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LIGHT FOOTED CLAPPER RAIL CENSUS AND STUDY, 1992

by

Richard Zembal

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CONTRACTOR

California State University, Long Beach Foundation
Long Beach, California 90840

AUTHOR AND
PRINCIPAL INVESTIGATOR

Richard Zembal

PROJECT ADMINISTRATOR

Dr. Charles T. Collins
Department of Biology
California State University
Long Beach, CA 90840

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Research Associate, California State University, Long Beach

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ABSTRACT

The thirteenth consecutive annual census of the endangered Light-footed Clapper Rail (Rallus longirostris levipes) was conducted by call counts throughout the bird's range in California, 9 March - 29 April 1992. There were 275 pairs of Clapper Rails exhibiting breeding behavior in 13 marshes, a 17% increase over 1991. One hundred and thirty-six pairs, or 49.4% of the state total, were detected at Upper Newport Bay. There were dramatic increases in the Tijuana Marsh National Wildlife Refuge (NWR), Seal Beach NWR, and some recovery at Kendall-Frost Reserve. Most of the subpopulations are small and face serious problems that should be dealt with through increased management and the provision of additional habitat or they will be lost. There is little security in the continued existence of the Light-footed Clapper Rail without several large viable population centers.

High tide counts were continued on the Seal Beach NWR and 159 Clapper Rails were sighted in November. This is the highest count by sightings ever reported for one marsh in a single day. Effective control of nonnative red foxes (Vulpes vulpes) allowed the manifestation of the Clapper Rail's high reproductive potential and is leading to the recovery of this important subpopulation. With proper management, rails could establish on the adjacent State Ecological Reserve at Bolsa Chica.

Ten trapping sessions at Upper Newport Bay with 15 - 19 drop-door traps and 527 trap-hours, resulted in the capture and unique color-banding of 28 more Clapper Rails and 2 recaptures. There were 46 resightings of 13 banded rails. The average movement detected of 12 of these rails was 47 meters. The largest spread of detection points for any rail was of 2,282 meters. This rail was a first-year bird that moved through half of Upper Newport and then established itself in one locale where it was observed repeatedly. The longest time span between banding and resighting

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of any one of the 163 rails banded since March 1981 has been 5 years. The longest banded of the 13 Clapper Rails resighted in 1992 was a female banded in 1988. Histories of some of the resighted rails are related, banding success over the 11 years of banding is compared, and resightings of banded rails are summarized for the 10 banding sessions accomplished 1981 - 1991. Over half of the 135 rails banded during this period were reencountered and 14% of the 129 rails captured in drop-door traps were recaptured in them, 1 hour to 27.2 months later.

Fifty-three Clapper Rail nests were found on the 80 rafts made available in the Seal Beach NWR. Thirty-two of the nests held 42 clutches of eggs and there were at least 12 additional brood nests. Recruitment was very high due to decreased predation. Hatching success was 73% for initial attempts and 95% for renests. There were at least 2 additional incubation nests in the marsh placed in large tumbleweeds. The 15 nesting rafts deployed at the Kendall-Frost Reserve contained 10 Clapper Rail nests and at least 11 clutches of eggs. Hatching success was 90% - 100%. More rafts are recommended for both these wetlands and three others.

Late rains caused damage to nesting habitat at Upper Newport Bay resulting in the selection of marginal nesting sites, probable abundant renesting, and late fledging. Information for one marsh parcel, Upper Island, suggests that the availability of alternative nesting sites would be very important in some years. The local utility of nesting rafts should be examined.

The importance of coyotes (Canis latrans) accessing the wetlands inhabited by these rails is stressed. Two papers highlighting this subject were accepted for publication.

Raptor watches at Upper Newport Bay were begun to quantify bird of prey activity and interactions with marsh birds. Activities and abundance of 7 diurnal species were summarized for the first two sessions of the 1992/1993 winter.

INTRODUCTION

The 1992 study included a survey of the California population of endangered Light-footed Clapper Rails (Rallus longirostris levipes) in the spring; a fall high tide count on the Seal Beach National Wildlife Refuge (NWR), Orange County, CA; trapping, banding, and observations at Upper Newport Bay Ecological Reserve, Orange County, including monitoring of predators; the placement and monitoring of nesting structures in the Seal Beach NWR, the University of California's Kendall-Frost Reserve in San Diego County, and initial trials in the Department of Fish and Game's Bolsa Chica Ecological Reserve in Orange County; and continued analysis of our data for publication and presentations.

This report is organized into subsections entitled The California Population; Miscellaneous Sightings; High Tide Counts at Seal Beach; Banding, Movements, and Observations; Nesting Rafts; Predators; Miscellaneous Observations; and Publications and Presentations which describe the different aspects of this year's study. Each subsection contains methods, results, discussion, and recommendations, where appropriate.

CALIFORNIA POPULATION

The thirteenth consecutive annual census of Light-footed Clapper Rails in California was conducted 9 March - 29 April 1992. This was initiated slightly later and was more prolonged than usual due to heavy spring rains. Thirty-six coastal wetlands were surveyed by mapping territorial pairs based on their calls (Zembal and Massey 1981, 1985).

Methods

In the 4 marshes with abundant Clapper Rails, spontaneous calling was mostly relied upon. In marshes with few rails and along long, narrow strips of habitat, playbacks of taped "clappering" calls were used sparingly to elicit responses. In a few years at several marshes, and each year at Tijuana Marsh National Wildlife Refuge (NWR), enough observers were stationed to be within potential hearing range of any calling rail over the entire marsh on a single evening. Most of the marshes are surveyed by a single observer visiting discrete patches of habitat on consecutive evenings until all of the habitat has been censused. Most of the observations for all years were those of three observers.

The more movement required of an observer during a survey, the more likely that breeding, but infrequently calling rails were missed. Calling frequency and the detection of calls were influenced by observer hearing ability and experience with the calls, the stage of breeding of individual pairs, rail density, and weather conditions (Zembal and Massey 1987). Many surveys attempted on stormy, windy days had to be repeated. If calling frequency was high with many rounds issuing from the marsh as

adjacent pairs responded to one another, it was possible to map the rails well and move on to survey more marsh. However, under usual circumstances covering more than 16.2 - 20.2 ha (40 - 50 acres) without the use of a tape recorder would result in missed calls.

Early morning and late evening surveys were comparable, although evening calling was more intense and often ended with one or more flurries (Zembal et al 1989). Surveys were usually conducted in the 1 - 2 hrs before dark, but some were done at first light to about 1 hr after sunrise.

The playback of a taped "clappering" call appeared to be responded to by the rails as if it were a living pair calling nearby. However, work done with Yuma Clapper Rails (Rallus longirostris yumanensis) suggests strongly that these rails can become conditioned to the tape if it is used excessively (B. Eddleman, pers. comm.). During prime calling times, of the evening or early morning, a playback sometimes elicited a response or even a round of calling. However, there was sometimes no vocal response to the tape. If played at a time of day when the rails are not particularly prone to call, the only response likely to be solicited was that of the territorial pair intruded upon. The response could be nonvocal investigation by the pair or one member. The playback was likely to elicit aggression in the male, particularly if it was repeated. In one instance a Clapper Rail attacked and knocked over a decoy that was set near a repeating tape. In another instance a male attacked a female (?) forcefully copulating with her while pecking at the head and neck, dislodging feathers. I finally disturbed these birds to divert the male's aggression. Subsequently, playbacks were used sparingly and with caution.

Used only once per year at a given marsh and with minimal playings, playbacks have yielded important results. Unmated Clapper Rails, for example, often respond at considerable distances and may approach the tape. Isolated single rails would often approach very closely and remain in the vicinity unless displaced by a perceived threat.

In mapping the rails, both duet and single "clapperings" were treated as territories. No advertising singles are treated as discrete territories, since the goal of the survey is an accurate assessment of breeding pairs at the time of the survey. A single is as good an indicator of a territory as a duet, as long as advertising is not heard later from the same vicinity. Given an entire census period, most pairs eventually duet from territories where single pair members called earlier.

Results and Discussion

As a test of the accuracy of the call count technique, results were compared to those from exhaustive nest searches throughout the breeding season, 1979 - 1981 for the three major subpopulations (Table 1). Meticulous nest searches eventually reveal all, or most, of the nests, depending upon the observer.

Table 1. Call and nest counts at three marshes, 1979 - 1981.

	1979 nests/calls	1980 nests/calls	1981 nests/calls	Totals nests/calls
Tijuana Marsh	- / nd	25 / 26	21 / 31	46 / 57
Seal Beach	23 / 21	29 / 30	14 / 19	66 / 70
Newport	38 / 38	35 / 37	20 / 20	93 / 95
Shellmaker	13 / 14	14 / 14	10 / 10	37 / 38
Middle	10 / 10	9 / 11	nd / -	19 / 21
Upper	15 / 14	12 / 12	10 / 10	37 / 36
Totals	61 / 59	89 / 93	55 / 70	205 / 222

Tijuana Marsh and Seal Beach are National Wildlife Refuges and the Upper Newport Bay is an Ecological Reserve of the California Department of Fish and Game. The three "islands" of marsh, Shellmaker, Middle, and Upper contained about 37% of the marsh habitat at Newport and were the sites of the summary data collection presented in the Newport row.

Table 2. Census of the Light-footed Clapper Rail in California, 1980-1992.

Location	Number of Pairs Detected In:									
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Santa Barbara County										
Goleta Slough	0	0	-	0	-	-	-	-	0	0
Carpinteria Marsh	16	14	20	18	26	7	4	5#	2#	0
Ventura County										
Ventura River Mouth	-	-	0	0	-	-	-	-	-	0
Santa Clara River Mouth	-	-	0	-	-	-	-	-	-	0
Mugu Lagoon	-	0	-	1	3	7	6	7#	7#	5
Los Angeles County										
Whittier Narrows Marsh	-	-	-	*	0	-	-	-	-	0
Orange County										
Seal Beach NWR	30	19	28	20	24	11	5	7	14	6#
Bolsa Chica	0	0	0	0	-	-	-	*	0	0*
Huntington Beach Strand	-	0	-	-	-	-	0	0	0	0
Upper Newport Bay	98	66	103	112	112	87	99	119	116	116
San Joaquin Reserve	-	-	5	4	1	2	1	0	0	0
Carlson Rd Marsh	-	-	5	4	2	0	0	1#	0	0
San Diego County										
San Mateo Creek Mouth	-	-	0	0	-	-	0	-	0	0
Las Pulgas Canyon Mouth	-	-	0	0	0	-	-	-	-	0
Las Flores Marsh	-	-	0	0	0	-	0	-	0	0
French Canyon Mouth	-	-	-	0	0	-	-	-	-	0
Cocklebur Canyon Mouth	-	-	1	0	0	-	-	0	0	0
Santa Margarita Lagoon	0	0	2	1	2	1	1	1	1	0
San Luis Rey River Mouth	-	-	0	0	-	-	0	0	0	0
Guajome Lake Marsh	-	-	0	1	2	0	0	0	0	0
Buena Vista Lagoon	0	0	0	*	0	-	-	-	0	0
Agua Hedionda Lagoon	1	2	1	7	6	1	0	0	0	0
Batiquitos Lagoon	0	0	0	0	0	-	-	-	-	0
San Elijo Lagoon	-	5a	4	4	10	1	0	2	5#	7#
San Dieguito Lagoon	-	-	-	-	-	-	-	*	0	0
Los Penasquitos Lagoon	-	0	-	0	0	-	0	-	1a#	0
Kendall-Frost Reserve	18	16	6	20	24	17	12	6a#	4a#	4#
San Diego Riv F. C. C.	-	3	1	2	2	1	0	0	1a#	0#
Paradise Creek Marsh	1	2	3	1	1	0	0	0	0	0
Sweetwater Marsh	4	5	7	6	14	3	9	5a#	5	5#
E Street Marsh	3	1	3	3	2	2	2	0a	1#	0
F Street Marsh	-	1	1	0	1	0	0	0	0	0
J Street Marsh	-	1	0	0	-	-	0	0	0	0
Otay River Mouth	3	4	5	3	5	1	1	0	0	0
South Bay Marine Reserve	3	3	1	1	2	1	1a	2#	5	5#
Dairymart Ponds	-	-	-	-	-	-	0	*	1a	0#
Tijuana Marsh NWR	26	31	25	41	38	0	2	23a#	14a#	15a#
Total: pairs	203	173	221	249	277	142	143	178	177	163
marshes	11	15	18	18	19	14	12	11	14	8

- indicates that no census was taken.
* indicates a fall or winter occurrence
# indicates the detection of unpaired rails (used beginning in 1987).
a Data are from Paul Jorgensen's field notes.

Table 2. Census of the Light-footed Clapper Rail in California, 1980 - 1992 (Continued).

Location	Number of Pairs Detected In: 1990	1991	1992
Santa Barbara County			
Goleta Slough	0	0	0
Carpinteria Marsh	0	0	0
Ventura County			
Ventura River Mouth	0	0	0
Santa Clara River Mouth	0	0	0
Mugu Lagoon	6#	4#	5#
Los Angeles County			
Whittier Narrows Marsh	-	-	-
Orange County			
Seal Beach NWR	16	28	36
Bolsa Chica	0#	0*	0#
Huntington Beach Strand	0	0	0
Upper Newport Bay	131	128	136
San Joaquin Reserve	0	0	0#
Carlson Rd Marsh	0	0	0
San Diego County			
San Mateo Creek Mouth	0	0	0
Las Flores Marsh	0	0	0
Cocklebur Canyon Mouth	0	0	0
Santa Margarita Lagoon	0	0	0
San Luis Rey River Mouth	0#	0	1
Guajome Lake Marsh	0	0	0
Buena Vista Lagoon	0a#	2#	5
Agua Hedionda Lagoon	0	0	0
Batiquitos Lagoon	0#	0#	0
San Elijo Lagoon	5#	5	4#
San Dieguito Lagoon	0	0	0
Los Penasquitos Lagoon	0	0#	0#
Kendall-Frost Reserve	5#	9	11
San Diego Riv F. C. C.	2	5	1a
Paradise Creek Marsh	0	0	1a
Sweetwater Marsh	2#	4a	4a
E Street Marsh	0	1a	1a
F Street Marsh	0	0	0
J Street Marsh	0	0	0
Otay River Mouth	0	0	0
South Bay Marine Reserve	5	2	3a
Dairymart Ponds	0a#	0#?	0#
Tijuana Marsh NWR	17a#	47a	67a
Total: pairs	189	235	275
marshes	9	11	13

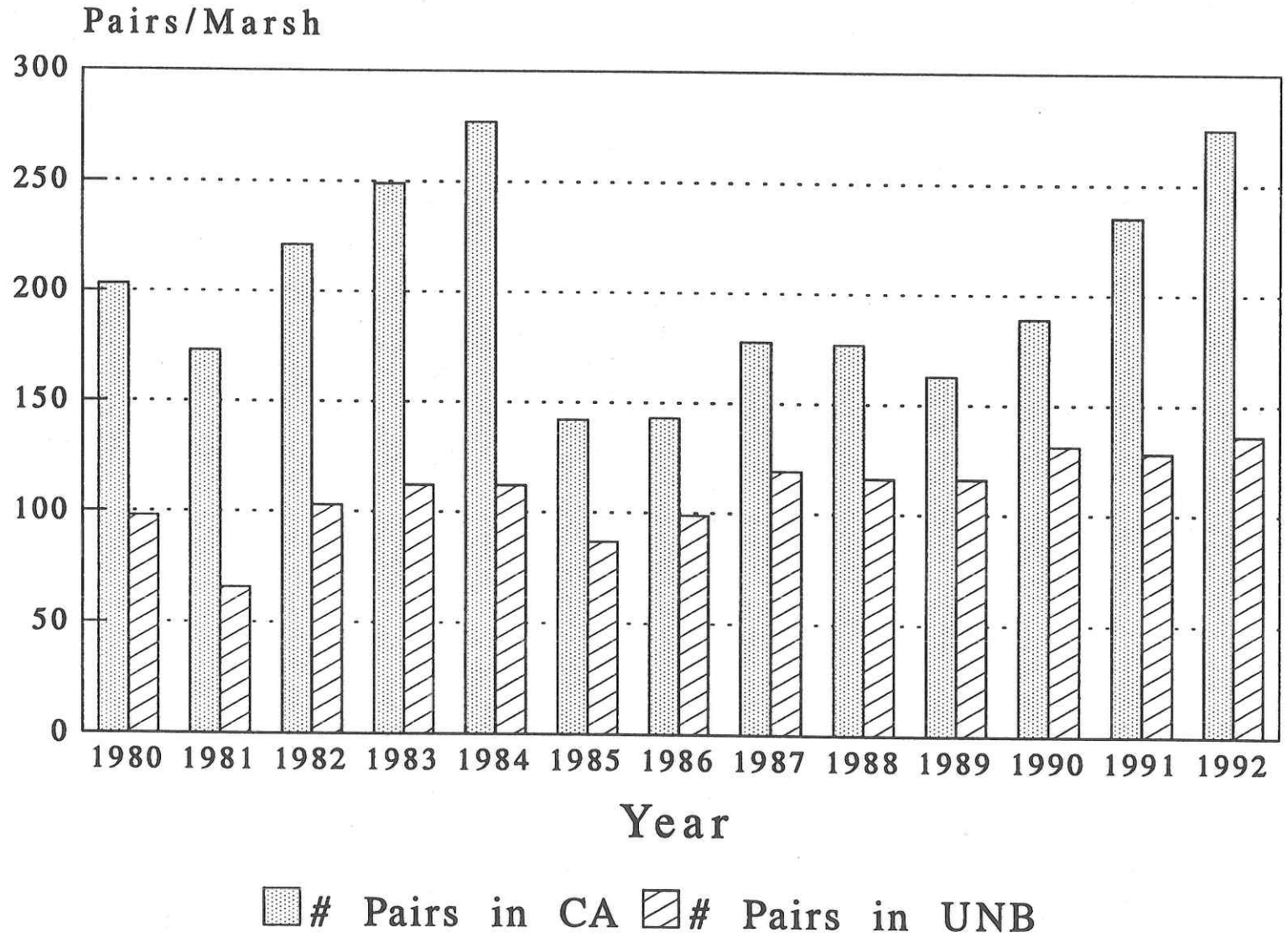
- indicates that no census was taken.
* indicates a fall or winter occurrence
# indicates the detection of unpaired rails (used beginning in 1987).
a Data are from Paul Jorgensen's field notes.

Successful nests are difficult to miss because the subsequent 1 - 3 brood nests are without canopy and conspicuous compared to incubation nests. Frequent exploration of the marshes gave high confidence of the accurate assessment of breeding territories by nest search in 1979 and 1980. Although there were fewer visits and weaker results in 1981 at Tijuana Marsh and Seal Beach NWRs the two techniques still had similar results. Furthermore, the call count technique is far less intrusive and labor intensive. Linear regression analysis of the data confirmed that call counts are good quantitative indicators of nesting activity ($n = 13$; $r = 0.916$; F-ratio = 57.68; $P = 0.00001$; residuals normal).

Breeding Clapper Rails, as indicated by behavior and vocalizations in 1992, were detected in 13 marshes and the state total was nearly back to the high recorded in 1984 (Table 2). Most of the increase was attributable to the highest counts on recent record for Tijuana Marsh NWR and Seal Beach NWR which comprised 24.4% and 13.1% of the state total, respectively. Having a larger number of rails distributed over several marshes, is an important result of this resurgence. The incredible concentration of Clapper Rails at just one marsh, Upper Newport Bay, has been a long-standing concern since a catastrophe at just this one place could jeopardize such a large percentage of the entire population (Figure 1). Although the numbers are encouraging for the three major subpopulations, and to a lesser extent for the University of California's Kendall-Frost Reserve, there are still major concerns for each of the subpopulations and for the continued existence of the Light-footed Clapper Rail.

The Upper Newport Bay subpopulation has been relatively stable for many years and held 49.4% of the state population in 1992 (Figure 1). However, there were late rains in 1992 that could be followed by a population decline as happened in 1981 and 1985. Nesting habitat was mashed or removed by the wash of flotsam driven through the marsh in storm tides and runoff. Limited nest searches in 1992 disclosed a high level of late nesting, many are probably renests, and nest placement was in very poor cover. Twelve nesting sites were found on 30 May 1992, after searching about 75% of Upper Island. Only 2 of the 12 were in cordgrass (Spartina foliosa); 5 were in scrawny tumbleweeds, 2 were in flotsam amongst heavy debris, 2 were right next to the paved road in bulrush (Scirpus spp.), and 1 was on an isolated berm. Although six of the nests displayed signs of hatching, they were mostly in such poor locations, affording little tidal protection, that fewer eggs than usual were probably hatched. Five nests held eggs or were being incubated, including 3 tumbleweed and 1 flotsam nest, and 1 of the tumbleweed nests had been predated (probably by raccoon, Procyon lotor). Nest predation is much more likely this year at locations where the available cover is poor. However, the effects of the storms were different in various parts of the bay, depending upon exposure to the flows. For example, a search of the immediate shoreline along Shellmaker Island revealed no late nests on 10 June 1992 and at least 6 territories with successful hatching and no

Figure 1: Census of the Light-footed Clapper Rail
In California, 1980 - 1992



UNB is Upper Newport Bay

renests. I will continue to monitor this situation.

There is also growing concern for Upper Newport Bay because the corridors to the bay are losing their viability and coyote (Canis latrans) visitation appears to be diminishing. Nonnative red foxes (Vulpes vulpes) access at least one side of the bay now and could experience explosive population growth without the regulating influence of the native top carnivores. The recent example at the Seal Beach NWR predicts that if the bay becomes effectively isolated and this mesopredator release occurs, the Newport rail population will crash. This should be guarded against through good planning and management. I will continue to monitor coyote activity in the bay and report the results.

The comeback of Clapper Rails at the Tijuana Marsh NWR from a detectable breeding population of zero in 1985 has been spectacular. Maximizing marsh acreage and potential there will go a long way toward guaranteeing the continued survival of the rail. Tasks requiring continued attention and priority include maximizing marsh restoration, monitoring and improving the hydrology, specifying and cleaning up the contaminants, meaningfully curtailing the flow of trespassers (mostly illegal immigrants) through the marsh, and abolishing helicopter overflights which greatly hamper rail communication and predator detection.

The Seal Beach NWR subpopulation continues to climb steadily, although slowly since nonnative red foxes continue to take an annual toll in excess of natural predation rates. For example, there was an active fox den on the edge of the marsh during the entire early breeding season in 1992 and at least one nest was lost. Episodic red fox control has allowed the rails to begin repopulating this marsh. However, because a few foxes continue to hunt the marsh, the growth of the rail population will probably not be as explosive as at Tijuana Marsh. Hopefully, the increase in rails will continue. To maximally foster this, predator control activities should be more regular, perhaps seasonal. Control activities should be done in conjunction with monitoring to help calibrate the monitoring technique. Eventually, the monitoring should be able to predict when control is needed. The clear inverse relationship between red fox and Clapper Rail numbers should dictate caution for the rails with enough control activity to ensure adequate protection (U.S. Fish and Wildlife Service and U.S. Navy 1990).

The University of California's Kendall-Frost Reserve suffers from isolation and will require management for the Clapper Rails to thrive there. This small subpopulation has rebounded slightly but faces substantial problems due to its small size and isolation. For example, there is definitive evidence of rat (Rattus sp.) predation on nests and cats (Felis domesticus) are abundant and are known predators of adults. Additionally, more nesting options must be provided.

The other 9 breeding subpopulations totalled 25 pairs, or only 9.1% of the state population. The Sweetwater Marsh NWR complex was the largest contributor with a total of 6 pairs. One

of these pairs nested in Paradise Marsh, the first such record there since 1984. These rails presumably accessed Paradise Marsh along the Connector Marsh from Sweetwater Marsh NWR. This implies suitability of the Connector Marsh to Clapper Rails, at least as a movement corridor with food and cover values. This is of interest because of recent speculation about this marsh's design and potential. Given optimal design, marsh recovery is liable to take time.

The discovery of 5 solid pairs breeding in Buena Vista Lagoon was a surprise because of this marsh's freshwater character. I also must ask, why now? The lagoon is a lake with fresh to brackish water and bulrush (Scirpus spp.) and cattails (Typha spp.) in clumps and lining the banks. Saltmarsh plants are locally distributed and found mostly in narrow belts on the fringe of the reeds. Light-footed Clapper Rails have not done well for very long in such lake-like conditions in the past. However, if predation is not excessive and local immigration occurs episodically, there is no reason for a small breeding subpopulation not to survive there.

Light-footed Clapper Rails declined greatly during the 1980s. The total population count is higher now but still too low for comfort, and most of the remaining rails are concentrated in a small percentage of the potential habitat. Significant insights have been gained concerning this species needs and effective management but far too little has been accomplished in the marshes of Southern California for any meaningful cushion from extinction for this endangered bird.

Each of our remaining coastal wetlands is in dire need of management and restoration activities. Most of them are relatively small, isolated, and otherwise heavily influenced by people. However, if such management does not begin soon, most of today's inhabited marshes won't have any Light-footed Clapper Rails left to manage. Good management could compensate for many of the inadequacies in habitat parcel size and functionality, and greatly reduce other human-induced problems, if it begins soon.

Management that emphasizes Light-footed Clapper Rails should begin with a focus on predation, providing nesting habitat, monitoring reproductive success, and identifying and alleviating chemical contaminant problems. Following the findings of Soule et al. (1987) and recent experiences at Seal Beach (U.S. Fish and Wildlife Service and U.S. Navy 1990), Point Mugu, and other marshes, it is now understood that certain predators can be devastating to the rails. Introduced species, in particular, must be monitored and controlled. Potential predator problems should be suspected and investigated in the small marshes where Clapper Rails are declining or have disappeared. With high predation pressure, many of the marshes inhabited by rails have inadequate nesting cover. Carpinteria Marsh is an extreme example of this. The only nesting sites available to the rails were on high marsh berms that were too easily accessible to terrestrial predators and the entire subpopulation was wiped out.

Clapper Rails should be reintroduced to Carpinteria along

with predator control, nesting raft deployment, and monitoring. The rails are subject to heavy contaminant problems in Mugu Lagoon (Ledig 1989) that should be better specified and alleviated. Full tidal regimes should be restored to several San Diego County marshes and management should be implemented at every marsh inhabited by Clapper Rails.

All but one of the remaining subpopulations of Light-footed Clapper Rails are too small or troubled to survive without effective management. The number of marshes inhabited by breeding Clapper Rails in coastal southern California has fluctuated widely and declined from 19 to 8 in a half decade. Monitoring these rails through more than a decade, has been partly a process of watching many small subpopulations barely hang on or disappear. Carpinteria Marsh was home to 26 pairs of Clapper Rails in 1984 and today to none. This kind of calamity can and should be avoided.

Miscellaneous Sightings

Clapper Rails were observed in 4 additional wetlands in 1992 but exhibiting nonbreeding behavior (Table 2). There still is no good evidence of recent breeding at the Bolsa Chica State Ecological Reserve or the inland marsh there, at the University of California's San Joaquin Marsh Reserve, Los Penasquitos Lagoon, or the Dairymart Ponds. However, advertising Clapper Rails were present at each of these sites in 1992. Surprisingly, the single detected at the mouth of the San Luis Rey River behaved as if it were mated and breeding.

The occurrence of rails has been detected at 4 of these 5 sites, off and on for many years. All but Los Penasquitos is probably explained by movement from subpopulations located very closely to each, unless there has been undetected local breeding. Los Penasquitos contrasts with the others in that it is not directly connected, or even nearly so, by wetlands to a known breeding subpopulation. The nearest donor subpopulation is in San Elijo Lagoon, located 11 km (6 mi) upcoast or Kendall-Frost which is 16.5 km (9 mi) downcoast. In either case, the most likely migration route is the immediate coastline.

HIGH TIDE COUNTS AT SEAL BEACH

There have been counts of Clapper Rails during extreme high tides on the Seal Beach NWR each winter or fall since 1975. The counts used to involve stationing enough observers around the perimeter of the flooded marsh to sight all of the rails forced from cover by an extremely high tide. More recently, remnant cover is checked mostly from the water by canoe. This has been necessitated partly by the provision of the nesting rafts and their tumbleweeds since 1987. Many of the rails take refuge on the rafts during higher tides and cannot be seen from shore in the dense cover. Fourteen observers in 7 canoes can adequately

cover the 911 acre refuge in about 2 hrs.

High tide counts provide important information about reproductive success in the marshes where they are feasable. The Seal Beach NWR is one of few marshes that are low enough for extreme high tides to inundate most of the available cover. In southern California, extreme high tides occur during daylight hours mostly during the fall and winter. Where and when good counts are possible, direct sightings can be made of many of the rails produced and surviving the few months since the breeding season. The counts are done prior to the onset of the harshest winter conditions, including the major influx of wintering raptors that depend on these environs for food.

This year's count was conducted on 26 October and a record high of 159 Clapper Rails was tallied (Table 3). If there is 70%+ winter survival again this year, the breeding population will exceed 50 pairs in 1993. This phenomenal comeback is a result of successful management including the provision of nesting rafts (see below) and predator control. The inverse relationship between red foxes (Vulpes vulpes) and Clapper Rail numbers is graphically depicted in Figure 2. With the continuation of the management program, the Clapper Rail subpopulation on the Seal Beach NWR should recover fully.

BANDING, MOVEMENTS, AND OBSERVATIONS

There were 10 trapping sessions, 31 July - 12 October 1992, for a total of 527 trap-hours with 15 - 19 drop-door traps. The traps are wire mesh boxes with two doors and a treadle in the center. They are set in tidal creeks and along other trails used by the rails (see Zembal and Massey 1983, for a full discussion of trapping and banding techniques). As usual, trapping was confined to the oceanward half of Upper Newport Bay from Shellmaker Island to the Narrows. Six of the trapping sessions were accomplished in the 3 - 4 hours before dark on evenings with appropriately low tides; the other 4 were morning sessions beginning near daylight and continuing for about 3 hours. The 6 evening sessions accounted for 332.5 trap-hours or 63% of the total effort.

A record high of 28 unbanded Clapper Rails were captured and uniquely color-banded (Table 4). This brings the total number of Light-footed Clapper Rails banded in Upper Newport Bay since 1981 to 163. There were also 5 captures of juveniles with flight feathers not fully emerged that were not banded (there was a lot of late breeding in some areas of the bay, see Miscellaneous Observations below), 1 escaped at the trap site, and two rails banded in previous years were recaptured.

Morning tides that were low enough to allow trapping occurred for the first time in three years and a disproportionate number of rails were captured during the 4 morning sessions. Morning sessions accounted for 17 new captures, or 61% of the total, with only 37% of the total trap-hours expended. There

Table 3. High tide and call counts of Clapper Rails on the Seal Beach National Wildlife Refuge, 1975 - 1992.

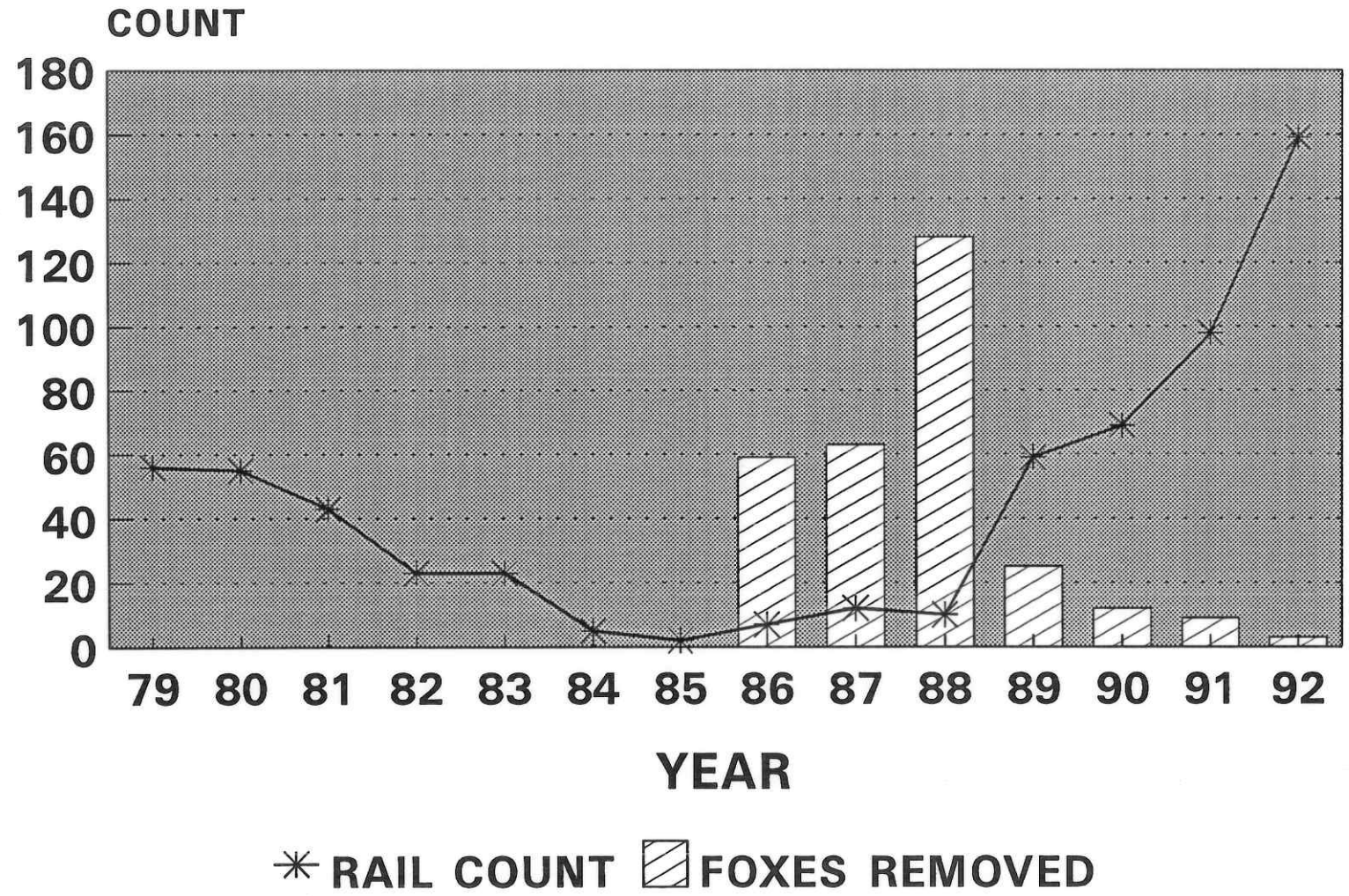
Date	Tidal Height	Clapper Rails Counted	Call Count [1]	% Diff.	Notes [2]	
2 Dec 1975	7.0	22	-	-		
31 Dec 1975	6.7	12	-	-		
21 Nov 1976	7.1	24	-	-		
20 Dec 1976	7.1	35	-	-		
21 Dec 1976	7.0	34	-	-		
10 Dec 1977	7.1	16	-	-		
11 Dec 1977	7.1	40	-	-		
18 Jun 1978	6.8	16	42	38.0%	(1979)	+6 youngsters
30 Nov 1978	6.7	38	42	90.5%		
1 Dec 1978	6.7	32	42	76.2%		
3 Sep 1979	6.4	20	42	47.6%		Tide too low
3 Nov 1979	6.6	56	60	93.3%	(1980)	
2 Dec 1979	6.7	32	60	53.3%		
3 Dec 1979	6.7	44	60	73.3%		
21 Nov 1980	6.9	55	38	144.7%	(1981)	
29 Jun 1981	7.0	34	38	89.5%		
12 Nov 1981	6.9	43	56	76.8%	(1982)	
29 Dec 1982	7.0	23	40	57.5%	(1983)	
18 Jan 1984	6.9	23	48	47.9%	(1984)	
21 Nov 1984	6.7	5	22	22.7%	(1985)	+ 7 red foxes
13 Nov 1985	7.1	2	10	20.0%	(1986)	+ 2 red foxes
12 Dec 1985	7.2	2	10	20.0%		+ 2 red foxes
30 Dec 1986	7.2	7	14	50.0%	(1987)	
28 Jan 1987	7.0	7	14	50.0%		
8 Aug 1987	7.3	8	14	57.1%		Tide too late
22 Nov 1987	6.7	12	28	42.9%	(1988)	
21 Dec 1987	7.0	8	28	28.6%		+ 2 red foxes
16 Feb 1988	6.8	10	28	35.7%		
22 Nov 1988	6.9	6	28	21.4%		
16 Oct 1989	6.9	59	12	491.7%	(1989)	Record Count
5 Oct 1990	6.4	57	32	178.1%	(1990)	Tide too low
2 Nov 1990	6.8	69	32	215.6%		Record Count
22 Nov 1991	6.9	98	56	175.0%	(1991)	Record High
26 Oct 1992	6.8	159	72	220.8%	(1992)	Record High

[1] The call count given is the number of rails documented in the early spring of the year given in parentheses under notes. The call count closest in time to the high tide count is the one compared.

[2] The notes, other than the call count year in parentheses, give additional observations made during the high tide count.

Figure 2:

CLAPPER RAILS COUNTED AND RED FOXES REMOVED FROM SBNWR



COUNTS ARE HIGH TIDE SURVEYS

Table 4. Clapper Rail trapping effort and success with drop-door traps, 1981 - 1992.

Year	1981	1982	1983	1984	1986	1987
#Trap Sessions	30	14	13	5	10	8
Date Span	3/8-12/19	2/14-10/16	1/10-10/21	9/10-10/25	5/27-11/5	7/14-10/23
#Traps Used	8	8-14	10-14	14	12-14	13
Total Trap-hrs	937	541	532	182	278	258
#New Captures	20	18	16	9	18	6
New Caps/Session	0.67	1.3	1.2	1.8	1.8	0.75
Trap-hrs/New Cap	47	30	33	20	15	43
#Recaptures	2	1	2	1	7	1
#Recaptured	2	1	2	1	6	1
#No-Cap Sessions	22	5	4	1	0	4
%Sessions w cap	27	64	69	80	100	50

Year	1988	1989	1990	1991	1992	Cumulative
#Trap Sessions	9	9	9	9	10	126
Date Span	9/17-10/30	8/18-10/13	9/11-10/22	8/28-10/24	7-31-10-12	- -
#Traps Used	12-16	14-18	7-8	8-16	15-19	8-19
Total Trap-hrs	349	560	197	374	527	4,735
#New Captures	6	16a	11	9	28	157a
New Caps/Session	0.67	1.8	1.2	1.0	2.8	1.67
Trap-hrs/New Cap	58	35	18	42	19	30
#Recaptures	0	0	0	4	2	20
#Recaptured	0	0	0	4	2	19
#No Cap Sessions	4	1	4	1	0	46
%Sessions w cap	56	89	56	89	100	64

[a] An additional 6 new captures were achieved by boat with dip nets.

were 3 - 6 new captures per morning session and 1 - 3 per evening session. The higher capture rates occurred earlier in the season, 31 July - 16 August 1992, than those resulting from evening trapping from 30 August to 12 October 1992. All of the rails captured in the morning sessions were first-year birds, indicated by the faintness of flank striping and lack of strong color contrast in the striping. These markings apparently change to the greater contrast typical of adults by late summer or fall. Three rails with adult flank contrast and one with intermediate contrast were captured during the late season evening sessions. The two recaptures of adults also occurred during evening trapping.

The high trapping success in 1992 could be attributed to a variety of factors including high population density due to good recruitment and/or improved trapping technique. Recruitment was good, based on casual observations, but there is no reason to believe it was exceptional. To the contrary, in at least one of the 4 trapping locations, fledging was later than usual due to spring storm damage to nesting habitat. This resulted in fewer than usual first-year rails of a bandable size at Upper Island in August and postponed further trapping of the site until September (see Miscellaneous Observations below).

Improved trapping technique could involve timing, number of traps, placement of traps, etc. The number of traps employed was a few higher than usual, and total effort (trap-hours) in 1992 was exceeded significantly only in 1981 (Table 4). Trap-hours per new capture was slightly better in 1984 and 1990 and much better in 1986, but there were many more trap-hours expended in 1992 than in these former years. Otherwise, technique has not changed much and I think that timing has a lot to do with trapping success. If the traps are placed near several families of rails with fledglings nearing or at independence, there are liable to be many captures, particularly in the morning. Twenty-two Clapper Rails were actually captured during the 4 morning sessions, counting the small birds released unbanded. All 22 appeared to be first-year birds.

It is tempting to hypothesize that younger rails are more active in the morning than late afternoon. Past monitoring with radio telemetry revealed peaks of activity at the beginning and again at the end of the day but age and sex differences were not examined (Zembal et al. 1989). Adults were only trapped in the evening in 1992, but this was late enough in the season that some of these birds could have been first-year rails in full adult plumage. However, the two evening recaptures were certainly adults and older, warrier rails. There may be a slight advantage to trapping warrier rails later in the day in the poorer light which renders the traps less conspicuous for a longer percentage of the session than in the morning. Ideally, we will get extremely unusual trapping conditions one year that allows morning and evening trapping to be pursued consecutively.

There were 46 sightings of 13 banded Clapper Rails at Upper Newport Bay during 1992 including our 2 recaptures. The largest

distance between a banding site and resighting was 2,282 m. This move is unusually large because most of the moves observed are of established rails moving about their small home ranges. This rail, # 364, was a first-year bird banded in mid-August that moved north by late September past the middle half of the bay to the vicinity of the main dike. It was subsequently observed repeatedly over several months, 10 - 100 m from where it was first sighted after relocating.

The resightings of the other 12 rails varied, 0 m - 304 m, from banding sites or between consecutive (but independent) sighting locations, and averaged 47 m. These observations are typical of those made in the past. First-year rails are the most likely to make relatively large moves in search of an occupiable home range, but once established, the usual move detected is generally under a few hundred meters (Zembal et al. 1989).

Eight of the resighted rails were first banded in 1992, 2 were banded in 1991, and 1 each was banded in 1990, 1989, and 1988. The Clapper Rail banded in 1988 was #488. She weighed 325 gm in 1988 and was 25 gm heavier when recaptured 4 years and 10 days later at the exact site of original capture. She had lost her plastic annual-code band and the plastic vinyl tape on her metal band was very weathered but still readily distinguishable. Our second 1992 recapture was rail #350, nearly one year after banding and 45 m from the original capture site.

Rails #938 and #942, first captured in 1990 and 1991, were watched repeatedly by one of the study team's more diligent observers, 10 m - 60 m from their banding sites. They may have been a mated pair and #942 was observed in May with a half-grown chick.

In the 10 years of banding and observing Light-footed Clapper Rails, 1981 - 1991 (there was no activity in 1985), a surprisingly high 52.6% of the banded rails were reencountered (Table 5). Fourteen percent of the 129 Clapper Rails captured in box traps were recaptured in them 1 hr to 27.2 months later. Sixty-four of the banded rails were resighted at least once, 0.1 - 61.9 months later, o m - 21,700 m from the original sites of capture. The average time between banding and last encounter of 67 Clapper Rails (4 death-only reencounters excluded) was 13.6 months. Thirteen of the 67 rails (19.4%) were last seen one month or less after banding; 29 or 43.3% of all last encounters, occurred within 6 months of banding. The time of last encounter for all 67 rails was less than 1 month for 13 rails; 1 - 6 mos for 16; 6 - 12 for 6; 12 - 18 for 12; 18 - 24 for 7; 24 - 30 for 4; 30 - 36 for 2; 36 - 42 for 4; 42 - 48 for 1; 48 - 54 for 1; 54 - 60 for 0; and 60 - 66 mos for 1 rail. Many of these rails were undoubtedly in their first year of life when banded, if the 1992 sample is an indication. Consequently, the above array of reencounters is the best index currently available of post-fledging survival, particularly if it is skewed by a few months to a year addition. It is probably very unusual that a Light-footed Clapper Rail lives beyond 5 or 6 years old. Additionally, the average survival of a pair together in a breeding territory

Table 5. Maximum time and distance between encounters with Light-footed Clapper Rails banded, 1981 - 1991.

Recaptures in box traps, 1981 - 1991.

Band #	Band Date	Retrap Date	Time Span	Distance
401t	3-22-81	11-14-81	7.7 mo	112 m
403	4-04-81	7-10-83	27.2 mo	327 m
406	5-17-81	7-27-83	26.3 mo	212 m
407dt	5-23-81	2-15-82	8.7 mo	5 m
409t	8-06-81	8-20-81	0.5 mo	25 m
428	9-03-82	10-07-83	13.1 mo	130 m
449	8-26-83	10-08-83	1.4 mo	67 m
464	5-27-86	7-29-87	14.1 mo	55 m
465	5-27-86	8-21-86	2.8 mo	105 m
467d	5-27-86	11-05-86	5.4 mo	25 m
470	8-22-86	10-24-86	1.9 mo	85 m
471nr	8-22-86	10-08-86	1.5 mo	15 m
472nr	8-22-86	9-21-86	1 mo	170 m
472		9-21-86	1 hr	0 m
476nr	10-08-86	10-24-86	0.5 mo	60 m
496	8-20-89	10-24-91	25.9 mo	75 m
612	9-24-89	9-24-91	24 mo	25 m
937	10-20-90	9-27-91	11.2 mo	45 m
941	10-22-90	9-28-91	11.2 mo	25 m

18 of 129 CRs captured in box traps, were retrapped in them = 14%

Clapper Rails known to be dead: 405, 407t, 410nrt, 415nr, 420t, 427, 457nrt, 460nrt, 467.

Clapper Rails resighted at least once:

Band #	Band Date	Date Last Observed	Time	Distance
401rt	3-22-81	9-20-84	41.9 mo	40 m
402	4-04-81	6-01-81	1.9 mo	93 m
403r	4-04-81	8-27-84	40.8 mo	5 m
404	4-26-81	10-02-82	17.2 mo	30 m
405d	4-26-81	9-10-84	40.5 mo	80 m
406r	5-17-81	7-15-86	61.9 mo	190 m
407rdt	5-23-81	4-18-83	22.8 mo	85 m
409rt	8-06-81	9-01-81	0.8 mo	15 m
412	8-29-81	10-21-82	13.7 mo	95 m
413	8-30-81	11-24-81	2.8 mo	10 m
416	9-05-81	9-09-83	24.1 mo	190 m
419	11-14-81	11-18-81	0.1 mo	10 m
420dt	11-21-81	12-06-81	0.5 mo	190 m
421t	2-17-82	6-06-83	15.6 mo	15 m
422t	2-17-82	7-18-82	5 mo	70 m
425	8-20-82	11-16-84	26.9 mo	485 m
426	8-20-82	9-05-82	0.5 mo	100 m
427	8-20-82	10-07-82	1.6 mo	75 m
428r	9-03-82	10-07-83	13.1 mo	130 m
430t	9-03-82	6-12-86	45.5 mo	50 m
431	9-04-82	9-09-83	12.2 mo	108 m
432	9-18-82	12-29-82	3.4 mo	21,700 m

Table 5 (continued).

433	9-18-82	1-13-83	3.8	mo	1,020 m
435	9-20-82	10-07-82	0.6	mo	270 m
436	9-20-82	2-26-83	5.2	mo	750 m
437	10-16-82	10-30-82	0.5	mo	35 m
439t	1-16-83	3-02-83	1.5	mo	90 m
441	1-21-83	2-15-83	0.8	mo	60 m
442	4-10-83	10-15-84	18.2	mo	156 m
446	7-13-83	9-09-87	49.9	mo	610 m
449r	8-26-83	10-21-83	1.8	mo	67 m
451	9-09-83	10-07-83	0.9	mo	20 m
455	9-10-84	10-07-84	0.9	mo	410 m
458t	9-10-84	7-15-87	34.2	mo	200 m
459	9-15-84	12-01-84	2.5	mo	15 m
462t	10-25-84	10-08-86	23.4	mo	111 m
463	10-25-84	11-03-84	0.3	mo	50 m
464r	5-27-86	7-29-87	14.1	mo	15 m
465r	5-27-86	6-08-89	36.4	mo	600 m check
467rd	5-27-86	2-28-87	9	mo	50 m
468	8-21-86	9-09-87	12.6	mo	125 m
469	8-21-86	9-09-87	12.6	mo	35 m
470r	8-22-86	9-10-87	12.6	mo	25 m
473	9-05-86	10-28-88	25.8	mo	778 m
475	10-08-86	6-24-87	8.5	mo	115 m
480	10-17-86	7-15-87	8.9	mo	0 m
481	11-02-86	10-12-88	23.3	mo	130 m
488	9-17-88	7-27-91	34.3	mo	50 m
494t	8-19-89	10-18-89	2	mo	60 m
495t	8-19-89	11-15-89	2.9	mo	180 m
496r	8-20-89	6-22-91	22.1	mo	50 m
601	9-01-89	5-01-91	20	mo	100 m
603	9-02-89	10-07-89	1.2	mo	75 m
605	9-02-89	9-29-90	12.9	mo	185 m
607t	9-02-89	9-29-89	0.9	mo	110 m
608	9-02-89	9-29-90	12.9	mo	185 m
611	9-23-89	2-13-91	16.7	mo	175 m
612r	9-24-89	7-06-91	21.4	mo	110 m
616	10-07-89	7-20-91	21.5	mo	150 m
937r	10-20-90	7-20-91	9	mo	10 m
938	10-22-90	7-27-91	9.2	mo	50 m
941r	10-22-90	6-05-91	7.4	mo	25 m
942	8-28-91	9-07-91	0.3	mo	30 m
945	8-29-91	10-31-91	2.1	mo	200 m

18 retrapped, 64 resighted, 9 dead = 71 reencountered
71/135 = 52.6% reencountered 0.1 - 61.9 mo later (avg = 13.6 mos)
912.4 mos/67 cr

t = birds that were followed by telemetry (401, 407, 409, 410, 420, 421, 422, 429, 430, 439, 440, 443, 457, 458, 460, 462, 494, 495, 602, 604, 606, 607);
d = dead; nr = no resighting; r = recaptured in a box trap.

is generally less than two full breeding seasons, based on observations of 6 pairs with both members banded, and an average final reencounter time of slightly less than 1 year. A view of the Light-footed Clapper Rail as a relatively short-lived species whose numbers are maintained through a high reproductive potential emerges.

One of the major problems with expounding upon this view any further is that individuals of this subspecies are secretive and some, particularly females, are extremely wary. The less wary rails are undoubtedly more prone to predation, spending more time in the open, and are probably more trappable too. For example, only 8 rails were retrapped 10 or more months after initial banding, whereas 32 were resighted. Consequently, it is likely that the warrier, longer-lived rails are not proportionately represented in the trapping sample. They certainly are not in the retrapping sample.

NESTING RAFTS

An Eagle Scout project added 20 rafts to the Seal Beach NWR, bringing the total available for potential rail nesting to 80 rafts. A description of the raft design is available in earlier reports (Zembal and Massey 1988). The rafts were renovated mostly in January and February 1992, by replacing damaged dowels and the old tumbleweeds and by adding floats to older rafts. New tumbleweeds were placed with the root stock and thickest branches down to deter perching by large birds. Additional flotation was added to water-logged rafts either in the form of PVC pipe in 3 ft lengths, plugged at the ends, or 4 in. pool floats. Two pieces of pipe were fastened with nylon cord between the outer and next inner planks, or 4 pool floats were attached, one in each corner of a raft. Fastening the flotation on the undersides keeps the rafts off the saturated substrate during low tide and helps dry the wood out. The PVC pipe used was 3 in. schedule 40, which is of a quality suitable for drinking water.

The rafts were checked about every 3 weeks from March through July 1992. The first Clapper Rail nest was found on a raft on 11 March 1992. The first clutch of eggs was present 1 week later and there were 11 others by 24 March 1992. By the end of the season, the rafts had held 53 nests, at least 42 clutches of eggs, and 12 additional brood nests (Table 6; Figure 3). Hatching success (one or more eggs hatched), was 73% for initial clutches (n = 32) and 95% for renests (n = 10; second clutches in the same nest), similar to years past (Table 7). Hatching failures were attributable to predation by small birds and mammals. At least one nest was predated by a red fox. The strangest case of nest failure was observed on raft 14 where an emaciated rail was found unmarked but dead on a clutch of 7 intact eggs. This was probably a female that lost her mate and succumbed in the midst of the high energetic demands of a renesting attempt.

Table 6. Nesting raft use by Clapper Rails in the Seal Beach NWR, 1992

		Dates of Detection		
Raft #	Nest	Egg/Incubation	Outcome	Remarks
1	3-19	3-19	H 4-24	BN by 5-12
3	6-3	6-3	A 7-11	
4	3-19	-	-	
6	6-23	-	-	
7	4-24	-	-	BN by 5-12
11	3-11	3-24	H 4-24	BN by 4-24
12	3-24	3-24 & 6-3	H 4-24 & 7-11	
14	4-24	7-11	? Dead rail on 7 eggs	
15	3-24	3-24	P 4-24	BN by 6-3
17	3-24	3-24 & 6-3	H 4-24 & 7-11	
18	6-3	-	-	BN 6-3
19	4-21	-	-	
21	5-19	6-23	H 6-23	
22	5-19	-	-	BN by 6-23
23	5-19	-	-	
24	3-24	3-24 & 5-19	P 4-21 & H 6-23	
25	3-24	-	-	BN by 5-19
26	3-24	3-24	H 5-19	BN by 5-19
27	3-24	4-21 & 6-15	H 5-12 & 7-11	
29	5-12	-	-	BN by 7-11
32	4-21	4-21	H 5-12	
33	3-24	4-21 & 6-15	H 5-12 & 7-11	
34	3-24	-	-	BN by 6-15
35	6-15	-	-	BN by 6-15
36	3-24	3-24,4-21 & 5-12	? & H 6-15	BN by 6-15
39	4-21	6-15	H 7-11	
40	4-21	-	-	BN by 7-11
41	3-24	4-21 & 6-15	H 5-12 & 7-11	
42	5-12	-	-	BN by 6-15
43	3-24	6-15	A 7-11	Cover gone
44	3-24	-	-	
47	6-15	6-15	H 7-11	
48	3-24	3-24	H 5-12	
49	7-11	-	-	BN by 7-11
50	7-11	-	-	BN by 7-11
52	4-3	4-3	P 4-28	BN by 6-23
53	3-19	3-19	H 4-24	BN by 5-19
54	3-19	5-19	H 6-23	
58	4-3	5-19	H 6-23	
59	4-3	4-24	H? 5-19	
60	5-19	-	-	

A = Abandoned; BN = Brood nest; H = Successful hatching;
P = Predated; V = Vandalized; ? = Uncertain

Table 6 (continued).

61	4-3	4-3 & 5-19	H	4-24 & 6-23	BN
62	5-19	-		-	
63	4-3	4-3	P	4-28	
64	4-3	4-24	H	5-19	
66	4-3	-		-	
67	4-3	4-3	H	4-28	
68	3-19	4-3 & 5-19	H?	4-28 & H 6-23	BN
70	4-3	4-3	H	4-24	BN by 5-19
71	3-24	3-24 & 5-19	H	4-24 & H? 6-23	
74	4-24	5-19	H	6-23	
76	3-19	-		-	BN by 4-28
77	4-3	-		-	

A = Abandoned; BN = Brood nest; H = Successful hatching;
P = Predated; V = Vandalized; ? = Uncertain

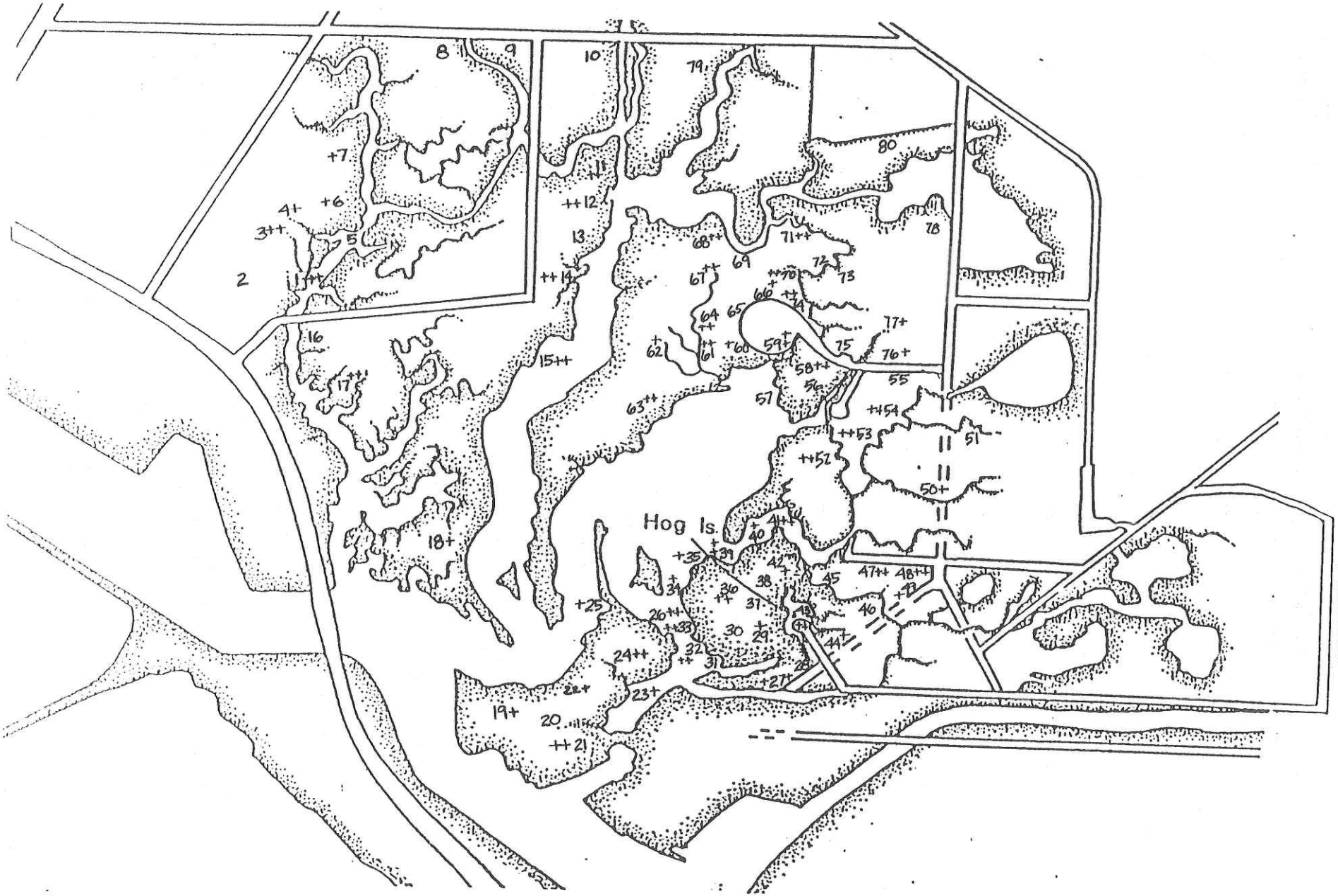


Figure 3. Locations of 80 nesting platforms in the Seal Beach National Wildlife Refuge, 1992. One + indicates a nest, two +s indicate at least one clutch of eggs.

Table 7. Clapper Rail use of nesting structures and hatching success by area in the Seal Beach NWR, 1987 - 1992.

	1992	1991	1990 (*)	1989	1988	1987
No. of rafts available	80	60	45 (20)	46	46	28
No. of nests	53	37	36 (15)	17	24	18
Spring call count	36	28	16	6	14	7
No. incubation nests	32	25	20 (8)	4	13	12
% of nests with eggs	60	68	56 (53)	24	54	67
% hatching success**	73	68	65 (38)	75	8	75
No. of renests***	10	5	3 (2)	-	2	4
% hatching success	95	90	100(100)	-	0	75
% incubation nests near:						
Nasa Island	38	47	30	100	46	58
% hatching success	63	86	83	75	17	71
Hog Island	31	17	30	-	31	17
% hatching success	88	50	50	-	0	100
Sunset Aquatic Park	10	13	15	-	8	17
% hatching success	75	75	100	-	0	50
Kitts Highway	5	7	10	-	15	8
% hatching success	50	0	100	-	0	100
South of Oil Island	17	17	15	-	-	-
% hatching success	71	80	0	-	-	-

*
The first number is for all nests; the second is for those placed in staked tumbleweeds.

**Hatching success is based upon post-hatching sign which is sometimes indeterminate (H?, Table 3); rather than 1 with certain hatching, 0.5 is used in the calculations for nests that probably hatched.

***A renest, as treated here, is a second clutch in the same nest.

There were at least two nesting attempts in tumbleweeds off of Oil Island, indicating the need for additional rafts there. Only 2 eggs, or less, in one tumbleweed survived and hatched. There may have been additional nesting in cordgrass on the east side of the NWR in the older restoration area. For the first time, Clapper Rails were conspicuously active in this vicinity during the entire nesting season. The cordgrass there was marginally adequate for nesting cover.

Most of the 20 new rafts were deployed near Hog Island because of the high nesting use of that area last year. The rafts available to the rails included 27 off Nasa Island, 23 off Hog Island, 8 off Oil Island, 8 off Sunset Aquatic Park, 7 off Kitts Highway, 5 off Bolsa Avenue, and 2 in the restoration area (Figure 3). Nearly 100% of the rafts were used by Clapper Rails for some purpose. For example, 61 of the rails counted during the November high tide count were sequestered on rafts. Additionally, careful examination revealed shed feathers, cast pellets, and/or crab remains on all but a few rafts indicating their use for cover and refugia, as well as nesting. In light of these uses and the growing rail population, 20 more rafts should be added to the total available in 1993, and perhaps 20 more annually thereafter for several years.

The rail's use of the rafts reached another peak in 1992 (Table 7). The decrease in predation, brought about by control of nonnative predators, and increasing rail numbers should result in the repopulation of this entire marsh, if the program is continued.

The 15 rafts placed in the Kendall-Frost Reserve in northern Mission Bay, San Diego County, were refurbished in late February with fresh tumbleweeds and floats and were checked 4 times on 31 March through 22 July 1992. Ten of the 15 rafts held Clapper Rail nests (Figure 4) and 8 of these held at least 11 clutches of eggs (Table 8). At least 2 additional rafts held brood nests. Small mammal domes and/or droppings were found on 7 rafts. In spite of this, hatching success for all 11 clutches was 91%. Most of the small mammal activity could be the work of rats (Rattus sp.).

All of the factors leading to the decrease in Clapper Rails at the Kendall-Frost Reserve are not clear but the rails now appear to be staging a comeback. The level of recent raft use gives credence to the theory that lack of suitable nesting sites may be limiting to the rails in the Reserve (Table 9). The rafts should serve as focal points for monitoring rail use of this marsh, documenting problems, and alleviating them. The observations of cats on freshly killed Clapper Rails during high tides in 1989 and 1990 should serve as a warning. Predation is probably a major limiting factor for the rails in this little isolated wetland. There were cat tracks all over the salt pan in 1992 and at least two different cats were seen. Predator monitoring and control should be ongoing by now at the reserve but is not.

Rat predation of eggs and young is potentially serious.

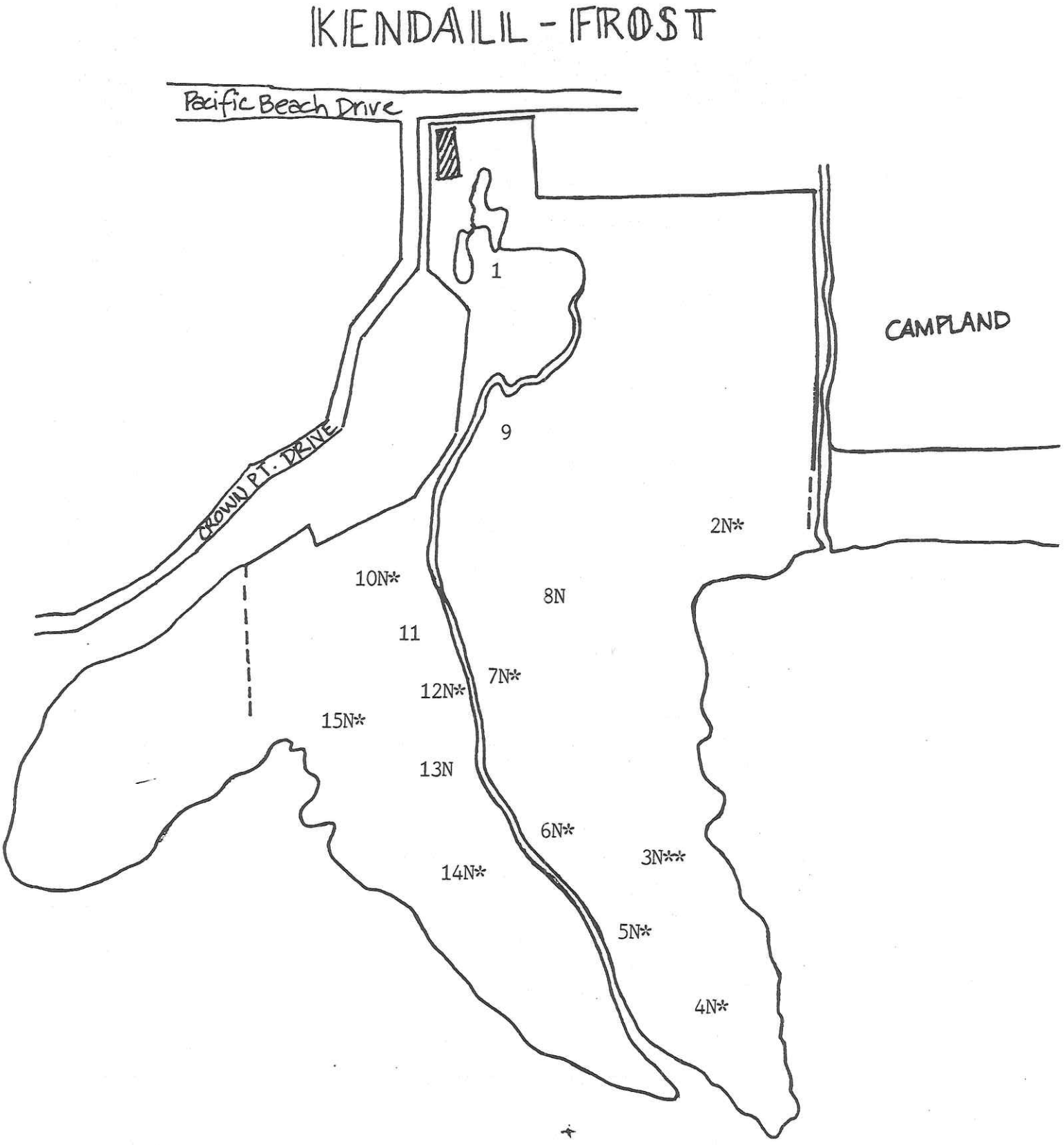


Figure 4. Locations of 15 nesting rafts in the Kendall-Frost Reserve, 1992. Rafts that held Clapper Rail nests are marked with an "N"; each "*" indicates a clutch of eggs.

Table 8. Clapper Rail use of nesting rafts in the Kendall-Frost Reserve, 1992.

	Dates of Detection			
Raft #	Nest	Egg/Incubation	Outcome	Remarks
2	3-31	3-31	H 5-8	
3	3-31	5-8 & 5-28	H 5-8 & 7-22	BN by 7-22
4	3-31	3-31	H 5-8	Rat use
5	3-31	3-31	H 5-8	Rat use
6	5-8	5-8	H 5-28	BN by 7-22
7	3-31	?	H 5-8	Rat use
8	-	-	-	BN by 7-22
10	3-31	3-31	H 5-8	Rat use
11	-	-	-	Small mammal use
12	3-31	?	P 5-8	Probable rat P
13	-	-	-	BN by 5-8
14	3-31	3-31	H 5-8	Rat use
15	5-28	5-28	H 7-22	BN by 7-22

BN = brood nest; H = successful hatch; Inc = incubation; ? = outcome uncertain; T = tumbleweed; TN = tumbleweed nest; F = failure.

Table 9. Clapper Rail use of nesting platforms and hatching success in the Kendall-Frost Reserve, 1989 - 1992.

	1992	1991	1990	1989
No. of nests	12	9	9	5?
Spring call count	11	9	5	4
No. incubation nests	10	8	7	3
% of nests with eggs	83	89	78	60
% hatching success*	90	88	85	83
No. of renests**	1	4	3	?
% hatching success	100	100	100	-

*Hatching success is based upon post-hatching sign which is sometimes indeterminate (H?, Table 3); rather than 1 with certain hatching, 0.5 is used in the calculations for nests that probably hatched.

**A renest, as treated here, is a second clutch in the same nest.

Consequently, the Clapper Rail Study Team undertook trapping on the edge of the wetlands at the Reserve. The first 100 trap-nights in May yielded 9 house mice (Mus musculus) and only 1 rat. The second trapping session surprisingly yielded harvest mice (Reithrodontomys megalotis). A greater effort at rat control should be undertaken. At least one clutch of eggs was probably taken by rats this year.

Additional rafts should be provided at Bolsa Chica for the rails that appear to move there regularly from the NWR. There is also the possibility of a joint project with the US Fish and Wildlife Service's refuge branch and the wildlife center personnel to provide rafts at the Sweetwater Marsh NWR. The Clapper Rails there would then have the advantage of immediately available nesting sites, which appear to be in short supply, and closer monitoring. This could result in a better understanding of why the Sweetwater Marsh subpopulation occurs in such low density and perhaps lead to corrective management actions. Finally, we have proposed a raft project to the California Department of Fish and Game on Middle Island in Upper Newport Bay. The half of this marsh parcel that is most exposed to storm flows and tides has little nesting habitat and would benefit from rafts. We would like to explore the utility of rafts even at Upper Newport Bay, where in some years in parts of the bay, nesting habitat is episodically in short supply (see Miscellaneous Observations below).

PREDATORS

Coyotes

It is now understood that the regular presence of coyotes keeps explosions in the number of smaller predators, or mesopredator release (Soule et al. 1988), from occurring, protecting other wildlife, particularly birds, from the heavy predation that follows coyote extirpation. These smaller predators, feral cats and foxes for example, prey heavily on birds and bird eggs and have caused local bird extinctions where coyotes have been precluded. Since the documentation of the circumstances leading to mesopredator release, concern for the viability of the local coyote population around Upper Newport Bay has grown. The local coyotes probably cover large expanses on a regular basis that include the bay. If this is to continue, viable corridors for wildlife movement must be maintained between the bay and the much larger open spaces remaining in Orange County to the east. Just as important is informing the public of the need for coyotes to keep uninformed sentiment or less important priorities from perpetuating poor coyote control practices. Regular dispersal by coyotes into the bay is still occurring along routes that connect to Big Canyon and San Diego Creek. As more of Orange County is converted to houses and similar purposes, the remaining corridors could easily be left

too narrow or urbanized to be viable. If urbanization proceeds as it has elsewhere, the remaining open space could also be rendered too fragmented to maximally function as wildlife habitat and home to large roaming top predators. Since the wetland organisms are directly affected by a food chain that includes critical habitat components located miles from the bay, decisions on the fate of that habitat should consider the importance of this viable wetland. The maintenance of Upper Newport Bay as a maximally functional wetland should be a top priority; its conversion to something approaching an outdoor zoo and requiring heavy and constant management should be avoided. The fate of endangered species and other significant resources is at risk.

Examples of predation problems involving endangered species were observed recently at the Seal Beach NWR and Mugu Lagoon. With a recent lack of coyote presence at Seal Beach, the introduced red fox population exploded locally and nearly extirpated the Light-footed Clapper Rail (USFWS and USN 1990). With control of the red fox and provision of nesting habitat, the rails are in the process of a dramatic resurgence (see Figure 2). In the marsh at Mugu Lagoon, a local explosion of red foxes was manifest for a few years, concurrent with the disappearance of coyotes. More recently, coyotes are again frequenting Mugu and red fox sightings are now rare. Along with the natural check on red foxes brought about by coyotes at Mugu Lagoon came the manifestation of a small subpopulation of Light-footed Clapper Rails beginning in 1983.

Coyote Monitoring and Movements Coyote activity increased in 1992, compared to 1989 - 1991 at Upper Newport Bay, the Seal Beach NWR, and the Bolsa Chica Ecological Reserve. Department-sponsored night surveys resulted in regular sightings in Upper Newport Bay and along San Diego Creek. There were daylight sightings in Big Canyon and an abundance of sign. The Animal Damage Control trapper reported coyote sightings and sign on the Seal Beach NWS and coyotes denned in the Bolsa Chica area in 1992.

Coyote movement in and around Upper Newport Bay will be monitored again through radio telemetry when we secure additional funding and/or a student eager to work the project. Trapping (particularly) and monitoring are extremely labor intensive. A grant proposal has gone out to the Environmental Protection Agency and other potential participants and we are hopeful for additional telemetry work in 1993. The coyote movement information collected to date was summarized for publication in 1992 (see Publications and Presentations below).

Raptor Watch

The Clapper Rail Study Group's winter activities include biweekly raptor monitoring on Saturdays, weather permitting. These are attempts at quantifying raptor presence and activity at Upper Newport Bay. Three stations with 2 - 5 observers per station were spaced along the edge of the bay and as much data as

possible were taken on number of individuals per species and time engaged in various activities. The results should portray a profile or index of raptor pressure on the bay. There were raptor watches on 7 and 21 November and 5 and 19 December 1992.

Table 10 summarizes the kind of information obtained. The entire data set will be compiled and reported after the 1992/1993 winter season. Seven species were observed during the two sample watches reported. Although we have seen Peregrine Falcons (Falco peregrinus) and Prairie Falcons (Falco mexicanus), they were not active in the bay during the two sessions reported. No direct kills were observed of the raptors fully capable of taking rails but the potential is well illustrated in the consistent presence of Red-tailed Hawks (Buteo jamaicensis) and Northern Harriers (Circus cyaneus), in particular. I have long doubted the ability of harriers to consistently prey on Clapper Rails but must report that a large female on the Tijuana Marsh NWR was observed in this process (P. Jorgensen pers. comm.). Harriers would be a great threat to young, if they hunted the marsh consistently or in numbers during the breeding season. However, harriers are uncommon now during the breeding season.

Combining time perched and in flight reveals the constant presence of more than one harrier and Red-tailed Hawk during both monitoring sessions reported. As many as 6 red-tails and 3 harriers were observed simultaneously, bay-wide. Interestingly, two Ospreys were documented during one of the sessions. Although it may take many sessions to observe a rail attacked, these observations give an index of predation pressure at the bay and over time may lead to a better understanding of the Clapper Rail's part in the raptor's diet.

MISCELLANEOUS OBSERVATIONS

There were late rains in the spring of 1992. Those parts of Upper Newport Bay most exposed to the storm flows were damaged. There was some damage in all marsh zones but it was concentrated in the cordgrass. This visual assessment was corroborated by late nest searches on Upper Island and scattered observations of fall broods. A 30 May 1992 search turned up 12 nesting sites, only 2 of which were in cordgrass and both had hatched. Five nests were in tumbleweeds that happened to have lodged in the marsh: 3 held eggs or incubating adults; 1 had been predated by raccoons (Procyon lotor); and the final tumbleweed nest showed signs of hatching but was low and wet. Two additional nests were in bulrush (Scirpus spp.) on the edge of the road (1 hatched, 1 with 8 eggs); 2 were marginally placed in flotsam cover (1 hatched, 1 with eggs); and the twelfth nest was on a high marsh berm and had hatched. Cordgrass, the preferred nesting cover, had been so widely mashed or removed by flotsam flows that only 17% of the Upper Island territories had adequate cordgrass available. There were actually 13 territories identified in this same parcel during the vocal count in March, so we missed only

Table 10. Raptor watch at Upper Newport Bay, 1992.

	Min. # Individuals		# of Encounters		% Time Perched		% Time in Flight		# of Kills	
	a	b	a	b	a	b	a	b	a	b
RTHA	6	4	55	74	193	183	62	16	0	0
TUVU	5	6	31	29	0	6	26	43	0	0
AMKE	4	5	23	9	47	11	21	4	2*	0
NOHA	3	3	9	39	0	92	23	23	0	0
OSPR	1	2	8	40	43	95	6	21	1**	1
RSHA	1	1	3	3	3	2	2	1	0	0
SSHA	1	-	1	-	0	-	1	-	0	0

a = 7 Nov 92, 0830-1130 hrs.;
b = 21 Nov 92, 0730-1200 hrs @ Shellmaker, 0900-1115 hrs @ the other two stations.
*very small prey, insect-sized
**flatfish, halibut?
Encounters represent 5 minutes perched or appear/disappear of an individual in less than 5 minutes.
% Time Perched is total time at least one individual perched during the observation period, addative for the three stations/total observation time.
% Time in Flight is as above for flight, soar, or hunting time in the air.
RTHA = Red-tailed Hawk; TUVU = Turkey Vulture; AMKE = American Kestrel; NOHA = Northern Harrier; OSPR = Osprey; RSHA = Red-shouldered Hawk; SSHA = Sharp-shinned Hawk.

one nesting site. Two-thirds of the nests were in very marginal cover, in terms of tidal vulnerability and/or were late attempts.

The first banding session on Upper Island was on 16 August and 6 first-year rails were captured. Three were too young to be banded and were released at the trap sites. Because of the late nesting, the second session on Upper Island was postponed until 13 September when yet a fourth rail too small for banding was captured and released. This bird was 4 - 5 weeks old. The low availability of good nesting cover forced the selection of marginal sites, renesting after limited success or outright nest failures, and late fledging.

Cordgrass was damaged elsewhere in Upper Newport Bay, as well. As a result, fall youngsters were also observed off Shellmaker Island. The heavier and more prolonged the winter, the greater percentage of habitat affected bay-wide. We are concerned enough that a proposal was developed to examine the utility of nesting rafts on Middle Island, since half the island is so exposed that nesting habitat is chronically poor or absent (see Nesting Rafts, above). Based on the limited damage to rail nesting observed in 1992, we believe it prudent to develop some understanding of the utility of rafts at Upper Newport Bay in case there is extensive damage in the future.

PUBLICATIONS AND PRESENTATIONS

The information gathered through these observations is disseminated to the public through publications and speaking engagements. A paper entitled "Status and management of Light-footed Clapper Rails in coastal southern California" was accepted for publication in the Transactions of the Western Section of the Wildlife Society (The presentation of this paper at the annual meetings was awarded the Nelson-Hooper Award). This article was peer-reviewed and highlights the rafts and the management success at the Seal Beach NWR. A second article entitled "The need for corridors between southern California's coastal wetlands and uplands" is accepted for publication in the southern California Academy of Sciences Transactions with just editor review. This paper highlights mesopredator release and presents the initial coyote movement data collected at Upper Newport Bay.

Aspects of the life history of the Light-footed Clapper Rail and recovery efforts were presented in speaking engagements to: El Dorado Audubon; Western Section of the Wildlife Society (won the award for best technical paper presentation for 1992); citizens of Costa Mesa and Newport at Mariner's Library Evening Forum; Newport Conservancy; Newport City Council Members; several classes at University of California, Irvine; Annual Vertebrate Pest Conference; Annual State Parks Symposium; El Dorado Park Daycamp; National Association of Interpretive Naturalists; Meadowpark Elementary School; Southern California Academy of Sciences; Newport Rotary; Ad Hoc Environmental Committee of the Orange County Bar Association; CDFG's docents

and instructors at Upper Newport Bay; and the annual meetings of the Western Bird Banders Association.

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