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Status of the Yuma Clapper Rail *(Rallus longirostris yumanensis)* in the northern Mojave Desert compared with other parts of its range

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INTRODUCTION

The Yuma Clapper Rail (*Rallus longirostris yumanensis*) is almost entirely restricted to the lower reaches of the Colorado River and its tributaries, roughly extending from the Virgin and Muddy Rivers in Arizona and Nevada to the Colorado River Delta area including the Cienega de Santa Clara in Mexico. Smaller, separate populations also occur in the Salton Sea and the Phoenix area. This subspecies of the Clapper Rail primarily nests in permanent and semi-permanent freshwater marshes (Eddleman and Conway 1998) that usually are dominated by cattail (*Typha* spp.) and bulrush (*Scirpus* spp.) and sometimes have been invaded by salt cedar (*Tamarix* spp.; Todd 1986, Eddleman 1989). Yuma Clapper Rails probe in marshy areas primarily for crustaceans, such as crayfish (*Procambarus clarki* and *Orconectes* sp.), and other invertebrates (Ohmart and Tomlinson 1977).

Historically, the lower reaches and delta of the Colorado River were thought to be dynamic due to high spring flows, rapid siltation rates, and high evaporation rates in the summer (Grinnell 1914), suggesting that local habitat availability for Clapper Rails was also dynamic. Marsh habitat was restricted to areas of sustained surface water, such as slow portions of the river channel, oxbows or lagoons, and swampy areas in the lower reaches of the Delta (Kiffen, 1929 *in* Ohmart, 1982). The lower Colorado River region has experienced profound changes over the past century, such as the construction of dams and reservoirs, changes in flows and course of the river, and establishment of agriculture, diversions, and other permanent infrastructure in the floodplains. Most remaining marsh habitat occurs around water impoundments and agricultural runoff areas based on recent vegetation mapping projects (CECARENA 1998). The most prominent example of an irrigation-runoff supported wetland is the Cienega de Santa Clara in Mexico, which supports a population of 5300 clapper rails based on recent estimates (Piest and Campoy 1998).

It is difficult to estimate how many Yuma Clapper Rails were present

prior to development of the lower Colorado River region. The Clapper Rail is a secretive marsh bird whose behavior and habitat does not facilitate casual observation. The only historic population data available are occasional anecdotal observations between 1902 and 1972 (Todd 1986). In March of 1967, the Yuma Clapper Rail was listed as endangered by the Secretary of the Interior (U.S. Department of Interior 1968). It was also listed as rare by California in 1971 (Leach and Fisk 1972) and as endangered in Arizona (AZ Dept. of Game and Fish Commission 1978). After the subspecies was listed as federally endangered, population inventories were conducted on a regular basis since 1973 throughout the known extent of its range.

In the late 1990s, Clapper Rail inventories were expanded into additional areas of the northern Mojave Desert by several governmental and private entities, including the Bureau of Reclamation Lower Colorado Region (Reclamation) and the Southern Nevada Water Authority and their contractors from SWCA Environmental Consultants and the San Bernardino County Museum, as well as the Nevada Department of Wildlife. The newly inventoried areas included two Colorado River tributaries, the Virgin River from Littlefield, Arizona, to its Lake Mead delta in Nevada, and the Muddy River near Overton, Nevada. Also newly inventoried are where the Las Vegas Wash and an isolated spring system in the Ash Meadows National Wildlife Refuge (Fig. 1). In this article, we compare the results of these inventories with similar inventories in other parts of the subspecies' range, and analyze abundance patterns in space (across five regions of the subspecies' range) and in time (among years). We will discuss these patterns in the context of historic changes to Yuma Clapper Rail habitat and their implications for species conservation.

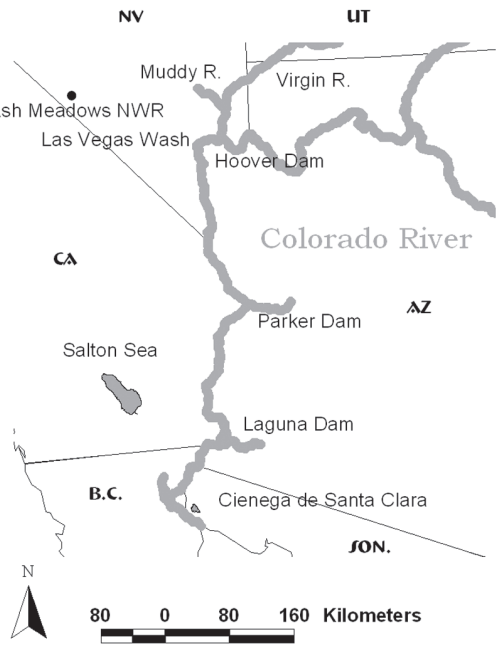

Figure 1. General area map of Yuma Clapper Rail populations.

DESCRIPTION OF NEW SURVEY AREAS

The areas surveyed along the Virgin and Muddy Rivers are located in Clark County, Nevada, and in Mohave County, Arizona, including the downstream end of Beaver Dam Wash (Fig. 1). The marsh vegetation along both rivers is dominated by cattail (*Typha domingensis*) and bullwhip bulrush (*Scirpus californicus*), with some patches of tamarisk. Both rivers have perennial flows. The Virgin River channel and floodplain are comparatively unaltered, while on the Muddy River, canals and flood control structures have been extensively installed for agricultural purposes.

Las Vegas Wash extends from within the city of Las Vegas through the city of Henderson and into Lake Mead (Fig. 1). The area is approximately 405 ha and is dominated by tamarisk and includes a combination of public and private lands, most of which are now protected.

Ash Meadows National Wildlife Refuge (NWR) is located approximately 90 miles northwest of Las Vegas in the Amargosa Valley of southern Nye County (Fig. 1). It consists of an extensive, but hydrologically isolated spring system that supports cattail and bulrush marshes and a variety of riparian woodlands.

SURVEY METHODS

All agencies and consultants involved in the Clapper Rail surveys reported here followed a standardized survey protocol developed by the US Fish and Wildlife Service (USFWS) in 1983 and modified in 2000. The surveys were performed a minimum of two, and by some agencies three times between 15 March and 31 May of 1999 – 2003, with intervals of at least one week between each survey. The number of individuals detected was averaged across survey periods to determine the average detections per year. Surveys were conducted from 30 minutes before, until 3 hours after sunrise and were not conducted in winds greater than 16 kilometers-per-hour due to increased difficulty in hearing the rails. For the surveys, standardized playback recordings of Yuma Clapper Rail vocalizations provided by the USFWS were broadcast using a tape player at 80 decibels to elicit responses. Surveyors approached the edge of the marsh, waited and listened for one minute, played clapper rail “kek” and “clatter” calls for two minutes, listened for two minutes, played the tape for another two minutes, listened for one minute, and then moved on to the next survey point for a total of eight minutes of survey time at each location. All Yuma Clapper Rail vocal responses and sightings were recorded individually, with pairs noted when present. Surveys at Las Vegas Wash, Ash Meadows NWR, and the Virgin and Muddy Rivers were conducted on land by walking transects along the shores of the marshes. At other sites along the Lower Colorado River, flat-bottomed, lightweight power boats were generally used to access the survey areas.

SOURCES OF OTHER SURVEY DATA

To review the results of the newly inventoried areas in comparison with similar data from other parts of the Yuma Clapper Rail's distribution, we compiled data that were collected according to the same survey protocol and were provided to us by the Arizona Ecological Services office of the U.S. Fish and Wildlife Service. For between-area comparisons, we used the number of individuals confirmed during playback surveys as a measure of minimum population size present at a survey site. This measure is not necessarily close to the real population size (Conway et al. 1993), but given the standardization of survey methods, we assume that the measure is sufficiently correlated with the true population size for the purpose of large-scale comparisons. To determine abundance patterns in space, we subdivided the extant Yuma Clapper Rail distribution into five regions (Fig. 1): (1) the middle Colorado River and its tributaries, i.e., all sites upstream Hoover Dam and Lake Mead, (2) the Hoover Dam to Parker Dam section, which includes sites along the Colorado River and its tributary the Bill Williams River, (3) Parker Dam to the Southern International Border (SIB) with Mexico, including the main stem of the Colorado River and its tributaries, (4) the Salton Sea/Imperial Valley area, and (5) in Mexico, the Colorado River Delta area and the Cienega the Santa Clara. To determine abundance patterns in time, we calculated the Coefficient of Variation in annual detections for each of the five regions in order to be able to directly compare annual fluctuation in abundance among the regions of the Clapper Rail's range. Also, we reviewed literature on the species that was available to us, both published literature and unpublished agency reports, to evaluate the findings in the context of the whole population's distribution.

RESULTS

Results are summarized in Table 1. When averaging all available data across years, an average of 963 detections were made annually throughout the five regions of the Yuma Clapper Rail range (although this overall average is somewhat compromised by incomplete data, see Table 1). The majority (90%) of these detections were from the three southern-most regions, the Colorado River reach extending from Parker Dam to the SIB with Mexico, the Salton Sea area, and the Colorado River Delta and the Cienega de Santa Clara in Mexico. Based on recent surveys of the northern-most populations, i.e. upstream of Hoover Dam, the Virgin River area has the largest Yuma Clapper Rail concentration within the newly surveyed areas (Micone and Tomlinson 2000; McKernan and Braden 2001; McKernan and Carter 2002; Rathbun and Braden 2003; Z. Marshall, pers. comm., 2004). However, the number of birds detected varied greatly from year to year (range 0 - 29) at this site. The Muddy River, Las Vegas Wash, and Ash Meadows NWR each had one to a few detections in some years, and none in others (Table 1; Micone and Tomlinson 2000, Gallagher et al 2001, McKernan and Braden 2001, McKernan and Carter 2002, Rathbun and Braden 2003), suggesting a scarce distribution among these sites.

Table 1. Summary of minimum population sizes in the newly surveyed and other areas of Yuma Clapper Rail distribution. Data were compiled from several sources as identified in the text. (-): data were not available.

Area/Survey Sites	1996	1997	1998	1999	2000	2001	2002	2003	Average
Middle Colorado River / Nevada (new survey sites)									
Virgin River	-	-	-	0	29	15	5	3	10.4
Muddy River	-	-	-	1	3	0	7	3	2.8
Las Vegas Wash	-	-	1*	1	0	0	0	0	0.2
Ash Meadows NWR	-	-	-	1	0	0	0	0	0.2
Total	-	-	-	3	32	15	12	6	13.6
Hoover – Parker Dams									
Mohave Division**	0	0	0	0	0	-	-	-	0
Topock Marsh	33	32	48	45	41	36	18	-	32.7
Topock Gorge	20	24	31	43	30	35	26	56	33.1
Havasu Division	4	0	1	9	-	-	7*	-	4.2
Bill Williams R. NWR	15	14	-	11	0	8	6	-	9
Total	72	70	80*	108	71*	79*	57*	56*	83.3
Parker Dam to Mexican Border									
Parker Division	0	0	-	5	-	0	0	-	1
Palo Verde Division	0	0	-	2	-	9	-	-	2.8
Cibola NWR	-	41	61	89	39	31	56	-	52.8
Imperial Division	117	104	1	10	23	17	13	-	40.7
Imperial NWR	43	31	59	51	11	26	54	-	39.3
Laguna Division	102*	119*	65*	87*	90*	53*	60*	-	
Yuma Division	11	1	-	6	-	2	-	-	5
Limitrophe Division	17	6	-	0	-	-	2	-	6.3
Lower Gila River	9	7	0	1	0	17	-	-	5.7
Phoenix Area	32	20	7	15	11	44	57	-	26.6
Picacho Reservoir	1	2	2	0	-	0	-	-	1
Total	332*	331*	195*	266*	174*	199*	242*	-	248*
Salton Sea Area									
Imperial WA	239	211	185	191	161	195	234	-	202
Salton Sea NWR	83	63	61	67	69	49	94	-	69
Salton Sea area	42	29	26	18	4	4	3	-	18
Total	364	303	272	276	234	248	331		289
Mexico* **									
Cienega de Santa Clara	-	-	-	313	305	-	-	-	309
Lower Colorado Delta	-	-	-	7	33	-	-	-	20
Total	-	-	-	320	338	-	-	-	329

* Includes incomplete survey data.
** Includes Laughlin Bay, the historically presumed northern-most occurrence of Yuma Clapper Rail.
*** Data from Hinojosa-Huerta et al. (2001), including only the "early breeding season" surveys, which were most comparable to other data presented here.

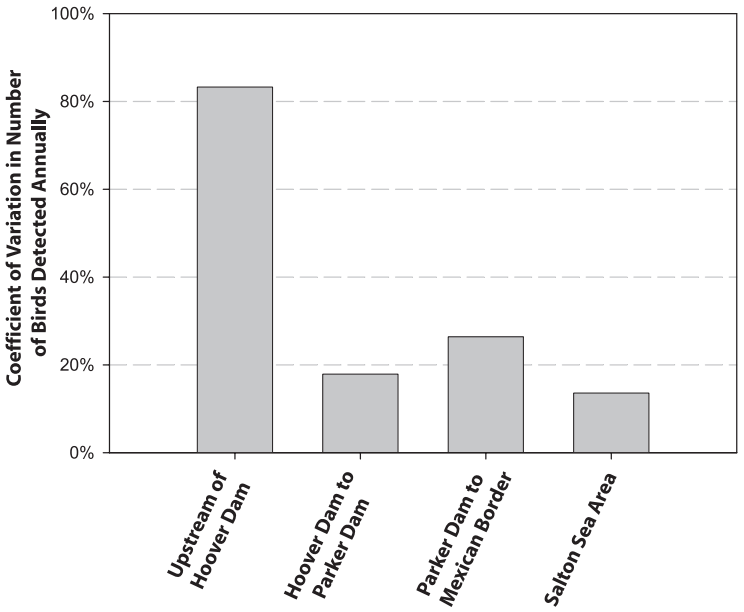

Figure 2. Coefficient of variation in numbers of Yuma Clapper Rails detected annually in four survey areas within the U.S.

The Coefficient of Variation describing annual population fluctuation was highest in the northernmost area, i.e., upstream of Hoover Dam, of the subspecies range (83% compared with 14-26% in the other areas; Fig. 2).

DISCUSSION

The data reviewed here suggest that the population center of Yuma Clapper Rail resides in the lower reaches of the Colorado River and that the range of this subspecies extends much farther north than previously assumed. Modifications to its primary habitat, permanent freshwater marshes, have been so extensive that it is difficult to estimate their effects on Clapper Rail distribution and abundance. The Yuma Clapper Rail was discovered in 1921 (Dickey 1923) in the vicinity of Laguna Dam near Yuma, Arizona. Yuma Clapper Rails were also sighted further north from Laguna Dam a few years after Imperial, Parker and Headgate Rock Dams were completed in 1939, 1938, and 1942 respectively (USFWS 1983). Laurence M. Huey (in Bent 1926) speculated that the Yuma Clapper Rail historically extended and contracted its range during wet and dry years from a population center in the lowest reaches of the Colorado River, an area which Leopold (1949) described as “green lagoons” during his 1922 trip

to the Delta and which had permanent marshes most times. In an early literature review on the subspecies, Ohmart and Smith (1973) argued that impoundments allowed the population to expand north of its original range and predicted that it would be found in Nevada in the future.

Pockets of permanent wetlands historically existed in the northern part of the Clapper Rail's range as well, such as in Ash Meadows, along the Virgin and Muddy Rivers, in Las Vegas Valley, and in other small areas that had year-round water from springs and other sources. Unfortunately, historic data are not available on Clapper Rail occurrences at these sites aside from a single report of eight "clapper rails" in 1959 at the Las Vegas Sewage disposal drainage ditch (Alcorn 1988). Therefore, it is unclear, whether these peripheral populations are historic or whether they are recent arrivals from a population expansion across impoundments along the lower Colorado River.The data reviewed here indicate that these northern-most populations are fairly isolated from the core populations along the Colorado River (see also Gallagher et al. 2001). Their large annual fluctuations in abundance (Fig. 2) could be a result of isolation alone, but could also be related to locally fluctuating habitat conditions (Rathbun and Braden 2003).

The findings presented here need to be confirmed in future analyses and surveys that also address the issue of how detection rates are influenced by a variety of factors (Conway et al. 1993, Hinojosa-Huerta et al. 2001). Here we assumed that the number of detected individuals is an adequate index of true population sizes and their differences; however, it should be noted that only 40 percent of the individuals present at a site were detected in similar surveys (Conway et al. 1993), so the absolute population sizes are likely to be quite different from the numbers presented here.

Today, the Yuma Clapper Rail is most abundant in areas of the lower Colorado River that are heavily influenced by dams and associated infrastructure. The challenge in preserving this species therefore lies in maintaining adequately functioning habitats in a highly modified environment and in face of growing pressure from urban centers on the resources of this region. The recent discovery of small isolated populations at the northern edge of the subspecies' range raises an interesting set of questions: Did they arrive recently due to a population expansion, or have they always been there? Are they genetically different from the core population along the main stem of the Colorado River? Do they form a metapopulation with the other populations? The high variability observed in their annual abundance may be typical of a peripheral population, but could also be compounded by ephemeral resource availability. Further study is needed to clarify these issues.

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