COMMON CROW—*Corvus brachyrhynchos*. Bryant (1888) listed the only records: two pairs seen in June 1885 and one pair seen in May 1887. We do not know exactly whose records these were. We suspect them to be incorrect in view of the fact that ravens were present on the island in most of those early years, but, interestingly, were not recorded for 1885 or 1887. Grinnell and Miller (1944) refer to these records and note "but from no other island."

WESTERN BLUEBIRD—*Sialia mexicana*. Bryant (1888) reported that "a few were seen occasionally" but there is no further evidence. Grinnell and Miller (1944) in reference to this record say "probably in winter."

DISCUSSION

The Farallon occurrences of 331 species of birds are documented to 2 April 1976 in the Species Accounts. Fifteen additional species occurred in the subsequent 42-month period, to 2 October 1979, and are documented in the Addenda. Of the 331 species, only 20 (12 seabirds and eight landbirds) are known to have bred. At least two of the breeding seabirds, Common Murre and Rhinoceros Auklet, and seven of the breeding landbirds also occur as visitants. These nine species, along with the 311 that have occurred only as visitants or nonbreeding residents, are the subject of the sections on visitants, and are discussed according to their ecological and seasonal distribution on mainland northern California, the nearest continental landmass. Species known to have occurred in northern California (see McCaskie et al. 1979) but not on the Farallones are also briefly mentioned.

BREEDING SEABIRDS

Few islands can compare with the Farallones in the variety and number of birds per unit area. To be sure, few other areas have received the concentrated, sustained attention given these islands. As the preceding pages amply document, such attention has been deserved; the Farallon bird life is truly remarkable.

The Farallon populations of breeding seabirds are among the largest in western North America south of the Aleutians. The world's largest breeding populations of Ashy Storm-Petrel, Brandt's Cormorant, and Western Gull occur on the Farallones. In fact, Farallon nesting populations account for about two-thirds of the marine birds breeding in California, and a substantial proportion of the individuals breeding on the US West Coast (Ainley and Whitt 1973). During fall and winter these Farallon birds disperse along the coast from British Columbia to Baja California. Olson (1977) recently remarked that a vast area of the Atlantic Ocean had been voided of birds by the rendering of Ascension Island into a site unsuitable for nesting seabirds. Considering that the Farallon populations contribute so heavily to the West Coast marine bird fauna, and perhaps not too long ago contributed even more heavily (see Ainley and Lewis 1974), one cannot help wondering how the West Coast marine bird populations would fare without them.

In addition, few sites along the West Coast exceed the Farallones in the number of breeding species. Of the 17 seabird species that breed on the Pacific Coast of California, 12 have populations on these islands. Besides the three species mentioned above, Leach's Storm-Petrel, Pelagic Cormorant, Common Murre, Pigeon Guillemot, and Cassin's Auklet are abundant breeders; Double-crested Cormorant, Black Oystercatcher, and Tufted Puffin are common breeders; and Rhinoceros Auklet is an uncommon breeder. Most of these species have subarctic affinities. Three of the five California breeding species not represented by nesting populations, Black

Storm-Petrel (*Oceanodroma melania*), Brown Pelican, and Xantus' Murrelet, breed to the south on islands in warmer waters; a fourth, Fork-tailed Storm-Petrel, breeds farther north; the fifth, Marbled Murrelet, requires a rather unusual habitat for a seabird—forests—not available on the Farallones.

Visitant Waterbirds

As of 2 April 1976, 122 species of waterbirds had occurred. Eleven were present only as breeding species or (as in the case of Common Murre) were so abundant as breeders that visitation rates of nonbreeding individuals could not be determined. These species will not be discussed further. The remaining total of 111 species, however, is truly remarkable when one considers the small size of the island, its distance from the mainland, and its virtual lack of estuarine or freshwater habitat. Although some species are represented by large nonbreeding seasonally resident populations, most are represented only by visitants during the migration periods. We further categorize these 111 species into four major groups: pelagic, neritic, estuarine and freshwater, and shorebird species.

Group 1: Pelagic seabirds

A number of seabirds occur off northern California in offshore marine waters. They rarely occur close inshore or in the larger, deep-water bays and, hence, are known as "pelagic." Occurrences of the 26 species known to have visited within 2 km of the Farallones are summarized in Table 1.

The most abundant pelagic seabird off the northern California coast, and off the Farallones, is the Sooty Shearwater (see Ainley 1976). This Southern Hemisphere breeder is sometimes present in immense numbers during the summer months and is the only nonbreeding summer resident to occur at the island. The flocks, occasionally numbering in the hundreds of thousands, are often observed passing the island in seemingly unending lines. Occasionally, when food is abundant, they may congregate in massive feeding flocks nearby and are often joined by large numbers of breeding cormorants, gulls, and murres. They generally remain exceedingly abundant during the fall but are less abundant during the spring. There appear to be no winter occurrences.

Fall.—Other than the Sooty Shearwater, the most abundant fall visitants are the Red and Northern Phalaropes which are extremely sporadic, being nearly absent in some years and exceedingly abundant in others. Surprisingly, Buller's Shearwater, once considered rare in California waters, is the next most common fall visitant but is also very sporadic. The Black-legged Kittiwake, Northern Fulmar, Ancient Murrelet, and Bonaparte's Gull are sporadically common or fairly common. The irregular nature of the occurrences of these and the remaining less abundant species is due, at least in part, to fluctuations in oceanographic climate (see Ainley 1976).

Winter.—The two predominate species, Black-legged Kittiwake and Northern Fulmar, are highly sporadic in occurrence. The remaining eight species are much less abundant.

Spring.—Other than the Sooty Shearwater, four species are abundant near the Farallones: Red and Northern Phalaropes, Bonaparte's Gull, and Black-legged Kittiwake. All are sporadic and generally are observed flying north past the island. Eight additional species are rare to extremely rare.

TABLE 1
FARALLON OCCURRENCES OF PELAGIC SEABIRDS (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall			Winter		Spring	
Sooty Shearwater[b]	A	201,880		—	—	A	4896
Red Phalarope	Sp A	65,451+		ER	1	Sp A	1252
Northern Phalarope	Sp A	31,851+		ER	1	Sp A	12,572+
Buller's Shearwater	Sp C-A	842+		—	—	—	—
Black-legged Kittiwake	Sp C	614		Sp A	1786	Sp A	6833
Northern Fulmar	Sp C	272		Sp FC	134	—	—
Ancient Murrelet	Sp FC	140		U	38	ER	3
Bonaparte's Gull	Sp FC	137		R	11	Sp A	32,231
Pink-footed Shearwater	FC	105		—	—	VR	5
Rhinoceros Auklet[c]	U	33		U	30	R	17
Common Tern	ER-R	3	+89*	—	—	—	—
Arctic Tern	ER-R	3		—	—	—	—
Horned Puffin	VR	7		—	—	ER	1
Pomarine Jaeger	VR	5	+5	ER	1+	—	—
Parasitic Jaeger	VR	4		—	—	—	—
Sabine's Gull	VR	5+		—	—	—	—
Black-footed Albatross	VR	4		ER	1	VR	5
Manx Shearwater	ER	3		—	—	—	—
Red-footed Booby	ER	2		—	—	—	—
South Polar Skua	ER	2		—	—	—	—
Xantus' Murrelet	ER	2		—	—	ER	1
Short-tailed Albatross	NRR			NRR		NRR	
Magnificent Frigatebird	NRR			—	—	—	—
Short-tailed Shearwater	—	—		ER	1	—	—
Fork-tailed Storm-Petrel	—	—		—	—	ER	1
Long-tailed Jaeger	—	—		—	—	ER	1

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.

[b] Also sporadically abundant as a nonbreeding summer resident near the Farallones. A total of 511,596 summer occurrences have been recorded.

[c] Also breeds on the Farallones.

* Numbers are inflated because of the occurrence of coherent flocks. The abundance code, therefore, is accordingly reduced.

Two pelagic species, Flesh-footed Shearwater (*Puffinus carneipes*) and Black Storm-Petrel, occur regularly as nonvagrants in central California waters but have never been recorded from the island. Fifteen additional species have occurred as vagrants in these waters but also have yet to be recorded from the Farallones.

Group 2: Neritic seabirds

A number of seabird species occur off central California as inhabitants of marine waters near the coast and within the larger deep-water bays. These generally occur in waters overlying the continental shelf and, hence, are known as "neritic" seabirds (Table 2). Inshore neritic species occur in waters shallow enough for birds to take food from the bottom; offshore neritic species occur in waters too deep for birds to exploit the bottom (see Ainley and Sanger 1979). We further divided neritic species into two subgroups based primarily on the manner in which they search for food. In Subgroup A, species rely heavily upon flight for finding food and include the Brown Pelican and all gulls and terns except five pelagic

TABLE 2
FARALLON OCCURRENCES OF NERITIC SEABIRDS (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Subgroup A: Species that search for food by flight and that occur in both inshore and offshore neritic habitats						
Brown Pelican	A	13,952+	R	12	—	—
California Gull	Sp A	6152+	Sp FC	197	R	10
Heermann's Gull	A	2023	R	12	VR	8
Glaucous-winged Gull	C	370	A	1290	C	252
Herring Gull	C	318+	C	277	FC	219+
Mew Gull	FC	152	R	20	VR	4
Ring-billed Gull	U	49+	—	—	ER	2
Thayer's Gull	VR	8+	ER	1+	ER	3
Elegant Tern	ER	14*	—	—	—	—
Caspian Tern	ER	3	—	—	VR	4
Glaucous Gull	—	—	VR	5	ER	3
Subgroup B: Species that search for food by swimming and diving and that usually occur only in inshore neritic habitats						
Surf Scoter	C	402+	C	252	C	610
Eared Grebe	FC	118	A	3120	—	—
Arctic Loon	FC	117+	U	38+	FC	196+
White-winged Scoter	U	98*	U	43	U	40
Western Grebe	U	80	ER	3	R	23
Red-throated Loon	R–U	28	VR	6	R	20
Common Loon	R	21	ER	1	VR	5
Oldsquaw	R	11	VR	5	ER	2
Red-breasted Merganser	VR	8	U	45	ER	1
Horned Grebe	VR	7	VR	8	ER	1
Black Scoter	VR	6	VR	5	—	—
Red-necked Grebe	VR	5	R	16	—	—
Harlequin Duck	ER	1	ER	3	—	—

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.

* Numbers are inflated because of the occurrence of coherent flocks. The abundance code, therefore, is accordingly reduced.

species treated in the previous group. In Subgroup B, species rely primarily upon swimming and diving to find food, and are typical of inshore neritic habitats. They include loons and grebes, except for the primarily freshwater Pied-billed Grebe, and various sea ducks. These two subgroups are treated separately below.

The Farallon Islands offer considerable excellent habitat for both neritic subgroups. As a result, certain of these species occur commonly or abundantly, both as fall and spring visitants and as winter residents. Large numbers of pelicans and gulls roost nightly on the island during the nonbreeding season and join the large feeding flocks of Sooty Shearwaters and resident Western Gulls, cormorants, and murres during the day. These flocks are a common sight when food is abundant. The various loons, grebes, and sea ducks occur singly or in large rafts, diving for food in the rich inshore waters. Some, such as the Surf Scoter, reach maximum numbers during the spring and fall migratory periods, while others, such as the Eared Grebe, build up to maximum numbers in mid-winter.

Subgroup A: Species that rely on flight to find food

Fall.—Three species occur abundantly: the Brown Pelican and Heermann's Gull as postbreeding residents or visitants from northern Mexico, and the California Gull as a sporadic visitant from interior western North America. Three northerly species, the Glaucous-winged, Herring, and Mew Gulls, are common or fairly common. Surprisingly, the Ring-billed Gull, generally considered least likely of the large gulls to occur in offshore waters, is an uncommon visitant. Although only eight Thayer's Gulls have been positively identified in fall, immatures of this species have probably been overlooked among the masses of large gulls that frequent the island.

Winter.—Except for the ubiquitous resident Western Gull, the Glaucous-winged is the principal gull around the Farallones; it becomes abundant in midwinter. Herring Gulls also remain common around the island. Large *Larus* gulls are not generally considered to be pelagic. However, the tendency for individuals of these two species to occur far from land in the eastern North Pacific has been noted by Sanger (1973). It is thus not surprising that they should occur as abundantly as they do on this offshore island. The California Gull, so abundant in fall, often does not winter at the Farallones, but is a sporadic fairly common visitant. Mew Gulls become rare around the island as do both the Brown Pelican and Heermann's Gull. Most individuals of the latter two species return to Mexico to breed at this time.

Spring.—Most species of this subgroup are less common as spring visitants than as fall visitants or winter residents. Only the Glaucous-winged and Herring Gulls are common or fairly common. There exist no "spring" occurrences of the Brown Pelican although fall postbreeding pelicans arrive at the Farallones as early as May in warm water years.

Subgroup B: Species that rely on swimming and diving to find food

Fall.—The Surf Scoter is the only common visitant of this subgroup, although the Arctic Loon, Eared and Western Grebes, and White-winged Scoter are uncommon or fairly common. The remaining species are, at best, rare to uncommon.

Winter.—Populations of these diving species differ considerably from the fall populations. A few, such as Red-necked and Eared Grebes, and Red-breasted Merganser, reach peak annual populations at this time. Huge rafts of Eared Grebes build up around the island during late fall, so that by winter the species is abundant. This is remarkable in that the Eared Grebe is often considered to be more of an estuarine or freshwater species than most other grebes. Surf Scoters remain common and White-winged Scoters remain uncommon but numbers of both species are reduced from fall. Similarly, numbers of all three loons and the Western Grebe are greatly reduced. The very rare or extremely rare Horned Grebe, Oldsquaw, Harlequin Duck, and Black Scoter, however, occur in numbers similar to those in the fall.

Spring.—Pronounced influxes of Arctic Loons and Surf Scoters occur, both of which are more common than in fall or winter. Many of these occurrences, however, involve birds merely flying north past the island. Similar but less pronounced influxes also occur for the Common and Red-throated Loons, Western Grebe, and White-winged Scoter. The remaining species show no pronounced

influx. No occurrences have been recorded for the Eared Grebe, Red-necked Grebe, Harlequin Duck, or Black Scoter. Interestingly, the latter three species are near the southern limits of their winter ranges at the Farallones.

Only three species of neritic seabirds known to occur regularly as nonvagrants in northern California have not occurred on the Farallones. Two, the Forster's and Least Terns (*Sterna forsteri* and *S. albifrons*), are at or near the northern limits of their coastal breeding ranges and generally tend to prefer somewhat estuarine habitats. The third, the Marbled Murrelet, apparently rarely strays out over the open ocean.

In addition, nine neritic species have occurred as vagrants in northern California but, as of 2 April 1976, had not been recorded on the Farallones. One of these, the Laughing Gull (*Larus atricilla*), has since occurred (see Addenda).

Group 3: Estuarine and freshwater birds: non-Charadrii

Many species occurring in northern California are primarily limited to estuarine and/or freshwater habitats; these, except for the Charadrii which will be treated separately, are included in a single group (Table 3). The virtual absence of estuarine or freshwater habitat on the Farallones (except for a few generally stagnant high water tide pools and a single artificial freshwater seepage) probably limits the number of occurrences and length of stay for species in this group.

Fall.—Only a single estuarine species, the Pintail, is common but most records of even this species consist of flocks which merely fly by without stopping. Many of the Pintails that actually stop on the island appear to be weak or exhausted. Not a single other species is even fairly common and only two are uncommon. The remaining 21 species are all quite rare.

Winter.—Very few estuarine or freshwater species have occurred on the Farallones in winter. A good deal of suitable winter habitat exists for them in central California. Because of this and the fact that they apparently do not move long distances during this period, their absence on the island is not surprising.

Spring.—Species of this group are nearly as rare in spring as in winter. This is perhaps related to the fact that movement during spring involves more of an inland component than in fall. The Cinnamon Teal and Common Goldeneye are very rare and 10 others are extremely rare.

Fully 17 estuarine or freshwater species occur regularly as nonvagrants in northern California, but, as of 2 April 1976, had not been recorded on the Farallones. They include the White Pelican, Least Bittern (*Ixobrychus exilis*), Whistling Swan (*Olor columbianus*), Snow Goose, Ross' Goose, Fulvous Whistling-Duck (*Dendrocygna bicolor*), Eurasian Wigeon (*Anas penelope*), Wood Duck (*Aix sponsa*), Redhead (*Aythya americana*), Ring-necked Duck (*A. collaris*), Canvasback (*A. valisineria*), Barrow's Goldeneye (*Bucephala islandica*), Bufflehead (*Bucephala albeola*), Hooded Merganser (*Lophodytes cucullatus*), Common Merganser (*Mergus merganser*), Sandhill Crane (*Grus canadensis*), and Black Tern (*Chlidonias niger*). Four of these, Whistling Swan, Snow Goose, Barrow's Goldeneye, and Bufflehead, have since been added to the list (see Addenda).

The absence of the rest of these species, many of which are abundant on the adjacent mainland estuaries, indicates their reluctance to fly out over the open ocean. It is especially interesting that dabbling ducks appear to fly out over the open ocean more often than most estuarine or freshwater diving ducks. In ad-

TABLE 3
FARALLON OCCURRENCES OF ESTUARINE AND FRESHWATER BIRDS: NON-CHARADRII (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Pintail	C	1252+*	ER	1	ER	1
Great Blue Heron	U	30	NRR		ER	2
Green-winged Teal	R–U	26+	ER	1	—	—
Brant	R	532*	—	—	ER	5*
Ruddy Duck	R	19	ER	2	—	—
American Wigeon	R	14	—	—	—	—
Blue-winged Teal	ER–R	1 } +22	—	—	—	—
Cinnamon Teal	ER–R	1 }	—	—	VR	10+*
Cattle Egret	VR	8	—	—	—	—
Mallard	VR	8	—	—	ER	1
Great Egret	VR	6	—	—	ER	2
Lesser Scaup	VR	6	—	—	—	—
American Coot	VR	6	—	—	ER	1
Snowy Egret	VR	5	—	—	—	—
Pied-billed Grebe	VR	4	—	—	—	—
Canada Goose	ER	18*	ER	1	—	—
Northern Shoveler	ER	3	—	—	—	—
Green Heron	ER	2	—	—	ER	2
White-fronted Goose	ER	2	—	—	ER	1
Gadwall	ER	2	—	—	—	—
Virginia Rail	ER	2	—	—	—	—
Black-crowned Night Heron	ER	1	—	—	—	—
American Bittern	ER	1	—	—	—	—
Greater Scaup	ER	1	—	—	—	—
Clapper Rail	NRR		—	—	—	—
Sora	NRR		—	—	ER	1
Black Rail	NRR		—	—	NRR	
White-faced Ibis	—	—	—	—	NRR	
Common Goldeneye	—	—	ER	1	VR	4
Common Gallinule	—	—	—	—	ER	1
Scaup (spp.)	—	—	ER	2	—	—

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.
* Numbers are inflated because of the occurrence of coherent flocks. The abundance code, therefore, is accordingly reduced.

dition, 12 estuarine or freshwater species have occurred as vagrants in northern California but have not yet been recorded on the island.

Group 4: Estuarine and freshwater birds: Charadrii (shorebirds)

Shorebirds that regularly occur in numbers in central California prefer one or more of six rather closely related habitats: rocky intertidal coasts, open beaches, tidal mud flats, salt marshes, freshwater marshes, and wet meadows. Because of these fairly narrow habitat requirements, all shorebirds on the Farallones (with the exception of the Red and Northern Phalaropes and the Black Oystercatcher) are treated as a single group (Table 4).

The Farallones offer excellent, perhaps unexcelled, habitat for those species preferring rocky intertidal coasts. The rocky flats and magnificent tidepools are

TABLE 4
FARALLON OCCURRENCES OF ESTUARINE AND FRESHWATER BIRDS: CHARADRII (SHOREBIRDS) (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Black Turnstone	C	490	C	466	U	38
Wandering Tattler	C	320	FC	103	FC	105
Western Sandpiper	FC	144+	ER	6*	—	—
Killdeer	FC	114	R	16	VR	9
Black-bellied Plover	FC	94	R	19	ER	2
Willet	FC	91	FC	98	VR	8
Baird's Sandpiper	FC	88	—	—	ER	1
Marbled Godwit	U–FC	142+*	—	—	ER–VR	3+
Short-billed Dowitcher	U–FC	62 } +64*	—	—	— } ER	— } 3
Long-billed Dowitcher	U–FC	61 }	—	—	— }	— }
Least Sandpiper	U–FC	77+	—	—	ER	1
Sanderling	U	91*	—	—	—	—
Whimbrel	U	72	R	17	R	12
Pectoral Sandpiper	U	54	—	—	ER	1
Ruddy Turnstone	U	46	VR	6	VR	4
American Golden Plover	U	44	—	—	ER	1+
Spotted Sandpiper	U	44	—	—	ER	3
Common Snipe	U	31	—	—	ER	1
Surfbird	R–U	64*	VR	4	ER	1
Semipalmated Plover	R–U	53*	—	—	—	—
Dunlin	R–U	28*	ER	1	ER	1
Greater Yellowlegs	R	11	—	—	ER	1
Lesser Yellowlegs	VR–R	7+	—	—	ER	1
Long-billed Curlew	VR	5	—	—	—	—
Rock Sandpiper	VR	4	VR	6	—	—
Red Knot	ER	3	—	—	—	—
American Avocet	ER	2	—	—	—	—
Dotterel	ER	1	—	—	—	—
Upland Sandpiper	ER	1	—	—	ER	1
Semipalmated Sandpiper	ER	1	—	—	—	—
Wilson's Phalarope	ER	1	—	—	—	—

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, UC—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.

* Numbers are inflated because of the occurrence of coherent flocks. The abundance code, therefore, is accordingly reduced.

renowned for the density and diversity of intertidal invertebrates they support. As expected, the most common visitant and winter resident shorebirds prefer just this habitat. With the exception of a few generally stagnant high water tide pools and a single artificial freshwater seepage, no open beach, mud flat, salt marsh, freshwater marsh, or wet meadow habitat exists. As a result, species preferring these habitats are generally rare or, at best, fairly common. It seems likely that many shorebirds, being very strong flyers, pass by without stopping. The Marbled Godwit, a large noticeable species, has often been recorded doing exactly this. Many of the smaller, less noticeable species may fly by undetected.

Fall.—All species that have occurred have done so during fall migration. In addition, all except the Upland Sandpiper (which has occurred but once in fall and once in spring) are considerably more common in fall than in spring. Only

two, however, Black Turnstone and Wandering Tattler, are truly common fall visitants. Both show distinct preferences for rocky intertidal coasts and appear to be very much at home. Five species are fairly common. Two of these, Black-bellied Plover and Willet, show at least a partial preference for rocky intertidal coasts; on the Farallones they generally frequent the rocky intertidal of Mussel Flat, often associating with turnstones and tattlers. Two others, Western Sandpiper and Killdeer, are abundant on the adjacent mainland where they demonstrate a wide range of habitat preferences. Killdeer, in addition, often prefer dry upland habitats and, when on the Farallones, generally prefer the grassy marine terrace. The fifth species, Baird's Sandpiper, presents somewhat of an enigma. It is far more common in fall than would be expected considering its relative scarcity on the mainland. This may be explained partially by its preference for the drier more upland flats; on the Farallones it invariably occurs on the grassy marine terrace rather than in the tidepools or rocky intertidal. Jehl (1979) has suggested that most Baird's Sandpipers in California are vagrant, immature individuals; their high frequency of occurrence on the island tends to support this. In addition, the fact that individuals often remain for extended visits and accumulate large quantities of fat indicates that they are about to undertake long flights. The direction and ultimate fate of these flights would be most interesting to ascertain.

The four uncommon to fairly common species, Marbled Godwit, Short- and Long-billed Dowitchers, and Least Sandpiper, generally prefer the small stagnant tidepools. Seven other species rank as uncommon. Four of these, Sanderling, Whimbrel, Ruddy Turnstone, and Spotted Sandpiper, are known to occur regularly on mainland rocky intertidal coasts and choose this habitat on the island. Two others, Pectoral Sandpiper and American Golden Plover, like Baird's Sandpiper, occur in surprisingly large numbers in relation to many species that are much more abundant on the mainland. They too may be represented by a high percentage of vagrants undertaking long flights and, like Baird's Sandpiper, tend to remain for extended visits. The seventh uncommon species, Common Snipe, prefers grassy freshwater habitats on the mainland and often occurs in the grass of the island's marine terrace.

Three species, Surfbird, Semipalmated Plover, and Dunlin, are rare to uncommon. Most of the Surfbird occurrences are of flocks early in the fall and may represent long-distance migrants bound for the southern hemisphere. Dunlin are surprisingly scarce considering their abundance on the adjacent mainland and their at least occasional preference for rocky intertidal coasts. This may indicate that most Dunlin in California are winter residents rather than passage migrants.

The remaining 10 species are rare, very rare or extremely rare. Five of these, Greater and Lesser Yellowlegs, Long-billed Curlew, American Avocet, and Wilson's Phalarope, at least partially prefer freshwater habitats. The Rock Sandpiper, a rocky intertidal species, appears to be at the southern extremity of its range on the Farallones. The Red Knot is both local and rather scarce on the adjacent mainland. The remaining three species are known only as vagrants in northern California, the Upland and Semipalmated Sandpipers originating from more eastern North America, and the Dotterel originating from Eurasia. Interestingly, both the Upland Sandpiper and Dotterel prefer upland habitats, and, when on the island, spent all of their time on the grassy marine terrace.

Winter.—Nearly all wintering species tolerate, or actually prefer, rocky intertidal habitats. Several, including Black Turnstone, Wandering Tattler, and Willet, are common or fairly common. The Killdeer prefers the grassy marine terrace for its winter visits. In addition, single winter records exist for Western Sandpiper (flock of six) and Dunlin, two species that prefer muddy or sandy substrates on the mainland.

Spring.—Of the spring visitants, only the Wandering Tattler, Black Turnstone, Whimbrel, and possibly Killdeer, Willet, and Ruddy Turnstone, occur somewhat regularly. All seem to find the available island habitats to their liking. The remaining 14 species are extremely rare. One, the Upland Sandpiper, occurs in California only as a vagrant. Three others, American Golden Plover, and Baird's and Pectoral Sandpiper, could also be considered spring vagrants in coastal northern California. It seems incredible that such abundant mainland species as Western Sandpiper, Sanderling, and Semipalmated Plover have never been recorded on the Farallones in spring.

Only four species of shorebirds that regularly occur as nonvagrants in northern California had not been recorded as of 2 April 1976: Snowy Plover (*Charadrius alexandrinus*), Mountain Plover (*C. montanus*), Solitary Sandpiper (*Tringa solitaria*), and Black-necked Stilt (*Himantopus mexicanus*). The Snowy Plover, however, has since been added to the list (see Addenda). In addition, 11 species of vagrant shorebirds have occurred in northern California but had not yet been recorded on the Farallones as of 2 April 1976. Since then the Buff-breasted Sandpiper (*Tryngites subruficollis*) has occurred (see Addenda).

Visitant Landbirds

A total of 209 landbird species is known to have occurred on the Farallones as of 2 April 1976. One of these, the California Quail, was introduced and was later extirpated. It is not known to have visited the island under its own power and is not included in this discussion. The remainder have all occurred as visitants, either during fall or spring migration or in winter. A few have also been present as winter residents. Those seven of the 208 that have bred on the island are additionally discussed in a later section.

The relative abundance of visitant species varies greatly. Some occur in astonishing numbers, but others are extremely rare, and several are represented by only a single occurrence. Most species, with several noteworthy exceptions, occur more commonly during fall than spring migration. We have divided the species into five major groups based on the proximity of their breeding or wintering ranges to the Farallones. The groups include species characteristic of (regularly breeding or wintering in numbers in): (1) coastal central California, (2) interior lowland central California, (3) montane central California, and (4) the Great Basin region of central California. The last group (5) includes species that occur only as vagrants in central California. Complete summaries of the Farallon occurrences of these groups are presented in Tables 6 through 10, respectively. In addition, a summary of the mean number of Farallon occurrences, per species, for each of these groups is presented, with the mean fall-to-spring ratio, in Table 5.

The South Farallon Islands offer a limited number of suitable habitats for nonbreeding landbirds. Such habitat considerations appear to be very important in determining the abundance of winter residents; most wintering species are those

TABLE 5

A QUANTITATIVE SUMMARY OF FARALLON OCCURRENCE RATES OF GROUPS OF LANDBIRD SPECIES (3 APRIL 1968 TO 2 APRIL 1976)

Landbird group[a]	No. of species	Occurrence rates[b] Fall	Winter	Spring	Fall-to-spring ratio
Coastal species					
A. Primarily winter residents	34[c]	974.0 ± 1911.7 (A)[b]	31.9 ± 138.8 (U)	108.4 ± 186.3 (FC)	8.98
B. Primarily summer residents	20	150.9 ± 185.2 (FC)	0.0	212.1 ± 475.2 (FC)	0.71
C. More or less permanent residents	27	112.5 ± 167.4 (FC)	2.0 ± 4.7 (ER)	28.6 ± 42.0 (U)	3.93
Interior lowland species					
A. Primarily winter residents	5	24.0 ± 30.6 (R)	0.2 ± 0.4 (ER)	2.6 ± 2.1 (ER)	9.23
B. Primarily summer residents	18	34.7 ± 53.6 (U)	0.1 ± 0.2 (ER)	11.9 ± 14.2 (R)	2.91
C. More or less permanent residents	8	18.9 ± 25.2 (R)	5.3 ± 10.2 (VR)	3.4 ± 8.7 (VR)	5.59
Montane species					
A. More or less permanent residents	5	2.0 ± 1.4 (ER)	0.4 ± 0.5 (ER)	0.6 ± 0.5 (ER)	3.33
B. Summer residents	16	93.9 ± 155.2 (FC)	0.0	36.1 ± 40.7 (U)	2.60
Great Basin species					
A. Winter residents	4	19.3 ± 29.1 (R)	0.0	2.0 ± 4.0 (ER)	9.63
B. Summer residents	6[c]	11.8 ± 12.1 (R)	0.0	9.8 ± 15.7 (R)	1.20
Vagrant species					
A. Northern species	41[d]	29.1 ± 48.8 (U)	0.0 ± 0.2 (ER)	9.9 ± 14.3 (R)	2.94
B. Southeastern species	20	2.1 ± 3.3 (ER)	0.0	3.0 ± 4.5 (ER)	0.68
C. Southwestern species	6	2.0 ± 1.8 (ER)	0.0	0.7 ± 1.2 (ER)	3.00
D. Palearctic species	3	0.7 ± 0.6 (ER)	0.0	0.3 ± 0.6 (ER)	2.00

[a] See text and Tables 6–10 for details and discussions of groups.

[b] Given in each column are the mean number of individuals per species in each landbird group, occurring in that season over the eight-year period of this study, followed by the standard deviation, and a letter designating the abundance code (A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare).

[c] Includes one additional well-marked form.

[d] Includes three additional well-marked forms.

that normally tolerate or prefer open, fairly treeless, and quite rocky habitats. To the contrary, habitat considerations appear to be virtually inconsequential in determining the abundance of fall and spring visitants. The vast majority of these probably find themselves, at dawn, over the open ocean. Indeed, nocturnal migrants are far more common on the Farallones than are diurnal migrants. A strong indication exists that most of these individuals are in the process of returning to the mainland when they sight the Farallones. DeSante (1973) showed that the "vanishing" directions of landbirds leaving or flying over the island during September and October mornings (1969, 1970, and 1971) lay almost entirely in the northeast quadrant, whether or not the mainland was visible. The mean of these flight directions, for 70 departures of 15 species (158 individuals), was 36° (true north = 0°). Similar reverse diurnal migrations have been recorded during the fall on Nantucket and Block Islands off the New England coast and elsewhere off the Atlantic Coast (Baird and Nisbet 1960); as expected, the direction of these movements was NW, also toward the mainland.

The number of landbirds arriving on any given day during the migration periods appears to be related to two, perhaps interdependent, factors: the number of landbird migrants that are aloft along or off the coast of central California, and the "gathering" area of the island. The gathering area is basically the area of the ocean over which the island, rather than the mainland, first becomes visible to a landbird returning toward the mainland from sea. This area is greatly reduced when the island is shrouded in fog or when the mainland is clearly visible from a great distance. The number of arriving landbirds is generally low under either of those conditions. Optimal conditions for arrival are usually low overcast skies with a visibility from the island of greater than 15 km, but less than 30 km. The proximate meteorological factors producing these conditions as well as the proximate and ultimate weather factors accounting for large numbers of migrants aloft over coastal central California are presently under investigation and will be the subject of future reports.

The ultimate fate of the landbirds that do visit the Farallones is of interest. The above data indicate that many individuals probably return to the mainland, and thus do not perish at sea. To test this hypothesis we can compare the recovery rates (banded birds recovered away from the banding station) from the Farallones with those from PRBO's mainland Palomarin station, approximately 32 km northeast near Bolinas (Fig. 1). Discounting all waterbirds and all totally sedentary species (e.g., Nuttall's White-crowned Sparrow, Wrentit, etc.), only 11 of 14,052 landbirds banded on the Farallones between 3 April 1968 and 2 April 1976 were recovered on the mainland. In comparison, 45 of 23,919 landbirds banded at Palomarin during the same period were recovered elsewhere on the mainland. The recovery rates are, thus, 0.2% for mainland-banded birds and 0.1% for island-banded birds. These rates are close, but in fact are statistically different (t_s = 26.73, $P < 0.01$; Sokal and Rohlf 1969:608). This difference may be attributed to a higher mortality rate of island-banded birds, either on the island, where small but substantial numbers of landbirds are known to die, or in the ocean. Care must be exercised in this interpretation, however, since it is possible that island-banded birds originate from breeding areas or are bound for wintering areas farther removed from human population centers than mainland-banded birds. This would bias the recovery rates in favor of the mainland station.

It should also be pointed out that nine of the 11 island-banded recoveries involve species that regularly breed or winter in coastal central California (Group 1 species; see below). Many, if not most, individuals of these species probably return to the mainland. One of the two remaining island-banded recoveries, a Mockingbird, also returned to its normal range in the interior lowland region of central California. The other, a Hermit Warbler, was recovered at Palomarin the day after it was last seen on the island. The same perhaps is true of a banded ♂ Black-throated Blue Warbler (not included in the figures above) observed at Rodeo Lagoon, Marin County, the day after one was banded on the Farallones. While these data indicate that some montane and possibly even vagrant individuals successfully return to the mainland, they provide no information as to their subsequent fate. It seems likely that many, if not most, vagrant individuals and perhaps even some montane and Great Basin birds, after returning to the mainland and accumulating a substantial quantity of fat, continue their somewhat westerly migration and embark on a long overwater flight. Such individuals, therefore, are doomed to perish in the ocean.

Group 1: Landbirds regularly breeding or wintering in coastal central California

The species included in this group comprise an integral part of the avifauna of coastal central California. This area is often included in the "Oregonian Biotic Province" and lies primarily in the "Transition Life Zone." It extends from the coast inland to the eastern edge of the summer fog belt on the lower eastern slopes of the Outer Coast Ranges, and is characterized by mild, wet winters and cool summers dampened by considerable coastal fog. Of the 208 landbird species that have visited the Farallones, 80 regularly breed or winter in this area. A summary of their occurrences is presented in Table 6.

We further classified these 80 species into three subgroups based upon their seasonal occurrence on the mainland. Subgroup A includes 33 species (and one additional well-marked form, the Yellow-rumped "Myrtle" Warbler) that are present in maximum numbers in coastal central California during the winter. A few, such as Golden-crowned and Fox Sparrow, occur there only as winter residents or passage migrants. Most, however, such as White-crowned and Savannah Sparrows, breed in this area, although their summer numbers are greatly augmented or actually replaced by winter individuals. Subgroup B includes 20 species that occur in coastal central California only as summer residents, although a few winter occurrences have been recorded for most of them. Subgroup C includes 27 species that occur in nearly equal numbers in coastal central California in both summer and winter. Some, such as Hutton's Vireo and House Sparrow, are generally thought to be represented in this area by permanent resident populations; others, such as Mourning Dove and Band-tailed Pigeon, may be represented by totally different populations in summer and winter; and still others may be represented by some combination of these two extremes. The seasonal occurrences on the Farallones of species in this subgroup may shed considerable light on their seasonal status on the mainland.

In many respects coastal central California is, for landbirds, a more favorable area for wintering than for breeding. The varied habitats, mild climate, and generally abundant moisture no doubt contribute to this. Hordes of landbirds begin

TABLE 6

FARALLON OCCURRENCES OF LANDBIRDS REGULARLY BREEDING OR WINTERING IN COASTAL CENTRAL CALIFORNIA (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Subgroup A: Species that occur in maximum numbers in coastal central California in winter						
Starling[b]	A	7818	A	813	U	37
Golden-crowned Sparrow	A	6221+	U	30	FC	216
White-crowned Sparrow	A	5113+	R	13	C	419
Savannah Sparrow	A	4374+	—	—	FC	84
Dark-eyed (Oregon) Junco	A	1603+	VR	4	C	717+
Fox Sparrow	A	955	R	11	U	30
Hermit Thrush	A	909+	VR–R	9+	FC	161
Yellow-rumped (Audubon's) Warbler	A	825+	R	11+	C	605+
Western Meadowlark	A	793	U	52	R	21
Water Pipit	C	844*	ER	1	VR	8
Lincoln's Sparrow	C	666	—	—	FC	113
Red-breasted Nuthatch	SpC	579	—	—	R	11
Ruby-crowned Kinglet	C	510	ER	2	C	365
Yellow-rumped (Myrtle) Warbler	C	365+	VR	4	FC	90+
Townsend's Warbler	C	252	—	—	C	477
American Robin	FC	233	U	68	FC	130
Golden-crowned Kinglet	FC	200	—	—	U	30
Cedar Waxwing	FC	196	ER	3	U	48
Common (Red-shafted) Flicker	FC	144+	R	16	U	36+
American Kestrel	FC	126	R	12	—	—
Varied Thrush	U–FC	86*	VR	8	U	65
Short-eared Owl	U	66	—	—	ER	1
Say's Phoebe	U	64	ER	1	VR	5
Winter Wren	U	43	ER	2	VR	8
Sharp-shinned Hawk	U	34	—	—	—	—
Horned Lark	R	26	—	—	VR	5
Peregrine Falcon[b]	R	14	R	25	ER	1+
Cooper's Hawk	R	13	—	—	—	—
Marsh Hawk	R	13	—	—	NRR	
Yellow-bellied (Red-breasted) Sapsucker	R	13	—	—	ER	1
Merlin	VR	7+	—	—	—	—
Tricolored Blackbird	VR	5+	—	—	ER	2
White-tailed Kite	ER	3	NRR		—	—
Red-tailed Hawk	ER	3	ER	1	NRR	
Subgroup B: Species that occur in maximum numbers in coastal central California in summer						
Brown-headed Cowbird	C	701	—	—	FC	175
Yellow Warbler	C	446	—	—	FC	147
Wilson's Warbler	C	364	—	—	A	2078
Western Flycatcher	C	326+	—	—	FC	132+
Swainson's Thrush	C	266+	—	—	FC	122+
Warbling Vireo	FC	161	—	—	U	68
Orange-crowned Warbler	FC	157	—	—	C	688
Western Wood Pewee	FC	155	—	—	C	544
Rough-winged Swallow	U–FC	99+*	—	—	R	16+
Violet-green Swallow	U–FC	98+*	—	—	R	12+

TABLE 6 (CONTINUED)

	Fall		Winter		Spring	
Barn Swallow	U–FC	88*	—	—	U	68
Black-headed Grosbeak	U	53	—	—	U	56
Olive-sided Flycatcher	U	44	—	—	U	70
Cliff Swallow	U	30+	—	—	R	11+
Grasshopper Sparrow	R	10	—	—	VR	7
Tree Swallow	VR–R	8+	—	—	R–U	25+
Allen's Hummingbird	ER–R	1+	—	—	VR–U	9+
Bank Swallow	VR	4+	—	—	VR–R	9+
Purple Martin	VR	4	—	—	VR	5
Osprey	ER	3	—	—	—	—
Subgroup C: Species that are more or less resident in coastal central California						
Pine Siskin	SpC	685+	R	18	R	23+
Purple Finch	SpC	401+	ER	2	U	36+
Brewer's Blackbird	C	350+	ER	1+	U	62
Mourning Dove	C	287	—	—	FC	103
Rufous-sided Towhee	C	263	—	—	R	10
Lesser Goldfinch	C	253+	NRR		R	16+
Red-winged Blackbird	FC–C	254+*	—	—	VR–R	9+
Common Yellowthroat	FC	113	—	—	FC	109
House Finch[b]	FC	95+	ER	1	FC	153+
Band-tailed Pigeon	FC	89	NRR		FC	89
Black Phoebe	U	50	R	13	VR	4
Brown Creeper	U	43	—	—	ER	1
Belted Kingfisher	U	37	R	13	VR	6
American Goldfinch	U	31	—	—	R	19
Anna's Hummingbird	R–U	11+	—	—	VR–R	9+
Rock Dove	R	29*	VR	4	U	32
Song Sparrow	R	17	ER	1	VR	5
Hutton's Vireo	R	12	—	—	ER	3
Saw-whet Owl	VR	5	—	—	—	—
Long-billed Marsh Wren	VR	4	—	—	—	—
Acorn Woodpecker	ER	3	ER	1	—	—
House Sparrow[b]	ER	2	—	—	U–FC	80+
Loggerhead Shrike	ER	1+	—	—	ER	2
Barn Owl	ER	1	—	—	—	—
Great-horned Owl	ER	1	—	—	—	—
Pygmy Nuthatch	ER	1	—	—	—	—
Common Raven[b]	NRR		NRR		ER	1

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, UC—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.

[b] Has bred on the Farallones.

* Numbers are inflated because of the occurrence of coherent flocks. The abundance code, therefore, is accordingly reduced.

to arrive on their coastal wintering grounds in late September and October. It comes as no great surprise, therefore, that massive "waves" of landbirds also occur at that time on the Farallones. Daily counts of over 1000 landbirds were recorded in late September and early October in four of the eight years reported here. It was estimated that nearly 10,000 were present on 2 October 1972. The

vast majority of individuals comprising these massive fall "waves" were members of species included in Subgroup A.

Subgroup A: Species that occur in maximum numbers in coastal central California in winter

Fall.—The mean number of occurrences of the 34 forms was 974.0 (Table 5) corresponding to a classification of abundant. In fact, all landbird species that are abundant during fall belong to this subgroup (Table 6A). It is entirely possible that their abundance is directly proportional to their abundance on the adjacent mainland. It is both interesting and distressing that the Starling, an introduced species not recorded in central California before 1952, is the most abundant landbird on the Farallones. The remaining abundant species include coastal California's five most common native sparrows as well as Hermit Thrush, Yellow-rumped "Audubon's" Warbler, and Western Meadowlark. Most of the remaining nocturnally migrating species are common or fairly common. In contrast, all of the diurnally migrating raptors, with the single exception of the fairly common American Kestrel, are, at best, uncommon or rare. This is probably due to their general reluctance to undertake long overwater flights. Interestingly, falcons and accipiters occur more commonly than do harriers, buteos, or kites.

Winter.—Twenty of the 34 forms have occurred with a mean number of occurrences per species of 31.9, corresponding to a classification of uncommon (Tables 5 and 6A). The only abundant species is the Starling, which appears to be very much at home on the grassy marine terrace and whose numbers are increasing each winter. Uncommon landbirds include American Robin, which only visits for short periods, and Western Meadowlark and Golden-crowned Sparrow, which reside during most winters. A few Peregrine Falcons and American Kestrels winter regularly, while Common "Red-shafted" Flickers, Yellow-rumped "Audubon's" Warblers, and White-crowned and Fox Sparrows winter irregularly. An additional 10 forms are very rare or extremely rare residents or visitants.

Spring.—Virtually all the species are considerably less common as spring than as fall visitants (Table 6A). Their mean number of spring occurrences was 108.4, corresponding to a classification of fairly common (Table 5). The ratio of fall-to-spring occurrences was 8.98. This seems logical since their fall migration tends to take many individuals south toward wintering areas along the coast, while their spring migration takes most individuals north away from the coast. The single exception is Townsend's Warbler, which is nearly twice as common in spring as in fall. Townsend's Warblers have an interesting winter distribution with two disjunct ranges, one in coastal Oregon and California, and the other in montane western Mexico and Guatemala. Possibly most fall visitant Townsend's Warblers are bound for the nearby winter range, while most spring visitants are coming from the distant one.

Except for Townsend's Warbler, only four other species, Dark-eyed "Oregon" Junco, Yellow-rumped "Audubon's" Warbler, White-crowned Sparrow, and Ruby-crowned Kinglet, are common. All remaining nocturnally migrating species have occurred in numbers ranging from only fairly common to extremely rare. It is noteworthy that several abundant or common fall visitants, such as Starling,

Fox Sparrow, Western Meadowlark, Water Pipit, and Red-breasted Nuthatch, are uncommon or rare in spring. Even more striking is the virtual absence of diurnally migrating raptors, except for the Peregrine Falcon, which has been recorded once or twice in early summer. The latter individuals, however, were probably from the adjacent mainland rather than true spring visitants.

Only a single nonvagrant landbird species that regularly occurs in coastal central California with maximum numbers in winter, the Bald Eagle, had not been definitively recorded as of 2 April 1976. This species, however, has since been added to the island list (see Addenda).

Subgroup B: Species that occur in maximum numbers in coastal central California in summer

Fall.—None of these 20 species occurs abundantly (Table 6B). Their mean number of occurrences per species was 150.9 (fairly common, Table 5), much less than the average occurrence rate for species of Subgroup A. Nocturnally migrating species such as warblers, flycatchers, and thrushes are generally much more common than diurnally migrating species such as swallows, hummingbirds, and the Osprey.

Winter.—As perhaps expected, none of these species has occurred.

Spring.—All species, with the exception of the Osprey, have been recorded in spring. The mean number of occurrences was 212.1 (fairly common, Table 5), a figure higher than that for species in Subgroup A. In striking contrast to the latter, nearly half of Subgroup B species (including all three abundant or common species) occur more commonly in spring than fall. The fall-to-spring ratio, 0.71, was very different from that for Subgroup A. This is logical since many individuals of Subgroup B tend to migrate northward to breeding areas on the California coast and beyond, thus toward the Farallones in spring, and southward, away from the coast, in fall. Wilson's Warblers, along with Orange-crowned and Townsend's Warblers, and Western Wood Pewees, comprise the bulk of the major landbird "waves" that occur in both early and late May. These waves have occasionally approached 1000 birds.

Only one species in this group, the Turkey Vulture (*Cathartes aura*), had not, as of 2 April 1976, been recorded from the island. It has since, however, been added to the list (see Addenda). This diurnal migrant must be extremely reluctant to fly over large expanses of water as it is very common on the immediately adjacent mainland.

Subgroup C: Species that are more or less resident in coastal central California

Occurrences of these 27 species are summarized in Table 6C. Their mean numbers (112.5, fairly common, in fall; 28.6, uncommon, in spring) were, as perhaps expected, smaller than those for Subgroups A and B (Table 5). Interestingly, their fall-to-spring ratio (3.93) was intermediate between the two other subgroups.

These data reveal several other patterns as well. First, are those 13 species that occur much more commonly on the island in fall than in spring. Eight of these species, Brewer's and Red-winged Blackbirds, Rufous-sided Towhee, Brown Creeper, Purple Finch, Pine Siskin, and both Lesser and American Gold-

finches, are common to uncommon on the island in fall, but occur in much reduced numbers in spring, indicating that substantial movement into coastal central California occurs during fall but less occurs during spring. Fall movements of the latter five of these eight species may, in addition, be somewhat associated with food shortages elsewhere. Only three of these species have occurred in winter. Two other species, Black Phoebe and Belted Kingfisher, also occur much more frequently in fall than in spring, but, in addition, winter regularly on the island. This indicates that a winter influx may occur into coastal central California. Three additional species, Anna's Hummingbird, Song Sparrow, and Hutton's Vireo, although rare at any time on the island, also occur more frequently in fall than in spring. This again suggests a minor fall influx from the north. Indeed, most Song Sparrows on the island, including the single winter resident, were strongly suspected of belonging to north coastal or Alaskan races.

A second pattern is shown by four species, Mourning Dove, Common Yellowthroat, House Finch, and Band-tailed Pigeon, that occur abundantly enough in both fall and spring to indicate that substantial movement into coastal central California occurs during both seasons. A third pattern of occurrence is shown by the House Sparrow and Rock Dove, which are more common in spring than in fall. This is extremely interesting in that both are well known for their excellent colonizing abilities. Perhaps a strategy of dispersal just prior to, rather than after, breeding aids their success at colonization. Finally, eight species are very rare or extremely rare in fall and extremely rare or unknown in spring, indicating that they may, indeed, be very nearly resident in coastal central California.

In contrast to Subgroups A and B, a large number of potential Subgroup C species have never been recorded on the Farallones. Nine may be partially migratory or at least subject to some seasonal dispersal, and thus may be expected eventually to show up: Red-shouldered Hawk (*Buteo lineatus*), Pygmy Owl (*Glaucidium gnoma*), Pileated Woodpecker (*Dryocopus pileatus*), Hairy Woodpecker (*Picoides villosus*), Steller's Jay (*Cyanocitta stelleri*), Common Crow, Dipper (*Cinclus mexicanus*), Bewick's Wren (*Thryomanes bewickii*), and Western Bluebird. Most, however, may migrate or disperse diurnally, which would further reduce their probability of occurring. Ten additional species, while generally common or even abundant on the immediately adjacent mainland, appear to be totally sedentary and, thus, are extremely unlikely ever to occur. These include California Quail (which was successfully introduced to the island and later extirpated), Ring-necked Pheasant (*Phasianus colchicus*), Screech Owl (*Otus asio*), Spotted Owl (*Strix occidentalis*), Downy Woodpecker (*Picoides pubescens*), Scrub Jay, Chestnut-backed Chickadee (*Parus rufescens*), Bushtit (*Psaltriparus minimus*), Wrentit (*Chamaea fasciata*), and Brown Towhee (*Pipilo fuscus*). Their absence is convincing evidence for their extremely sedentary nature, especially when considered in light of the multitude of Farallon occurrences of highly migratory species from areas as far distant as eastern United States.

Group 2: Landbirds regularly breeding or wintering in interior lowland central California

Included in this group are those species that comprise an integral part of California's interior lowland avifauna; they are much less frequently encountered or are absent as breeding or wintering species in the coastal region. The interior

lowland region is often included in the "California Biotic Province" and lies primarily in the "Lower Sonoran" and "Upper Sonoran Life Zones." It extends from the eastern edge of the coastal region, through the Inner Coast Ranges and Great Central Valley to (and including) the foothills and lower western slopes of the Sierra Nevada. (The higher parts of the Coast Ranges and Sierra Nevada, generally above snowline, are included in the montane region discussed later.) The area is characterized by fairly mild, rather wet winters and hot, dry summers. Of the 208 landbird species that have visited the Farallones, 31 regularly breed or winter in this area; their Farallon occurrences are summarized in Table 7. These 31 species are further categorized into three subgroups similar to those described above for the coastal region.

Subgroup A: Species that occur in maximum numbers in interior lowland central California in winter

In many respects, interior lowland central California, like the coastal region, is a more favorable area for wintering than for breeding populations of landbirds. Most, but not all, species wintering in coastal areas also winter in the interior lowland area. Table 7A includes only those five wintering species that are characteristic of this area and that do not winter regularly in numbers along the coast. These species are, as a group, quite rare on the Farallones in fall. Table 5 indicates that their mean number of fall occurrences was only 24.0 (rare). Only one, Rough-legged Hawk, has occurred in winter, and, as perhaps expected, all are, at best, very rare in spring. The mean number of spring occurrences was only 2.6 (extremely rare). Interestingly, the fall-to-spring ratio for this subgroup, 9.23, was very similar to that ratio for coastal wintering species (8.98). Only a single wintering interior lowland species, Ferruginous Hawk, has not yet been definitively recorded on the Farallones.

Subgroup B: Species that occur in maximum numbers in interior lowland central California in summer

Fall.—Considerably more Farallon species (18) are characteristic of interior lowland central California as summer residents and breeders than as winter residents (Table 7B). This is, perhaps, to be expected since this region differs climatically from the coastal region more in summer than in winter. Species in this subgroup are considerably less common in fall than are those in the corresponding coastal subgroup. Their mean number of occurrences was only 34.7 (uncommon; Table 5). Two factors may account for this. First, many of these species are typical of hot, fairly xeric climates and tend to avoid conditions of coastal fog. Thus, habitat characteristics may tend to restrict them, even in migration, to inland areas. Second, several, particularly those rarer on the Farallones, reach the northern limits of their breeding ranges in central California. As a result, most individuals may be vagrants on the Farallones.

Winter.—A few of these species, such as Lark Sparrow, Yellow-headed Blackbird, and White-throated Swift, winter regularly in reduced numbers in interior lowland central California and many of the others have been recorded. However, only one, the Lark Sparrow, has ever been recorded during this season on the island. It represents the only Farallon winter record for any landbird that occurs anywhere in central California primarily as a summer resident.

TABLE 7
FARALLON OCCURRENCES OF LANDBIRDS REGULARLY BREEDING OR WINTERING IN INTERIOR LOWLAND CENTRAL CALIFORNIA (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Subgroup A: Species that occur in maximum numbers in interior lowland central California in winter						
Vesper Sparrow	U	76	—	—	VR	5
Long-eared Owl	R	21	—	—	ER	1
Rough-legged Hawk	SpR	20	ER	1	—	—
Lewis' Woodpecker	ER	2	—	—	ER	3
Mountain Bluebird	ER	1	NRR		VR	4
Subgroup B: Species that occur in maximum numbers in interior lowland central California in summer						
Northern (Bullock's) Oriole	FC	190	—	—	U	42+
Lazuli Bunting	FC	119+	—	—	U	39
Lark Sparrow	FC	117	ER	1	R	11
Ash-throated Flycatcher	U	53	—	—	U	35
House Wren	U	40	—	—	VR	4
Western Kingbird	U	35+	—	—	R	18
Yellow-headed Blackbird	R	19	—	—	R	14
Yellow-breasted Chat	R	15	—	—	R	15
Blue Grosbeak	R	12	—	—	VR	4
Lawrences's Goldfinch	R	10	—	—	ER	2
Blue-gray Gnatcatcher	VR	5	—	—	ER	3
White-throated Swift	ER	3	—	—	—	—
Yellow-billed Cuckoo	ER	2	—	—	ER	2
Poor-will	ER	2	—	—	—	—
Lesser Nighthawk	ER	1+	—	—	R	24
Hooded Oriole	ER	1	—	—	—	—
Black-chinned Sparrow	ER	1	—	—	—	—
Costa's Hummingbird	—	—	—	—	ER	2
Subgroup C: Species that are more or less resident in interior lowland central California						
Burrowing Owl[b]	U	50	R	15	—	—
Rock Wren[b]	U	49	R	27	ER	1
Mockingbird	U	49	—	—	R	25
Golden Eagle	ER	1	—	—	—	—
White-breasted Nuthatch	ER	1	—	—	—	—
Phainopepla	ER	1	—	—	—	—
Prairie Falcon	NRR		—	—	—	—
Sage Sparrow	—	—	—	—	ER	1

[a] Species area arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.
[b] Has bred on the Farallones.

Spring.—Farallon species of this subgroup are much less common in spring than are summering coastal species. Table 5 shows that the mean number of occurrences for these subgroups were, respectively, 11.9 (rare) and 212.1 (fairly common). Furthermore, the fall-to-spring ratio for interior breeders (2.91) was considerably higher than that for coastal breeders (0.71) although, as expected, it was lower than that for wintering species of either the interior region (9.23) or the coast (8.98). In contrast to many coastal breeders, only two interior breeders, Lesser Nighthawk and Costa's Hummingbird, occur more commonly on the is-

land in spring than in fall. Thus we may conclude that most individuals of these species that occur on the island in spring are vagrants.

Only three summering interior lowland species, Swainson's Hawk (*Buteo swainsoni*), Black-chinned Hummingbird, and Cassin's Kingbird (*Tyrannus vociferans*), had not been recorded as of 2 April 1976. The Black-chinned Hummingbird, however, has since been added to the list (see Addenda). The Swainson's Hawk may be reluctant to undertake long overwater flights, but the Cassin's Kingbird remains as one of the outstanding missing species.

Subgroup C: Species that are more or less resident in interior lowland central California

Eight species have occurred (Table 7C). Table 5 shows that they are less common in fall than those in both other subgroups of interior species and considerably less common in fall than the more or less resident coastal species. Their mean number of fall occurrences was only 18.9 (rare). These species were also much less common in spring than in fall, with a mean number of occurrences of only 3.4 (very rare). The fall-to-spring ratio (5.59) was again intermediate between the two other subgroups of interior species but was somewhat higher than that for resident coastal species (3.93).

Two of these eight species, Burrowing Owl and Rock Wren, turn up surprisingly often in fall and, in addition, regularly winter. Furthermore, both have bred on the Farallones, which apparently provide nearly optimal habitat—burrows, mice, and rocks abound. The Mockingbird also occurs surprisingly often both in fall and spring. A high rate of dispersal, however, may be characteristic of this species, which has recently undergone considerable range expansion. The remaining five species are all extremely rare on the island and may, indeed, be very nearly resident species.

Twelve species characteristically resident in the interior lowlands have never been recorded on the Farallones. Of these, the California Condor (*Gymnogyps californianus*), Spotted Dove (*Streptopelia chinensis*), and LeConte's Thrasher (*Toxostoma lecontei*) have ranges that barely reach the southern part of central California and are unlikely ever to occur on the island, although the Spotted Dove is expanding its range. The Chukar (*Alectoris graeca*), Turkey (*Meleagris gallopavo*), Roadrunner (*Geococcyx californianus*), Yellow-billed Magpie (*Pica nuttalli*), Plain Titmouse (*Parus inornatus*), California Thrasher (*Toxostoma redivivum*), and Rufous-crowned Sparrow (*Aimophila ruficeps*) are thought to be totally sedentary and thus are also unlikely ever to occur on the island. The Nuttall's Woodpecker (*Picoides nuttalli*) and Cañon Wren (*Catherpes mexicanus*) are known to wander somewhat in winter and may, sometime, reach the island.

Group 3: Landbirds regularly breeding or wintering in montane central California

These species comprise an integral part of the avifauna of montane central California. This region includes the higher parts of the Coast Ranges and Sierra Nevada, including areas lying in the "Transition," "Canadian," "Hudsonian," and "Arctic-Alpine Life Zones," and is characterized by cold, rather wet winters with considerable snow, and warm, dry summers. Some 21 Farallon species are characteristic of this region (Table 8). They are further categorized into two

TABLE 8
FARALLON OCCURRENCES OF LANDBIRDS REGULARLY BREEDING OR WINTERING IN MONTANE CENTRAL CALIFORNIA (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Subgroup A: Species that occur in both winter and summer in montane central California						
Townsend's Solitaire	VR	4	ER	1	ER	1
Clark's Nutcracker	ER	2	—	—	—	—
Evening Grosbeak	ER	2	—	—	ER	1
Cassin's Finch	ER	2	—	—	ER	1
Red Crossbill	—	—	ER	1	—	—
Subgroup B: Species that occur only in summer in montane central California						
Chipping Sparrow	C	624+	—	—	FC	144
Western Tanager	FC	161	—	—	FC	107
MacGillivray's Warbler	FC	119	—	—	U	47
Black-throated Gray Warbler	FC	100	—	—	R	13
Hermit Warbler	FC	86	—	—	R	22
Willow Flycatcher	U–FC	78+	—	—	U–FC	71+
Vaux's Swift	U	212*	—	—	VR	4
Solitary Vireo	U	47	—	—	R	14
Nashville Warbler	U	45	—	—	R	27
Hammond's Flycatcher	R	8+	—	—	U–FC	50+
Rufous Hummingbird[b]	VR–U	7+	—	—	U	32+
Dusky Flycatcher	R	6+	—	—	U	34+
Green-tailed Towhee	VR	7	—	—	VR	5
Black Swift	ER	2	—	—	VR	5
Common Nighthawk	ER	1+	—	—	—	—
Calliope Hummingbird	—	—	—	—	ER	3

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.
[b] Does not breed in montane central California but migrates through in midsummer.
* Numbers are inflated because of the occurrence of coherent flocks. The abundance code, therefore, is accordingly reduced.

subgroups. Subgroup A includes five species that occur in montane central California during both summer and winter although they may not, necessarily, be permanent residents; Subgroup B includes 16 species that only occur there during summer. As a result of the rather harsh winter climate, most species do, in fact, occur in the montane region only during summer.

Subgroup A: Species that occur in montane central California during both winter and summer

These five species are extremely rare on the Farallones (Table 8A). Their mean number of fall occurrences was only 2.0 (Table 5). Interestingly, all but two fall occurrences of the Townsend's Solitaire and all fall occurrences of the remaining species were in 1972. Only Townsend's Solitaire and Red Crossbill have occurred in winter. The single occurrence of the Red Crossbill was the only island record. Three of these species have also occurred once in spring. The fall-to-spring ratio for these species (3.33) probably does not mean much because of the small sample size (Table 5).

Eleven potential species of this subgroup have not been recorded on the Far-

allones: Goshawk (*Accipiter gentilis*), Blue Grouse (*Dendragapus obscurus*), White-tailed Ptarmigan (*Lagopus leucarus*), Mountain Quail (*Oreortyx pictus*), Great Gray Owl (*Strix nebulosa*), Williamson's Sapsucker (*Sphyrapicus thyroideus*), White-headed and Black-backed Three-toed Woodpeckers (*Picoides albolarvatus* and *P. arcticus*), Mountain Chickadee (*Parus gambeli*), Pine Grosbeak (*Pinicola enucleator*), and Gray-crowned Rosy Finch (*Leucosticte tephrocotis*). Most of these are sedentary in California and most likely will never occur.

Subgroup B: Species that occur in montane central California only in summer

Fall.—Many of these 16 species occur quite often (Table 8B); their mean number of occurrences (Table 5) was 93.9 (fairly common). They thus occur more commonly than the summering interior lowland species (34.7) but less commonly than the summering coastal species (150.9). This is reasonable as their distribution extends farther north than interior species but lies farther east than coastal species. The Chipping Sparrow is noteworthy in that it is the only noncoastal landbird species found commonly at any time.

Winter.—As expected, none of this subgroup has ever occurred in winter.

Spring.—The mean number of occurrences for these species was 36.1 (uncommon), and was also intermediate between the summering coastal (212.4) and the summering interior lowland species (11.9; Table 5). The fall-to-spring ratio (2.60), however, more closely resembled that for the interior species (2.91) than that for the coastal species (0.71). It is likely that many individuals of the summering montane species may also be vagrants on the Farallones. Only five are more common on the island in spring than in fall: Hammond's Flycatcher, Rufous Hummingbird, Dusky Flycatcher, Black Swift, and Calliope Hummingbird. These species apparently remain very much in the mountains during fall migration.

Only a single summering montane species typical of central California, the Flammulated Owl (*Otus flammeolus*), has not occurred on the Farallones.

Group 4: Landbirds regularly breeding or wintering in the Great Basin of central California

The landbird species included in this group comprise an integral part of the avifauna of the Great Basin region of central California east of the higher parts of the Sierra. This area, often included in the "Nevadan Biotic Province," lies primarily in the "Upper Sonoran" and "Transition Life Zones" and is characterized by rather cold, dry winters and warm, dry summers. Only nine Farallon species are characteristic of this area. Their occurrences are summarized in Table 9. These species are further categorized into two subgroups. Subgroup A includes four species that only winter in this area, while Subgroup B includes five species (and one additional well marked form, the Yellow-bellied "Red-naped" Sapsucker) that only summer in this area.

Subgroup A: Species that occur only in winter in the Great Basin of central California

The mean number of fall occurrences for these species was 19.3 (rare). They thus are less common than either coastal or interior lowland wintering species, but more common than montane wintering species (Table 5). Surprisingly, none

TABLE 9
FARALLON OCCURRENCES OF LANDBIRDS REGULARLY BREEDING OR WINTERING IN THE GREAT BASIN OF CENTRAL CALIFORNIA (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Subgroup A: Species that occur only in winter in the Great Basin in central California						
Lapland Longspur	U	62	—	—	—	—
Tree Sparrow[b]	R	13	—	—	VR	8
Bohemian Waxwing[b]	ER	1	—	—	—	—
Northern Shrike	ER	1	—	—	—	—
Subgroup B: Species that occur only in summer in the Great Basin in central California						
Brewer's Sparrow	U	34+	—	—	R	11+
Sage Thrasher	R	16	—	—	ER	2
Virginia's Warbler[b]	R	10	—	—	ER	2
Black-throated Sparrow	VR	7	—	—	ER	2
Gray Flycatcher	ER–VR	3+	—	—	U	41+
Yellow-bellied (Red-naped) Sapsucker	ER	1	—	—	ER	1

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, UC—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.
[b] May not be regular in central California east of the Sierra but occurs throughout much of the Great Basin.

has been recorded in winter. Only one, Tree Sparrow, has ever occurred in spring. The lateness of its spring occurrences suggests that most individuals are vagrants, as most individuals of these species probably are, even in fall. The mean number of spring occurrences for this subgroup was 2.0 (extremely rare) and parallels the pattern of fall occurrences in comparison with the other species' subgroups. Moreover, the fall-to-spring ratio (9.63) was similar to that of other wintering subgroups.

Subgroup B: Species that occur only in summer in the Great Basin of central California

These six forms occur less frequently in fall than the summering species of any previous group. Their mean fall abundance was only 11.8 (rare; Table 5). All are apparently vagrants on the Farallones and none has been recorded in winter. Their mean number of spring occurrences was 9.8 (rare), also less than that of any other summering group. Their fall-to-spring ratio, however, was unexpectedly low, 1.20. This is due primarily to the surprisingly large number of spring Gray Flycatchers, the only species more common in spring than fall. No explanation is available for the anomalously high numbers of this species. It is also known, however, to occur regularly in spring in mainland western California.

Only four Great Basin species that are still extant in central California, Sage Grouse (*Centrocercus urophasianus*), Broad-tailed Hummingbird (*Selasphorus platycercus*), Black-billed Magpie (*Pica pica*), and Piñon Jay (*Gymnorhinus cyanocephalus*), have never occurred on the Farallones.

Group 5: Vagrant landbirds

The remaining 67 species of Farallon landbirds are basically vagrants, that is, misdirected, out-of-range migrants, in northern California. Five of these, Chim-

ney Swift, Eastern Kingbird, Northern Parula, American Redstart, and Bobolink, have bred on occasion in northern California. Several others, such as Black-and-white and Palm Warblers, and White-throated and Swamp Sparrows, appear to winter regularly there. Still, none comprises a truly integral part of the northern California avifauna. Three additional well marked forms, Common "Yellow-shafted" Flicker, Northern "Baltimore" Oriole, and Dark-eyed "Slate-colored" Junco, are also treated in this group. These species' Farallon occurrences are summarized in Table 10.

It is certainly a tribute to the phenomenal ability of the Farallones to concentrate vagrants that such an amazing array of out-of-range *species* should have occurred on such a small parcel of land. In fact, nearly all have been observed at one time or another in the same tree! Perhaps no other location on this continent could boast of species with such widely divergent geographical origins as Connecticut Warbler, Golden-cheeked Warbler, and Red-throated Pipit (not to mention waterbirds such as Upland Sandpiper, Dotterel, and Red-footed Booby). However, when one considers the staggering number of *individuals* involved (no fewer than 1723 individual vagrant landbirds have been recorded in the eight-year period considered here), it becomes a tribute to the phenomenal dispersal ability of migratory landbirds to occur so abundantly in such an unexpected location.

Only two decades ago, many of these 67 species were unrecorded in California or, for that matter, anywhere west of the Rocky Mountains. Those that had occurred in California had been described by the terms "casual" or "accidental" (AOU 1957). While these two words seem to denote different meanings in the Check-list, dictionary definitions show them to be synonymous. As pointed out by DeBenedictis (1971), the term "accidental" is misleading. The abundance patterns shown by these species on the Farallones, in terms of their total occurrences, yearly occurrences, and timing, do not suggest mere "accidents." These occurrences indicate a need for new terminology to describe this phenomenon. Perhaps the term "vagrant," as synonymous with "out-of-range," is the best choice. However, care must be exercised here. As mentioned above, many landbirds breeding or wintering inland from the California coast (and even some on the coast) may also be vagrants on the Farallones. Thus, as pointed out by DeSante (1973), the term vagrant can be rigorously applied only to individuals, not to populations or species. Only if all individuals of a given species that occur in a given geographical area must be vagrants, can the species be referred to as a vagrant species, and then only in the geographical area in question.

It should also be stressed that no positive data indicate the vagrant phenomenon on the Farallones to be a recent one. Nineteenth-century Farallon records exist for Gray Catbird, Black-and-white Warbler, and Black-throated Blue Warbler. Dawson (1911b) witnessed a "wave" of vagrant warblers on the island in the spring of 1911. His prediction that "practically every species of eastern *Mniotiltidae* [*Parulidae*] should report sooner or later at this inhospitable rock," has, according to Table 10, become a reality. Both DeBenedictis (1971) and DeSante (1973) suggested that the paucity of vagrants before the early 1960s was due to a paucity of observers in localities favored by vagrants such as coastal or desert "oases." Certainly the Farallones have proven to be the most spectacular coastal "oasis" yet discovered, at least on this continent.

TABLE 10
FARALLON OCCURRENCES OF VAGRANT LANDBIRDS (3 APRIL 1968 TO 2 APRIL 1976)[a]

	Fall		Winter		Spring	
Subgroup A: Northern species that breed primarily east of the Rocky Mountains and extensively or entirely in Canada						
Blackpoll Warbler	FC	220	—	—	R	20
Palm Warbler	FC	208	—	—	R	11
American Redstart	FC	133	—	—	U	32
White-throated Sparrow	U	59	—	—	ER	3
Tennessee Warbler	U	57	—	—	U	43
Clay-colored Sparrow	U	56+	—	—	R	12+
Chestnut-sided Warbler	U	42	—	—	R	13
Bobolink	U	41	—	—	VR	5
Ovenbird	U	38	—	—	U	57
Magnolia Warbler	U	34	—	—	U	37
Common (Yellow-shafted) Flicker	R–U	24+	ER	1+	ER–VR	2+
Rose-breasted Grosbeak	R	27	—	—	U	48
Least Flycatcher	R	23	—	—	VR	4
Black-throated Blue Warbler	R	22	—	—	—	—
Northern Waterthrush	R	22	—	—	ER	2
Blackburnian Warbler	R	19	—	—	ER	3
Lark Bunting	R	17	—	—	—	—
Dark-eyed (Slate-colored) Junco	R	16	—	—	R	11+
Black-and-white Warbler	R	15	—	—	R	20
Chestnut-collared Longspur	R	14	—	—	ER	1
Bay-breasted Warbler	R	10	—	—	R	13
Canada Warbler	R	10	—	—	ER	3
Swamp Sparrow	R	10	—	—	ER	2
Red-eyed Vireo	VR	8	—	—	R	24
Cape May Warbler	VR	8	—	—	R	13
Eastern Kingbird	VR	7+	—	—	ER	3
Northern (Baltimore) Oriole	VR	7+	—	—	VR	5+
Connecticut Warbler	VR	7	—	—	ER	1
Black-throated Green Warbler	VR	6	—	—	VR	6
Snow Bunting	VR	6	—	—	—	—
Gray-cheeked Thrush	VR	5	—	—	ER	2
Mourning Warbler	VR	5	—	—	—	—
Harris' Sparrow	VR	5	—	—	ER	2
Brown Thrasher	ER	3	—	—	VR	5
Eastern Phoebe	ER	2	—	—	ER	2
Rusty Blackbird	ER	2	—	—	ER	1
Gray Catbird	ER	1	—	—	—	—
Veery	ER	1	—	—	—	—
Philadelphia Vireo	ER	1	—	—	ER	1
Baird's Sparrow	ER	1	—	—	—	—
LeConte's Sparrow	ER	1	—	—	—	—

TABLE 10 (CONTINUED)

	Fall		Winter		Spring	
Subgroup B: Southeastern species that breed in eastern US and to a limited extent or not at all in Canada						
Orchard Oriole	R	13	—	—	—	—
Prairie Warbler	VR	8	—	—	—	—
Indigo Bunting	VR	5	—	—	R	19
Great Crested Flycatcher	VR	4	—	—	—	—
Pine Warbler	ER	2	—	—	—	—
Dickcissel	ER	2	—	—	ER	3
Golden-winged Warbler	ER	1	—	—	ER	1
Northern Parula	ER	1	—	—	VR	8
Yellow-throated Warbler	ER	1	—	—	ER	1
Hooded Warbler	ER	1	—	—	VR	5
Scarlet Tanager	ER	1	—	—	—	—
Summer Tanager[b]	ER	1	—	—	VR	5
Painted Bunting	ER	1	—	—	—	—
Chimney Swift	—	—	—	—	VR–R	7+
Eastern Wood Pewee	—	—	—	—	ER	1
White-eyed Vireo	—	—	—	—	ER	1
Yellow-throated Vireo	—	—	—	—	ER	1
Worm-eating Warbler	—	—	—	—	ER	3
Kentucky Warbler	—	—	—	—	VR	4
Field Sparrow	—	—	—	—	ER	1
Subgroup C: Southwestern species that breed in southwestern US and Mexico						
Tropical Kingbird	VR	5	—	—	—	—
White-winged Dove	ER	3	—	—	—	—
Bendire's Thrasher	ER	2	—	—	—	—
Golden-cheeked Warbler	ER	1	—	—	—	—
Cassin's Sparrow	ER	1	—	—	ER	3
Scissor-tailed Flycatcher	—	—	—	—	ER	1
Subgroup D: Palearctic species that breed in eastern Siberia and Alaska						
White Wagtail	ER	1	—	—	—	—
Red-throated Pipit	ER	1	—	—	—	—
Wheatear	—	—	—	—	ER	1

[a] Species are arranged in order of their fall abundance. Numbers are total individuals per season, cumulative for eight years. Letter designations of abundance values are: A—abundant, C—common, FC—fairly common, U—uncommon, R—rare, VR—very rare, ER—extremely rare, NRR—no recent record. The prefix Sp designates sporadic occurrence.

[b] Could be considered a southwestern species. All Farallon individuals, however, were thought to be of the eastern race, *P. r. rubra*.

For the purpose of this discussion, the 67 vagrant species have been further categorized into four subgroups based on the geographic location of their breeding ranges. Subgroup A includes 38 species (and three additional forms) breeding primarily east of the Rocky Mountains and extensively or entirely in Canada; these are referred to as "northern" species. Subgroup B includes 20 "southeastern" species breeding in eastern United States and to a limited extent or not at all in Canada. Subgroup C includes six "southwestern" species breeding in southwestern United States and possibly Mexico. Subgroup D includes three "palearctic" species breeding in eastern Siberia and possibly Alaska.

Subgroup A: Northern species

Fall.—Three species, Blackpoll and Palm Warblers and American Redstart, are fairly common (Table 10A). In fact, Blackpoll and Palm Warblers occur more commonly in fall than all nonvagrant landbirds that do not regularly breed or winter in coastal central California (Groups 2, 3, and 4) with the single exception of the Chipping Sparrow. The former two species thus occur about twice as commonly in fall as such typical montane species as MacGillivray's, Black-throated Gray, and Hermit Warblers! It does not seem unreasonable then to suggest that many Farallon individuals from Groups 2, 3, and 4 may well represent vagrants. The remaining species of northern vagrants range from uncommon to extremely rare. The mean number of fall occurrences for northern vagrants, 29.1 (uncommon; Table 5), was only slightly less than that for summering interior lowland species (34.7), and considerably more than that for summering Great Basin species (11.8).

Several trends are evident. The first, previously pointed out by DeBenedictis (1971) for vagrant vireos and warblers occurring in California as a whole, is that species with larger source populations, that is, species more common over their total range, are more common as vagrants. This, however, fails to explain many details of Table 10A. Certainly the Palm Warbler has a smaller source population than the American Redstart, Ovenbird, and Red-eyed Vireo, yet it occurs far more commonly on the Farallones than any of those species.

A second trend, first pointed out by DeSante (1973) for vagrant warblers occurring in California, is that species with more easterly, rather than southerly, migration routes occur more commonly. This, coupled with orientation cage data on Blackpoll Warblers, led DeSante (1973) to hypothesize that "mirror-image misorientation," the confusion or nondiscrimination of right and left in relating an inherited migration direction to a compass reference point, is responsible for most fall occurrences of immature vagrant warblers in California. Certainly the Blackpoll Warbler, in addition to having a large source population, also has a strong easterly component in its normal fall migration route. "Mirror-image misorientation" also provides an immediate explanation for DeBenedictis' (1971) "exceptionally numerous" species (Palm, Black-throated Blue, and Prairie Warblers), all of which have a strong easterly component in their normal migration routes.

A third trend is that nine-primaried passerines, particularly wood warblers, are proportionally more common as vagrants on the Farallones than 10-primaried passerines with similarly sized source populations and similar breeding ranges and migration routes. In fact, the mean number of fall occurrences for all 29 nine-primaried northern vagrant passerines (wood warblers, icterids, and finches) was 37.8 ± 55.8 (SD), much greater than that of the nine 10-primaried northern vagrant passerines (tyrant flycatchers, mimids, thrushes, and vireos), which was only 5.7 ± 7.0 (SD). This difference, furthermore, is statistically significant ($t = 1.710$, $df = 36$, $P < 0.05$, one-sided test). This result may have interesting evolutionary implications. Storer (1971) has pointed out that most recent classifications of the passerines have placed the nine-primaried species last because "they are believed to be undergoing a rapid and extensive adaptive radiation." A relatively high degree of vagrancy, that is, a relatively large number of misoriented migrants, in

these apparently recently evolved species may therefore not be unexpected. Rather, it may be an expected result of a high degree of genetic variability in their populations. Furthermore, by contributing to the establishment of new isolated populations, such vagrancy could, in fact, serve to enhance these species' rapid and extensive radiation.

Winter.—Only a single vagrant landbird, the Common "Yellow-shafted" Flicker, has ever been recorded in winter.

Spring.—Most northern vagrants are considerably less common in spring than in fall (Table 10A). Noteworthy exceptions include Ovenbird, Magnolia Warbler, Rose-breasted Grosbeak, Black-and-white Warbler, Bay-breasted Warbler, Red-eyed Vireo, Cape May Warbler, and Brown Thrasher. We cannot presently explain these exceptions. The mean number of occurrences was 9.9 (rare; Table 5), slightly less than that for summering interior lowland species (11.9) and about equal to that for summering Great Basin species (9.8). The fall-to-spring ratio for this group was 2.94, quite similar to that for interior lowland and montane summering species (2.91 and 2.60, respectively).

Subgroups B, C, D: Southeastern, southwestern, and palearctic species

Summaries of these species' occurrences are presented in Table 10B, C, and D, respectively. The mean numbers of occurrences for each of these subgroups was extremely low in both fall and spring (Table 5). Furthermore, both southwestern and palearctic species are more common in fall than in spring (fall-to-spring ratios were 3.00 and 2.00, respectively). However, southeastern species were more common in spring than in fall (fall-to-spring ratio was 0.68). We cannot presently explain this anomaly.

The Farallones are indeed remarkable in their ability to concentrate vagrant landbirds. It is interesting to note that, as of 2 April 1976, all vagrant landbird species known to have occurred in northern California had occurred on the Farallones with the exception of 11 northern, four southeastern, 17 southwestern, and two palearctic species. Since then, three of the southwestern species, Lucy's Warbler (*Vermivora luciae*), Scott's Oriole (*Icterus parisorum*), and Hepatic Tanager (*Piranga flava*), have occurred (see Addenda).

Breeding Landbirds

The breeding landbird community of the South Farallones has historically been a small one both in species and number of individuals (Table 11). All species that have nested, including introduced and alien ones (California Quail, House Sparrow, and Starling), are known to nest in the absence of trees. The native species, with the exception of the House Finch, actually prefer to nest in sparsely vegetated and rocky areas, and the House Finch is renowned for its great plasticity in nesting requirements (see Woods 1968). All species except the latter nest regularly in the absence of fresh water, and sufficient numbers of seepages and leaks in cisterns exist to provide water for the finch.

Several trends are evident in the history of the breeding populations. First, until the second decade of this century, the Common Raven was a fairly regular nesting species. On at least three occasions from 1895 to 1911, the ravens were shot, but replacements arrived soon after each extermination (see Common Raven account). Since 1911, however, only one raven has been recorded, an individual

TABLE 11

CHANGES IN THE COMMUNITY OF BREEDING LANDBIRDS ON THE FARALLONES FROM 1864 TO 1976

	Survey year[a]																	
	1864[b]	1888	1895	1903–04	1911	1922	1933	1958	1964–65	1968	1969	1970	1971	1972	1973	1974	1975	1976
Peregrine Falcon	o	o					x	o		o	o	o	o	o	o	o	o	o
California Quail[c]				x														
Burrowing Owl		o			x			o	o	o	o	o	o	o	o	o	o	o
Common Raven	x	o	x	x	x									o				
Rock Wren		x	x	x	x	x	x	o	x	x	o	o	x	x	x	o	o	o
Starling[c]										o	o	o	o	o	o	x	o	x
House Sparrow[c]					o	o	x	x	x	o	o	o	o	o	o	o	o	o
House Finch		x		x	x		o	o	x	o	o	o	o	o	o	o	o	o
Total breeding species[c]		2	2	3	4	1	2	0	2	1	0	0	1	1	1	0	0	0
% species turnover between successive surveys[d]			50	20	14	50	33	100	100							50		

[a] The symbol o denotes species present but not breeding; the symbol x, species definitely breeding.

[b] Census incomplete.

[c] Introduced and alien species not included in calculating total breeding species or turnover rates.

[d] Turnover rates were determined between adjacent surveys, introduced and alien species excluded, using the method by Diamond (1969). The mean species turnover was 51% per mean 11.6-year survey interval. (The ten-year interval, 1964–1974, was used to calculate this, with surveys between those years excluded.) In comparing turnover between 1911 and 1922, the Common Raven was not included (see text).

present on one day in 1972. This suggests that (1) the mainland population pool of ravens has been markedly reduced during this century; (2) the regular visitants were offspring of the breeding ravens, and that the three extirpations and the passage of time eliminated all of the regular visitants; (3) the island is not now suitable for either breeding or visitation by ravens; or (4) selection against visitation has taken place in the mainland population.

The island Rock Wren population exhibits a similar, although not as obvious, trend. During the late 1800s and early 1900s most accounts listed this species as a regular and common breeder. Some estimates went as high as 100 birds, but they seem to have been exaggerated. Ray (1904), however, located 20 nests, both "old" and "new." This may be compared with recent years when it has been difficult to find a single nest except by following a parent bird. In May 1887 Bryant (1888) collected five males, presumably a small portion of the population; May populations in recent years have rarely included more than two males. During the past several years the species has bred only sporadically, compared with formerly consistent year-to-year breeding. One factor contributing to this reduction of breeding Rock Wrens has perhaps been the increased gull population and resultant predation (Ainley and Lewis 1974). During recent years wrens have confined their activities to gull-free areas on the southern quarter of the island, and mainly on the southern slope of Lighthouse Hill. This area is the most xeric (dry, southern exposed talus slopes) and was the area favored by the wrens in former years (Bryant 1888). In the late 1800s and early 1900s the gull population, because of human activities, was almost nonexistent (Ainley and Lewis 1974) and more areas were open to wrens. A part of the southern quarter formerly named for them by virtue of their concentration, i.e., Rock Wren Path (see map in Emerson 1904), is now devoid of wrens except during the fall when gulls are absent. Whether or not other factors, such as declines in mainland population pools, also account for this decline, we cannot say (see above discussion on ravens). The suggestion is that changes in island populations of wrens and ravens are partly or entirely artifacts of direct or indirect interference by man.

An opposite trend is evident in the examples of the Starling and House Sparrow. Starlings were first reported in 1968 and have been present as winter residents ever since. Pairs bred in 1974, 1976, and 1977. The House Sparrow was first reported in 1911 and was first recorded breeding in 1932. That species has been present regularly ever since and has bred sporadically. Both species were introduced into North America during the last century and are apparently still expanding their ranges. By building structures and planting trees, man has likely aided them in colonizing the island, and has thus also figured prominently in the changed status of these two breeding landbirds on the South Farallones.

The Farallones support far fewer breeding landbird species (maximum of four during any given year; eight in all) than any of the Channel Islands (Table 12). The Channel Islands' breeding landbird avifauna has been summarized by Diamond (1969), Power (1972, 1976), and H. L. Jones and J. M. Diamond (unpubl. data). These studies suggest that we should look at degree of isolation, plant diversity, and island size as a starting point in explaining why so few species breed on the Farallones. The Farallones are farther off the coast than four of the Channel Islands, about the same distance as two others, and closer than the farthest two. The South Farallones are close to no other island except a few tiny

TABLE 12

SPECIES OF LANDBIRDS KNOWN TO HAVE BRED (X) OR SUSPECTED OF HAVING BRED (O) ON THE CALIFORNIA ISLANDS[a]

	San Miguel	Santa Rosa	Santa Cruz	Anacapa	San Nicholas	Santa Barbara	Santa Catalina	San Clemente	S. Farallones
Red-tailed Hawk		x	x	x			x	x	
Bald Eagle	x	x	x	x	x	x	x	x	
Osprey					x		x	x	
Peregrine Falcon		x	x	x		x	x	x	x
American Kestrel		x	x	x		x	x	x	
Mourning Dove		x	x	x			x	x	
Barn Owl	x	o	o	o		o	x		
Burrowing Owl		o	o		x	x	x	o	x
Long-eared Owl							x		
Saw-whet Owl			o						
Lesser Nighthawk						o			
White-throated Swift		o	o	o			o	x	
Costa's Hummingbird	o					x			
Anna's Hummingbird							o	x	
Allen's Hummingbird	x	x	x	x			x	x	
Belted Kingfisher			o						
Common Flicker			x				x		
Acorn Woodpecker			x				o		
Ash-throated Flycatcher			x						
Black Phoebe		x	x	x			o	x	
Western Flycatcher		x	x	x			x	o	
Horned Lark	x	x	x	x	x	x	o	x	
Barn Swallow	x	x	x	x			x	o	
Scrub Jay			x						
Common Raven	x	x	x	x	x	x	x	x	x
Bushtit			x				o		
Red-breasted Nuthatch			o						
Bewick's Wren		x	x	x			x	x	
Rock Wren	o	x	o	x	x	x	o	x	x
Mockingbird		x	o		x		o	x	
Blue-gray Gnatcatcher			x						
Loggerhead Shrike	x	x	x	x			x	x	
Starling	x	x	x	x	x	x	o	x	x
Hutton's Vireo		x	o	o			o		
Orange-crowned Warbler	x	x	x	x	x		x	x	
House Sparrow		o			x		x	x	x
Western Meadowlark	x	o	x	x	x	x	o	x	
Red-winged Blackbird			x						
Hooded Oriole							x		
Brewer's Blackbird					x				
Black-headed Grosbeak			x						
House Finch	x	x	x	o	x	x	x	x	x
Lesser Goldfinch		x	o				o		
Rufous-sided Towhee		x	x				x	o	
Lark Sparrow			o						
Rufous-crowned Sparrow			x	x					
Sage Sparrow								x	
Chipping Sparrow		x	o	x			x	x	
White-crowned Sparrow					x				
Song Sparrow	x	x	x			x		x	

[a] Data are from Power (1972), Lynch and Johnson (1974), and H. L. Jones and J. M. Diamond (unpubl. data). The introduced California Quail is not included.

rocks. Thus they are comparatively isolated, which theoretically (see Diamond 1969) should account for their depauperate avifauna. They do not want for potential immigrants, however, as is amply demonstrated in the Species Accounts.

Apparently more important than isolation is the Farallon plant community, which contains only 15 native members, 25 fewer than the most depauperate flora of any Channel Island (see Power 1972). The simplicity of the Farallon plant community must be critical; except for three isolated trees, and some thistles and mallows reaching 1 m in height, the dominant characteristic of the community is its low growth of herbaceous annuals (grasses, composites). Birds that breed on the Farallones, therefore, are those preferring dry areas of sparse vegetation. Another factor secondarily affecting the small landbird breeding community through its relationship to plant diversity (Power 1972, 1976) is the small area of the islands. Only 0.16 sq. miles in area, the South Farallones are one-sixth the size of the smallest Channel Island. Thus, the Farallon data are consistent with trends observed by others among the avifaunas of the Channel Islands: with a simpler flora and a smaller area, the Farallones should have a smaller breeding avifauna, and they do.

Diamond (1969), Hunt and Hunt (1974), Lynch and Johnson (1974), and H. L. Jones and J. M. Diamond (1976 and unpubl. data) have discussed the avifaunal turnover rates for the different Channel Islands. Their results suggest that bird species diversity and habitat complexity have important effects on rates of extinction and colonization in insular bird communities. If we compare turnover on the South Farallones—excluding introduced species, alien species, and the raven after 1911 (see Lynch and Johnson 1974)—between successive complete bird surveys, we find that results vary from 0 to 100% (Table 11). Part of this variation seems due to the number of years between surveys. Therefore, taking data from 1964 and 1974 and ignoring surveys between those years to give a 10-year interval or one comparable to survey-intervals of earlier years, the figures range from 14 to 100%. The mean of these turnover rates is 52% for mean 11.6-year periods. Using a "compound interest" method to figure yearly rates, if turnover rate is x, then

$$100\,(1 - x)^{11.6} = 48$$

$$\text{and } x = 0.0612, \text{ or } 6.12\%.$$

This rate compares with a 1% turnover measured over a similar time interval (about 10 years) at Anacapa Island (Jones and Diamond 1976). The more rapid rate on the South Farallones is expected, given the lesser complexity of their habitats. Ten-year intervals, however, were found to reduce the apparent rate on Anacapa by a factor of 10, compared with one-year census intervals. It is likely that the 6.12% turnover at the Farallones is also an underestimate.

On theoretical grounds, several authors (e.g., MacArthur and Wilson 1967; Diamond 1969) have suggested that island faunas and turnover rates achieve a state of dynamic equilibrium. At the Farallones this turnover rate fluctuates widely. We would expect variation in the Farallon rate to be less if the degree of habitat complexity and the resultant avifaunal diversity were greater. If removal of rabbits on Southeast Farallon results in increased habitat complexity, this hypothesis might be tested. Successive, careful annual surveys on the Channel Islands might also prove fruitful in this regard.

California Island Breeding Landbirds and the Immigrant Pool

A review of landbird species that nest on the Channel Islands compared with their status on the Farallones reveals some interesting trends. On the one hand, species that *have* bred on the Farallones (five, excluding aliens and introduced species) are among those few that have bred on all or almost all the Channel Islands (Table 12). A possible exception is the Burrowing Owl. Some authors, however, believe that this species has nested on all the islands (e.g., Power 1972), but since its breeding has been difficult to confirm, we cannot be certain of such a wide distribution (see below). In company with these species, the alien Starling, so far known to breed on seven of eight Channel Islands, also has bred on the Farallones. In contrast, a few species that have bred on all or almost all the Channel Islands *have not* been known to breed on the Farallones. One such species is the Bald Eagle. It seems odd that a species as ubiquitous on California islands as the Bald Eagle has not once bred on the Farallones; perhaps it did prior to year-round occupation by man (pre-1810). Other widespread insular species not breeding on the Farallones are the Horned Lark, Orange-crowned Warbler, and Western Meadowlark. Had it not been for the grasslands created a few hundred years ago by grazing livestock on most of the southern islands, and maintained in the same way on many to this day, perhaps the first and third of these species would not be so widespread.

Table 12, which summarizes the breeding avifaunas of the California islands, is important in the following discussions. Before proceeding further, some explanatory comments should be made concerning the table. Power (1972), Lynch and Johnson (1974), and H. L. Jones and J. M. Diamond (unpubl. data) compiled the records used in Table 12 from the literature and from their recent work, but we take responsibility for the way it is presented here. We distinguished between whether a species' supposed breeding on an island had been based on unequivocal direct evidence, or whether breeding was considered "probable" because only indirect evidence was available. Only those species for which direct evidence exists for each island are considered further in our analysis of the breeding avifaunas and the potential immigrant pool (Table 13; see below). While this conservative approach might overlook some cases where a species does indeed breed (or has bred) on a given island, we feel that for our purposes it puts us closer to the real pattern than would a more liberal definition of direct evidence. Extreme care and often much time are required to establish the breeding status of birds in little known areas, as recently discussed by Lynch and Johnson (1974). Reasons why we have not considered anything less than direct evidence of breeding (i.e., observations of nest, eggs, young, adults feeding young, or adults carrying nesting material or food consistently to a likely nesting spot) are based on our experience at the Farallones. Our data on bird occurrences amply show that a species is not necessarily breeding if present on an island during the nesting season. This is so even if many individuals of the species are observed or if researchers find the species on short successive visits even if several months elapse between them. Examples of this kind of evidence were used in the past to confirm breeding of Lesser Nighthawk on Santa Barbara (Willet 1912), Belted Kingfisher on Santa Cruz (Dawson 1924), and Lark Sparrow on Santa Cruz (Dickey and Van Rossem 1923). Lynch and Johnson (1974) agree with us on this and discuss these and other examples. At the Farallones we have also many times observed singing

TABLE 13
FARALLON OCCURRENCES OF LANDBIRD SPECIES KNOWN TO HAVE BRED ON THE CALIFORNIA ISLANDS[a]

	No. of Channel Islands[b]	Occurrence on the Farallones		
		Bred	Extended visits	Individuals per year
Red-tailed Hawk	5			0.5
Bald Eagle	8			0.0
Osprey	3			0.4
Peregrine Falcon	6	x	x	5.0
American Kestrel	6		x	17.3
Mourning Dove	5		x	48.7
Barn Owl	2			0.1
Burrowing Owl	3	x	x	8.1
Long-eared Owl	1		x	2.7
White-throated Swift	1			0.4
Costa's Hummingbird	1			0.3
Anna's Hummingbird	1			2.5
Allen's Hummingbird*	6			2.0
Common Flicker	2		x	24.5
Acorn Woodpecker	1			0.5
Ash-throated Flycatcher	1		x	11.0
Black Phoebe	4		x	8.4
Western Flycatcher*	4			57.3
Horned Lark*	7			3.9
Barn Swallow	5		x	19.5
Scrub Jay*	1			—
Common Raven	8	x		0.1
Bushtit	1			—
Bewick's Wren*	5			—
Rock Wren	5	x	x	9.6
Mockingbird	3		x	9.3
Blue-gray Gnatcatcher	1			1.0
Loggerhead Shrike*	6			0.4
Starling	7	x	x	1083.5
Hutton's Vireo	1			1.7
Orange-crowned Warbler*	7			105.6
House Sparrow	3	x	x	10.3
Western Meadowlark	6		x	108.3
Red-winged Blackbird	1			32.9
Hooded Oriole	1			0.1
Brewer's Blackbird	1			51.6
Black-headed Grosbeak	1			13.6
House Finch*	7	x	x	31.1
Lesser Goldfinch	1			33.6
Rufous-sided Towhee*	3			34.1
Rufous-crowned Sparrow*	2			—
Sage Sparrow*	1			0.1
Chipping Sparrow	4			96.0
White-crowned Sparrow	1		x	693.1
Song Sparrow*	5		x	2.9

[a] Feral and introduced species omitted. List taken from Table 12 (see text).
[b] Number of Channel Islands upon which the species breeds is indicated.
* Indicates endemic subspecies on the Channel Islands (Johnson 1972).

males, sometimes with females present, of species that have never bred there; for example, Western Wood Pewee, Cape May Warbler, Ovenbird, and Black-headed Grosbeak. We have also observed direct territorial defense, again with no indication of breeding, in, for example, Ash-throated Flycatcher, Black Phoebe, Western Wood Pewee, and Rock Wren. This kind of evidence has been used to confirm breeding in the Channel Islands of such species as the Western Meadowlark on Santa Rosa and Santa Catalina, Anna's Hummingbird on Santa Cruz, and Black Phoebe on Santa Catalina (H. L. Jones and J. M. Diamond, unpubl. data). Finally, on at least three occasions we have banded female House Finches and once a female Rose-breasted Grosbeak with well-developed incubation patches during the spring and summer but have no evidence that these individuals bred on the Farallones. Fortunately, the latter kind of evidence in the absence of other direct evidence has not yet been used to confirm a species' breeding status in the Channel Islands.

In comparing the Channel Island breeding avifaunas with the potential immigrant pool as measured at the Farallones (Table 13), there is evident a direct relationship between the number of Channel Islands upon which a species breeds and the number of individuals that visit offshore islands. On the one hand, 13 of 20 species (65%) that nest or have nested on only one or two of the eight Channel Islands rarely visited the Farallones; that is, on the average, one (usually no) individual of each species visited per year. The seven species that occurred more frequently (Common Flicker, Ash-throated Flycatcher, Red-winged Blackbird, Brewer's Blackbird, Black-headed Grosbeak, Lesser Goldfinch, and White-crowned Sparrow), have been known to breed on a single island during only one of several years during which surveys were made.

If the latter seven are so very abundant as potential colonists, why have they not established insular breeding populations more often? Our opinion is that colonization by these seven species comes under Jones and Diamond's (1976) classification of "Flukes," or species that are unlikely to colonize an island because of the absence of suitable habitat but nevertheless do breed during one year. Jones and Diamond, in fact, gave as three examples of this phenomenon, breeding by Brewer's Blackbird, Lesser Goldfinch, and White-crowned Sparrow on certain Channel Islands.

On the other hand, excluding the raven and the four largest raptors, 15 of 20 species (75%) that breed (or have bred) on three or more Channel Islands, visit the Farallones rather frequently, with approximately eight or more individuals per year. The raptors and raven were excluded because their mainland populations, and hence their potential visitant pool, are currently very small as compared with their populations earlier in this century when their island breeding was recorded (see Lynch and Johnson 1974). The other five, less frequently occurring, species (Allen's Hummingbird, Horned Lark, Bewick's Wren, Loggerhead Shrike, Song Sparrow) are all among species that have diverged phenetically in the Channel Islands and will be discussed below. This relationship, between visitation rate and number of islands colonized, quantifies and confirms what would be expected: the more potential colonists a species "sends forth," the more colonies will be established, given the existence of suitable habitat.

Let us next consider visitation rates of those species having endemic forms on the Channel Islands. Here we are fortunate to have the detailed study by Johnson

(1972). Discounting the California Quail, which was imported to Southeast Farallon and possibly to the Channel Islands, three of the 12 species having endemic forms have never been recorded on the Farallones: Scrub Jay, Bewick's Wren, and Rufous-crowned Sparrow. All occur on the adjacent central California coast and are known to be quite sedentary; we would thus be very surprised should they ever arrive on the Farallones by overwater flight. Two other such species, the Loggerhead Shrike and Sage Sparrow, are extremely rare on the Farallones. Their low incidence of occurrence must result from their being only slightly mobile species; coastal populations of the Sage Sparrow are, in fact, sedentary. The shrike breeds uncommonly north and south along the adjacent mainland coast, and the sparrow breeds uncommonly along the coast from Monterey south and slightly inland to the north (Grinnell and Miller 1944). Three other species, the Allen's Hummingbird, Horned Lark, and Song Sparrow, are extremely rare to rare at the Farallones, although they too breed uncommonly to commonly along the mainland coast (Grinnell and Miller 1944); and another, the Rufous-sided Towhee, is rare during the spring but common during the fall. This high abundance of the towhee is somewhat surprising since it has not been known locally as a particularly mobile species. Johnson (1972: Table 4) considered it to be within that group of California birds having the lowest tendency to disperse or migrate. To be sure, most individuals occurring on the Farallones seem referable to one or the other of the subspecies breeding in northeastern California or along the coast of Oregon and known for at least a small degree of movement (Grinnell and Miller 1944). The resident coastal central California form has rarely, if ever, been seen on the islands. Finally, three species having endemic Channel Island forms, the Western Flycatcher, Orange-crowned Warbler, and House Finch, are fairly common to common on the Farallones.

Eight of 12 species having endemic subspecies on California islands (quail excluded) thus have a restricted potential gene flow from mainland to island populations. As demonstrated by the Farallon data, rarely, if ever, did individuals of these species visit the island. In view of this fact, genetic and morphological differentiation in their insular populations is not surprising. On the other hand, the four remaining species send rather frequent potential immigrants to California islands but two of these show a tendency to diverge phenetically. The Orange-crowned Warbler and Rufous-sided Towhee are represented by three and six well-defined subspecies, respectively, on the California mainland (AOU 1957). The third, House Finch, is well known for great morphological variability between populations, and possible extensive subspeciation on the mainland has been suggested (see review by Woods 1968). Thus even the mild restriction of gene flow induced by habitation on an offshore island may be sufficient for differentiation in these latter species' island populations. For the last of the commonly immigrating species, the Western Flycatcher, we can make no comment. Of all these species, only the House Finch has also bred on the Farallones.

A review of the status on the South Farallon Islands for the remaining 33 Channel Island breeding species (those without endemic forms) is also interesting, especially in terms of the amount of time they spend on the Farallones. Six of these species have bred naturally on the Farallones (Peregrine Falcon, Burrowing Owl, Common Raven, Rock Wren, Starling, House Sparrow), and four (the falcon, owl, wren, and starling) winter there regularly. Ten other species also winter

or have spent long periods on the Farallones: American Kestrel, Mourning Dove, Long-eared Owl, Common "Red-shafted" Flicker, Ash-throated Flycatcher, Black Phoebe, Barn Swallow, Mockingbird, Western Meadowlark, and White-crowned Sparrow. All are regular in occurrence and range from uncommon to abundant. Conditions on the Farallones may be almost, but not quite, adequate for breeding for some of them. For instance, the swallow has been observed frequenting deserted buildings and may need only a little fine-grained mud for nest-building before it would breed. Five others (Red-winged Blackbird, Brewer's Blackbird, Black-headed Grosbeak, Lesser Goldfinch, and Chipping Sparrow) have occurred commonly to abundantly but most individuals have not remained for very long, indicating that conditions must not be as suitable as they are on the Channel Islands. According to Grinnell and Miller (1944), they prefer complex habitats not currently available on the Farallones. The Hutton's Vireo is rare on the Farallones but also requires more complex habitats, e.g., live oaks (Grinnell and Miller 1944).

The 11 Channel Island breeding species not yet discussed (the three large raptors, Barn Owl, White-throated Swift, Costa's and Anna's Hummingbirds, Acorn Woodpecker, Bushtit, Blue-gray Gnatcatcher, and Hooded Oriole) occur extremely to very rarely, if at all, on the Farallones (Anna's Hummingbird excepted—rare to uncommon), and spend very little time there. Of the preceding species the Barn Owl seems the most likely eventually to breed on the Farallones. Should a male and female ever occur together, the three critical requirements described by Grinnell and Miller (1944) for breeding seem to be present: (1) open hill sides productive of small mammals, (2) brush thickets or buildings for daytime roosting, and (3) cavities for nesting (e.g., holes in earth banks).

SUMMARY

The South Farallon Islands are a group of rocky islets, 0.41 km^2 in area, situated 32 km off the coast of Marin County in central California. Birds arriving on or near the island were censused every day, weather permitting, for eight years, from 3 April 1968 to 2 April 1976. Museum collections and the extensive Farallon literature, including about 70 sources dating back to the 1850s, were searched for other records of bird occurrences. In all, 331 species of birds, including 216 normally of land or freshwater habitats, were documented through 2 April 1976. Fifteen additional species, recorded through 2 October 1979, are mentioned in the Addenda. Thus 346 of the 496 species known to have occurred in northern California are documented from the Farallones. Details of first state records of four species are published for the first time. Eight other species are relegated to hypothetical status. For each species, seasonal status, total number of individuals that visited, high counts, timing of peak arrivals, and extreme arrival and departure dates are given. The breeding and residence history of each species, where appropriate, is also reviewed. The intensive census data, summarized for the eight recent years, provide a concise description of the migratory periods for each species' movements through central coastal California.

The greatest density and diversity of visitant species occurs during fall. Shorebirds, rocky intertidal species predominating, begin arriving in July and gradually increase to maximum visitation rates in September, when the generally rare estuarine and freshwater species also occur. Pelagic seabirds likewise reach max-