

ABSTRACT OF THE THESIS

Population Distribution and Bioenergetics of
Isopods in Hutcheson Memorial Forest

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Isopod population composition, density, structure, distribution pattern and biomass were studied from July to October, 1971 and 1972, in 31 acres of Hutcheson Memorial Forest, a mature oak-hickory forest in Somerset County, New Jersey. Trachelipus rathkei, the dominant species of the population, comprised 81% of the 1971 population and 89% in 1972. Porcellio scaber ranked second in order of dominance, constituting 19% of the 1971 population and 11% in 1972. Cylisticus convexus represented less than 1% of the populations during both seasons. An average of 32.4 isopods/m² contributed a mean biomass of 0.18 g/m² in 1971 while the 1972 population averaged 23.2 isopods/m² with a mean biomass of 0.111 g/m². Densities data analyses verified a clumped distribution for both populations.

P. scaber and T. rathkei fed on oak, flowering dogwood, mapleleaf viburnum and honeysuckle vine litter leaves in the forest. Laboratory ingestion studies of isopods at simulated forest temperatures (5, 10, 15 and 20 C) revealed that isopods consumed from 0.37 to 2.80 mg of food/isopod per day. Annual consumption rates for each species were estimated. Food preference studies of isolated and

aggregated isopods at 20 C showed that isolated T. rathkei isopods preferred honeysuckle vine leaves as they did when aggregated. P. scaber, when both isolated and aggregated, preferred mapleleaf viburnum. Given a single food source, isolated T. rathkei consumed less of that food than when the species were fed on a mixed diet. P. scaber consumed more of a single diet food than when it was presented to them with other leaf types.

Ingestion, egestion, respiration and growth rates for Hutcheson Memorial Forest isopods were measured independently via controlled laboratory experimentation. Individuals of each species were fed on oak, dogwood, mapleleaf viburnum and honeysuckle vine leaves for 72 hours at 5, 10, 15 and 20 C. Ingestion rates were determined by the difference between initial and final dry food weights. Results revealed that isopods consumed more of each food at higher temperatures with the exception of honeysuckle vine. Egestion rates were dry weights of feces collected during the feeding periods. Isopods egested from 0.88 to 7.10 mg of feces dry weight per 72-hour period. Respiration rates were measured by means of direct Gilson respirometry readings. Data showed that P. scaber rates (8.72 to 11.5 μ l oxygen/isopod per hour) were higher than those for T. rathkei. Growth rates were the differences between initial and final dry body weights.

Caloric equivalents for the foods consumed, feces and experimental isopods were obtained by micro-oxygen bomb

calorimetry. Daily energy budgets for individual isopods were calculated by difference and by gravimetric methods. These budgets were balanced within $\pm 4\%$. Finally, the energy flow for the forest population was estimated. The isopod population consumed 149 kcal or approximately 6% of the caloric input to the litter (2,136 kcal/m² per year). The egested energy lost as feces amounted to 115 kcal or 77% of the input energy. Three percent (4 kcal/year) of the input was dispensed for maintenance. Approximately 5% of the energy input was growth energy. Thus, the isopod population added 7 kcal per population per year into the biomass. This growth energy was fed back to isopod biomass which registered a standing adult biomass of 0.51 kcal/m². The population exhibited an assimilation efficiency of 23%.

Hutcheson Memorial Forest isopod populations did not contribute significant amounts of biomass energy to the food chain; however, they consumed appreciable amounts of litter and thus served as decomposers in the ecosystem.