BRIEF NOTE

CALORIC INGESTION RATE AND ASSIMILATION EFFICIENCY OF THE SHORT-TAILED SHREW, *BLARINA BREVICAUDA*[1]

Although several studies have been concerned with the bioenergetics of the short-tailed shrew, *Blarina brevicauda* (e.g., Pearson, 1947; Morrison *et al.*, 1957; Buckner, 1964; Platt, 1974), only the studies by Martinsen (1969) and Randolph (1973) permit direct comparison between geographical regions regarding caloric intake and assimilation efficiency values, i.e., age, weight, diet, and laboratory conditions were similar for the latter two studies. There remains a wide discrepancy concerning various energetic values for this species.

Interestingly, Randolph (1973) has shown *Blarina* to differ, according to season of capture, for various laboratory energetic determinations. It is possible that these seasonal differences may relate to geographical differences as well. It was the objective of our study to quantify the caloric intake and assimilation efficiency parameters, and to measure and partially evaluate the bioenergetics of the short-tailed shrew collected from southern Ohio.

Mean food (caloric) intake and assimilation efficiency of four adult short-tailed shrews (two male and two female) were measured for a 12-day period for each individual during the months of October and November, 1972. The shrews were trapped near Oxford, Ohio, in the early fall of 1972. The food consumption method, as outlined by Odum *et al.* (1962), was used in determination of energetic parameters. Shrews were placed on a diet of mealworms (*Tenebrio molitor*) and all feeding experiments were conducted in metabolism cages in order that food intake and feces could be measured separately. Water was provided *ad libitum* and all experiments were conducted at room temperature (22°–23° C). The bioenergetics data are summarized in table 1 and all data are expressed as mean ± standard deviation.

Each shrew was weighed daily during a 12-day study period. The mean weight for all individuals was 16.35±2.47 g. A mean weight gain of 0.32±0.28 g for the shrews during the course of the feeding studies indicates that individual weights did not fluctuate greatly. This was expected of adult animals that channel little assimilated energy into secondary production.

TABLE 1

Bioenergetics of the short-tailed shrew maintained on a diet of mealworms.

Shrew* Sex	Weight (g)	Food Intake (Kcal/g live wt/day)	Assimilation Efficiency (%)
M_1	19.99±2.25	1.16±0.39	88.00±3.34
M_2	15.56±0.75	0.91±0.19	87.79±5.99
F_1	15.32±0.57	1.18±0.12	90.84±1.46
F_2	14.51±1.87	1.13±0.19	91.47±1.00
$\bar{X}$	16.35±2.47	1.09±0.13	89.53±1.90

*Data are based on 12 daily measurements for each shrew and are expressed as mean ± standard deviation.

Feces and uneaten mealworms were collected daily. Collected feces were dried to a constant weight at 40° C in a vacuum oven. A fecal caloric value of 3.35 Kcal/g dry weight, as determined by Barrett (1969) for the least shrew, *Cryptotis parva*, was used to determine the caloric fecal output per day. A caloric equivalent of 2.33 Kcal/g live weight was

[1]Manuscript received July 10, 1975, and in revised form as a note November 6, 1975 (#75-46).

used for the mealworms (Brisbin, 1966) in computation of daily ingestion rates. The mean daily ingestion rate for the 4 animals was 7.95 ± 0.17 g live weight food or 18.51 ± 3.80 Kcal. Thus, the shrews ingested approximately 0.49 g live weight food per gram live weight animal per day or 1.09 Kcal/g live weight (see table 1). Martinsen (1969), working with 20 g shrews collected from Illinois between July and December, reports an ingestion rate of approximately 6.0 Kcal/day or 0.30 Kcal/g for animals maintained on mealworms at 22°–24° C. Randolph (1973) reports a daily food intake rate of 22.93 Kcal per 20 g adult animal (2.29 Kcal/g live weight) for summer-caught shrews and 18.59 Kcal per animal (1.86 Kcal/g live weight) for winter-caught shrews. These shrews, collected in Ontario, Canada, were measured at 23° C and fed "shrewburgers" (i.e., mixed portions of cereal, hamburger, ground beef liver, and vegetable juice) with a caloric value of 6.34 Kcal/g dry weight, a value energetically comparable to mealworms (Slobodkin and Richman, 1961).

Energy loss through defecation was 0.57 ± 0.17 g/day or 1.95 ± 0.56 Kcal/day. Thus, mean assimilation efficiency (ingestion energy-fecal energy/ingestion energy$\times$100) was $89.53 \pm 1.90\%$ (see table 1). The assimilation efficiency found in this study is approximately equal to that found by both Martinsen (1969) and Randolph (1973), regardless of locality or season of capture. It should be noted, however, that difference in diet is an important factor in determining assimilation efficiency. For example, Buckner (1964) found that *Blarina* has an assimilation efficiency of 78% when eating larch sawfly eonymphs and 92% when feeding on canned dog food. Based on the results of our study, short-tailed shrews exhibit comparable assimilation efficiency values when tested under laboratory conditions regardless of season or site of capture. Such is not the case concerning rate of food intake of *southern* shrews which exhibited an intermediate rate of food consumption as compared to *northern* individuals. It appears that the energy needs of the short-tailed shrew are dependent upon variation in the amount of food intake, rather than on variation in assimilation efficiency.—GARY W. BARRETT AND KAREN L. STUECK, *Department of Zoology, Miami University, Oxford, Ohio 45056.*

LITERATURE CITED

Barrett, G. W. 1969. Bioenergetics of a captive least shrew, *Cryptotis parva*. J. Mammol. 50: 629–630.

Brisbin, I. L., Jr. 1966. Energy-utilization in a captive hoary bat. J. Mammol. 47: 719–720.

Buckner, C. H. 1964. Metabolism, food capacity, and feeding behavior in four species of shrews. Can. J. Zool. 42: 259–279.

Martinsen, D. L. 1969. Energetics and activity patterns of short-tailed shrews on restricted diets. Ecology 50: 505–510.

Morrison, P. R., M. Pierce and F. A. Ryser. 1957. Food consumption and body weight in the masked and short-tailed shrews. Am. Midl. Nat. 57: 493–501.

Odum, E. P., C. E. Connell, and L. B. Davenport. 1962. Population energy flow of three primary consumer components of old-field ecosystems. Ecology 43: 88–96.

Pearson, O. P. 1947. The rate of metabolism of some small mammals. Ecology 28: 127–145.

Platt, W. J. 1974. Metabolic rates of short-tailed shrews. Physiol. Zool. 47: 75–90.

Randolph, J. C. 1973. Ecological energetics of a homeothermic predator, the short-tailed shrew. Ecology 54: 1166–1187.

Slobodkin, L. B. and S. Richman. 1961. Calories/gm. in species of animals. Nature 191: 299.