———, & A. C. WILSON. 1957. A quantitative examination of testicular growth in the White-crowned Sparrow. Biol. Bull. 113: 254–267.

———, B. K. FOLLETT, J. R. KING, & M. L. MORTON. 1966. A quantitative examination of ovarian growth in the White-crowned Sparrow. Biol. Bull. 130: 67–75.

FRIEDMAN, M. H., & G. S. FRIEDMAN. 1939. Gonadotropic extracts from green leaves. Amer. J. Physiol. 124: 486–490.

GOLDBERG, M., N. R. TABROFF, & R. H. TAMARIN. 1980. Nutrient variation in beach grass in relation to beach vole feeding. Ecology 61: 1029–1033.

HINKLEY, R. 1966. Effect of plant extracts in the diet of *Microtus montanus* on cell types in the anterior pituitary. J. Mammal. 47: 396–400.

KERN, M. D. 1970. Annual and steroid-induced changes in the reproductive system of the female White-crowned Sparrow, *Zonotrichia leucophrys gambelii*. Unpublished Ph.D. dissertation, Pullman, Washington, Washington State Univ.

KING, J. R., B. K. FOLLETT, D. S. FARNER, & M. L. MORTON. 1966. Annual gonadal cycles and pituitary gonadotropins in *Zonotrichia leucophrys gambelii*. Condor 68: 476–487.

KUPPUSWAMY, S., M. SRINIVASAN, & V. SUBRAHMANYAN. 1958. Proteins in foods. New Delhi, Indian Council of Medical Research.

LEOPOLD, A. S., M. ERVIN, J. OH, & B. BROWNING. 1976. Phytoestrogens: adverse effects on reproduction in California Quail. Science 191: 98–100.

MEWALDT, L. R., & J. R. KING. 1978. Latitudinal variation in prenuptial molt in wintering Gambel's White-crowned Sparrows. North Amer. Bird Bander 3: 138–144.

MORTON, M. L. 1967. Diurnal feeding patterns in White-crowned Sparrows, *Zonotrichia leucophrys gambelii*. Condor 69: 491–512.

NEGUS, N. C., & A. J. PINTER. 1966. Reproductive responses of *Microtus montanus* to plants and plant extracts in the diet. J. Mammal. 47: 596–601.

PINTER, A. J., & N. C. NEGUS. 1965. Effects of nutrition and photoperiod on reproductive physiology of *Microtus montanus*. Amer. J. Physiol. 208: 633–638.

Received 2 March 1981, accepted 12 May 1981.

Wing- and Tail-flapping in Anhingas: a Possible Method for Drying in the Absence of Sun

ANN M. FRANCIS

Department of Zoology, Birge Hall, University of Wisconsin, Madison, Wisconsin 53706 USA

Anhingas (*Anhinga anhinga*) commonly spread their wings and perch in the sun, ostensibly to dry wettable feathers (Bent 1922, Life histories of North American Petrels and Pelicans and their allies, Washington, U.S. Natl. Mus. Bull. 230). The flight feathers themselves appear not to become appreciably wet, but the body feathers absorb water that helps reduce the submerged bird's buoyancy (Owre 1967, Ornithol. Monogr. 6: 61; see also Casler 1973, Auk 90: 324). While drying, the wings and tail are usually held open but immobile, presumably to allow sunlight and breeze to strike the body plumage. I observed two perched Anhingas flapping their spread wings and tails after emerging from the water, however, a behavioral pattern not reported in the literature.

The behavior occurred at Wakulla Springs, Florida just after sunset (1815 E.S.T.) on 12 March 1980, an overcast day with occasional drizzle. The birds vertically raised and lowered both wings simultaneously through a 60° arc (±30° from the horizontal). The tail also moved vertically, through about 90°, and was raised when the wings were lowered and vice-versa. Flapping occurred 3–5 times per second for 11 min in one bird and at least 20 min in the second.

Because the birds did not appear to direct attention toward any conspecifics, it is unlikely that such behavior is an intraspecific signal. Also, I never observed such flapping behavior during times of wing-spread posture in sunlight. Therefore, it is possible that Anhingas flap their wings and tails on overcast days or after sunset to create air currents that facilitate drying of the body feathers in the absence of direct sunlight.

I thank Jack P. Hailman and Oscar Owre for comments on this manuscript.

Received 5 September 1980, accepted 18 May 1981.