Fla. Field Nat. 25(2):60-63, 1997.

BREEDING SEASON MASSES OF SNAIL KITES IN FLORIDA

Patricia L. Valentine-Darby, Robert E. Bennetts, and Wiley M. Kitchens
Department of Wildlife Ecology and Conservation
Florida Cooperative Fish & Wildlife Research Unit, University of Florida
P. O. Box 110450, Gainesville, Florida 32611-0450

Of the three currently recognized subspecies of the Snail Kite, only *Rostrhamus sociabilis plumbeus* is resident in the United States, in peninsular Florida. Although body masses have been reported for other Snail Kite subspecies, few data have been published for the Florida subspecies (Beissinger 1988, Sykes et al. 1995). Herein, we report body masses of adult female, adult male, and fledging juvenile Snail Kites for two years. Note that the average female and male body masses for 1993 have previously been published in Sykes et al. (1995). We also examine differences between sex and age classes and compare our results to the patterns of breeding season mass change reported for other raptors in northern temperate climates.

Body mass data were collected in 1993 and 1994 in central and south Florida during February, March, April, and May of the breeding season. Masses were taken as part of a larger, on-going study of survival and dispersal of Snail Kites in Florida. Birds were weighed only once at the time of initial capture for banding and radio telemetry. Adult kites were captured with a net gun (Mechlin and Schaiffer 1979) that propels a 3-m triangular nylon net. We did not attempt to capture adults prior to their laying a full clutch to eliminate or minimize trauma associated with net gun capture, as birds are known to be more sensitive during the early phase of reproduction (e.g., prelay and egg laying) (Grier and Fyfe 1987). Juveniles were captured just prior to fledging, at approximately 30-35 days old, without a net gun. Masses were taken with a 1-kilogram Pesola scale and recorded to the nearest 5 grams.

We compared masses between age classes, sex classes and years using analysis of variance (ANOVA). Prior to this analysis, we tested for normality of these data using a Shapiro-Wilk test (Shapiro and Wilk 1965, SAS Institute Inc. 1988). We failed to reject the assumption of normality for any of these data ($P > 0.05$) and concluded that a nonparametric alternative was not warranted.

We recorded the masses of 109 adult (56 female and 53 male) and 39 juvenile Snail Kites (Table 1). Body masses differed between ages ($F = 25.6$, 1 df, $P < 0.001$) and sexes ($F = 38.3$, 1 df, $P < 0.001$), but not years ($F = 1.9$, 1 df, $P = 0.169$). No interaction terms between age, sex, or year were significant.

Table 1. Mean (± SD) masses (g) and ranges of adult female, adult male, and juvenile Snail Kites in south and central Florida during the breeding season.

Year	Adult Females	Adult Males	Juveniles
1993	446.0 (47.8) (350-570) n = 29	394.5 (22.4) (360-440) n = 29	385.8 (45.1) (290-480) n = 32
1994	453.5 (46.3) (360-555) n = 27	412.5 (28.2) (360-480) n = 24	380.7 (33.0) (350-420) n = 7

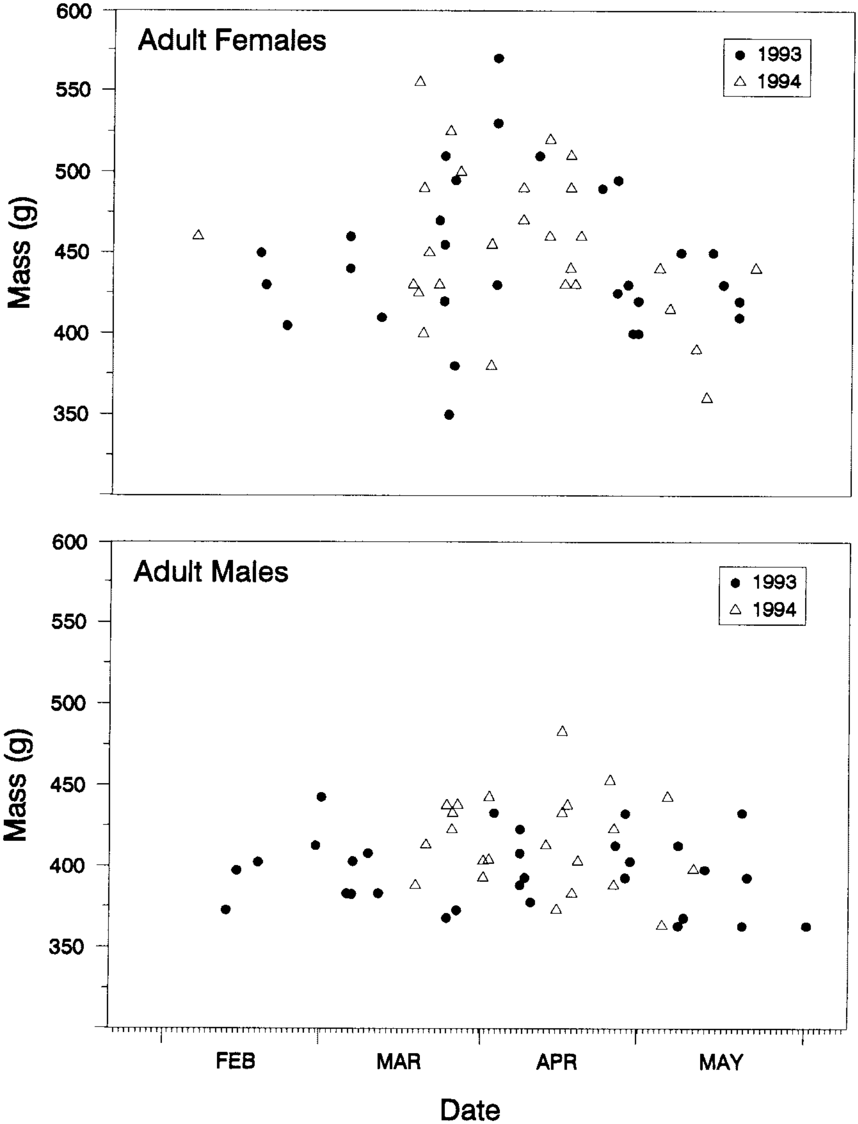

Figure 1. Female and male Snail Kite masses in south and central Florida during the breeding season.

A linear model of the body mass of female kites over time through the breeding season was not significant (R^2 = 0.02, P = 0.249); however, the model was significant if a quadratic term was included (R^2 = 0.11, P = 0.048; Figure 1). A model for males was not significant either for a linear model (R^2 = 0.01, P = 0.994), or a model including a quadratic term (R^2 = 0.06, P = 0.233; Figure 1). Similarly, a model of juveniles did not differ over time for either a linear model (R^2 = 0.01, P = 0.540), or a model including a quadratic term (R^2 = 0.07, P = 0.272).

The difference in body mass between sexes was not surprising because Snail Kites, like many raptors, exhibit reversed sexual size dimorphism (e.g., Friedmann 1950). Adults and fledging juveniles also differed in mass, with adults being heavier. A similar size difference has been reported for raptors such as the Northern Goshawk (*Accipiter gentilis*), Sharp-shinned Hawk (*Accipiter striatus*), and Cooper's Hawk (*Accipiter cooperii*) (Mueller et al. 1981), and Eurasian [European] Sparrowhawk (*Accipiter nisus*) (Newton et al. 1983).

Body mass changes during the breeding season have been documented for many raptors. Female masses are highest prior to and during egg laying, remain constant during incubation, and then decline during the nestling period (Eurasian [European] Sparrowhawk, Newton et al. 1983; Eurasian [European] Kestrel *Falco tinnunculus*, Village 1983, Dijkstra et al. 1988; Tawny Owl *Strix aluco*, Hirons et al. 1984; and Tengmalm's Owl *Aegolius funereus*, Korpimäki 1990); this pattern of mass change is known as incubatory mass constancy (Moreno 1989). Male masses, however, show little variation during the breeding season. Our findings for Snail Kites indicate that, like these other raptors, there is a gender difference in mass change. Masses of the male kites we studied did not change as the breeding season progressed, while those of female kites did. Peak egg laying for our kites occurred in March (Bennetts and Kitchens, unpubl. data), which corresponded to the time of highest masses in females. Masses were lower as the season progressed, as more of our trapped birds had nestlings.

Caution, however, must be taken in comparing the observed mass change in female kites to that of other raptors. Because our study was not focused on reproduction, we were unable to account for the nesting phase of all birds, although the vast majority had either eggs or nestlings. The comparison may be further confounded by the wide range of laying dates often exhibited by Snail Kites in Florida, as well as by the fact that kites may attempt to nest more than once per season (Snyder et al. 1989). Also unlike some temperate raptor species, such as the Tawny Owl (Hirons et al. 1984) and Sparrowhawk (Newton et al. 1983), both female and male kites incubate (Bent 1937, Beissinger 1987). Consequently, in contrast to other female raptors, female Snail Kites have opportunities to feed throughout the day during incubation, and thus do not rely solely on their mate for food. The reliance on the male for food during incubation has been cited as one of the likely reasons females accumulate body mass prior to egg laying (Newton et al. 1983, Hirons et al. 1984).

This study is part of a larger ongoing study of survival and movements of Snail Kites by Kitchens and Bennetts. Funding for this work was provided by the U.S. Fish and Wildlife Service and National Park Service through Cooperative Agreement #14-16-0007-1544, RWO90 of the Florida Cooperative Fish and Wildlife Research Unit, the U.S. Army Corps of Engineers, Biological Resources Div. of the U.S. Geological Surv., South Florida Water Manage. Dist., and St. Johns River Water Manage. Dist. We also thank H. Franklin Percival, Paul W. Sykes Jr., and Steven R. Beissinger for review of the manuscript. This paper is contribution No. R-05203 of the Florida Agricultural Experiment Station Journal Series, Institute of Food and Agricultural Sciences, University of Florida.

Literature Cited

Beissinger, S. R. 1987. Mate desertion and reproductive effort in the Snail Kite. Anim. Behav. 35:1504-1519.

Beissinger, S. R. 1988. The Snail Kite. Pages 148-165. *In* Handbook of North American Birds. Vol. 4. R. S. Palmer, (ed). Yale Univ. Press, New Haven, Connecticut.

Bent, A. C. 1937. Life histories of North American birds of prey. Dover Publications Inc., New York. 409 pp.

DIJKSTRA, C., S. DAAN, T. MEIJER, A. J. CAVÉ, AND R. P. B. FOPPEN. 1988. Daily and seasonal variations in body mass of the Kestrel in relation to food availability and reproduction. Ardea 76:127-140.

FRIEDMANN, H. 1950. The Birds of North and Middle America. U.S. Natl. Mus. Publ. No. 50.

GRIER, G. W., AND R. W. FYFE. 1987. Preventing research and management disturbance. Pages 173-182. *In*: Raptor management techniques manual. B. A. G. Pendleton, B. A. Millsap, K. W. Kline, and D. M. Bird, (eds). Natl. Wildl. Fed., Washington, D.C.

HIRONS, G. J. M., A. R. HARDY, AND P. I. STANLEY. 1984. Body weight, gonad development and moult in the Tawny Owl (*Strix aluco*). J. Zool., Lond. 202:145-164.

KORPIMÄKI, E. 1990. Body mass of breeding Tengmalm's Owls *Aegolius funereus*: Seasonal, between-year, site and age-related variation. Ornis Scand. 21:169-178.

MECHLIN, L. M., AND C. W. SCHAIFFER. 1979. Net firing gun for capturing breeding waterfowl. U.S.D.I. Fish & Wildlife Service, Northern Prairie Wildl. Res. Center. Jamestown, North Dakota.

MORENO, J. 1989. Strategies of mass change in breeding birds. Biol. J. Linnean Soc. 37:297-310.

MUELLER, H. C., D. D. BERGER, AND G. ALLEZ. 1981. Age, sex, and seasonal differences in size of Cooper's Hawks. J. Field Ornithol. 52:112-126.

NEWTON, I., M. MARQUISS, AND A.VILLAGE. 1983. Weights, breeding, and survival in European Sparrowhawks. Auk 100:344-354.

SAS INSTITUTE INC. 1988. SAS/STAT User's guide. Release 6.03. SAS Instit. Inc. Cary, North Carolina.

SHAPIRO, S. S., AND M. B. WILK. 1965. An analysis of variance test for normality (complete samples). Biometrika 52:591-611.

SNYDER, N. F. R., S. R. BEISSINGER, AND R. CHANDLER. 1989. Reproduction and demography of the Florida Everglade (Snail) Kite. Condor 91:300-316.

SYKES, P. W., JR., J. A. RODGERS, JR., AND R. E. BENNETTS. 1995. Snail Kite (*Rostrhamus sociabilis*). *In* The Birds of North America, No. 171. (A. Poole and F. Gill, eds). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

VILLAGE, A. 1983. Body weights of Kestrels during the breeding cycle. Ringing and Migration 4:167-174.