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TICKS FROM RACCOONS OF CADES COVE, GREAT SMOKY MOUNTAINS NATIONAL PARK

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ABSTRACT

Raccoons were live-trapped in the Cades Cove area of the Great Smoky Mountains National Park from September 15, 1979 through September 30, 1980. All raccoons were marked with ear tags, aged according to tooth wear, sexed, weighed and measured. Ticks were collected primarily from the facial area and ears of the animals and placed in 70% ethanol. A total of 385 ticks was collected from 77 raccoons; 268 of these were *Dermacentor variabilis*, the American dog tick. The remaining 103 were *Ixodes* sp. with 34 identified as *I. texanus* and 12 as *I. cookei*. The adult stages of *D. variabilis* were prevalent during spring and summer. Few nymphs and larvae were collected during any season. All stages of *Ixodes* were found on raccoons during all 4 seasons, with adult stages prevailing during spring, and nymphs and larvae during winter.

INTRODUCTION

In conjunction with an ecological study of the raccoon population in Cades Cove, Great Smoky Mountains National Park, ticks were collected from captured animals. Ticks are second only to mosquitoes as vectors of human disease (Benenson 1975) and are important vectors in the transmission of diseases to domestic and wild animals (Benenson 1975; Bram 1978; Levine 1978). The paucity of information concerning the ecology of ticks (Sonenshine 1975), especially for raccoons, makes such data important for population management and predictions concerning future trends in tick borne diseases.

MATERIALS AND METHODS

Raccoons of the Cades Cove area were captured from September 15, 1979 through September 30, 1980 in 12 gauge collapsible wire traps (Tomahawk Live Trap Company, Tomahawk, Wisconsin) baited with sardines. Captured animals were anesthetized with 0.2 ml ketamine hydrochloride/kg of body weight (Park, Davis and Co., Morris Plains, New Jersey) delivered through a syringe attached to a one meter pole (Bigler and Hoff 1973; Gregg and Olson 1975). Ticks were collected primarily from the facial area and ears with forceps and placed in 70% ethanol (DeBlase and Martin 1974). Samples were limited to 10 ticks per animal when more than this number were

present. Ticks were identified to genus and when possible to species on the basis of morphological characteristics.

All captured raccoons were marked with plastic ear tags (Rototag, NASCO, Ft. Atkinson, Wisconsin), sexed, weighed, measured and aged. Estimations of age were based primarily upon tooth wear, particularly of the molars. Animals were placed into five wear classes (1-5) corresponding to age groups 0-14, 15-38, 39-57, 58-86 months, and greater than 86 months, respectively (Grau et al. 1970). Preweaned raccoons were more precisely aged according to the presence of particular deciduous or permanent teeth (Montgomery 1964).

RESULTS AND DISCUSSION

A total of 385 ticks was collected from 77 raccoons (38 females, 39 males); 268 of these were identified as *Dermacentor variabilis*, the American dog tick. The remaining 103 were identified as *Ixodes* sp.; 34 were identified as *I. texanus*, 12 as *I. cookei*. Identification was based upon

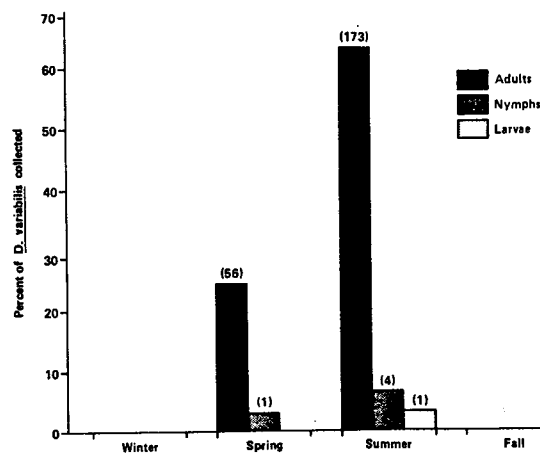


FIG. 1. Seasonal frequencies of *Dermacentor variabilis* collected from raccoons in Cades Cove, Great Smoky Mountains National Park, 1979-1980. Numbers in parentheses represent sample size.

criteria established in previous studies (USDHEW) 1967; Ko 1973; Levine 1978; Sonenshine 1979). These 3 tick species have been previously reported in raccoons (Sonenshine & Stout 1971; Good 1972; Cooney & Burgdorfer 1974).

Dermacentor variabilis has received wide attention because of its potential as a vector for rocky mountain spotted fever and tularemia. Serologic studies carried out in the Tennessee Valley Region (Burgdorfer et al. 1974; Cooney & Burgdorfer 1974) showed the raccoon to have the highest prevalence of tularemia antibodies (45%, N=161) of the 22 mammalian species examined. This might be expected considering that *D. variabilis* is one tick from which the infectious agent for this disease has been isolated, and the raccoon is one of the most common mammalian hosts for the tick (Sonenshine & Stout 1971; Sonenshine 1975). *Ixodes* sp. are also commonly found on raccoons, but they have not been implicated in the transmission of diseases. *I. cookei*, however, is a vector of Powassan virus, a cause of human encephalitis in northern Ontario (McLean et al. 1964).

The adult stages of *D. variabilis* were prevalent in spring and summer (Fig. 1); none were found during winter and fall. This corresponds to previous reports that activity of the adult *D. variabilis* eq. extends from April (spring) through mid-August (summer) with a peak in June (Garvh et al. 1978). Few larvae were collected during any season, although the majority were collected during the summer. The scarcity of nymphs and larvae probably resulted from the sampling methods used and the fact that larvae and nymphs of *D. variabilis* do not usually feed on medium-sized mammals (Sonenshine 1975). Nymphal activity is reported to extend from May through August with a peak in June (Garvh et al. 1978).

The collection of *Ixodes* sp. exhibited very different seasonal patterns as compared to *D. variabilis* (Fig. 2). *Ixodes* was found on raccoons during all 4 seasons with many more nymphs and larvae represented. This may be because the raccoon is an important host of the immature stages of *Ixodes* (Sonenshine 1975) and the preferred host of *I. texanus* (Bishop & Trembley 1945). The adult stages were prevalent on the raccoons during the spring months

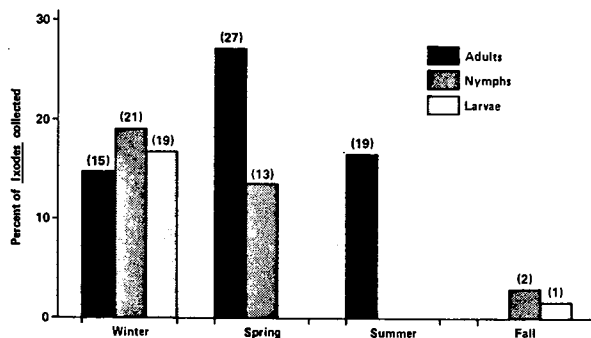


FIG. 2. Seasonal frequencies of *Ixodes* sp. collected from raccoons in Cades Cove, Great Smoky Mountains National Park, 1979-1980. Numbers in parentheses represent sample sizes.

while the majority of the nymphs and larvae were collected during the winter months. These seasonal trends parallel the life cycle because *I. cookei* is present most months of the year (Tugwell & Lancaster 1963); *I. texanus* adults and nymphs are prevalent in May while the larvae occur most frequently during the colder months (Sonenshine 1975).

Despite the presence of these 3 tick species on the raccoons of Cades Cove additional serological and ecological data indicated a healthy, thriving population (Rabinowitz 1981; Rabinowitz et al. In Press). Evidently these ticks do not present a health hazard to the raccoons. However, it is possible that the raccoons are serving as reservoirs of the disease agents transmitted by these tick species.

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