

Seabirds on the CalCOFI/CCE-LTER Survey, Winter 2017

Data Report

William J. Sydeman, Principal Investigator
Sophie Webb, Observer
Marcel Losekoot, Programmer
Sarah Ann Thompson, Analyst



FARALLON INSTITUTE

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

8 March 2018

Introduction

Seabird studies are an integral part of the California Cooperative Oceanic Fisheries Investigation (CalCOFI), California Current Ecosystem - Long-term Ecological Research (CCE-LTER), and Southern California Coastal Ocean Observing System (SCCOOS) programs. The seabird data are valuable for several reasons. First, information on seabird distribution and abundance provides an upper trophic level perspective which complements the lower trophic level plankton and hydrographic data collected by others. Second, estimates of seabird abundance, diversity, and distribution contribute to understanding the spatial ecology of the Southern California Bight and adjacent marine habitats (e.g., Santora et al. 2017), a region characterized by substantial temporal environmental heterogeneity and a major biogeographic boundary associated with Point Conception. Third, by extending our existing records (currently over 30 years and building; 1987-present) and coupling this information with long-term hydrographic and plankton data, seabird data contribute to understanding the effects of climate variability and change on the southern sector of the CCE (e.g., Veit et al. 1996, Hyrenbach and Veit 2003, Santora and Sydeman 2015, Sydeman et al. 2015). Other anthropogenic impacts for this region include coastal oil and gas development and shipping, as well as other biotic changes due to fisheries and other extractive uses of marine life. Seabirds may be responsive to all of these factors.

This data report summarizes observations made during the 2017 winter CalCOFI/CCE-LTER cruise. We present basic data on survey effort as well as summary information on seabird distribution and abundance.

Methods

Observations of seabirds are made continuously during daylight ship transits between oceanographic and plankton 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. The observer records all birds seen within a 300-meter strip transect to one side and front of the vessel while the ship is underway at > 5 knots. 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”). 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 1987 to the present. These data are used to derive summary statistics.

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

Criteria	Value
Behavior codes included	All values
Species categories included	Birds, Unidentified
Species categories excluded	Mammals, Fish, Excluded Species List
Year	2017
Month	All
Bin length	All bins > 0.1 km
Region	Lines 60-93
Season	Winter

Taxa excluded from this summary were all mammals, fish, terrestrial birds, and most shorebirds except phalaropes, which are largely pelagic. Species density was calculated as the total number of individuals observed per species divided by the area (km²) surveyed. Density over time in the winter is shown for select warm and cold water-affinity seabird species in the “core” survey area (defined as the six lines 77–93), 1988–2017. For this winter survey, we have defined species with warm water affinity to include black-vented shearwater and Heermann’s gull (Hyrenbach and Veit 2003). Cold water affinity species include Bonaparte’s gull, black-legged kittiwake, northern fulmar, and rhinoceros auklet (Hyrenbach and Veit 2003). Additionally, we summarize western gull and Brandt’s cormorant, which have affinities to more moderate temperatures.

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 survey area are shown in Table 3 (see Appendix 1 for exclusions). A total of 14 days of survey effort covering 1,125 km (337 km²) of ocean habitat is summarized. Observations from one whole day were not successfully recorded due to technical issues with the GPS logger on board, and we therefore consider that day not surveyed. That day fell at the end of the survey, however, so the days in which data

were collected are consecutive. Density over time in the core area for the selected seabird species (listed above) is shown in Figures 2-4. Notable results from the 2017 winter survey for these species were higher than average density (greater than one standard deviation) of black-vented shearwater, Heermann’s gull, and western gull. There were no species with density lower than one standard deviation of the mean; the cold-water species as well as Brandt’s cormorant had densities near normal for the winter.

Table 2. Summary of survey effort and seabird statistics, winter 2017.

2017	Winter
Survey Vessel	<i>RV Reuben Lasker</i>
Start Date	1/6/2017
End Date	1/19/2017
Number of Survey Days	14
Distance Surveyed (km)	1,125
Area Surveyed (km ²)	337
Number of Bird Species	34
Overall Bird Density (per km ²)	7.289
Total Individuals Counted	2,460

Figure 1. Core transects sampled, winter 2017.

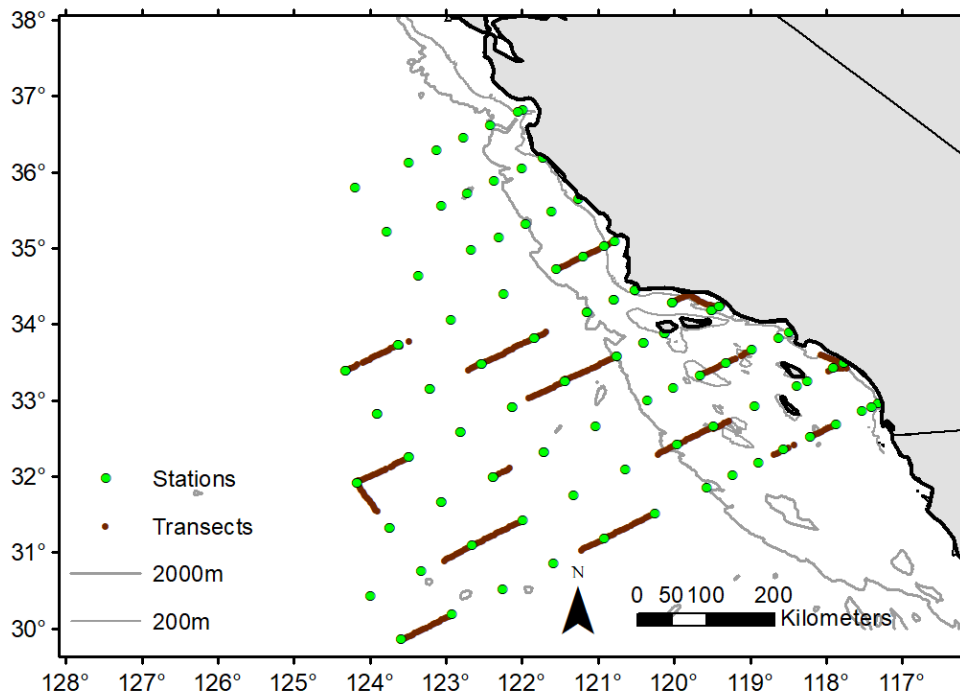


Table 3. Observations in winter 2017 by species in the core survey area. Cell values: total number of individuals (ind.) / number of observations per species (obs.) / species density (dens.) in individuals per km².

Common Name	Scientific Name	Winter 2017
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>	
Black guillemot	<i>Cepphus grylle</i>	
Black Scoter	<i>Melanitta nigra</i>	
Black Storm-Petrel	<i>Oceanodroma melania</i>	
Black-Footed Albatross	<i>Phoebastria nigripes</i>	7 / 7 / 0.02
Black-Legged Kittiwake	<i>Rissa tridactyla</i>	21 / 15 / 0.06
Black-Vented Shearwater	<i>Puffinus opisthomelas</i>	1156 / 186 / 3.43
Bonaparte's Gull	<i>Larus philadelphia</i>	88 / 5 / 0.26
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>	61 / 17 / 0.18
Brant	<i>Branta bernicla</i>	2 / 1 / 0.01
Brown Booby	<i>Sula leucogaster</i>	2 / 2 / 0.01
Brown Noddy	<i>Anous stolidus</i>	
Brown Pelican	<i>Pelecanus occidentalis</i>	47 / 33 / 0.14
Buller's Shearwater	<i>Puffinus bulleri</i>	
California Gull	<i>Larus californicus</i>	241 / 126 / 0.71
Caspian Tern	<i>Sterna caspia</i>	
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	57 / 20 / 0.17
Clark's Grebe	<i>Aechmophorus clarkii</i>	5 / 5 / 0.01
Common Loon	<i>Gavia immer</i>	
Common Murre	<i>Uria aalge</i>	1 / 1 / 0
Common Tern	<i>Sterna hirundo</i>	
Cook's Petrel	<i>Pterodroma cookii</i>	2 / 2 / 0.01
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>	1 / 1 / 0
Eared Grebe	<i>Podiceps nigricollis</i>	1 / 1 / 0
Elegant Tern	<i>Sterna elegans</i>	
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>	
Glaucous-Winged Gull	<i>Larus glaucescens</i>	1 / 1 / 0
Guadalupe Murrelet	<i>Synthliboramphus hypoleucus</i>	
Hawaiian Petrel	<i>Pterodroma sandwichensis</i>	
Heermann's Gull	<i>Larus heermanni</i>	84 / 32 / 0.25

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>	7 / 7 / 0.02
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	1 / 1 / 0
Least Storm-Petrel	<i>Oceanodroma microsoma</i>	
Least Tern	<i>Sterna antillarum</i>	
Long-Tailed Jaeger	<i>Stercorarius longicaudus</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>	
Northern Fulmar	<i>Fulmarus glacialis</i>	30 / 29 / 0.09
Osprey	<i>Pandion haliaetus</i>	
Pacific Loon	<i>Gavia pacifica</i>	4 / 4 / 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>	
Peregrine Falcon	<i>Falco peregrinus</i>	
Pigeon Guillemot	<i>Cephus columba</i>	
Pink-Footed Shearwater	<i>Puffinus creatopus</i>	
Pomarine Jaeger	<i>Stercorarius pomarinus</i>	1 / 1 / 0
Red Phalarope	<i>Phalaropus fulicaria</i>	5 / 3 / 0.01
Red-Billed Tropicbird	<i>Phaethon aethereus</i>	
Red-Footed Booby	<i>Sula sula</i>	
Red-Necked Grebe	<i>Podiceps grisegena</i>	
Red-Necked Phalarope	<i>Phalaropus lobatus</i>	
Red-Tailed Tropicbird	<i>Pheathon rubricauda</i>	
Red-Throated Loon	<i>Gavia stellata</i>	
Rhinoceros Auklet	<i>Cerorhinca monocerata</i>	61 / 35 / 0.18
Ring-Billed Gull	<i>Larus delawarensis</i>	6 / 4 / 0.02
Royal Tern	<i>Sterna maxima</i>	
Ruddy Turnstone	<i>Arenaria interpres</i>	
Sabine's Gull	<i>Larus sabini</i>	
Scripps's murrelet	<i>Synthliboramphus scrippsi</i>	14 / 6 / 0.04
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>	
South Polar Skua	<i>Stercorarius maccormicki</i>	
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>	
Tufted Puffin	<i>Fratercula cirrhata</i>	
Unidentified Albatross	(species group)	
Unidentified Auklet	(species group)	2 / 2 / 0.01
Unidentified Cormorant	(species group)	
Unidentified Duck	(species group)	
Unidentified Grebe	(species group)	3 / 3 / 0.01
Unidentified Gull	(species group)	82 / 22 / 0.24
Unidentified Jaeger	(species group)	
Unidentified Large Alcid	(species group)	
Unidentified Leach's Storm-Petrel	(species group)	
Unidentified Loon	(species group)	
Unidentified Murre	(species group)	4 / 2 / 0.01
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)	46 / 32 / 0.14
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>	76 / 22 / 0.23
Western Gull	<i>Larus occidentalis</i>	340 / 101 / 1.01
Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>	
Xantus's / Craveri's Murrelet	(species group)	
Xantus's Murrelet	<i>Synthliboramphus hypoleucus</i>	

Figure 2. Density ($\#/km^2$) over time from winter surveys for species with warm water affinity, core survey area only, 1988–2017. A) black-vented shearwater and B) Heermann’s gull. The dashed lines indicate ± 1 s.d. of the long-term mean, and ‘x’ indicates years when no winter survey was conducted.

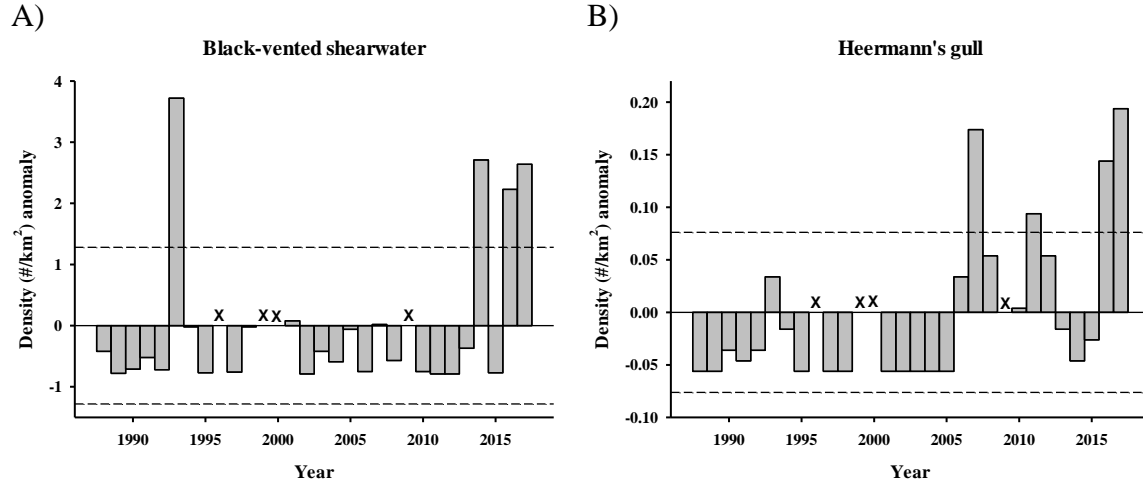


Figure 3. Density ($\#/km^2$) over time in the winter for species with cold water affinities, core area only, 1988–2017. A) Bonaparte’s gull, B) black-legged kittiwake, C) northern fulmar, and D) rhinoceros auklet. The dashed lines indicate ± 1 s.d. of the long-term mean, and ‘x’ indicates years when no winter survey was conducted.

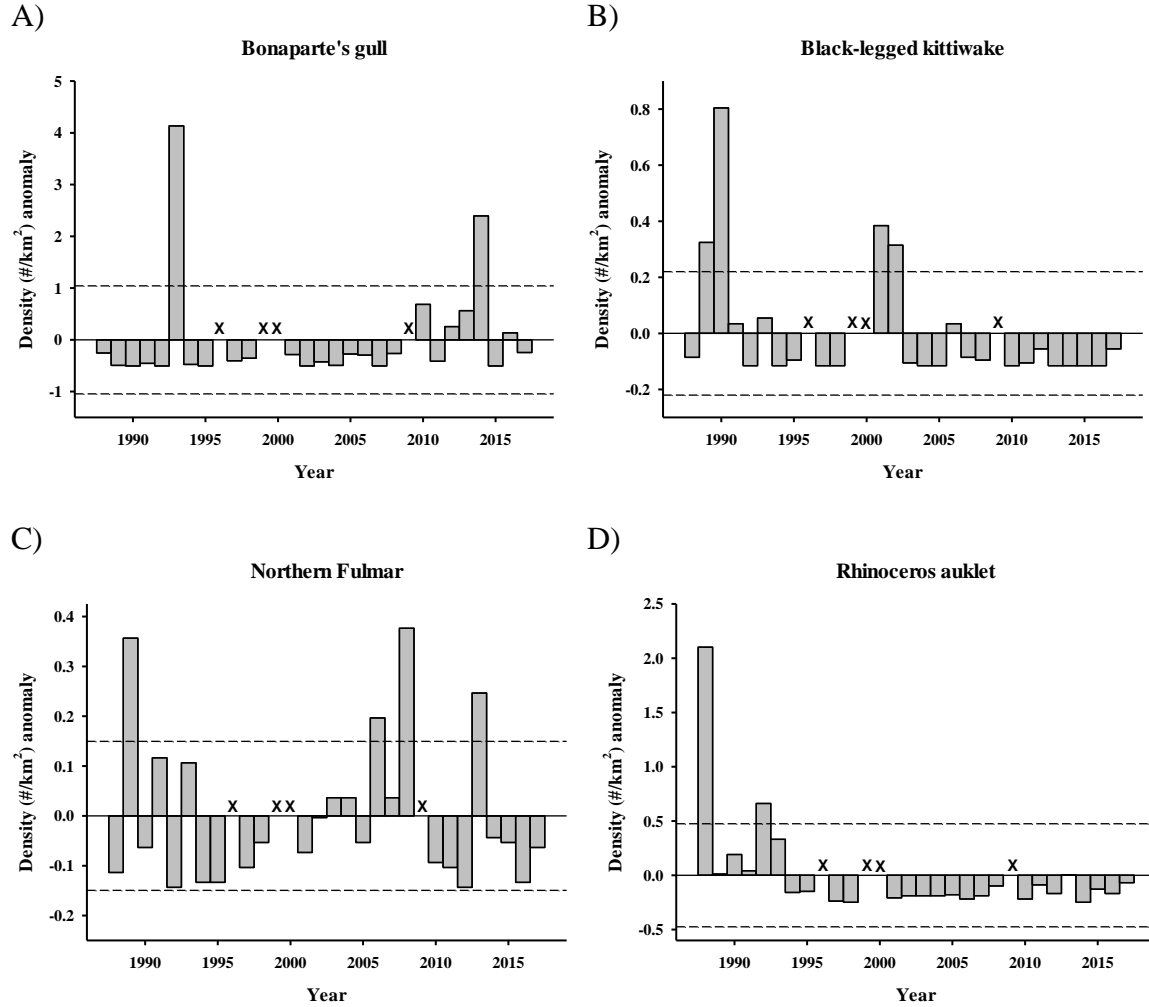
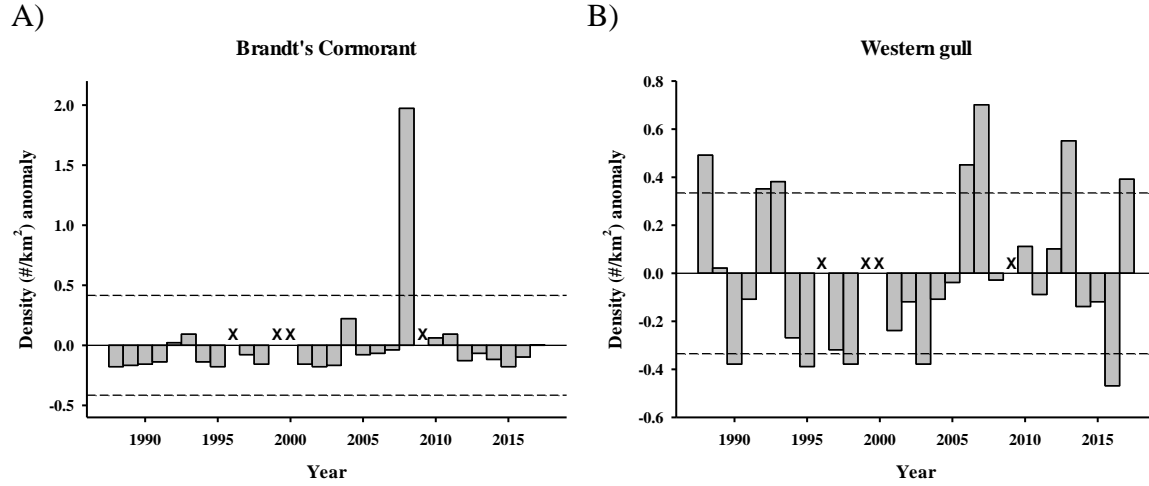


Figure 4. Density ($\#/km^2$) over time in the winter for species with moderate water temperature affinity, core area only, 1988–2017. A) Brandt’s cormorant and B) western gull. The dashed lines indicate ± 1 s.d. of the long-term mean, and ‘x’ indicates years when no winter survey was conducted.



List of References

Hyrenbach, D.K., and R.R. Veit. 2003. Ocean warming and seabird communities of the Southern California Current System (1987–98): response at multiple temporal scales. *Deep-Sea Research Part II* 50:2537-2565.

Santora, J.A. and W.J. Sydeman. 2015. Persistence of hotspots and variability of seabird species richness and abundance in the southern California Current. *Ecosphere* 6:214.

Santora, J.A., W.J. Sydeman, I.D. Schroeder, J.C. Field, R.R. Miller, and B.K. Wells. 2017. Persistence of trophic hotspots and relation to human impacts within an upwelling marine ecosystem. *Ecological Applications* 27:560-574.

Sydeman, W.J., S.A. Thompson, J.A. Santora, J.A. Koslow, R. Goericke, and M.D. Ohman. 2015. Climate-ecosystem change off southern California: Time-dependent seabird predator-prey numerical responses. *Deep-Sea Research Part II* 112:158-170.

Veit, R.R., P. Pyle, and J.A. McGowan. 1996. Ocean warming and long-term change in pelagic bird abundance within the California Current System. *Marine Ecology Progress Series* 139:11-18.

Appendix 1. 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	
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>

