

BRIEF NOTE

BAT SPECIES DIVERSITY PATTERNS IN EAST CENTRAL INDIANA

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Various investigators have employed species diversity indices to describe animal community patterns in nature (Pianka 1967; Karr and Roth 1971; Adams and Barrett 1976). Only Humphrey (1975) and Kunz (1973), however, have used such indices to describe bat community patterns, especially in regard to resource utilization. To date no investigator has attempted to compare a variety of diversity indices to depict bat community structure for a single geographical area. The objective of our study was to evaluate information, richness, evenness, and equitability species diversity values for a community of bats mist-netted in east central Indiana and relate this to resource utilization and/or limitation.

Personnel of the Joseph Moore Museum (Earlham College, Richmond, Indiana) mist-netted bats weekly from 6 July through 5 October 1972 over Noland's Ford River in Wayne County, Indiana. Details regarding field methodology have been previously described (Cope *et al* 1974). A total of 58 net nights com-

prised the study period and 87 different individuals (24 male, 63 female) of 7 species were captured and banded. Species composition was as follows: *Eptesicus juscus* (44), *Lasiurus borealis* (17), *Myotis lucifugus* (10), *Myotis sodalis* (10), *Myotis keenii* (2), *Lasiurus cinereus* (2), and *Lasionycteris noctivagans* (2).

Indices used to compute diversity and apportionment values were the Shannon-

$$\text{Wiener function: } H' = -\sum_{i=1}^S p_i \log_e p_i$$

(Shannon and Weaver 1949), the Margalef (1957) richness index ($D = S - 1 / \log_e N$), the Pielou (1966) evenness index ($e = H' / \log_e S$), and the Lloyd and Ghelardi (1964) equitability index ($e = S / S'$), where p_i is the proportion of individuals represented by i^{th} species, S is the total number of species, N is the total number of individuals, and S' is the theoretical number of species distributed according to MacArthur's broken-stick model (1957). Values for information, richness, evenness, and equitability were found to be 1.42, 0.89, 0.73, and 0.86, respectively.

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These data indicate that this taxon lacks community richness and that bat communities are probably apportioned according to the broken-stick model for contiguous, non-overlapping niches. Previous studies (Barrett 1968; Pulliam *et al* 1968; Bulan and Barrett 1971) have shown that relatively high equitability values (i.e., values which approach 1.0) describe animal communities which had become food-resource limited. Since temperate zone bats form a discrete consumer trophic unit in terrestrial ecosystems (Humphrey 1975), we suggest that future bat community studies be focused upon both insect food quantity (e.g., grams of biomass or kcal of energy available) and quality (e.g., nutrient or protein composition) parameters in order to determine if food is a resource in short supply. Studies in which the food source is manipulated, perhaps by the use of a short-lived insecticide, should provide insight as to the role of food as a limiting resource for bat communities in nature.

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