THE LITERATURE OF THE WESTERN CLAPPER RAILS

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THE LITERATURE OF THE WESTERN CLAPPER RAILS

By Sanford R. Wilbur
and
Roy E. Tomlinson

Patuxent Wildlife Research Center
California Field Station, Ojai, California

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Yuma clapper rail at Topock Marsh, Arizona. Photo by R. Tomlinson.

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Clapper rails (Rallus longirostris) are widely distributed in coastal marshes and river valleys of North and South America and the Caribbean. Seven of the 26 subspecies currently recognized by various authorities (Oberholser 1937; van Rossem 1947) occur in the western portions of the United States and Mexico (fig. 1). Three races are classified by both the Secretary of Interior (U.S. Fish and Wildlife Service 1974) and California Department of Fish and Game (1974) as "endangered" (i.e., in danger of extinction). These subspecies are the California clapper rail (R. l. obsoletus), the light-footed clapper rail (R. l. levipes), and the Yuma clapper rail (R. l. yumanensis).

Our investigations of these endangered forms included a review of pertinent literature and an examination of specimen data in selected museum collections. This paper deals primarily with the endangered forms but also attempts to describe the general relationships of all western clapper rails. Table 1 lists western clapper rail specimens in museum collections.

The taxonomic status of the western clapper rails is unclear. Distributional boundaries are still being defined (e.g., Banks and Tomlinson 1974). Moreover, some investigators believe all or part of the clapper rail group are conspecific with the king rail (Rallus elegans) (Meanley 1969; Dickerman 1971). Vocalizations of all Rallus elegans-longirostris are essentially identical, and variation in color, weight, and size is at least as pronounced among races as between species. The two species have been known to interbreed where their preferred habitats occur side by side (Meanley 1969). Both the California clapper rail and light-footed clapper rail were originally considered to be king rails (Ridgway 1874; Henshaw 1876), and Peters (1934) placed all three western races in the Rallus elegans group. Whatever their true systematic position, it is certain that each constitutes a geographically isolated population that must be individually protected and managed if it is to survive.

CALIFORNIA CLAPPER RAIL

Discovery and Nomenclature

The various naturalists of the Pacific Railroad Surveys found clapper rails at San Francisco Bay in the 1850's, although they considered them king rails. They were described as belonging to a separate race, Rallus elegans var. obsoletus, the type specimen being a bird taken at San Francisco in March 1857 by Dr. G. Suckley (Ridgway 1874). Later Ridgway (1880) decided that these were not king rails but "true" clapper rails found only in salt-water marshes. Because they were geographically isolated from other clapper

FIGURE 1. DISTRIBUTION OF WESTERN CLAPPER RAILS

Table 1

Locations of Western Clapper Rail Museum Specimens

Museum	Subspecies and Number of Specimens*								
	Obs.	Lev.	Yum.	Bel.	Rhiz.	Nay.	RxN	Unc.	Total
Univ. of Arizona, Tucson			2		6				8
California Acad. Sci., San Francisco	179	11				1			191
County Museum, Los Angeles	6	29		1				2	38
Moore Laboratory, Los Angeles		1			1	1	4		7
Natural History Museum, San Diego	8	31	1		22			38	100
San Bernardino Co. Mus., Bloomington		2							2
Natural History Museum, Santa Barbara	2								2
Mus. Vertebrate Zoology, Berkeley	81	15	7					14	117
Univ. of California, Los Angeles	15	27	2	1	16			1	62
Peabody Museum - Yale Univ., New Haven	5	1							6
Field Mus. Nat. Hist., Chicago	41	28		11					80
Univ. of Kansas, Lawrence					1				1
Louisiana State Univ., Baton Rouge	1				3			1	5
Museum Comp. Zool., Cambridge	23	18		14					55
Univ. of Michigan, Ann Arbor	28	10		1					39
Am. Mus. Nat. Hist., New York	37	7		4					48
Carnegie Museum, Pittsburgh	4	4		1				1	10
Acad. Nat. Sciences, Philadelphia	1	1							2
National Museum, Washington, D.C.	10	19	21	4	4	9	4	1	72
Royal Ontario Museum, Toronto	10	4							14
TOTALS	451	208	33	37	53	11	8	58	859

*Abbreviations: Obs., obsoletus; Lev., levipes; Yum., yumanensis; Bel., beldingi; Rhiz., rhizophorae; Nay., nayaritensis; RxN, rhizophorae x nayaritensis; Unc., Baja California specimens unclassified as to subspecies.

rails, he gave this group of birds full species status, Rallus obsoletus. When van Rossem (1929) combined all Pacific Coast clapper rails into one species, the California clapper rail became Rallus obsoletus obsoletus. A further revision by Oberholser (1937) placed all North American clapper rails in one species, and this race became Rallus longirostris obsoletus.

Description

The "typical" California clapper rail is larger and grayer plumaged than the southern California races. There are decided overlaps, and subspecific taxonomy is based as much on geographical distribution as on size or coloration (van Rossem 1929). Full descriptions and comparisons are presented by Bangs (1899), Grinnell et al. (1918), van Rossem (1929), and Ridgway and Friedmann (1941).

One case of "partial albinism" (large areas of white feathering on wings, back, and neck) has been reported in the literature (Cohen 1895). A similarly marked rail was captured and banded in November 1972 (Bruce Elliott, personal communication).

Distribution

Since at least 1915, the majority of California clapper rails have inhabited the shores of South San Francisco Bay in Alameda, Santa Clara, and San Mateo counties (Grinnell 1915; Grinnell and Wythe 1927; Grinnell and Miller 1944; Moffitt 1940; Gill 1972a, 1972b). They also occur sparingly in other portions of San Francisco Bay and possibly in nearby coastal marshlands (Gould 1973). A small population inhabits Elkhorn Slough and vicinity, Monterey County (DeSante and Remsen 1972; Varoujean 1973).

Outside the San Francisco Bay area, California clapper rails have been reported at Humboldt Bay, about 200 miles to the north (Storer 1915), and at Morro Bay, 150 air miles south (Brooks 1940). There have been no authenticated records for Humboldt Bay since 1947 (S. W. Harris, personal communication) or for Morro Bay since about 1942 (A. I. Roest, personal communication), but recent unconfirmed reports from both areas suggest that clapper rails may still occur there. The subspecific identity of Morro Bay rails is still disputed, but they are usually considered to be of this race.

Outside California, Dawson and Bowles (1909) listed several sightings for Washington State, but they considered these records questionable.

California clapper rails appear to be nonmigratory, but in at least some years there is considerable wandering in fall and early winter. During these seasons, clapper rails have been found some distance from the nearest salt marsh in residential areas, in farmlands, and on ocean shores (Anon 1936; Linsdale 1936; Anon 1937; Wythe 1937; Parmenter 1938; Orr 1939).

Life History and Habitat

Nesting

The nesting season begins in mid-March and extends into July (DeGroot 1927). Data for 128 museum egg sets indicate rather even distribution of nesting from 1 April through 10 May, with only six later records, but concentration of collecting activity during periods when eggs were most likely to be found may bias the data. DeGroot (1927) recorded a peak in nesting activity between 10 and 25 April, an almost complete cessation of nesting from 15 May to 15 June, then renewed activity during late June and early July. Applegarth (1938) and Gill (1972a) recorded a similar pattern, but the peak of activity was in May rather than in April. This difference in peak activity may indicate year-to-year differences in nesting chronology or may be a result of different methods of collecting data.

Late nesting attempts have been interpreted differently by separate investigators. DeGroot (1927) estimated that perhaps 50% of California clapper rails raise two broods per year. Zucca (1954) and Gill (1972a) suggested that late nestings resulted when first clutches were destroyed during high tides in May and June. Clapper rails in the eastern United States have been known to rear two broods successfully during a single season (Schmidt and McLain 1951; Blandin 1963). It may be that late nesting by California clapper rails includes both renesting attempts and second broods.

Clutch size

California clapper rail nests have been found with as few as 3 eggs (Gill 1972a) and as many as 21 (DeGroot 1927). However, some of the smallest clutches were incomplete, and the 21-egg nest was almost certainly used by more than one female. The reported range of apparently complete, single-female clutches is from 5 to 14 eggs, most commonly 6 to 10 eggs (Bryant 1880; Cohen 1895; DeGroot 1927; Applegarth 1938; Zucca 1954; Gill 1972a).

Nest location and construction

Nests are located on or near the ground, usually on a slight rise near a tidal slough; many well-defined trails lead from them to the water (Bryant 1880; Taylor 1894; Cohen 1895; DeGroot 1927). Early writers, almost without exception, described nests as occurring in pickleweed (Salicornia sp.) or at the base of gumweed plants (Grindelia sp.). Later studies showed regular use of cordgrass (Spartina foliosa) as a nest site (Zucca 1954; Gill 1972a). Zucca (1954) provided data to support his theory that time of nesting and tidal influence determine in part the type of vegetation used. He suggested that early nests are constructed before cordgrass growth has occurred, so that the dense gumweed is used for nest locations. High tides are least likely to affect pickleweed

nests because this plant grows at slightly higher elevations than either cordgrass or gumweed, so this cover is used for nestings interrupted by tidal flooding.

The nest itself is constructed of cordgrass and dead plant material (Zucca 1954). It is most often described as a "mass" or "heap" of vegetation (Bryant 1880; Cohen 1895; DeGroot 1927), but it may sometimes be deeply cupped and securely woven to the surrounding live vegetation (Emerson 1885; DeGroot 1927). DeGroot (1927) suggested that nests made in late June and July were woven to the surrounding vegetation in such a way that they would float up with the tide and therefore escape inundation. However, Zucca (1954) showed that, even though nests constructed of cordgrass have a certain buoyancy and do float, they seldom remain intact through a series of high tides.

Nesting habits

The California clapper rail apparently builds several nests, but uses only one (Adams 1900; Gill 1972a). Both sexes incubate the eggs, which hatch in 23 to 29 days (Applegarth 1938; Zucca 1954; Johnston 1956a). Hatching requires approximately 48 h after pipping (Johnston 1956a). Incubation probably begins with the laying of the last egg and ceases when the first egg hatches (Zucca 1954). However, eastern clapper rails apparently begin incubation 1 day prior to the laying of the last egg (accounting for the 24- to 48-h interval between the start and end of hatching), and continue until all eggs have hatched (Kozicky and Schmidt 1949; Schmidt and McLain 1951).

Nest success

No specific information is available on nest success of the California clapper rail. Norway rats (Rattus norvegicus)are known to have destroyed rail eggs, but there is disagreement as to the magnitude of loss. Cohen (1895) believed rats play havoc with the eggs and young, and other writers (Bryant 1880; DeGroot 1927) report substantial conflict between rats and rails. Zucca (1954) acknowledged that rats take eggs but noted that many nests close to rat runways go unharmed. He concluded that rat predation on nests was a minor problem. Other nest losses are attributed to unknown mammals (Bryant 1915) and to nest inundation by high tides (Zucca 1954).

Food and feeding habits

Stomachs of 18 clapper rails collected near Palo Alto, Santa Clara County, in February 1939, contained 85.5% animal matter (Moffitt 1941). The four major items found were: plaited horse mussel (Modiolus [Volsella] demissus), 56.5%; spiders, Family Lycosidae, 15%; clams (Macoma balthica), 7.6%; and yellow shore crabs (Hemigrapsus oregonensis), 3.2%. Also

represented were small numbers of snails (Ilyanassa obsoleta), nereid worms, and insects. Seeds of cordgrass made up 14.5% of the total stomach contents.

Food of clapper rails reported by other writers includes Macoma clams (Williams 1929), shore crabs (Cohen 1895; Grinnell et al. 1918), and "beach hoppers," Order Amphipoda (Test and Test 1942). During extremely high tides, clapper rails have been observed eating mice (probably Reithrodonotomys raviventris), which they captured or found dead (Sibley 1955; Bruce Elliott, personal communication). One vagrant clapper rail was observed eating earthworms on a residential lawn (Orr 1939).

When feeding, rails walk a few steps, thrust their beaks into the mud up to eye level, then walk a few more steps, and repeat their probing (Williams 1929). Food is dug out with the bill; in one reported case 41 loads of mud were removed before the prey was reached. Food is often washed before being swallowed. Small clams are swallowed whole, but larger ones are picked open and only the contents eaten. Apparently crabs are dismembered before being eaten (Cohen 1895; Grinnell et al. 1918).

Mortality

Adult rails are known to have been taken by two avian predator species. At least 20 instances of rail captures by red-tailed hawks (Buteo jamaicensis) have been observed (DeGroot 1927), and clapper rail remains have been identified in three samples of short-eared owl (Asio flammeus) pellets (Johnston 1956b). Rails probably are prey of other birds and mammals, but no other specific instances of mortality are recorded. Some rails died after having the shells of an introduced mussel (Modiolus demissus) close on their bills or feet (DeGroot 1927).

General behavior

The California clapper rail has been described as shy and elusive (Zucca 1954) and also as remarkably tame (Bryant 1880; Williams 1929; Orr 1939). They frequent dense vegetation and are reluctant to flush and, consequently, are often unnoticed; but when encountered in the open, they often are unsuspicious and sometimes can be closely approached. Williams (1929) observed rails feeding only 8 f (2.5 m) away from him, and these same birds regularly fed within 40 f (12 m) of a busy highway. One clapper rail at Golden Gate Park, San Francisco, allowed people to approach within 15 f (4.5 m) (Orr 1939).

Clapper rails swim well (Bryant 1880; Emerson 1885; Zucca 1954) and can apparently take flight readily from either land or water, although either occurrence is seldom witnessed. Bathing also has been observed (Williams 1929).

A light-footed clapper rail among the pickleweed at Upper Newport Bay, California. Photo by S. Wilbur.

Reasons for Decline

The California clapper rail has apparently always had a limited distribution but was at one time abundant within its range. "Thousands" were reported killed in a single day in 1859, some of which were served as a delicacy in San Francisco, and others were salted and shipped to the gold fields to feed meat-hungry miners (Medders 1972). Despite much harvesting, clapper rails continued abundant through the 1880's (Bryant 1880; Ray 1902; Cooke 1914), but by 1893, they had become so scarce in Alameda and San Mateo counties that supervisors declared a closed season on rail hunting (Cohen 1895). This decline was apparently the result of overharvesting, although some marshlands were being converted to grain production (Ray 1902). Rail numbers apparently increased following the several years of hunting closure, and the season was reopened (Cohen 1899). By 1913, when the Migratory Bird Treaty Act put an end to most rail hunting in California, the California clapper rail was considered to be nearly extinct (Bryant 1915).

Protection from overharvesting was apparently one of the main needs of the clapper rail because it began to increase "remarkably fast" in the years following 1913 (Bryant 1915). By 1930, rails were again plentiful in the marshes of San Mateo and Santa Clara counties (Medders 1972); by 1944, they regained much of their former abundance in many parts of the range (Grinnell and Miller 1944). Nevertheless, local populations were being reduced and eradicated because of loss of habitat. By 1925, marsh reclamation for agriculture, salt evaporation ponds, airports, industrial sites, and other uses of the land had made major inroads in clapper rail habitat (DeGroot 1927). This trend has continued in recent years; for example, about 75% of all marshland that existed around San Francisco Bay has been destroyed (U. S. Bureau of Sport Fisheries and Wildlife 1970).

Current Status

No estimate of the total California clapper rail population has been made. The population in South San Francisco Bay was estimated at 2,750 birds in 1971 (Gill 1972a), but there is evidence of considerable reduction in numbers since then (R. Gill, personal communication). South San Francisco Bay appears to contain the best rail habitat and supports the largest rail population. Probably 50% or more of the total California clapper rails are found in that area.

Until recently, California clapper rails appeared to be maintaining their populations. However, loss of their restricted habitat continues, and total numbers are probably being reduced. Some evidence exists that nesting success may also be declining (R. Gill, personal communication).

LIGHT-FOOTED CLAPPER RAIL

Discovery and Nomenclature

It is unclear when the light-footed clapper rail was "discovered." Henshaw (1876) described what were certainly clapper rails at Santa Barbara, California, in 1875, and called them king rails. Belding (1883) noted clapper rails breeding at San Quintin Bay, Baja California, which he considered to be the same species found farther north in California (Rallus obsoletus). Bangs (1899) described the light-footed rail as a new species (Rallus levipes), the type specimen of which was collected by Frank Stephens on 23 February 1886 at Newport Landing, Orange (then Los Angeles) County, California. Later it was shown that the Pacific Coast clapper rails were best considered as geographical races of a single species. The light-footed rail thus became Rallus obsoletus levipes Bangs (van Rossem 1929). Later, all North American clapper rails were included in one species, and the name of this form was changed to Rallus longirostris levipes (Oberholser 1937).

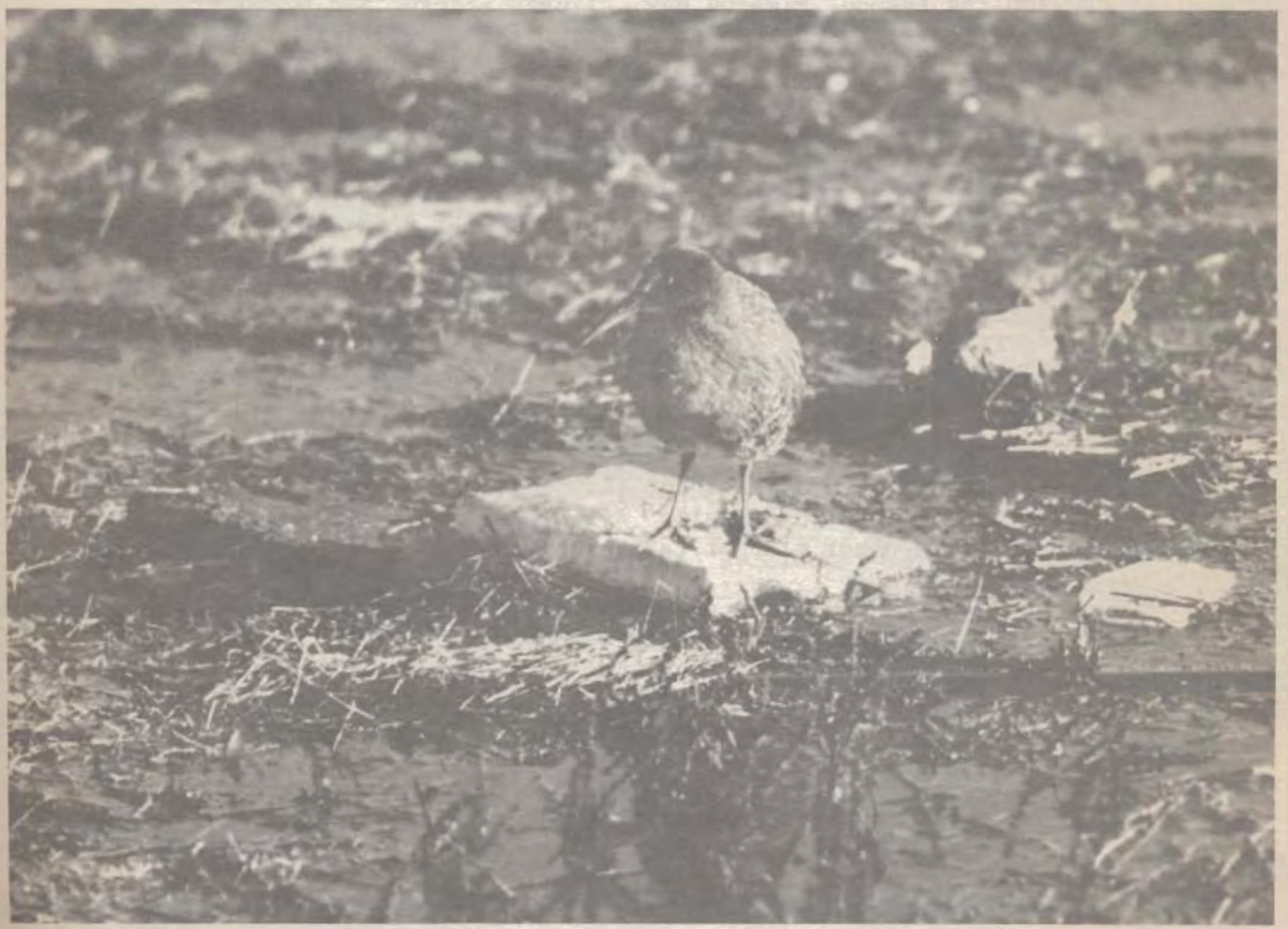
The subspecific identity of R. l. levipes is undisputed in the California segment of its range, but there is disagreement as to the extent of its occurrence in Baja California. The American Ornithologist's Union (AOU) Check-list (1957), following van Rossem (1947), considers clapper rails breeding at San Quintin Bay to be the subspecies R. l. magdalenae. S. D. Ripley (personal communication), who is currently reevaluating the clapper rails, does not recognize magdalenae as a valid subspecies and extends the range of levipes south to Scammons Lagoon and San Ignacio, where he believes it intergrades with R. l. beldingi.

Description

In general, the light-footed rail is intermediate among the western clapper rails in size and coloration. Its size is somewhat smaller than R. l. obsoletus and slightly larger than R. l. yumanensis. The coloration is characterized by brighter rufous-brown tones than are exhibited by the others. More extensive descriptions and comparisons are recorded elsewhere (Bangs 1899; Grinnell et al. 1918; Dickey 1923; van Rossem 1929; Ridgway and Friedmann 1941).

Distribution

The originally described range of this race extended from Santa Barbara County, California, to San Quintin Bay, Baja California, Mexico (Cooke 1914; Grinnell et al. 1918; Bent 1926). Later evaluations included no additional Santa Barbara records after 1875, so the northern distributional limits were set at Point Mugu and Hueneme, Ventura County (Grinnell and Miller 1944; AOU 1957). Disagreement over the identity of clapper rails in Baja California caused some authorities to consider the southern limit of the range as Ensenada, Baja California, although suggesting that some individuals might occasionally reach San Quintin Bay as winter stragglers (Friedmann et al. 1950; AOU 1957).



This light-footed clapper rail rests on a convenient chunk of styrofoam as high winter tides temporarily inundate the marsh at Tijuana Estuary. Photo by S. Wilbur.

Within the total range of this race (approximately 400 miles, 624 km, from Santa Barbara to San Quintin Bay, or 250 miles, 400 km, from Point Mugu to Ensenada), the rail population was originally discontinuous because the salt marsh habitat generally used by the rails occurred as scattered parcels. However, most salt marshes along the coastline were probably inhabited by clapper rails (Grinnell et al. 1918). They were apparently common near Santa Barbara (Henshaw 1876), and the numbers of skins and eggs in museum collections indicate they must have been common in the marshes of Orange and San Diego counties as well. Collectors also found clapper rails in various marshes in Los Angeles County and a few in the lagoons of northern San Diego County.

Light-footed rails currently occupy 12 California marshes: Goleta Slough and El Estero (Carpenteria Marsh), Santa Barbara County; Point Mugu, Ventura County; Anaheim Bay and Upper Newport Bay, Orange County; and Los Penasquitos Lagoon, Mission Bay, Tijuana Slough, San Diego River, and three localities in San Diego Bay in San Diego County (Wilbur 1974). Current status and distribution in Baja California is unknown.

Despite published inferences to the contrary (Friedmann et al., 1950; AOU, 1957), no evidence exists that the light-footed clapper rail wanders from its home marsh after the breeding season. The concept is apparently attributable to van Rossem (1947), who examined three clapper rail specimens taken at San Quintin Bay, Baja California, in midwinter and tentatively concluded that two races, a resident form (magdalena) and a casual winter visitor (levipes), were represented. The fall wanderings observed in the California clapper rail population at San Francisco Bay have never been noted in southern California.

Life History and Habitat

Very little has been written about the behavior, habits, and habitat requirements of the light-footed rail. Available information suggests they behave much like other clapper rails and have the same general needs.

Museum egg records and a few published articles indicate that nests are most often found on the ground under clumps of pickleweed (Salicornia sp.), on the elevated banks of tidal channels close to water. They are usually well concealed and often have well-defined runways leading from the nest to water (Edwards 1922; Bent 1926). Less typical nests have been found as far as one-half mile from water (Edwards 1922), among dead branches formerly part of a hunting blind, alongside a dead hog on a dry sandy beach (Bent 1926), and in a freshwater marsh several miles from the ocean (Willett 1906). The last named is the only reported record of light-footed rails nesting in a freshwater situation.

The nest itself is usually composed of dry grasses and bits of pickleweed. It may be well constructed but more often seems to be a loose assemblage of whatever happens to be at the site (Bent 1926).

Nesting occurs from mid-March to June. Sixty-three apparently complete egg sets (primarily in the collection of the Western Foundation of Vertebrate Zoology) bear collection dates between 20 March and 2 June; 40 of these were collected between 12 April and 7 May, and only one was collected after 23 May.

We examined 55 egg sets which included 3 to 11 eggs each; 75% (41) contained 6 to 8 eggs, and 95% (52) ranged from 5 to 9 eggs. Another study showed clutch size to vary from 4 to 9 eggs, the usual set having 5 to 7 eggs (Edwards 1922).

Little is known about nesting behavior, development of the young, or about the enemies of the light-footed rail. Both sexes are believed to share incubation, and the young can apparently run and swim the day they hatch (Bent 1926). Nests have been destroyed by rats and by high tides (L. B. Howsley, field notes). There are no recorded instances of predation on young or adults.

Reasons for Decline

By 1915, ornithologists were beginning to speak of the scarcity of light-footed rails in southern California. Willett (1912) believed the rail was "becoming scarcer every year", and Grinnell (1915) noted that "in many marshes where it formerly occurred commonly it is now unknown." Grinnell et al. (1918) and Stephens (1919) felt it was then almost completely gone from Santa Barbara and San Diego counties, respectively.

Early losses in Santa Barbara and San Diego counties were attributed to overshooting. Because rails could be taken easily by a meat hunter at high tide, overharvesting may have occurred in some areas (Bent 1926). However, major losses occurred as the result of alteration and destruction of habitat. Edwards (1922) describes one area which in 1 yr had "close to a dozen nests" and the next year was buried under several feet of dredged mud and sand. In 1934, Howsley (unpublished field notes) found an oil derrick at a site that had been occupied by clapper rails in 1932. Dredging and filling continued at an accelerated rate until there were only about 8,500 acres (3,440 h) of salt marsh between Santa Barbara and the Mexican border, an area that formerly had an estimated 26,000 acres (10,520 h) of salt marsh (Speth 1971). Several areas known to have supported large populations of clapper rails were especially affected: San Diego Bay, reduced from 2,450 acres (990 h) to 360 acres (145 h); Mission Bay, from 2,400 acres (970 h) to 21 acres (8.5 h); and the Los Angeles-Long Beach area, from 6,800 acres (2,750 h) to 70 acres (28 h) (Speth 1971).

Current Status

The California population of light-footed clapper rails includes fewer than 1,000 individuals, possibly as few as 500 (Wilbur 1974). Only two areas, Anaheim Bay and Tijuana Slough, appear to support more

Land fills to hold apartment complexes are among the many current threats to light-footed rail habitat. This one is at Tijuana Estuary, California. Photo by S. Wilbur.

than 100 rails each (Romero 1972; Wilbur 1974). The two next largest populations, at Upper Newport Bay and Los Penasquitos Lagoon, probably do not exceed 50 birds each (Sexton 1972; Wilbur 1974).

Rail habitat continues to be lost to dredging, filling, marina and highway development, and similar construction. Only a very few salt marshes remain in the range of this subspecies that can be considered really secure. Whether the light-footed rail survives within the United States may well be decided within the next few years.

YUMA CLAPPER RAIL

Discovery and Nomenclature

The Yuma clapper rail was described from specimens collected by May Canfield and L. M. Huey near Laguna Dam, Imperial County, California, on 15 May 1921, (Dickey 1923). An earlier specimen had been collected by Herbert Brown at Yuma, Arizona, on 25 August 1902, (Cooke 1914; Banks and Tomlinson 1974).

Like the other clapper rails, the taxonomic position of the Yuma clapper rail has been changed several times. First misidentified as Rallus levipes (Cooke 1914), it was described as a full species by Dickey (1923). Later taxonomic revisions resulted in name changes to Rallus obsoletus yumanensis (van Rossem 1929), and finally, to Rallus longirostris yumanensis (Oberholser 1937), the name it retains today (AOU 1957).

Description

The Yuma clapper rail is generally the most slender and pale of the western clapper rails, but there is considerable overlap in color and measurements with R. l. levipes. Further descriptions are found in Dickey (1923), Bent (1926), van Rossem (1929), Oberholser (1937), and Ridgway and Friedmann (1941).

Distribution

In the United States, Yuma clapper rails are found in marshes along the Colorado River from near Needles, San Bernardino County, California, south to the Mexican border. They also occur at the Salton Sea, Imperial County, California, and near Phoenix, Maricopa County, and Tacna, Yuma County, Arizona. The Colorado River population extends into the Colorado River Delta of Baja California and Sonora, Mexico. Distribution within this area varies from year to year with changes in local water conditions (Tomlinson and Todd 1973).

The Yuma rail differs from other western clapper rails in that it breeds almost entirely in freshwater habitat and is migratory. Except for

Typical mudflat feeding area for Yuma clapper rails. Vegetation is a mixture of cattails and three-square bulrush. Photo by R. Tomlinson.

stragglers, the Yuma rail is gone from the United States from October until late April (Tomlinson and Todd 1973). Those that migrate probably winter in inland and coastal marshes in Mexico (Banks and Tomlinson 1974).

Life History and Habitat

Habitat

Along the Colorado River and at the Salton Sea, Yuma rails reside in shallow, fresh-water marshes containing dense stands of cattail (Typha latifolia) and bulrush (Scirpus acutus). In the Colorado River Delta, Tomlinson and Todd (1973) reported that the rails inhabit brackish water areas dominated by salt cedar (Tamarix sp.) and iodinebush (Allenrolifa occidentalis). During the winter, the birds apparently utilize either freshwater or saltwater habitats (Banks and Tomlinson 1974). Unlike most clapper rails, this race thus seems to have adapted to fresh, brackish, and saltwater situations. Preferred habitat everywhere includes mudflats and shallow water for feeding (Tomlinson and Todd 1973).

Behavior

As soon as rails return to the breeding areas, courtship activities begin. Males give a territorial "kek" call before and during the initial stages of nesting. They also emit other calls for various purposes during and after the breeding season as Meanley (1969) described for the king rail (Tomlinson and Todd 1973). The "clatter," or "primary advertising" call is usually given in unison by a male and his mate. At times, a whole marsh comes alive with these calls from several pairs.

Nesting

The duration of the nesting season is unknown. At the Salton Sea, incomplete clutches were found during the first week in May, and full clutches by 11 May (Abbott 1940). A full clutch of unhatched eggs was found on 25 May. The average clutch size of four completed nests was 6.5 eggs.

Two types of nest construction have been described. Three nests were composed of sticks with a few dead leaves attached and two were on finer stems with dry blossoms still intact. Two nests were on dry hummocks, and three were in forks of small shrubs just above the water in dense cattail-saltcedar associations. The water depth at the nests varied from a few inches to "knee-deep" (Abbott 1940).

Hatching dates and nesting success are unknown. Two broods of three young each were observed on 17 July 1948, (Phillips et al. 1964) and on 23 June 1969, (Tomlinson 1969).

Cattail marsh in Topock Gorge area of Colorado River. Areas like this support one or two breeding pairs of Yuma clapper rails. Photo by R. Tomlinson.

Food habits

Preliminary results of a study made by the junior author of 18 Yuma rails collected in 1971 indicate that crayfish of two or more genera constitute a major food item. Other food items were small fish, isopods, snout beetles (Curculionidae) and water beetles (Hydrophilidae), a small clam (Corbicula sp.), dragonfly and damselfly nymphs, other insects, and small seeds.

Reasons for Decline

It is uncertain whether Yuma clapper rail numbers have declined. (U. S. Bureau of Sport Fisheries and Wildlife 1973; Tomlinson and Todd 1973). They have apparently never been subjected to heavy hunting or collecting pressure; only 16 museum specimens existed before 1968 (Tomlinson 1969), and 18 additional specimens were collected in 1971 (Banks and Tomlinson 1974). Marshland habitat has been destroyed by reclamation projects, but other favorable habitat has been created as a result of dam construction (Tomlinson and Todd 1973) and development of Imperial Valley marshland following the refilling of the Salton Sea in 1906 (Hosmer 1966). It may be that Yuma clapper rails have a greater geographical distribution now than at any other time in recent history.

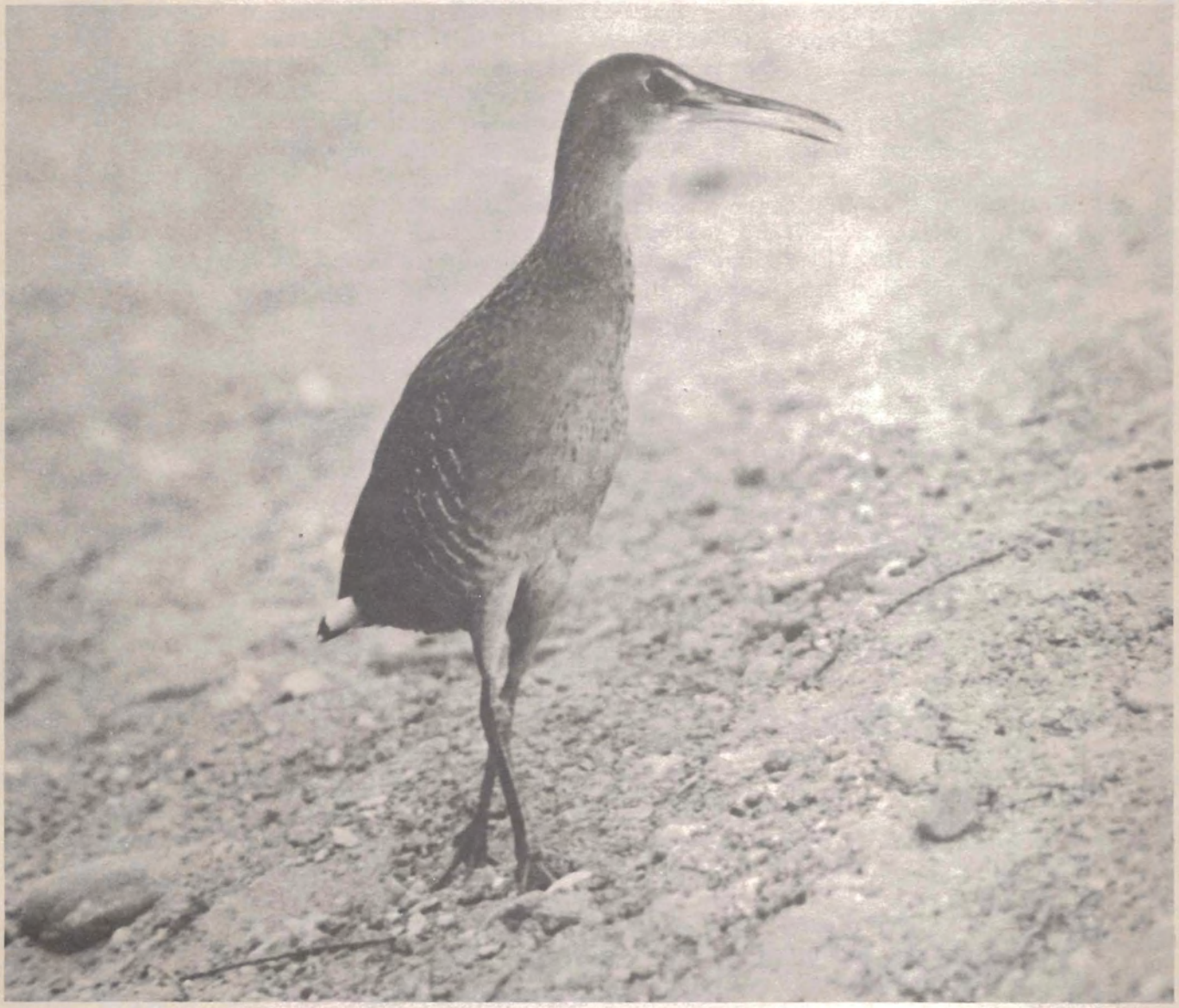
Current Status

An extensive survey in May 1973 resulted in the location by sight or sound of 910 Yuma clapper rails, which indicates that the total population exceeds 1,000 birds (R. Tomlinson, unpublished data. Of the 910 birds recorded, 161 were in the Havasu National Wildlife Refuge (NWR), 44 in Cibola NWR, 132 in Imperial NWR, 56 in Mittry Lake Arizona Wildlife Management Area, 31 in marshes just south of the Salton Sea, 145 in the Colorado River Delta in Mexico, and 341 along other sections of the Colorado River and its tributaries.

The Yuma clapper rail does not appear to be immediately threatened with extinction, but population levels should be monitored carefully. Reclamation projects, mosquito control activities, and other occurrences may affect the welfare of this bird.

DISCUSSION

The light-footed rail is certainly the most endangered of the western clapper rails and is in need of immediate action to preserve its remaining population. Even though the California and Yuma clapper rails are not as immediately threatened, they do require careful long-range management. Concern should not stop with these three rails, because essentially all king rail-clapper rail populations face similar serious limiting factors which are directly related to man's activities. Most destructive are "reclamation" projects that destroy marshes directly by converting them



Sonoran clapper rail in mangrove swamp, Punta Sargento, Sonora, Mexico. Photo by R. Tomlinson.

to other uses or by diverting the water from the marsh to other areas. Agricultural, recreational, commercial, and residential "development" are all significant modifiers of marshland habitat. Such loss is well known and evident in some areas, as along the California coast, but it is occurring also in less familiar locations. For instance, recent construction activities in northern Mexico have eliminated several swamps which were excellent clapper rail habitat.

Another significant danger to rails is the use of insecticides to control biting and disease-carrying insects. Insecticides can kill birds directly, may modify their capacity to complete their reproductive cycle, or may kill invertebrate animal populations on which they feed. Polluting agents such as sewage, herbicides, other chemicals, and litter threaten clapper rails in a variety of ways.

Preserving marshlands for clapper rails yields additional benefits because many other forms of fish and wildlife depend directly or indirectly on such habitat. Marshes can be important recreational and educational areas, especially those close to communities that have retained little other open space. Marshlands also play a vital role in oxygen and energy exchanges that are essential for humans as well as for wildlife. Consideration of the welfare of the clapper rails equates to consideration of our own well-being.

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