

by conscientious observers (see Acknowledgments), most of whom had had experience in both banding and the identification of birds in the field and in the hand. Supplementing this information are more than 70 publications, dating from 1859, which deal with the wildlife of the Farallon Islands. In addition, Donald R. Medina visited the islands in May 1963 and collected many bird specimens which are now at the Museum of Vertebrate Zoology; PRBO also visited the islands 7–14 June and 20–26 September 1967, and banded or observed many birds. Records from these last three trips have not previously been published. The literature and unpublished data supply information on the avifauna from the mid-1800s through 1967.

In the instances of unusual or difficult-to-identify species, the consensus of at least two persons and a written description were required for acceptance of a sight record. Where only one observer was involved, a good photograph or a specimen was required. In very few instances, a single observer's sight record was accepted if the observation was accepted by the Western Field Ornithologists' California Bird Records Committee (see *Western Birds*). Identifications of such difficult-to-identify species as *Empidonax* flycatchers or certain wood warblers in immature plumage were based on the capture and keying of individuals. The library of the research station was amply stocked with literature helpful in making identifications. The birds present were recorded daily in the *Journal* of the Farallon Research Station. This and the banding records, which include measurements of difficult-to-identify species and often subspecific definitions and age differentiation, are on file at the station. In fact, Farallon data on the age ratios of several species are included in two previous reports (Ralph 1971, Stewart et al. 1974). Most of the critical specimens have been deposited in the California Academy of Sciences, San Francisco (CAS), but some have been deposited in the Museum of Vertebrate Zoology, Berkeley (MVZ), San Diego Natural History Museum (SDNHM), California State University at San Francisco, US National Museum (USNM), Academy of Natural Sciences, Philadelphia, and the Point Reyes Bird Observatory (PRBO). These specimens are listed in the Species Accounts unless previously published.

We have followed the classification and nomenclature of the American Ornithologists' Union *Check-list of North American Birds* (1957) and its supplements (1973, 1976). The exceptions are *Puffinus bulleri*, for which we used the common name, Buller's Shearwater (see Serventy et al. 1971), and *Catharacta macormicki*, South Polar Skua (see Devillers 1977). We made no consistent attempt to include subspecific designations in this paper, but in many cases these may be found in the banding records and the Farallon *Journal*.

DESCRIPTION OF THE ISLANDS

The South Farallones are located just inside the edge of the continental shelf (37°42'N, 123°00'W) 43 km west of San Francisco, California (see Fig. 1). They comprise Southeast Farallon (the main island), West End, and several large, close-by rocks, in all an area of 41 ha. Maps of the South Farallones have been published by Emerson (1888), Bowman (1961), and Ainley and Lewis (1974). Some other rocks, 3 and 6 km northwest, are known respectively as Middle Farallon and the North Farallones; they are not considered further in this report.

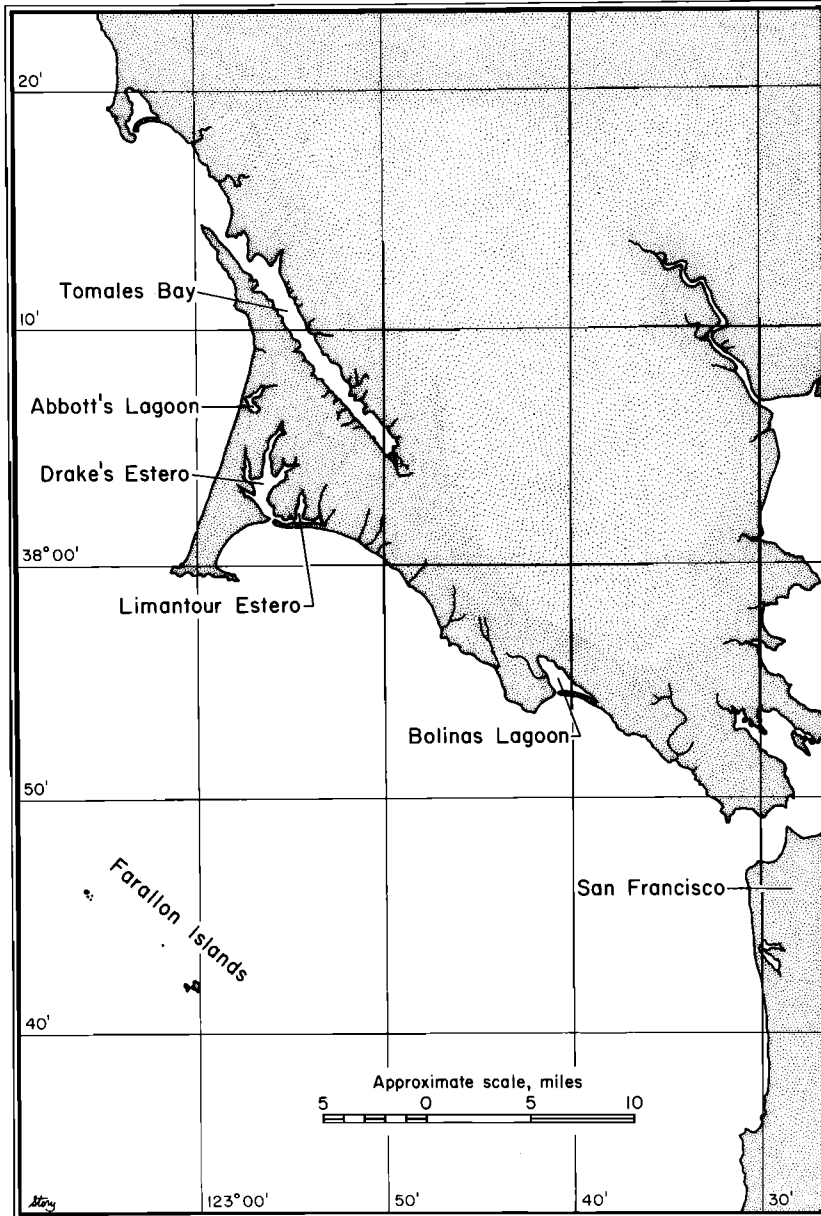


FIGURE 1. Map of coastal central California showing the location of the South Farallon Islands.

Point Reyes and Bolinas Point, Marin County, are the nearest mainland areas, 32 km due north and northeast, respectively.

The most complete descriptions of the geology, topography, and edaphic conditions are given by Blankinship and Keeler (1892), Hanna (1951), and Anderson (1960). Bowman (1961) and Ainley et al. (1974) included several habitat photographs in their reports. An ancient marine terrace, now about 16 m above sea

level, is the basic land form (see Frontispiece). From this rise several rugged hills of weathered granite, the highest of which is Lighthouse Hill (elev. 109.1 m). Rocky talus encircles this and other hills at their bases. Sandy soil occurs in most flat areas but is nowhere more than 1 m in depth. On the north and east sides of the island and on West End, seabird guano, sometimes to a depth of about 1 m, is the dominant substrate. The periphery of the island is cut profusely by deep surge channels. There are numerous sea caves, including several at higher elevations that were carved out before the last of the island's three periods of uplift (Hanna 1951). There is little fresh water except where small seeps keep the ground moist, where it leaks from a few storage tanks, or where it is placed in bird traps. Rainwater remains for long periods in some natural basins, and heavy fogs frequently dampen the substrate. It seems likely that the island has been isolated from the mainland for at least 11,000 years (Anderson 1960).

The vegetation has been described by Blankinship and Keeler (1892), Anderson (1960), Ornduff (1961), Pinney (1965), and Coulter (1972). The latter two authors discuss plant associations and distributions and provide a list of species. The 38 species of plants present in 1972 (a few more have occurred since) include 15 that are native and 23 that were introduced. This depauperate flora is due to the severe edaphic conditions and the grazing by European rabbits (*Oryctolagus cuniculus*) introduced some time before the 1870s (Hanna 1951; Ornduff 1961). Few plants grow on the rocky hills but a thick mat of grasses (*Hordeum*, *Vulpia*) blankets the southern quarter of the island; Farallon weed (*Lasthenia minor maritima*) is the dominant plant in other flat areas where vegetation grows (see maps in Pinney 1965 and Coulter 1972). Three trees are currently present, two 8-m-high Monterey cypresses (*Cupressus macrocarpa*) growing together in the lee of the living quarters, and one Monterey pine (*Pinus radiata*) growing prostrate to a diameter of 10 m and a height of 3 m, 100 m southeast of the living quarters (see photos in Bowman 1961). Doughty (1971) mentioned that attempts to plant trees in the late 1940s failed because of rabbits; the cypress trees present now must have been planted much earlier. One, of which only a stump now remains, was cut down sometime before 1967 and has at least 40 growth rings. Ray (1904) mentioned the existence of a grove of "evergreens." Almost all other plant species are annuals, a few of which reach 1 m in height.

The weather is influenced strongly by the cold subarctic waters of the California Current that flow by the island. Daily temperatures range from an average minimum of 10.6°C (8.9° in winter, 11.1° in summer) to an average maximum of 12.8°C (12.2° in winter, 14.4° in summer; from Coulter 1972). On rare occasions (twice from 1970 to 1974) temperatures have dipped to freezing and on equally rare occasions they have reached 20°C. Rain usually occurs only during October to April, and during 1968–1973 averaged 42.7 cm per year. On 84% of the days the wind is from the north and northwest at 10–20 knots (Blankinship and Keeler 1892). On most other days it is from the south and southwest, particularly during winter storms. On occasion winds have reached over 50 knots. Fog usually prevails during the summer; otherwise it is often overcast. The clearest weather occurs during the fall.

The only land mammal present other than the rabbit is the feral house mouse (*Mus musculus*). We do not know when it was introduced. Four species of pinnipeds breed at the South Farallones and are present year-round: Steller's sea lion (*Eu-*

metopias jubatus), California sea lion (*Zalophus californicus*), harbor seal (*Phoca vitulina*), and northern elephant seal (*Mirounga angustirostris*). Banana slugs (*Ariolimax* sp.) and an endemic subspecies of arboreal salamander (*Aneides lugubris farallonensis*) are present. The insects have not been well studied, but they include an endemic cave cricket (*Farallonophilus cavernicolus*), an endemic kelp fly (*Fucellia evermanni*), and several rather abundant beetles (tenebrionids, scarabids, coccinellids, and dermestids).

Human inhabitants, their work, and their life-styles have greatly affected the island's wildlife, especially from the early 1800s to about 1970. A lighthouse station has been present since 1854, and during the 50 years prior to that the large pinniped populations were a source of skins and meat for New England and Russian sealers. The history of human occupancy and reviews of effects on marine bird and mammal faunas are presented by Doughty (1971) and Ainley and Lewis (1974). The dogs and cats kept by the lightkeepers had potentially disruptive effects on both marine birds and landbirds. When PRBO established its research station in 1968 there were five cats, but they all disappeared not long afterwards (1972). In 1973 and 1974 the rabbits were exterminated. Since then the vegetation has become much denser and several species of plants have survived longer and formed rather large bushes. Gulls are important predators of landbirds on the island; several gull pellets have been found that contained landbird remains. During the spring, when both landbirds and gulls are present, the former tend to occur in areas free of gulls.

TERMINOLOGY AND METHODS OF ANALYSIS

One purpose of this work is to define the status and occurrence patterns of avian species on the South Farallon Islands. These definitions are based on only the eight years of census data gathered daily by the Point Reyes Bird Observatory between 3 April 1968 and 2 April 1976. Three parameters are used to define the status of any given species: the residency or length of stay, the seasonality, and the abundance of the individuals.

Residency.—The birds occurring on the Farallones are classified into two groups: residents and visitants. **Residents** are individuals known to have remained on or around the island for more than three weeks during any given season; **visitants**, on the other hand, are individuals that remained for three weeks or less. Sick or wounded individuals that remained for more than three weeks during their normal migratory period are classified as visitants. We consider the general term, visitant, to be more appropriate in describing occurrences than several more specific terms such as migrant, transient, dispersant, and vagrant. In using the latter terms, we would have had to make many more arbitrary classifications, thus greatly decreasing the value in their use.

Seasonality.—Residents may or may not breed on the island. Those that do are additionally termed **breeders**. Fifteen species (12 seabirds and three landbirds) have bred during the eight-year period analyzed here. Some, such as Black Oystercatcher and Western Gull, are present the entire year and are referred to as year-round (not permanent) residents and breeders. Others, such as Leach's Storm-Petrel and Tufted Puffin, are only present during spring and summer and are classified as spring and summer residents and breeders.

A number of species, both waterbirds and landbirds, remain on or around the