a territory without an adult female resident, I think she fortuitously began a clutch in an already occupied box. This sort of opportunism may be an adaptive option for females of nest-site limited species such as bluebirds (Miller, Blue Jay 28:38–46, 1970; Zelany, The Bluebird, Indiana Univ. Press, Bloomington, Indiana, 1976). Intraspecific nest parasitism is not uncommon among bluebirds (Gowaty and Karlin, unpubl.) and also suggests the importance of nest-sites to females (Yom-Tov, Biol. Rev. 55:93–108, 1980). Access to nest-sites may be the single most important determinant of female breeding success among Eastern Bluebirds.

Although my observations are not extensive enough to discriminate amongst the explanations for brood reduction of the first female's nestlings, it is possible that female L229 killed the two nestlings that were found dead, thereby increasing the possibility that her own reproductive efforts would be successful. Such infanticide which makes critical resources available for reproduction by others has been described in langurs (*Presbytis entellus*) (Hrdy, The Langurs of Abu, Harvard Univ. Press, Cambridge, Massachusetts, 1977), lions (*Leo leo*) (Bertram, *in* Growing Points in Ethology, E. Bateson and R. Hinde, eds., Cambridge Univ. Press, Cambridge, England, 1976), and several other species as well. However, the first nestling was underweight (relative to its siblings) and the second lost weight markedly just before dying (Table 1), suggesting that they were not adequately fed after female R426 disappeared. Starvation might then be attributable to infanticide through neglect by the father, siblicide through competition or harassment (Stinson, Evolution 33:1219–1225, 1979), or suicide (O'Connor, Anim. Behav. 26:79–96, 1978).—PATRICIA ADAIR GOWATY, *Dept. Zoology, Clemson Univ., Clemson, South Carolina 29631. (*Present address: *Dept. Zoology, Univ. Oklahoma, Norman, Oklahoma 73109.)* *Accepted 15 June 1982.*

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Annual adult survival rates for Brown-headed Cowbirds wintering in southeast Texas.—For several years we have been studying the Brown-headed Cowbirds (*Molothrus ater*) which winter in large communal roosts in southeast Texas. One of us (KAA) has conducted a banding program in the vicinity of Bryan-College Station, Brazos Co., Texas, since 1969 (Coon and Arnold, N. Am. Bird Bander 2:7–11, 1977; Coon and Arnold, unpubl.; Arnold et al., unpubl.). The other (DMJ) has supervised studies of cowbird mortality at a roost on the Rice University campus in Houston, Houston Co., Texas (Good, Ph.D. diss., Rice Univ., Houston, Texas, 1979; Johnson et al., Auk 97:299–320, 1980; Johnson et al., The Ecology of Roosting Birds in Winter *in* Symp. Ecol. Soc. Am., in press). The roosts studied are near the southern limit of the winter range of *M. ater* (Meanley, U.S. Bur. Sport Fish. and Wildl. Resour. Publ. 100, 1971; Giltz and Burtt, Ecology of Roosting Birds in Winter *in* Symp. Ecol. Soc. Am., in press). Roost populations are usually composed of more than 70% males. We wished to know if cowbird mortality in winter in this region differed from that experienced by the whole population. Might migrating so far south provide an advantage due to mild winter weather, or a disadvantage resulting from migration? Might the preponderance of males in these roosts alter sex-specific survivorship?

The Bryan-College Station banding program for wintering cowbirds began in 1969 and has continued, essentially without interruption, through the 1980–81 season. The use of decoy traps and floodlight traps has resulted in banding over 75,000 cowbirds from 1969 through the 1976–77 season, the last year used in this analysis. Basically, all birds captured were banded and released. The sex ratios recorded in captured birds varied annually from more than 3:1 (males vs females) to in excess of 8:1 (males vs females) (Arnold et al., unpubl.). Recaptures suggest reasonable fidelity to wintering areas (Coon and Arnold, unpubl.).

TABLE 1
FREQUENCY OF RECOVERY OF DEAD COWBIRDS BY MONTH

Month	Males	Females	Total
Jan.	29	7	36
Feb.	41	0	41
Mar.	30	2	32
April	20	3	23
May	14	3	17
June	6	1	7
July	2	0	2
Aug.	0	1	1
Sept.	1	2	3
Oct.	1	0	1
Nov.	3	0	3
Dec.	3	1	4
Totals	150	20	170

Table 1 presents the seasonal distribution of band recoveries from dead cowbirds (150 males, 20 females) reported to the U.S. Fish and Wildlife Service Bird Banding Laboratory by persons other than the banders. Most recoveries were made between January and April, suggesting that winter is not a season of low mortality for these birds. The high percentage of males among these recoveries is to be expected, since males predominate in the population banded.

Table 2 (males) and Table 3 (females) summarize the survival times for birds banded during each roosting season in a form appropriate for calculating annual survivorship estimates. Since some of these must be considered incomplete data (i.e., we have not yet received all recoveries which will eventually result from some of the more recent banding seasons), we use the method derived by Haldane (pp. 454–458 *in* Proc. XI Inter. Ornithol. Congr., Basel, Switzerland, 1955) to calculate an estimate of annual survivorship based on all the data (complete and incomplete) for each sex. We base the distinction between complete and incomplete recovery data (9 years after banding for males, 6 years for females) on maximum longevities reported by Fankhauser (Bird Banding 42:36–42, 1971) which were greater than those included in our data (7.5 years for males, 4.8 years for females). The resulting estimates of survival rates (±SE) are: males—53 ± 3%, $P(47\% < S < 59\%) = 0.95$ and females—63 ± 7%, $P(48\% < S < 78\%) = 0.95$. The estimate of female survivorship is characterized by higher variance and is based on only 20 recoveries; both factors make its 95% confidence interval very broad.

Previously published estimates of Brown-headed Cowbird survivorship (or mortality) included different calculation methods and lacked estimates of variance. Therefore, we will conclude that they are significantly different from our estimates only if they are not contained within our 95% confidence intervals.

Fankhauser (1971) calculated weighted annual survival rates for Brown-headed Cowbirds banded in North America before 1 January 1960 and subsequently recovered dead through August 1965. Records for 195 male and 85 female cowbirds met his criteria that: (1) birds were at least 6 months old when recovered, and (2) recoveries were not influenced by the bander. Fankhauser's estimates of annual survival rates were 48.5% for males and 40.4%

TABLE 2

NUMBER OF MALE BROWN-HEADED COWBIRDS BANDED DURING SUCCESSIVE WINTER SEASONS WHICH WERE RECOVERED DEAD WITHIN EACH ONE-YEAR INTERVAL (X) FOLLOWING BANDING

Season banded	k[a]	N_k[b]	1	2	3	4	5	6	7	8	9	10	11
1969–70	11	5	3	1	0	0	0	0	0	1	0	0	0
1970–71	10	45	20	9	6	4	3	2	1	0	0	0	—
1971–72	9	19	4	7	2	1	3	1	0	1	0	—	—
Complete	$\Sigma d_x = 69$[c]	$d_x = 27$	17	8	5	6	3	1	2	0	$\Sigma (x-1)d_x = 107$		
1972–73	8	20	10	5	2	2	1	0	0	0	—	—	—
1973–74	7	23	9	4	5	5	0	0	0	—	—	—	—
1974–75	6	1	1	0	0	0	0	0	—	—	—	—	—
1975–76	5	35	18	16	0	1	0	—	—	—	—	—	—
1976–77	4	2	1	0	0	1	—	—	—	—	—	—	—
Incomplete	$\Sigma n_k = 81$ $\Sigma kn_k = 150$	$d_x = 39$	25	7	9	1	0	0	0	—	$\Sigma (x-1)d_x = 70$		

[a] k = maximum number of years of survival that could be recorded for individuals banded in each year.
[b] n_k = number recovered dead that were banded in each season.
[c] d_x = number recovered dead that had survived x years since banding.

for females. These estimates are both lower than our respective estimates, but only the one for females lies outside our 95% confidence intervals. Thus, we might conclude that female cowbirds wintering in southeast Texas have better annual survivorship than the average for all North America.

TABLE 3

NUMBER OF FEMALE BROWN-HEADED COWBIRDS BANDED DURING SUCCESSIVE SEASONS WHICH WERE RECOVERED DEAD WITHIN EACH ONE-YEAR INTERVAL (X) FOLLOWING BANDING

Season banded	k[a]	N_k	1	2	3	4	5	6	7	8	9	10	11
1969–70	11	1	1	0	0	0	0	0	0	0	0	0	0
1970–71	10	5	1	1	1	2	0	0	0	0	0	0	—
1971–72	9	4	1	2	0	0	1	0	0	0	0	—	—
1972–73	8	2	1	0	0	1	0	0	0	0	—	—	—
1973–74	7	4	2	0	1	1	0	0	0	—	—	—	—
1974–75	6	0	0	0	0	0	0	0	—	—	—	—	—
Complete	$\Sigma d_x = 16$	$d_x = 6$	3	2	4	1	0		$\Sigma (x-1)d_x = 23$				
1975–76	2	4	1	1	0	2	0	—	—	—	—	—	—
1976–77	1	0	0	0	0	0	—	—	—	—	—	—	—
Incomplete	$\Sigma n_k = 4$ $\Sigma kn_k = 20$	$d_x = 1$	1	0	2	0	—	—	$\Sigma (x-1)d_x = 7$				—

[a] Symbols are identified in Table 2.

Darley (Auk 88:560–566, 1971) (the only other published estimate of Brown-headed Cowbird survivorship) based his study on a local breeding population in Ontario. Darley estimated survivorship as the percentage of birds banded one year that returned to breed in the same area the following year. He estimated 62% survivorship for adult males and only 45% for adult females, based on 60 and 40 initially banded birds, respectively. Male survivorship is greater than, and female survivorship less than our estimates for southeast Texas.

Our estimates of annual survivorship rates for cowbirds that winter in southeast Texas tend to be greater than Fankhauser's (1971) estimates for the North American population as a whole. This difference is slight (and not significant) for males, but it is great (and highly significant) for females. Thus, we might conclude that migrating farther south confers some survival advantage, especially for females. We find it especially interesting that these females appear to experience considerably better survivorship than the males with whom they roost in the winter (63 vs 53%), when both Fankhauser (1971) and Darley (1971) reported lower female survivorship. Our results are consistent with the observation (Johnson et al., 1980) that mortality experienced in the Houston roost was due to food-limitation, and tended to affect males more than females in some years. Perhaps some as-yet-unidentified difference in foraging behavior, related to sexual dimorphism in size, causes the minority sex (females in southeast Texas roosts) to experience less competition for food and enjoy better survival.

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Flocking pattern of foraging American Crows in Oklahoma.—Field studies of American Crows (*Corvus brachyrhynchos*) outside the breeding season have concentrated upon the large communal roosting sites that these birds use during the winter (e.g., Kalmbach and Aldous, Wilson Bull. 52:198–206, 1940; Haase, Ohio J. Sci. 63:145–151, 1963). The implication from those studies is that the roosting flock is the social unit for the species at this time of year, and that birds disperse broadly to forage. Two hypotheses have been proposed as to how crows may find food when leaving the roost. The first maintains that birds are attracted to birds already foraging. Hinde (pp. 373–411 *in* Biology and Comparative Physiology of Birds, A. J. Marshall, ed., Academic Press, London, England, 1971) referred to this process as foraging by "local enhancement." The alternative hypothesis is that the roost serves as a "center" (Ward and Zahavi, Ibis 115:517–534, 1973) where birds obtain information about the location of food resources nightly, and then fly to sites having greatest availability of food resources the following morning. A recent study (Loman and Tamm, Am. Nat. 115:285–289, 1980) inconclusively addressed these theories relative to food finding by Hooded Crows (*C. cornix*) and Common Ravens (*C. corax*). From November 1977 through September 1978 we monitored the size of flocks of foraging crows in north-central Oklahoma and observed habits of those flocks. The observations lead us to speculate that the social unit of American Crows is the family throughout the year, and raise some doubts about the dependence of crows upon either of the two approaches to locating food resources during winter as proposed by Hinde (1971) and Ward and Zahavi (1973).

We recorded the location and flock size of all crows observed foraging between 08:00 and 16:00 within a 25-km radius of Stillwater, Payne Co., Oklahoma, 1 November 1977–30 September 1978. Most crows foraged in rangelands within 10 km of a roost-site located 13 km