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Mortality of an Adult Veery Incurred During the Defense of Nestlings

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ABSTRACT.—Cost-benefit analyses of the adaptive significance of nest defense in birds are based on the assumption that parent birds attacking nest predators risk serious injury or death. However, there are few published records of adult birds dying during nest defense. I found an adult male Veery (*Catharus fuscesens*) dead in circumstances indicating that the bird died while defending his nest. This observation supports speculation that adult birds risk injury or death in the course of nest defense, and lends support to explanations of variability in nest-defense behavior that are presented in terms of cost-benefit analysis and the optimization of fitness. *Received 11 Jan. 1999, accepted 27 May 1999.*

On 27 June 1997 I located a Veery (*Catharus fuscesens*) nest containing 3 eggs 1.6 m from the ground in a 9 year-old clearcut in the White Mountain National Forest (43° 58′ N–70° 97′ W) in north-central New Hampshire. On 11 July I approached the nest and observed an adult on the rim of the nest with its tail tilted up in an unusual posture. The adult was dead, the body cold. Autopsy revealed that the adult was a male and that the body had numerous puncture wounds, one on the central-posterior region of the right pectoralis muscle and four more on the back in the vicinity of the synsacrum. The four puncture wounds on the back were symmetrically oriented on either side of the spine, 1.5–2.0 cm apart and up to 7 mm deep, and probably caused the death of the bird. The depth and spacing of the wounds suggest that the predator may have been a Sharp-shinned Hawk (*Accipiter striatus*), a species known to attack Veery nests (Day 1953).

The adult was missing all of its secondary feathers and all but three rectrices. The missing feathers were scattered over the nest and the immediate vicinity of the nest bush. Another adult, presumably the female, was heard alarm calling nearby. The nest cup was torn down and had come to rest on some branches of the nest bush below the original level of the nest. Two nestlings were found prone on ground beneath the nest. The nestlings were cold, and gaped weakly. Based on previous experience with the nesting phenology of this species, I estimated the nestlings to be at least three days short of fledging. The original clutch size was three eggs. It is unknown whether the third egg hatched. No sign of a third nestling or eggshells was found in the vicinity.

On the basis of several lines of evidence, I conclude the male Veery was killed in the course of nest defense. First, based on the spacing of the puncture marks, the predator was evidently large enough to consume a Veery (K. Doyle, pers. comm.). Under these circumstances, it is difficult to conceive of a scenario in which a predator would kill the adult, leave it on the nest, attempt to depredate the nest, and subsequently leave. In contrast, the disposition of the male, and of the nest and its contents are all consistent with the hypothesis that the adult was killed in association with nest defense. The adult was killed yet not consumed, indicating that it was not the original target of the predator. Furthermore, the nestlings were not consumed, suggesting that the predator was interrupted during the predation event. Veerys have been observed successfully defending nests by striking the predator with their wings (Nice 1962; Pettingill 1976, pers. obs.), which would account for the symmetrical loss of wing feathers I observed. It could be argued that the male was the original target of the predator, was wounded elsewhere, and returned to the nest seeking a secure hiding place, were it not for the fact that the nest had been attacked.

Cost-benefit analyses of the adaptive significance of nest defense in birds are based on the assumption that birds attacking predators during the course of nest defense are at some

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risk of injury or death (Montgomerie and Weatherhead 1988). However, observations of nest predation events under natural conditions are rare (Pettingill 1976) and observations of attacks on parent birds by predators during the course of nest predation are even more scarce. Brunton (1986) observed a Killdeer (*Charadrius vociferous*) killed by a red fox (*Vulpes vulpes*) while performing a distraction display. This observation of a Veery confronting a predator at the cost of its own life during active defense of the nest is to my knowledge, unprecedented. This observation supports speculation that adult birds assume risk of injury or death in the course of nest defense (Curio and Regelman 1985), and lends support to explanations of variability in nest-defense behavior that are couched in terms of cost-benefit analysis and the optimization of fitness (Montgomerie and Weatherhead 1988).

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Relationships of Clutch Size and Hatching Success to Age of Female Prothonotary Warblers

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ABSTRACT.—We obtained 1033 clutch sizes from 281 known-age female Prothonotary Warblers (*Protonotaria citrea*) nesting in nest boxes at Presquile National Wildlife Refuge in eastern Virginia from 1987 through 1998. Prothonotary Warblers typically nested twice during each breeding season; first clutches of all birds averaged 1.01 eggs greater than second clutches [4.96 ± 0.72 (SD) vs 3.94 ± 0.55]. Clutch size was significantly smaller in first nests of one-year-old warblers (4.64 ± 0.48) than in first clutches of females two to eight years old (5.05 ± 0.62). First clutches did not differ among age classes of birds older than one year. The mean size of second clutches was not significantly different among any of the age classes. One year old birds initiated laying significantly later than older birds (125.0 ± 6.4 vs 121.5 ± 7.7; Julian dates). The average number of infertile eggs in first clutches was larger in one year old females and differed significantly from that of older females (1.01 ± 0.90 vs 0.63 ± 0.87). The number of infertile eggs in second clutches did not differ significantly with female age. Significantly fewer eggs hatched in first nests of one year old birds than in those of older birds (3.75 ± 0.89 vs 4.33 ± 1.09). *Received 2 Dec. 1998, accepted 2 May 1999.*

The Prothonotary Warbler (*Protonotaria citrea*) is unusual among wood warblers (Parulidae) because it nests in secondary cavities. It shares this trait with only one other member of the 116 members of the subfamily Parulinae [Lucy's Warbler (*Vermivora luciae*); Curson et al. 1994]. It is likewise noteworthy among the birds of the eastern United States in that it migrates farther than the other small passerines nesting in secondary cavities. Determinants of clutch size of Prothonotary Warblers therefore may be of interest for comparison with other cavity-nesting passerines and with other Neotropical migrants. Several re-

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