Fisher 1958). Therefore adaptation remains as a viable competitor to mal-adaptive or neutral hypotheses.

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DESTRUCTION OF EGGS BY WESTERN MEADOWLARKS[1]

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Key words: Egg destruction; Western Meadowlark; Sturnella neglecta; *predation; competition.*

Creighton and Porter (1974) reported two cases of destruction of Horned Lark, *Eremophila alpestris,* and Lark Bunting, *Calamospiza melanocorys,* eggs by Western Meadowlarks, *Sturnella neglecta,* and one probable case of a meadowlark pecking a Lark Bunting nestling. Based on these observations, Creighton and Porter (1974) suggested that egg destruction by Western Meadowlarks might be common. In this note, we provide additional evidence for egg pecking by this icterid suggesting that this behavior may be characteristic of this species.

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Between 24 April and 14 June 1987, we studied patterns and rates of nest predation of ground-nesting birds in short- and mixed-grass prairies at Shilo, Manitoba. To identify potential predators, we used 18 automatic camera setups baited with artificial nests, each containing one quail, *Coturnix coturnix,* egg. Artificial nests were constructed by pressing two layers of grass, held together with a few strips of transparent LePage glue, into plastic bowls the size and shape of a Red-winged Blackbird, *Agelaius phoeniceus,* nest. To thin the shell of the quail eggs so that small avian predators could break them, eggs were placed in a 20% acetic acid solution for 20 min and then thoroughly washed in running water. The procedure does not seem to affect the palatability of the eggs because a variety of avian and mammalian predators will consume these eggs (J. Picman, unpubl. data). Eggs were dyed a brown/beige color to replace pigment lost during the treatment. With the experimental setup, any predator manipulating the egg triggered the camera and a picture was taken (see Picman 1987). Setups were placed along three transects throughout the 70-ha study site (six per transect, 10 to 20 m apart, with at least 100 m between transects), and checked (i.e., cameras reset and eggs replaced as necessary), once or twice a day for 10 days. Transects were then moved to new locations, at least 100 m away.

Three predators were revealed by pictures of predation events (n = 331); the thirteen-lined ground squirrel, *Citellus tridecemlineatus* (63.4%), the American Crow, *Corvus brachyrhynchos* (32.3%), and the Western Meadowlark (4.2%). Crows and ground squirrels are accepted as frequent nest predators (e.g., Hamilton 1931, Yom-Tov 1974, Sugden and Beyersbergen 1986). However, although two cases of egg pecking by Western Meadowlarks were reported by Creighton and Porter (1974), this species has not usually been considered as an important egg predator. Meadowlarks were photographed in the egg-pecking position (i.e., their beaks were either touching or pointing towards the egg), and thus they did not trigger the cameras accidentally. We could not determine whether one or both sexes were destroying eggs since male and female meadowlarks are similar in appearance.

Results of our nest-predation study, including frequency of egg destruction by meadowlarks, were most likely influenced by our experimental design (120 nests distributed in three quadrats to simulate uniform, clumped, and random distribution patterns). Over 90% of all artificial nests with eggs were depredated within 48 hr (Schaeff and Picman, unpubl.), representing an abnormally high predation level for a grassland habitat (Gottfried 1978; Gottfried and Thompson 1978; Picman, unpubl.). The large number of experimental nests may have attracted many predators to the area and/or influenced their foraging patterns. Other studies involving artificial increases of nest density which listed crows as predators also experienced very high predation rates (Goransson et al. 1978, Sugden and Beyersbergen 1986). Since meadowlark territories in our area were extremely large (approximate mean territory size was 7 ha; n = 11) and meadowlarks generally remain on their territories throughout the breeding season (Lanyon 1957), the relative importance of meadowlarks is probably underestimated. Concomitantly, meadowlark predation occurred in seven of 11 territories sampled, suggesting that in our study area the egg-destroying behavior was fairly widespread. Hence meadowlarks could play a more important role in grasslands where their densities are higher and other nest predators are less abundant.

The Eastern Meadowlark, *Sturnella magna*, a species which closely resembles the Western Meadowlark in behavior and appearance, has also recently been observed destroying eggs. In a similar study in meadow habitat near Ottawa, Ontario, Eastern Meadowlarks were found to be the second most important predator, responsible for about 20% of egg destruction (J. Picman, unpubl. data). Predation level for this area was only 10% after 48 hr.

Evidence of egg destruction by meadowlarks raises the question: what is the function of this behavior? Since egg destruction activities are likely to result in costs to the aggressor (including injuries administered by owners of the attacked nest and increased chances of predation while the attacker is absent from its own nest), this behavior should be favored only if its advantages outweigh its disadvantages. Creighton and Porter (1974) proposed that the meadowlark egg-pecking could either be a form of predation or a mechanism of interference competition promoting spatial and temporal segregation of nesting activities of ecologically similar species. The following predictions could be used to discriminate between these two hypotheses: the predation hypothesis predicts that meadowlarks should indiscriminately attack and consume any eggs. Conversely, the competition hypothesis predicts that meadowlarks should preferentially destroy clutches of their competitors and that their interference should lead to increased spatial and temporal segregation of nesting activities of competing birds breeding in a given area. Although we do not have data to test these predictions, we propose that competition may have played an important role in the evolution of meadowlark egg-pecking behavior. Egg destruction, as an interference competition mechanism, should be favored in situations where competition for limited resources cannot be reduced through divergence (Picman 1977). In such a case, destruction of competitors' eggs could be a form of territorial aggression leading to increased spatial and temporal segregation of nesting activities. This situation is likely to occur in simple habitats such as grasslands and marshes, where interspecific territoriality is most common (Orians and Wilson 1964, Cody 1969). However, to fully understand the adaptive value of the egg-pecking behavior in Western Meadowlarks, we must establish: (1) the relative frequency of egg destruction within and between meadowlark populations, (2) how this behavior is affected by food availability and intensity of intraspecific and interspecific competition, and (3) whether egg destruction by meadowlarks promotes spatial and temporal segregation between sympatric birds.

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HEMATOCRIT AND PROTEIN CONCENTRATION OF BLACK VULTURE AND TURKEY VULTURE BLOOD[1]

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Key words: Cathartes aura; Coragyps atratus; *Black Vulture; hematocrit; hematology; packed cell volume; protein concentration; Turkey Vulture.*

Blood protein concentration and hematocrit (packed cell volume) values are easily obtained and can be useful in determining the health of trapped or captive birds (Hunter and Powers 1980, Duke and Redig 1984). However, if these parameters are to be useful, there must be baseline data for comparison. Bond and Gilbert (1958), Hunter and Powers (1980), and Gessaman et al. (1986) have provided data for a variety of raptors, yet information on vultures is lacking. Our purpose is to provide baseline data on the blood characteristics of the Black Vulture (*Coragyps atratus*) and the Turkey Vulture (*Cathartes aura*).

METHODS

As part of a study of Black and Turkey vultures habitat use and feeding ecology in the mid-Atlantic states, we caught and took blood from 45 Black Vultures and eight Turkey Vultures. The study area, near Gettysburg, Pennsylvania, has been described previously (Coleman and Fraser 1987) and has an altitude of 100–450 m. The birds were trapped from March–November in 1983 and March–August in 1984. They were captured by hand in nest caves or with rocket nets. We processed and released the birds within 4 hr of capture except in the case of one sick individual which was held after processing until death 10 hr later. We tried to limit the capture of migrant birds by not trapping in the fall or late winter.

Blood was taken by pricking the large vessel at the humerus to radius-ulna articulation and pulling blood into heparinized capillary tubes. Within 1 hr, a portion of the blood was separated by spinning for 5 min at an RCF of 5,900 g on a Clay Adams Readacrit clinical blood centrifuge to determine hematocrit and plasma protein concentration values. Hematocrit was measured with calipers and plasma protein concentration measured with an American Optical refractometer. Samples of blood were provided to the USDA Avian Influenza Task Force for testing for the H5N2 Avian Influenza virus. All values were compared using *t*-tests.

RESULTS AND DISCUSSION

Mean packed cell volume for 44 healthy Black Vultures ($\bar{x}$ = 49.8%; Table 1) was higher than that reported by Schmitt (1972; n = 22, $\bar{x}$ = 47.0%; P = 0.005). We found no difference in Black Vulture blood characteristics by two seasons (March 15–September 14 and September 15–March 14) or by age (SY and ASY) (P > 0.05; Table 1). However, our samples were small ($\leq$ three) in some seasons. We found no difference

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