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WALTERS, J. R., P. D. DOERR, AND J. H. CARTER III. The cooperative breeding system of the Red-cockaded Woodpecker. Ethology (In press).

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Wilson Bull., 100(3), 1988, pp. 496–499

Response of Least Bitterns to tape-recorded calls.—Tape-recorded calls have been used in the study of a variety of bird species. The technique is useful for estimating avian abundance, investigating habitat use or behavior, and in detecting elusive or secretive species (Johnson et al. 1981, Marion et al. 1981). Johnson et al. (1981) noted that the Least Bittern (*Ixobrychus exilis*) was responsive to playback recordings, but application of the technique for this species has not been documented. In the present study, we used tape-recorded calls of Least Bitterns to increase their detection in dense marsh vegetation. Although the study was not specifically designed to evaluate this technique, the data should be useful for planning further studies of this species, which is considered rare, uncertain, or declining, in many regions of the United States (Chandler 1985, Tate 1986, NYSDEC 1987.)

Methods.—Breeding bird censuses were conducted in six tidal freshwater marshes located along the Hudson River in New York State. All study areas included extensive stands of cattail (primarily *Typha angustifolia*) interspersed with varying amounts of river bulrush (*Scirpus fluviatilis*), purple loosestrife (*Lythrum salicaria*), reed (*Phragmites australis*), and tidal open water. In 1986 and 1987, we counted birds on 169, 0.28-ha plots (30-m radius) among the six areas. Only 50 of the plots were sampled in both years. Plot centers were located randomly within each study area and were separated by at least 60 m.

Breeding birds were counted four times in 1986 and five times in 1987. Counts were conducted by two observers during early morning (05:00–10:00 h DST) and evening periods (16:30–21:00 h), between 1 May and 20 June each year, at times with no measurable precipitation or strong winds (greater than approximately 25 km/h). Each plot visit consisted of an approximate 10-min observation period during which tape-recorded calls of Green-backed Heron (*Butorides virescens*), Least Bittern, American Bittern (*Botaurus lentiginosus*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), and/or Common Moorhen (*Gallinula chloropus*) were broadcast from the center point using portable cassette recorders. Maximum sound pressure 1 m from the source was approximately 90 db. A standardized sequence of alternating calls and silent listening periods, including up to 5 min of Least Bittern calls, was used during each census round. For Least Bittern, we used the "cooing" call (Bent 1926) as recorded on the "Peterson Field Guide to Bird Songs" (Kellogg et al. 1975). This call is generally attributed to the male and may serve a function in courtship (Weller 1961, Palmer 1962). Estimated distance, movement, and time of observation were noted for all Least Bitterns seen or heard within 30 m of a plot center. Sex of individual birds was usually not confirmed. Additional information on study areas and census methods was reported previously (Swift 1987).

Results.—Least Bitterns were observed 73 times on 48 (28%) of the 169 plots. Approx-

TABLE 1

NUMBER OF LEAST BITTERNS OBSERVED (SEEN OR HEARD) DURING 1986 AND 1987

Year	Counts per round	Census Round[a]					OSL[b]
		1	2	3	4	5	
1986	119	0	3	10	13	—	0.0005
1987	100	0	4	6	22	15	0.0000

[a] Census rounds corresponded to the following dates in 1986: 1—May 5–9; 2—May 11–21; 3—May 23–June 3; and 4—June 4–16. Census rounds in 1987 were as follows: 1—May 5–9; 2—May 11–19; 3—May 20–28; 4—June 1–11; and 5—June 15–18.

[b] Observed significance level for ANOVA between census rounds within years.

imately 75% of these observations were based at least in part on vocalizations (47 "cooing" and 8 "cackling" birds), while the remainder (18 observations) were birds seen and not heard. Observation frequency was generally considered low, since repeat occurrences on a plot (within the same year) were noted only 8 times during the study. On plots where Least Bitterns were seen or heard, the mean number observed was 0.3 per plot visit. Use of tape-recorded calls appeared to increase substantially detection of Least Bitterns. Only 12 (16%) of all Least Bitterns seen or heard, and only 5 (9%) of those that were heard, were observed prior to playback of at least one Least Bittern call. In addition, over half of all Least Bitterns seen or heard moved towards the observer during the playback period.

Least Bitterns were first observed on 16 May in 1986 and on 4 May in 1987. Thereafter, frequency of observation increased significantly during the breeding season, to an apparent peak in early to mid-June (Table 1). This increase may have occurred as a result of behavioral changes, increased abundance over time, or greater responsiveness to the playback sequence. Our data suggested the latter, since in both years, highest response rates occurred during

TABLE 2

NUMBER OF LEAST BITTERNS OBSERVED DURING ONE-HOUR INTERVALS

Count start time	Number of counts[a]	Number of Least Bitterns observed
05:00–05:59 h	29	14
06:00–06:59 h	57	18
07:00–07:59 h	52	15
08:00–08:59 h	43	15
09:00–09:59 h	5	4
Total AM	186	66
16:00–16:59 h	1	0
17:00–17:59 h	20	0
18:00–18:59 h	26	5
19:00–19:59 h	21	2
20:00–20:59 h	2	0
Total PM	70	7

[a] Number of counts conducted among 48 plots where Least Bitterns were observed at least once during the year.

TABLE 3

TWO-WAY ANALYSIS OF VARIANCE OF NUMBER OF LEAST BITTERNS OBSERVED AMONG DAILY TIME PERIODS (AMPM) AND CENSUS ROUNDS (CENSRND)[a]

Source of variation	Sum of squares	df	Mean square	*F*	OSL[b]
AMPM	0.21	1	0.21	0.92	0.34
CENSRND	10.45	4	2.61	11.25	0.00
AMPM × CENSRND	1.34	4	0.34	1.45	0.22
Residual	57.09	246	0.23	—	—
Total	72.18	255	0.28	—	—

[a] Includes data from only those plots where Least Bitterns were observed at least once during the year (N = 48).
[b] Observed significance level.

census rounds with the greatest number of Least Bittern calls per sequence. Playback of other species' calls did not seem to influence the response of Least Bitterns.

Using data from only the 48 plots where Least Bitterns were observed (at least one time during the year), we analyzed possible effects of time of day and different observers. Observation rates were higher during morning visits (Table 2), but this was largely because most evening counts were conducted during the first three census rounds (Table 3). In 1986, differences between the two observers were significant ($\bar{x}$ = 0.4 vs 0.1; $P < 0.01$), suggesting possible differences in detection ability (Cyr 1981) and a need for additional observer training (Kepler and Scott 1981). In 1987, differences between observers were not significant ($\bar{x}$ = 0.3 for both; $P < 0.6$).

Subjective estimates of cloud cover (0–10, 11–50, 51–90, and 91–100%) and wind speed (0–17, and 17–25 km/h) were used to assess possible effects of weather conditions. No significant correlations were indicated from a chi-square test for goodness of fit among the 8 combinations of cloud cover and wind speed ($\chi^2 = 4.91$, df = 6, $P < 0.5$). Nonetheless, strong winds may decrease observation of Least Bitterns by reducing an observer's ability to hear their soft calls. Relationships to temperature were not analyzed, since site-specific data were not available.

Discussion.—Despite our relatively low observation rate, it appears that Least Bitterns are responsive to playback of tape-recorded calls. A number of factors seemed to influence response frequency, suggesting that there is considerable potential for developing a reliable survey method for this species. Despite obvious limitations of our study, we observed significant response to tape-recorded calls, both numerically, and in field observations of individual birds. Based on these observations, we offer the following conclusions and recommendations regarding application of the playback technique to the study of Least Bitterns: (1) under favorable circumstances, a relatively high response rate can be obtained from birds within 30 m; (2) relatively high response rates can be observed between mid-May and mid-June, during morning surveys, on relatively calm days, regardless of cloud cover; (3) a minimum of 3 visits, with at least 5 min playback of the "cooing" call each time, is recommended for survey of point locations; (4) observers must be trained to recognize calls and estimate distances to calling birds; and (5) basic research is needed to determine seasonal and sexual differences in response behavior.

Acknowledgments.—This study was financed in part through research grants from the Hudson River Foundation for Science and Environmental Research, Inc. Additional funding was provided by the New York State Division of Fish and Wildlife and the Hudson River

National Estuarine Research Reserve. The Laboratory of Ornithology at Cornell University provided tape recordings of bird calls used in this study. The authors appreciate the constructive comments and editorial reviews provided by C. Blem, J. Dinsmore, R. Johnson, and W. Marion. We also thank S. Sheridan for typing the manuscript.

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Wilson Bull., 100(3), 1988, pp. 499–501

The development of kleptoparasitic behavior in Red-billed Woodhoopoes.—In review of kleptoparasitism, Brockmann and Barnard (1979) state that birds from some orders are disproportionately likely to exhibit this behavior. Kleptoparasitism frequently has been recorded among passerines and predatory nonpasserines but seldom among insectivorous nonpasserines. In particular, only three instances have been documented in which members of the order Coraciiformes exhibited interspecific kleptoparasitic behavior, namely the Common Kingfisher (*Alcedo atthis*), Carmine Bee-eater (*Merops nubicus*), and Abyssinian Roller