

Seabirds and Marine Mammals on the NMFS *Juvenile Rockfish* – Ecosystem Survey: 2018 Data Report

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Introduction

Seabird and marine mammal observations are an integral part of the NMFS Juvenile Rockfish – Ecosystem Survey (JRES). These data are valuable on several fronts: (1) measurements provide an upper trophic level perspective to complement the oceanographic and 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 19 years and counting), measuring annual variation in the top predator community contributes to understanding the effects of climate variability and change on the California Current Ecosystem (CCE). This data report summarizes the at-sea survey observations made during the 2018 cruise, and presents basic distribution and abundance estimates for seabirds and mammals. We thank John Field, Keith Sakuma, and the captain and crew of the *R/V Reuben Lasker* for facilitating this project. Funding for making observations was provided by NOAA (IOOS), NSF, and private sources.

Methods

Observations of seabirds and marine mammals are made continuously during daylight ship transits between oceanographic and fish sampling 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. For seabirds, the observer records all individuals seen within a 300-meter strip transect to one side and front of the vessel while the ship is underway at

speeds greater than 5 knots. For mammals, the observer records all individuals out to the horizon while the ship is underway. Observations are entered into a portable computer using the dedicated application “Dlog”; the ship’s position is automatically recorded periodically from an external GPS. Each observation includes the species, the number of individuals observed, and their behavior (mostly “flying” or “sitting on the water” 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 summary statistics on abundance. Species data are available presented for both the core region and the full region surveyed since 2004 (see Sakuma et al. 2006 for delineations).

Table 1. The following criteria were applied to the survey database to select data for the data summary and report.

Criteria	Value
Behavior codes included	All values
Species categories included	Birds, Mammals, Unidentified
Species categories excluded	Fish, Excluded Species List
Year	2018
Month	All
Bin length	All bins > 0.1 km
Region	Core and Full

Taxa excluded from this summary were fish, terrestrial birds, and most shorebirds except phalaropes, which are largely pelagic. For seabirds, density is calculated as the total number of individuals observed per species divided by the area (km²) surveyed. For mammals, an “encounter rate” is defined as the total number of individuals observed per species divided by the linear amount of habitat (km) sampled. Density/encounter rate over time is shown for select seabird and mammal species in the core survey area 1996–2018. Seabirds highlighted in this report are black-footed albatross (*Phoebastria nigripes*), Cassin’s auklet (*Ptychoramphus aleuticus*), common murre (*Uria aalge*), northern fulmar (*Fulmarus glacialis*), pink-footed shearwater (*Ardenna creatopus*), rhinoceros auklet (*Cerorhinca monocerata*), and sooty shearwater (*A. griseus*). Marine mammals included in the 2018 report are humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and Risso’s dolphin (*Grampus griseus*).

Results

A summary of survey effort is shown in Table 2; transects surveyed are shown in Figure 1. Summarized species observations for all species in the core and total survey area are shown in Tables 3 and 4 (see Appendix 1 for exclusions). A total of 25 days of survey effort covering 2,393 km (718 km²) of ocean habitat is summarized; 10 days were spent covering 793 km (238 km²) in the core survey area between Cypress Point and Bodega Bay. Density/encounter rate over time in the core area for the selected species is shown in Figures 2 and 3. Notable results from the 2018 survey for these species were that none of our highlighted seabird species were seen at exceptionally high or low densities (± 1 s.d.), including the density for those seven species combined. Within 1 s.d., black-foot albatross, Cassin’s auklet, common murre, and pink-footed shearwater were below average, while northern fulmar and sooty shearwater were above average. Rhinoceros auklets were of average density. Our marine mammals of focus, on the other hand, were seen at above average densities; humpback whale, fin whale, and Pacific white-sided dolphin had the highest density of our time series. Risso’s dolphin was just under 1 s.d. above average density. Combining these four species also had a very high density.

Large baitballs of small forage fish and discrete “krillballs” were visually observed in the core area off of Davenport and in Monterey Bay, with numerous fin and humpback whales seen in the vicinity. These observations match the high anchovy and krill abundance documented in trawl samples throughout the core area.

Table 2. Summary of survey effort and seabird and mammal community statistics.

2018	Core Area	Full
Survey vessel		<i>R/V Reuben Lasker</i>
Start date		5/8/2018
End date		6/10/2018
Number of survey days	10	25
Distance surveyed (km)	793	2,393
Area surveyed (km ²)	238	718
Number of bird species	26	47
Overall bird density (per km ²)	26.55	17.38
Total birds observed	6,312	12,477
Number of mammal species	14	21
Overall mammal encounter rate (per 100 km)	88.1	89.2
Total mammals observed	698	2136

Figure 1. 2018 survey transects for the full (left) and core (right) regions. Gaps usually reflect nighttime.

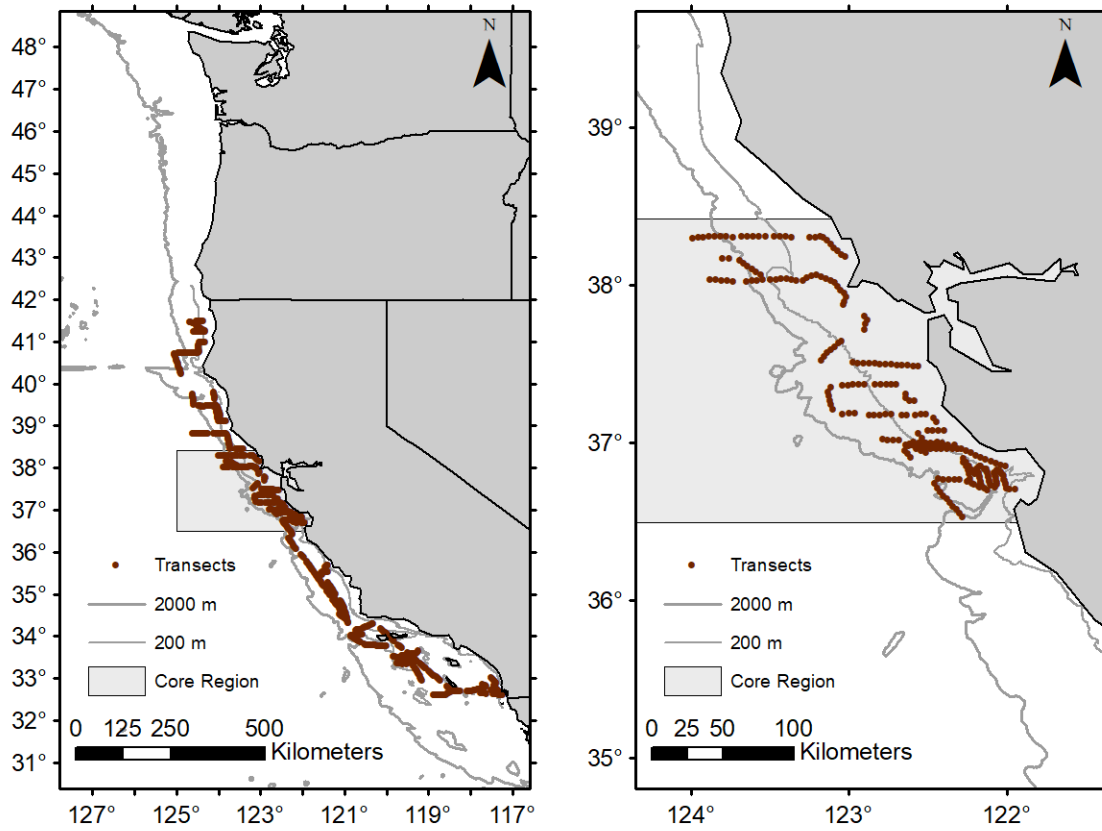


Table 3. Bird survey observations, stratified by area and species. Cell values represent: total number of individuals seen / number of species sightings / average density (birds/km²).

Common Name	Scientific Name	Core Area	Full Area
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>		
Ashy Storm-Petrel	<i>Oceanodroma homochroa</i>		15 / 10 / 0.02
Black guillemot	<i>Cephus grylle</i>		
Black Scoter	<i>Melanitta nigra</i>		
Black Storm-Petrel	<i>Oceanodroma melania</i>		94 / 15 / 0.13
Black-Footed Albatross	<i>Phoebastria nigripes</i>	89 / 67 / 0.37	177 / 138 / 0.25
Black-Legged Kittiwake	<i>Rissa tridactyla</i>		
Black-Vented Shearwater	<i>Puffinus opisthomelas</i>		7 / 4 / 0.01
Bonaparte's Gull	<i>Larus philadelphia</i>	54 / 13 / 0.23	57 / 16 / 0.08
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>	41 / 6 / 0.17	49 / 14 / 0.07
Brant	<i>Branta bernicla</i>		
Brown Booby	<i>Sula leucogaster</i>		
Brown Noddy	<i>Anous stolidus</i>		
Brown Pelican	<i>Pelecanus occidentalis</i>	30 / 15 / 0.13	70 / 31 / 0.1
Buller's Shearwater	<i>Puffinus bulleri</i>		
California Gull	<i>Larus californicus</i>	27 / 15 / 0.11	30 / 18 / 0.04
Caspian Tern	<i>Sterna caspia</i>		3 / 2 / 0
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	150 / 42 / 0.63	198 / 60 / 0.28
Clark's Grebe	<i>Aechmophorus clarkii</i>		
Common Loon	<i>Gavia immer</i>		1 / 1 / 0
Common Murre	<i>Uria aalge</i>	1332 / 490 / 5.6	1923 / 596 / 2.68
Common Tern	<i>Sterna hirundo</i>		2 / 1 / 0
Cook's Petrel	<i>Pterodroma cookii</i>		3 / 2 / 0
Craveri's Murrelet	<i>Synthliboramphus craveri</i>		
Dark Shearwater	(species group)		
Dark-Rumped Petrel	<i>Pterodroma phaeopygia sandwichensis</i>		
Double-Crested Cormorant	<i>Phalacrocorax auritus</i>		3 / 3 / 0
Eared Grebe	<i>Podiceps nigricollis</i>		
Elegant Tern	<i>Sterna elegans</i>		55 / 16 / 0.08
Flesh-Footed Shearwater	<i>Puffinus carneipes</i>		
Fork-Tailed Storm-Petrel	<i>Oceanodroma furcata</i>		
Forster's Tern	<i>Sterna forsteri</i>		
Franklin's Gull	<i>Larus pipixcan</i>		
Glaucous Gull	<i>Larus hyperboreus</i>	1 / 1 / 0	1 / 1 / 0
Glaucous-Winged Gull	<i>Larus glaucescens</i>	1 / 1 / 0	1 / 1 / 0
Guadalupe Murrelet	<i>Synthliboramphus hypoleucus</i>		
Hawaiian Petrel	<i>Pterodroma sandwichensis</i>		1 / 1 / 0
Heermann's Gull	<i>Larus heermanni</i>		
Herring Gull	<i>Larus argentatus</i>		
Horned Puffin	<i>Fratercula corniculata</i>		

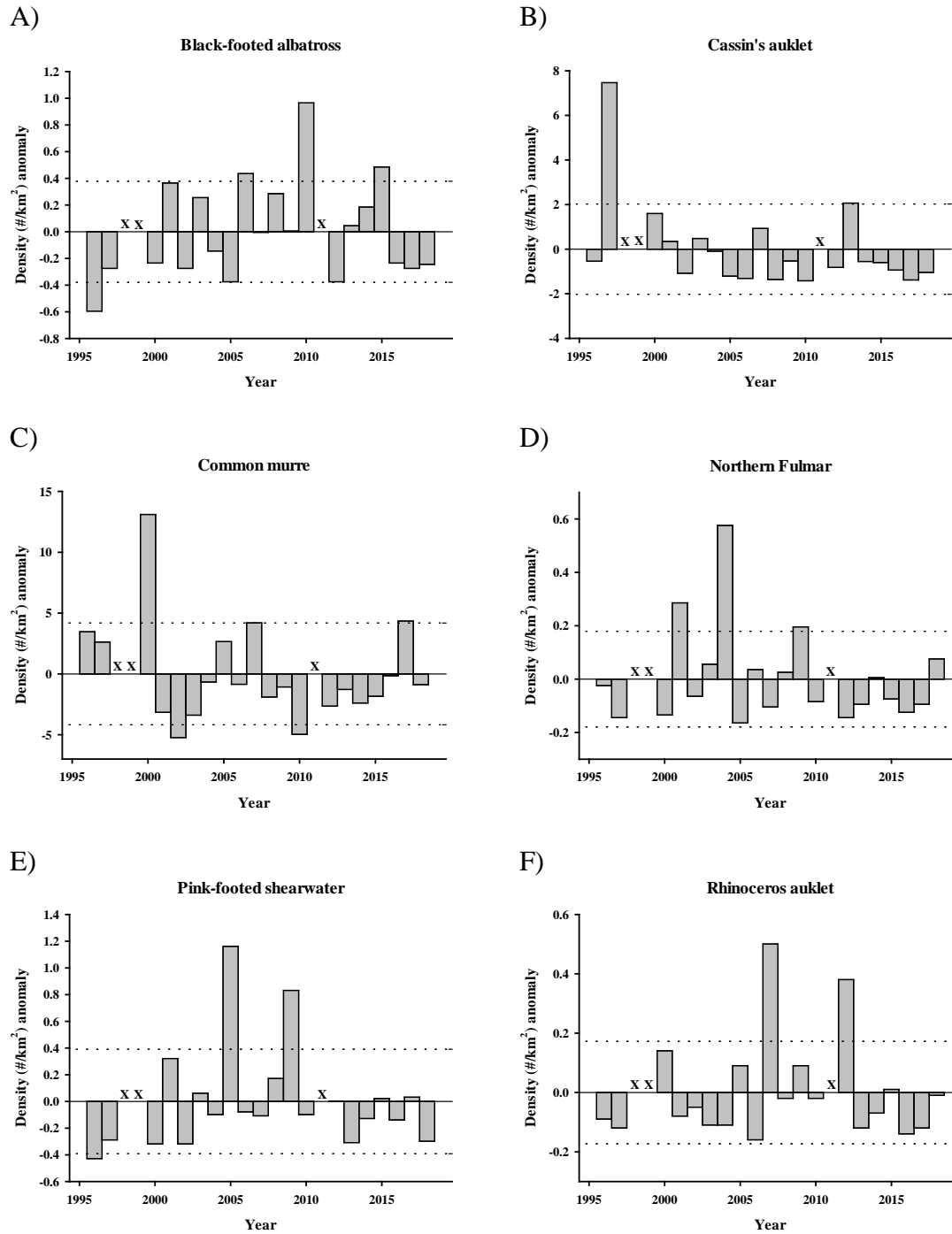
Hybrid Gull	(species group)		
Juan Fernandez Petrel	<i>Pterodroma externa</i>		
Kelp Gull	<i>Larus dominicanus</i>		
Kermadec Petrel	<i>Pterodroma neglecta</i>		
Laughing Gull	<i>Larus atricilla</i>		
Laysan Albatross	<i>Phoebastria immutabilis</i>		3 / 3 / 0
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>		21 / 20 / 0.03
Least Storm-Petrel	<i>Oceanodroma microsoma</i>		
Least Tern	<i>Sterna antillarum</i>		3 / 1 / 0
Long-Tailed Jaeger	<i>Stercorarius longicaudus</i>		
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	1 / 1 / 0	2 / 2 / 0
Masked Booby	<i>Sula dactylatra</i>		1 / 1 / 0
Mew Gull	<i>Larus canus</i>		
Mottled Petrel	<i>Pterodroma inexpectata</i>		
Murphy's Petrel	<i>Pterodroma ultima</i>		1 / 1 / 0
Northern Fulmar	<i>Fulmarus glacialis</i>	56 / 52 / 0.24	86 / 74 / 0.12
Osprey	<i>Pandion haliaetus</i>		
Pacific Loon	<i>Gavia pacifica</i>	4 / 4 / 0.02	6 / 6 / 0.01
Parakeet Auklet	<i>Aethia psittacula</i>		
Parasitic Jaeger	<i>Stercorarius parasiticus</i>		1 / 1 / 0
Parkinson's Petrel	<i>Procellaria parkinsoni</i>		
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>	2 / 1 / 0.01	25 / 11 / 0.03
Peregrine Falcon	<i>Falco peregrinus</i>		
Pigeon Guillemot	<i>Cephus columba</i>		
Pink-Footed Shearwater	<i>Puffinus creatopus</i>	31 / 25 / 0.13	212 / 116 / 0.3
Pomarine Jaeger	<i>Stercorarius pomarinus</i>		2 / 2 / 0
Red Phalarope	<i>Phalaropus fulicaria</i>		
Red-Billed Tropicbird	<i>Phaethon aethereus</i>		1 / 1 / 0
Red-Footed Booby	<i>Sula sula</i>		
Red-Necked Grebe	<i>Podiceps grisegena</i>		
Red-Necked Phalarope	<i>Phalaropus lobatus</i>	202 / 20 / 0.85	376 / 33 / 0.52
Red-Tailed Tropicbird	<i>Pheathon rubricauda</i>		
Red-Throated Loon	<i>Gavia stellata</i>	1 / 1 / 0	3 / 3 / 0
Rhinoceros Auklet	<i>Cerorhinca monocerata</i>	52 / 31 / 0.22	108 / 55 / 0.15
Ring-Billed Gull	<i>Larus delawarensis</i>	7 / 4 / 0.03	7 / 4 / 0.01
Royal Tern	<i>Sterna maxima</i>	1 / 1 / 0	7 / 5 / 0.01
Ruddy Turnstone	<i>Arenaria interpres</i>		
Sabine's Gull	<i>Larus sabini</i>	2 / 2 / 0.01	3 / 3 / 0
Scripps's murrelet	<i>Synthliboramphus scrippsi</i>		23 / 11 / 0.03
Short-Tailed / Slender-Billed Shearwater	<i>Puffinus tenuirostris</i>		
Short-Tailed Albatross	<i>Phoebastria albatrus</i>		
Solander's Petrel	<i>Pterodroma solandri</i>		
Sooty Shearwater	<i>Puffinus griseus</i>	4130 / 516 / 17.37	8603 / 1114 / 11.98
South Polar Skua	<i>Stercorarius maccormicki</i>		3 / 3 / 0
Stejneger's Petrel	<i>Pterodroma longirostris</i>		
Surf Scoter	<i>Melanitta perspicillata</i>		
Thayer's Gull	<i>Larus thayeri</i>		

Townsend's Storm-Petrel	<i>Oceanodroma socorroensis</i>		1 / 1 / 0
Tufted Puffin	<i>Fratercula cirrhata</i>	9 / 8 / 0.04	11 / 10 / 0.02
Unidentified Albatross	(species group)		
Unidentified Auklet	(species group)		
Unidentified Cormorant	(species group)	1 / 1 / 0	1 / 1 / 0
Unidentified Duck	(species group)		
Unidentified Grebe	(species group)		
Unidentified Gull	(species group)	14 / 14 / 0.06	31 / 25 / 0.04
Unidentified Jaeger	(species group)		
Unidentified Large Alcid	(species group)		
Unidentified Leach's Storm-Petrel	(species group)		
Unidentified Loon	(species group)	1 / 1 / 0	1 / 1 / 0
Unidentified Murre	(species group)		
Unidentified Petrel	(species group)		
Unidentified Phalarope	(species group)		
Unidentified Procellarid	(species group)		
Unidentified Shearwater	(species group)		
Unidentified Skua	(species group)		
Unidentified Small Alcid	(species group)		
Unidentified Storm-Petrel	(species group)		10 / 5 / 0.01
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>		
Western Gull	<i>Larus occidentalis</i>	73 / 65 / 0.31	236 / 151 / 0.33
Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>		
Xantus's / Craveri's Murrelet	(species group)		
Xantus's Murrelet	<i>Synthliboramphus hypoleucus</i>		

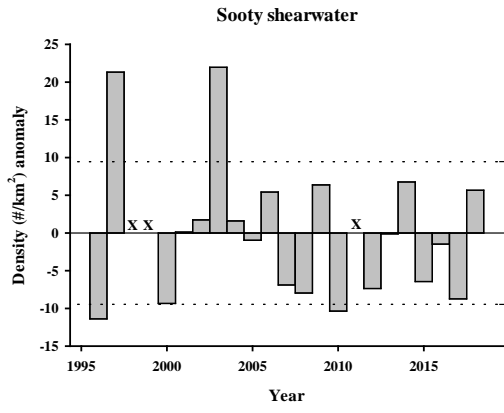
Table 4. Mammal survey observation summary, broken down by survey area and species. Cell values represent: total number of species individuals / number of species sightings / average species encounter rate (individuals per 100 km).

Common Name	Scientific Name	Core Area	Full Area
Baird's Beaked Whale	<i>Berardius bairdii</i>		
Blue Whale	<i>Balaenoptera musculus</i>	3 / 2 / 0.4	3 / 2 / 0.1
Bottlenose Dolphin	<i>Tursiops truncatus</i>		
California Sea Lion	<i>Zalophus californianus</i>	30 / 19 / 3.8	175 / 79 / 7.3
Common Dolphin	<i>Delphinus delphis</i>		
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>		6 / 1 / 0.3
Dall's Porpoise	<i>Phocoenoides dalli</i>	20 / 5 / 2.5	31 / 8 / 1.3
False Killer Whale	<i>Pseudorca crassidens</i>		
Fin Whale	<i>Balaenoptera physalus</i>	35 / 21 / 4.4	50 / 28 / 2.1
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>	136 / 94 / 17.2	179 / 120 / 7.5
Killer Whale	<i>Orcinus orca</i>		1 / 1 / 0
Long-beaked Common Dolphin	<i>Delphinus capensis</i>		25 / 1 / 1
Minke Whale	<i>Balaenoptera acutorostrata</i>	1 / 1 / 0.1	2 / 2 / 0.1
Northern Elephant Seal	<i>Mirounga angustirostris</i>	1 / 1 / 0.1	1 / 1 / 0
Northern Fur Seal	<i>Callorhinus ursinus</i>	11 / 8 / 1.4	18 / 14 / 0.8
Northern Right Whale Dolphin	<i>Lissodelphis borealis</i>		20 / 1 / 0.8
Pacific White-Sided Dolphin	<i>Lagenorhynchus obliquidens</i>	423 / 36 / 53.4	478 / 44 / 20
Pilot Whale	<i>Globicephala spp.</i>		
Pygmy Sperm Whale	<i>Kogia breviceps</i>		
Ridley Sea Turtle	<i>Lepidochelys olivacea</i>		
Right whale dolphin	<i>Lissodelphis spp</i>		
Risso's Dolphin	<i>Grampus griseus</i>	24 / 3 / 3	37 / 5 / 1.5
Sea Otter	<i>Enhydra lutris</i>		
Sei Whale	<i>Balaenoptera borealis</i>		2 / 1 / 0.1
Short-Beaked Common Dolphin	<i>Delphinus delphis</i>		1011 / 36 / 42.2
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)	1 / 1 / 0.1	1 / 1 / 0
Unidentified Beaked Whale	(species group)		
Unidentified Cetacean	(species group)		
Unidentified Dolphin	(species group)	3 / 1 / 0.4	71 / 7 / 3
Unidentified Large Whale	(species group)		
Unidentified Pinniped	(species group)		
Unidentified Sea Lion	(species group)	1 / 1 / 0.1	2 / 2 / 0.1
Unidentified Seal	(species group)		1 / 1 / 0
Unidentified Whale	(species group)	9 / 7 / 1.1	22 / 17 / 0.9

Figure 2. Density (number/km²; expressed as anomalies) over time from core area surveys, 1996–2018. A) black-footed albatross, B) Cassin’s auklet, C) common murre, D) northern fulmar, E) pink-footed shearwater, F) rhinoceros auklet, G) sooty shearwater, and H) the previously shown seven species (note not all seven species were seen every year). The dashed lines indicate ± 1 s.d. of the long-term mean, and ‘x’ indicates years when no survey was conducted.



G)



H)

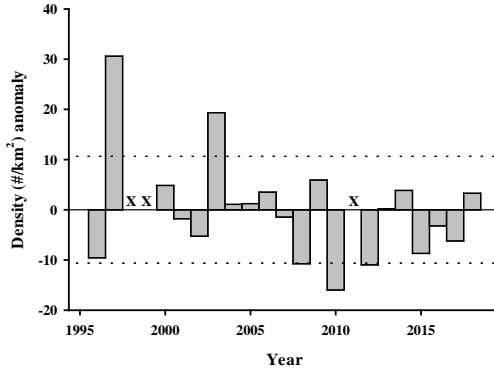
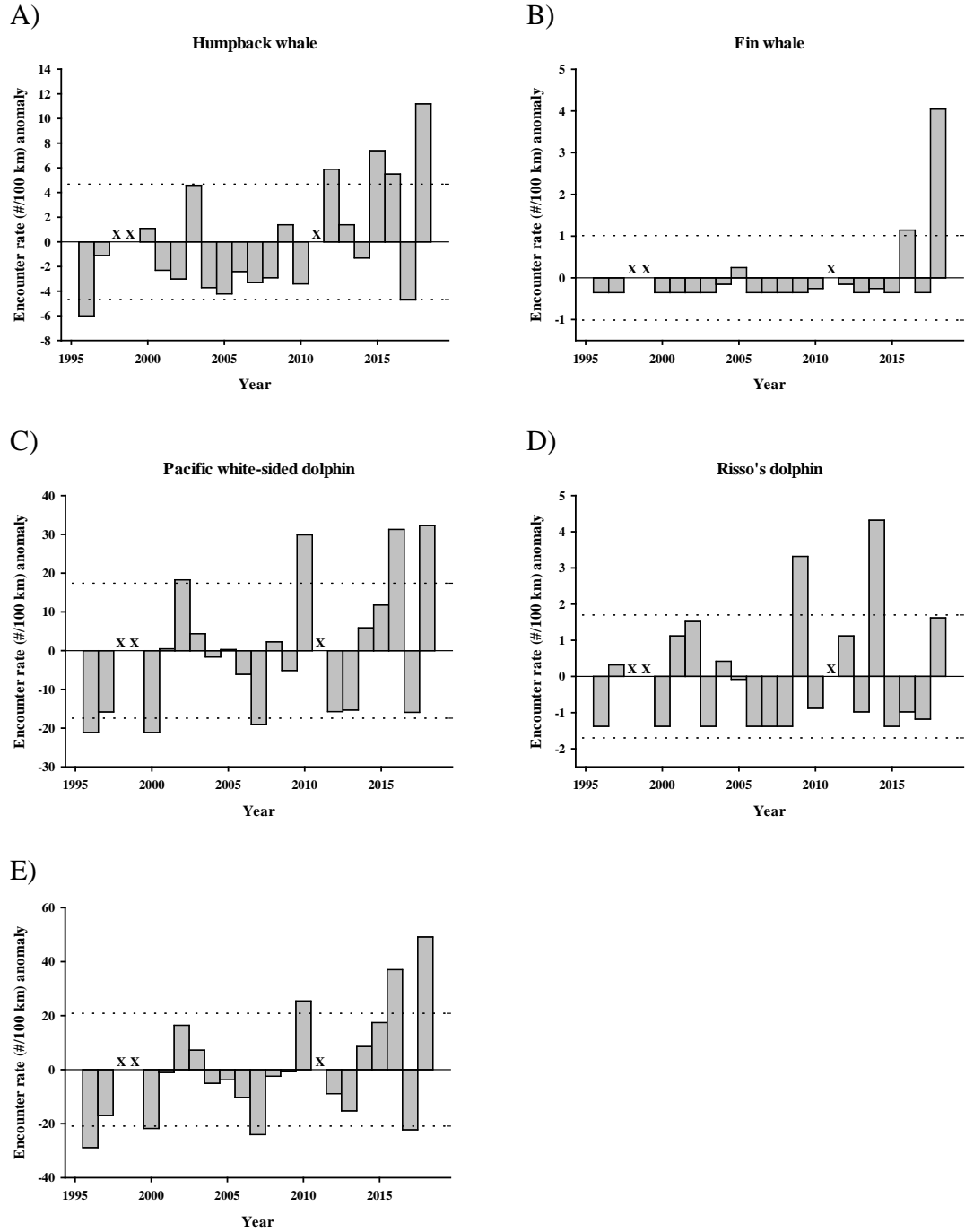


Figure 3. Encounter rate (number/100 km; expressed as anomalies) over time from core area surveys, 1996–2018, of A) humpback whale, B) fin whale, C) Pacific white-sided dolphin, D) Risso’s dolphin, and E) the previously shown four species (note not all four species were seen every year). The dashed lines indicate ± 1 s.d. of the long-term mean, and ‘x’ indicates years when no survey was conducted.



Reference

Sakuma, K.M., Ralston, S., and Wespestad, V.G. 2006. Interannual and spatial variation in the distribution of young-of-the-year rockfish (*Sebastes* spp.): Expanding and coordinating a survey sampling frame. California Cooperative Oceanic Fisheries Investigations (CalCOFI) Report 47:127-139.

Appendix. List of bird species excluded from this summary. These species may or may not have been observed during the survey.

Common Name	Scientific Name
American Coot	<i>Fulica americana</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Black Oystercatcher	<i>Haematopus bachmani</i>
Black Skimmer	<i>Rynchops niger</i>
Black Tern	<i>Chlidonias niger</i>
Black Turnstone	<i>Arenaria melanocephala</i>
Brewer's Sparrow	<i>Spizella breweri</i>
Black-throated gray warbler	<i>Setophaga nigrescens</i>
Bufflehead	<i>Bucephala albeola</i>
Chaplan's Storm-Petrel	<i>Oceanodroma leucorhoa chapmani</i>
Unidentified Dowitcher	(species group)
Eurasian collared dove	<i>Streptopelia decaocto</i>
European Starling	<i>Sturnus vulgaris</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
Green Heron	<i>Butorides virescens</i>
Long-billed Curlew	<i>Numenius americanus</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
Least Sandpiper	<i>Calidris minutilla</i>
Marbled Godwit	<i>Limosa fedoa</i>
Mallard Duck	<i>Anas platyrhynchos</i>
Mourning Dove	<i>Zenaida macroura</i>
Nazca Booby	<i>Sula granti</i>
Unidentified raptor	(species group)
Red-Breasted Merganser	<i>Mergus serrator</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>
Sanderling	<i>Calidris alba</i>
Savannah sparrow	<i>Passerculus sandwichensis</i>
Snowy Egret	<i>Egretta thula</i>
Snow Goose	<i>Chen caerulescens</i>
Townsend's warbler	<i>Setophaga townsendi</i>
Unidentified Bird	(species group)
Unidentified Goose	(species group)
Unidentified Hummingbird	(species group)
Unidentified Passerine	(species group)
Unidentified Shorebird	(species group)
Wandering tattler	<i>Tringa incana</i>
Western Sandpiper	<i>Calidris mauri</i>
Whimbrel	<i>Numenius phaeopus</i>
Willet	<i>Catoptrophorus semipalmatus</i>
Wilson's warbler	<i>Cardellina pusilla</i>
White-Winged Scoter	<i>Melanitta fusca</i>
Yellow-Rumped Warbler	<i>Dendroica coronata</i>