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NON-VIOLENT DEATHS OF FEMALE PROTHONOTARY WARBLERS ON THEIR NESTS

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Abstract.—Two female Prothonotary Warblers found dead on their nests may have died as a result of prior illness and the energetic demands of reproduction.

MUERTES NO-VIOLENTAS DE HEMBRAS DE *PROTONOTARIA CITREA* EN SUS NIDOS

Sinopsis.—Se presume que dos especímenes hembras de *Protonotaria citrea,* encontrados muertos en sus nidos, perecieron como resultado de haber estado previamente enfermas, unido esto a la demanda energética del proceso de reproducción.

Reports of female birds dying on their nests while incubating or brooding are uncommon. Nearly all of the incidences have been attributed to predation (e.g., Blackly 1976, Joern and Jackson 1983, Smith and Anderson 1982), weather (e.g., Hering 1947, Musselman 1939), or other natural disasters (e.g., Bent 1932). Post (1964) reported the death of an incubating female Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), apparently from pneumonia after a period of inclement weather, and there are two reports of female Snow Geese (*Chen caerulescens*) dying from starvation while incubating (Ankey and MacInnes 1978, Harvey 1971). Here, we report the non-violent deaths of two female Prothonotary Warblers (*Protonotaria citrea*) while incubating.

During 1984 and 1985 we studied the reproductive ecology of Prothonotary Warblers nesting along the Tennessee River in west central Tennessee. Nest boxes constructed from 1.9 l (0.5 gallon) milk cartons (Fleming and Petit 1986) were used to facilitate collection of nesting data on this cavity-nesting species. During the 2-yr period, we monitored 322 Prothonotary Warbler nests, most (82%) of them in milk cartons, with the remainder in natural cavities or other types of nest boxes.

On 15 May 1985, nest box LS2-7 contained a dead female warbler in the incubating position. The nest was intact, and there was no sign of disturbance. The four Prothonotary Warbler eggs and single Brown-headed Cowbird (*Molothrus ater*) egg contained dead embryos approximately 8 d old, about 5 d short of hatching. The female had been dead 2–3 d based on the known stage of the nest, showed no evidence of external wounds, and weighed 9.8 g, which is approximately 30% below the average adult female weight. The carcass was desiccated, most organs

and muscles had atrophied, and there was no subcutaneous fat. We could not locate the bird's mate.

Also on 15 May 1985, we found another dead female Prothonotary Warbler in the incubating position in nest box HI1-18, approximately 2 km from nest box LS2-7. Like the other female, this bird showed no external wounds and weighed 12.5 g, approximately 15% less than the population mean for this period of the nesting cycle. In the intact nest were four Prothonotary Warbler eggs containing dead embryos approximately 11 d old, 1–2 d away from hatching. The female had died 1–2 d before we discovered her and the carcass was slightly desiccated. Although there was no subcutaneous fat, the organs and muscles were not atrophied. The liver was yellowish with numerous white spots covering the exterior. The stomach was nearly empty, but did contain 13 pieces (<5 mm) of arthropod body parts, most of them from spiders. This female's mate was still on the territory.

Other reports of female deaths on the nest have determined the proximate causes (for example, predation, weather, starvation). We can discount predation and weather as the causes of the deaths reported here. There was no precipitation during the 7 d prior to our finding the birds and the daytime (10–24° C) and nighttime (5–10° C) temperatures were not extreme. In addition, percent canopy cover (70–75%) for these two nest boxes fell within the range found for all other boxes. Therefore, these boxes did not differ from others in their exposure to sunlight. The female Prothonotary Warblers may have exhibited unusually strong incubation behavior and, therefore, died from starvation (cf. Harvey 1971). However, female HI1-18 was not unusually light compared to the mean weight of the population, considering that she had been dead 1–2 d before being weighed. Also, there was no degeneration of the muscles as would be expected if starvation were the cause of death. We cannot, however, rule out the possibility that female LS2-7 died from starvation.

Toxic chemicals were probably not responsible for either death. There were no nearby agricultural fields and, to our knowledge, the study area had not been sprayed with pesticides. Also, while some toxic chemicals may cause liver damage (W. J. Fleming, pers. comm.), the lack of muscle atrophy in female HI1-18 may indicate that organochlorines were not responsible for her death (e.g., Porter and Wiemeyer 1972).

The substantial energetic costs of producing (Ricklefs 1974) and perhaps incubating (Haftorn and Reinertsen 1985; but see Walsberg and King 1978) a clutch of eggs could be sufficient to promote the death of old or sick birds. While the ages of the birds were not known, it is evident that female HI1-18 was sick (liver), so the illness, regardless of the additional energetic costs of reproduction, may have been responsible for her death.

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