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USE OF PLAYBACK RECORDINGS IN SAMPLING ELUSIVE OR SECRETIVE BIRDS

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ABSTRACT.—The playback technique has been used successfully to detect the presence of many bird species and to study the behavior of others. Few reports, mostly involving the family Rallidae, were reviewed in which the playback of avian vocalizations was used in population estimation. Our application of this technique to field studies of three species of rails, Limpkins, and Plain Chachalacas was successful. The detection of rails and Plain Chachalacas without stimulation from playback recordings would be nearly impossible, as these birds are otherwise difficult to find and observe. Playback techniques augment studies of Limpkins, making them more readily observed in the field. Since Limpkins seem to be attracted by recorded calls and typically approach the observer, it is necessary to record a bird's location at initial response to avoid a bias in density estimation.

Rails and Plain Chachalacas are best sampled in the early morning hours and in the case of the latter species, during the breeding season. Limpkins could be sampled successfully with recordings either morning or evening. Repeatability of the recordings in eliciting calling responses from Plain Chachalacas was found to be excellent over short time intervals.

Researchers have not taken full advantage of the characteristics of birds which could assist in detecting or censusing inconspicuous species. The playback technique has great potential for use with highly vocal avian species that are otherwise difficult to detect in the field.

Tape recordings of avian vocalizations have been employed in a variety of studies over the last two decades to elicit behavioral or vocal responses from birds. Playback techniques have proven advantageous in eliciting responses from otherwise detectable birds, thereby increasing the number of observations possible per unit of time and increasing sampling efficiency in the field. Playback recordings of bird sounds have been used in several ways, including (1) detection of secretive, elusive or nocturnal birds by scientists and birdwatchers (e.g., Christmas Bird Counts), (2) investigation of avian social behavior and territoriality, and (3) estimation of population size. The increase in use of natural recordings and a thorough review of available equipment were presented by Bradley (1977).

Tape recorded sounds have been used to aid in the detection of birds by Bohl (1956) for Chukar (*Alectoris chukar*), Stirling and Bendell (1966) for Blue Grouse (*Dendragapus obscurus*), MacDonald (1968) for Spruce Grouse (*Canachites canadensis*), Braun et al. (1973) for White-tailed Ptarmigan (*Lagopus leucurus*), Marion (1974a, b) for Plain Chachalacas (*Ortalis vetula mccalli*), and Glahn (1974) for Virginia Rails (*Rallus limicola*). Levy et al. (1966) used recorded female calls to detect male Gambel's Quail (*Lophortyx gambelii*), Harlequin Quail (*Cyrtonyx montezumae*), and Scaled Quail (*Callipepla squamata*). In addition, recorded sounds have been used successfully in trapping Greater Prairie Chickens (*Tympanuchus cupido*) on their booming grounds (Silvy and Robel 1967) and female Sharp-tailed Grouse (*Pedioecetes phasianellus*) during the brood-rearing period (Artmann 1971). With a variety of songbirds, recordings have been used to investigate intraspecific recognition of territorial boundaries (Weeden and Falls 1959, Falls 1969, S. T. Emlen 1971, Krebs 1971, Verner and Milligan 1971, Goldman 1973, Kroodsma 1976a, Patterson and Petrinovich 1978, and Robbins 1978a) and to stimulate reproductive development in females (Kroodsma 1976b).

Glinski (1976) cited a number of potential problems associated with the repeated use of tape-recorded territorial calls employed by birdwatchers and recommended that these uses be minimized when they involve certain rare species. He was concerned about unnecessary disturbance of birds at their nest sites and the possible consequences of extra energy drain on birds responding to taped vocalizations.

Playback recordings apparently have not been employed extensively to estimate populations of elusive or secretive birds. The technique has been used at sunrise and sunset during the breeding season to study the presence, distribution, and density of rails in Colorado (Glahn 1974, Griese et al. 1980) and Kansas (Baird 1974). We could not find previous evidence of the use of playback recordings with Limpkins (*Aramus guarauna*) and only two references (Marion 1974a, b) to its use in studying Plain Chachalacas. Despite a paucity of published information on their use, playback recordings show good potential for use with highly vocal species of birds. In this paper, we use King Rails (*Rallus elegans*), Virginia Rails, Soras (*Porzana carolina*), Limpkins, and Plain Chachalacas to assess the value of this technique.

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TABLE 1
DENSITY ESTIMATES FOR THREE SPECIES OF RAILS DETECTED USING THE PLAYBACK RECORDING TECHNIQUE ON THE TWO WETLANDS IN NORTHERN FLORIDA, 1979–80

	Density (birds/ha)			
Wetlands	Spring	Summer	Fall	Winter
King Rails				
A	0.6	0.6	0.6	0.0
B	0.0	1.1	0.6	0.0
Virginia Rails				
A	2.1	0.0	0.0	0.6
B	0.6	0.6	0.0	0.3
Soras				
A	5.3	0.9	1.2	0.6
B	3.5	0.3	0.9	0.0

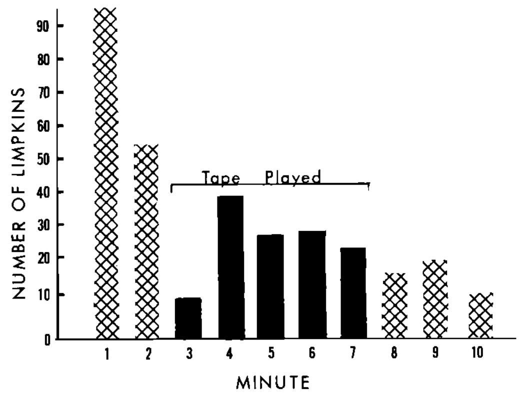

FIGURE 1. Number of Limpkins detected by 1-minute intervals during 10-minute sampling periods, Lake Ocklawaha, Florida, June 1980. Recorded vocalizations were played during minutes 3–7.

METHODS

RAILS

Rails were studied as part of a larger investigation of bird communities in habitats created by phosphate mining in Hamilton County, Florida. Since the three species of rails present on these areas are secretive inhabitants of freshwater marshes or other densely vegetated wetlands, they are often difficult to census. To facilitate detection of these species, recordings of their calls were played at six sample points along the periphery of densely vegetated, diked impoundments. Recordings were played for approximately one minute every morning for 10 days each season from spring 1979 through winter 1980. Distances to rails that responded were estimated and recorded. Ramsey and Scott's (1979) variable circular plot method was used to estimate rail densities in these impoundments.

LIMPKINS

Playback recordings of vocalizations were used to determine their effectiveness in detecting and estimating populations of Limpkins on Lake Ocklawaha, Marion and Putnam counties, Florida. Lake Ocklawaha is a shallow, man-made reservoir flooded in the early 1970's in preparation for its inclusion in the unfinished Cross-Florida Barge Canal. Limpkins were sampled on two areas of the lake, both of which were located along the former channel of the Ocklawaha River. The "downriver" area was characterized by an open water channel (approximately 30 m wide) bordered by a 200 m wide band of flooded dead timber with extensive mats of floating water hyacinth (*Eichhornia crassipes*) and scattered emergent vegetation. The "upriver" area was similar to the downriver area with the exceptions that standing dead timber was virtually absent and a higher proportion of emergent vegetation (e.g., *Cicuta maculata*) was present.

Permanent sample points were marked along the former river channel (13 upriver and 12 downriver). These were sampled mornings and evenings by boat for five consecutive days in early June 1980. Each sample included 10 minutes of observation while we were anchored at a point. Samples consisted of two minutes prior to playing recorded Limpkin vocalizations on a portable cassette recorder, five minutes during which the tape was played, and three minutes subsequent to playing the tape. Distances (up to 100 m) to all detected Limpkins were estimated and recorded. The order in which points were sampled was rotated daily to avoid confounding effects of time of day and sample location with the number of birds detected.

The distance from sampling points at which the number of birds detected began to decline (inflection point) was determined by plotting the density of birds observed in 10 m annuli around each sample point. Densities were estimated as the number of birds observed within the basal radius divided by the area of a circle with radius equal to the distance to the inflection point. Densities between the upriver and downriver areas and number of detections between morning and evening counts were compared using *t*-tests.

PLAIN CHACHALACAS

The most comprehensive data available to us on the use of playback recordings was included in a survey of the distribution and abundance of Plain Chachalacas in southern Texas (Marion 1974a). A total of 880 census points was established at 0.4 and 0.8 km intervals adjacent to tracts of suitable habitat throughout the Lower Rio Grande Valley of Texas. These points were censused at least once during 1971; the majority of these censuses occurred within the breeding season (late March–June). A tape recording of Plain Chachalaca vocalizations was played at each census point and the distance to all responding chachalacas was recorded. The maximum distance at which Plain Chachalacas consistently responded was estimated from these data. The percentage of birds present within a circle of this radius that did not respond was estimated from censuses at two relatively distinct, isolated tracts of habitat where population sizes were known from counts at local feeders. Counts of birds at other points were adjusted to account for nonresponding birds using this correction factor.

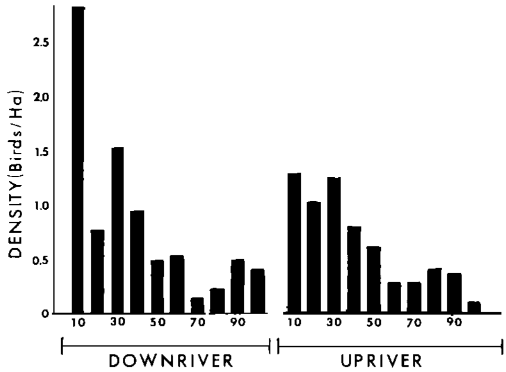

FIGURE 2. Density of Limpkin detections in 10-m annuli around sample points, Ocklawaha River, Florida, June 1980.

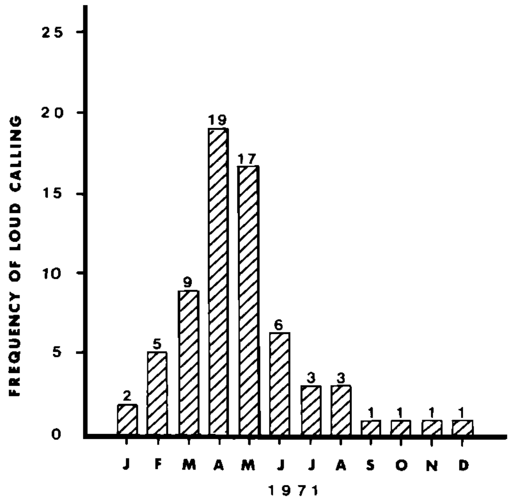

FIGURE 3. Seasonal variation in calling frequency of Plain Chachalacas at Santa Ana National Wildlife Refuge, Hidalgo County, Texas. Data shown are the total number of days each month on which loud calling was heard in 1971.

A total population estimate for Plain Chachalacas in Texas was calculated using two correction factors; one for areas known to contain Plain Chachalacas but not included in the survey and the other for nonresponding birds in the population. All suitable Plain Chachalaca habitat was not sampled during the survey due to limitations on time and access to private property. Area correction factors were calculated for each county involved using the ratio of known occupied habitat to the area sampled at census points.

RESULTS AND DISCUSSION

Rails

Playback recordings were effective in detecting each of the three species of rails on our study areas. Density estimates resulting from the variable plot estimator of Ramsey and Scott (1979) are shown in Table 1. Overall, Soras appeared to be year-round residents and had the greatest density of the three species, with a peak in density occurring in the spring. Densities of Virginia Rails also were recorded as being greatest on our study areas during the spring, but these rails were not detected during the fall. King Rails occurred in relatively lower densities in the spring, summer, and fall, but they were not detected during the winter. Detection of rails appeared to be strongly dependent upon the use of playback recordings and these recordings were successfully used to augment variable plot census techniques.

Limpkins

Limpkin counts were enhanced appreciably by the use of playback recordings of their calls. Frequency of observations declined rapidly during the first three minutes of observation, but increased markedly within two minutes of initiation of the recorded calls (Fig. 1). Rate of new detections then diminished at a slower rate during and after the time the tape was played. Most Limpkins observed responded vocally to the tape; however, some birds were observed which apparently heard the tape but did not respond vocally. Also, a typical response to the tape was for Limpkins to fly toward the tape recorder and circle or perch near the sample point. Care must be taken to record a bird's location at its initial response to the tape to avoid a possible bias in density estimation.

Importance of using a technique for determining radii of similar detectability (i.e., inflection points) was exemplified by a comparison of absolute and relative densities between areas. Inspection of detection curves indicated inflection points at 30 m for both areas (Fig. 2). Mean densities per point (within 30 m) by this method did not differ ($P > 0.05$) between the upriver and downriver areas with estimates of 1.4 and 1.1 birds per ha, respectively. However, when mean number of birds per point (all detections) were compared between areas, a higher density ($P < 0.01$) was indicated for the downriver area than for the upriver area with means of 2.9 and 1.5 birds per point, respectively. The apparently erroneous conclusion of greater densities on the downriver area resulting from the relative index was probably a result of vegetation differences on the two areas. Numerous standing dead trees on the downriver area apparently increased Limpkin detectability at greater distances by providing perches which elevated birds above the obscuring vegetation. This demonstrates the

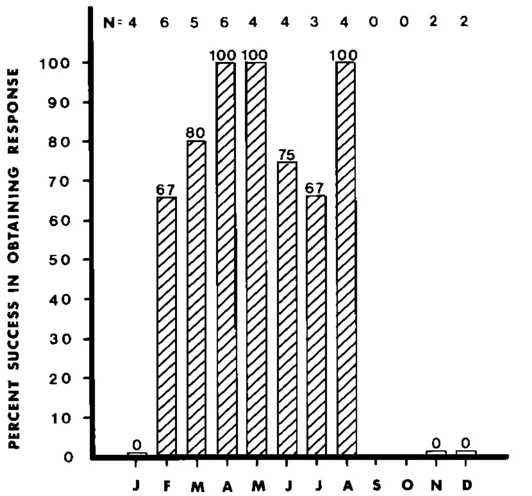

FIGURE 4. Seasonal variation in effectiveness of recorded calls in obtaining responses from Plain Chachalacas on four areas in southern Texas. Number of attempts (N) during each month are also shown. Data were lacking for September and October due to the extensive flooding and inaccessability of study areas.

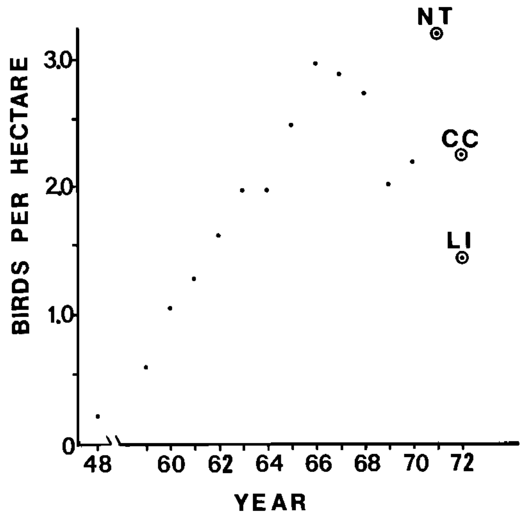

FIGURE 5. Plain Chachalaca population estimates at Santa Ana National Wildlife Refuge, Texas. Estimates for years prior to 1970 were made by refuge managers. Estimates from this study in 1971 came from nest transects (NT), and in 1972 came from call counts (CC) and Lincoln Index (LI).

importance of obtaining comparable estimates of density when censuses from two areas with differing vegetation characteristics are to be compared.

No difference ($P > 0.05$) was found between the number of birds detected during morning and evening counts. Limpkins calling naturally without stimulation from the tapes vocalize extensively during June; they call at various times throughout the day, and occasionally at night. It seems therefore, that "time of day" is not as important in sampling this species as it is with other avian species.

Our overall assessment of these results was that playback techniques are useful for increasing both detections and observations of Limpkins but are not absolutely necessary to obtain observations of this species.

TABLE 2

POPULATION ESTIMATES FOR PLAIN CHACHALACAS AT THE 648-HA SANTA ANA NATIONAL WILDLIFE REFUGE, HIDALGO COUNTY, TEXAS, 1971–72

Method	Population estimate: Total birds	Density (birds/ha)
Lincoln	998	1.5
Nest transects	1993	3.1
Call counts	1593	2.2

PLAIN CHACHALACAS

Plain Chachalacas responded readily to tape-recorded vocalizations, particularly just prior to and during the spring breeding season when the frequency of natural calling was highest (Fig. 3). Recorded calls were from 75–100% effective in eliciting calling responses from wild birds during the breeding season (Fig. 4) and these were used in detecting the birds in the field.

Data were available from nine separate areas with a total of 21 census points where samples were repeated on alternate mornings. Comparisons of responses revealed no significant difference ($P > 0.05$) between days in number of birds responding to calls at the nine locations.

TABLE 3

ESTIMATES OF PLAIN CHACHALACA POPULATIONS IN THE LOWER RIO GRANDE VALLEY OF TEXAS, 1972

County	Chachalacas counted	Population[a] size	Area sampled (hectares)	Density (birds per hectare)	Total population[b]
Cameron	1701	3402	1195	2.9	8845
Hidalgo	971	1942	777	2.5	9322
Starr	71	142	121	1.2	880
Willacy	30	60	66	0.9	204
Total	2773	5546	2159	2.6	19,251

[a] Number counted times the correction factor for nonresponding birds, i.e., 2.0.
[b] Population size times area correction factor.

These data indicated that, at least over short time intervals, the repeatability of responses obtained using recorded calls was excellent. Observations recorded at these nine locations also indicated that Plain Chachalacas respond more readily to recorded calls during early morning hours (06:00–09:30) than during late morning hours (09:30–12:00).

The maximum distance at which Plain Chachalacas consistently responded to recorded calls was estimated as 180 m. Pairs of Plain Chachalacas generally responded together within this distance, but apparently not all birds responded to recorded calls. The proportion of nonresponding birds within this distance was estimated on two isolated tracts of known density. On one tract, 22 out of 50 (44%) Plain Chachalacas responded to recorded calls. On the other tract, 10 out of 17 (59%) responded. A correction factor for nonresponding birds was calculated as the ratio of the total number of Plain Chachalacas present to the number responding to recorded calls. In the two observations, approximately half of the Plain Chachalacas responded to recorded calls; therefore an average correction factor of 2.0 was used to account for nonresponding birds within 180 m of the census point.

Specific examples to illustrate the practical use of playback recordings in population estimation follow. On April 18, 1972, 111 Plain Chachalacas responded to recorded calls at 10 census points at Santa Ana National Wildlife Refuge in southern Texas. Use of the correction factor for nonresponding birds (2.0) gave a corrected total of 222 birds on the approximately 101.8 hectares sampled, for a density of 2.2 birds/ha. This density extrapolated to a total population estimate for the Refuge of 1,426 birds per 648 hectares.

This estimate of 2.2 birds per hectare was compared with two other population estimates for the same area, the Lincoln Index and estimates based upon nest density (Table 2) as measured along transects. For the Lincoln Index, which is based upon proportions of marked birds in the population, the density of birds was estimated as 1.5 birds per hectare. Using nest density data obtained from nest transects which were extrapolated to the entire area, a value of 3.1 birds per hectare was obtained. The population estimate based upon the call counts was between the above two estimates and was probably the most accurate of the three methods of population estimation. Also, our estimates based upon call counts closely approximated annual estimates made by managers at Santa Ana National Wildlife Refuge; these estimates, apparently based upon observations at photo blinds and other feeding locations, were obtained from unpublished annual reports. The estimates were 2.5, 2.8, 2.8, 2.8, 2.0, and 2.2 birds per hectare for 1965–70, respectively. These estimates yielded a 6-year average of 2.5 birds per hectare, comparable to the call count estimate obtained for the same area during 1972 (Fig. 5).

Another example on a broader scale includes the following estimation of Plain Chachalaca populations throughout the Lower Rio Grande Valley of Texas based entirely upon responses obtained using the playback technique. A total of 2773 Plain Chachalacas responded to recorded calls at 447 out of 880 census points. After correction for nonresponding birds in the population and for habitat area not sampled, the total Plain Chachalaca population in Texas was calculated to be approximately 19,000 birds (Table 3).

Generally, our evaluation of the playback technique for use with this species was very favorable. It seems to be the only practical way of estimating populations of these elusive birds in their dense habitats.

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