

Seabirds and Marine Mammals on the NMFS Juvenile Rockfish – Ecosystem Survey, 2012

William J. Sydeman, PI
Dawn Breese/Sophie Webb, Observers
Marcel Losekoot, Analyst

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

Introduction

Seabird and marine mammals are an integral part of the NMFS Juvenile Rockfish – Ecosystem (JRE) research program, providing data that is valuable on several fronts: 1) measurements provide an upper trophic level perspective to complement the lower- mid-trophic level data collected by NMFS; 2) estimates of seabird and marine mammal abundance, diversity and distribution may contribute to fisheries management; and, 3) by extending our existing time series (now 16 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 2012 NMFS JRE cruise, and presents basic distribution and abundance estimates for seabirds and mammals. In 2012, a total of 1724 km (517 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, used 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 which includes data from May 1996 to the present. These data are used to derive the summary statistics reported herein.

This report summarizes observations for the survey conducted in 2012. 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 surveys (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 (core area) and Figure 2 (extended area). A summary of species observations is shown in Table 2 (seabirds) and (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 statistics for 2012.

Annual Survey 2012	Core region	Extended region	Total
Survey Vessel	Shimada	Simada	NA
Start Date	5/6/2012	5/23/2012	NA
End Date	6/2/2012	5/27/2012	NA
Survey Days	17	5	22
Distance Surveyed (km)	1339	385	1724
Area Survey (birds; km ²)	402	116	517
Number of Bird Species Obs.	34	21	41
Overall Bird Density (per km ²)	31.7	2.8	25.3
Total Birds Observed	12727	330	13057
Number of Mammal Species	12	7	15
Overall Mammal Encounter Rate (per km surveyed)	0.26	0.54	0.32
Total Mammals Observed	343	208	551

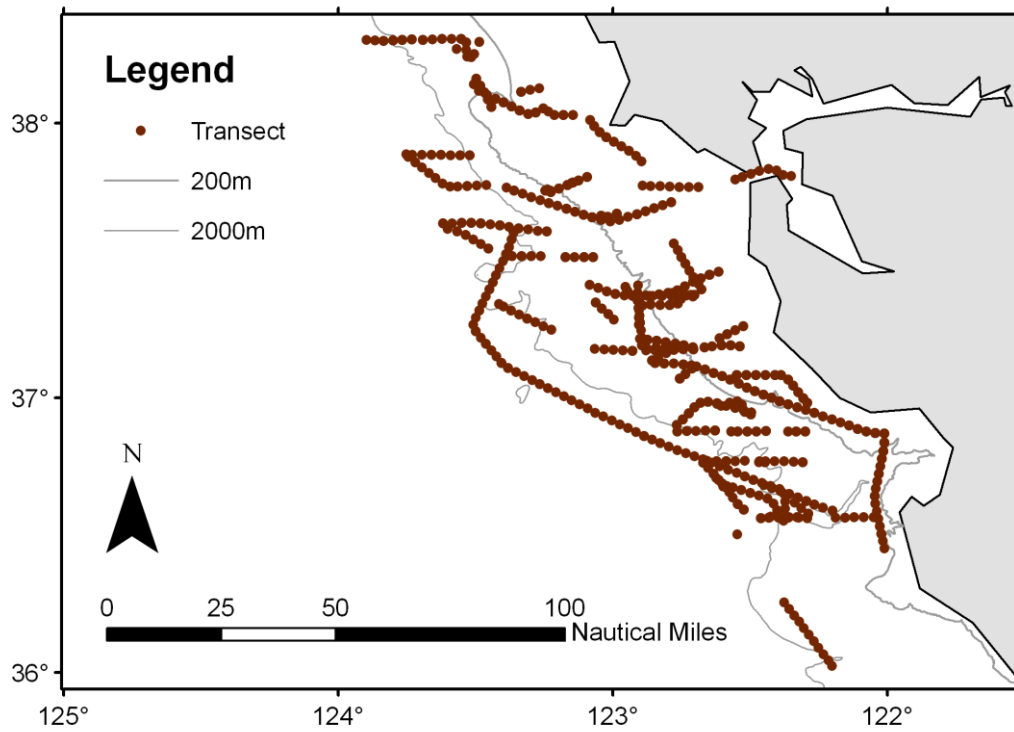


Figure 1. Survey transects for the core region.

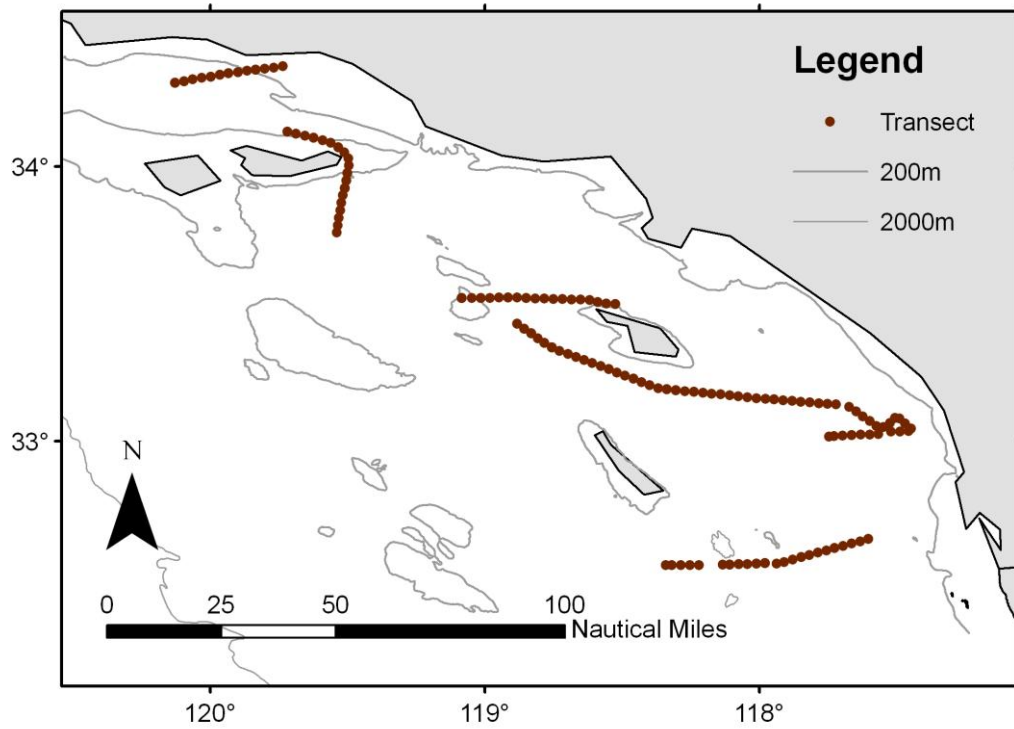


Figure 2. Survey transects for the extended region

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
Ancient Murrelet	<i>Synthliboramphus antiquus</i>			
Arctic Loon	<i>Gavia arctica</i>			
Arctic Tern	<i>Sterna paradisaea</i>	5 / 3 / 0.01		5 / 3 / 0.01
Ashy Storm-Petrel	<i>Oceanodroma homochroa</i>			
American White Pelican	<i>Pelecanus erythrorhynchos</i>			
Black-Footed Albatross	<i>Phoebastria nigripes</i>	95 / 78 / 0.24	2 / 2 / 0.02	97 / 80 / 0.19
Black-Legged Kittiwake	<i>Rissa tridactyla</i>			
Black Scoter	<i>Melanitta nigra</i>			
Black Storm-Petrel	<i>Oceanodroma melania</i>		11 / 5 / 0.11	11 / 5 / 0.02
Bonaparte's Gull	<i>Larus philadelphia</i>	24 / 8 / 0.03		24 / 8 / 0.03
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>	15 / 13 / 0.05	6 / 4 / 0.06	21 / 17 / 0.06
Brant	<i>Branta bernicla</i>	1 / 1 / 0		1 / 1 / 0
Brown Booby	<i>Sula leucogaster</i>			
Brown Noddy	<i>Anous stolidus</i>			
Brown Pelican	<i>Pelecanus occidentalis</i>		5 / 5 / 0.05	5 / 5 / 0.01
Buller's Shearwater	<i>Puffinus bulleri</i>			
Black-Vented Shearwater	<i>Puffinus opisthomelas</i>	1 / 1 / 0	1 / 1 / 0.01	2 / 2 / 0
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	331 / 85 / 1.17		331 / 85 / 0.91
California Gull	<i>Larus californicus</i>	90 / 48 / 0.16	1 / 1 / 0	91 / 49 / 0.12
Caspian Tern	<i>Sterna caspia</i>	4 / 3 / 0.01		4 / 3 / 0.01
Clark's Grebe	<i>Aechmophorus clarkii</i>			
Common Loon	<i>Gavia immer</i>	6 / 6 / 0.03		6 / 6 / 0.02
Common Murre	<i>Uria aalge</i>	1490 / 411 / 4.42	1 / 1 / 0.02	1491 / 412 / 3.42
Cook's Petrel	<i>Pterodroma cookii</i>			
Common Tern	<i>Sterna hirundo</i>			
Craveri's Murrelet	<i>Synthliboramphus craveri</i>			
Double-Crested Cormorant	<i>Phalacrocorax auritus</i>			

Common Name	Latin Name	Core Region	Extended Region	Total
Dark Shearwater	(species group)			
Dark-Rumped Petrel	<i>Pterodroma phaeopygia sandwichensis</i>			
Eared Grebe	<i>Podiceps nigricollis</i>			
Elegant Tern	<i>Sterna elegans</i>		34 / 22 / 0.31	34 / 22 / 0.07
Flesh-Footed Shearwater	<i>Puffinus carneipes</i>			
Forster's Tern	<i>Sterna forsteri</i>		12 / 6 / 0.05	12 / 6 / 0.01
Franklin's Gull	<i>Larus pipixcan</i>			
Fork-Tailed Storm-Petrel	<i>Oceanodroma furcata</i>			
Glaucous Gull	<i>Larus hyperboreus</i>			
Glaucous-Winged Gull	<i>Larus glaucescens</i>	3 / 2 / 0.01		3 / 2 / 0.01
Hawaiian Petrel	<i>Pterodroma sandwichensis</i>			
Heermann's Gull	<i>Larus heermanni</i>			
Herring Gull	<i>Larus argentatus</i>			
Horned Puffin	<i>Fratercula corniculata</i>			
Hybrid Gull	(species group)			
Juan Fernandez Petrel	<i>Pterodroma externa</i>			
Kelp Gull	<i>Larus dominicanus</i>			
Kermadec Petrel	<i>Pterodroma neglecta</i>			
Laysan Albatross	<i>Phoebastria immutabilis</i>		1 / 1 / 0.01	1 / 1 / 0
Laughing Gull	<i>Larus atricilla</i>			
Least Tern	<i>Sterna antillarum</i>			
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	3 / 2 / 0.01	8 / 5 / 0.06	11 / 7 / 0.02
Long-Tailed Jaeger	<i>Stercorarius longicaudus</i>	1 / 1 / 0		1 / 1 / 0
Least Storm-Petrel	<i>Oceanodroma microsoma</i>			
Marbled Murrelet	<i>Brachyramphus marmoratus</i>			
Mew Gull	<i>Larus canus</i>			
Mottled Petrel	<i>Pterodroma inexpectata</i>			
Murphy's Petrel	<i>Pterodroma ultima</i>	4 / 4 / 0.01		4 / 4 / 0.01

Common Name	Latin Name	Core Region	Extended Region	Total
Northern Fulmar	Fulmarus glacialis	6 / 6 / 0.01		6 / 6 / 0.01
Osprey	Pandion haliaetus			
Parakeet Auklet	Aethia psittacula			
Parasitic Jaeger	Stercorarius parasiticus	4 / 4 / 0.01		4 / 4 / 0.01
Pacific Loon	Gavia pacifica	20 / 11 / 0.03	7 / 2 / 0.04	27 / 13 / 0.03
Parkinson's Petrel	Procellaria parkinsoni			
Pelagic Cormorant	Phalacrocorax pelagicus	3 / 2 / 0.02		3 / 2 / 0.02
Peregrine Falcon	Falco peregrinus			
Pink-Footed Shearwater	Puffinus creatopus	168 / 77 / 0.42	12 / 10 / 0.12	180 / 87 / 0.35
Pigeon Guillemot	Cephus columba	6 / 3 / 0.01		6 / 3 / 0.01
Pomarine Jaeger	Stercorarius pomarinus	2 / 2 / 0		2 / 2 / 0
Ring-Billed Gull	Larus delawarensis	6 / 5 / 0.02		6 / 5 / 0.02
Red-Billed Tropicbird	Phaethon aethereus			
Red Phalarope	Phalaropus fulicaria	5267 / 548 / 9.21		5267 / 548 / 9.12
Red-Footed Booby	Sula sula			
Rhinoceros Auklet	Cerorhinca monocerata	236 / 77 / 0.9		236 / 77 / 0.9
Red-Necked Grebe	Podiceps grisegena			
Red-Necked Phalarope	Phalaropus lobatus	978 / 147 / 1.67	9 / 2 / 0.11	987 / 149 / 1.31
Royal Tern	Sterna maxima		1 / 1 / 0	1 / 1 / 0
Red-Throated Loon	Gavia stellata			
Red-Tailed Tropicbird	Phaethon rubricauda			
Ruddy Turnstone	Arenaria interpres			
Sabine's Gull	Larus sabini	229 / 44 / 0.45	1 / 1 / 0	230 / 45 / 0.35
Short-Tailed / Slender-Billed Shearwater	Puffinus tenuirostris	1 / 1 / 0		1 / 1 / 0
Solander's Petrel	Pterodroma solandri			
Sooty Shearwater	Puffinus griseus	1695 / 172 / 6.88	66 / 46 / 0.7	1761 / 218 / 5.47
South Polar Skua	Stercorarius maccormicki	2 / 2 / 0.01	1 / 1 / 0.01	3 / 3 / 0.01
Short-Tailed Albatross	Phoebastria albatrus			

Common Name	Latin Name	Core Region	Extended Region	Total
Stejneger's Petrel	<i>Pterodroma longirostris</i>			
Surf Scoter	<i>Melanitta perspicillata</i>			
Thayer's Gull	<i>Larus thayeri</i>			
Tufted Puffin	<i>Fratercula cirrhata</i>	5 / 4 / 0.01		5 / 4 / 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)	2 / 2 / 0	1 / 1 / 0	3 / 3 / 0
Unidentified Jaeger	(species group)			
Unidentified Large Alcid	(species group)			
Unidentified Loon	(species group)			
Unidentified Murre	(species group)			
Unidentified Procellarid	(species group)			
Unidentified Petrel	(species group)			
Unidentified Phalarope	(species group)	1551 / 14 / 2.46		1551 / 14 / 2.46
Unidentified Small Alcid	(species group)			
Unidentified Shearwater	(species group)			
Unidentified Skua	(species group)			
Unidentified Storm-Petrel	(species group)			
Unidentified Tern	(species group)			
Unidentified Tropicbird	(species group)			
Western Grebe	<i>Aechmophorus occidentalis</i>			
Western Gull	<i>Larus occidentalis</i>	473 / 382 / 1.21	149 / 82 / 1.63	622 / 464 / 1.3
Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>		1 / 1 / 0.01	1 / 1 / 0
Wedge-Rumped Storm-Petrel	<i>Oceanodroma tethys</i>			
Wedge-Tailed Shearwater	<i>Puffinus pacificus</i>			
Xantus's Murrelet	<i>Synthliboramphus hypoleucus</i>			

Common Name	Latin Name	Core Region	Extended Region	Total
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>	3 / 3 / 0.6		3 / 3 / 0.6
Bottlenose Dolphin	<i>Tursiops truncatus</i>		20 / 1 / 3.9	20 / 1 / 3.9
California Sea Lion	<i>Zalophus californianus</i>	5 / 5 / 1	4 / 3 / 0.8	9 / 8 / 1.7
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>			
Common Dolphin	<i>Delphinus delphis</i>			
California Sea Lion	<i>Zalophus californianus</i>			
Dall's Porpoise	<i>Phocoenoides dalli</i>	52 / 15 / 10.1		52 / 15 / 10.1
Fin Whale	<i>Balaenoptera physalus</i>	3 / 2 / 0.6	3 / 2 / 0.6	6 / 4 / 1.2
False Killer Whale	<i>Pseudorca crassidens</i>			
Guadalupe Fur Seal	<i>Arctocephalus townsendi</i>			
Green Sea Turtle	<i>Chelonia mydas</i>			
Gray Whale	<i>Eschrichtius robustus</i>	1 / 1 / 0.2		1 / 1 / 0.2
Harbor Porpoise	<i>Phocoena phocoena</i>			
Harbor Seal	<i>Phoca vitulina</i>	1 / 1 / 0.2		1 / 1 / 0.2
Humpback Whale	<i>Megaptera novaeangliae</i>	155 / 94 / 30	1 / 1 / 0.2	156 / 95 / 30.2
Killer Whale	<i>Orcinus orca</i>	8 / 2 / 1.5		8 / 2 / 1.5
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>	2 / 2 / 0.4		2 / 2 / 0.4
Northern Right Whale Dolphin	<i>Lissodelphis borealis</i>		9 / 2 / 1.7	9 / 2 / 1.7
Pilot Whale	<i>Globicephala</i> spp.			
Pygmy Sperm Whale	<i>Kogia breviceps</i>	1 / 1 / 0.2		1 / 1 / 0.2
Pacific White-Sided Dolphin	<i>Lagenorhynchus obliquidens</i>	70 / 5 / 13.5		70 / 5 / 13.5
Risso's Dolphin	<i>Grampus griseus</i>	32 / 3 / 6.2	11 / 4 / 2.1	43 / 7 / 8.3
Ridley Sea Turtle	<i>Lepidochelys olivacea</i>			

Common Name	Latin Name	Core Region	Extended Region	Total
Short-Beaked Common Dolphin	<i>Delphinus delphis</i>		157 / 4 / 30.4	157 / 4 / 30.4
Sea Otter	<i>Enhydra lutris</i>			
Sei Whale	<i>Balaenoptera borealis</i>			
Short-Finned Pilot Whale	<i>Globicephala macrorhynchus</i>			
Sperm Whale	<i>Physeter macrocephalus</i>			
Striped Dolphin	<i>Stenella coeruleoalba</i>			
Steller Sea Lion	<i>Eumetopias jubatus</i>			
Unidentified Baleinoptera	(species group)			
Unidentified Beaked Whale	(species group)			
Unidentified Cetacean	(species group)			
Unidentified Dolphin	(species group)			
Unidentified Large Whale	(species group)	10 / 9 / 1.9	3 / 3 / 0.6	13 / 12 / 2.5
Unidentified Pinniped	(species group)			
Unidentified Seal	(species group)			
Unidentified Sea Lion	(species group)			
Unidentified Whale	(species group)			
Unidentified Mammal	(species group)			

Appendix 1. Distribution maps

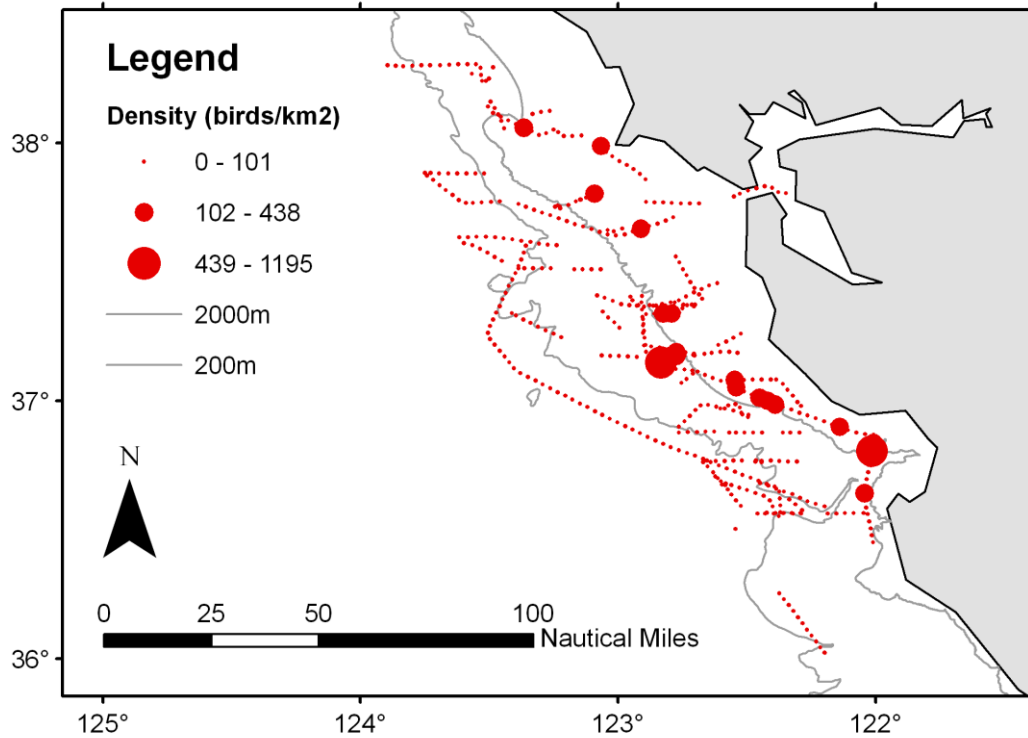


Figure 3. Bird distribution in the core region.

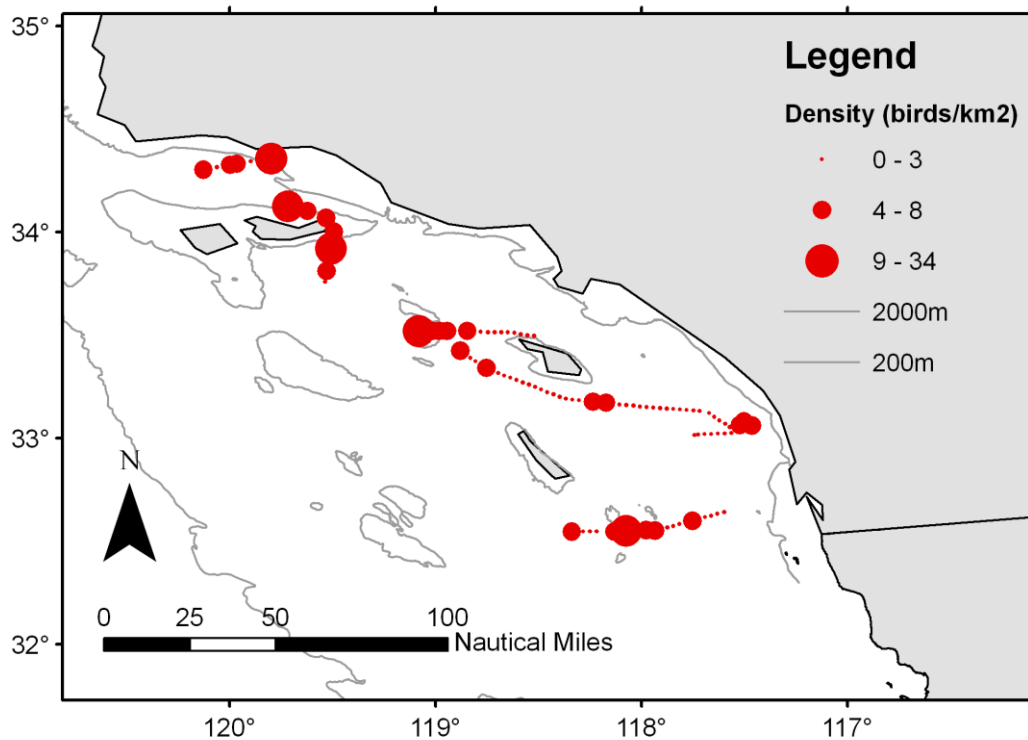


Figure 4. Bird distribution in the extended region. Note the different density scales.

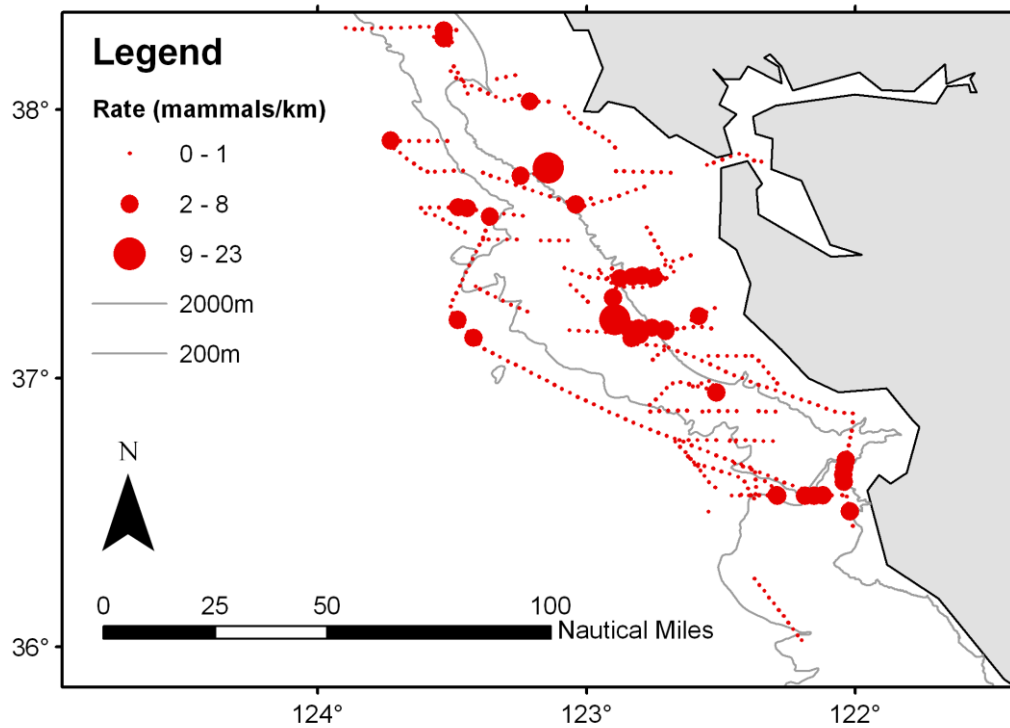


Figure 5. Mammal distribution in the core region.

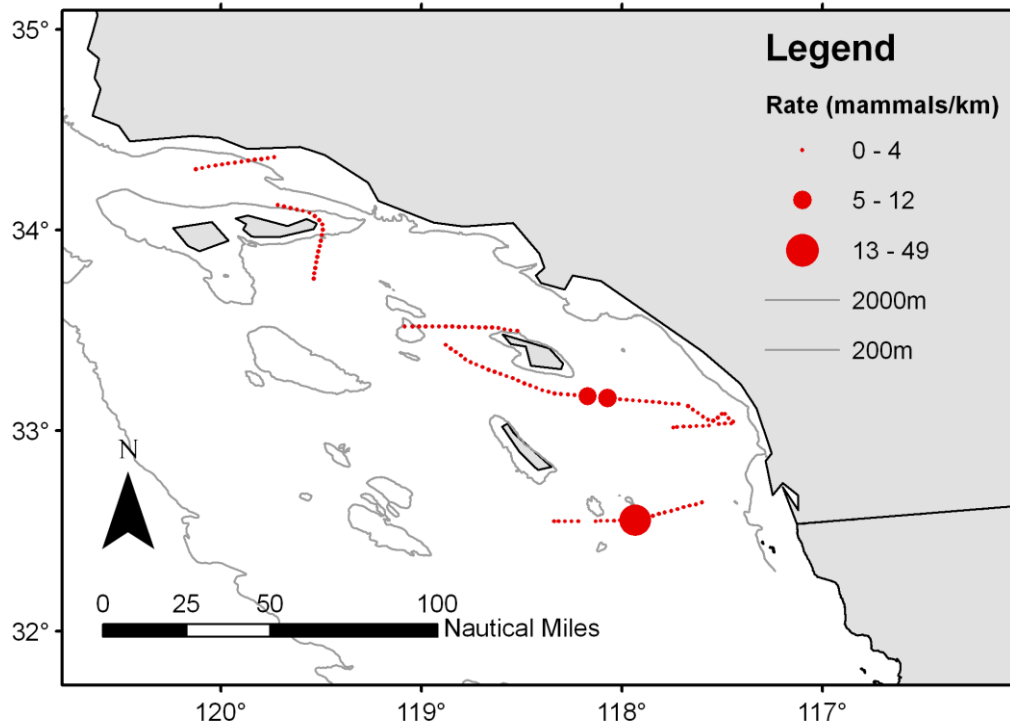


Figure 6. Mammal distribution in the extended region. Note the different rate scale.

Appendix 2. Species Lists

Data selection criteria

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	2012
Months	All months
Bin length	All bins > 0.1km
Region	JRS core region and extended region
Seasons	All seasons

Excluded Species List

The following species were excluded from the analysis.

Common Name	Latin Name
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	Numenius phaeopus
White-Winged Scoter	Melanitta fusca
Willet	Catoptrophorus semipalmatus
Yellow-Rumped Warbler	Dendroica coronata
Basking Shark	Cetorhinus maximus
Blue Shark	Prionace glauca
Hammerhead Shark	Sphyrna spp.
Hawksbill Sea Turtle	Eretmochelys imbricata
Leatherback Turtle	Dermochelys coriacea
Mako Shark	Isurus oxyrinchus
Mola Mola	Mola mola
Unidentified Shark	(species group)
Unidentified Turtle	(species group)

Included Species List

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