

## BRIEF NOTE

PREY COAT COLOR SELECTION AND BIOENERGETICS  
OF CAPTIVE SCREECH OWLS<sup>1</sup>

R. DAVID TRUMPY, GARY W. BARRETT and ELIZABETH A. KRUSE, The Institute of Environmental Sciences and Department of Zoology, Miami University, Oxford, OH 45056.

OHIO J. SCI. 83 (1): 65-67, 1983

There is disagreement concerning the primary factor controlling screech owl-small mammal prey selection behavior. Previous studies have shown screech owls (*Otus asio*) select transient over resident white-footed mice (*Peromyscus leucopus*) (Metzgar 1967), white over agouti house mice (*Mus musculus*) (Kaufman 1974c), active over inactive house mice (Kaufman 1974b), conspicuous over nonconspicuous old-field mice (*Peromyscus polionotus*) (Kaufman 1974a), and smaller over larger white laboratory mice (Marti and Hogue 1979). In this study, we attempted to hold constant the above factors (e. g., habitat familiarity and prey size) as well as such variables as habitat cover (Sparrowe 1972), hunger (Mueller 1973), energy content (Emlen 1966), and energy reward (Barrett and Mackey 1975) in an attempt to evaluate the role of coat color (i. e., conspicuousness) in screech owl-small mammal prey selection and bioenergetic relationships.

This study was conducted at the Miami University Ecology Research Center near Oxford, Ohio. An aviary (9.1 × 6.1 × 3.7 m), described in detail by Barrett and Mackey (1975) and Wallick and Barrett (1976), was divided into 2 identical compartments, each with a volume of 102.7 m<sup>3</sup>. Wooden perches, 2.5 m high, were placed in the 4 corners and across the middle of each aviary. A shelter box (0.6 × 0.5 × 0.9 m) was attached to the west wall of each aviary approximately

3.0 m above ground level. The west wall was covered with burlap to provide shade and to visually separate the owls. In addition, tree branches were situated around the nest box to provide for a more natural roosting site.

Vegetation in each aviary consisted of fescue (*Festuca elatior*), giant foxtail (*Setaria faberii*) and Kentucky blue grass (*Poa pratensis*). Vegetation was maintained at a height of approximately 10 cm because deer mice (*Peromyscus maniculatus*), the prey species used in the study, prefer an area of sparse vegetative cover (Verts 1957).

An adult screech owl (wild captured) was placed in each aviary on 30 October 1977 for a 3-day acclimation period. During this time, the owls were fed white laboratory mice (*Mus musculus*). The owls and any remaining mice were removed following the acclimation period. The screech owls were weighed at the beginning (4 November) and the end (17 November) of the experiment. A mean weight value of 168 g compared favorably with the 172 g mean weight reported by Craighead and Craighead (1969).

Deer mice, a major constituent of the screech owl's diet (Craighead and Craighead 1969), were introduced into the aviaries on 2 November 1977. Each aviary contained 10 (5 male, 5 female) normal, wild *Peromyscus* and 10 (5 male, 5 female) mutant, blond *Peromyscus*. The mean body weight for both the wild and blond strains was 15.8 g. Each mouse was toe-clipped and marked with a #1 monel eartag. Mice were allowed a 2-day acclimation period

<sup>1</sup>Manuscript received 10 July 1981 and in revised form 21 August 1981 (#81-31).

before being subjected to owl predation.

The *Peromyscus* diet was supplemented with 75 g of wild bird seed handsown evenly at 2-day intervals. Owl pellets were collected daily, oven-dried at 80 C for 72 h, weighed and examined for tags of mice consumed.

A caloric equivalent of 2.50 kcal/g dry wt for *Peromyscus* (Kaufman et al. 1975) was employed in the computation of screech owl ingestion rates. Feces were calculated using Graber's (1962) estimate of 8% of the average food intake. Secondary production (growth) was considered to be zero since no significant amount of ingested energy was channeled into weight gain.

Observations revealed both strains of *Peromyscus* successfully adapted to their habitat and became quite active at dusk, i. e., at the time when the screech owls initiated their hunting and feeding activities. Feeding was initiated at dusk when both the blond and wild types *Peromyscus* could be easily distinguished. Based on feeding data obtained during the initial 7 days of the study, 62% (13 of 21) of the mice taken were of the blond (i. e., more conspicuous) strain. Chi-square analysis, however, revealed no significant selection preference ( $df = 1$ ,  $\chi^2 = 1.19$ ,  $P > 0.05$ ).

Regression analysis indicated the removal patterns of both blond and wild *Peromyscus* followed linear functions. The linear function for the blond mutant was  $Y = 90.0 - 8.04 \times (r^2 = 0.90; P \leq 0.001)$  while that for the wild was  $Y = 9.54 - 5.65 \times (r^2 = 0.94; P \leq 0.001)$ , where  $Y$  equals the percent remaining and  $X$  equals time in days. No significant difference ( $P > 0.05$ ) was found between the slopes of these 2 lines.

A mean ingestion rate of  $0.35 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$  was computed for the screech owls feeding exclusively on the *Peromyscus* populations. Mean energy lost in the form of pellets was  $0.04 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$ . Since neither bird exhibited a significant weight change, secondary

production was zero.

Assimilation energy (ingestion—pellets—feces) was  $0.28 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$ . Respiration (assimilation energy—secondary production) was also  $0.28 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$ . Mean assimilation efficiency (ingestion energy—nonassimilated energy/ingestion energy  $\times 100$ ) was 80%.

We hypothesized the screech owls would select the light-colored (blond) mutant over the normal (wild-type) coat color deer mice. This hypothesis should have been reinforced by feeding the owls white laboratory mice (i. e., by the possibility of forming a specific searching image) before being introduced into each aviary. The owls, however, did not select the more conspicuous prey.

Both adult owls used in the present study had previously existed under natural habitat conditions and had, undoubtedly, fed on wild *Peromyscus*. To initiate a significant short-term shift toward conspicuous prey, selection may be related to (a) the degree of prey coat color difference, (b) the age of the predator, (c) a complementary habitat factor (e. g., soil color contrast), or (d) prey selection rates associated with temporal or spatial habitat differences which are difficult to identify under semi-natural or natural field conditions. Future studies should focus upon prey contained within large experimental enclosures (e. g., Spencer and Barrett 1980) where long-term selection rates could be determined.

Ingestion and assimilation values of these owls, which consumed exclusively *Peromyscus*, were compared with values of owls presented with a different small mammal prey diet. Postler and Barrett (1981) found that screech owls appeared to select *Microtus* as the primary food source, although *Peromyscus* were considered to be equally abundant and vulnerable—a feeding behavior which resulted in a larger energy reward. The Postler and Barrett (1981) study was conducted under similar experimental conditions. They found ingestion and assimilation values of 0.37

and  $0.28 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$ , respectively. Interestingly, these values were nearly identical to the  $0.35$  and  $0.28 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$  values observed in the present study. Our screech owl ingestion rate is also comparable to the  $0.34 \text{ kcal} \cdot \text{g live wt}^{-1} \cdot \text{day}^{-1}$  fall and winter values reported for screech owls by Craighead and Craighead (1969). Differences in food choice, therefore, appear not to cause significant changes in screech owl bioenergetics.

**ACKNOWLEDGMENTS.** We thank Scott Davis, Mark Knight, Lynn Postler, Scott Springer and Vicki Teubner for helping in the construction of the aviary. We also thank Drs. Donald W. Kaufman, Carl D. Marti, Eugene P. Odum and David R. Osborne for constructive criticism of the manuscript. We are grateful to Dr. Robert Robbins, John A. King Laboratory, Michigan State University, for the blond, mutant strain of mice and Mrs. Ruth McLeod for manuscript preparation. This study was supported by a grant from the Miami University Research Committee.

#### LITERATURE CITED

- Barrett, G. W. and C. V. Mackey 1975 Prey selection and caloric ingestion rate of captive American Kestrels. *Wilson Bull.* 87: 514-519.
- Craighead, J. J. and F. C. Craighead 1969 Hawks, owls, and wildlife. Dover Publ. Inc., NY. p. 1-443.
- Emlen, J. M. 1966 The role of time and energy in food preference. *Amer. Nat.* 100: 611-617.
- Graber, R. R. 1962 Food and oxygen consumption in three species of owls (*Strigidae*). *Condor* 64: 473-487.
- Kaufman, D. W. 1974a Adaptive coloration in *Peromyscus polionotus*: Experimental selection by owls. *J. Mammal.* 55: 271-283.
- 1974b Differential predation on active and inactive prey by owls. *Auk* 91: 172-173.
- 1974c Differential owl predation on white and agouti *Mus musculus*. *Auk* 91: 145-150.
- G. A. Kaufman and J. G. Wiener 1975 Energy equivalents for sixteen species of xeric rodents. *J. Mammal.* 56: 946-949.
- Marti, C. D. and J. G. Hogue 1979 Selection of prey by size in screech owls. *Auk* 96: 319-327.
- Metzgar, L. H. 1967 An experimental comparison of screech owl predation on resident and transient white-footed mice (*Peromyscus leucopus*). *J. Mammal.* 48: 387-391.
- Mueller, H. C. 1973 The relationship of hunger to predatory behavior in hawks (*Falco sparverius* and *Buteo platypterus*). *Anim. Behav.* 21: 513-520.
- Postler, J. L. and G. W. Barrett 1982 Prey selection and bioenergetics of captive screech owls. *Ohio J. Sci.* 82: 55-58.
- Sparrowe, R. D. 1972 Prey-catching behavior in the sparrow hawk. *J. Wild. Manag.* 36: 297-308.
- Spencer, R. S. and G. W. Barrett 1980 Meadow vole population response to vegetational changes resulting from 2, 4-D application. *Amer. Midl. Nat.* 103: 32-46.
- Verts, B. J. 1957 The population distribution of two species of *Peromyscus* on some Illinois strip-mined land. *J. Mammal.* 38: 53-59.
- Wallick, L. G. and G. W. Barrett 1976 Bioenergetics and prey selection of captive barn owls. *Condor* 78: 139-141.