CALIFORNIA CLAPPER RAIL INVESTIGATIONS IN SOUTH SAN FRANCISCO BAY

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Abstract. The California clapper rail (Rallus longirostris obsoletus) was one of 43 avian species included in the 1971 breeding bird survey of south San Francisco Bay. Data on nesting and populations were obtained from direct observation and rope drag techniques from March to December, 1971. Nesting was studied from April to July with peak nesting found in May. Eighty-seven nests were located during the study; 58 of which were active when discovered. Mean clutch size was 6.83 eggs with a range between 3-11. All but one nest were made of dried cord grass stalks with 69 (79%) of the nests located in 2-3' tall stands of cord grass. No data were taken on hatching or fledging success.

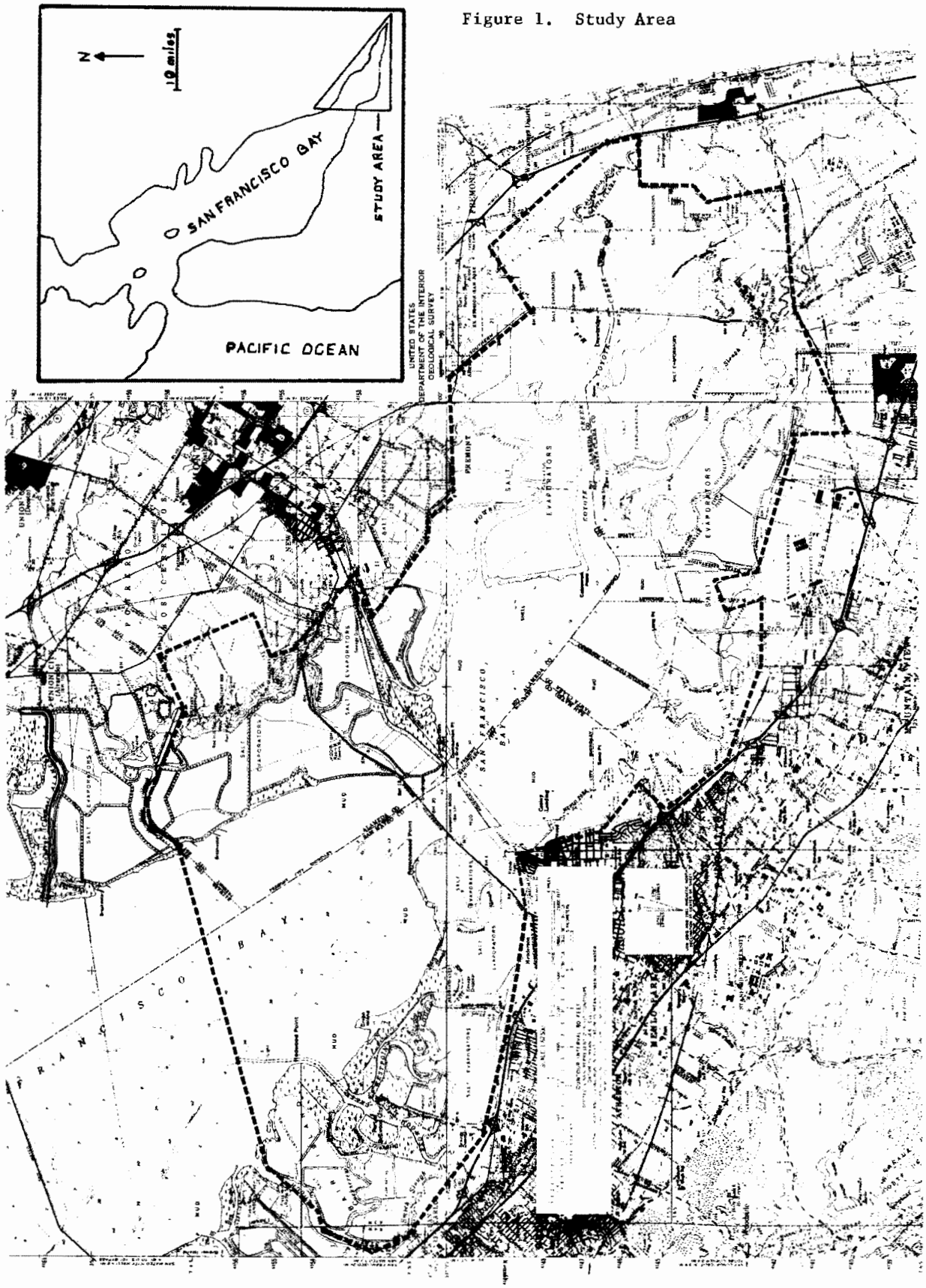
Population densities were assessed from April to December. A modified rope drag was used during the nesting season while direct observation during flood tides was used during winter months. Densities with rope drags varied with tide conditions and habitat type surveyed. Medium high tides (4.5'+) produced high densities of 1.08 rails per acre on primary rail habitat and 0.70 rails per acre on secondary rail habitat. Censusing primary habitat marshes inundated by high winter tides produced a density of 1.42 rails per acre. Clapper rail habitat within the study area was figured at 4,250 acres with 1,950 acres classified as primary rail habitat, 1,120 acres as secondary habitat and 1,180 acres as bare surface in the form of sloughs, creeks, and mudflats or brackish sloughs which were considered poor rail habitat. Population projections based on density figures and habitat acreage put the number of California clapper rails in the study area at 2,750 with a range of 2,420 to 2,880. Population projections based on direct observation at flood tide conditions need further investigation.

INTRODUCTION

The California clapper rail (Rallus longirostris obsoletus) was one of 43 species of birds studied during the 1971 nesting season as part of the south San Francisco Bay breeding bird survey. Efforts were made to obtain reproductive information on all species with special efforts directed toward establishing population indices for the clapper rail and salt marsh song sparrow.

Major clapper rail populations in San Francisco Bay are centered in the salt marshes bordering the south arm of the Bay in Alameda, Santa Clara, and San Mateo Counties. Small populations exist in and around the salt marshes of San Pablo Bay in Sonoma and Marin

Figure 1. Study Area



Counties, Elkhorn Slough in Monterey County, and Tomales Bay and Bolinas Lagoon, Marin County.

Grinnell and Miller (1944) list three records from Humboldt Bay, California; however, it is doubtful that any resident populations exist north of Tomales Bay.

In spite of its reported secret habits, the California clapper rail has been the object of numerous studies throughout its range. The majority of the work has been centered in the south San Francisco Bay marshes and dates back to when the clapper rail was hunted as a game bird. Studies in the 1890's have described the nesting habits of this bird in the San Francisco Bay (Taylor, 1894 and Adams, 1900). Other nesting studies were reported by Bryant (1915), DeGroot (1927), Applegarth (1938), and Zucca (1954). Behavior and feeding studies have been reported by Williams (1929) and Moffitt (1941). Population studies were reported on by Applegarth (1938) and Zucca (1954).

This study inventories and delineates rail habitats and rail populations in south San Francisco Bay as well as reports on nesting studies during the 1971 season. The study was initiated as part of the 1971 south San Francisco Bay Breeding Bird Survey supported by Special Wildlife Investigations, California Department of Fish and Game.

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STUDY AREA

The study was conducted over approximately 47,000 acres (74 sq. miles) of south San Francisco Bay (Figure 1). Seven habitat types were delineated during the breeding bird survey: salt ponds, 21,744 acres; tidal or mud flats, 13,530 acres; open water, 6,500 acres; salt marsh, 4.250 acres; fresh water marsh, 200 acres; grassland, 700 acres; and dikes and levees, 200 miles. Clapper rail investigations were restricted to the 4,250 acres of salt marshes.

The most extensive areas of undisturbed salt marshes are found near Plummer Creek, Mowry Slough, and Coyote Creek in Alameda County, and near Redwood City and Greco Island, San Mateo County. Salt marshes represent the most productive type of natural habitat found in the Bay area. San Francisco Bay salt marshes are characterized by two plant associations. The Spartina zone, found on low ground subject to daily tidal coverage, is characterized by pure stands of salt marsh cord cress (Spartina foliosa). The higher grounds are represented by the Salicornia zone. The dominant plant here is pickleweed (Salicornia virginica) with other vegetative forms such as gumplant (Grindelia humilis) and salt grass (Distichlis spicata) often occurring in equal abundance.

The salt marshes on both the east and west sides of San Francisco Bay are built on extensive alluvial deposits from the numerous streams draining the Santa Cruz and Mt. Hamilton Mountains. The marshes themselves are drained by an intricate network of small sloughs or tidal meanders with the smaller converging to form several major ones which empty into the Bay at the marshes' edge. Most of a clapper rail's life is centered around these tidal meanders.

TECHNIQUES

Field investigations were conducted between March and December, 1971. Nesting studies were concentrated from March to July. Nests were located by walking tidal meanders as described by DeGroot (1927) and by a modified rope drag method. In both cases, incubating birds were flushed and nests were located and described. Population indices were arrived at by rope drag, nest counts, call counts, and direct observation during flood tides. In both nesting and population studies rope drags were conducted using a 100 yard length of

#10, single ply nylon twine, marked with 3' lengths of red and yellow surveyors tape alternately attached to the rope at 12' intervals. Transect widths averaged 75 yards. Transects covered approximately 20 sq. acres and were run both parallel and perpendicular to the drainage pattern of the marsh. Transect acreage figures were computed from aerial photographs and topographic maps of the study area. Flushed rails were marked with reference to the colored tape on the rope and followed in flight so as to reduce duplicate counts. The area was searched for nests within a 15' diameter of the flushing site. Data were recorded on nest location, habitat type found in, nest construction, and clutch size.

Rails were also censused during flood tides (6.7'+) as described by Zucca (1954). On large sections of marsh (100 acres +) a flat bottomed boat was used to run transects through flooded marsh. Observation under flood tides was limited to between one hour before and one hour after slack tide. A recorded tape of clapper rail calls was used to induce calls for census purposes.

Habitat acreages were mapped from aerial photographs, aerial reconnaissance, relief maps, and field observations, and measured with a polar planimeter.

NESTING STUDIES

Eighty-seven nests were located during the 1971 season (73 by rope drag and 14 by walking tidal meanders). Active nesting was recorded between the middle of April to the middle of July. Peak nesting occurred during the first two weeks of May (Figure 2). When necessary, dates of first laying were determined by back-dating, allowing one day for each egg in the nest at the time of discovery (for clutches of less than 6 eggs).

Grinnell, et al (1918) reported egg laying dates from the middle of March to the end of June. Applegarth (1938) and Zucca (1954) reported the first nest in April with peak of nesting in May. Of the 87 nests, 58 were active when discovered. Five nests appeared new but without eggs (DeGroot, 1926 and Stewart, 1953 found rails to build as many as 6 duplicate or dummy nests for every one actually used), 19 additional were classified as old nests without eggs or old duplicate nests, and 5 nests with eggs were found destroyed.

DeGroot (1927) reported a second nesting period between June 25 and July 15 for the California clapper rail. Zucca (1954) also found a second nesting but attributes DeGroot's and his to renesting attempts as a result of first nesting attempts being destroyed by high spring tides. Similar studies on the Northern clapper rail of the east coast (Rallus longirostris crepitans) by Schmidt and McClain (1951) report a definite second nesting. A second nesting peak did occur this year between June 15 and July 15 (Figure 2) but was of a smaller magnitude than the major nesting period in May. A series of high tides on May 22-25 and June 19-21 of this year was sufficient to disrupt nesting at that time and probably accounted for the late peak in July. Reasons for the apparent second nesting attempts need further clarification.

Clutch Size

Fifty-eight active nests, containing 396 eggs, were found this year. Clutch size ranged from 3-11 eggs. A distribution of clutch sizes is presented in Figure 3. Nests which contained eggs but appeared abandoned or destroyed were not considered. Mean number of eggs per clutch, based on data taken from 58 nests, was 6.83. A comparison of 3 other studies of the California clapper rail in south San Francisco Bay shows a somewhat higher mean clutch size (Table 1).

Because nests were not followed to hatching during this study, mean clutch size was based on the number of eggs recorded at time of discovery, with many of these containing 3-5 eggs and obviously incomplete clutches. This would lower mean clutch size from that which probably occurred.

Structure of Nests

Four nesting habitats within salt marsh were recorded. These were classified as cord grass, pickleweed, salt grass, and mixed cord grass and pickleweed, based on the predominant

Table 1. Comparison of clutch sizes from four clapper rail nesting studies, south San Francisco Bay.

	DeGroot 1926	Applegarth 1938	Zucca 1951	Gill 1971
Number of nests:	74	27	27	58
Total # of eggs:	611	214	195	396
Mean # of eggs:	8.51	7.92	7.22	6.83
Range of clutch size:	5-14	6-9	5-9	3-11

Table 2. Summary of clapper rail transects, south San Francisco Bay (April - July, 1971).

Date	Location	Habitat type	size/ acres	Tide/ ht-ft.	# rails flushed	Density per acre
4-09-71	Greco Is., s.e. corner	Primary	32.60	2.5	14	0.43
4-14-71	Greco Is., middle	Secondary	22.30	0.0	11	0.48
4-16-71	Mouth, Coyote Crk., n. side	Secondary	25.80	-0.3	8	0.31
4-19-71	marsh, 1 mi. w. Coyote Hills	Primary	47.20	-0.3	21	0.45
4-23-71	" "	Primary	38.00	4.3	41	1.08
5-07-71	n. Mouth Mowry Sl.	Primary	7.6	4.2	8	1.05
"	" "	"	13.2	4.2	14	1.06
"	" "	"	8.3	4.2	7	0.84
5-10-71	Greco Is., s.e. corner	Primary	30.0	-0.6	13	0.43
5-11-71	Palo Alto marsh	Primary	10.1	2.9	7	0.69
5-14-71	Mouth, Coyote Crk., n. side	Secondary	41.60	5.0	29	0.70
6-06-71	Greco Is., n. corner	Primary	15.90	4.1	17	1.07
6-11-71	Mowry Sl., mouth s.	Primary	27.80	4.6	28	1.01

marsh vegetation in which the nests were located. Zucca (1954) gives detailed descriptions of each type of nesting habitat. All nests were constructed of dried cord grass with the exception of one made of dried salt grass. Sixty-nine of the 87 nests (79%) were located in pure stands of cord grass 2-3' tall. Ten were built in the bases of gumplant bushes, 6 in pickleweed, and 2 in mixed cord grass and pickleweed. Schmidt and McLain (1951) found 192 of 234 (82%) clapper rail nests located in tall stands of East Coast cord grass (Spartina alterniflora) during a two year study of clapper rails in New Jersey.

Hatching and Fledging Success

Because of the limited time available to observe each species during the survey, no data were taken on hatching or fledging success. Breeding success has previously been reported on by DeGroot (1927) and Zucca (1954) for the California clapper rail and by Adams and Quay (1958), Kozicky and Schmidt (1949), Schmidt and McLain (1951), and Stewart (1953 and 1954) for clapper rails on the East Coast.

POPULATION STUDIES

Rope Drag

Thirteen transects were run on 11 different sections of marsh (Table 2). All transects were run during the nesting season (April-July). No difference was found between transects run parallel or perpendicular to the drainage pattern of the marsh. Tidal conditions were found to affect transect results. Low tides exposed the overhanging banks of the tidal meanders and afforded rails excellent escape cover. Flushed rails showed a marked preference to fly opposite the direction of the drag. Of 218 rails flushed by this method, only 4 flew into the path of the drag.

Salt marsh habitat was classified as either primary or secondary according to vegetative type. Primary was composed of pure stands of cord grass while secondary was often pure stands of pickleweed or mixtures of cord grass, pickleweed, and other marsh vegetation.

Transects run on primary habitat during medium high tides produced densities ranging from 0.84 to 1.08 rails per acre. Those run on primary habitat during low tides ranged from 0.43 to 0.84 rails per acre.

Transects run on secondary habitat during medium high tides produced a density of 0.70 rails per acre while those run during low tides on secondary habitat ranged from 0.31 to 0.43 rails per acre.

Average densities for all transects run during high and low tides on both primary and secondary habitat are summarized in Table 2.

Call Counts

Censusing rails by call counts proved unsuccessful this year. Rails tended to stimulate calls from other rails creating a chorus effect making it hard to distinguish individual rails. This same problem was encountered by Adams and Quay (1958) and Bateman (1965). Rails were found to respond to recorded calls, but once a chorus effect was created it was impossible to get an accurate count. This method would be very effective in establishing the presence or absence of rails on a section of questionable marsh.

Visual Census at Flood Tides

This method was limited during the nesting season due to lack of sufficiently high tides during daylight hours. It did prove successful during November and December of 1971 when several excellent tides of 6.8'+ occurred in daylight. Census efforts were directed to a 90 acre section of marsh west of Coyote Hills, Alameda County. Rails were easily censused between one hour before and after slack tide when they were forced up out of the marsh onto floating debris. Censusing was done from a 12' flat bottomed boat run through sections of flooded marsh. A density of 1.42 rails per acre was found for a 35 acre section of marsh on December 24. Zucca (1954) using similar methods reports densities of 1.22 and 1.21 rails per acre during a two day census on a 63 acre section of primary salt marsh

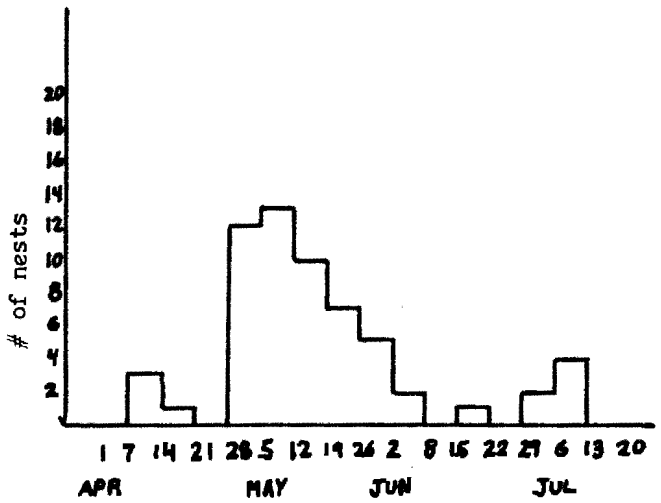

Figure 2. Nests found by weeks, California clapper rail, s. San Francisco Bay, 1971.

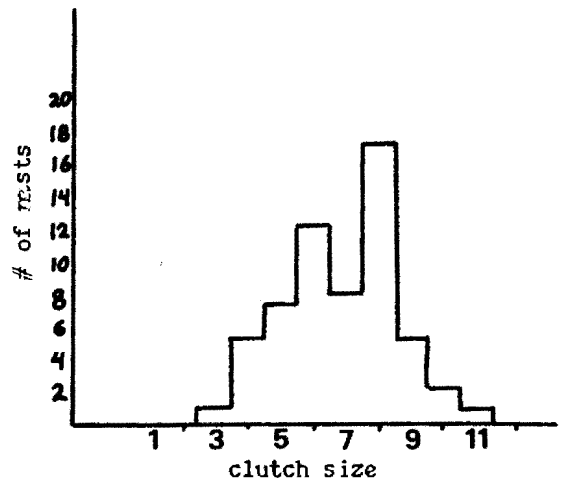

Figure 3. Distribution of clutch sizes, Calif. clapper rail south San Francisco Bay, 1971.

near the west end of the Dumbarton Bridge, San Mateo County. Censusing was done during high winter tides (6.9', 6.8') under "favorable conditions" with good visibility.

DISCUSSION

Total salt marsh in the study area was 4,250 acres. Approximately 1/10 (425 acres) is bare surface in the form of sloughs, creeks, and mudflats. Considering this, 1,950 acres were classified as primary rail habitat and 1,120 acres as secondary rail habitat. The remaining 746 acres, which comprised most of the brackish headwaters of the numerous sloughs in the study area, was considered poor clapper rail habitat.

Population projections based on the average densities found during medium high tides, on both primary and secondary habitat from rope drag techniques, put the number of rails within the study area at 2,750 with a range of 2,420-2,880. These figures represent the minimum rail populations in the study area since it isn't probable that all rails were flushed during transect operations.

Establishing population indices from visual census during flood tide conditions needs further investigation. Population investigations using this method produced densities inversely proportional to those obtained from rope drag, i.e. higher densities in pickleweed than cord grass. This, I feel, is the result of more floating debris being trapped in pickleweed than cord grass. Rails would tend to congregate in these areas of dense flotsam as the tide forced them up out of the marsh.

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Table 3. Average densities for primary and secondary clapper rail habitat during high and low tide conditions.

Habitat type; tide cond.	# of transects run	density range per acre	avg. density per acre
Primary; medium high	6	0.84-1.08	1.02
Primary; low tide	4	0.43-0.69	0.50
Secondary; medium high	1	0.70	0.70
Secondary; low tide	2	0.31-0.48	0.39