ABSTRACTS OF THESES AND DISSERTATIONS

ECOLOGICAL ENERGETICS AND FORAGING BEHAVIOR OF WINTERING BALD EAGLES

The ecological energetics and foraging ecology of wintering Bald Eagles (*Haliaeetus leucocephalus*) were studied for 2 years on the Nooksak River in northwestern Washington and in the laboratory at Utah State University. During 36 food consumption trials, daily consumption by 4 winter-acclimatized eagles was 92.0 g/kg on a chum salmon (*Oncorhynchus keta*) diet, 74.8 g/kg on a black-tailed jackrabbit (*Lepus californicus*) diet, and 65.1 g/kg on a mallard duck (*Anas platyrhynchos*) diet which was inversely related to the wet energy contents (0.90, 1.22, and 1.96 kcal/g) of the diets, respectively. Daily consumption for combined diets was 88.4 g/kg at -10 C, 75.5 g/kg at 5 C, and 68.0 g/kg at 20 C. Daily gross energy intake, existence metabolism, and excretory energy for combined diets were 116.9, 94.3, 22.5 kcal/kg at -10 C, 101.8, 81.8, and 20.0 kcal/kg at 5 C, and 89.7, 69.1, and 20.6 kcal/kg at 20 C, respectively. Basal metabolic rate, as determined by oxygen consumption, was 2.771 kcal/g/hr with a lower critical temperature at 10.6 C and a thermal conductance of 0.083 cal/g/hr - C. Artificially-produced rain in the laboratory caused 9 and 21 percent increases in energy metabolism at rainfall levels of 6.1 and 22.2 cm/hr, respectively; however, natural rain levels in the Pacific Northwest were estimated to induce a negligible increase in metabolism. Deep body temperatures of 2 free-living eagles, measured with ingested transmitters, were higest during flight, intermediate during diurnal perching, and lowest during nocturnal roosting. This nocturnal depression allowed a 5 percent energy savings of total metabolic heat production. Ambient temperature, wind velocity, long-wave radiation, and rainfall data from 3 meteorological stations were used as input to the equivalent black-body temperature model to determine heat production of free-living eagles. Daily metabolic heat production varied between 383 and 426 kcal for a 4.5 kg eagle depending on habitat selection and time of day. By roosting in coniferous habitat rather than deciduous habitat, eagles experienced a 6% reduction in total heat production. Energy savings were attributed to milder wind speed, ambient temperature, and long-wave radiation conditions found in coniferous roosts. Flight activity, as monitored for 4 radio-tagged eagles for 38 days, involved only 1 percent of the 24-hour day and comprised only 6% of the daily energy budget. The daily energy budget (total energy metabolized) for a wild 4.5 kg Nooksack eagle was 407 kcal/day and daily energy consumption (total energy requirement) was 494 kcal/day; these values were approximately 10% greater than existence metabolism and gross energy intake of captive eagles, respectively. Daily consumption of 500, 364, or 296 g of chum salmon, black-tailed jackrabbits, or mallard ducks, respectively, is needed by a wild eagle to meet daily energy requirements. Intraspecific interactions while eating salmon on the Nooksack River were unusually high with kleptoparasitism being the primary means by which eagles procured food. Adult eagles were dominant over younger birds and were more successful at stealing food. Juveniles and subadults had low feeding efficiencies and consumed 410 and 459 g/bird/day of salmon, respectively, on an artificial feeding station which was less than the 552 g/bird/day ingested by adults. Young eagles thus failed to procure the needed 500 g/bird/day. The effects of this socially-mediated food deprivation on young eagles ranged from suboptimization of the time budget to possible starvation. Analyses of the

factors affecting winter energy budgets indicate that Bald Eagles exhibit physiological and behavioral traits which maximize energy-exploitation efficiency and minimize needless energy drains. Protective management efforts should be directed at reducing energy stress thereby increasing overwinter survival.

Stalmaster, Mark Victor. 1981. Ecological energetics and foraging behavior of wintering Bald Eagles. Ph.D. Dissertation. Utah State University, Logan. 157 pp.

BOOK REVIEWS

Haller, H. 1982. Raumorganisation und Dynamik einer Population des Steinadler *Aquila chrysaetos* in den Zentralalpen. Ornithologische Beobachter, 79:163-211. German with English summary and captions for tables and maps.

Important long-term study of a population of Golden Eagles that is believed at saturation level, now that human persecution has stopped. Concludes that rate of production is controlled by pressure from fledged immatures and non-breeding adults. Productivity is between .4 to .6 fledged eaglets per pair annually, whereas it can be twice that in a sparser, recovering population.

Dean Amadon

ANNOUNCEMENTS: 1982 ANNUAL RRF MEETING

THANK YOU TO LOCAL COMMITTEE AND ALL PARTICIPANTS

We thank the following people, from the local committee, for all their time and energy donated in planning and coordinating the 1982 annual RRF meeting in Salt Lake City, Utah: James Gessaman, Albert Heggen, Owen Hogle, Ronald Joseph, Carl Marti, J. R. Murphy, Kathy Smith, James Ure, Stellanie Ure, Phillip Wagner, and C. M. White.

We thank all those students from Utah State University and Brigham Young University who helped in so many ways. We are also grateful to those who chaired sessions, and most importantly, we are thankful to those who shared their data with us through the papers they presented.

All of these working together made for a successful annual meeting.