(Utah Division of Wildlife Resources), and a major one involving "many thousands" in southwestern Utah and eastern Nevada on 12 December 1928 (Cottam 1929). While detection of downings in this area is enhanced by the correspondent bearings of an interstate highway (not present in 1928) and the grebes' migration path, their frequency suggests that local meteorological and geographical conditions, perhaps related to basin-and-range topography and the proximity of the Wasatch Front, play a role. If these promote a fog and snow belt in early winter, forcing the grebes to run a hazy gantlet, this area may represent an especially hazardous but unavoidable sector of the fall migration route. An earlier departure could reduce the chance of encountering fog or snow, but the risk is probably trivial compared to the benefits of exploiting an abundant and uncontested source of food (brine shrimp) on the staging grounds for as long as possible.

R. Fridell, C. Jensen, B. Olson, D. Paul, F. Howe, R. Radant, and others from the Utah Division of Wildlife Resources alerted me to this event and took part in gathering and banding downed migrants, and arranging for further study. C. White and students from Brigham Young University, E. Sorensen, and P. Dutton helped greatly in processing hundreds of carcasses. S. I. Bond was invaluable in assisting in all phases of this study. P. Yochem, C. Beuchat, H. Ellis, T. Piersma, D. McDonald, and several reviewers made helpful comments on a draft manuscript. The research was supported by the Los Angeles Department of Water and Power.

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THE PREVALENCE OF ABDOMINAL LESIONS ON WOOD STORK NESTLINGS IN NORTH AND CENTRAL FLORIDA[1]

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Key words: Wood Stork; Mycteria americana; *ectoparasite; dermestid beetle,* Dermestes nidum; *soldier fly,* Hermetia illucens; *Florida.*

The United States population of the Wood Stork (*Mycteria americana*) currently is decreasing and endangered (USFWS 1984, Kushlan and Frohling 1986, Ogden and Patty 1981). Snyder et al. (1984) were the first to identify abdominal lesions on stork nestlings caused by larval dermestid beetles (*Dermestes nidum,* Dermestidae, Coleoptera), but were unable to determine precisely the degree of threat posed by dermestid infestation and whether the problem was confined to southern Florida. As part of a multi-year and multicolony study of the reproductive biology of Wood Storks, we collected data on the occurrence of lesions on nestlings. In this paper, we present information on the distribution and effect of abdominal lesions on Wood Stork nestlings in north and central Florida.

Eleven wading-bird colonies in northern and central Florida were visited at one- or two-week intervals during the breeding seasons of 1981–1985. See Nesbitt et al. (1982) and Rodgers et al. (1987, 1988) for specific colony locations, general vegetation characteristics, and total number of stork nests. Wood Stork nests were individually marked and nestlings were examined in hand (< 3 weeks of age) or at a distance with 7 × 35 mm binoculars (> 3 weeks of age). Lesions on young nestlings (< 2 weeks of age) were characterized by open wounds, especially in the upper and lower abdominal featherless tract. The lesions were 1–3 mm deep and surrounded by a raised region of swollen tissue. No penetration of the lower abdominal wall was noted. Older nestlings (2–6 weeks of age) exhibited evidence of lesions with red-brown, dried material that matted small feather regions (1–3 cm) on the upper and lower abdomen (see Snyder et al. 1984: Fig. 1B). These le-

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TABLE 1. Prevalence of Wood Stork nestlings that exhibited visual sign of lesions as evidenced by transudate stained feathers.[1,2]

Colony	Year					Total percent
	1981	1982	1983	1984	1985	
Brewster	3/46	NA	F	NA	NA	6.5
Chaires	9/859	6/129	0/213	0/522	2/212	0.9
Dee Dot	10/247	9/258	4/321	4/155	8/261	2.8
Grant Farm	4/87	0/32	2/351	0/91	F	1.1
Lake Yale	2/248	0/48	1/85	5/249	4/272	1.3
Little Gator	NM	NM	0/288	2/235	3/103	0.8
Moore Creek	NA	F	0/116	2/372	0/78	0.4
NE Mulberry	4/221	0/62	NA	NA	NA	1.4
Ochlockonee	NM	NM	NM	NM	3/259	1.2
Pelican Island	1/215	13/125	0/273	0/252	1/159	1.4
San Antonio	NA	NM	5/578	1/198	NA	0.8
Total	33/1,923	28/654	12/2,225	14/2,074	21/1,344	1.3

[1] Number of affected nestlings/total nestlings.
[2] Abbreviations: NA = not active; F = breeding failed before nestling phase; NM = not monitored.

sions probably were the result of the larvae that primarily feed on carrion in stork nests. Our evidence of larval depredation of stork nestlings is based on indirect evidence of lesions and from darkly stained feathers from transudate. Care was taken to distinguish between nestlings with transudate-stained feathers indicative of abdominal lesions from nestlings with feathers soiled by guano or stained by food items. However, values in Table 1 are probably underestimates of actual infestation because they represent only nestlings with obvious, darkly transudate-stained feathers, indicative of extensive lesions (see below).

Wood Stork nests with nestlings exhibiting abdominal lesions from Pelican Island (n = 11, 1986) and Dee Dot (n = 9, 1991) were examined for all potential ectoparasites. Adult and larval dermestid beetles were found at both Pelican Island (n = 5 nests) and Dee Dot (n = 3 nests). In addition, all examined nests contained live or recently molted remains of soldier fly larvae (*Hermetia illucens,* Stratiomyiidae, Diptera), another carrion-feeding insect (Oldroyd 1964:116, Cole 1969: 159, Snyder et al. 1987:266). Representative voucher specimens of both dermestid beetle and soldier fly larvae were deposited in the Florida State Collection of Arthropods at the Florida Department of Agriculture, Gainesville, Florida.

The proportion of Wood Stork nestlings that possessed red-brown, dried material that matted their abdominal feathers and indicated larval infestation varied among colonies and years, but generally was relatively small compared to unaffected nestlings (Table 1). Whereas the prevalence of nestlings with evidence of lesions ranged from 0 to 6.5% per colony-year, the overall colony frequency for affected nestlings (1.3%) was low for the five-year period. Many colonies had no nestlings with obvious lesions during some years. The presence of abdominal lesions was most obvious on 2–4 week old nestlings. Younger nestlings may not be as subject to severe infestation by larvae because of two reasons: (1) there probably is a delay in hatching of beetle and fly eggs because carrion is found in the nest only after stork egg hatching, and (2) parent storks regularly deposit green nest material during the early nestling phase (Rodgers et al. 1988) that may help isolate the young from feeding larvae. Older nestlings (> 4 weeks of age) regularly stand upright off the nest surface or leave the nest, and the large body contour feathers may cover the rapidly healing lesions. We noted that 47.5% of the nests with nestlings with abdominal lesions (n = 59) contained both nestlings with and without evidence of lesions. Similar observations were made by Snyder et al. (1984).

Our values are generally lower than found by Snyder et al. (1984), but they examined stork nestlings in the hand and included affected nestlings that we would not have noticed by our methods during most colony-years. However, our own analysis of stork nestlings in hand at Pelican Island in 1986 indicated that infestation (any evidence of body lesions) rates may be in the range of 5–6% (n = 45 nestlings in 24 nests examined). This usually consisted of a few lesions on the ventral featherless tract. None of these lesions contributed to nestling mortality. Only severe cases result in the large, stained and matted feathers as noted in Table 1.

Data presented by Snyder et al. (1984) were insufficient to indicate if infestation by dermestid larvae was a significant threat to Wood Stork nestling survivorship. Our long term, multi-colony study with repeated nest visits indicated that lesion-induced mortality was minimal. Of the 108 affected nestlings (1.3%, n = 8,220 nestlings), only one nestling had severe enough lesions such that they may have contributed to its death (i.e., a 2–3 day old nestling with many lesions on the abdomen, lower neck, and upper legs). The remaining 107 nestlings fledged. Snyder et al. (1987) observed only a single nestling death in the Puerto Rican Parrot (*Amazona vittata*) due to infestation by soldier fly larvae. Snyder et al. (1984) also noted that snail kites (*Rostrhamus sociabilis*) nesting in melaleuca (*Melaleuca quinquenervia*) and mixed-species wading bird colonies exhibited a higher prevalence of dermestid lesions. Whereas Wood Storks nest in a variety of woody plant species in northern and central Florida (Rodgers et al. 1988), we found no correlation between the fre-

quency of lesions and species of vegetation used as nesting substrate. Further, all the colony sites listed in Table 1 were mixed-species colonies, which included nestlings with no obvious lesions. However, we noted that only 9.7% of the affected nests ($n = 59$ nests) were higher than 7 m. While our failure to examine these nestlings in hand may have biased or detection of abdominal lesions, female dermestid beetles and soldier flies may have difficulty in colonizing stork nests located in taller trees.

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WINTERING SWAINSON'S HAWKS IN ARGENTINA: FOOD AND AGE SEGREGATION[1]

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Key words: Swainson's Hawks; Buteo swainsoni; *winter; diet; Argentina.*

Traditionally, the Swainson's Hawk (*Buteo swainsoni*) has been considered to be largely insectivorous (Bent 1937, Snyder and Wiley 1976). Many workers report *B. swainsoni* feasting on grasshoppers (Bent 1937, Taylor 1946, Littlefield 1973, Woffinden 1986). In contrast, other studies found that mammals and birds make up most of the food brought to the nest (Dunkle 1977, Johnson 1978, Houston 1990, Gilmer and Stewart 1984). Johnson et al. (1987) observed that summering flocks of non-breeding individuals were almost strictly insectivorous. They proposed that *B. swainsoni* is insectivorous, but that breeding pairs switch to vertebrate prey due to the energetic demands of reproduction.

Food habits of *B. swainsoni* on their non-breeding range are poorly known. The only report of the food of *B. swainsoni* in the wintering grounds is the comment by C. C. Olrog (in Smith 1980) that in Argentina they exploit local outbreaks of locusts. Apparently based on this comment, it has been generally accepted that locusts are the main food on the wintering grounds (Palmer 1988b, Houston 1990).

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