# Seabirds on the CalCOFI/CCE-LTER Survey, Summer 2017 Data Report

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



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

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## 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 summer 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	Summer

Taxa excluded from this summary were all mammals, fish, terrestrial birds, and most shorebirds except phalaropes, which are largely pelagic. Species density is calculated as the total number of individuals observed per species divided by the area (km²) surveyed. Density over time in the spring is shown for select warm and cold water-affinity seabird species in the "core" survey area (defined as the six lines 77–93), 1987–2017. For summer, we have defined species with warm water-affinity to include black-vented shearwater, Cook's petrel, and elegant tern (Hyrenbach and Veit 2003). Cold water-affinity species include common murre, pink-footed shearwater, and sooty shearwater (Hyrenbach and Veit 2003).

### **Results**

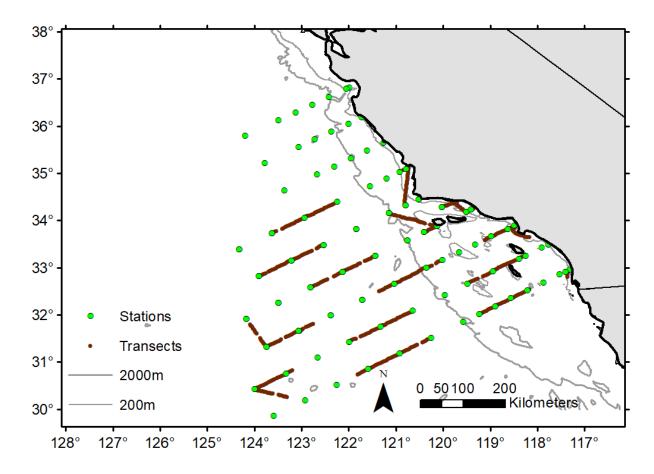
A summary of survey effort is shown in Table 2; transects surveyed are shown in Figure 1. Summarized species observations for all species in the core and extended survey area combined are shown in Table 3 (see Appendix 1 for exclusions). A total of 15 days of survey effort covering 1,700 km (510 km²) of ocean habitat is summarized. Density over time in the core area for the selected seabird species (listed above) is shown in Figures 2 (warm water-affinity) and 3 (cold water-affinity).

Notable results from the 2017 summer survey for these species were 1) very high density of black-vented shearwater and common murre (highest densities in the survey history (summer)), and 2) higher than average densities of elegant tern and sooty shearwater (greater than 1 s.d. of the mean). Interestingly, these species with high occurrence are categorized as both "warmwater" (black-vented shearwater and elegant tern) and "cold-water" species (common murre and sooty shearwater). None of the featured species had density lower than one standard deviation of the mean.

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

2017	Spring
Survey Vessel	RV Sally Ride
Start Date	8/1/2017
End Date	8/15/2017
Number of Survey Days	15
Distance Surveyed (km)	1,700
Area Surveyed (km²)	510
Number of Bird Species	39
Overall Bird Density (per km <sup>2</sup> )	36.117
Total Individuals Counted	18,423

**Figure 1.** Transects sampled, summer 2017. Gaps represent nighttime when bird surveys are not possible, or daytime when weather conditions may preclude sampling.



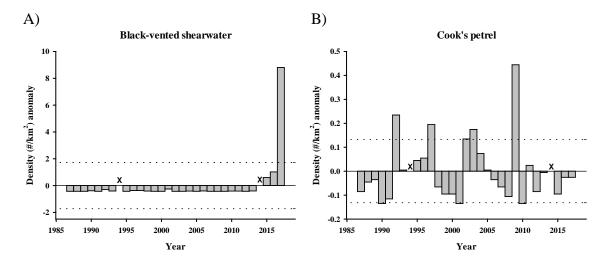
**Table 3.** Observations in summer 2017 by species in the core survey area. Cell values: total number of individuals (ind.) / number of observations per species (obs.) / species density (dens.) in individuals per km<sup>2</sup>.

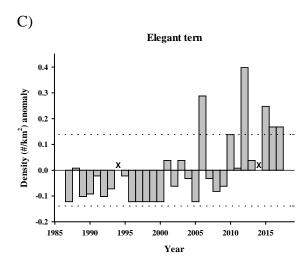
Common Name	Scientific Name	Summer 2017
American White Pelican	Pelecanus erythrorhynchos	
Ancient Murrelet	Synthliboramphus antiquus	
Arctic Loon	Gavia arctica	
Arctic Tern	Sterna paradisaea	
Ashy Storm-Petrel	Oceanodroma homochroa	2/1/0
Black guillemot	Cepphus grylle	
Black Scoter	Melanitta nigra	
Black Storm-Petrel	Oceanodroma melania	
Black-Footed Albatross	Phoebastria nigripes	21 / 21 / 0.04
Black-Legged Kittiwake	Rissa tridactyla	
Black-Vented Shearwater	Puffinus opisthomelas	4710 / 165 / 9.23
Bonaparte's Gull	Larus philadelphia	
Brandt's Cormorant	Phalacrocorax penicillatus	13 / 10 / 0.03
Brant	Branta bernicla	
Brown Booby	Sula leucogaster	5 / 4 / 0.01
Brown Noddy	Anous stolidus	
Brown Pelican	Pelecanus occidentalis	14 / 9 / 0.03
Buller's Shearwater	Puffinus bulleri	17 / 10 / 0.03
California Gull	Larus californicus	20 / 17 / 0.04
Caspian Tern	Sterna caspia	1/1/0
Cassin's Auklet	Ptychoramphus aleuticus	2/1/0
Clark's Grebe	Aechmophorus clarkii	
Common Loon	Gavia immer	
Common Murre	Uria aalge	627 / 69 / 1.23
Common Tern	Sterna hirundo	
Cook's Petrel	Pterodroma cookii	56 / 37 / 0.11
Craveri's Murrelet	Synthliboramphus craveri	
Dark Shearwater	(species group)	
	Pterodroma phaeopygia	
Dark-Rumped Petrel	sandwichensis	
Double-Crested Cormorant	Phalacrocorax auritus	1/1/0
Eared Grebe	Podiceps nigricollis	
Elegant Tern	Sterna elegans	150 / 72 / 0.29
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	
Guadalupe Murrelet	Synthliboramphus hypoleucus	1/1/0
Hawaiian Petrel	Pterodroma sandwichensis	
Heermann's Gull	Larus heermanni	23 / 12 / 0.05
Herring Gull	Larus argentatus	

Hybrid Gull   General Composition   Frenandez Petrel   Prevodroma externa   Kelp Gull   Larus dominicanus   Kermadec Petrel   Prevodroma neglecta   Laughing Gull   Larus atricilla   Larus atricilla   Lasyan Albatross   Phoebastria immutabilis   Leach's Storm-Petrel   Oceanodroma leucorhoa   91/78/0.18   Least Storm-Petrel   Oceanodroma microsoma   Least Tern   Sterna antillarum   Long-Tailed Jaeger   Stercorarius longicaudus   Marbled Murrelet   Brachyramphus marmoratus   Mew Gull   Larus canus   Mottled Petrel   Prevodroma inexpectata   Prevodroma ultima   Northern Fulmar   Fulmarus glacialis   Osprey   Pandion haliaetus   Pacific Loon   Gavia pacifica   Aethia psitacula   Parasitic Jaeger   Stercorarius parasiticus   5 / 4 / 0.01   Parkinson's Petrel   Procellaria parkinsoni   Pelagic Cormorant   Phalacrocorax pelagicus   1/1/0   Peregrine Falcon   Falco peregrinus   Pigeon Guillemot   Cepphus columba   Pink-Footed Shearwater   Paffinus creatopus   254/69/0.5   Pomarine Jaeger   Stercorarius pomarinus   Red-Billed Tropicbird   Phaethon aethereus   4/4/0.01   Red-Footed Booby   Sula sula   Sula sula   Larus sabini   11/3/0.02   Red-Tailed Tropicbird   Phaethon aethereus   4/4/0.01   Red-Footed Booby   Sula sula   Larus sabini   11/3/0.02   Sortina aethia sabini   Larus sabini   11/3/0.02   Sortina sabini   Sortina sabini   Sortina sabini   11/3/0.02   Sortina sabini   11/3/0.02   So	Horned Puffin	Fratercula corniculata	
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Surf Scoter Melanitta perspicillata Thayer's Gull Larus thayeri	Stejneger's Petrel	Pterodroma longirostris	
Thayer's Gull Larus thayeri		·	
Townsend's Storm-Petrel Oceanodroma socorroensis	Thayer's Gull	• •	
	Townsend's Storm-Petrel	Oceanodroma socorroensis	

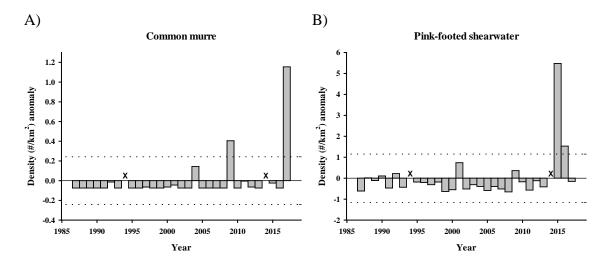
Tufted Puffin	Fratercula cirrhata	
Unidentified Albatross	(species group)	2/1/0
Unidentified Auklet	(species group)	
Unidentified Cormorant	(species group)	
Unidentified Duck	(species group)	
Unidentified Grebe	(species group)	
Unidentified Gull	(species group)	8 / 8 / 0.02
Unidentified Jaeger	(species group)	
Unidentified Large Alcid	(species group)	
Unidentified Leach's Storm-Petrel	(species group)	47 / 37 / 0.09
Unidentified Loon	(species group)	
Unidentified Murre	(species group)	3 / 2 / 0.01
Unidentified Petrel	(species group)	2/2/0
Unidentified Phalarope	(species group)	8 / 2 / 0.02
Unidentified Procellarid	(species group)	
Unidentified Shearwater	(species group)	1 / 1 / 0
Unidentified Skua	(species group)	
Unidentified Small Alcid	(species group)	
Unidentified Storm-Petrel	(species group)	13 / 12 / 0.03
Unidentified Tern	(species group)	1/1/0
Unidentified Tropicbird	(species group)	1/1/0
Wedge-Rumped Storm-Petrel	Oceanodroma tethys	
Wedge-Tailed Shearwater	Puffinus pacificus	
Western Grebe	Aechmophorus occidentalis	
Western Gull	Larus occidentalis	148 / 115 / 0.29
Wilson's Storm-Petrel	Oceanites oceanicus	
Xantus's / Craveri's Murrelet	(species group)	
Xantus's Murrelet	Synthliboramphus hypoleucus	

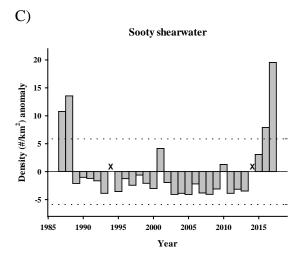
**Figure 2.** Density (expressed as anomalies) over time from summer surveys for species with "warm water" affinities, 1987-2017. A) black-vented shearwater, B) Cook's petrel, and C) elegant tern. The dashed lines indicate  $\pm 1$  s.d. of the long-term mean, and 'x' indicates years when no summer survey was conducted.





**Figure 3.** Density (expressed as anomalies) over time for summer surveys for species with "cold water" affinities, 1987-2017. A) common murre, B) pink-footed shearwater, and C) sooty shearwater. The dashed lines indicate  $\pm 1$  s.d. of the long-term mean, and 'x' indicates years when no summer survey was conducted.





## **List of References**

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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.

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**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	Fulica americana
Black Oystercatcher	Haematopus bachmani
Black Skimmer	Rynchops niger
Black Tern	Chlidonias niger
Black Turnstone	Arenaria melanocephala
Black-throated gray warbler	Setophaga nigrescens
Brewer's Sparrow	Spizella breweri
Brown-headed cowbird	Molothrus ater
Bufflehead	Bucephala albeola
Chanman's Storm Datral	Oceanodroma leucorhoa
Chapman's Storm-Petrel	chapmani
Eurasian collared dove	Streptopelia decaocto
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
Savannah sparrow	Passerculus sandwichensis
Snow Goose	Chen caerulescens
Snowy Egret	Egretta thula
Townsend's warbler	Setophaga townsendi
Unidentified Bird	(species group)
Unidentified Dowitcher	
Unidentified Goose	(species group)
Unidentified Hummingbird	(species group)
Unidentified Passerine	(species group)
Unidentified raptor	(species group)
Unidentified Shorebird	(species group)
Wandering tattler	Tringa incana
Western Sandpiper	Calidris mauri
Whimbrel	Numenius phaeopus
White-Winged Scoter	Melanitta fusca
Willet	Catoptrophorus semipalmatus
Wilson's warbler	Cardellina pusilla
Yellow-Rumped Warbler	Dendroica coronata