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TROPHIC LEVELS AND TURNOVER RATES: THE AVIFAUNA OF SANTA BARBARA ISLAND, CALIFORNIA

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With the study of the equilibrium theory of island biogeography pioneered by MacArthur and Wilson (1963, 1967), increasing attention has been paid to the study of turnover rates (Mayr 1965; Diamond 1969, 1971; Power 1972; Terborgh and Faaberg 1973). The failure of bird species turnover rates to show the predicted negative correlation with island size in the California Channel Islands (Diamond 1969) raises questions as to what factors other than island size may be involved in determining species turnover. Previous studies of avifaunal turnover have treated faunas as a whole and have not differentiated turnover rates for rare species from those of common species. Since very large birds and species at high levels on the food chain often exist at relatively low densities, these organisms would be expected to have a greater probability of extinction on small islands than those species which maintain larger populations (Brown 1971). A theoretical basis for this hypothesis can be derived from Gilpin (1974). He has shown (pers. comm.) that extinction rates should be a negative exponential function of K , and thus should be very sensitive to small population size.

In this paper we present heretofore unpublished data and a review of the literature on the avifauna of Santa Barbara Island (Channel Islands, Santa Barbara County, California). These data provide the bases for a comparison of the turnover rates of various groups of breeding birds, e.g., "birds of prey" and "songbirds." This comparison supports the hypothesis relating turnover rates to trophic levels.

Santa Barbara Island is a volcanic island approximately 38 miles (61 km) from the nearest mainland and 24 miles (39 km) from the nearest large island, Santa Catalina Island. It is about 1.75 miles (3.8 km) long and 1.1 mile (1.8 km) wide and has a maximum elevation of 635 ft (193 m). Its surface area is approximately one square mile (2.6 km²). Corey (1954) and Valentine and Lipps (1967) presented different theories as to the geological history of the island and Philbrick (1972)

provided an up-to-date account of the island's vegetation.

METHODS

The authors made observations on 29 January, 24 March, and between 15 May and 23 July 1972. Other observations cited include those of E. Lowell Sumner, Jr., who visited the island in April 1939, and those of Jared Diamond who was on the island from 23 to 25 July 1968. Dr. Diamond also provided records of other visitors in 1967 and 1968.

In order to obtain percent turnover, a baseline of species' presence or absence is needed. In light of the small size of Santa Barbara Island and the fact that there were early records for the two most cryptic species of small land birds listed as breeding, we feel that the work of Howell (1917), Willett (1933), and Maillard (1918) taken together provide an accurate baseline for determining extinctions and invasions of birds (see table 1). For the same reasons, we also have confidence in the data of Sumner and Diamond, whose censuses were designed specifically to assess the species breeding on the island.

Although Lynch and Johnson (1974) feel that data on gonadal conditions are important for proving nesting, for our own avifaunal records we felt that it was inappropriate to collect individuals from very small island populations in danger of extinction. Furthermore, we feel that behavioral criteria such as territorial defense or persistent use of burrows are preferable to gonadal data, since the gonads of migrants may show enlargement equivalent to that expected from resident breeding birds (Lofts and Murton 1973).

RESULTS

For a systematic list of species recorded on or near Santa Barbara Island see the appendix. Of the total of 83 species listed from Santa Barbara Island as of 1972, 24 species are known to breed or are believed to have bred there (table 1). Included are nine species of marine birds, six birds of prey including the raven, and nine small land birds. Species previously recorded which were not recorded in the censuses of Sumner and Diamond were assumed to be absent at the time of their censuses.

Known extinctions and immigrations (*sensu* Simberloff 1969) are not equally common in the three groups of birds listed above. Among the species of seabirds breeding on the island, three extinctions have taken place. Of these

TABLE 1. Birds reported breeding on Santa Barbara Island.^a

Species	Howell (1917)	Willett (1933)	Summer (unpubl.)	Other	Diamond (unpubl.) ^b	Present study
Brown Pelican	1911, 1912	1912	—	1967 ^c	—	NB
Double-crested Cormorant	B	1897	1939	—	—	1972
Brandt's Cormorant	1908	1897	1939	—	—	1972
Pelagic Cormorant	—	1897	1939	—	—	NP
Bald Eagle	—	1911	—	—	—	NP
Peregrine Falcon	1908	—	—	—	—	NP
American Kestrel	—	—	—	1927 ^d	1968	1972
Black Oystercatcher	B	1863	—	—	—	1972
Western Gull	B	B	1939	—	1968	1972
Pigeon Guillemot	1897	1897	1939	—	—	1972
Xantus' Murrelet	—	1868, 1911, 1912	X	—	—	1972
Cassin's Auklet	1863, 1897 1911, NP 1908	1897, 1911 NP 1908	—	—	—	NP
Barn Owl	—	—	—	—	1968	1972
Burrowing Owl	NP	—	—	1927 ^d	1968	1972
Costa's Hummingbird	1911	1911	—	—	—	U
Allen's Hummingbird	B	—	P	—	—	P
Island Horned Lark	1910	1897	1939	—	1968	1972
Common Raven	B	—	1939	—	—	NP
Rock Wren	1908	B	1939	—	1968	1972
Starling	—	—	—	—	—	1972
Orange-crowned Warbler	—	—	—	1918, ^e 1927 ^e 1939 ^f	—	NP
Western Meadowlark	B	—	1939	—	1968	1972
House Finch	B	B	1939	—	P	NB
Santa Barbara Island Song Sparrow	1897, 1908	1897, 1911	1939	—	Y	NP

^a B = breeding; NB = present, but not breeding; P = present, breeding status uncertain; U = presence uncertain; NP = not present, but looked for; X = one dead bird only found in 1939; Y = last seen 1967; — = not recorded.

^b Land birds only.

^c Schreiber & de Long, 1969.

^d Pemberton, 1928; additions to Howell.

^e Maillard, 1918.

^f McDiarmid, unpubl. data.

^g Johnson, unpubl. data.

the loss of the Cassin's Auklet (*Ptychoramphus aleuticus*) was due to the introduction of cats (Howell 1917), and the Brown Pelican (*Pelecanus occidentalis*), which historically has bred only irregularly in the Channel Islands, has become progressively less successful in its breeding efforts since the introduction of DDE into the marine ecosystem (Schreiber and de Long 1969). The cause of the disappearance of the Pelagic Cormorant (*Phalacrocorax pelagicus*) is not known. While the causes of turnover in seabirds are of interest in understanding their population fluctuations in the Channel Islands, these extinctions are not relevant to the following discussion as seabird populations in general are not correlated with island size.

Among the nesting birds of prey, there have been five extinctions and five immigrations (table 2). There are no documented reasons for any of the extinctions. Although it is possible that farming activity on the island

between 1915 and 1926 (Philbrick 1972) may have played a part in the disappearance of the Bald Eagle (*Haliaeetus leucocephalus*) and the Peregrine Falcon (*Falco peregrinus*) which were not recorded subsequent to 1911, these birds have nested successfully in the vicinity of man elsewhere. It is clear from the dates of the last recording of the Bald Eagle and the Peregrine Falcon that pesticides were not responsible for their disappearance from Santa Barbara Island, and therefore could not have created a bias in favor of our hypothesis due to an accumulation through the food chain. Extinctions and immigrations of Barn Owls (*Tyto alba*), Burrowing Owls (*Speotyto cunicularia*), and American Kestrels (*Falco sparverius*) are likely to have been entirely natural events unaffected by man. These mobile species may be opportunistic invaders of unoccupied areas.

Of the nine species of small land birds recorded breeding on the island (table 2), the

TABLE 2. Extinctions and invasions of breeding land bird species, Santa Barbara Islands.

	Extinctions	Invasions
Birds of Prey		
(6 species total)		
Bald Eagle	1	-
Peregrine Falcon	1	-
American Kestrel	1	2
Barn Owl	-	1
Burrowing Owl	1	2
Common Raven	1	-
Total	5	5
Songbirds (7 passerines and 2 hummingbirds total)		
Costa's Hummingbird	1?	-
Allen's Hummingbird	1?	1?
Starling	-	1
Orange-crowned Warbler	1	-
House Finch	1	-
Song Sparrow	1	-
Total	3 + 2?	1 + 1?

extinction of two species, the Song Sparrow (*Melospiza melodia*) and the House Finch (*Carpodacus mexicanus*), are probably related to the destruction of suitable nesting habitat by introduced rabbits and by a fire in 1959. Although few data on the breeding population of the Orange-crowned Warbler (*Vermivora celata*) exist, this species may also have been driven to extinction by the habitat destruction mentioned above.

Comparisons can be made of the rates of immigration, extinction, and turnover for the various groups of birds found on the island. The results shown in table 2 indicate that the "birds of prey," including the raven, may have higher incidences of both extinction and immigration than the "song birds," including two species of hummingbirds. Calculations of the Fisher Exact Probability test for the difference in extinction rates between "birds of prey" and "songbirds" show $P = 0.08$ ($P = 0.05$ when the Tocher modification for a one-tailed test is applied, Siegel 1956) when it is assumed that the hummingbirds have not changed status. If, due to the uncertainty in their status, hummingbirds are excluded from the calculations, then the same test (without modification) yields $P = 0.23$.

Percent turnover since the turn of the century was calculated according to the methods of Diamond (1969) using the data presented in table 1. It was found that for all land birds (excluding the hummingbirds for which the status is uncertain) the turnover was 69% but, when the groups were treated separately, "birds of prey" had a turnover of 120% and "song birds" a turnover of 42%.

TABLE 3. Comparison of turnover rates of breeding land birds on islands in southern California and northern México.

Island	Area in square miles	% turn-over all species	% turn-over song birds	% turn-over birds of prey
Los Coronados	1.0	36	26	100
San Nicolas	22	50	43	67
San Clemente	56	25	17	60
Santa Catalina	75	24	18	50
Santa Barbara	1.0	62	40	100
San Miguel	14	46	33	75
Santa Rosa	84	32	25	67
Santa Cruz	96	17	15	23
Anacapa	1.1	31	22	67

Data courtesy of Dr. Jared Diamond.

When the hummingbirds are included, the turnover for all land birds was 79% and for "song birds" alone, 61%.

DISCUSSION

Diamond (1971), MacArthur and Wilson (1963, 1967), and Brown (1971) pointed out that extinction rates should depend upon the size of a species' population and the yearly mortality rate of the species. Predatory birds, although long-lived, are generally found in low frequency within an avifauna because of their position high in the food chain and their requirement of a large territory. Therefore, turnover rates for animals at high trophic levels should be greater than for those at lower trophic levels, for any given island size. Although turnover rates of birds on Santa Barbara Island were probably accelerated by man's influence, for the purposes of this paper we feel that it is appropriate to make the above comparisons of turnover between species from different trophic levels. The meager historical data available (see Philbrick 1972) suggest that man's activities on this island may have increased extinction rates among the small land birds to a greater extent than among the predatory birds, which would create, if anything, a bias against our hypothesis, as does the inclusion of the introduced starling.

On Santa Barbara Island all predatory land birds except the Burrowing and Barn Owls have rarely if ever been represented by more than two pairs (see the appendix for quantification of population sizes). The reproductive success of raptors can fluctuate according to their food supply (Pitelka et al. 1955; Grossman and Hamlet 1964:126). It is reasonable to suppose that only one or two poor seasons would be sufficient to cause extinctions of small island populations of raptors due either to lack

of reproductive success in a nonmobile population or to emigration in more mobile species. This phenomenon would likely be damped out on large islands where heterogeneous patches in the environment would allow predators a chance to obtain alternate foods.

The hypothesis is consistent with the results of a comparison of percent turnover calculated by Diamond (unpubl. data) for birds on all the Channel Islands between Howell's report (1917) and that of Diamond (1969) (table 3). On all islands percent turnover was higher for predatory birds than for song birds (as defined above). Furthermore, there is a statistically significant negative correlation between island area and predator turnover ($r = -0.805$, $P < 0.01$) which is not found when turnover of "songbirds" is ranked against island area ($r = -0.623$, $P > 0.05$). While the slopes of these two lines are similar, there may be a biological reason for the lack of a statistically significant correlation in the case of the "song birds." The negative correlation between island area and percent turnover for predatory birds suggests that these birds utilize entire islands rather than patches of island habitat. The lack of a statistically significant negative correlation for the small land birds in the Channel Islands may result from these birds restricting their activities to patches of their appropriate habitats, which do not always vary in availability according to island size.

It is presently not known whether species at high trophic levels generally have higher turnover rates than species at lower trophic levels. Heatwole and Levins (1972), in an analysis of the data of Simberloff and Wilson (1969, 1970) on invertebrate recolonization of small islands, have shown that not all trophic classes show the same rates of colonization and stability. From table 4 in Heatwole and Levins (1972), it can be calculated that parasites and predators had higher turnover rates in reaching the final faunal equilibrium than any other trophic class. Brown (1971) has shown that for small mammals inhabiting montane islands within the Great Basin, extinction rates have been higher for carnivores, large herbivores, and herbivores with specialized habitat requirements. These three classes of organisms would be expected to have small populations. The relatively small size of populations of predatory species and the sensitivity of those species to fluctuation in food resources (e.g., Pitelka et al. 1955) may combine to make organisms at high trophic levels particularly susceptible to local extinctions.

The occurrence of higher turnover rates for predatory bird species than for species at

lower trophic levels presents difficulties for the comparison of turnover rates on various islands (e.g., Diamond 1969, 1971). If the proportion of predators in the taxon studied is not similar on all islands, then some turnover rates may be unrealistically high or low, depending upon the proportion of predatory species in the population. Such shifts could mask other factors normally influencing turnover rates such as distance from the source of propagules and island area.

What is currently needed for an adequate test of the generality of our hypothesis are data from a group of small islands, the fauna of which has been frequently censused over a long period, and which have not been disturbed by man, though these conditions may be difficult to fulfill.

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- Aechmophorus occidentalis*. Western Grebe. Reported in the vicinity of the island during the winter (Howell 1917:17).
- Diomedea nigripes*. Black-footed Albatross. Several reported between Santa Barbara and Santa Catalina Islands, 27 August 1903 (Howell 1917:30).
- Oceanodroma homochroa*. Ashy Petrel. One seen near the island in 1904 and one in 1910. Reported between Santa Barbara and San Nicolas Islands, June 1911 (Howell 1917:34).
- Pelecanus occidentalis californicus*. Brown Pelican. Formerly breeding. Historically, Santa Barbara Island has been the second most important rookery in the Channel Islands after Anacapa (Schreiber and de Long 1969:57). Twenty-five nests counted, 14 July 1911, and 300-400 nests, 2 July 1912 (Howell 1917:40). Breeding reported in 1940 (M. B. Dunkle in Philbrick 1972:384). Breeding reported in 1967 but no nesting was seen in 1968 (Schreiber and de Long 1969). In 1972 there were no nests. No more than five pelicans were seen at a time until early June 1972, when large flocks appeared. Adults and immatures numbering 279 were counted, 2 July 1972.
- Phalacrocorax auritus albociliatus*. Double-crested Cormorant. Breeding. Large numbers reported by Howell (1917:37). In April 1939, 2000 birds counted (Sumner, unpubl. rept.). On 2 July 1972, 66 nests counted.
- Phalacrocorax penicillatus*. Brandt's Cormorant. Breeding. Large rookeries reported 1 May 1908 (Howell 1917:38). In April 1939, 1000 nests counted (Sumner, unpubl. rept.). Two probable nests and 35 adults seen 2 July and one nest, 7 July 1972.
- Phalacrocorax pelagicus resplendens*. Pelagic Cormorant. Formerly breeding. Breeding reported in 1897 (Willett 1933:20). Present in 1939 but in considerably fewer numbers than the preceding two species (Sumner, unpubl. rept.). No nests or individuals seen in 1972.
- Ardea herodias*. Great Blue Heron. Two, 11-12 November 1928 (Pemberton 1929:37). One, 22 July 1968 (Diamond, unpubl. data).
- Melanitta deglandi*. White-winged Scoter. Observed several times, April 1939 (Sumner, unpubl. rept.).
- Melanitta perspicillata*. Surf Scoter. Several seen near 1 May (Howell 1917:43) and in April 1939 (Sumner, unpubl. rept.).
- Buteo jamaicensis*. Red-tailed Hawk. One, mid-July 1968. (Diamond, unpubl. data).
- Haliaeetus leucocephalus leucocephalus*. Bald Eagle. Formerly breeding. One pair reported in June 1911 (Willett 1933:45).
- Falco peregrinus anatum*. Peregrine Falcon. Formerly breeding. One pair reported 1 May 1908 (Howell 1917:56).
- Falco sparverius*. American Kestrel. Probably breeding. Two pairs, 27 March 1927 (Pemberton 1928:45). Sumner (unpubl. rept.) does not include this species as present in 1939. Two birds, 23-26 July 1968 (Diamond, unpubl. data). Two females and one male present June-July 1972, although no nest was found.
- Haematopus palliatus frazari*. American Oystercatcher. One (collected), 2 June 1863 (Howell 1917:51).
- Haematopus bachmani*. Black Oystercatcher. Breeding. Reported by Howell (1917:52). At least three pairs resident May-July 1972.
- Aphriza virgata*. Surf-bird. One possible early record by J. C. Cooper (Howell 1917:50). One, 24 March 1972.

APPENDIX

Birds reported on or near Santa Barbara Island, California, include the following species (all observations in 1972 were made by the present authors).

- Gavia arctica pacifica*. Arctic Loon. One, 11-12 November 1928 (Pemberton 1929:37).
- Podiceps nigricollis californicus*. Eared Grebe. One, 11-12 November 1928 (Pemberton 1929:37).

- Arenaria melanocephala*. Black Turnstone. Winter visitor. Reported as "common" August–May, also seen 4–5 July 1909 and 14 June 1911 (Willett 1933:59). One, April 1939 (Sumner, unpubl. rept.).
- Numenius phaeopus*. Whimbrel. One, 29 June 1968 (Diamond, unpubl. data). Three, 23 July 1972.
- Actitis macularia*. Spotted Sandpiper. Reported in late April and early May (Howell 1917:48).
- Heteroscelus incanus*. Wandering Tattler. Reported "common" September–June; several seen in July 1909 (Willett 1933:63). Two, 12 June 1972; two, 21 June 1972; one, 15 July 1972.
- Catoptrophorus semipalmatus*. Willett. One, 6 April 1968 (Diamond, unpubl. data). One, 19 June 1972; one, 15 July 1972; two, 21 July 1972.
- Larus occidentalis wymani*. Western Gull. Breeding. Reported as "abundant" (Howell 1917:26). In April 1939, 2500–3500 birds noted (Sumner, unpubl. rept.). On 7 July 1972, 1510 pairs counted on territory.
- Larus philadelphia*. Bonaparte's Gull. "A few," 11–12 November 1928 (Pemberton 1929:37).
- Larus heermanni*. Heermann's Gull. About a dozen reported 11–12 November 1928 (Pemberton 1929:37).
- Xema sabini*. Sabine's Gull. Flock reported between Santa Barbara and Santa Cruz islands, 1 August 1912 (Howell 1917:29).
- Thalasseus maximus*. Royal Tern. "Several" reported on 11–12 November 1928, under the old scientific name of *Sterna maxima*, but using the English name of Caspian Tern, which places doubt on the validity of this observation (Pemberton 1929:37).
- Hydroprogne caspia*. Caspian Tern. One, 1 July 1972. Also see Royal Tern, above.
- Cephus columba*. Pigeon Guillemot. Breeding. Reported in 1897 (Howell 1917:29) and 1939 (Sumner, unpubl. rept.). On 2 July 1972, 48 were noted.
- Endomychura hypoleuca scrippsi*. Xantus' Murrelet. Breeding. Reported in 1868, 1911, and 1912 (Willett 1933:81). Sumner (unpubl. rept.) found only one dead bird in 1939 and surmised that the population had been exterminated by feral house cats which were prevalent on the island from about 1896 to 1957 (Philbrick 1972:344, 350). The murrelet population has since made a comeback. From an anchored boat on the night of 24 March 1972, 150 were counted. They were heard nightly and occasionally seen ashore from mid-May to mid-June 1972. A downy chick was found in the waters off the island, 19 May 1972.
- Ptychoramphus aleuticus*. Cassin's Auklet. Formerly breeding. Reported breeding in large numbers in 1863 and 1897. By 1908 the colony had been completely decimated by feral house cats, although in 1911, 100 breeding pairs were reported on one of the two small rocky islands off Santa Barbara Island (Howell 1917:20–21). None was seen in 1939 (Sumner, unpubl. rept.) or in 1972.
- Lunda cirrhata*. Tufted Puffin. Recorded in summer by Howell who suggested that this species may have bred on the island at one time. He found burrows but no eggs in July 1912 (Howell 1917:19). None was seen in 1972.
- Columba fasciata*. Band-tailed Pigeon. One, 24 July 1968. One, 21 August 1968 (Diamond, unpubl. data).
- Zenaidura macroura*. Mourning Dove. About 12, 12 May 1897. One, 1 May 1908 (Howell 1917:53). One, late June 1968. One, 2 July 1968 (Diamond, unpubl. data). One, 18 June 1972.
- Tyto alba*. Barn Owl. Probably breeding. Up to five seen at once, summer 1968. Five dead ones were found in August 1968, but at least three live ones were left (Diamond, unpubl. data). One, 26 May 1972. Two, 3 June 1972. Four alive (reported by Ranger Mike Larrence) and one dead, 9 July 1972. One dead, 16 July 1972.
- Bubo virginianus*. Great Horned Owl. One, 9–10 July 1972.
- Speotyto cunicularia*. Burrowing Owl. Breeding. Reported lacking by Howell (1917:59). Two, 27 March 1927 (Pemberton 1928:145). Sumner (unpubl. rept.) does not include this species as present in 1939. Six pairs, summer 1968 (Diamond, unpubl. data). One, 29 January 1972. At least three pairs were resident May–July 1972.
- Chordeiles acutipennis texensis*. Lesser Nighthawk. One (collected), 20 June 1911 (Howell 1917:61).
- Calypte costae*. Costa's Hummingbird. Status uncertain. An adult with young just out of the nest reported 20 June 1911 (Howell 1917:62). No positive identification of this species was made in 1968 (Diamond, unpubl. data) or in 1972, although several unidentified hummingbirds were seen in both summers.
- Selasphorus rufus*. Rufous Hummingbird. One male, 16 July 1972, with two Allen's and a female which was either Rufous or Allen's.
- Selasphorus sasin*. Allen's Hummingbird. Status uncertain. Reported as resident (Howell 1917:64). About a dozen reported, April 1939 (Sumner, unpubl. rept.). Not seen by Diamond in 1968 (pers. comm.). One male, 16 July 1972, seen in the company of an immature (probably Allen's), a female (either Rufous or Allen's), and a male Rufous. Males were seen with other hummingbirds, 19 July 1972, and alone, 21 July 1972. No definite indications of breeding were found in 1972.
- Megaceryle alcyon*. Belted Kingfisher. One, 11–12 November 1928 (Pemberton 1929:37). One, 9 August 1930 (Pemberton 1931:219). One, 6 April 1968. At least two, 15–22 August 1968 (Diamond, unpubl. data). One, 24 March 1972.
- Colaptes auratus cafer*. Common Flicker. Two, 27 March 1927 (Pemberton 1928:145).
- Tyrannus verticalis*. Western Kingbird. One, 19 August 1968 (Diamond, unpubl. data); one, 2 June 1972.
- Myiarchus cinerascens*. Ash-throated Flycatcher. One, 6 April 1968; one, 23–24 July 1968. Six, 19 August 1968 (Diamond, unpubl. data).
- Empidonax* sp. Reported in the last century by J. C. Cooper (Howell 1917:66). Two, 19 August 1968 (Diamond, unpubl. data).
- Eremophila alpestris insularis*. Island Horned Lark. Breeding. "Abundant," May 1910 (Howell 1917:68). "Common," April 1939 (Sumner, unpubl. rept.). Flocks of up to 30, 23–25 July 1968 (Diamond, unpubl. data). Pairs and small flocks were seen almost daily in May and June, and flocks of up to 100 birds, in July 1972.
- Hirundo rustica*. Barn Swallow. Reported 2–3 July 1912 (Howell 1917:88).
- Petrochelidon pyrrhonota*. Cliff Swallow. Two, late June 1968 (Diamond, unpubl. data). One, 4 July 1972.
- Corvus corax*. Common Raven. Formerly breeding. Two or three pairs reported breeding by Howell (1917:70). Two, 11–12 November 1928 (Pemberton 1929:37). Two, April 1939 (Sumner, unpubl. rept.). None was seen in 1972.
- Thyomanes bewickii*. Bewick's Wren. Reported by

- Cooper (1870). Several seen 27 March 1927 (Pemberton 1928:145).
- Salpinctes obsoletus*. Rock Wren. Breeding. "Several" seen 1 May 1908, two pairs of which were building nests (Howell 1917:95). "Several," April 1939 (Sumner, unpubl. rept.). Seven, 23–25 July 1968 (Diamond, unpubl. data). Two pairs, 17 June 1972; three, 7 July 1972.
- Mimus polyglottos*. Mockingbird. Two reported 23 July 1968, one of which was found dead the following day. One, 20 August 1968 (Diamond, unpubl. data).
- Turdus migratorius propinquus*. American Robin. "Several," 27 March 1927 (Pemberton 1928:145).
- Catharus guttatus guttatus*. Hermit Thrush. Reported 27 March 1927 (Pemberton 1928:145). One (collected), 25 February 1929 (Pemberton 1931:219).
- Catharus ustulatus*. Swainson's Thrush. Three (1 collected), 16 May 1897 (Howell 1917:101).
- Sialia mexicana*. Western Bluebird. One, 1 May 1908 (Howell 1917:102).
- Sturnus vulgaris*. Starling. Breeding. A newcomer to Santa Barbara Island. One dead, 24 March 1972. Four to six adults were seen almost daily from 23 May until late June when they were joined by many immatures, making a flock of about 40.
- Mniotilta varia*. Black and White Warbler. One, 27 March 1927 (Pemberton 1928:145).
- Vermivora celata sordida*. Orange-crowned Warbler. Formerly breeding. One, 29 March 1918 (Maillard 1918:189). One male (collected), 15 May 1927 (Ned K. Johnson, unpubl. data). One male and one female (collected) 28 May 1939. The female was in juvenile plumage and the last stages of post-natal molt, which we interpret to indicate breeding (Mercedes F. McDiarmid, unpubl. data).
- Parula americana*. Northern Parula. One (collected), May 1968 (Diamond, unpubl. data).
- Dendroica magnolia*. Magnolia Warbler. One, 15 May 1897 (Howell 1917:93).
- Dendroica coronata coronata*. Myrtle Warbler. One, 15 May 1897 (Howell 1917:92).
- Dendroica coronata auduboni*. Yellow-rumped Warbler. One, 29 March 1918 (Maillard 1918:189).
- Dendroica townsendi*. Townsend's Warbler. Two females (collected), 15 May 1897 (Howell 1917:93). One male seen by Mary Zetlmaier, 26 May 1972.
- Dendroica occidentalis*. Hermit Warbler. One female and "others," 14 May 1897 (Howell 1917:93).
- Dendroica pensylvanica*. Chestnut-sided Warbler. One female, 18 June 1972. Fall records of 32 and five spring records of this eastern species in California were noted by Austin (1971:456). Ours is the second spring record for Southern California.
- Wilsonia pusilla*. Wilson's Warbler. Three females and two males (collected), 14–16 May 1897 (Howell 1917:94). One male, 15 May 1972. One male seen by Mary Zetlmaier, 26 May 1972.
- Sturnella neglecta*. Western Meadowlark. Breeding. "A few" seen 1 May 1909 (Howell 1917:71). Reported in April 1939 (Sumner, unpubl. rept.). Seen singly or in flocks of up to 30, 23–25 July 1968 (Diamond, unpubl. data). Singly on territory and in small flocks, May–July 1972.
- Xanthocephalus xanthocephalus*. Yellow-headed Blackbird. One female, 27 June 1972.
- Icterus galbula bullockii*. Northern Oriole. One female, 21 July 1972.
- Piranga ludoviciana*. Western Tanager. One male seen by Mary Zetlmaier, 27 May 1972. Western Tanager feathers were found in a cave apparently used by owls, 12 June 1972. A male which had been dead for some time was found 24 June 1972.
- Pheucticus melanocephalus*. Black-headed Grosbeak. One male, 12 June 1972.
- Passerina cyanea*. Indigo Bunting. One male, 10 July 1972. Six other records of this eastern species in California were noted by Thompson (1964:445).
- Carpodacus mexicanus clementis*. House Finch. Formerly breeding. An "abundant resident" (Howell 1917:73). "Common," April 1939 (Sumner, unpubl. rept.). Three seen 19 August 1968 (Diamond, unpubl. data). One female came for water daily at the rangers' cabin, 10–15 July; two females, 16 July; and four females, 17 July 1972. No male was seen. There was no indication of breeding in 1972. Most of their appropriate nesting habitat, the bushy vegetation of the island, has been destroyed by rabbits and fire (Philbrick 1972:352).
- Passerculus sandwichensis*. Savannah Sparrow. Two, 15–22 August 1968 (Diamond, unpubl. data).
- Pooecetes gramineus*. Vesper Sparrow. Several seen 21 May 1972.
- Junco hyemalis oregonus*. Oregon Junco. One, 29 March 1918 (Maillard 1918:189).
- Spizella passerina arizonae*. Chipping Sparrow. One (collected), 29 March 1917 (Maillard 1918:189).
- Zonotrichia leucophrys*. White-crowned Sparrow. One, 13 February 1889 (Howell 1917:78). "Common," spring 1939 (Sumner, unpubl. rept.).
- Zonotrichia atricapilla*. Golden-crowned Sparrow. One (collected), 13 February 1889 (Howell 1917:78).
- Passerella iliaca*. Fox Sparrow. One, 27 March 1927 (Pemberton 1928:145). One (collected), 25 February 1929 (Pemberton 1931:219).
- Melospiza lincolni*. Lincoln's Sparrow. One (collected), 29 March 1918 (Maillard 1918:189).
- Melospiza melodia graminea*. Santa Barbara Island Song Sparrow. Formerly breeding. "Abundant," 1897 and 1908 (Howell 1917:81). "Abundant," April 1939 (Sumner, unpubl. rept.). Their numbers declined as their nesting habitat, *Coreopsis gigantea*, was destroyed by farming, fire, and introduced rabbits (Philbrick 1972:352). The last individual was seen 19 August 1967 (Diamond, unpubl. data). None was seen in 1972, and it is presumed that this endemic subspecies is now extinct.

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