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URBAN INFESTATION BY THE MILLIPEDE, *OXIDUS GRACILIS* (KOCH)[1]

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ABSTRACT

An unusual aggregation of millipedes, *Oxidus gracilis* (Koch) occurred during the spring and summer of 1968 and three previous years at homes in Lenoir City, Tennessee. We hypothesize that these large numbers were due to exceptional breeding conditions and that the urban infestations were attributable to known physiological and behavioral traits of the millipedes.

INTRODUCTION

During the spring of 1968, the authors' attention was directed to the occurrence of large number of millipedes around homesites in Lenoir City, Loudon County, Tennessee. At one home the numbers reached several hundred thousand on mornings following rains, despite frequent treatment with insecticides and removal of dead or dying individuals at almost daily intervals. In the immediate area, millipedes occurred to a depth of several inches against obstacles impeding their forward movement, e.g., walls and foundations. During the day many individuals would die from desiccation, to which they are extremely sensitive (O'Neill 1969), indicating that there was a continuous recruitment by migration into the area, rather than localized breeding.

A number of millipede aggregations have been reported in the literature particularly from West Virginia (Cloudsley-Thompson 1949). Similar aggregations have not been reported for: 1) the state of Tennessee, 2) for this species, or 3) for re-infestation occurring over several consecutive years. On the basis of information on the level of infestation at a number of sites in Lenoir City and a review of the known behavioral and physiological traits of the millipedes, we attempt to present a reasonable hypothesis to explain the phenomenon of aggregation.

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RESULTS AND DISCUSSION

A telephone survey of Lenoir City residents[2] permitted construction of a map indicating levels of infestation at a number of homes in the area. The distributional patterns then were correlated with physiographic characteristics of the region. Figure 1 incorporates these data and shows the three areas of primary millipede concentration. These three sites shared several characteristics: proximity to streambeds, proximity to wooded areas drained by the streams, and uphill locations with respect to the streams. The levels of infestation showed good correlation with distance and elevation from the nearest streambed (Table 1).

[2]This survey was made by Mrs. Idus Connor with the cooperation of the Lenoir City newspaper, *The News-Banner*.

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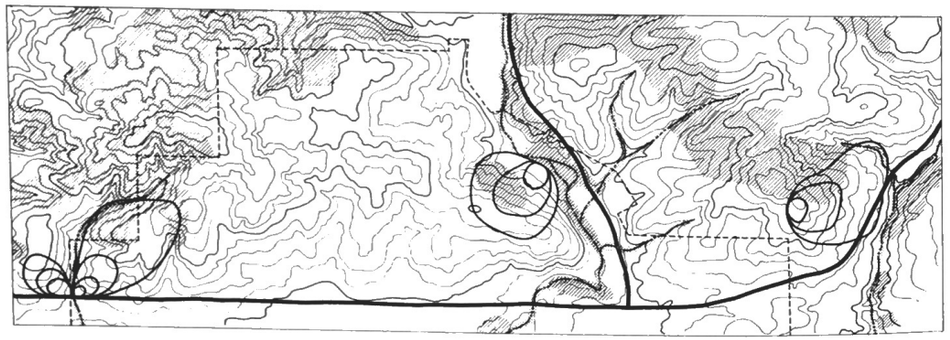

Fig. 1. Map of Lenoir City, Tennessee showing areas of infestation by the millipede, *Oxidus gracilis* (Koch). The map indicates city limits (dotted line), twenty foot contour lines, major roads (heavy line) and streams (interrupted lines). Forested areas are indicated by shading and concentric circles show areas of diminishing infestation with distance from streams.

Table 1. Distance and elevation (in meters) from nearest streambed for sites in Lenoir City, Tennessee infested with Oxidus gracilis (Koch).

Intensity rank	# Observations	Mean distance (±S.E.)	Mean height (±S.E.)
1. Large numbers almost every morning	5	95(48)	12(5)
2. Large numbers following soaking rains only	38	330(36)	20(1)
3. Moderate numbers following soaking rains	50	448(42)	23(1)
4. Occasional observations	5	502(10)	41(8)

It is known that population levels of millipedes are regulated by environmental stresses such as temperature and moisture (Cloudsley-Thompson 1949). Millipedes have few predators and, therefore, good breeding conditions can result quickly in very large populations. *Oxidus gracilis*[3] is not a native American species but an imported pest frequently associated with greenhouse cultivation. The woodlands of Tennessee are moist and warm and these introduced animals apparently are able to reproduce. When large populations are produced, millipedes can be forced to emigrate due to various population pressures; e.g., lack of deposition sites for eggs (Williams 1951). Once the stimulus for migration has occurred, the movements of the population are not random but follow a definite pattern. Due to the sensitivity of the animals to desiccation stress (O'Neill 1969), the necessity of remaining in a moist environment causes the emigrations to follow optimal moisture gradients, i.e., along streambeds. Where these optimal pathways are blocked, e.g., bridges, roadways or open areas, the animals congregate (Williams 1951). This increased population pressure intensifies the stimulus for migrations. When soaking rains cause the moisture environment of the streambeds to become unfavorable, the known response of the millipedes (O'Neill 1967) is to move uphill to avoid drowning. This pattern of uphill movements following rains also has been noted by Young (1958) and Garner (1963).

Because of desiccation stress, it is improbable that individual *O. gracilis* would survive daylight hours in exposed habitats. Mass death during the day following emigration has been noted by Mauck (1901). Data given by Cloudsley-Thompson (1949) indicate that the animals are capable of a maximum movement of about a half mile a day. This evidence explains the absence of millipedes at exposed urban sites farther than a half mile from the streambeds in Lenoir City.

[3]Specimens were identified through the kindness of R. L. Hoffman, Radford College, Radford, Va.

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