    | 0    |
| 5/3/2017  | Franklin Point     | 1120-1250 | M     | M    | 0    | 11/3/2017  | Piedras Blancas     | 1430-1745 | L     | L    | 0    |
| 5/25/2017 | Pacific Valley     | 0445-0645 | L     | L    | 0    | 11/4/2017  | Boathouse           | 1430-1630 | L     | L    | 0    |
| 5/26/2017 | Mill Creek         | 0430-0845 | L     | L    | 0    | 11/5/2017  | Point Sierra Nevada | 1315-1700 | L     | L    | 0    |
| 5/26/2017 | Damnation Creek    | 0545-1045 | L     | L    | 0    | 11/5/2017  | Rancho Marino       | 1800-1940 | L     | L    | 0    |
| 5/27/2017 | Pigeon Point       | 0530-0900 | L     | L    | 0    | 11/5/2017  | Vista Del Mar       | 1805-1840 | L     | L    | 0    |
| 5/27/2017 | False Klamath Cove | 0515-1130 | L     | L    | 0    | 11/6/2017  | Cayucos             | 1415-1800 | L     | L    | 0    |
| 5/28/2017 | Pescadero Point    | 0615-0845 | L     | L    | 0    | 11/6/2017  | Harmony Headlands   | 1445-1645 | L     | L    | 0    |
| 5/28/2017 | Ano Nuevo          | 0615-0930 | ND    | ND   | ND   | 11/6/2017  | Eel Point           | 1530-1715 | L     | L    | L    |
| 5/28/2017 | Damnation Creek    | 0545-1140 | L     | L    | 0    | 11/7/2017  | Hazards             | 1430-1800 | L     | L    | 0    |
| 5/30/2017 | Fitzgerald         | 0645-1030 | L     | H    | 0    | 11/7/2017  | West Cove           | 1500-1700 | L     | L    | 0    |
| 5/31/2017 | Burnt Hill         | 1030-1130 | L     | L    | 0    | 11/7/2017  | Hopkins             | 1545-2100 | L     | L    | 0    |
| 6/10/2017 | Shelter Cove       | 0800-0830 | M     | L    | L    | 11/8/2017  | Shell Beach         | 1545-1845 | L     | L    | 0    |
| 6/11/2017 | Cape Mendocino     | 0715-0745 | L     | L    | 0    | 11/15/2017 | South Point         | 1030-1545 | L     | L    | 0    |
| 6/12/2017 | Hopkins            | 0930-1000 | L     | L    | 0    | 11/16/2017 | South Point         | 1030-1700 | L     | L    | 0    |
| 6/12/2017 | Soberanes          | 0630-0900 | L     | L    | 0    | 11/17/2017 | Carrington Point    | 1130-1730 | L     | M    | 0    |
| 6/17/2017 | Kibesillah Hill    | 0930-1000 | L     | L    | 0    | 11/18/2017 | Ford Point          | 1200-1800 | M     | L    | 0    |
| 6/23/2017 | Sea Ranch          | 0500-0945 | L     | L    | 0    | 11/19/2017 | Johnsons Lee        | 1230-1745 | L     | L    | 0    |
| 6/23/2017 | Gerstle Cove       | 0500-0915 | M     | L    | 0    | 11/20/2017 | Carrington Point    | 1400-1645 | L     | M    | 0    |

**Table 2. Field sampling dates, sites, times, and physical conditions noted during sampling (0-none, L-low, M-moderate, H-high, ND-no data) for the period of Feb. 21, 2017 to Nov. 30 2017**

| Site               | Date      | Time | harbor seal |           |          |           |          |          |          |          | Notes |  |   |
|--------------------|-----------|------|-------------|-----------|----------|-----------|----------|----------|----------|----------|-------|--|---|
|                    |           |      | adults      |           |          |           | pups     |          |          |          |       |  |   |
|                    |           |      | 0           | 1         | 2        | 3         | 0        | 1        | 2        | 3        |       |  |   |
| Andrew Molera      | 4/29/2017 | 0900 | 1           |           |          |           |          |          |          |          |       |  | In water offshore of site   |
| Point Pinos        | 5/1/2017  | 0940 | 1           | 1         |          | 7         |          |          | 1        |          |       |  | On reef at and adjacent to site, observed researchers. Small group flushed      |
| Franklin Point     | 5/3/2017  | 1130 |             | 3         |          | 7         |          |          |          |          |       |  | On reef, flushed to water when researchers approached                           |
| Pebble Beach       | 5/30/2017 | 1130 | 30          |           |          |           |          |          |          |          |       |  | On reef 100 meters downcoast of site  |
| Fitzgerald         | 5/30/2017 | 0645 | 40          |           |          | 8         |          |          |          |          |       |  | Large group on beach upcoast of site, 8 flushed while researchers accessed site |
| Shelter Cove       | 6/10/2017 | 0800 |             | 2         |          | 10        |          |          |          |          |       |  | On reef, flushed to water when researchers approached                           |
| Kibesillah Hill    | 6/17/2017 | 0945 | 2           |           |          |           |          |          |          |          |       |  | On reef adjacent to site  |
| Del Mar Landing    | 6/24/2017 | 0600 | 2           | 3         |          |           |          |          |          |          |       |  | On reef adjacent to site  |
| Stornetta          | 6/25/2017 | 0815 | 1           |           |          |           |          |          |          |          |       |  | In water offshore of site   |
| Point Arena        | 6/26/2017 | 0545 |             |           |          | 1         |          |          |          |          |       |  | On reef, flushed to water when researchers approached                           |
| Point Arena        | 6/26/2017 | 0800 |             | 2         |          |           |          |          |          |          |       |  | On reef, observed researchers   |
| Fogarty Creek      | 7/10/2017 | 0630 | 20          |           |          | 5         |          |          |          |          |       |  | On reef, small group flushed to water when researchers approached               |
| Bodega             | 7/24/2017 | 0630 |             |           |          | 20        |          |          |          |          |       |  | On reef, flushed to water when researchers approached                           |
| Bodega             | 7/25/2017 | 0630 |             |           |          | 5         |          |          |          |          |       |  | On reef, flushed to water when researchers approached                           |
| Boathouse          | 11/4/2017 | 1630 | 10          |           |          |           |          |          |          |          |       |  | On offshore rocks   |
| Shell Beach        | 11/8/2017 | 1600 | 1           |           |          |           |          |          |          |          |       |  | In water offshore of site   |
| <b>Totals</b>      |           |      | <b>108</b>  | <b>11</b> | <b>0</b> | <b>63</b> | <b>0</b> | <b>1</b> | <b>0</b> | <b>0</b> |       |  |   |
| <b>Total Takes</b> | <b>63</b> |      |             |           |          |           |          |          |          |          |       |  |   |

**Table 3. 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)**

| Site               | Date      | Time | California sea lion |          |          |          |          |          |          |          | Notes    |  |   |
|--------------------|-----------|------|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|--|---|
|                    |           |      | adults              |          |          |          | pups     |          |          |          |          |  |   |
|                    |           |      | 0                   | 1        | 2        | 3        | 0        | 1        | 2        | 3        |          |  |   |
| Franklin Point     | 5/3/2017  | 1145 |                     |          |          | 2        |          |          |          |          |          |  | On reef, flushed to water when researchers approached         |
| Kibesillah Hill    | 6/17/2017 | 0945 |                     | 2        |          |          |          |          |          |          |          |  | Males on reef adjacent to site. Observed researchers          |
| Del Mar Landing    | 6/24/2017 | 0830 | 1                   |          |          |          |          |          |          |          |          |  | On reef adjacent to site                                      |
| Cape Arago         | 7/11/2017 | 0600 | 100                 |          |          | 1        |          |          |          |          |          |  | 100+ on offshore rocks. One sea lion on site flushed to water |
| Eel Point          | 7/11/2017 | 0800 | 2                   |          |          |          |          |          |          |          |          |  | In water offshore of site                                     |
| Shell Beach        | 11/8/2017 | 1600 | 1                   |          |          |          |          |          |          |          |          |  | In water offshore of site                                     |
| <b>Totals</b>      |           |      | <b>104</b>          | <b>2</b> | <b>0</b> | <b>3</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> |  |   |
| <b>Total Takes</b> | <b>3</b>  |      |                     |          |          |          |          |          |          |          |          |  |   |

**Table 4. 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)**

| Site               | Date      | Time | northern elephant seal |          |          |          |                |          |          |          | Notes    |          |   |
|--------------------|-----------|------|------------------------|----------|----------|----------|----------------|----------|----------|----------|----------|----------|---|
|                    |           |      | adults                 |          |          |          | pups (*weaned) |          |          |          |          |          |   |
|                    |           |      | 0                      | 1        | 2        | 3        | 0              | 1        | 2        | 3        |          |          |   |
| Piedras Blancas    | 3/9/2017  | 1600 | 1                      | 1        |          |          |                |          |          |          |          |          | Adult males adjacent to site                    |
| Chimney Rock       | 7/24/2017 | 0830 |                        | 3        |          |          |                |          |          |          |          |          | In water offshore of site, observed researchers |
| Harmony Headlands  | 11/6/2017 | 1500 | 1                      |          |          |          |                |          |          |          |          |          | In water offshore of site                       |
| <b>Totals</b>      |           |      | <b>2</b>               | <b>4</b> | <b>0</b> | <b>0</b> | <b>0</b>       | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> |   |
| <b>Total Takes</b> | <b>0</b>  |      |                        |          |          |          |                |          |          |          |          |          |   |

**Table 5. 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)**

## **References**

- Allen, B.M. and R.P. Angliss. 2014. Alaska marine mammal stock assessments, 2013. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-277: 294.
- Barlow, J., R.L. Brownell, Jr., D.P. DeMaster, K.A. Forney, M.S. Lowry, S. Osmek, T.J. Ragen, R.R. Reeves, and R.J. Small. 1995. U.S. Pacific marine mammal stock assessments: 1995. NOAA Technical Memorandum NMFSSWFSC-219: 162.
- Bonnot, P. 1928. Report on the seals and sea lions of California. Fish Bulletin 14. California Division of Fish and Game.
- Carretta, J.V., K.A. Forney, E. Olsen, K. Martien, M.M. Muto, M.S. Lowry, J. Barlow, J. Baker, D. Johnston, B. Hanson, D. Lynch, L. Carswell, R.L. Brownell Jr., J. Robbins, D.K. Mattila, K. Ralls, and M.C. Hill. 2010. U.S. Pacific marine mammal stock assessments: 2009. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-453: 336.
- Carretta, J.V., E. Oleson, J. Baker, D.W. Weller, A.R. Lang, K.A. Forney, M.M. Muto, B. Hanson, A.J. Orr, H. Hubet, M.S. Lowry, J. Barlow, J.E. Moore, D. Lynch, L. Carswell, and R. L. Brownell Jr. 2016. U.S. Pacific marine mammal stock assessments: 2015. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-SWFSC-561: 419.
- Loughlin, T. R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. Pp. 329-341 In A. Dizon, S. J. Chivers, and W. Perrin (eds), Molecular genetics of marine mammals, incorporating the proceedings of a workshop on the analysis of genetic data to address problems of stock identity as related to management of marine mammals. Society of Marine Mammals, Spec. Rep. No. 3.
- M. M. Muto, V. T. Helker, R. P. Angliss, B. A. Allen, P. L. Boveng, J. M. Breiwick, M. F. Cameron, P. J. Clapham, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Sheldon, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2016. Alaska marine mammal stock assessments, 2015. U.S. Dep. Commerce., NOAA Technical Memorandum. NMFS AFSC-323, 300.
- National Marine Fisheries Service (NMFS). 2013. Endangered and threatened species: delisting of the eastern distinct population segment of Steller sea lion under the Endangered Species Act; amendment to special protection measures for endangered marine mammals/Final rule. Federal Register 78: 66140-66199.

National Marine Fisheries Service (NMFS). 2016, March 17. 2013-2016 California sea lion unusual mortality event in California. Retrieved from <http://www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm>

Pitcher, K.W., P.F. Olesiuk, R.F. Brown, M.S. Lowry, S.J. Jeffries, J.L. Sease, W. L. Perryman, C.E. Stinchcomb, and L.F. Lowry. 2007. Status and trends in abundance and distribution of the eastern Steller sea lion (*Eumetopias jubatus*) population. Fisheries Bulletin 107: 102-115

Reeves, R.R., B.S. Stewart, P.J. Clapham, J.A. Powell. 2002. National Audubon Society: Guide to Marine Mammals of the World. Alfred A. Knopf, New York.

Stewart, B.S., B.J. Le Boeuf, P.K. Yochem, H.R. Huber, R.L. DeLong, R.J. Jameson, W. Sydeman, and S.G. Allen. 1994. History and present status of the northern elephant seal population. In: B.J. Le Boeuf and R.M. Laws (eds.) Elephant Seals. Univ. Calif. Press, Los Angeles.