fledging success were not closely monitored but appeared to be good. Predation in nests boxes was a low 1–2%, perhaps because most of the nest boxes were over water and were approached by boat or wading.

We believe these milk carton nest boxes have many applications for field studies of Prothonotary Warblers and perhaps other small cavity-nesting passerines.—W. JAMES FLEMING, *U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, Maryland 20708,* AND DANIEL R. PETIT, *Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701.* Received 17 Feb. 1986; accepted 15 July 1986.

Deaths of Female Passerine Birds on Their Nests while Incubating.—Nest losses by breeding birds often are attributed to predation of the nest contents, inclement weather, and sometimes to starvation of the young. Nests rarely fail because an incubating parent is preyed upon, dies from exposure during inclement weather, or starves to death (e.g., Ankney and MacInnes 1978, Blackly 1976, Clark 1889, Howell 1941, Kitchin 1925, LaFave 1955, Sawyer 1955). When an incubating bird is lost to a predator, feathers or some other clue often remain at the nest. On the other hand, an incubating parent that dies at the nest of exposure, disease or starvation may be scavenged by a predator along with the nest contents between nest checks, and would be less likely to leave such clues. Thus, the infrequently reported deaths of birds while incubating suggests that such deaths occur either rarely or that their occurrences are overlooked by field workers. Here we report the deaths of 7 female passerines, of three species, on their nests during incubation. Our study area is a 3-km portion of the forested dune ridge, Delta Marsh, Manitoba (see MacKenzie 1982).

On 20 June 1976 a female Western Kingbird (*Tyrannus verticalis*) was found dead on an intact nest, 6.8 m high, that contained a clutch of 6 eggs. This female showed no signs of external injuries, and had been dead 1–2 d when discovered.

A dead female Least Flycatcher (*Empidonax minimus*), showing no sign of external injury, was found on 16 June 1981, on an intact, 5.4-m high nest that contained 4 eggs. The stomach of the slightly decomposed bird was empty, there was no visible subcutaneous fat, and it weighed 10.3 g, which is about average mass for Least Flycatchers during the incubation period in this population (Biermann and Sealy 1985). It is during this period that Least Flycatchers of both sexes are at their lowest weights during the breeding season.

On 26 June 1979 a female Yellow Warbler (*Dendroica petechia*), at least 2 yrs old, was found dead on her intact, 1-m high nest, which contained 4 eggs, 1 egg less than the day before when the completed clutch was present. This female had been incubating 9–10 d when she died, a day or two before the young would have hatched (Goossen 1978). She lacked external injuries and weighed 10.1 g, almost 1 g below the mean mass of incubating older females in this population (Biermann and Sealy 1985). On about 19 June 1984, another female Yellow Warbler, also at least 2 yrs old, died on her 0.3-m high nest. Her nest and clutch of 4 eggs were intact. This female had incubated for about 9 d and also showed no sign of external injury. A double-brooding female Yellow Warbler died on 2 July 1985 at about 1300 h (i.e., rigor mortis had not yet set in) while incubating in direct sunlight (max. 27.5 C that day), about 5–6 d into the incubation of her second clutch, which contained 3 eggs.

A Least Flycatcher was killed by a predator, or possibly died and was scavenged later, on its 3.2-m high nest on 17 June 1983; its head and one wing were on the ground under the nest while the tail and feet were in the empty, intact nest. On 13 June 1984, another dead Least Flycatcher was found in a nest that contained a clutch of 4 eggs that had been completed 4 d earlier. This nest, 5.2 m high, was active 24 h earlier. The bird, probably a female because males have not been observed incubating in this population (Briskie, pers. obs.), had a 2-cm long wound in its abdomen. The clutch was still intact in the slightly disturbed nest.

One and possibly two of the Least Flycatchers were killed on their nests by predators, or died there and were scavenged later. Causes of death in the 5 other individuals are not known for sure. Each bird could have died from disease, but none of the birds was necropsied. We suspect, however, that if disease-caused mortality occurred regularly during the breeding season on our study area, we would have found over the years other dead adults of these species away from their nests. We have not found such dead birds whose cause of death could not be attributed to predation or accidents. Sealy prepared three of the above individuals as study skins so that the absence of visible external injuries was confirmed; in each case, there was no visible degeneration of the muscles. The Yellow Warbler that died in 1985 may have done so because of heat stress, although sunlight probably struck the incubating bird directly only for a few min and the temperature was not abnormally high. The common denominator among the Western Kingbird, at least one Least Flycatcher, and the Yellow Warblers in 1979 and 1984, is that they died during or shortly after 2–3-d storms with high winds, heavy rainfall, and lower-than-normal temperatures. We speculate that these individuals suffered from cold shock or starved to death, although if starvation is implicated we might expect some of the individuals' body mass to have been less than the average, and degeneration of muscles to be visible. Such was not the case. If the deaths were due to starvation, why would the female birds we observed remain on their nests until they starved or died of exposure, when presumably they could have sought food? Ankney and MacInnes (1978) found some female Lesser Snow Geese (*Chen caerulescens caerulescens*) dead or dying on nests, presumably from starvation, but only during hatch, the time when the incubation drive is thought to be strongest (Harvey 1971).

It seems that the birds we observed, if indeed they starved, could have avoided death, although their exposed clutches possibly would have failed. Except for the second nest of the Yellow Warbler in 1985, all of the females could have renested because clutches have been initiated in these species as late as early to mid-July on our study area. Yellow Warblers there are known to lay up to 4 clutches in one year (unpubl. data). If the birds died from cold shock, disease, or heavy parasite load, on the other hand, they simply may not have been able to leave their nests, and died on them. It might be a sick bird's best option to continue incubating.

Losses of incubating birds were observed rarely. Since 1974, approximately 2200 Yellow Warbler nests, 500 Least Flycatcher nests, and 30 Western Kingbird nests have been located on the study area and visited once per day to twice per week. However, the seven cases we observed in which we knew the parent had died while incubating, reveals that incubation may cost considerably. The infrequency with which death on the nest has been observed suggests that selection favors nest-desertion when the female's survival is threatened, particularly early in the nesting cycle. Deserted nests have been found infrequently on our study area (e.g., 1.2% of 162 Least Flycatcher nests; 3.1% of 320 Yellow Warbler nests) and the effects of human disturbance or predation of adults away from the nest could not be ruled out.

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Use of Body Weight and Length of Footpad as Predictors of Sex in Golden Eagles.—Bortolotti (1984) recently proposed measurement of culmen length and hallux claw length as field characteristics suitable for identifying sex of Golden Eagles (*Aquila chrysaetos*). Unfortunately, these characteristics have not traditionally been collected on Golden Eagles, and extracting information on population or fledgling sex ratios from extant data sets is therefore difficult. Two characteristics commonly measured and reported in unpublished (e.g., Kochert 1972) and published (e.g., Ellis 1979) literature are body weight and/or footpad length. A technique using such measurements as a tool for *a posteriori* identification of eagle sex could prove useful, and our purpose here is to present a multivariate method by which measurement or knowledge of these variables can be used to sex individual Golden Eagles.

Data on weight and footpad length were collected by MNK on 49 Golden Eagles found dead in southern Idaho. Routine post-mortem examinations were performed on all birds, and all were internally sexed. Eagles whose ovaries or testes were not easily detected were excluded from analysis, thereby overcoming problems associated with the sex identification of immature birds with underdeveloped gonads (see Garcelon et al. 1985). Eagles were weighed (g) on a triple beam or Metler balance prior to being autopsied. Footpad length (mm), taken from the tip of the middle toe to the tip of the hallux, was measured with vernier calipers.

Weight and footpad length from the autopsied eagles were subjected to discriminant function analysis to test the accuracy of the variables as predictors of sex. The analysis generates a linear function of the independent variables, weight and footpad length, that discriminates between sexes in a manner that minimizes misclassification errors. To measure the overall accuracy of the function, classification from the discriminant function is compared to the known classifications, and misclassification probabilities are calculated. This percentage measure represents the ability of the function to correctly classify individuals at the population level and should be fairly high if the function is to have general application.

Posterior probabilities estimating the accuracy of classification for each individual, P_i, can be obtained from the equation:

$$P_i = 1/[1 + \exp^{(-z)}], \tag{1}$$

where z is the value of the discriminant function for that individual (Affifi and Clark 1984). Note that P_i values do not represent statistical probabilities; rather, they estimate the probability of belonging to a particular classification (here sex) and provide a subjective measure by which investigators can accept or reject the classification. As used here, P_i is the probability the classified bird is female while $1.0 - P_i$ is the probability of being male. Investigators should be cautious of sex classifications where P_i for either sex is close to 0.5. If a