

**Request for Marine Mammal Protection Act
Incidental Harassment Authorization**

Rocky Intertidal Monitoring

Submitted by:

**Partnership for Interdisciplinary Studies of Coastal Oceans
University of California Santa Cruz
Center for Ocean Health
100 Shaffer Road
Santa Cruz, CA 95060**



To:

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



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July 8, 2013

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

Dear Permits, Conservation, and Education Division,

Our research group at the University of California Santa Cruz is requesting a renewal of our 2013 Incidental Harassment Authorization (IHA) under the Marine Mammal Protection Act. If approved, this IHA would allow the incidental harassment of a small number of pinnipeds during rocky intertidal monitoring surveys from December 2013-December 2014.

Our research takes place at rocky intertidal sites ranging from Alaska to Mexico and we are requesting that this IHA cover our research activities in Oregon and California. Although rare, hauled-out pinnipeds are encountered by researchers at some of our monitoring sites. In these instances, researchers have remained at a distance great enough to avoid disturbing any hauled-out pinnipeds and have either waited for the animals to vacate the area or have left the site and rescheduled surveys. Each of our sites is generally sampled one to two times per year and sampling must be scheduled during a negative low tide series. Sampling often involves overnight travel and multiple sampling teams are often working in different geographic regions concurrently. Due to the increasing number and geographic range of our monitoring sites, it has become financially and logistically difficult to postpone and reschedule sampling of a site due to the presence of pinnipeds. This IHA is being requested to allow our researchers to continue to conduct rocky intertidal monitoring at sites where pinnipeds are present. Every effort will still be made to avoid disturbing pinnipeds when possible.

We are requesting that this IHA be valid for use by the following UC Santa Cruz researchers:

Karah Ammann- research specialist
Laura Anderson-research specialist
Christy Bell- research specialist
Nathaniel Fletcher- research specialist
Rani Gaddam- research specialist
Maya George- research specialist
David Lohse - assistant project scientist
Melissa Miner- research specialist
Monica Moritsch – graduate student
Kristin De Nesnera- graduate student
Daniel Orr- research specialist
Pete Raimondi- PI
Melissa Redfield- research specialist
Rachael Williams- research specialist
Sara Worden- research specialist

All research is conducted under the direction of Dr. Pete Raimondi- Professor and Chair of Ecology and Evolutionary Biology Department, UC Santa Cruz.

Sincerely,



Nathaniel Fletcher
Assistant Research Specialist
UC Santa Cruz



Pete Raimondi
Professor and Chair
Department of Ecology and Evolutionary Biology
UC Santa Cruz

1. Detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals:

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

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 made available to the public through outreach and educational programs.

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

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:

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. 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 and 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 they reside in. Such information provides managers with insight into the causes and consequences of changes in species abundance. Such changes in species and their habitats result from human or

non-human factors and form 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. Biodiversity surveys are part of a long-term monitoring project with sites ranging from Southeast Alaska to Baja California Sur, Mexico. Biodiversity surveys are conducted every 3-5 years at established sites. In addition, biodiversity surveys are a component of our Marine Protected Area (MPA) baseline monitoring and Wave Energy Conversion Device (WECD) baseline monitoring (described below). Table 2 lists established biodiversity sites in Oregon and California. For more information on sites and protocols please visit www.pacificrockyintertidal.org.

Marine Protected Area Baseline Monitoring

In September of 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, PISCO established additional intertidal monitoring sites within the Central Coast (Table 3), North Central Coast (Table 4), and South Coast (Table 5) study regions. Baseline characterization of MPAs involves sampling of new sites as well as established sites both within and outside of MPAs. These sites were sampled using existing community structure and biodiversity survey protocols for consistency, and to ensure that adequate baseline data were collected both at the newly established MPAs and at appropriate reference locations. Resampling of newly established sites may take place every 5 years as part of future MPA evaluation.

We anticipate the establishment and sampling of additional sites in the North Coast Study Region as part of the North Coast MPA Baseline Program. Although specific site locations are unknown at this time, we expect sampling to occur both within and outside the following MPAs:

Pyramid Point SMCA
Point St. George Reef
Offshore SMCA
Reading Rock SMR
Reading Rock SMCA
Samoa SMCA
South Humboldt Bay
SMRMA

South Cape Mendocino SMR
Mattole Canyon SMR
Sea Lion Gulch SMR
Big Flat SMCA
Double Cone Rock SMCA
Ten Mile SMR
Ten Mile Beach SMCA
Ten Mile Estuary SMCA

MacKerricher SMCA
Point Cabrillo SMR
Russian Gulch SMCA
Big River Estuary SMCA
Van Damme SMCA
Navarro River Estuary
SMCA

Site	Latitude (dd)	Longitude (dd)	Samples/year	Sampling seasons
Ecola (Oregon)	45.91809	-123.98031	1	July
Fogarty Creek (Oregon)	44.83684	-124.05875	1	July
Bob Creek (Oregon)	44.24456	-124.11443	1	July
Cape Arago (Oregon)	43.30894	-124.40077	1	June/July
Burnt Hill (Oregon)	42.22814	-124.38786	1	May/June/July
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
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	2	March/April, 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
Oculto	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, location, sampling frequency, and months sampled

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

Table 2. Biodiversity Survey sites and locations in Oregon and California

Site	Latitude (dd)	Longitude (dd)
Point Arena	38.9433714	-123.73301
Moat Creek	38.8809149	-123.67475
Saunders Reef	38.8613795	-123.65361
Del Mar Landing	38.7405128	-123.51086
Phillips Gulch	38.5858523	-123.34147
Gerstle Cove	38.5661362	-123.32919
Windermere Point	38.5239429	-123.26747
North Jenner Beach	38.4561761	-123.14244
Bodega Head	38.3031581	-123.05261
Chimney Rock	37.9938296	-122.96729

Table 3. North Central Coast MPA Baseline Monitoring Program sites

Site	Latitude (dd)	Longitude (dd)
Año Nuevo	37.1126	-122.32957
Davenport Landing	37.0223	-122.21537
Wilder Ranch	36.956083	-122.10405
Natural Bridges	36.949033	-122.06113
Point Piños	36.63796	-121.93758
China Rocks	36.60567	-121.95975
Pescadero Point	36.56109	-121.95436
Garrapata	36.46904	-121.93444
Lucia	36.0143833	-121.5405
Duck Pond	35.85942	-121.42263
Piedras Blancas	35.66568	-121.28653
San Simeon Point	35.63485	-121.19577
Vista del Mar	35.60434	-121.14227
Diablo	35.22665	-120.87367

Table 4. Central Coast MPA Baseline Monitoring Program sites

Site	Latitude (dd)	Longitude (dd)
Ellwood	34.4347	-119.949
Point Vicente	33.741	-118.4115
Abalone Cove	33.7379	-118.3758
Cardiff Reef	32.8476	-117.279
Wind and Sea	32.8142	-117.2733
Sea Ridge	32.6829	-117.2496
Navy North	32.6829	-117.2496

Table 5. South Coast MPA Baseline Monitoring Program 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 6).

Ocean Acidification:

The Ocean Margin Ecosystems Group for Acidification Studies (OMEGAS) is a National Science Foundation funded project that 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 6). The intention of this project is to monitor oceanic pH on large spatial and temporal scales and to determine if any relationship exists between changing ocean chemistry and the state of intertidal calcifying organisms. The project involves field experiments as well as lab studies. The field component entails 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. Currently these sites are visited 2-3 times per month for sampling and equipment maintenance.

Site	Latitude (dd)	Longitude (dd)
Terrace Point	36.94841	-122.06457
Hopkins	36.6212	-121.9073
Soberanes	36.44787	-121.92874

Table 6. Intertidal Recruitment and Ocean Acidification monitoring sites and location

Wave Energy Conversion Device Baseline Project:

Beginning in the summer of 2013 our research group will sample eight sites along the Oregon coast using a combination of community structure and biodiversity survey methods. This sampling will be used to establish a 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 will occur at the five existing Oregon sites and at three additional sites (Table 7) during the summers of 2013 and 2014.

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

Table 7. Oregon Wave Energy Conversion Device baseline monitoring sites

2. Date(s) and duration of such activity and the specific geographical region where it will occur:

Our research is conducted throughout the year along the California and Oregon coasts and will continue indefinitely. Most sites are sampled one to two times per year over a one day period (4-6 hours) during a negative low tide series. Details for site locations and sampling seasons are described above in Question 1. Due to the large number of research sites, scheduling constraints, the necessity for negative low tides and favorable weather/ocean conditions, exact survey dates are variable and difficult to predict.

3. Species and numbers of marine mammals likely to be found within the activity area:

Research activities take place in the rocky intertidal at sites ranging 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.
- 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*)

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 and additional animals were likely outside of the census area or were at sea during the time of the survey (Carretta et. al. 2013). The number of sea lions found at any one of our study sites is variable and often no California sea lions are observed during sampling.

Harbor seal (*Phoca vitulina richardii*)

The most recent census of the California stock of harbor seals occurred in May and June of 2009. This census counted 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). At several sites harbor seals are often observed and have the potential to be disturbed by researchers accessing or sampling the site. The largest number of harbor seals occurs at Hopkins where often 20-30 adults and occasionally 10-15 pups are hauled-out on a small beach adjacent to the site.

Northern elephant seal (*Mirounga angustirostris*)

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). During our research activities, the maximum number of Northern elephant seals observed at a single site was at least 10 adults plus an unknown number of pups. These were observed off-shore of Piedras Blancas. Five adults and five pups have been observed in the vicinity of our site at Piedras Blancas and one elephant seal has been observed at Pigeon Point. Elephant seals are very rarely observed during research activities.

Steller sea lion (*Eumetopias jubatus*)

Counts at rookery and haul-out sites in 2009 found a total of 2,479 Steller sea lions (891 pups and 1,588 adults) in California and 1,418 pups in Oregon. Adult counts in Oregon in 2002 found 4,169 individuals (Allen and Angliss 2013). During our research activities, the maximum number of Steller sea lions observed at a single site was five. These were observed hauled out at Cape Arago, Oregon. Steller sea lions are very rarely observed during research activities and therefore they do not pose an issue for site access and sampling. In the case that Steller sea lions are present at a site, sampling will be abandoned and rescheduled for a later date. Prior to accessing a site, researchers will observe the site from a distance to insure that no Steller sea lions are present. At Cape Arago, OR, the site is easily observable from a vista point on a bluff overlooking the site.

4. Description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities:

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 US/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).

According to the 2012 Pacific Marine Mammal Stock Assessment, California sea lions have reached a minimum population size of 153,337 individuals with an estimated population size of 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 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. 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 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).

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. No current estimation of annual growth rate has been made (Carretta et. al. 2013). The Oregon/Washington outer coast stock has an estimated population size of 24,732. Due to outdated aerial survey data, there is no current minimum population size available. The stock is growing at a maximum annual rate of 12% (Carretta et. al. 2010). Neither stock is listed under the Endangered Species Act 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 and 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).

According to the 2012 Pacific Marine Mammal Stock Assessment, the minimum population size of the California stock is 74,913 with an estimated population size of 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 Endangered Species Act 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 the range and even 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).

According to the 2012 Alaska Marine Mammal Stock Assessment, the minimum population size of the eastern Steller sea lion stock is 52,847 with an estimated

population size of 58,334 to 72,223 individuals (Allen and Angliss 2013). The eastern US stock of the species is currently listed as threatened under the ESA and therefore is considered depleted and a strategic species under the MMPA.

5. Type of incidental taking authorization that is being requested and the method of incidental taking:

An Incidental Harassment Authorization (IHA) is being requested. Research activities may result in disturbance of pinnipeds by the presence of humans in haul-out habitats only. Any incidental take will be Level B Harassment only (take by incidental harassment).

6. Number, by age, sex, and reproductive condition (if possible), of marine mammals (by species) that may be taken and the number of times such takings by each type of taking are likely to occur:

For the purpose of this IHA, only Oregon and California sites that are frequently sampled and have a marine mammal presence that poses a problem for site access and/or sampling were used for take estimates. Steller sea lions are not included in take estimates as they will not be disturbed by researchers or research activities.

Take estimates were based on marine mammal observations from each site. Marine mammal observations are done as part of our site observations which include notes on physical and biological conditions at the site. The maximum number of marine mammals, by species, seen at any given time throughout the sampling day is recorded at the conclusion of sampling. A marine mammal is counted if it is seen on access ways to the site, at the site, or immediately upcoast or downcoast of the site. Marine mammals in the water immediately offshore are also recorded. Any other relevant information including the location of a marine mammal relevant to the site, any unusual behavior, and the presence of pups is also noted.

These observations formed the basis from which researchers with extensive knowledge and experience at each site estimated the actual number of marine mammals that may be subject to take. In most cases the number of takes is based on the maximum number of marine mammals that have been observed at a site throughout the history of the site (2-3 observation per year for 5-10 years or more) (Table 8).

	California sea Lion						harbor seal						Northern elephant seal					
	adult			pup			adult			pup			adult			pup		
	# Takes/event	Events/year	Total # Takes	# Takes/event	Events/year	Total # Takes	# Takes/event	Events/year	Total # Takes	# Takes/event	Events/year	Total # Takes	# Takes/event	Events/year	Total # Takes	# Takes/event	Events/year	Total # Takes
Fogarty Creek	0	0	0	0	0	0	20	1	20	2	1	2	0	0	0	0	0	0
Cape Arago	20	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kibesillah Hill	0	0	0	0	0	0	5	1	5	0	0	0	0	0	0	0	0	0
Sea Ranch	5	1	5	0	0	0	5	1	5	0	0	0	0	0	0	0	0	0
Chimney Rock	5	1	5	0	0	0	0	0	0	0	0	0	5	1	5	0	0	0
Bodega	0	0	0	0	0	0	10	1	10	0	0	0	0	0	0	0	0	0
Pebble Beach	0	0	0	0	0	0	25	1	25	5	1	5	0	0	0	0	0	0
Pigeon Point	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
Franklin Point	0	0	0	0	0	0	5	1	5	1	1	1	0	0	0	0	0	0
Hopkins	0	0	0	0	0	0	10	20	200	0	0	0	0	0	0	0	0	0
Stillwater	5	2	10	0	0	0	5	2	10	2	1	2	0	0	0	0	0	0
Point Piños	0	0	0	0	0	0	10	1	10	2	1	2	0	0	0	0	0	0
Carmel Point	0	0	0	0	0	0	5	1	5	2	1	2	0	0	0	0	0	0
Piedras Blancas	10	2	20	0	0	0	5	2	10	0	0	0	10	2	20	5	2	10
Occulto	0	0	0	0	0	0	5	2	10	0	0	0	0	0	0	0	0	0
Government Point	0	0	0	0	0	0	10	2	20	0	0	0	0	0	0	0	0	0
Totals			60			0			335			14			26			10

Table 8. Anticipated number of takes by event, species, and age, at sites where incidental takes are most likely to occur

Fogarty Creek (N 44.83684, W 124.05875): This site is visited once per year in July for community structure monitoring. There is often a small group of adult harbor seals along with several pups in the vicinity of and hauled-out at the site that may be disturbed by the presence of researchers.

Cape Arago (N 43.30894, W 124.40077): This site is visited once per year in June or July for community structure monitoring. In 2009 there was a large group of California sea lions in the vicinity of and hauled-out at this site. Since then only a small group of sea lions has been observed in the area. This group may be disturbed by the presence of researchers in the area. Some of these individuals may also need to be flushed to gain access to the plots within the site.

Kibesillah Hill (N 39.60412, W 123.78887): This site is visited once per year in June or July for community structure monitoring. A small group of adult harbor seals is often hauled-out at this site and may be disturbed by the presence of researchers.

Sea Ranch (N 38.7305, W 123.48864): This site is visited once per year in June or July for community structure monitoring. A small group of adult harbor seals as well as adult California sea lions is often hauled-out at this site and may be disturbed by the presence of researchers.

Chimney Rock (N 37.9938296, W 122.96729): This site is a North Central Coast MPA site that may be resampled in the future. A small group of adult California sea lions and a small group of adult elephant seals has been observed hauled-out in the vicinity of this site and they may be disturbed by the presence of researchers accessing the site.

Bodega (N 38.3182, W 123.07365): This site is visited once per year in June or July for community structure monitoring. A small group of adult harbor seals is often observed hauled-out at this site and may be disturbed by the presence of researchers. Some of these individuals may also need to be flushed to gain access to the plots within the site.

Pebble Beach (N 37.23263, W 122.41607): This site is visited once per year in the spring for components of community structure monitoring. A group of adult harbor seals and pups is often hauled-out at this site and may be disturbed by the presence of researchers. Some of these individuals may also need to be flushed to gain access the plots within the site.

Pigeon Point (N 37.18361, W 122.39529): This site is visited once per year in the spring for components of community structure monitoring. Occasionally, one adult elephant seal has been observed hauled-out along an access way to the site. This individual may be disturbed by the presence of researchers accessing the site.

Franklin Point (N 37.1495, W 122.36101): This site is visited once per year in the spring for components of community structure monitoring. A small group of harbor seals is often hauled-out at this site and may be disturbed by the presence of researchers.

Hopkins (N 36.6212, W 121.9073): This site is visited twice per year for community structure monitoring as well as 2-3 times per month for ocean acidification and recruitment sampling. A group of adult harbor seals is often hauled-out adjacent to and on this site. This group may be disturbed by the presence of researchers accessing the site. Recent changes to site access have reduced the likelihood of disturbing this group of harbor seals. Note: Terrace Point and Soberanes are also visited 2-3 times per month, but do not have a marine mammal presence and, therefore, no takes are anticipated at these sites.

Point Piños (N 36.63796, W 121.93758): This site is visited once per year in the spring for community structure monitoring. There is often a small group of adult harbor seals along with several pups in the vicinity of and hauled-out at the site that may be disturbed by the presence of researchers.

Stillwater (N 36.56087, W 121.94053): This site is visited twice per year in the spring and fall for components of community structure monitoring. A small group of adult

harbor seals along with a several pups is often hauled-out at this site and may be disturbed by the presence of researchers. Occasionally, several California sea lions are also hauled-out in the vicinity of the site.

Carmel Point (N 36.54376, W 121.93412): This site is visited once per year in the spring for components of community structure monitoring. There is often a small group of adult harbor seals along with several pups in the vicinity of and hauled-out at the site that may be disturbed by the presence of researchers.

Piedras Blancas (N 35.66493, W 121.28699): This site is visited twice per year in the spring and fall for community structure monitoring. There is often a large group of adult elephant seals offshore of the site. A small group of adults and pups is occasionally hauled-out adjacent to the site and may be disturbed by the presence of researchers. A small group of adult harbor seals and California sea lions are also present at this site and may be disturbed by the presence of researchers.

Occulto (N 34.88122, W 120.63954): This site is visited twice per year in the spring and fall for community structure monitoring. Recently there has been a small group of adult harbor seals hauled-out on rocks just offshore of the site. This group may be disturbed by the presence of researchers.

Government Point (N 34.44334, W 120.45655): This site is visited twice per year in the spring and fall for community structure monitoring. There is often a small group of adult harbor seals in the vicinity of and hauled-out at the site that may be disturbed by the presence of researchers.

7. Anticipated impact of the activity upon the species or stock:

Affected marine mammals would only be disturbed by the presence of researchers in the rocky intertidal or along access ways to rocky intertidal sites. Research activities at regularly sampled sites do not take place at any major marine mammal rookeries so very few breeding individuals or pups are likely to be impacted. Efforts will be made to approach any site where marine mammals may be present with caution in an attempt to avoid the stampeding of hauled-out individuals towards the water. Hauled-out pinnipeds may still be flushed to the water and may avoid the area while researchers are present. This type of disturbance will likely have only minimal short-term effects on the individual animals affected. No long term effects on disturbed individuals are expected as they may return to the site from which they were disturbed within 30 minutes of the departure of researchers (Allen et. al. 1985) or are likely to haul-out in a non-disturbed area (Schneider and Payne 1983). In addition, very few pinnipeds have been encountered at our research sites and most sites are only visited for a one day period, 1-2 times per year, therefore it is unlikely that an individual pinniped will be taken repeatedly in a given year. For these reasons, there is no anticipated long-term impact on affected marine mammal stocks.

8. Anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses:

There is no impact on subsistence uses as activities will not take place in areas where subsistence hunting occurs.

9. Anticipated impact of the activity upon the habitat of the marine mammal populations and the likelihood of restoration of the affected habitat:

Our research activities take place in the rocky intertidal, which can be used as a haul-out site for pinnipeds. The only potential adverse impact to this habitat would be due to the placement of permanent bolts and other sampling equipment in the intertidal. Bolts are installed during the set-up of a site. In some instances, bolts will need to be replaced or installed for new plots. Bolts are 2" to 5" long, stainless steel 3/8" Hex or Carriage bolts. They are installed by drilling a hole with a battery powered DeWalt 24v rotary hammer drill with a 3/8" bit. The bolts protrude 1/2"-3" above the rock surface and are held in place with marine epoxy. Although the drill does produce noticeable noise, we have never observed an instance where nearby marine mammals were disturbed by it. Any marine mammal at the site would likely be disturbed by the presence of researchers and retreat to a distance where the noise of the drill would not increase the disturbance. In most instances wind and wave noise also drown out the noise of the drill. The installation of bolts and other sampling equipment is conducted under the appropriate permits (Monterey Bay National Marine Sanctuary, California State Parks). Once a particular study has ended, the respective sampling equipment is removed. No trash or field gear is left at a site.

10. Anticipated impact of the loss or modification of the habitat on the marine mammal populations involved:

There is no anticipated impact of the loss or modification of marine mammal habitat.

11. Availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance:

In order to reduce the impact of research activities on affected marine mammal species and stocks, researchers will abide by the following mitigation measures. When possible, researchers will observe a site from a distance to detect any marine mammals prior to approaching the site. Researchers will approach a site with caution (slowly and quietly) to avoid surprising any hauled-out individuals and to reduce the stampeding of individuals towards the water. If it is possible to avoid pinnipeds along access ways to sites, by locating and taking a different access way, researchers will do so. Researchers will maintain the minimum legal distance from any marine mammal while conducting research, unless it is absolutely necessary to flush a marine mammal in order to continue conducting research (i.e. if a site can not be accessed or sampled due to the presence of pinnipeds). It may be unavoidable to flush hauled-out pinnipeds if they are hauled-out

within plots or sampling areas. Researchers will observe offshore waters for predators prior to flushing any marine mammal and flushing will be avoided if predators are observed. In addition, intentional flushing will be avoided if pups are present. Any site where Steller sea lions are present will not be approached and will be sampled at a later date. Researchers will promptly vacate a site at the conclusion of sampling.

It should be noted that UCSC, in collaboration with PISCO and MARINe, has been conducting rocky intertidal research for over 20 years and during this time very few sites have been unsamplable due to the presence of pinnipeds and encountering pinnipeds at sites is rare. When pinnipeds have been present at a site, researchers have left the site in order to avoid any disturbance and have rescheduled sampling of the impacted site. Due to the increasingly large number and extensive geographic range of sites, as well as scheduling constraints (sites can only be sampled during negative low tides) it has become economically and logistically difficult to reschedule sampling due to marine mammal presence. Researchers will continue to avoid marine mammals whenever feasible.

12. Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses:

Not applicable. No activities will take place in or near subsistence hunting areas, nor will they affect the availability of species or stocks for subsistence uses.

13. The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity:

Species and numbers, by age and sex when possible, of any marine mammals subjected to incidental take, along with the location, date, and time of the event, will be recorded and reported to NMFS. For consistency, any reactions by pinnipeds to researchers will be recorded according to a three point scale (1= reaction not considered harassment; 2 = moving greater than 1 meter or a behavior considered harassment, but not flushing; 3 = flushing). In addition, observations regarding the number and species of any marine mammals observed, either in the water or hauled-out, at or adjacent to a site, are recorded as part of field observations during research activities. Information regarding physical and biological conditions pertaining to a site, as well as the date and time that research was conducted are also noted. This information will be incorporated into a report for NMFS.

14. Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects:

At most sites, research activities will occur for a single day, one to two times per year, unless otherwise necessary, reducing the likelihood of disturbing the same individual more than once. In the case that a particular site becomes problematic due to a large number of marine mammals, researchers will attempt to coordinate sampling with any other research group using the site. Any future research occurring on the Channel Islands, Farrallon Islands or Año Nuevo Island will be coordinated with researchers who regularly work in these areas in order to both gain access and reduce the amount of disturbance to marine mammals as well as birds and sensitive habitat. In the case that a new site or sampling area falls within a known marine mammal haul-out, researchers will attempt to conduct sampling during a time of year when marine mammals are least likely to be present.

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