TABLE 2. Weight changes (g) of 11 Screech Owls between spring and fall-winter.

| Sex | Spring | Fall-winter | |
|---|---|---|---|
| | Date captured (weight) | Date captured (weight) | Wt. gain |
| Male | 05-14-75 (150) | 10-29-75 (180) | +30 |
| Male | 04-15-76 (145) | 10-30-75 (180) | +35 |
| Male | 05-18-78 (170) | 12-28-77 (185) | +15 |
| Male | 04-24-75 (160) | 02-22-77 (165) | +5 |
| Male | 05-04-76 (185) | 02-22-77 (150)[a] | −35 |
| Female | 05-11-78 (205) | 12-05-78 (225) | +20 |
| Female | 05-14-76 (160) | 12-28-77 (200) | +40 |
| Female | 05-22-75 (190) | 02-21-77 (220) | +30 |
| Female | 04-24-76 (180) | 02-21-77 (190) | +10 |
| Female | 05-04-76 (180) | 02-22-77 (185) | +5 |
| Unknown | 05-06-76 (205) | 01-01-75 (220) | +15 |
| Mean males | 156.2 | 177.5 | +21.3 |
| Mean females | 183.0 | 204.0 | +21.0 |

[a] Banded as adult on 1 May 1967, was at least 10¾ yr old and in poor condition; excluded from mean for males.

the extremely cold winter of 1977–78, which included deep snow, five dead Screech Owls were found. No dead owls were found in 1975–76 or 1976–77 when the boxes were checked in the spring. Eighteen and 15 pairs nested successfully in the 150 nest boxes in 1976 and 1977, respectively. The number declined to 6 in 1978 (6 in 150 boxes, or 4%) following the severe winter; this is the lowest percentage recorded since the study began in 1944 (VanCamp and Henny 1975). It appears that a fall weight gain is important to the Screech Owl, but in spite of the weight gain, extreme weather conditions, which tend to occur irregularly, can still pose a hardship for this species near the northern edge of its breeding range in Ohio.

The manuscript was improved by the reviews of Vivian M. Mendenhall and Anne R. McLane.

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## Nest Desertion by the Piñon Jay

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We recorded parental behavior within two flocks of Piñon Jays (*Gymnorhinus cyanocephalus*) nesting near Flagstaff, Arizona. Nests in one flock, known as the Town Flock, were visited regularly and young banded, but were otherwise undisturbed. Broods from some nests in the other flock, called the Doney Park Flock, were artificially reduced in size. The events described below occurred in late March and early April in 1976 and 1977. A detailed description of the Doney Park Flock's breeding ground is found in Balda and Bateman (1972, Living Bird 11:5), while that of the Town Flock is described in Gabaldon,

(1978, Factors involved in nest-site selection in Piñon Jays, Unpublished Ph.D. dissertation, Flagstaff, Northern Arizona Univ.).

The following events occurred in the Doney Park Flock in 1977. This breeding season was the earliest recorded for the Doney Park Flock in 12 yr of observation (Balda, pers. comm.). Nest building was initiated in mid-February, and the first eggs were laid about 28 February. Several snow storms in late February destroyed newly completed nests, forcing many jays to rebuild. This resulted in two peaks of egg-laying activity, one on the 3rd and the other on the 10th of March.

On 19 March, nest 29 contained 4 nestlings, aged 4 days, and 1 egg. Three of the nestlings were temporarily removed for metabolic tests; the fourth was left in the nest to prevent abandonment of the nest by the parent birds (Clark and Balda MS). Six h later, an attempt was made to return the three nestlings to the nest. Upon returning to the nest we found the fourth nestling gone, the egg still in the nest. There were no signs to suggest that a predator had been at the nest.

A similar incident occurred on 25 March at nest 16. Three of the newly hatched nestlings were taken, while the fourth was left in the nest. When the nestlings were removed, the ambient temperature was −1°C at 0900. Shortly afterwards, snow began to fall (~1030) and continued until 1400. Six h later, this nest was empty, again with no sign of disturbance.

On 21 March, nest 26 contained four 1-day-old nestlings. The ambient temperature at 0830 was 5°C. Two nestlings were inadvertantly killed while being choke-collared and were removed from the nest. The remaining nestlings appeared healthy. The female that had been brooding the young returned to the nest but did not resume brooding. Approximately 12 min later, the male returned. Both the male and female flew to the nest, looked into it, called, and then left. The two nestlings were removed from the nest 2.5 h later in an extremely lethargic state, were revived, and were taken back to the laboratory, where they were hand reared.

There are several possible interpretations of these observations. Nest desertion may occur as a response to low energy stress due to lack of food, as suggested by Balda and Bateman (1976, Condor 78:562), who report a case of brood reduction by cannibalism in Piñon Jays. Even if energy stress is not so severe as to cause cannibalism, parents may desert nests containing starving young. Observations on nest 26 also suggest that parents may abandon partially depredated nests because of the probability that the predator will soon return. We suggest that nest desertion may also occur in response to low-temperature thermal stress of young. Yarbrough (1970, Comp. Biochem. Physiol. 34: 917) showed that broods of less than three in Gray-crowned Rosy Finches (*Leucosticte tephrocotis*) never fledged young, and he suggested that a lower limit to brood size may be of selective advantage to species nesting in cold climates. Clark and Balda (MS) suggest the same relationship for the Piñon Jay and also note that broods of one or two have rarely been known to fledge young.

Individuals are first able to maintain 75% of adult body temperature and exhibit metabolic rates characteristic of endotherms at 0°C for 1 h at 12 days of age. Under similar conditions, a brood of two within a nest can remain endothermic at 10 days, and a brood of three within a nest at 8 days of age (Clark and Balda MS). At earlier ages, nestlings become hypothermic at low ambient temperatures.

Observations made on the Town Flock tend to support the hypothesis that nest desertion is a consequence of low-temperature stress of young. In contrast to the Doney Park Flock, which depends entirely on seasonal seed crops and insects, the Town Flock is heavily subsidized year round by feeders, which means that a shortage of food to adults and young cannot be an important factor in nest desertion by Town Flock jays.

On 20 April 1976, following a severe snow storm with low ambient temperatures (minimum $T_a$ of −9°C, $\bar{x}$ day $T_a$ = −1°C), nest 17 of the Town Flock contained five dead nestlings, aged 5–6 days. Parts of sunflower seeds (available from feeders) were scattered on each body, suggesting that the adults had attempted to feed the dead young. At the same time, nest 15, located approximately 10 m away from nest 17 and built 4–5 days earlier than nest 17, contained a single live nestling, aged 10–11 days. These observations suggest that broods too young to thermoregulate may be vulnerable to death from low-temperature thermal stress when left unattended and that such thermal stress may thus be responsible for many nest desertions. In flocks subject to variations in local food supply, energy stress may be an alternative or contributory factor in nest desertion.

It is possible that the nests mentioned above were abandoned due to human activity. In 2 yr of study on the Doney Park Flock, however, no other nests were abandoned after visits (number of nests = 52, number of visits = 238), either during incubation or when nestlings were present. Gabaldon (1978) also analyzed the relative reproductive success of nests in the Town Flock that were regularly visited (number of nests = 137, number of recorded visits = 580) versus those that were not found by investigators, over a 5-yr period, 1973–1977. The existence of unfound nests was determined by observing the behavior of

color-banded adults at feeding stations (G. Foster and J. Balda, pers. comm.). Males with eggs or young visit feeders alone or with other males and carry large amounts of food away. In non-nesting pairs, both male and female visit feeders together and do not carry food away. Fledglings were brought to the feeders by parents, at which time nest success could be assessed. There was no statistically significant difference ($P > 0.05$) in number of young fledged between visited and unvisited nests. It therefore appears that human intrusion had no effect on nestling mortality (or, by implication, on nest desertion) in Piñon Jays.

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## The Impact of Loggerhead Shrikes on Nesting Birds in a Sagebrush Environment

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Although shrikes (*Lanius* spp.) are known to prey on small vertebrates, most authors consider birds to be a minor portion of their diet (Beal and McAtee 1912, Bent 1950, Sprunt 1950). Miller (1931, 1950) states that "birds at no time comprise more than 15% of the food." Craig (1978), in his analysis of the predatory behavior of Loggerhead Shrikes (*L. ludovicianus*) in California, does not record a single instance of shrikes preying on other passerines. Analysis of the stomach contents of Loggerhead Shrikes indicates that birds account for only 1–8% of their annual food intake (Howell 1932, Graber et al. 1973). Thus, in most situations the incidence of avian prey in a shrike's diet is relatively low. However, the impact of this limited predation on the avifauna of a particular area has not been assessed. This paper documents a situation in which Loggerhead Shrikes reduced the density of other passerines nesting in a sagebrush environment and effectively eliminated the production of young by the three species commonly nesting in this habitat.

Information presented here was gathered in conjunction with an investigation of avian populations on the Idaho National Engineering Laboratory (INEL) Site, approximately 48 km west of Idaho Falls, Idaho. A 4-ha study grid (Reynolds 1978) was established in each of two areas, dominated by big sagebrush (*Artemisia tridentata*), that were nearly 12 km apart. During 1976 and 1977, the breeding activities of all birds nesting within the study areas were carefully monitored. Nests were located by flushing a bird from a nest or by observing nest building, courtship, or food-carrying behavior and then rigorously searching the area for the nest. Nests were checked at 1–2-day intervals. Nesting success was calculated as the number of successful nests (those producing at least one fledged young) divided by the total number of nests in which eggs were laid.

The Loggerhead Shrike is a conspicuous and fairly common nesting species in the sagebrush habitat of the Snake River Plain (Larrison et al. 1967). Shrikes did not nest in either study area in 1976, although they were occasionally (albeit rarely) observed hunting in the grid systems. In 1977, a pair of shrikes nested in each of the study areas. This provided the opportunity to compare the nesting density and success rates of other species with and without the presence of shrikes. The Chi-square test (Snedecor and Cochran 1967) was used for statistical comparisons.

There were no significant differences in nesting density or nesting success between the two study areas in 1976 or 1977. This permitted the data from both areas to be pooled for a comparison between the 2 yr. During 1976, 22 of 29 (76%) passerine nests within the grids were successful (Table 1). In 1977, only 14 nests (excluding shrike nests) were in the study areas. This was significantly fewer ($P < 0.01$) than the previous year. Additionally, only one nesting pair successfully fledged young. This success rate (7%) was significantly ($P < 0.005$) below that calculated for 1976. During 1977, one pair of shrikes fledged 7 young, while the other fledged 9.

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