NOTE

Variation in Infestation by *Ixodes scapularis* (Acari: Ixodidae) Between Adjacent Upland and Lowland Populations of *Odocoileus virginianus* (Mammalia: Cervidae) in Western Tennessee[1]

Thomas M. Kollars, Jr.

Institute of Arthropodology and Parasitology
Landrum Box 8056, Georgia Southern University
Statesboro, GA 30460 U.S.A.

J. Entomol. Sci. 31(3): 286-288 (July 1996)

KEY WORDS *Ixodes scapularis, Odocoileus virginianus,* Ixodidae, Cervidae, ectoparasite

Ixodes scapularis Say, formerly *Ixodes dammini* Spielman, Clifford, Piesman & Corwin (1979), is the primary vector of *Borrelia burgdorferi,* the etiologic agent of Lyme disease, in the eastern United States (Oliver et al., 1993, J. Med. Entomol. 30: 54-63). The white-tailed deer (*Odocoileus virginianus* Zimmerman) is the principal, but not the only host, of adult *I. scapularis* in Tennessee (Durden and Kollars, 1992, Bull. Soc. Vector Ecol. 17: 125-131). The abundance of *I. scapularis* has been reported to be correlated to the presence of white-tailed deer on local and regional scales (Stafford, 1993, J. Med. Entomol. 30: 986-996) including variations within physiographic regions (Amerasinghe et al., 1992, J. Med. Entomol. 29: 54-61).

Environmental quality and vegetation structure affect populations of both white-tailed deer (Manlove et al., 1985, Proc. Southeast. Assoc. Game Fish Comm. 30: 487-492) and *I. scapularis* (Lord, 1995, J. Med. Entomol. 32: 66-70). Differences in antler growth, fecundity, and allozymes have been found in adjacent upland and lowland populations of deer in the southeastern U. S. (Dapson et al., 1979, J. Wildl. Manage. 43: 889-898). Significant spatial heterozygosity can exist between adjacent populations of upland and lowland deer herds, indicating very little interchange. In addition to habitat, population dynamics of host species are important in understanding the distribution and abundance of parasites.

The purpose of the present study was to determine if adjacent populations of lowland and upland deer differ in rates of parasitism by *I. scapularis.* The study site was the Meeman Shelby Forest, a 7,500-ha state park located northwest of Memphis, Shelby Co., TN. The park is composed of the Third Chickasaw Loess

[1] Received 23 January 1996; Accepted for publication 06 May 1996.

Bluff and the Mississippi River alluvial plain physiographic regions, characterized by two very different flora. The Loess Bluff is a deeply dissected landscape of ridges and ravines that rises above the alluvial plain. The forest of the Loess Bluff is a mixed mesophytic association related to that of the Appalachian Plateau with sweetgum, poplar, sugar maple, beech, oaks, and bitternut hickory as predominant trees. The alluvial plain is composed of vegetation associated with the Southeastern Evergreen Forest Region and is composed principally of cottonwood, sycamore, bald cypress, and hackberry (Miller and Neiswender, 1987, J. Tenn. Acad. Sci. 62: 1-6).

Ticks were collected from the head and neck of hunter-killed deer during the November and December gun seasons in 1991 and 1992. Host sex, area from which deer were killed, and the number of ticks present were recorded. Ticks were preserved in 70% isopropyl alcohol until they could be identified. Differences between the prevalence (percent of hosts infested, following Margolis et al. 1981, J. Parasitol. 68: 131-133) of *I. scapularis* collected from upland and lowland deer, and from different sex deer, were tested using Chi-square analysis. Differences between the mean intensities of ticks (mean number per infested deer, following Margolis et al., 1981, J. Parasitol. 68: 131-133) on upland or lowland deer were tested using the Mann-Whitney U test (Sokal and Rohlf, 1981, Biometry, Freeman and Company, USA). Test for interactions between sex and habitat (upland and lowland) was tested using Chi-square analysis.

Thirty-five deer (25 males and ten females) were collected during the two sampling years. Eighty adult *I. scapularis* were collected from deer. Eleven of 14 upland males and four of 11 lowland males were parasitized by *I. scapularis;* no ticks were found on females from either herd. Six females were from lowland and four from upland habitats. There was no interaction between habitat and sex of deer ($P > 0.05$). The difference in prevalence of *I. scapularis* between male vs. female deer was significant ($P < 0.001$) as was upland males vs. lowland males ($P < 0.05$). Other studies also have shown males to have higher infestation intensities of *I. scapularis* than females (Kitron et al., 1992, J. Med. Entomol. 29: 259-266). The mean intensity for parasitized upland males (6.6) was significantly higher than that of parasitized lowland males (2.0) (Mann-Whitney U test $Z = -2.2$, $P \leq 0.05$).

Kennedy et al. (1987, Genetica 74: 189-201) found environmental factors to be correlated with allozyme heterozygosity in deer collected from Meeman Shelby Forest and northwest Shelby Co. In the present study, the difference between tick burdens of lowland and upland males indicated little mixing between these adjacent populations.

Several studies have examined the distribution of *I. scapularis* among habitat types, but few have examined tick abundance in a range of local habitats. Risk to humans of exposure to Lyme disease through attack by *I. scapularis* is a complex function of ecological interactions specific to particular landscape configurations (Ostfeld et al., 1995, Ecol. Appl. 5: 353-361). The present study is the first ecological description of *I. scapularis* in western Tennessee. Differences between parasitism of upland and lowland deer indicate populations of adult *I. scapularis* are affected more by habitat than the availability of deer in upland and lowland habitats in Meeman Shelby Forest.

Rates of parasitism can be added to population variables, such as allozymes, antler growth, and fecundity, which indicate minimal mixture between adjacent upland and lowland populations of white-tailed deer. These conclusions should be tested in other areas and could be useful in modeling *I. scapularis* populations in the southern United States.

The author would like to thank L. Durden (Institute of Arthropodology and Parasitology, Georgia Southern University) for helpful comments on the manuscript. This study was supported by the Memphis and Shelby Co. Health Department, the Department of Biology, University of Memphis, the Lyme Disease Institute, Cape Girardeau, MO, and the Institute of Arthropodology and Parasitology, Georgia Southern University.