



Landbird Trends 2016–2021, and 2021 Annual Report

Channel Islands National Park

Natural Resource Report NPS/MEDN/NRR—2023/2561



ON THE COVER

Orange-crowned Warbler (*Leiothlypis celata sordida*) nestlings on Santa Rosa Island in 2021.
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Executive Summary

The National Park Service (NPS) began monitoring landbirds at Channel Islands National Park in 1993 as part of its long-term inventory and monitoring program. The park's landbird monitoring later became part of the NPS Inventory and Monitoring Division's Mediterranean Coast Network long-term monitoring programs. Consequently, landbird monitoring has been conducted during every breeding season since 1993. In this report, we summarize data collected during the 2021 breeding season and we analyze trends in a select number of species.

Landbird monitoring was conducted between 10 March and 22 May 2021. Using distance-based sampling methods in a standardized protocol, birds were counted on 334 of 338 permanent point count stations (99%) across the Channel Islands monitored for landbirds. These surveys were conducted at 29 of 33 points on Santa Barbara Island, 8 of 8 on East Anacapa Islet, 112 of 112 on Santa Cruz Island, 40 of 40 on San Miguel Island, and 145 of 145 on Santa Rosa Island. Four points on Santa Barbara Island were not counted due to nesting California Brown Pelicans (*Pelecanus occidentalis*) and Western Gulls (*Larus occidentalis*); 3 of 4 points (i.e., 17, 19, and 20) were also not counted in 2016–2021 to avoid disturbing breeding pelicans.

This was the first monitoring season that the permanent line transects on Santa Barbara, East Anacapa, and San Miguel Islands were not surveyed. During the 2021 monitoring season, Channel Islands National Park decided to stop using line transects and focus on point count stations only, based on an external review of the landbird monitoring program.

Fifty-six bird species were counted at point count stations across all of the islands in 2021. Parkwide, 40 of these species are breeders in Channel Islands National Park. Parkwide, the 10 most detected breeding landbirds in 2021 were, in descending order: Spotted Towhee, Song Sparrow, Bewick's Wren, Orange-crowned Warbler, House Finch, Western Meadowlark, Horned Lark, Common Raven, Island Scrub-Jay, and Pacific-slope Flycatcher (scientific names in Table 2 and Appendix A).

On East Anacapa Islet, 26 landbird species have been counted since 1993; 7 species were counted in 2021. No new transient species were detected in 2021; 6 transient or visiting species have been counted on the island overall since 1993.

On Santa Barbara Island, 50 landbird species have been counted since 1993; 13 species were counted in 2021. Lincoln's Sparrow was a new transient species counted in 2021 on Santa Barbara; 23 transient or visiting species have been counted on the island since 1993.

On Santa Cruz Island, 78 landbird species have been counted since 2013; 45 species were counted in 2021. Hermit Warbler, Lawrence's Goldfinch and Warbling Vireo were new transient species counted in 2021 on Santa Cruz Island; 21 transient or visiting species have been counted on this island since 2013.

On San Miguel Island, 70 landbird species have been counted since 1993; 10 were counted in 2021. No transient species were counted in 2021; 32 transient or visiting species have been counted on the island since 1993.

On Santa Rosa Island, 78 landbird species have been counted since 1994; 39 were detected in 2021. No new transient species were counted in 2021 on Santa Rosa; 21 transient or visiting species have been counted on the island since 1994.

Nonnative and invasive birds were counted on only 1 of the 5 islands in 2021: 23 European Starlings on Santa Rosa Island. However, anecdotal sightings of nonnative species occurred more frequently (i.e., outside of survey times) on Santa Cruz and Santa Rosa Islands in 2021. The highest numbers of nonnative species detections occurred on Santa Rosa Island, with 25 detections of Eurasian Collared Dove (primarily at the Historic Ranch), 18 detections of European Starling (Historic Ranch), 2 detections of Brown-headed Cowbird, and 1 Rock Pigeon detection (Historic Ranch). Other species were not reported by Channel Islands National Park landbird monitors or in eBird in 2021.

This was the first annual monitoring report since the Coonan and Dye (2016) trend report to incorporate density estimates for particular species across Channel Islands National Park. Parkwide, 13 species were analyzed using the Distance Package in R. Of the 13 species analyzed, 5 had either increasing or decreasing densities from 2016 to 2021. All park islands except for Santa Barbara had a species that showed an increasing or decreasing trend from 2016 to 2021. Horned Lark and House Finch on San Miguel Island were the only species to show decreasing trends from 2016 to 2021, which is opposite from the trend presented by Coonan and Dye (2016).

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Paul Collins and Stacey Ostermann-Kelm provided critical reviews. Data were gathered by P. Larramendy (Western Foundation of Vertebrate Zoology [WVZ], PTL) on Santa Barbara, Santa Cruz and Santa Rosa Islands, as well as by Stacy Baker of the National Park Service (San Miguel and Santa Cruz Islands, SB), Jim Howard of California Institute of Environmental Studies (East Anacapa Islet, JAH), Lyndal Laughrin of the UC Reserve (Santa Cruz Island, LL), Nick Todd (Santa Rosa and Santa Cruz Islands, NT) and Dan Maxwell (Santa Rosa Island, DM), who are sub-contractors to the WVZ, and James Mouton (Santa Rosa Island, JM) of the Smithsonian Institute. National Park Service staff were instrumental in getting observers on, off, and around the islands safely. The UC Reserve on Santa Cruz Island provided lodging, and L. Laughrin assisted with all logistics on this island. Island Packers provided additional transportation on and off island. The California Institute for Environmental Studies and the Western Foundation of Vertebrate Zoology generously provided additional logistical and technical support. Sonya Daw provided expert editing of this report. Thanks to all!

Introduction

Channel Islands National Park (CHIS) comprises 5 of the 8 Channel Islands that lie off the coast of southern California. The park islands range in size from <300 hectares (East Anacapa and Santa Barbara Islands) to >20,000 hectares (Santa Rosa and Santa Cruz Islands). Fifty-four terrestrial bird species (hereafter “landbird species”), not including exclusively marine species, have been confirmed as breeding regularly or occasionally on the park islands (Appendix A; Collins and Jones 2015).

The National Park Service (NPS) began monitoring landbirds at CHIS in 1993 as part of its long-term inventory and monitoring program (Davis et al. 1994). The park’s landbird monitoring later became part of the NPS Inventory and Monitoring Division’s Mediterranean Coast Network (MEDN) long-term monitoring programs (Cameron et al. 2005). Data were originally collected on line transects (van Riper III et al. 1988) until the program shifted primarily to the point count method starting in 2001 as a result of a program review in 2000 (Fancy 2000; Coonan et al. 2011). Prior to 2016, monitoring was conducted by experienced CHIS staff, partners, interns, and volunteers. Because of a loss of institutional knowledge due to a reduction in staffing and retirement of key personnel, the park partnered with the Western Foundation of Vertebrate Zoology to coordinate and conduct the landbird monitoring from 2016 to 2021.

The objectives of the landbird monitoring program (van Riper III et al. 1988; Coonan et al. 2011) are as follows:

- 1) Determine long-term trends in species composition, distribution, and abundance of native and nonnative landbird species in selected areas of Channel Islands National Park.
- 2) Improve our understanding of breeding bird–habitat relationships and the effects of management actions such as alien plant and animal control on bird populations by correlating changes in landbird species composition, distribution, and abundance with changes in specific habitat variables.

In this report, we summarize data collected during landbird monitoring in 2021. We present simple summaries of raw observational data and trends in density for selected species.

Methods

In 2021, landbird monitoring was conducted on established point count sites called “stations” (Coonan et al. 2011). This was the first monitoring season that the permanent line transects on Santa Barbara, East Anacapa, and San Miguel Islands were not surveyed. Based on the 2020 program review (George 2022), it was decided that line transects would no longer be monitored, and eventually, point counts will be established to replace the line transects. A statistical power analysis is currently underway to inform additional modifications to the sampling design.

Point count sampling occurred in the morning, beginning as soon as it was light enough to see a distance of at least 150 m and ending no later than 4 hours after official sunrise. Counts were conducted for 10 minutes at each point count site and were not conducted during high winds (wind strength on the Beaufort scale is sustained at 4 or greater) or heavy rain. Observations were made by sight and sound of either perched or flying birds, and included horizontal distances in meters from the observer to the bird.

On Santa Cruz Island, we conducted an eighth year of monitoring at 100 non-random point count sites established by R. C. Klinger of The Nature Conservancy in 1991 along trails and roads. In addition, we conducted an eighth year of monitoring at 12 non-random point count sites established by NPS in 2013 on the east side of Santa Cruz Island. Access points to the stations were spaced 0.8 km (0.5 mi) apart along the major roads and trails on the island. A random compass bearing and distance (within 150 m) to the station were selected from these access points.

The methodology used in 2021 followed Coonan et al. (2011), except for the fog modification that was adopted in 2015 and repeated again during the 2016–2021 seasons: the minimum visibility distance necessary to conduct monitoring was reduced from 400 m to 150 m. For a complete description of methods and Standard Operating Procedures see the *Landbird Monitoring Protocol for Channel Islands National Park – Version 2.0* (Coonan et al. 2011).

Seven observers conducted landbird monitoring in 2021 (Appendix B). Data were entered into the CHIS Landbird Database by P. Larramendy, and then quality-checked and verified for errors by L. Hall. Validation queries were run to highlight field values that were not consistent with expected results (i.e., out-of-range values). These values were double-checked against field datasheets, and discrepancies were corrected as appropriate and/or noted in the database.

Data summaries were generated using an automated report run in Program R (R Core Team 2021).

Density analyses were performed on 12 species using data from monitoring seasons 2016–2021. Species were selected for density analysis if they showed increasing or decreasing trends in the 1993–2015 trend analysis (Coonan and Dye 2016) and had a sample size of ≥ 50 individuals detected (Buckland et al. 2015). In addition, the authors also evaluated species that they determined warranted closer investigation, for example, Acorn Woodpecker on Santa Rosa, since they were not evaluated in the 2016 trend report. We used half-normal and hazard rate key functions with cosine and polynomial adjustments (Buckland et al. 2015; Coonan and Dye 2016). Distances were truncated to

include 90% of observations recorded during point count surveys, while removing outlier distances. Distances for all species were truncated to 100 m, except for Acorn Woodpecker, which was truncated at 200 m because woodpecker observations are generally recorded at greater distances than passerines because woodpecker vocalizations are louder. We ran models using the Distance Package in R, and the model with the lowest Akaike's Information Criterion (AIC) and best Cramér-von Mises statistic for goodness-of-fit were used for density estimations and interannual linear regression analyses (Miller et al. 2019; R Core Team 2021).

Landbird monitoring point count stations and line transects are presented in Figures 1–5. Line transects were not surveyed in 2021 per agreement from the program review team convened in 2021.

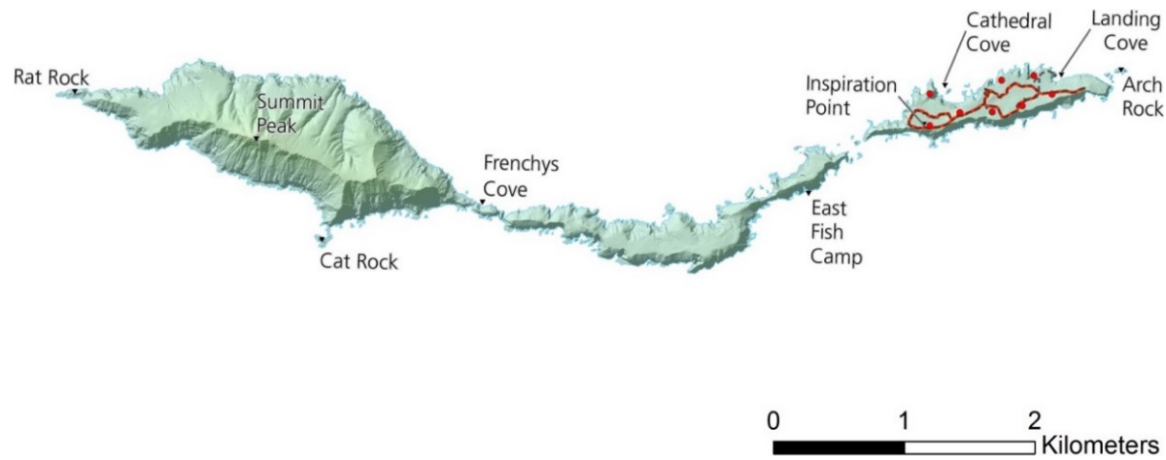


Figure 1. Landbird monitoring point count stations (red dots) and line transects (red lines) on East Anacapa Islet. Line transects were not surveyed in 2021.



Figure 2. Landbird monitoring point count stations (red dots) and line transects (red lines) on Santa Barbara Island. Line transects were not surveyed in 2021.

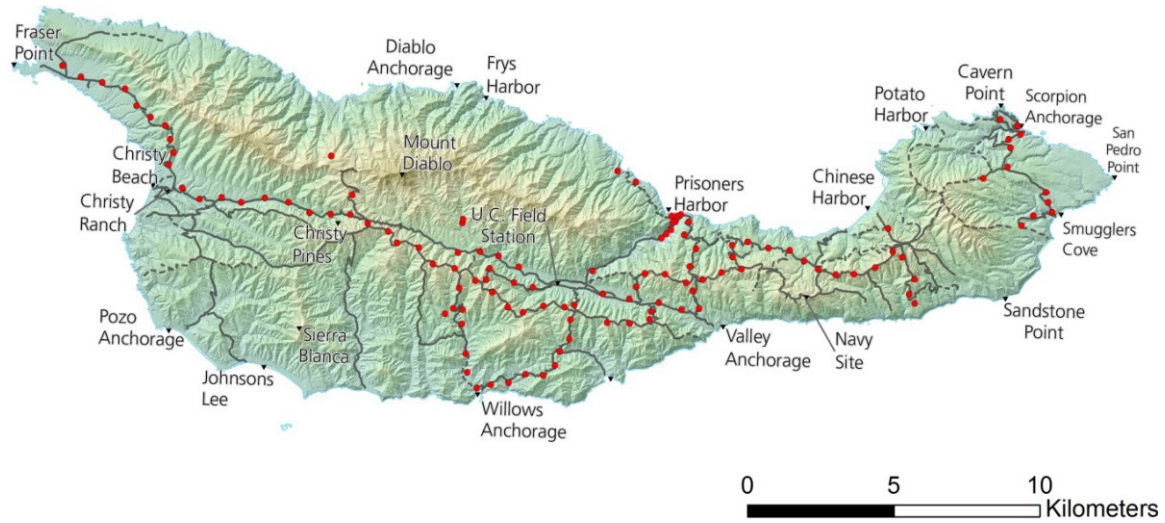


Figure 3. Landbird monitoring point count stations (red dots) on Santa Cruz Island.

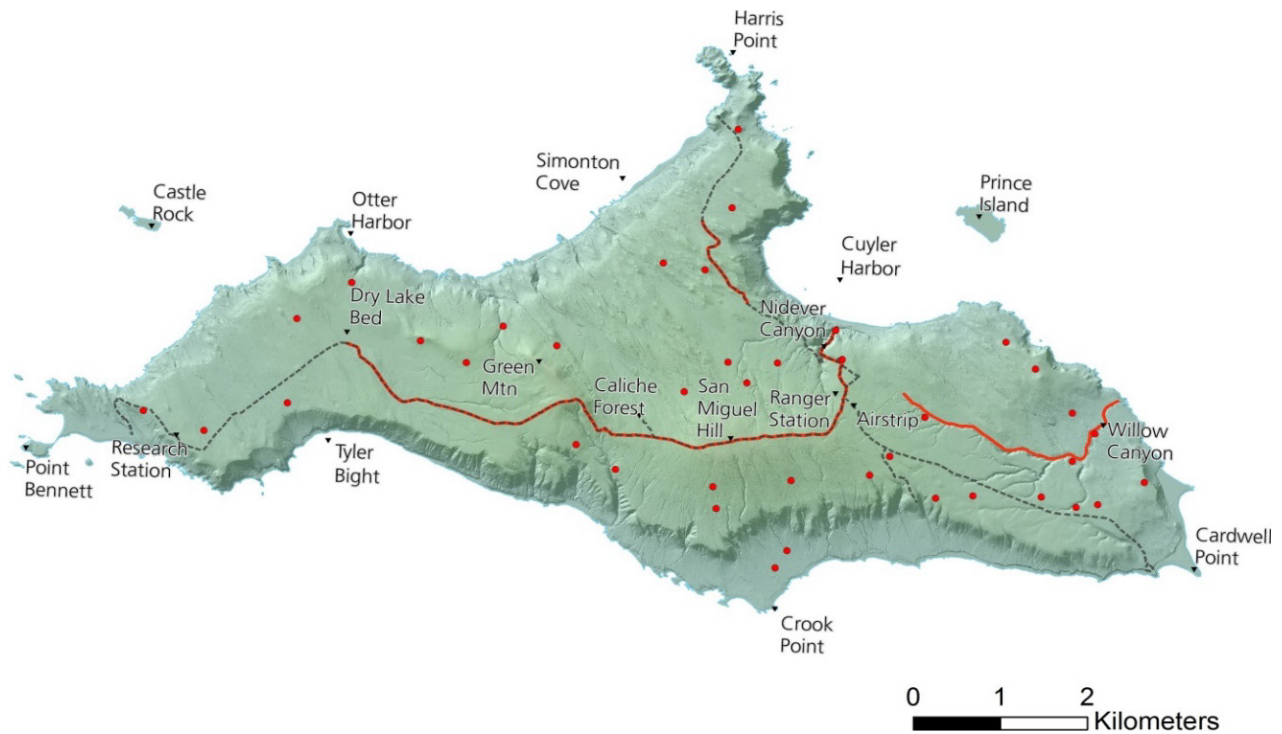


Figure 4. Landbird monitoring point count stations (red dots) and line transects (red lines) on San Miguel Island. Line transects were not surveyed in 2021.

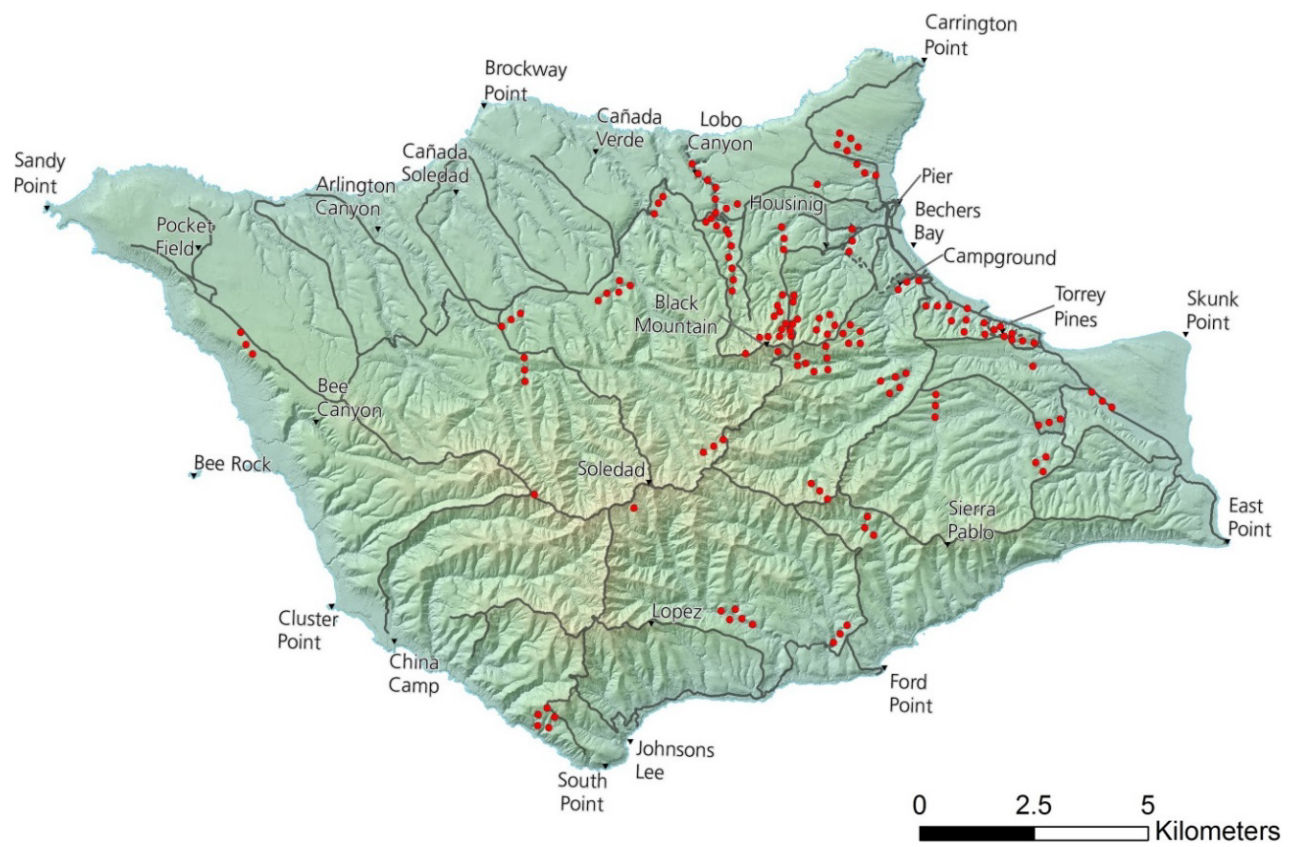


Figure 5. Landbird monitoring point count stations (red dots) on Santa Rosa Island.

Results

Monitoring was conducted between 10 March and 22 May 2021 (Table 1). Using distance-based sampling methods (Buckland et al. 2015) for point counts, 334 of 338 permanent point count sites (99%) were sampled in 2021 (i.e., 29 of 33 points on Santa Barbara, 8 of 8 on East Anacapa, 112 of 112 on Santa Cruz, 40 of 40 on San Miguel, and 145 of 145 on Santa Rosa). Four points on Santa Barbara Island were not counted due to nesting pelicans and gull disturbance. Three of these points on the east side of the Santa Barbara Island (i.e., 17, 19, and 20) have not been surveyed for the last 5 years, 2016–2021. Line transects were not conducted this year on any island and are currently under review.

Table 1. Start and end dates with the number of point count stations monitored in 2021, Channel Islands National Park.

Island	Start Date	End Date	# Point Counts
Santa Barbara	03/10/2021	03/14/2021	29
East Anacapa	03/18/2021	03/19/2021	8
San Miguel	04/06/2021	04/27/2021	40
Santa Cruz	04/20/2021	05/22/2021	112
Santa Rosa	05/04/2021	05/18/2021	145

Bird Species Occurrence in 2021

The numbers of individuals of each species that were detected on all islands in 2021 are presented in Table 2. Indices of abundance on point counts (number of birds counted and mean number of birds per station) are presented by island in Tables 3–7.

Fifty-six bird species were counted from points counts across all islands in 2021 (Table 2). Forty of these were breeding species on the island (Table 2, Appendix A). Parkwide, the 10 most detected breeding landbirds in 2021 were, in descending order: Spotted Towhee, Song Sparrow, Bewick's Wren, Orange-crowned Warbler, House Finch, Western Meadowlark, Horned Lark, Common Raven, Island Scrub-Jay, and Pacific-slope Flycatcher (Table 2; scientific names given in Table 2 and Appendix A).

Table 2. Number of individuals of each species counted during bird surveys on all islands in 2021, Channel Islands National Park. Data are from point counts only and do not include birds observed before or after the counts.

Common Name	Scientific Name	Total # Detected	East Anacapa	Santa Barbara	Santa Cruz	San Miguel	Santa Rosa
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	78	–	–	24	–	54
Allen's Hummingbird	<i>Selasphorus sasin</i>	57	–	–	4	4	49
American Kestrel	<i>Falco sparverius</i>	5	1	1	3	–	–
Anna's Hummingbird	<i>Calypte anna</i>	24	–	–	6	1	17
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	26	–	–	26	–	–
Bald Eagle	<i>Haliaeetus leucocephalus</i>	3	–	–	3	–	–
Barn Owl	<i>Tyto alba</i>	1	–	1	–	–	–
Barn Swallow	<i>Hirundo rustica</i>	34	–	–	21	–	13
Bewick's Wren	<i>Thryomanes bewickii</i>	396	–	–	138	4	254
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	15	–	–	13	–	2
Black Phoebe	<i>Sayornis nigricans</i>	3	–	–	2	–	1
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	4	–	–	4	–	–
Bushtit	<i>Psaltirparus minimus</i>	42	–	–	20	–	22
California Quail	<i>Callipepla californica</i>	28	–	–	15	–	13
Chipping Sparrow	<i>Spizella passerina</i>	86	–	–	30	–	56
Common Raven	<i>Corvus corax</i>	218	3	–	41	75	99
Common Yellowthroat	<i>Geothlypis trichas</i>	2	–	–	1	–	1
Cooper's Hawk	<i>Accipiter cooperii</i>	1	–	–	1	–	–
European Starling	<i>Sturnus vulgaris</i>	23	–	–	–	–	23
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	2	–	–	–	–	2
Hermit Thrush	<i>Catharus guttatus</i>	2	–	–	2	–	–
Hermit Warbler	<i>Dendroica occidentalis</i>	4	–	–	1	–	3
Horned Lark	<i>Eremophila alpestris</i>	249	–	179	2	37	31
House Finch	<i>Carpodacus mexicanus</i>	359	14	5	203	–	137
House Wren	<i>Troglodytes aedon</i>	3	–	2	–	1	–
Hutton's Vireo	<i>Vireo huttoni</i>	23	–	–	15	–	8
Island Scrub-Jay	<i>Aphelocoma insularis</i>	136	–	–	136	–	–

Table 2 (continued). Number of individuals of each species counted during bird surveys on all islands in 2021, Channel Islands National Park. Data are from point counts only and do not include birds observed before or after the counts.

Common Name	Scientific Name	Total # Detected	East Anacapa	Santa Barbara	Santa Cruz	San Miguel	Santa Rosa
Lawrence's Goldfinch	<i>Carduelis lawrencei</i>	4	–	–	3	–	1
Lesser Goldfinch	<i>Carduelis psaltria</i>	75	–	–	13	–	62
Lincoln's Sparrow	<i>Melospiza lincolni</i>	1	–	1	–	–	–
Loggerhead Shrike	<i>Lanius ludovicianus</i>	19	–	–	3	–	16
Mourning Dove	<i>Zenaida macroura</i>	15	–	–	14	–	1
Northern Flicker	<i>Colaptes auratus</i>	76	–	–	76	–	–
Northern Harrier	<i>Circus cyaneus</i>	5	–	4	1	–	–
Northern Mockingbird	<i>Mimus polyglottos</i>	24	–	–	3	–	21
Orange-crowned Warbler	<i>Leiothlypis celata</i>	396	–	5	96	75	220
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	118	–	–	13	–	105
Peregrine Falcon	<i>Falco peregrinus</i>	8	2	2	–	–	4
Red-breasted Nuthatch	<i>Sitta canadensis</i>	2	–	–	1	–	1
Red-tailed Hawk	<i>Buteo jamaicensis</i>	8	–	–	3	–	5
Rock Wren	<i>Salpinctes obsoletus</i>	7	–	–	–	–	7
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>	30	–	–	30	–	–
Savannah Sparrow	<i>Passerculus sandwichensis</i>	14		14	–	–	–
Say's Phoebe	<i>Sayornis saya</i>	4	1	3	–	–	–
Song Sparrow	<i>Melospiza melodia</i>	558	19	–	111	101	327
Spotted Towhee	<i>Pipilo maculatus</i>	761	–	–	288	–	473
Townsend's Warbler	<i>Dendroica townsendi</i>	2	–	–	1	–	1
Virginia Rail	<i>Rallus limicola</i>	1	–	–	–	–	1
Warbling Vireo	<i>Vireo gilvus</i>	4	–	–	3	–	1
Western Meadowlark	<i>Sturnella neglecta</i>	296	–	3	17	72	204
Western Tanager	<i>Piranga ludoviciana</i>	4	–	–	2	–	2
Western Wood-Pewee	<i>Contopus sordidulus</i>	1	–	–	–	–	1
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	90	26	54	8	2	–
White-throated Swift	<i>Aeronautes saxatalis</i>	6	–	–	5	–	1

Table 2 (continued). Number of individuals of each species counted during bird surveys on all islands in 2021, Channel Islands National Park. Data are from point counts only and do not include birds observed before or after the counts.

Common Name	Scientific Name	Total # Detected	East Anacapa	Santa Barbara	Santa Cruz	San Miguel	Santa Rosa
Wilson's Warbler	<i>Wilsonia pusilla</i>	5	–	–	1	–	4
Yellow-rumped Warbler	<i>Dendroica coronata</i>	1	–	–	1	–	–
Total Number of Species per Island (Richness):	–	56	7	13	45	10	39

Table 3. Results from point count sampling in 2021 at 8 stations on East Anacapa Islet: number of individual birds detected, mean number of birds per point count station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
AMKE	American Kestrel	1	0.12	0.12	1	12.5
CORA	Common Raven	3	0.38	0.37	1	12.5
HOFI	House Finch	14	1.75	1.37	2	25.0
PEFA	Peregrine Falcon	2	0.25	0.25	1	12.5
SAPH	Say's Phoebe	1	0.12	0.12	1	12.5
SOSP	Song Sparrow	19	2.38	0.56	7	87.5
WCSP	White-crowned Sparrow	26	3.25	0.65	8	100.0

Table 4. Results from point count sampling in 2021 at 29 stations on Santa Barbara Island: number of individual birds detected, mean number of birds per point count station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
AMKE	American Kestrel	1	0.03	0.03	1	3.5
BANO	Barn Owl	1	0.03	0.03	1	3.5
HOLA	Horned Lark	179	6.17	0.63	29	100.0
HOFI	House Finch	5	0.17	0.10	3	10.3
HOWR	House Wren	2	0.07	0.05	2	6.9
LISP	Lincoln's Sparrow	1	0.03	0.03	1	3.5
NOHA	Northern Harrier	4	0.14	0.07	4	13.8
OCWA	Orange-crowned Warbler	5	0.17	0.12	2	6.9
PEFA	Peregrine Falcon	2	0.07	0.05	2	6.9
SAVS	Savannah Sparrow	14	0.48	0.16	39	31.0
SAPH	Say's Phoebe	3	0.10	0.06	3	10.3
WEME	Western Meadowlark	3	0.10	0.10	1	3.5
WCSP	White-crowned Sparrow	54	1.86	0.79	11	37.9

Table 5. Results from point count sampling in 2021 at 112 stations on Santa Cruz Island: number of individual birds detected, mean number of birds per point count station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
ACWO	Acorn Woodpecker	24	0.21	0.06	13	11.6
ALHU	Allen's Hummingbird	4	0.04	0.02	4	3.6
AMKE	American Kestrel	3	0.03	0.02	2	1.8

Table 5 (continued). Results from point count sampling in 2021 at 112 stations on Santa Cruz Island: number of individual birds detected, mean number of birds per point count station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
ANHU	Anna's Hummingbird	6	0.05	0.02	6	5.4
ATFL	Ash-throated Flycatcher	26	0.23	0.05	23	20.5
BAEA	Bald Eagle	3	0.03	0.02	2	1.8
BARS	Barn Swallow	21	0.19	0.08	9	8.0
BEWR	Bewick's Wren	138	1.23	0.11	80	71.4
BLPH	Black Phoebe	2	0.02	0.01	2	1.8
BHGR	Black-headed Grosbeak	13	0.12	0.03	12	10.7
BGGN	Blue-gray Gnatcatcher	4	0.04	0.02	3	2.7
BUSH	Bushtit	20	0.18	0.07	7	6.2
CAQU	California Quail	15	0.13	0.04	10	8.9
CHSP	Chipping Sparrow	30	0.27	0.06	23	20.5
CORA	Common Raven	41	0.37	0.11	20	17.9
COYE	Common Yellowthroat	1	0.01	0.01	1	0.9
COHA	Cooper's Hawk	1	0.01	0.01	1	0.9
HETH	Hermit Thrush	2	0.02	0.01	2	1.8
HEWA	Hermit Warbler	1	0.01	0.01	1	0.9
HOLA	Horned Lark	2	0.02	0.02	1	0.9
HOFI	House Finch	203	1.81	0.42	50	44.6
HUVI	Hutton's Vireo	15	0.13	0.04	13	11.6
ISJA	Island Scrub-Jay	136	1.21	0.12	64	57.1
LAGO	Lawrence's Goldfinch	3	0.03	0.03	1	0.9
LEGO	Lesser Goldfinch	13	0.12	0.04	9	8.0
LOSH	Loggerhead Shrike	3	0.03	0.02	3	2.7

Table 5 (continued). Results from point count sampling in 2021 at 112 stations on Santa Cruz Island: number of individual birds detected, mean number of birds per point count station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
MODO	Mourning Dove	14	0.12	0.04	11	9.8
NOFL	Northern Flicker	76	0.68	0.08	53	47.3
NOHA	Northern Harrier	1	0.01	0.01	1	0.9
NOMO	Northern Mockingbird	3	0.03	0.02	3	2.7
OCWA	Orange-crowned Warbler	96	0.86	0.11	46	41.1
PSFL	Pacific-slope Flycatcher	13	0.12	0.04	10	8.9
RBNU	Red-breasted Nuthatch	1	0.01	0.01	1	0.9
RTHA	Red-tailed Hawk	3	0.03	0.02	2	1.8
RCSP	Rufous-crowned Sparrow	30	0.27	0.06	22	19.6
SOSP	Song Sparrow	111	0.99	0.12	54	48.2
SPTO	Spotted Towhee	288	2.57	0.14	104	92.9
TOWA	Townsend's Warbler	1	0.01	0.01	1	0.9
WAVI	Warbling Vireo	3	0.03	0.03	1	0.9
WEME	Western Meadowlark	17	0.15	0.04	13	11.6
WETA	Western Tanager	2	0.02	0.02	1	0.9
WCSP	White-crowned Sparrow	8	0.07	0.05	4	3.6
WTSW	White-throated Swift	5	0.04	0.03	3	2.7
WIWA	Wilson's Warbler	1	0.01	0.01	1	0.9
YRWA	Yellow-rumped Warbler	1	0.01	0.01	1	0.9

Table 6. Results from point count sampling in 2021 at 40 stations on San Miguel Island: number of individual birds detected, mean number of birds per point count station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
ALHU	Allen's Hummingbird	4	0.10	0.07	3	7.5
ANHU	Anna's Hummingbird	1	0.03	0.02	1	2.5
BEWR	Bewick's Wren	4	0.10	0.05	4	10.0
CORA	Common Raven	75	1.88	0.30	30	75.0
HOLA	Horned Lark	37	0.92	0.28	13	32.5
HOWR	House Wren	1	0.03	0.02	1	2.5
OCWA	Orange-crowned Warbler	75	1.88	0.23	30	75.0
SOSP	Song Sparrow	101	2.52	0.24	37	92.5
WEME	Western Meadowlark	72	1.80	0.25	27	67.5
WCSP	White-crowned Sparrow	2	0.05	0.03	2	5.0

Table 7. Results from point count sampling in 2021 at 145 stations on Santa Rosa Island: number of individual birds detected, mean number of birds per station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
ACWO	Acorn Woodpecker	54	0.37	0.07	28	19.3
ALHU	Allen's Hummingbird	49	0.34	0.06	34	23.4
ANHU	Anna's Hummingbird	17	0.12	0.03	16	11.0
BARS	Barn Swallow	13	0.09	0.03	7	4.8
BEWR	Bewick's Wren	254	1.75	0.09	127	87.6
BLPH	Black Phoebe	1	0.01	0.01	1	0.7

Table 7 (continued). Results from point count sampling in 2021 at 145 stations on Santa Rosa Island: number of individual birds detected, mean number of birds per station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
BHGR	Black-headed Grosbeak	2	0.01	0.01	2	1.4
BUSH	Bushtit	22	0.15	0.05	10	6.9
CAQU	California Quail	13	0.09	0.03	8	5.5
CHSP	Chipping Sparrow	56	0.39	0.05	46	31.7
CORA	Common Raven	99	0.68	0.08	62	42.8
COYE	Common Yellowthroat	1	0.01	0.01	1	0.7
EUST	European Starling	23	0.16	0.07	8	5.5
GRSP	Grasshopper Sparrow	2	0.01	0.01	1	0.7
HEWA	Hermit Warbler	3	0.02	0.01	3	2.1
HOLA	Horned Lark	31	0.21	0.06	19	13.1
HOFI	House Finch	137	0.94	.10	72	49.7
HUVI	Hutton's Vireo	8	0.06	0.02	8	5.5
LAGO	Lawrence's Goldfinch	1	0.01	0.01	1	0.7
LEGO	Lesser Goldfinch	62	0.43	0.07	40	27.6
LOSH	Loggerhead Shrike	16	0.11	0.03	16	11.0
MODO	Mourning Dove	1	0.01	0.01	1	0.7
NOMO	Northern Mockingbird	21	0.14	0.04	17	11.7
OCWA	Orange-crowned Warbler	220	1.52	0.11	107	73.8
PSFL	Pacific-slope Flycatcher	105	0.72	0.07	69	47.6
PEFA	Peregrine Falcon	4	0.03	0.02	3	2.1
RBNU	Red-breasted Nuthatch	1	0.01	0.01	1	0.7
RTHA	Red-tailed Hawk	5	0.03	0.02	5	3.5
ROWR	Rock Wren	7	0.05	0.02	7	4.8

Table 7 (continued). Results from point count sampling in 2021 at 145 stations on Santa Rosa Island: number of individual birds detected, mean number of birds per station and standard error, number of stations where a bird species was detected, and frequency (percent of total stations where a bird species was detected in 2021).

Species	Common Name	# Detected	Mean	S.E.	# Stns Where Detected	% Stns Where Detected
SOSP	Song Sparrow	327	2.26	0.14	125	86.2
SPTO	Spotted Towhee	473	3.26	0.14	140	96.6
TOWA	Townsend's Warbler	1	0.01	0.01	1	0.7
VIRA	Virginia Rail	1	0.01	0.01	1	0.7
WAVI	Warbling Vireo	1	0.01	0.01	1	0.7
WEME	Western Meadowlark	204	1.41	0.11	107	73.8
WETA	Western Tanager	2	0.01	0.01	2	1.4
WTSW	White-throated Swift	1	0.01	0.01	1	0.7
WIWA	Wilson's Warbler	4	0.03	0.01	4	2.8

Nonnative and Parasitic Bird Species

Nonnative birds were counted during regular monitoring on 1 of the 5 islands in 2021: Santa Rosa Island, 23 European Starlings (Table 2). However, anecdotal sightings (from eBird reports) of nonnative birds occurred on the Santa Rosa and Santa Cruz Islands, but did not occur on the small islands. The highest numbers of nonnative species detections occurred on Santa Rosa Island ($n = 46$), with 25 detections of Eurasian Collared-Dove (primarily at the Historic Ranch), 2 detections of parasitic Brown-headed Cowbird (primarily at the Historic Ranch), and 1 detection of Rock Pigeon (at the Historic Ranch, Table 8).

Table 8. Summary of anecdotal observations of nonnative bird species observed on surveyed islands at Channel Islands National Park and reported to eBird in 2021.

Island	Species				
	Eurasian Collared-Dove	Rock Pigeon	European Starling	Brown-headed Cowbird	House Sparrow
Santa Barbara	0	0	0	0	0
East Anacapa	0	0	0	0	0
Santa Cruz	5	0	23	3	0
Santa Rosa	25	1	18	2	0
San Miguel	0	0	0	0	0
Total (all islands):	30	1	41	5	0

Bird Species Occurrence in 2021 Compared to All Years of Monitoring

Figures 6–10 summarize the mean number of birds per point count station on each island in 2021 compared to the mean number of birds per point count station across all years of sampling. No species on East Anacapa Islet had decreasing numbers in 2021 (Figure 6). Based on 2021 counts falling below the first quartile range of counts for all years, the following species decreased in number in 2021: American Kestrel and Western Meadowlark on Santa Barbara Island (Figure 7); California Quail, Hutton’s Vireo, Western Meadowlark on Santa Cruz Island (Figure 8); Song Sparrow on San Miguel Island (Figure 9); and Chipping Sparrow and House Finch on Santa Rosa Island (Figure 10).

Bird species with increased detections (above the third quartile) in 2021 were House Finch, Song Sparrow, and White-crowned Sparrow (a wintering species) on East Anacapa Islet (Figure 6); Horned Lark, House Finch, Savannah Sparrow on Santa Barbara Island (Figure 7); House Finch on Santa Cruz Island (Figure 8); Bewick’s Wren on San Miguel (Figure 9); and Acorn Woodpecker, Bewick’s Wren, Bushtit, European Starling (an introduced species) and Spotted Towhee on Santa Rosa Island (Figure 10).

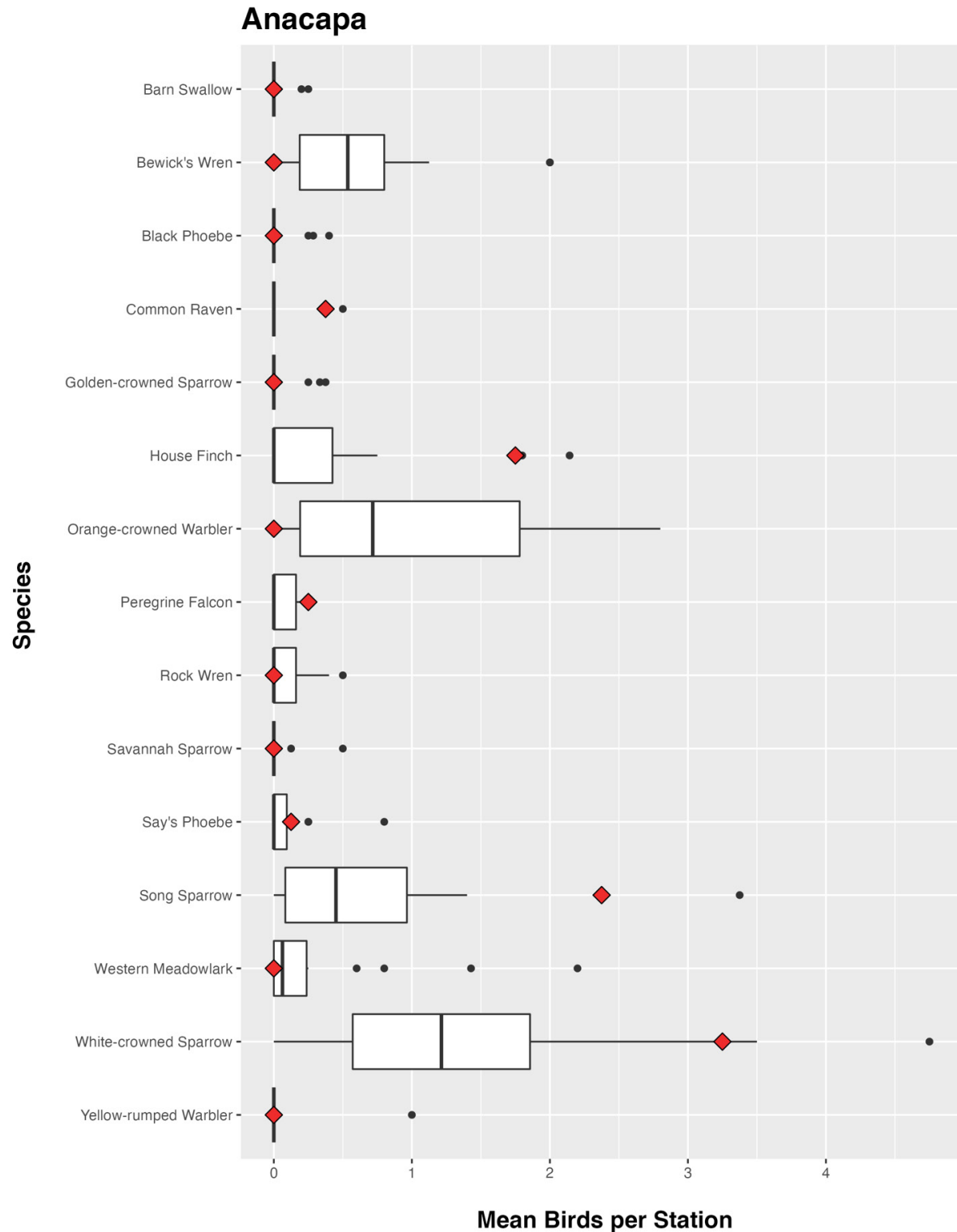


Figure 6. Boxplots for each bird species detected at point count stations on East Anacapa Islet in 2021. Boxplots display the distribution of data based on the 5 number summary: minimum, first quartile, median, third quartile, and maximum for 2001–2021. Boxes represent the third and first quartile and vertical lines represent the median. Dots are counts outside the first and third quartile range. Red diamonds represent the mean value for 2021.

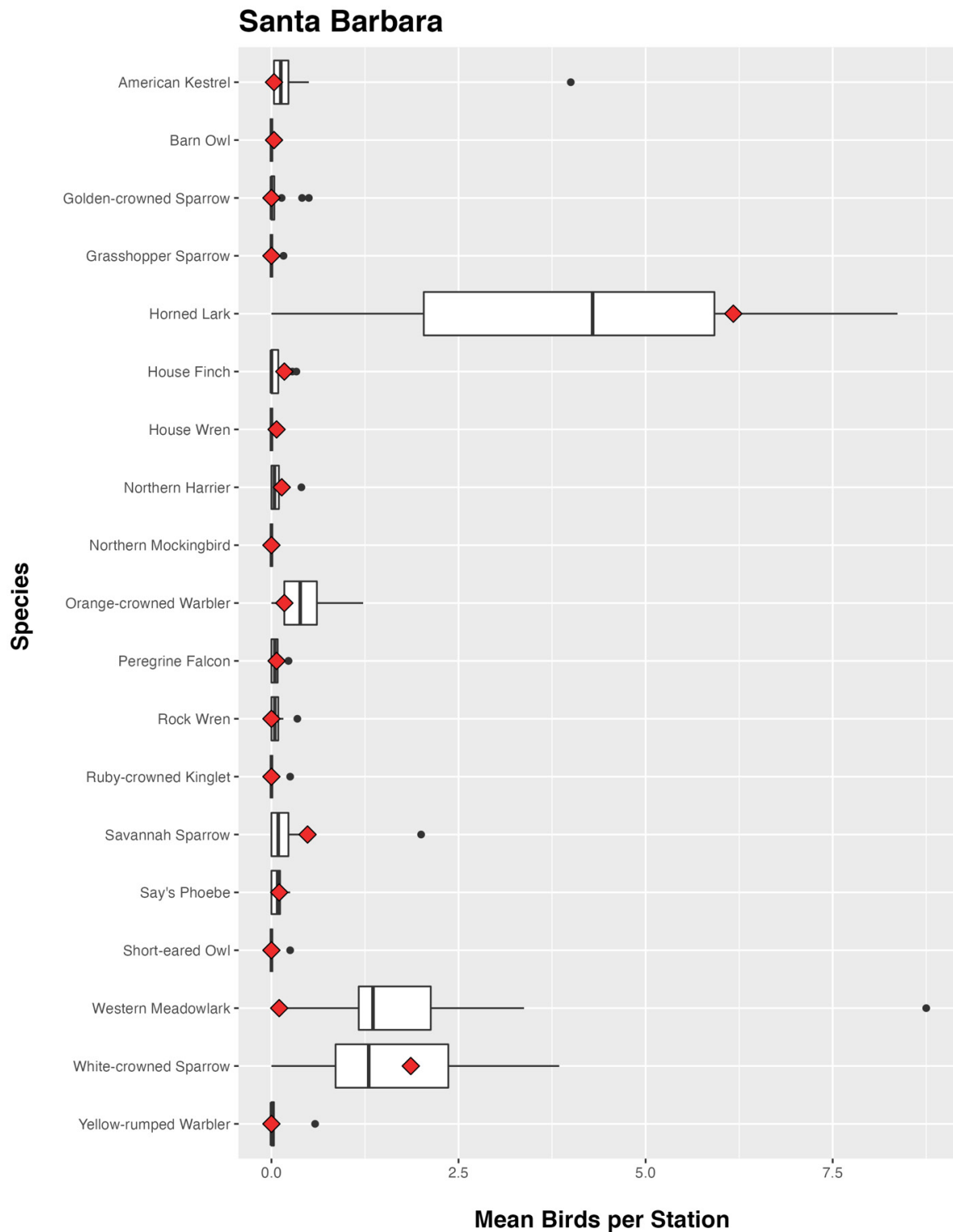


Figure 7. Boxplots for each bird species detected at point count stations on Santa Barbara Island in 2021. Boxplots display the distribution of data based on the 5 number summary: minimum, first quartile, median, third quartile, and maximum for 1995–2021. Boxes represent the third and first quartile and vertical lines represent the median. Dots are counts outside the first and third quartile range. Red diamonds represent the mean value for 2021.

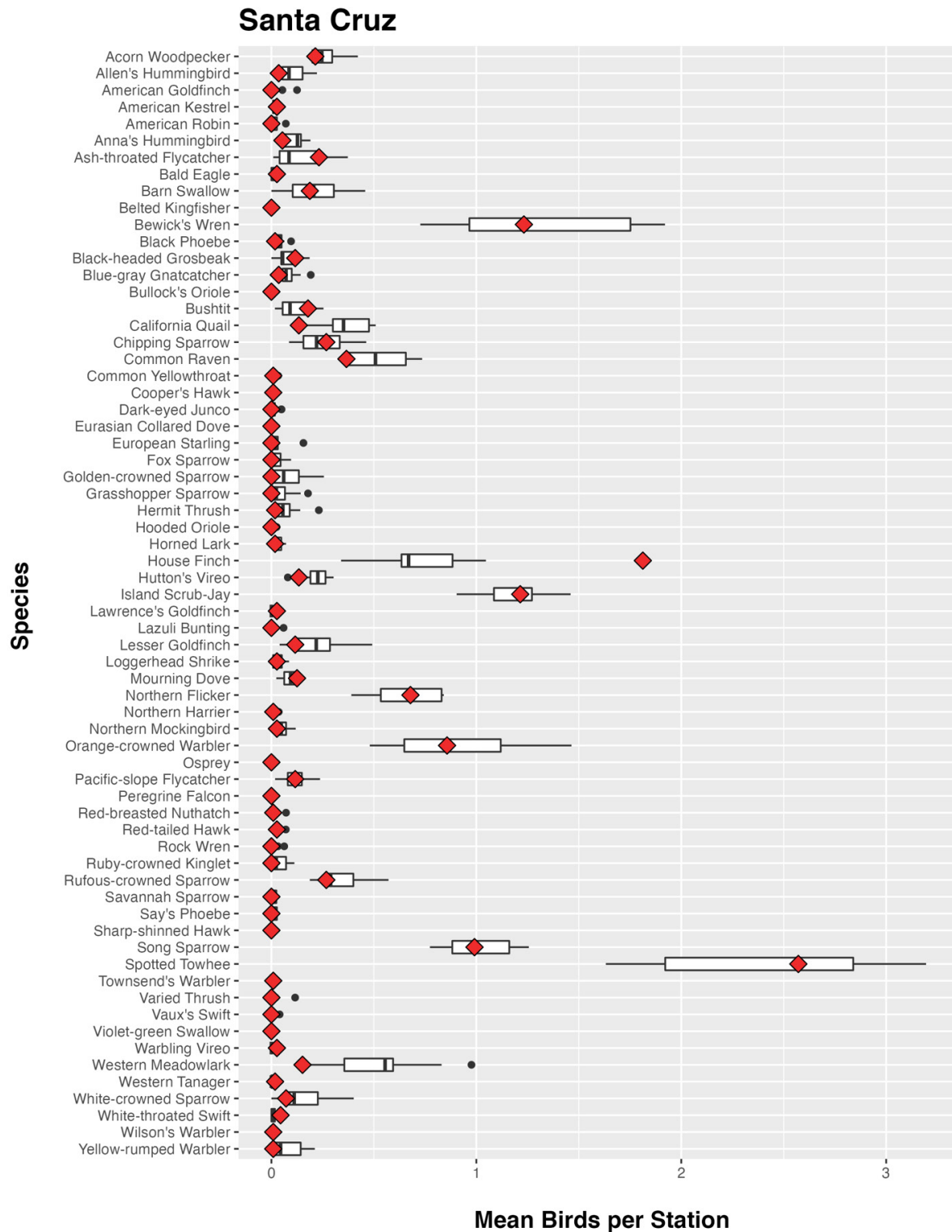


Figure 8. Boxplots for each bird species detected at point count stations on Santa Cruz Island in 2021. Boxplots display the distribution of data based on the 5 number summary: minimum, first quartile, median, third quartile, and maximum for 2013–2021. Boxes represent the third and first quartile and vertical lines represent the median. Dots are counts outside the first and third quartile range. Red diamonds represent the mean value for 2021.

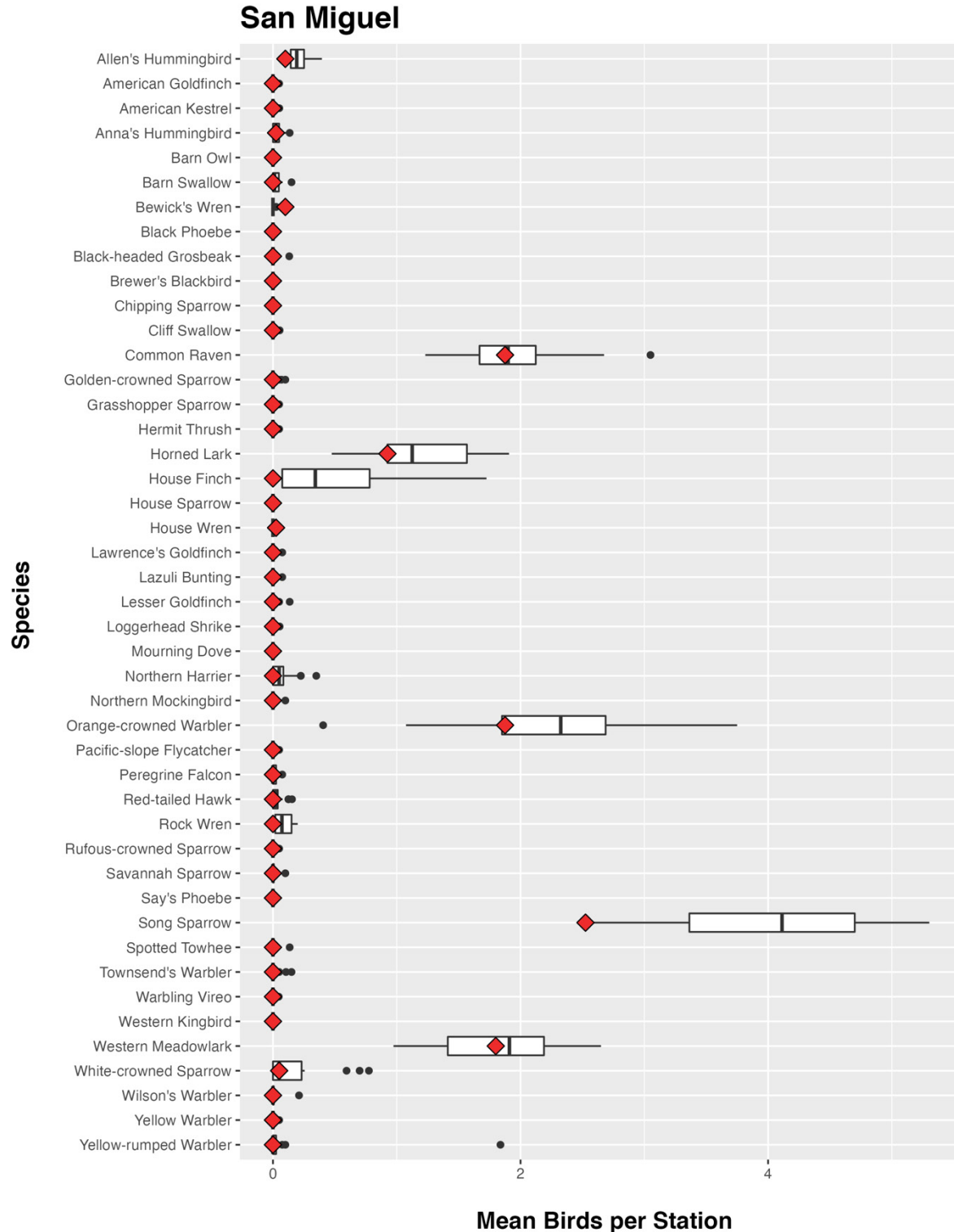


Figure 9. Boxplots for each bird species detected at point count stations on San Miguel Island in 2021. Boxplots display the distribution of data based on the 5 number summary: minimum, first quartile, median, third quartile, and maximum for 2002–2021. Boxes represent the third and first quartile and vertical lines represent the median. Dots are counts outside the first and third quartile range. Red diamonds represent the mean value for 2021.

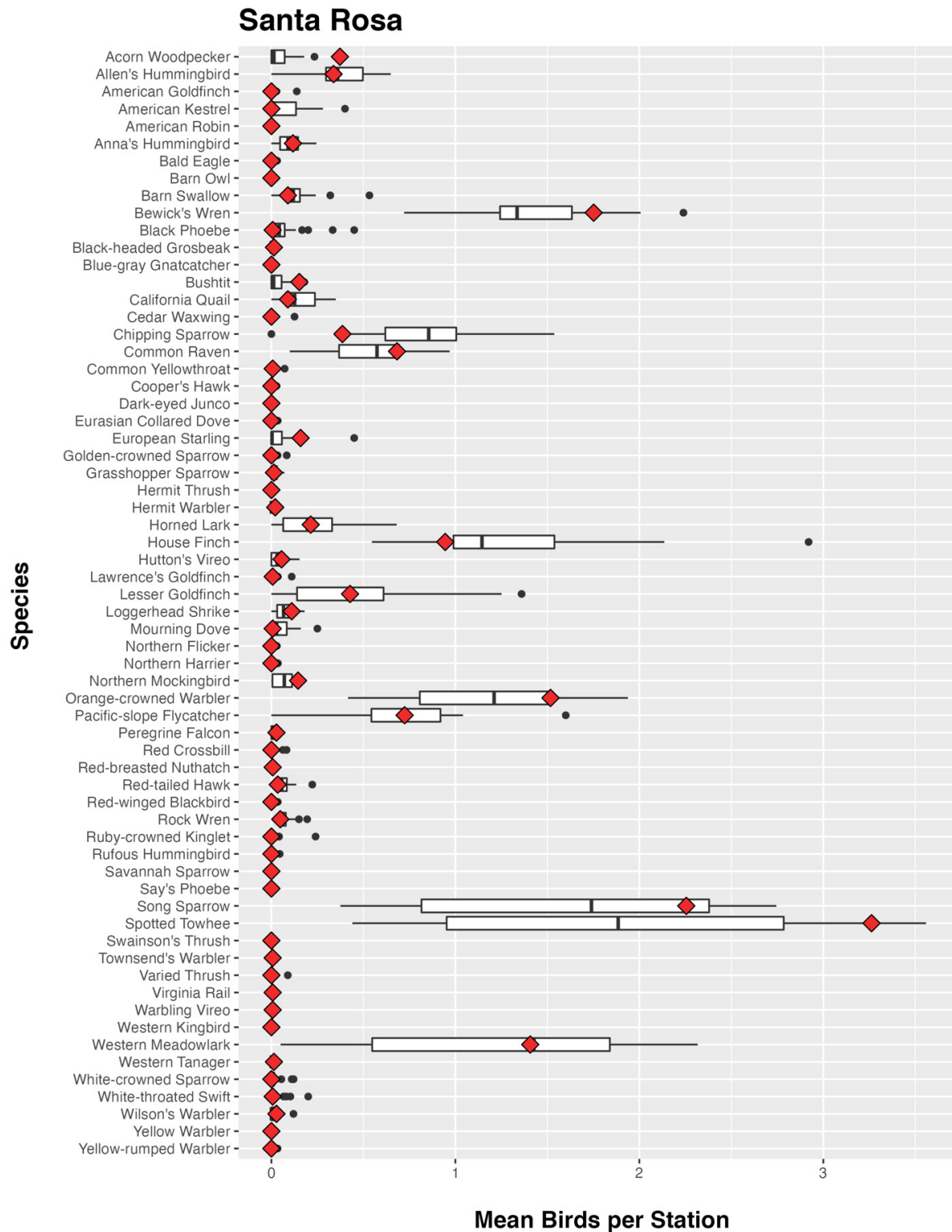


Figure 10. Boxplots for each bird species detected at point count stations on Santa Rosa Island in 2021. Boxplots display the distribution of data based on the 5 number summary: minimum, first quartile, median, third quartile, and maximum for 1994–2021. Boxes represent the third and first quartile and vertical lines represent the median. Dots are counts outside the first and third quartile range. Red diamonds represent the mean value for 2021.

Patterns in Bird Species Occurrence Over Time

The species richness graphics in Figures 11–15 summarize patterns of species occurrences since 1993 for San Miguel, Santa Barbara, and East Anacapa Islands; since 1994 for Santa Rosa Island; and since 2013 for Santa Cruz Island. This analysis includes data from both line transects (1993–2020) and point counts but does not include incidental observations of species that occurred outside of line transects or the point counts. These graphs can be used to determine whether species are appearing on or are disappearing from the counts. Also, in the following summaries, and in Table 9, “transient or visiting” species are defined as native species that have been recorded only once or twice during point counts or transects on an island, do not breed on an island, and occur either as transients or winter/spring visitors. These records were compared to the records summarized by Collins and Jones (2015) and are equivalent to their “transient” and “visitor” nomenclature. Birds that may be regular breeders on one island might also be classified as a transient non-breeding species on another (e.g., Spotted Towhee on Santa Rosa vs. San Miguel). For purposes of this report the definition of transient or visitor does not include nonnative bird species or native invasive species (i.e., Brown-headed Cowbird).

Notable findings on each island follow:



Figure 11. Bird species occurrence from 1993 to 2021 for East Anacapa Islet. A dot indicates that a species was detected on a point count during that year. A dot indicates that a species was detected on a line transect or point count from 1992 to 2020, or on a point count in 2021.

Species Detected on Santa Barbara

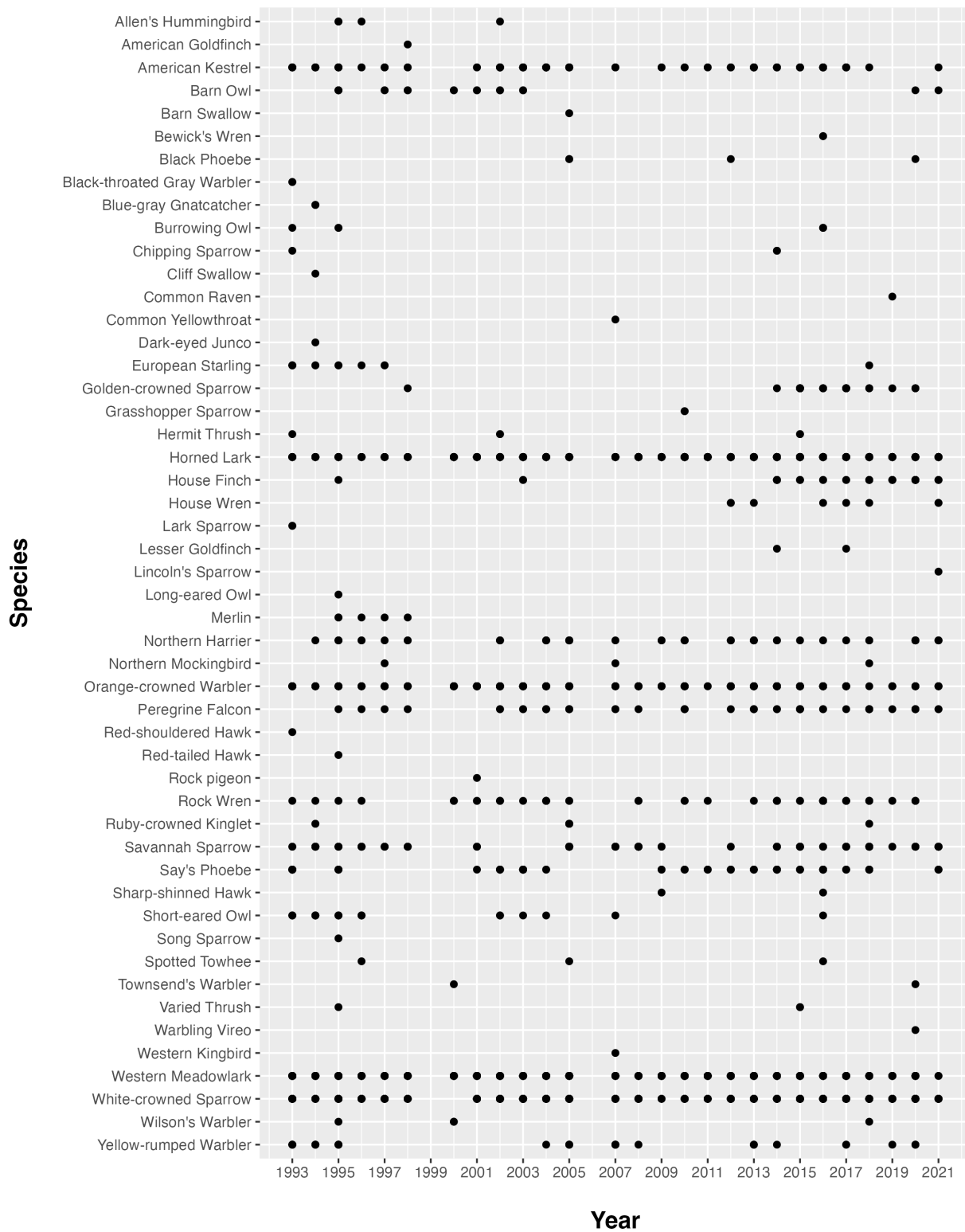


Figure 12. Species occurrence from 1993 to 2021 for Santa Barbara Island. A dot indicates that a species was detected on a line transect or point count from 1992 to 2020, or on a point count in 2021.

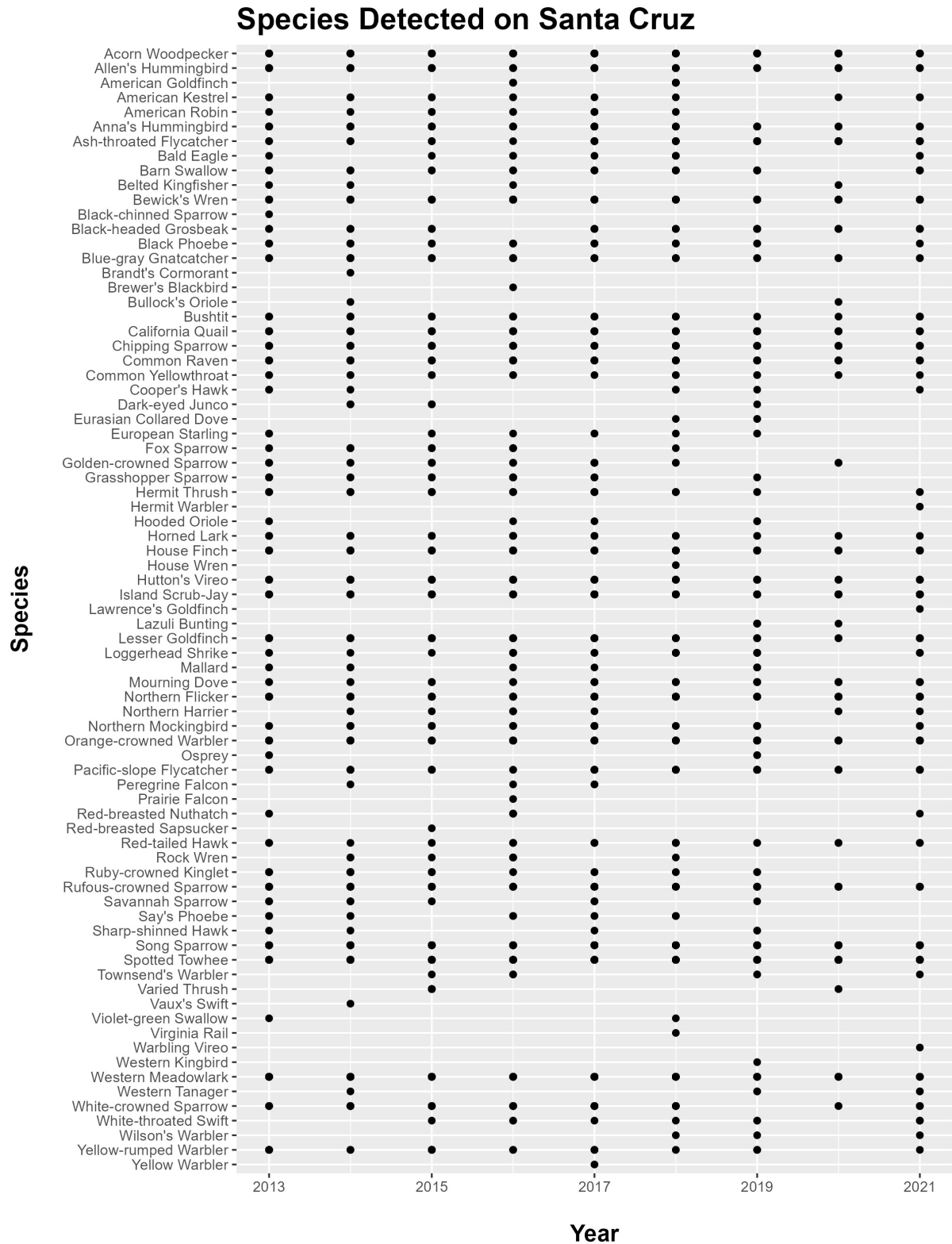


Figure 13. Species occurrence from 2013 to 2021 for Santa Cruz Island. A dot indicates that a species was detected on a line transect or point count from 1992 to 2020, or on a point count in 2021.



Figure 14. Species occurrence from 1993 to 2021 for San Miguel Island. A dot indicates that a species was detected on a line transect or point count from 1992 to 2020, or on a point count in 2021.

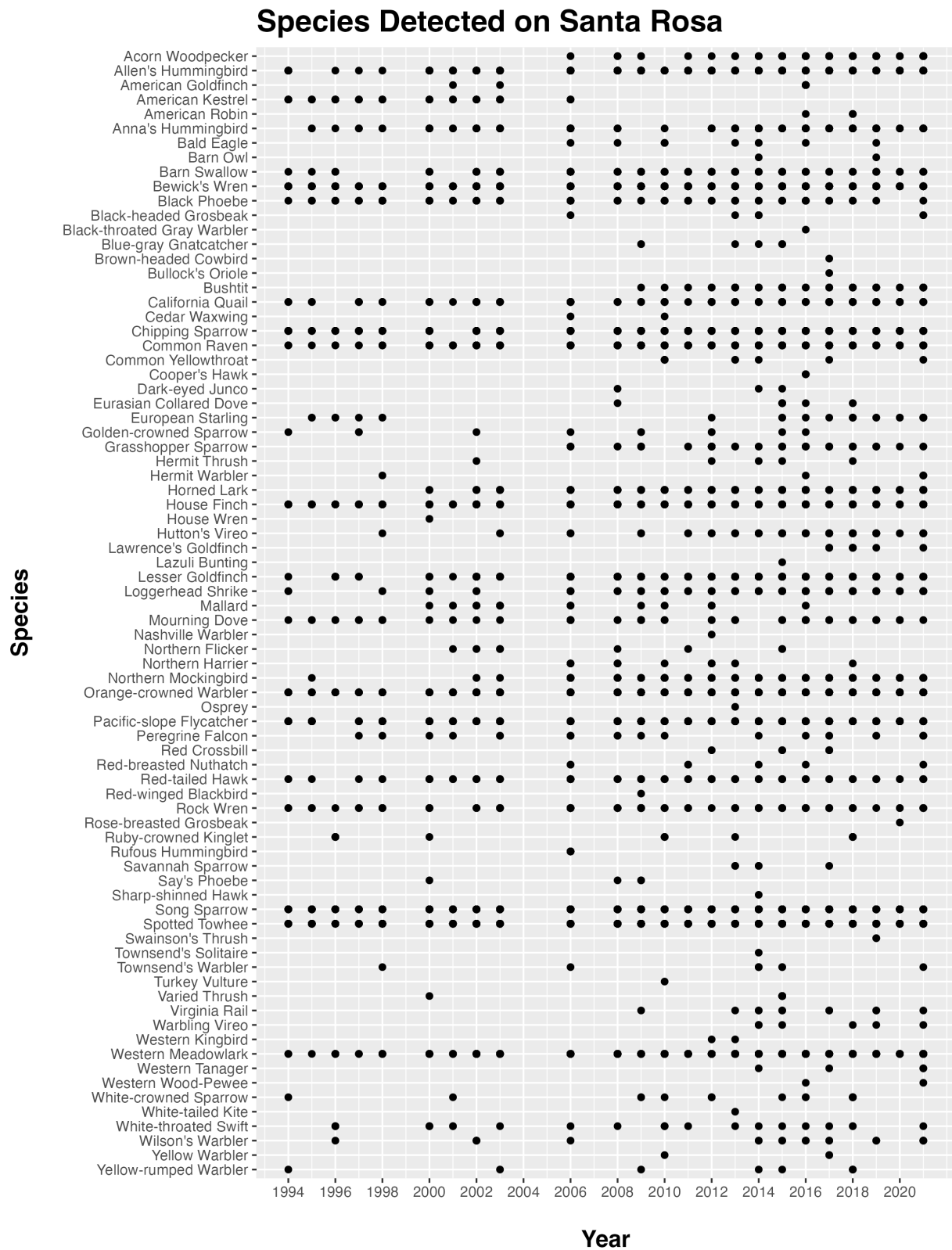


Figure 15. Species occurrence from 1994 to 2021 for Santa Rosa Island. A dot indicates that a species was detected on a line transect or point count from 1992 to 2020, or on a point count in 2021.

Table 9. New transient or visiting bird species counted in 2021 (“X”)*, and other transients and visiting species counted in all other years since monitoring began (“X”), on each of the 5 northern Channel Islands. “Transient or visiting” species are defined here as native species that have been recorded only once or twice during point counts or transects and do not breed on the island.

Species	East Anacapa Islet	Santa Barbara Island	Santa Cruz Island	San Miguel Island	Santa Rosa Island
American Goldfinch	–	X	X	X	–
American Robin	–	–	–	–	X
Ash-throated Flycatcher	–	–	–	X	–
Bald Eagle	–	–	–	X	–
Barn Owl	–	–	–	–	X
Barn Swallow	–	X	–	–	–
Bewick’s Wren	–	X	–	–	–
Black-chinned Sparrow	–	–	X	–	–
Black-throated Gray Warbler	–	–	–	–	X
Blue-gray Gnatcatcher	–	X	–	–	–
Brewer’s Blackbird	–	–	X	X	–
Bullock’s Oriole	–	–	X	–	–
Burrowing Owl	–	–	–	X	–
Bushtit	–	–	–	X	–
Cedar Waxwing	–	–	–	–	X
Cliff Swallow	X	X	–	–	–
Common Raven	–	X	–	–	–
Common Yellowthroat	–	X	–	X	–
Cooper’s Hawk	–	–	X	–	X
Dark-eyed (Oregon) Junco	–	X	X	X	–
Fox Sparrow	–	–	–	X	–
Grasshopper Sparrow	–	X	–	–	–
Hermit Warbler	–	–	X*	–	X
Hooded Oriole	X	–	–	X	–
House Wren	–	–	X	X	–
Hutton’s Vireo	X	–	–	X	–
Lark Sparrow	–	X	–	–	–
Lawrence’s Goldfinch	–	–	X*	X	XX
Lazuli Bunting	–	–	X	X	–
Lesser Goldfinch	–	X	–	–	–
Lincoln’s Sparrow	–	X*	–	–	–
Loggerhead Shrike	–	–	–	X	–

* New transient or visiting bird species counted in 2021 (text also in red).

Table 9 (continued). New transient or visiting bird species counted in 2021 (“X”)*, and other transients and visiting species counted in all other years since monitoring began (“X”), on each of the 5 northern Channel Islands. “Transient or visiting” species are defined here as native species that have been recorded only once or twice during point counts or transects and do not breed on the island.

Species	East Anacapa Islet	Santa Barbara Island	Santa Cruz Island	San Miguel Island	Santa Rosa Island
Long-eared Owl	–	X	–	–	–
Merlin	–	–	–	X	–
Nashville Warbler	–	–	–	X	X
Northern Flicker	–	–	–	X	–
Northern Mockingbird	–	X	–	X	–
Olive-sided Flycatcher	–	–	–	X	–
Osprey	X	–	X	–	–
Prairie Falcon	–	–	X	X	–
Red-breasted Sapsucker	–	–	X	–	–
Red-shouldered Hawk	–	X	–	–	–
Red-winged Blackbird	–	–	–	–	X
Rose-breasted Grosbeak	–	–	–	–	X
Ruby-crowned Kinglet	–	X	–	–	–
Rufous Hummingbird	–	–	–	X	X
Rufous-crowned Sparrow	–	–	–	X	–
Sharp-shinned Hawk	–	X	–	X	X
Short-eared Owl	–	–	–	X	–
Song Sparrow	–	X	–	–	–
Spotted Towhee	–	–	–	X	–
Swainson’s Thrush	–	–	–	–	X
Townsend’s Solitaire	–	–	–	–	X
Townsend’s Warbler	–	–	X	–	–
Turkey Vulture	–	–	–	X	X
Varied Thrush	–	X	X	–	X
Vaux’s Swift	–	–	–	X	–
Vesper Sparrow	–	X	–	–	–
Violet-green Swallow	–	–	X	X	–
Warbling Vireo	–	X	X*	X	X
Western Kingbird	X	X	X	X	X
Western Tanager	–	–	X	X	X
White-tailed Kite	–	–	–	–	X
Wilson’s Warbler	–	X	X	–	–

* New transient or visiting bird species counted in 2021 (text also in red).

Table 9 (continued). New transient or visiting bird species counted in 2021 (“X”)*, and other transients and visiting species counted in all other years since monitoring began (“X”), on each of the 5 northern Channel Islands. “Transient or visiting” species are defined here as native species that have been recorded only once or twice during point counts or transects and do not breed on the island.

Species	East Anacapa Islet	Santa Barbara Island	Santa Cruz Island	San Miguel Island	Santa Rosa Island
Yellow-rumped Warbler (Audubon’s)	X	–	–	–	–
Yellow Warbler	–	–	X	–	X
No. of transients/visiting species on each island since counting started	6	23	21	32	21
No. of new transients/visiting species	0	1	3	0	0

* New transient or visiting bird species counted in 2021 (text also in red).

East Anacapa Islet

Since 1993, 26 landbird species have been counted on East Anacapa Islet (Figure 11); 7 species were counted in 2021 (Table 2). Song Sparrow was observed for the second year in a row above the 75% quartile. A common species on the island, Orange-crowned Warbler has not been counted for 4 consecutive years, including the 2021 monitoring season. This was the first year an American Kestrel was detected since 2001. No new transient species were detected in 2021; 6 transient or visiting species (defined as above) have been counted on the island overall since 1993 (Table 9).

Santa Barbara Island

Since 1993, 50 landbird species have been counted on Santa Barbara Island (Figure 12); 13 species were counted in 2021 (Table 2). For a third consecutive year, Western Meadowlark was observed below the 25% quartile of its abundance at point count stations in 2021. American Kestrel was observed for the first time since 2018 on Santa Barbara Island. Lincoln’s Sparrow was a new transient species counted in 2021 on Santa Barbara; 23 transient or visiting species have been counted on the island since 1993 (Table 9).

Santa Cruz Island

A total of 78 landbird species have been counted on Santa Cruz Island since 2013, when monitoring by CHIS staff and volunteers began (Figure 13). A total of 45 species were counted in 2021 (Table 2). This is the fourth consecutive year that Western Meadowlark was counted below the 25% quartile of its abundance at point count stations on Santa Cruz Island. Hermit Warbler, Lawrence’s Goldfinch, and Warbling Vireo were new transient species counted in 2021 on Santa Cruz Island; 21 transient or visiting species have been counted on this island since 2013 (Table 9).

San Miguel Island

Since 1993, 70 landbird species have been counted on San Miguel island (Figure 14); 10 were counted in 2021 (Table 2). Barn Swallow has not been detected for 3 consecutive monitoring seasons on San Miguel Island. House Wren was observed for the first time since 2006. Bewick’s Wren was

counted for the first time above the third quartile of its abundance average. House Finch has not been counted on a point count station since 2018. No transient species were counted in 2021. Thirty-two transient or visiting species have been counted on the island since 1993 (Table 9).

Santa Rosa Island

Since 1994, 78 landbird species have been counted on Santa Rosa Island (Figure 15); 39 were detected in 2021 (Table 2). A common species, Chipping Sparrow was counted below the first quartile of its abundance average in 2021. For the second consecutive monitoring season, European Starling (a nonnative species) was counted above the third quartile (i.e., 75%) of its abundance average in 2021. Acorn Woodpecker had its highest abundance ($n = 54$) since counting began in 1994. Twenty-one transient or visiting species have been counted on the island since 1994 (Table 9).

Anecdotal breeding observations on Santa Rosa Island from 4 May to 18 May 2021 included: Bushtit pair between stations 26 and 27 were on a nesting territory and were displaying nesting behavior, but a nest could not be identified. A possible Virginia Rail pair was observed responding to playback of calls using a grunt display, which may have indicated a possible nesting pair in Quemada Canyon.

All Islands

Across all the surveyed islands in Channel Islands National Park, one brand new transient or visiting bird species (i.e., Lincoln's Sparrow) was counted in 2021, for a total of 67 such species counted since NPS monitoring began on the islands (Table 9).

Trends in Landbird Density, 2016–2021

Table 10 and Figures 16–19 display density and trend results from monitoring years 2016–2021. For comparison, Table 10 also present results from the most recent trend report for Channel Islands National Park birds from 1993 to 2015 (Coonan and Dye 2016). Five species had significant trends during the 2016–2021 period (Table 10). Chipping Sparrow on Santa Rosa Island had a significant decreasing trend (Figure 18). There was no significant trend reported previously for Chipping Sparrow on Santa Rosa Island (Coonan and Dye 2016). Horned Lark and House Finch on San Miguel Island had significant decreasing trends during 2016–2021 (Table 10), in contrast to the historical increasing trends for both species in the Coonan and Dye (2016) analysis. The decreasing Horned Lark trend p-value was 0.07, but this may be indicative of a biologically meaningful decline (Figure 19). Song Sparrow on East Anacapa Islet and Acorn Woodpecker on Santa Rosa Island had increasing trends from 2016 to 2021, but were not analyzed in Coonan and Dye (2016).

Table 10. Current status and trend in density for selected bird species on each island in Channel Islands National Park, compared with the most recent trend analysis (1993–2015; Coonan and Dye 2016). Density values are average density estimates per hectare from 2016 to 2021. Direction of trend for 2016–2021 is “Increasing” or “Decreasing” for significant p-values using a linear regression, or “No trend” for nonsignificant p-values ($p > 0.10$). Results from a 1993–2015 trend analysis (Coonan and Dye 2016) are presented in the table for comparison.

Island	Species	Average Density (2016–2021)	SE	Direction of 2016–2021 Trend	Coonan and Dye (2016) Trend Report (1993–2015)
East Anacapa	Song Sparrow	1.59	0.35	Increasing	Not analyzed
Santa Barbara	Horned Lark	6.95	0.48	No trend	No trend
Santa Barbara	Western Meadowlark	0.29	0.06	No trend	No trend
Santa Cruz	Island Scrub-Jay	4.24	1.37	No trend	No trend
Santa Cruz	Pacific-slope Flycatcher	0.04	0.006	No trend	Increasing
Santa Cruz	Rufous-crowned Sparrow	0.22	0.03	No trend	Decreasing
Santa Cruz	Spotted Towhee	5.19	0.66	No trend	Increasing
Santa Rosa	Acorn Woodpecker	0.20	0.08	Increasing	Not analyzed
Santa Rosa	Chipping Sparrow	0.48	0.07	Decreasing	No trend
Santa Rosa	Loggerhead Shrike	0.05	0.01	No trend	Not analyzed
Santa Rosa	Orange-crowned Warbler	3.70	0.37	No trend	No trend
Santa Rosa	Pacific-slope Flycatcher	1.11	0.16	No trend	No trend
Santa Rosa	Spotted Towhee	12.40	2.36	No trend	Increasing
Santa Rosa	Western Meadowlark	0.22	0.01	No trend	Increasing
San Miguel	Common Raven	0.17	0.04	No trend	No trend
San Miguel	House Finch	0.35	0.09	Decreasing	Increasing
San Miguel	Horned Lark	0.74	0.14	Decreasing	Increasing
San Miguel	Orange-crowned Warbler	1.80	0.24	No trend	No trend
San Miguel	Western Meadowlark	0.36	0.02	No trend	Increasing

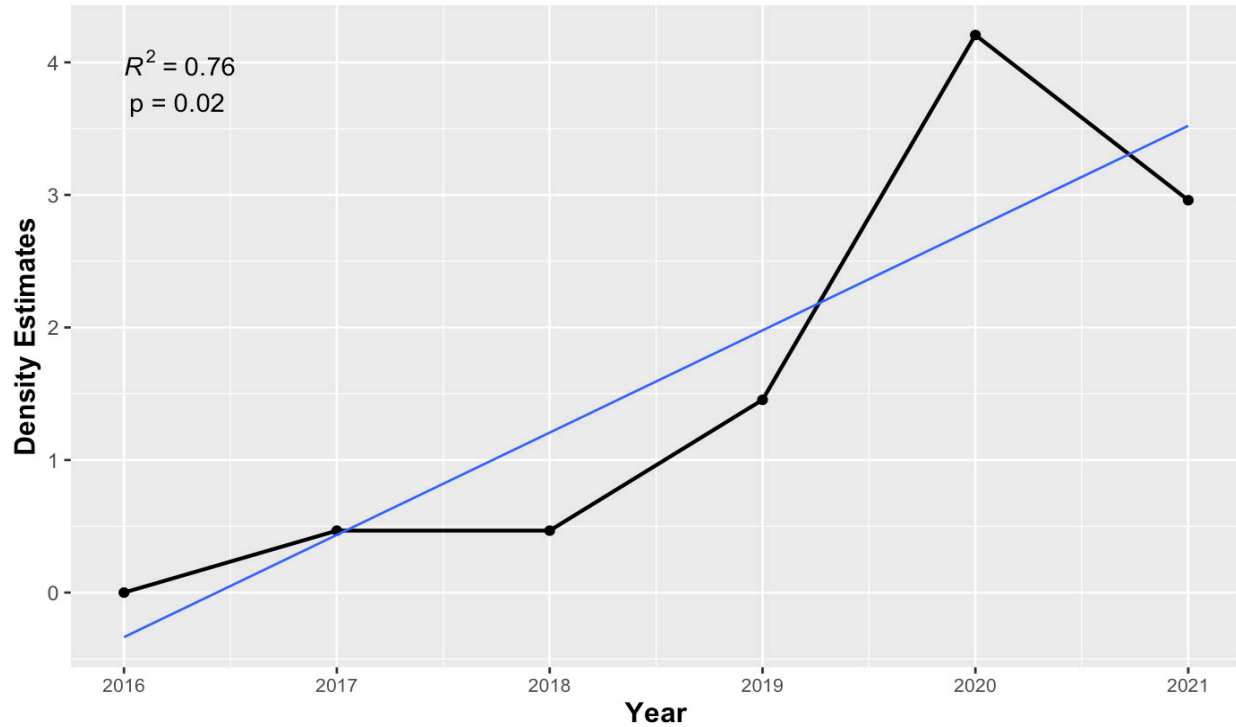


Figure 16. Increasing Song Sparrow density trend on East Anacapa Islet from 2016 to 2021. Distances were truncated at 100 meters. There was no historical trend from Coonan and Dye (2016).

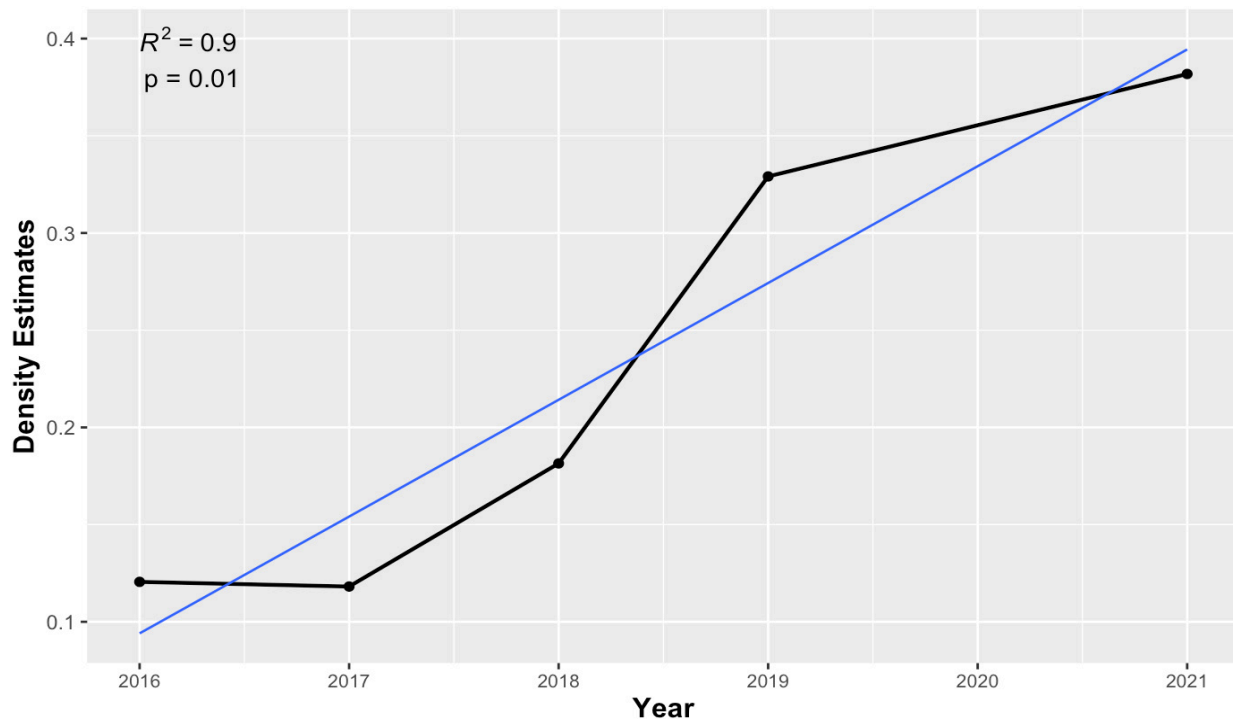


Figure 17. Increasing Acorn Woodpecker density trend on Santa Rosa Island from 2016 to 2021. Distances were truncated at 200 meters. There was no historical trend from Coonan and Dye (2016).

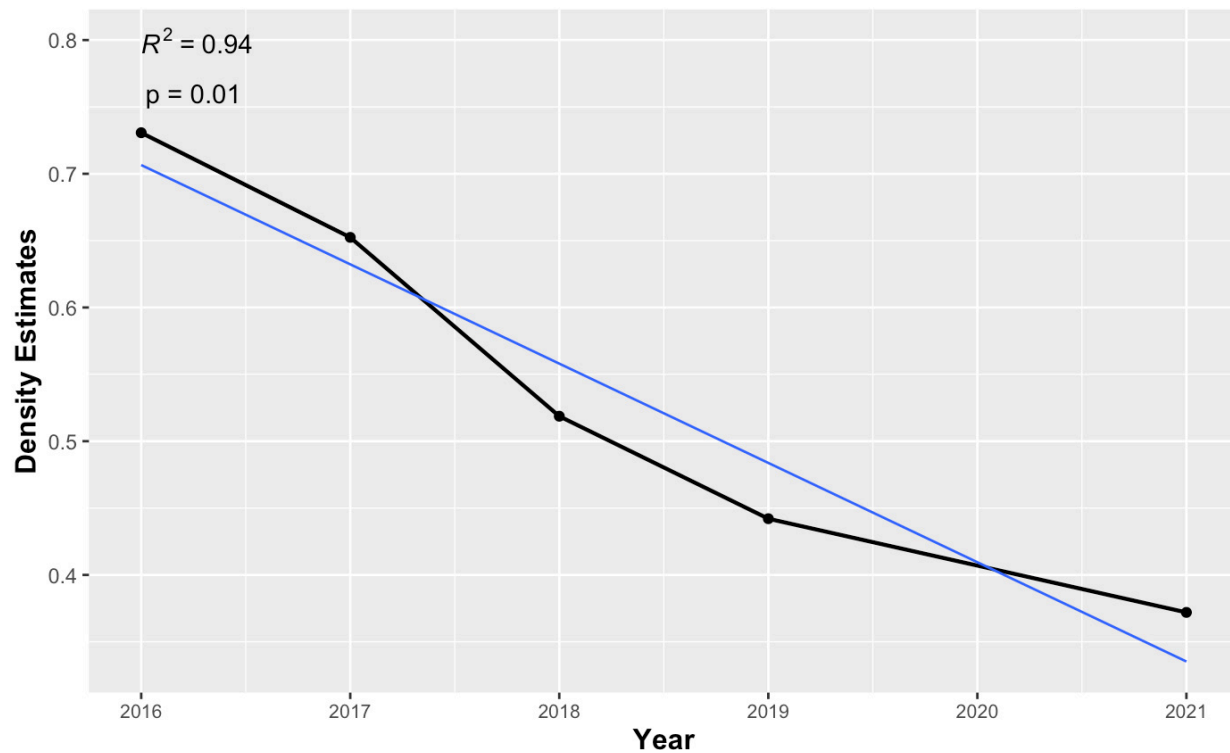


Figure 18. Decreasing trend in Chipping Sparrow density on Santa Rosa Island from 2016 to 2021. Distances were truncated at 100 meters. This species was not analyzed in the previous trend analysis (Coonan and Dye 2016).

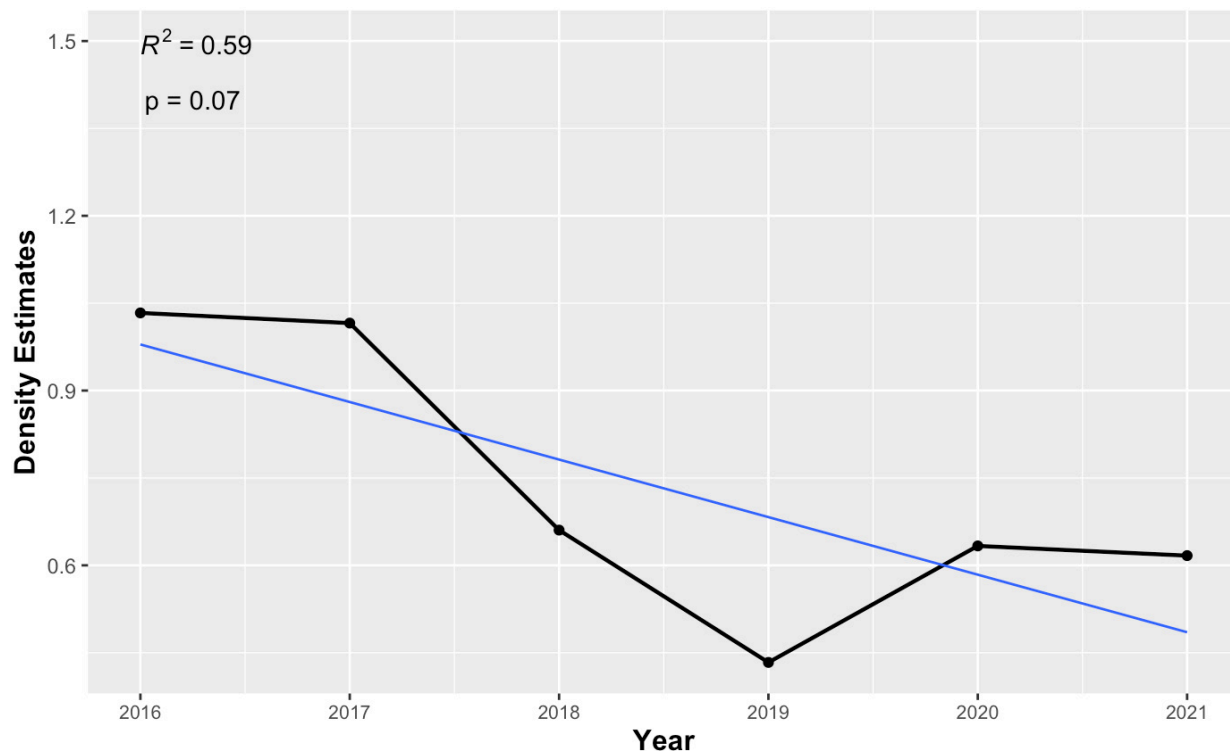


Figure 19. Decreasing Horned Lark density trend on San Miguel Island from 2016 to 2021. Distances were truncated at 100 meters. The historical trend was increasing from Coonan and Dye (2016).

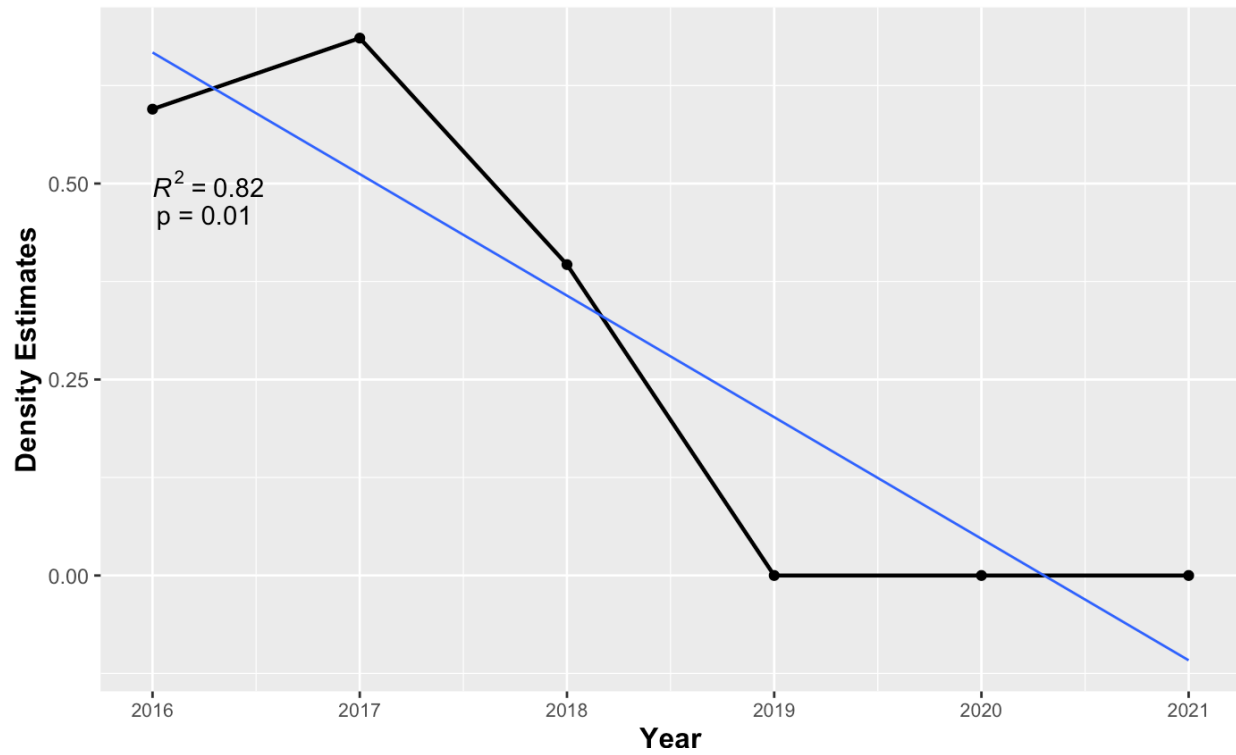


Figure 20. Decreasing House Finch density trend on San Miguel Island from 2016 to 2021. Distances were truncated at 100 meters. The historical trend was increasing from Coonan and Dye (2016).

Discussion

Across all 61 terrestrial bird species counted at Channel Islands National Park in 2021 (Table 2), island specificity was greatly evident. For example, no species were detected on all 5 islands, whereas 6 species were detected among 4 islands, 6 species were detected among 3 islands, 29 species were detected among 2 islands, and 20 species were detected on only 1 island. As predicted by island biogeography, and as observed over the 28 years of the monitoring program, species richness (number of species) was greatest on the larger islands (76 on Santa Cruz and 75 on Santa Rosa islands) and least on the smallest islands (49 on Santa Barbara, 26 on East Anacapa).

Favorable weather and improved access to the islands as the coronavirus pandemic lessened this monitoring season allowed surveyors to complete all surveys before June, which is normally not the case. Furthermore, favorable weather allowed surveyors to complete Santa Rosa Island within 2 island tours, rather than the 3 tours that are usually needed because of high winds.

This was the first year density analyses were conducted for a select group of species on each island since the Coonan and Dye (2016) trend report. Of the 12 species analyzed because of their large sample sizes, 5 produced significant density trends. Song Sparrow (on East Anacapa Islet) and Acorn Woodpecker (on Santa Rosa Island) increased in density from 2016 to 2021. However, neither species was analyzed in the 2016 trend report due to small sample size in 2015 when analyses were conducted. Davidson et al. (2019) reported that Song Sparrow has increased and may breed frequently on East Anacapa since being first observed in 2002. Acorn Woodpecker, considered an uncommon breeder on Santa Rosa Island, may be increasing because of improving oak woodland habitat (Davidson et al. 2019). Chipping Sparrow on Santa Rosa Island and House Finch and Horned Lark on San Miguel Island exhibited decreasing trends from 2016 to 2021. For example, House Finch has not been reported on a point count station on San Miguel Island since the 2018 monitoring season. However, an opposite, positive trend was reported from 1993 to 2015 for Horned Lark and House Finch on San Miguel Island (Coonan and Dye 2016). The decreasing trends seen more recently may indicate a real decline in the field for all 3 species on this island, warranting further investigation. Similarly, although the sample size for Bewick's Wren on East Anacapa Islet was not large enough to conduct a density analysis from 2016 to 2021, the species has been experiencing a declining trend with only sporadic observations on the island (Coonan and Dye 2016; Hall et al. 2021). European Starling was reported to be increasing on point count stations at Santa Rosa Island (Hall et al. *In press*). However, the sample size ($n = 38$) for starlings was not large enough to conduct a density analysis. Their numbers should be evaluated in 2022 if possible. Although starlings have been increasing on Santa Rosa Island, they may not be as much of a concern for woodpeckers as once thought (Hall et al. 2017; Hall et al. *In press*), and woodpecker densities were at their highest abundance in 2021 since surveying began in 1994 on Santa Rosa Island.

Similar to counts made in 2016–2020, each observer in 2021 was skilled at identifying bird species by vocalizations and by sight. As a result of the observers' qualifications, the authors' confidence in detection accuracy is high. However, it is important to note that inter-observer differences, environmental factors (i.e., variability in wind speeds and fog density), and only 1 count (replicate)

per season at each point count station can all affect the accuracy of estimates of species' numbers. These factors are significant challenges to any monitoring program and should be evaluated carefully to minimize misrepresentation of trends in density. We look forward to hearing the comments from the external review of the Channel Islands National Park landbird monitoring program conducted in spring 2021 (George 2022).

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Appendix A. Resident Breeder Species List

List of 54 terrestrial avian species confirmed to be nesting on at least 1 of the 5 northern Channel Islands monitored in this study (East Anacapa, Santa Barbara, Santa Cruz, San Miguel, and Santa Rosa) (Table A1). Data on nesting status from Collins and Jones (2015). List does not include exclusively marine species since these are not monitored in this landbird program, and does not include species only suspected of breeding on an island.

Table A1. List of terrestrial avian species on at least one of the Channel Islands monitored in this study.

Common Name	Scientific Name
Acorn Woodpecker	<i>Melanerpes formicivorus</i>
Allen's Hummingbird	<i>Selasphorus sasin</i>
American Coot	<i>Fulica americana</i>
American Kestrel	<i>Falco sparverius</i>
American Robin	<i>Turdus migratorius</i>
Anna's Hummingbird	<i>Calypte anna</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Barn Owl	<i>Tyto alba</i>
Barn Swallow	<i>Hirundo rustica</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
Black Phoebe	<i>Sayornis nigricans</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>
Bushtit	<i>Psaltiriparus minimus</i>
California Quail	<i>Callipepla californica</i>
Canyon Wren	<i>Catherpes mexicanus</i>
Chipping Sparrow	<i>Spizella passerina</i>
Common Raven	<i>Corvus corax</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
European Starling	<i>Sturnus vulgaris</i>
Grasshopper Sparrow	<i>Ammodramus savannarum</i>
Hooded Oriole	<i>Icterus cucullatus</i>
Horned Lark	<i>Eremophila alpestris</i>
House Finch	<i>Haemorhous mexicanus</i>
Hutton's Vireo	<i>Vireo huttoni</i>
Island Scrub-Jay	<i>Aphelocoma insularis</i>
Killdeer	<i>Charadrius vociferus</i>
Lesser Goldfinch	<i>Spinus psaltria</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
Mallard	<i>Anas platyrhynchos</i>
Mourning Dove	<i>Zenaida macroura</i>

Table A1 (continued). List of terrestrial avian species on at least one of the Channel Islands monitored in this study.

Common Name	Scientific Name
Northern Flicker	<i>Colaptes auratus</i>
Northern Harrier	<i>Circus hudsonius</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
Northern Saw-whet Owl	<i>Aegolius acadicus</i>
Orange-crowned Warbler	<i>Oreothlypis celata</i>
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Phainopepla	<i>Phainopepla nitens</i>
Red-breasted Nuthatch	<i>Sitta canadensis</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Rock Pigeon	<i>Columba livia</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>
Short-eared Owl	<i>Asio flammeus</i>
Song Sparrow	<i>Melospiza melodia</i>
Spotted Towhee	<i>Pipilo maculatus</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Virginia Rail	<i>Rallus limicola</i>
Western Meadowlark	<i>Sturnella neglecta</i>
White-throated Swift	<i>Aeronautes saxatalis</i>

Appendix B. 2021 Landbird Monitoring Site Observers

Table B1. Site observers point count stations on East Anacapa Islet in 2021.

Site	Survey Date	Observer*
AE01	3/18/21	JAH
AE02	3/18/21	JAH
AE03	3/18/21	JAH
AE04	3/18/21	JAH
AE05	3/18/21	JAH
AE06	3/18/21	JAH
AE07	3/18/21	JAH
AE08	3/18/21	JAH

*JAH = Jim Howard

Table B2. Site observers for point count stations on Santa Barbara Island in 2021.

Site	Survey Date	Observer*
SB01	3/13/2021	PTL
SB02	3/12/2021	PTL
SB03	3/13/2021	PTL
SB04	3/12/2021	PTL
SB05	3/13/2021	PTL
SB06	3/12/2021	PTL
SB07	3/12/2021	PTL
SB08	3/12/2021	PTL
SB09	3/14/2021	PTL
SB10	3/12/2021	PTL
SB11	3/12/2021	PTL
SB13	3/14/2021	PTL
SB14	3/14/2021	PTL
SB15	3/12/2021	PTL
SB16	3/12/2021	PTL
SB18	3/12/2021	PTL
SB21	3/13/2021	PTL
SB22	3/13/2021	PTL
SB23	3/13/2021	PTL
SB24	3/13/2021	PTL
SB25	3/13/2021	PTL
SB26	3/13/2021	PTL
SB27	3/13/2021	PTL
SB28	3/11/2021	PTL
SB29	3/11/2021	PTL

* PTL = Peter Larramendy

Table B2 (continued). Site observers for point count stations on Santa Barbara Island in 2021.

Site	Survey Date	Observer*
SB30	3/11/2021	PTL
SB31	3/11/2021	PTL
SB32	3/11/2021	PTL
SB33	3/11/2021	PTL

* PTL = Peter Larramendy

Table B3. Site observers for point count stations on Santa Cruz Island in 2021.

Site	Survey Date	Observer*
SC001	4/20/2021	PTL
SC002	4/20/2021	PTL
SC003	4/20/2021	PTL
SC004	4/20/2021	PTL
SC005	4/20/2021	PTL
SC006	4/22/2021	PTL
SC007	4/22/2021	PTL
SC008	4/22/2021	PTL
SC009	4/23/2021	PTL
SC010	4/23/2021	PTL
SC011	4/23/2021	PTL
SC012	4/23/2021	PTL
SC013	4/23/2021	PTL
SC014	4/23/2021	PTL
SC015	4/23/2021	PTL
SC016	4/23/2021	PTL
SC017	4/23/2021	PTL
SC018	4/23/2021	PTL
SC019	4/23/2021	PTL
SC020	4/27/2021	LL
SC021	4/27/2021	LL
SC022	4/27/2021	LL
SC023	4/27/2021	LL
SC024	4/27/2021	LL
SC025	4/29/2021	LL
SC026	4/29/2021	LL
SC027	4/29/2021	LL
SC028	4/29/2021	LL
SC029	4/29/2021	LL
SC030	4/29/2021	LL
SC031	4/29/2021	LL

* PTL = Peter Larramendy, LL = Lyndal Laughrin, NT = Nick Todd, SB = Stacy Baker

Table B3 (continued). Site observers for point count stations on Santa Cruz Island in 2021.

Site	Survey Date	Observer*
SC032	4/29/2021	LL
SC033	4/21/2021	PTL
SC034	4/21/2021	PTL
SC035	4/21/2021	PTL
SC036	4/21/2021	PTL
SC037	4/21/2021	PTL
SC038	4/21/2021	PTL
SC039	4/21/2021	PTL
SC040	4/21/2021	PTL
SC041	4/21/2021	PTL
SC042	4/28/2021	LL
SC043	4/28/2021	LL
SC044	4/28/2021	LL
SC045	4/28/2021	LL
SC046	4/28/2021	LL
SC047	4/28/2021	LL
SC048	4/28/2021	LL
SC049	4/28/2021	LL
SC050	4/28/2021	LL
SC051	4/28/2021	LL
SC052	4/30/2021	LL
SC053	4/30/2021	LL
SC054	4/30/2021	LL
SC055	4/30/2021	LL
SC056	4/30/2021	LL
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SC060	5/19/2021	LL
SC061	5/19/2021	LL
SC062	5/19/2021	LL
SC063	5/19/2021	LL
SC064	5/19/2021	LL
SC065	5/19/2021	LL
SC066	5/19/2021	LL
SC067	5/20/2021	NT
SC068	5/20/2021	NT
SC069	4/26/2021	LL
SC070	4/26/2021	LL
SC071	4/26/2021	LL

* PTL = Peter Larramendy, LL = Lyndal Laughrin, NT = Nick Todd, SB = Stacy Baker

Table B3 (continued). Site observers for point count stations on Santa Cruz Island in 2021.

Site	Survey Date	Observer*
SC072	4/26/2021	LL
SC073	4/26/2021	LL
SC074	4/26/2021	LL
SC075	4/26/2021	LL
SC076	4/26/2021	LL
SC077	4/22/2021	PTL
SC078	4/22/2021	PTL
SC079	4/22/2021	PTL
SC080	4/25/2021	LL
SC081	4/25/2021	LL
SC082	4/25/2021	LL
SC083	4/25/2021	LL
SC084	4/25/2021	LL
SC085	4/25/2021	LL
SC086	4/25/2021	LL
SC087	4/25/2021	LL
SC088	4/25/2021	LL
SC089	4/25/2021	LL
SC090	4/25/2021	LL
SC091	4/25/2021	LL
SC092	4/25/2021	LL
SC093	4/25/2021	LL
SC094	4/25/2021	LL
SC095	4/21/2021	PTL
SC096	5/19/2021	NT
SC097	5/19/2021	NT
SC098	4/22/2021	PTL
SC099	4/22/2021	PTL
SC100	4/22/2021	PTL
SC109	5/20/2021	SB
SC110	5/20/2021	SB
SC111	5/20/2021	SB
SC112	5/20/2021	SB
SC113	5/20/2021	SB
SC114	5/20/2021	SB
SC115	5/20/2021	SB
SC116	5/20/2021	SB
SC117	5/21/2021	SB
SC118	5/21/2021	SB

* PTL = Peter Larramendy, LL = Lyndal Laughrin, NT = Nick Todd, SB = Stacy Baker

Table B3 (continued). Site observers for point count stations on Santa Cruz Island in 2021.

Site	Survey Date	Observer*
SC119	5/21/2021	SB
SC120	5/21/2021	SB

* PTL = Peter Larramendy, LL = Lyndal Laughrin, NT = Nick Todd, SB = Stacy Baker

Table B4. Site observers on Santa Rosa Island in 2021.

Site	Survey Date	Observer*
SR001	5/12/2021	DM
SR002	5/10/2021	PTL
SR003	5/7/2021	NT
SR004	5/9/2021	NT
SR005	5/9/2021	NT
SR006	5/9/2021	NT
SR007	5/5/2021	PTL
SR008	5/5/2021	PTL
SR009	5/5/2021	PTL
SR010	5/10/2021	PTL
SR011	5/7/2021	NT
SR012	5/7/2021	NT
SR013	5/11/2021	DM
SR014	5/11/2021	DM
SR015	5/11/2021	DM
SR016	5/9/2021	PTL
SR017	5/9/2021	PTL
SR018	5/9/2021	PTL
SR019	5/6/2021	NT
SR020	5/6/2021	NT
SR021	5/6/2021	NT
SR022	5/7/2021	PTL
SR023	5/7/2021	PTL
SR024	5/7/2021	PTL
SR025	5/7/2021	PTL
SR026	5/7/2021	PTL
SR027	5/7/2021	PTL
SR028	5/11/2021	PTL
SR029	5/11/2021	PTL
SR030	5/11/2021	PTL
SR031	5/12/2021	PTL
SR032	5/13/2021	PTL
SR033	5/13/2021	PTL

* PTL = Peter Larramendy, NT = Nick Todd, SB = Stacy Baker, DM = Dan Maxell, JM = James Mouton

Table B4 (continued). Site observers on Santa Rosa Island in 2021.

Site	Survey Date	Observer*
SR034	5/5/2021	PTL
SR035	5/5/2021	PTL
SR036	5/5/2021	PTL
SR037	5/11/2021	DM
SR038	5/11/2021	DM
SR039	5/11/2021	DM
SR040	5/7/2021	NT
SR041	5/7/2021	NT
SR042	5/5/2021	NT
SR043	5/11/2021	PTL
SR044	5/11/2021	PTL
SR045	5/11/2021	PTL
SR046	5/12/2021	DM
SR047	5/12/2021	DM
SR048	5/12/2021	DM
SR049	5/6/2021	PTL
SR050	5/6/2021	PTL
SR051	5/6/2021	PTL
SR052	5/9/2021	PTL
SR053	5/9/2021	PTL
SR054	5/9/2021	PTL
SR055	5/8/2021	PTL
SR056	5/8/2021	PTL
SR057	5/8/2021	PTL
SR058	5/8/2021	PTL
SR059	5/8/2021	PTL
SR060	5/8/2021	PTL
SR061	5/12/2021	PTL
SR062	5/12/2021	DM
SR063	5/12/2021	DM
SR064	5/12/2021	PTL
SR065	5/10/2021	DM
SR066	5/12/2021	PTL
SR067	5/12/2021	PTL
SR068	5/10/2021	DM
SR069	5/10/2021	DM
SR070	5/6/2021	NT
SR071	5/6/2021	NT
SR072	5/6/2021	NT
SR073	5/13/2021	DM

* PTL = Peter Larramendy, NT = Nick Todd, SB = Stacy Baker, DM = Dan Maxell, JM = James Mouton

Table B4 (continued). Site observers on Santa Rosa Island in 2021.

Site	Survey Date	Observer*
SR074	5/16/2021	PTL
SR075	5/16/2021	PTL
SR076	5/6/2021	PTL
SR077	5/6/2021	PTL
SR078	5/6/2021	PTL
SR079	5/10/2021	PTL
SR080	5/10/2021	PTL
SR081	5/10/2021	PTL
SR082	5/10/2021	PTL
SR083	5/12/2021	PTL
SR084	5/12/2021	PTL
SR085	5/12/2021	PTL
SR086	5/8/2021	NT
SR087	5/8/2021	NT
SR088	5/8/2021	NT
SR089	5/13/2021	DM
SR090	5/16/2021	PTL
SR091	5/13/2021	DM
SR092	5/13/2021	DM
SR093	5/13/2021	DM
SR094	5/16/2021	PTL
SR095	5/13/2021	JM
SR096	5/13/2021	JM
SR097	5/13/2021	JM
SR098	5/13/2021	JM
SR099	5/13/2021	JM
SR100	5/16/2021	PTL
SR101	5/5/2021	PTL
SR102	5/5/2021	PTL
SR103	5/8/2021	PTL
SR104	5/8/2021	NT
SR105	5/8/2021	NT
SR106	5/8/2021	PTL
SR107	5/8/2021	PTL
SR108	5/8/2021	PTL
SR109	5/8/2021	PTL
SR110	5/8/2021	PTL
SR111	5/13/2021	PTL
SR112	5/13/2021	PTL
SR113	5/13/2021	PTL

* PTL = Peter Larramendy, NT = Nick Todd, SB = Stacy Baker, DM = Dan Maxell, JM = James Mouton

Table B4 (continued). Site observers on Santa Rosa Island in 2021.

Site	Survey Date	Observer*
SR114	5/13/2021	PTL
SR115	5/13/2021	PTL
SR116	5/9/2021	PTL
SR117	5/9/2021	PTL
SR118	5/9/2021	PTL
SR119	5/9/2021	PTL
SR120	5/9/2021	PTL
SR121	5/8/2021	NT
SR122	5/8/2021	NT
SR123	5/8/2021	NT
SR124	5/8/2021	NT
SR125	5/8/2021	NT
SR126	5/7/2021	NT
SR127	5/7/2021	NT
SR128	5/7/2021	NT
SR129	5/7/2021	NT
SR130	5/7/2021	NT
SR131	5/6/2021	NT
SR132	5/12/2021	PTL
SR133	5/12/2021	PTL
SR134	5/12/2021	PTL
SR135	5/10/2021	DM
SR136	5/10/2021	DM
SR137	5/5/2021	NT
SR138	5/5/2021	NT
SR139	5/5/2021	NT
SR140	5/5/2021	NT
SR141	5/5/2021	NT
SR142	5/7/2021	NT
SR143	5/9/2021	PTL
SR144	5/8/2021	NT
SR145	5/13/2021	DM

* PTL = Peter Larramendy, NT = Nick Todd, SB = Stacy Baker, DM = Dan Maxell, JM = James Mouton

Table B5. Site observers on San Miguel Island in 2021.

Site	Survey Date	Observer*
SM01	4/7/2021	SB
SM02	4/7/2021	SB
SM03	4/22/2021	SB

* SB = Stacy Baker

Table B5 (continued). Site observers on San Miguel Island in 2021.

Site	Survey Date	Observer*
SM04	4/8/2021	SB
SM05	4/24/2021	SB
SM06	4/24/2021	SB
SM07	4/24/2021	SB
SM08	4/24/2021	SB
SM09	4/23/2021	SB
SM10	4/22/2021	SB
SM11	4/22/2021	SB
SM12	4/22/2021	SB
SM13	4/7/2021	SB
SM14	4/9/2021	SB
SM15	4/6/2021	SB
SM16	4/6/2021	SB
SM17	4/6/2021	SB
SM18	4/7/2021	SB
SM19	4/24/2021	SB
SM20	4/9/2021	SB
SM21	4/9/2021	SB
SM22	4/9/2021	SB
SM23	4/8/2021	SB
SM24	4/24/2021	SB
SM25	4/24/2021	SB
SM26	4/8/2021	SB
SM27	4/24/2021	SB
SM28	4/24/2021	SB
SM29	4/8/2021	SB
SM30	4/8/2021	SB
SM31	4/23/2021	SB
SM32	4/24/2021	SB
SM33	4/23/2021	SB
SM34	4/24/2021	SB
SM35	4/20/2021	SB
SM36	4/20/2021	SB
SM37	4/20/2021	SB
SM38	4/22/2021	SB
SM39	4/22/2021	SB
SM40	4/22/2021	SB

* SB = Stacy Baker

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
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