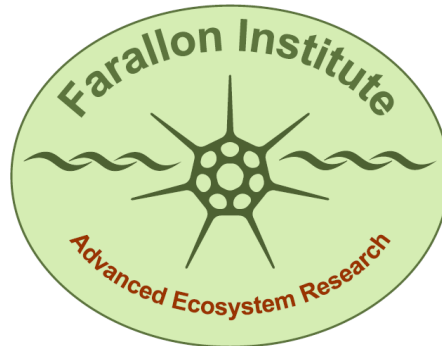


Seabirds and Marine Mammals on the NMFS Juvenile Rockfish – Ecosystem Survey: 2013 Data Report

William J. Sydeman, PI
Sophie Webb, Observer
Marcel Losekoot, Analyst



Farallon Institute,
101 H Street, Suite Q,
Petaluma, CA 94952
www.faralloninstitute.org

27 February 2014

Introduction

Seabird and marine mammal observations are an integral part of the NMFS Juvenile Rockfish – Ecosystem Survey (JRES) research program, providing data valuable on several fronts: 1) measurements provide an upper trophic level perspective to complement the oceanographic, lower-, mid-trophic level data collected by NMFS; 2) estimates of seabird and marine mammal abundance, diversity and distribution may contribute to various aspects of ecosystem and fisheries management; and, 3) by extending our existing time series (now 15 years and counting), measuring annual variation in the seabird community contributes to understanding the effects of climate variability and change on the California Current ecosystem. This data report summarizes the at-sea survey observations made during the 2013 NMFS JRES cruise, and presents basic distribution and abundance estimates for seabirds and mammals. A total of 2494 km (748 km²) of ocean habitat was surveyed over a period of 22 days.

Methods

At-sea observations are made continuously during daylight ship transits between trawl and hydrographic stations. The observer, located on the bridge approximately 15 meters above sea level, uses hand-held binoculars to assist in the identification and enumeration of birds and mammals. The observer records all bird seen within a 300 meter strip transect to one side of the

vessel while the ship is underway at > 5 knots. Marine mammals are surveyed out to the horizon. Observations are entered into a portable computer using the dedicated application “Dlog”; the ship’s position is automatically recorded every 10 seconds using an external GPS. Each observation includes the species, the number of individuals observed, and their behavior (mostly flying or sitting for birds). At-sea observation data are post-processed using standardized species codes, validation of positioning data, and binning of observations into along-track sections of 3 km in length. The data are then integrated into a survey database containing data from May 1996 to the present. These data are used to derive the summary statistics reported herein.

Species data are presented for both the core region, and the extended region surveyed since 2004 (see Sakuma et al. 2006); relevant seabird species are listed in Table 2. Taxa excluded from this summary include fish, terrestrial birds, and most shorebirds with the exception of phalaropes which are largely pelagic. Species density is calculated as the total number of individuals observed per species divided by the area (km²) surveyed. Mammal abundance is estimated as the number of individuals observed by the distance surveyed (100 km). The distribution of seabirds and mammals is illustrated by plotting abundance at each bin’s center position. Abundance is represented by a circle whose diameter is scaled using the Jenks method in ArcGIS version 9.3.

Results

A summary of survey effort is shown in Table 1. The areas surveyed and transects are shown in Figure 1 and Figure 2. A summary of species observations is shown in Table 2 (seabirds) and Table 3 (mammals). Spatial distribution maps for overall seabird density and mammal encounter rate (all species) are shown in Appendix 1. A detailed species list is provided in Appendix 2.

Table 1. Summary of survey effort, seabird and mammal community statistics.

Annual Survey Summary	Core region	Extended region	Total
Survey Vessel			-
Start Date	5/9/2013	5/9/2013	5/9/2013
End Date	6/5/2013	6/5/2013	6/5/2013
Survey Days	20	3	22
Distance Surveyed (km)	2099	395	2494
Area Surveyed (birds; km ²)	630	118	748
Number of Bird Species Obs.	31	15	35
Overall Bird Density (per km ²)	31.97	10.91	28.63
Total Birds Observed	20134	1293	21427
Number of Mammal Species	10	9	11
Overall Mammal Encounter Rate (per 100 km surveyed)	19.7	30.6	21.4
Total Mammals Observed	413	121	534

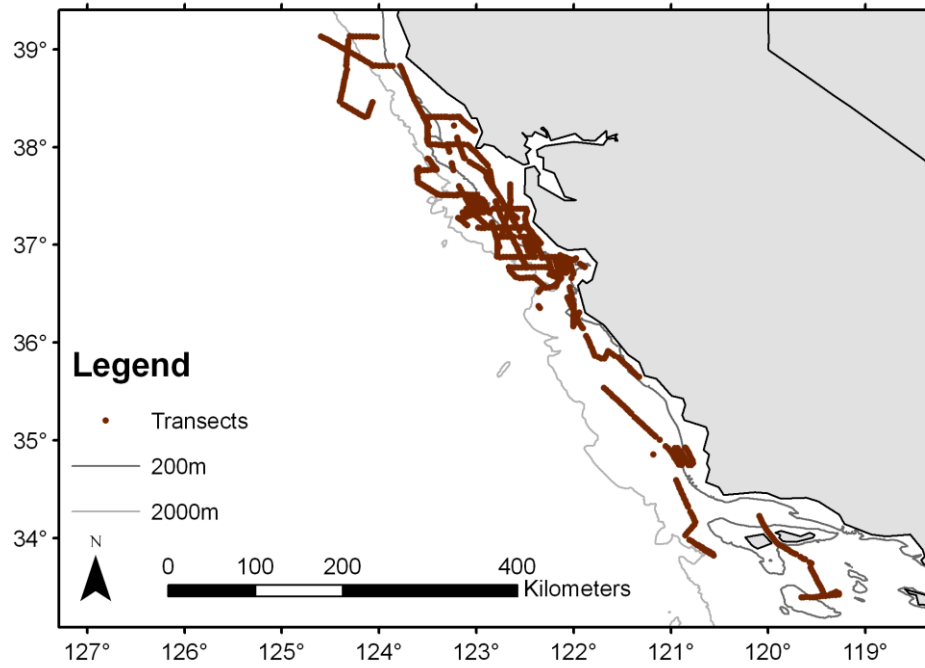


Figure 1. 2013 survey transects for the total region.

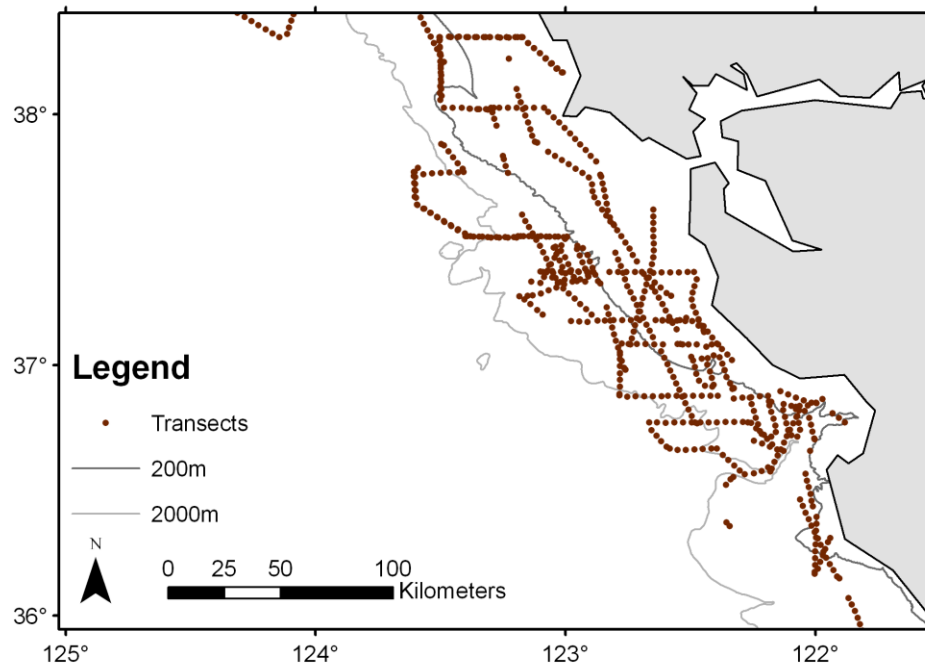


Figure 2. 2013 survey transects for the core region.

Table 2. Bird survey observations, stratified by region and species. Cell values represent: the total number of individuals seen / number of species sightings / average density (birds per km²).

Common Name	Latin Name	Core Region	Extended Region	Total
American White Pelican	<i>Pelecanus erythrorhynchos</i>			
Ancient Murrelet	<i>Synthliboramphus antiquus</i>			
Arctic Loon	<i>Gavia arctica</i>			
Arctic Tern	<i>Sterna paradisaea</i>	2 / 2 / 0		2 / 2 / 0
Ashy Storm-Petrel	<i>Oceanodroma homochroa</i>	9 / 6 / 0.01	2 / 2 / 0.02	11 / 8 / 0.01
Black Scoter	<i>Melanitta nigra</i>			
Black Storm-Petrel	<i>Oceanodroma melania</i>		1 / 1 / 0.01	1 / 1 / 0
Black-Footed Albatross	<i>Phoebastria nigripes</i>	425 / 310 / 0.67	10 / 10 / 0.08	435 / 320 / 0.58
Black-Legged Kittiwake	<i>Rissa tridactyla</i>			
Black-Vented Shearwater	<i>Puffinus opisthomelas</i>			
Bonaparte's Gull	<i>Larus philadelphia</i>	271 / 5 / 0.43		271 / 5 / 0.36
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>	5 / 5 / 0.01	537 / 15 / 4.53	542 / 20 / 0.72
Brant	<i>Branta bernicla</i>			
Brown Booby	<i>Sula leucogaster</i>			
Brown Noddy	<i>Anous stolidus</i>			
Brown Pelican	<i>Pelecanus occidentalis</i>			
Buller's Shearwater	<i>Puffinus bulleri</i>			
California Gull	<i>Larus californicus</i>	310 / 226 / 0.49		310 / 226 / 0.41
Caspian Tern	<i>Sterna caspia</i>	2 / 2 / 0		2 / 2 / 0
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	2001 / 398 / 3.18	94 / 36 / 0.79	2095 / 434 / 2.8
Clark's Grebe	<i>Aechmophorus clarkii</i>			
Common Loon	<i>Gavia immer</i>			
Common Murre	<i>Uria aalge</i>	2561 / 936 / 4.07	2 / 2 / 0.02	2563 / 938 / 3.42
Common Tern	<i>Sterna hirundo</i>	2 / 1 / 0		2 / 1 / 0
Cook's Petrel	<i>Pterodroma cookii</i>			

Common Name	Latin Name	Core Region	Extended Region	Total
Craveri's Murrelet	Synthliboramphus craveri			
Dark Shearwater	(species group)			
Dark-Rumped Petrel	Pterodroma phaeopygia sandwichensis			
Double-Crested Cormorant	Phalacrocorax auritus	1 / 1 / 0		1 / 1 / 0
Eared Grebe	Podiceps nigricollis			
Elegant Tern	Sterna elegans			
Flesh-Footed Shearwater	Puffinus carneipes			
Fork-Tailed Storm-Petrel	Oceanodroma furcata			
Forster's Tern	Sterna forsteri			
Franklin's Gull	Larus pipixcan			
Glaucous Gull	Larus hyperboreus			
Glaucous-Winged Gull	Larus glaucescens	3 / 3 / 0		3 / 3 / 0
Guadalupe Murrelet	Synthliboramphus hypoleucus			
Hawaiian Petrel	Pterodroma sandwichensis	1 / 1 / 0		1 / 1 / 0
Heermann's Gull	Larus heermanni			
Herring Gull	Larus argentatus	3 / 3 / 0		3 / 3 / 0
Horned Puffin	Fratercula corniculata	1 / 1 / 0		1 / 1 / 0
Hybrid Gull	(species group)			
Juan Fernandez Petrel	Pterodroma externa			
Kelp Gull	Larus dominicanus			
Kermadec Petrel	Pterodroma neglecta			
Laughing Gull	Larus atricilla			
Laysan Albatross	Phoebastria immutabilis			
Leach's Storm-Petrel	Oceanodroma leucorhoa			
Least Storm-Petrel	Oceanodroma microsoma			
Least Tern	Sterna antillarum			
Long-Tailed Jaeger	Stercorarius longicaudus			

Common Name	Latin Name	Core Region	Extended Region	Total
Marbled Murrelet	Brachyramphus marmoratus	2 / 1 / 0		2 / 1 / 0
Mew Gull	Larus canus			
Mottled Petrel	Pterodroma inexpectata			
Murphy's Petrel	Pterodroma ultima	5 / 4 / 0.01		5 / 4 / 0.01
Northern Fulmar	Fulmarus glacialis	40 / 38 / 0.06	3 / 3 / 0.03	43 / 41 / 0.06
Osprey	Pandion haliaetus			
Pacific Loon	Gavia pacifica	39 / 20 / 0.06		39 / 20 / 0.05
Parakeet Auklet	Aethia psittacula			
Parasitic Jaeger	Stercorarius parasiticus	4 / 4 / 0.01		4 / 4 / 0.01
Parkinson's Petrel	Procellaria parkinsoni			
Pelagic Cormorant	Phalacrocorax pelagicus	2 / 2 / 0		2 / 2 / 0
Peregrine Falcon	Falco peregrinus			
Pigeon Guillemot	Cepphus columba	2 / 2 / 0		2 / 2 / 0
Pink-Footed Shearwater	Puffinus creatopus	110 / 77 / 0.17	68 / 34 / 0.57	178 / 111 / 0.24
Pomarine Jaeger	Stercorarius pomarinus	1 / 1 / 0		1 / 1 / 0
Red Phalarope	Phalaropus fulicaria	1235 / 135 / 1.96		1235 / 135 / 1.65
Red-Billed Tropicbird	Phaethon aethereus		1 / 1 / 0.01	1 / 1 / 0
Red-Footed Booby	Sula sula			
Red-Necked Grebe	Podiceps grisegena			
Red-Necked Phalarope	Phalaropus lobatus	4625 / 378 / 7.34		4625 / 378 / 6.18
Red-Tailed Tropicbird	Pheathon rubricauda			
Red-Throated Loon	Gavia stellata			
Rhinoceros Auklet	Cerorhinca monocerata	63 / 49 / 0.1	12 / 8 / 0.1	75 / 57 / 0.1
Ring-Billed Gull	Larus delawarensis			
Royal Tern	Sterna maxima		1 / 1 / 0.01	1 / 1 / 0
Ruddy Turnstone	Arenaria interpres			
Sabine's Gull	Larus sabini	14 / 8 / 0.02		14 / 8 / 0.02

Common Name	Latin Name	Core Region	Extended Region	Total
Scripps's Murrelet	Synthliboramphus scrippsii			
Short-Tailed / Slender-Billed Shearwater	Puffinus tenuirostris			
Short-Tailed Albatross	Phoebastria albatrus			
Solander's Petrel	Pterodroma solandri			
Sooty Shearwater	Puffinus griseus	7207 / 1125 / 11.44	467 / 159 / 3.94	7674 / 1284 / 10.25
South Polar Skua	Stercorarius maccormicki			
Stejneger's Petrel	Pterodroma longirostris			
Surf Scoter	Melanitta perspicillata			
Thayer's Gull	Larus thayeri			
Tufted Puffin	Fratercula cirrhata	6 / 5 / 0.01	1 / 1 / 0.01	7 / 6 / 0.01
Unidentified Albatross	(species group)			
Unidentified Auklet	(species group)			
Unidentified Cormorant	(species group)			
Unidentified Duck	(species group)			
Unidentified Grebe	(species group)			
Unidentified Gull	(species group)	25 / 25 / 0.04		25 / 25 / 0.03
Unidentified Jaeger	(species group)			
Unidentified Large Alcid	(species group)			
Unidentified Loon	(species group)			
Unidentified Murre	(species group)			
Unidentified Petrel	(species group)	2 / 2 / 0		2 / 2 / 0
Unidentified Phalarope	(species group)	32 / 18 / 0.05		32 / 18 / 0.04
Unidentified Procellarid	(species group)			
Unidentified Shearwater	(species group)			
Unidentified Skua	(species group)			
Unidentified Small Alcid	(species group)			

Common Name	Latin Name	Core Region	Extended Region	Total
Unidentified Storm-Petrel	(species group)			
Unidentified Tern	(species group)			
Unidentified Tropicbird	(species group)			
Wedge-Rumped Storm-Petrel	<i>Oceanodroma tethys</i>			
Wedge-Tailed Shearwater	<i>Puffinus pacificus</i>			
Western Grebe	<i>Aechmophorus occidentalis</i>		3 / 1 / 0.03	3 / 1 / 0
Western Gull	<i>Larus occidentalis</i>	1123 / 788 / 1.78	91 / 81 / 0.77	1214 / 869 / 1.62
Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>			
Xantus's / Craveri's Murrelet	(species group)			

Table 3. Mammal survey observation summary, broken down by survey region and by species. Cell values represent: the total number of species individuals / number of species sightings / average species encounter rate (individuals per 100 km).

Common Name	Latin Name	Core Region	Extended Region	Total
Baird's Beaked Whale	<i>Berardius bairdii</i>			
Blue Whale	<i>Balaenoptera musculus</i>	5 / 2 / 0.2	11 / 9 / 2.8	16 / 11 / 0.6
Bottlenose Dolphin	<i>Tursiops truncatus</i>			
California Sea Lion	<i>Zalophus californianus</i>	5 / 5 / 0.2	74 / 38 / 18.7	79 / 43 / 3.2
Common Dolphin	<i>Delphinus delphis</i>			
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>			
Dall's Porpoise	<i>Phocoenoides dalli</i>	23 / 8 / 1.1	1 / 1 / 0.3	24 / 9 / 1
False Killer Whale	<i>Pseudorca crassidens</i>			
Fin Whale	<i>Balaenoptera physalus</i>	8 / 5 / 0.4	1 / 1 / 0.3	9 / 6 / 0.4
Gray Whale	<i>Eschrichtius robustus</i>			
Green Sea Turtle	<i>Chelonia mydas</i>			
Guadalupe Fur Seal	<i>Arctocephalus townsendi</i>			
Harbor Porpoise	<i>Phocoena phocoena</i>			
Harbor Seal	<i>Phoca vitulina</i>			
Humpback Whale	<i>Megaptera novaeangliae</i>	138 / 82 / 6.6	2 / 1 / 0.5	140 / 83 / 5.6
Killer Whale	<i>Orcinus orca</i>			
Long-beaked Common Dolphin	<i>Delphinus capensis</i>			
Minke Whale	<i>Balaenoptera acutorostrata</i>	1 / 1 / 0		1 / 1 / 0
Northern Elephant Seal	<i>Mirounga angustirostris</i>		1 / 1 / 0.3	1 / 1 / 0
Northern Fur Seal	<i>Callorhinus ursinus</i>	8 / 8 / 0.4		8 / 8 / 0.3
Northern Right Whale Dolphin	<i>Lissodelphis borealis</i>			
Pacific White-Sided Dolphin	<i>Lagenorhynchus obliquidens</i>	204 / 12 / 9.7	21 / 3 / 5.3	225 / 15 / 9
Pilot Whale	<i>Globicephala</i> spp.			
Pygmy Sperm Whale	<i>Kogia breviceps</i>			
Ridley Sea Turtle	<i>Lepidochelys olivacea</i>			

Common Name	Latin Name	Core Region	Extended Region	Total
Risso's Dolphin	Grampus griseus	6 / 2 / 0.3	5 / 2 / 1.3	11 / 4 / 0.4
Sea Otter	Enhydra lutris			
Sei Whale	Balaenoptera borealis			
Short-Beaked Common Dolphin	Delphinus delphis			
Short-Finned Pilot Whale	Globicephala macrorhynchus			
Sperm Whale	Physeter macrocephalus			
Steller Sea Lion	Eumetopias jubatus	1 / 1 / 0	1 / 1 / 0.3	2 / 2 / 0.1
Striped Dolphin	Stenella coeruleoalba			
Unidentified Baleinoptera				
Unidentified Beaked Whale				
Unidentified Cetacean				
Unidentified Dolphin		3 / 2 / 0.1		3 / 2 / 0.1
Unidentified Large Whale				
Unidentified Pinniped			3 / 3 / 0.8	3 / 3 / 0.1
Unidentified Sea Lion		1 / 1 / 0	1 / 1 / 0.3	2 / 2 / 0.1
Unidentified Seal				
Unidentified Whale		10 / 8 / 0.5		10 / 8 / 0.4

Appendix 1. Distribution maps

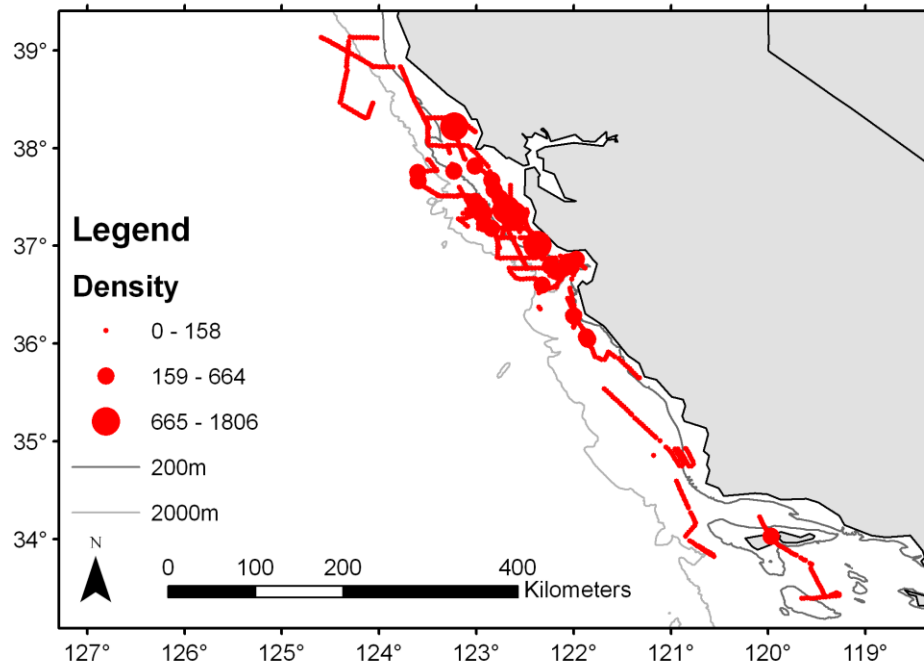


Figure 3. Bird distribution (all species pooled) in the total region.

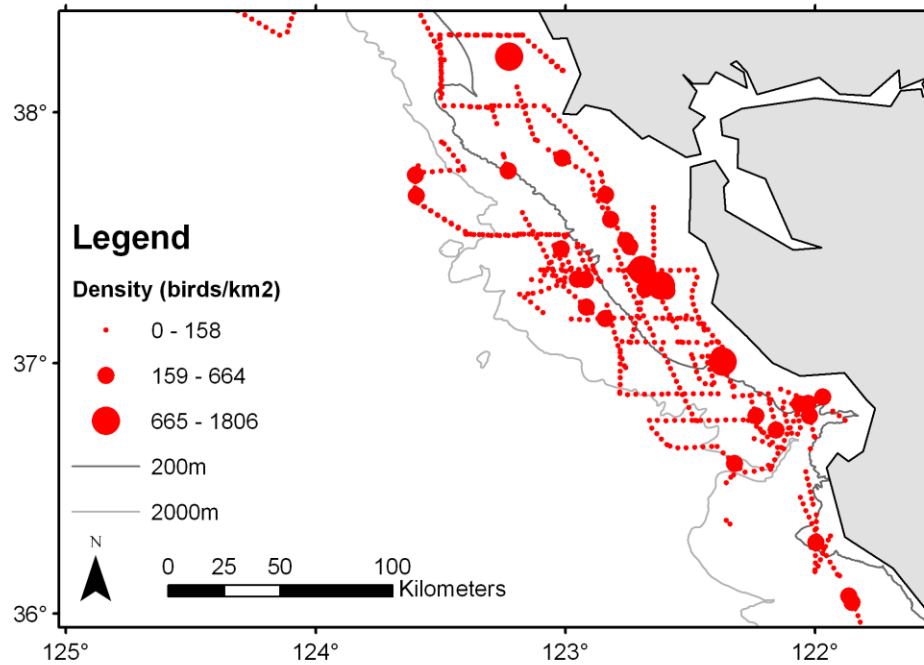


Figure 4. Bird distribution in the core region.

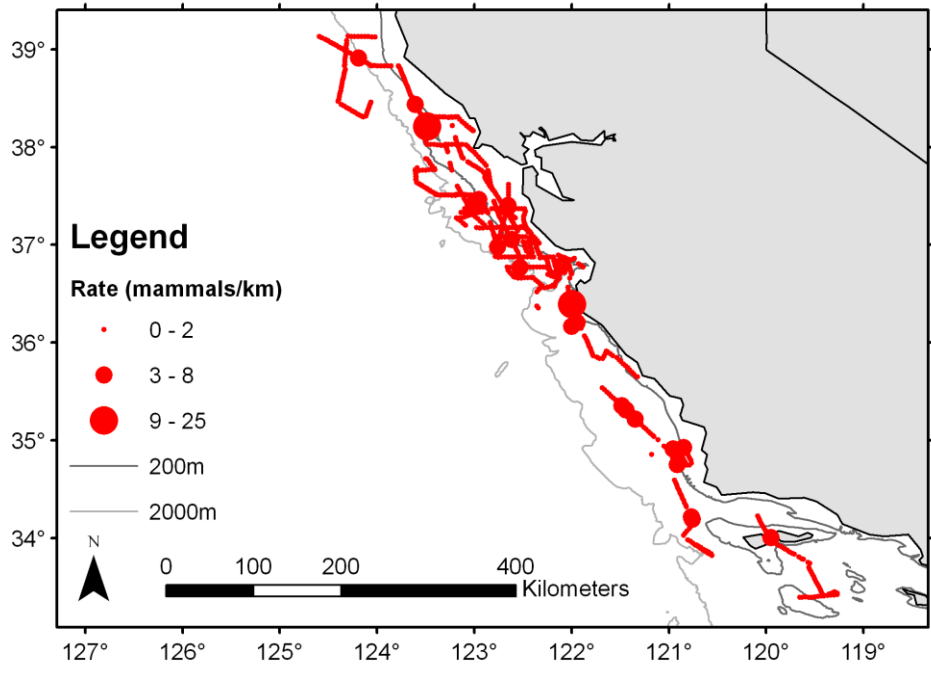


Figure 5. Mammal distribution in the total region.

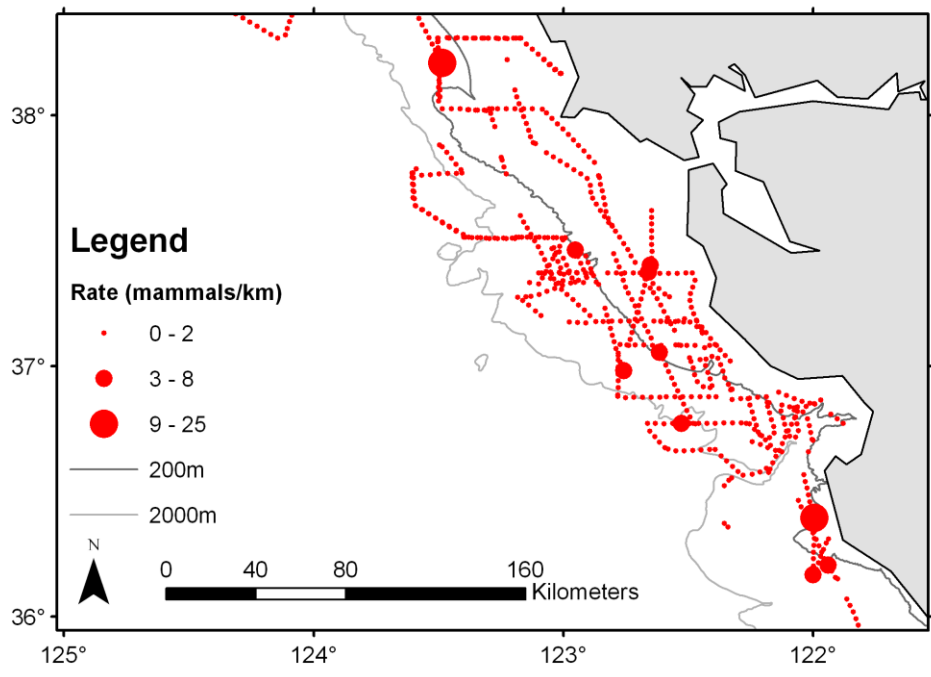


Figure 6. Mammal distribution in the core region.

Appendix 2. Species Lists

Data selection criteria

Table 4. The following criteria were applied to the survey database to select data for the summary.

Behavior codes included	All values
Species categories included	Birds, Mammals, Unidentified
Species categories excluded	Fish, Excluded Species List
Years	2013
Months	All months
Bin length	All bins > 0.1km
Region	JRS core region and extended region
Seasons	All seasons

Excluded Species List

Table 5. The following species were excluded from the analysis.

American Coot	Fulica americana
Black Oystercatcher	Haematopus bachmani
Black Skimmer	Rynchops niger
Black Tern	Chlidonias niger
Black Turnstone	Arenaria melanocephala
Brewer's Sparrow	Spizella breweri
Bufflehead	Bucephala albeola
European Starling	Sturnus vulgaris
Great Blue Heron	Ardea herodias
Great Egret	Ardea alba
Green Heron	Butorides virescens
Least Sandpiper	Calidris minutilla
Long-billed Curlew	Numenius americanus
Long-billed Dowitcher	Limnodromus scolopaceus
Mallard Duck	Anas platyrhynchos
Marbled Godwit	Limosa fedoa
Mourning Dove	Zenaida macroura
Red-Breasted Merganser	Mergus serrator
Ruddy Duck	Oxyura jamaicensis
Sanderling	Calidris alba
Snow Goose	Chen caerulescens
Snowy Egret	Egretta thula
Unidentified Bird	(species group)
Unidentified Dowitcher	(species group)
Unidentified Goose	(species group)
Unidentified Hummingbird	(species group)
Unidentified Passerine	(species group)
Unidentified Shorebird	(species group)
Western Sandpiper	Calidris mauri

Whimbrel	<i>Numenius phaeopus</i>
White-Winged Scoter	<i>Melanitta fusca</i>
Willet	<i>Catoptrophorus semipalmatus</i>
Xaveri's Murrelet	(species group)
Yellow-Rumped Warbler	<i>Dendroica coronata</i>
Baird's Beaked Whale	<i>Berardius bairdii</i>
Blue Whale	<i>Balaenoptera musculus</i>
Bottlenose Dolphin	<i>Tursiops truncatus</i>
California Sea Lion	<i>Zalophus californianus</i>
California Sea Lion	<i>Zalophus californianus</i>
Common Dolphin	<i>Delphinus delphis</i>
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>
Dall's Porpoise	<i>Phocoenoides dalli</i>
False Killer Whale	<i>Pseudorca crassidens</i>
Fin Whale	<i>Balaenoptera physalus</i>
Gray Whale	<i>Eschrichtius robustus</i>
Green Sea Turtle	<i>Chelonia mydas</i>
Guadalupe Fur Seal	<i>Arctocephalus townsendi</i>
Harbor Porpoise	<i>Phocoena phocoena</i>
Harbor Seal	<i>Phoca vitulina</i>
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>
Humpback Whale	<i>Megaptera novaeangliae</i>
Killer Whale	<i>Orcinus orca</i>
Leatherback Turtle	<i>Dermochelys coriacea</i>
Long-beaked Common Dolphin	<i>Delphinus capensis</i>
Minke Whale	<i>Balaenoptera acutorostrata</i>
Northern Elephant Seal	<i>Mirounga angustirostris</i>
Northern Fur Seal	<i>Callorhinus ursinus</i>
Northern Right Whale Dolphin	<i>Lissodelphis borealis</i>
Pacific White-Sided Dolphin	<i>Lagenorhynchus obliquidens</i>
Pilot Whale	<i>Globicephala</i> spp.
Pygmy Sperm Whale	<i>Kogia breviceps</i>
Ridley Sea Turtle	<i>Lepidochelys olivacea</i>
Risso's Dolphin	<i>Grampus griseus</i>
Sea Otter	<i>Enhydra lutris</i>
Sei Whale	<i>Balaenoptera borealis</i>
Short-Beaked Common Dolphin	<i>Delphinus delphis</i>
Short-Finned Pilot Whale	<i>Globicephala macrorhynchus</i>
Sperm Whale	<i>Physeter macrocephalus</i>
Steller Sea Lion	<i>Eumetopias jubatus</i>
Striped Dolphin	<i>Stenella coeruleoalba</i>
Unidentified Baleinoptera	(species group)
Unidentified Beaked Whale	(species group)
Unidentified Cetacean	(species group)
Unidentified Dolphin	(species group)
Unidentified Large Whale	(species group)
Unidentified Mammal	(species group)
Unidentified Pinniped	(species group)
Unidentified Sea Lion	(species group)

Unidentified Seal	(species group)
Unidentified Turtle	(species group)
Unidentified Whale	(species group)
Basking Shark	Cetorhinus maximus
Blue Shark	Prionace glauca
Hammerhead Shark	Sphyrna spp.
Mako Shark	Isurus oxyrinchus
Mola Mola	Mola mola
Unidentified Fish	(species group)
Unidentified Shark	(species group)

Included Species List

For a list of species included in the analysis, please refer to Table 2 and Table 3.