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Sex-ratio Adjustment in Malnourished Red-winged Blackbird Broods.—Howe (1977) recently reported that differential mortality among nestling Common Grackles (*Quiscalus quiscula*) resulted in more females than males surviving to leave the nest. Because female grackles are smaller and, therefore, presumably require less parental expenditure than males, Howe's observation is consistent with the prediction that at the end of parental care the less expensive sex should be the more numerous (Fisher 1958, Leigh 1970, Trivers 1972). In this note we report another example of apparent differential mortality among nestlings which favors females, in this case in the sexually size-dimorphic Red-winged Blackbird (*Agelaius phoeniceus*).

Study area and methods.—We added two nestlings at hatching to nests assigned by a random process to 1 of 3 categories: (1) experimental nests in which brood size was increased from 3 or 4 to 5 or 6, respectively; (2) control nests in which nestlings were exchanged, but in which brood size remained the same; and (3) natural nests in which brood size was not increased and nestlings were not exchanged. All nestlings added or exchanged were the same age (within 1 day) as their new nest mates, and we assumed that they were an unbiased sample of the population's sex ratio. By 9 days of age, nestlings in all 3 treatments fell into 2 distinct size classes based on length of bill, body, 8th primary, tarsus, and wing (Cronmiller 1978). We classified the larger group as males and the smaller females, using the criteria of Holcomb and Twiest (1971). Both of these size/sex categories were homogeneous with respect to treatment for all measures of size except weight (Cronmiller and Thompson 1980). The fate of individual nestlings was followed to determine whether or not there were differences among nests in the numbers of young lost to predators or abandonment (whole-brood loss) and starvation (partial-brood loss). In the absence of direct evidence of the fate of missing young, we assumed that predators were responsible when all young disappeared from the nest before the 8th day of the nestling period (see Thompson and Nolan 1973:160–161, Nolan 1978:411) and that abandonment had occurred when nestlings that seemed to be healthy and vigorous the day before all died in the nest. Nestlings that disappeared were assumed to have died of starvation if earlier they had been less vigorous, smaller, and lighter than their nest-mates. The experiment was performed during the summer of 1977 in wet meadow and marsh of the Conesus Inlet Wildlife Management Area, Livingston County, New York (see Cronmiller and Thompson 1980).

Results and discussion.—Of 88 nestlings in experimental nests, 18 (20.5%) died of apparent starvation, in contrast to less than 1% of the nestlings in control and natural nests. Although females increased their feeding trips to experimental nests, they were unable to compensate proportionately for the increased brood size; as a result, their nestlings suffered greater mortality and weighed less at nest-leaving than did nestlings in natural and control nests (Cronmiller and Thompson 1980). Under conditions of resource limitation, fewer males than females should be produced, and, as expected, the sex ratio of nestlings at nest-leaving in experimental nests strongly favored females, although not

TABLE 1. Reproductive success and sex ratios in Red-winged Blackbird nests.

	Nest category		
	Experimental	Natural	Control
No. broods	9	8	6
No. nestlings	48	23	14
No. nestlings disappeared	13	2	0
No. males at nest-leaving	13	11	8
No. females at nest-leaving	22	10	6
Females/Male	1.69	0.91	0.75

statistically significantly different at the 5% level ($\chi^2 = 2.31$, $df = 1$, 1-tailed, $P = 0.13$). The sex ratio of nestlings in natural and controls did not differ greatly from 1:1 ($\chi^2 = 0.3$, $df = 1$, $P > 0.05$) (Table 1).

Thus, sex ratios at hatching and at nest-leaving in control and natural nests were probably equal, as has been reported in other studies of Red-wings (see Haigh 1968, Myers 1978); however, the sex ratio at nest-leaving in experimental nests strongly favored females, implying that most of the nestlings that died from apparent starvation were males.

The consequence of resource limitation during the nestling period was differential mortality and the production of a sex ratio at nest-leaving favoring the less-expensive-to-raise females. The differential mortality could have been caused in 2 ways: (1) females apportioned the inadequate food more or less equally among all nestlings and the males' higher growth rates made them more susceptible to starvation or (2) females preferentially fed the less expensive sex when faced with more nestlings than that for which they could obtain adequate food. We cannot distinguish between these possibilities, and there are conflicting reports on differential provisioning of young. For example, Howe (1977) found that Common Grackles "... allocate investment differentially to their young . . .," whereas in other species there seems to be equal apportionment among young (e.g., Skutch 1976:272 ff). In conclusion, we repeat Myers' (1978) recommendation that further studies of food-limited populations of sexually dimorphic species are needed to investigate the proximal causes of differential nestling mortality and its long-term effects on primary sex ratios.

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Osprey Nest Site Characteristics in Yellowstone National Park.—Osprey (*Pandion haliaetus*) nest site characteristics have changed in some areas due to silvicultural practices and the introduction of artificial structures (Reese 1969, Henny et al. 1974). In eastern North America, the proportion of Osprey nest sites that is located on artificial structures varies from about 70% in portions of Nova Scotia and on the Atlantic coast from New Jersey through Virginia (Henny et al. 1974, Henny et al. 1977, Prévost et al. 1978) to 6% in the coastal Carolinas (Henny and Noltemeier 1975). Nesting by Ospreys on artificial structures is uncommon in Florida, but may be increasing in some areas (Schreiber and Schreiber 1977). In the western United States, it varies from 16% in northern Idaho and northeastern Washington (Melquist and Johnson 1975) to <10% in northern California and Oregon (Henny et al. 1978a; Henny et al. 1978b). Because of the changes occurring in the use of nest sites by Ospreys, it is of interest to document the nest site characteristics of Ospreys nesting in nearly pristine environments. Also, few published studies quantitatively describe natural Osprey nest sites (Mathisen 1968, Szaro 1978). Here I present data from Yellowstone National Park, where little development and no logging has occurred.

The study area encompassed Yellowstone National Park, which occupies 8,995 km² in the northwestern corner of Wyoming and adjacent Montana and Idaho. Almost all of the tree nests occurred in the Engelmann spruce (*Picea engelmannii*)–subalpine fir (*Abies lasiocarpa*) or the lodgepole pine (*Pinus contorta*) vegetative zones (Despain 1973). The following characteristics were measured or described for tree nests: height of nest using a Stratex Stratolevel, tree height, diameter at breast height (dbh), condition and species of the nest tree, distance to water, relationship of the nest tree to surrounding trees, and general habitat type. The study was conducted during the summers of 1972 through 1974.

Of 55 nests examined, 45 (82%) were in trees. Osprey nests were generally placed at or near the apex of the nest tree (Table 1). Of the 45 tree nests examined, 40 (89%) were

TABLE 1.
Characteristics of Osprey tree nest sites in Yellowstone National Park.

Parameter	Mean or percent	Range	n
Nest height (m)	22.8	6-33	45
Tree height (m)	23.1	10-33	45
Tree dbh (cm)	58.9	28.2-136.4	45
Distance to water (m)	121	2-1,430	45
Species of tree:			
Lodgepole pine	39%		13
Engelmann spruce	30%		10
Subalpine fir	30%		10
Relationship of nest tree to surrounding trees ¹ :			
Larger	73%		33
Similar	16%		7
Smaller	11%		5

¹ Comparing height, or dbh if of similar height.