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TICKS ON WHITE-TAILED DEER FAWNS FROM SOUTHERN ILLINOIS

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ABSTRACT: Seventy-six white-tailed deer (*Odocoileus virginianus* (Zimmermann)) fawns captured on Crab Orchard National Wildlife Refuge in southern Illinois during June–July 1980–1983 were aged and examined for ticks. The prevalence of ticks (*Amblyomma americanum* (Linnaeus, 1758) and *Dermacentor variabilis* (Say, 1821)) was 80%; intensity of infestation ranged from one to 123 ticks per fawn, averaging 21.6. Tick intensity correlated poorly with age suggesting that there were other, more important determinants of infestation rates. Packed cell volumes in blood of the fawns increased significantly with age, but were not significantly affected by existing tick intensities. Ticks were not directly or indirectly implicated in any of 16 mortalities that occurred among 61 radio-collared fawns monitored for approximately 6 mo post-partum, and were not considered a serious health problem for fawns on the study area.

INTRODUCTION

White-tailed deer are hosts for a variety of ectoparasites, most commonly ticks. Strickland et al. (1981) listed five harmful features of tick infestation: 1) blood loss, 2) cutaneous wounds with secondary infections, 3) disease transmission, 4) local irritation, and 5) tick paralysis. The first three can be of particular significance among neonatal deer fawns, as blood volumes and immune-responses are lower relative to older animals. The potential impact of ticks on fawn survival was demonstrated in eastern Oklahoma, where fawn mortality due to ticks was estimated at 34% (Bolte et al., 1970). The coexistence of a large deer population and high tick densities on Crab Orchard National Wildlife Refuge (CONWR) in southern Illinois suggested a potential impact by ticks on the condition and survival of fawns. We had the opportunity to assess the extent of this impact during a 4-yr survival study conducted on CONWR.

MATERIALS AND METHODS

Fawns were captured using the technique of Downing and McGinnes (1969). Captured fawns were aged (Haugen and Speake, 1958) and examined for ticks. The general condition of each

was subjectively judged on behavior, appearance of the coat, umbilicus, and anus, and the extent of infection or tissue damage at tick attachment sites.

During the summers of 1980–1982, the numbers of adult and nymphal ticks on each fawn were counted, but ticks were not removed and identified to species, as their subsequent impact on fawn survival was of interest. In 1983, all ticks were removed from 15 fawns and placed immediately in individually labelled vials of ethanol with 5% glycerin and subsequently identified. Voucher specimens were deposited in the Smithsonian Institution, Washington, D.C. 20560, USA and assigned accession numbers RML 117371 and 117372.

Duplicate heparinized micro-hematocrit tubes of whole blood were collected from 35 fawns captured during 1981–1983 for determination of packed cell volume (PCV). All 61 fawns captured during 1980–1982 were equipped with mortality-monitoring radio-collars (Telonics MK-V transmitters, Telonics, Inc., Mesa, Arizona 85204, USA); each was subsequently monitored daily to assess survival.

On four occasions fawns were recaptured within several days for collar adjustments or additional blood collections; ticks were again collected. Tick intensity at recapture, and the time interval between captures, were used to calculate tick attachment rates. The General Linear Models procedure available in the SAS computer system (Barr et al., 1976) was used to conduct all simple and multiple regressions.

RESULTS AND DISCUSSION

A total of 76 fawns from 1 to 26 days old ($\bar{x} = 6.4$; $SD = 4.6$) were captured dur-

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ing June–July 1980–1983; the prevalence of ticks on these fawns was 80% (61/76). Among 1,646 ticks observed, 1,016 (62%) were nymphs. Intensity of infestation varied from one to 123 ticks, averaging 21.6 (SD = 28.6). Tick intensities did not vary significantly between years ($F = 1.05$; 3,72 df; $P = 0.38$). These prevalence and intensity values were greater than those reported in a brief note describing ticks on adult and fawn deer captured on CONWR in a prior study. Montgomery and Hawkins (1967) found that only three of 29 deer examined between May 1965 and April 1966 were infested: each carrying a single adult female *Amblyomma americanum*. While these data suggest that tick density may have increased in the 14 yr between studies, this remains speculative due to potential differences in the season and climatic conditions in which deer were captured.

Two species, *Amblyomma americanum* and *Dermacentor variabilis*, were found among 226 ticks collected from 15 fawns in 1983. Both are common deer parasites (Bishopp and Trembley, 1945; Strickland et al., 1981), and have been reported previously from southern Illinois (Montgomery and Hawkins, 1967; Montgomery, 1968). Nymphs of *A. americanum* predominated, comprising 52% (118/226) of the sample; they were found on 73% of the fawns (11/15). Of 108 adults collected, 97 (42 males, 55 females) were *A. americanum* and 11 (5 males, 6 females) were *D. variabilis*. The prevalence of *A. americanum* adults was 87% (13/15), while that of *D. variabilis* adults was 33% (5/15). Mean intensity for the former was 7.5 (SD = 10.1) adults per infested fawn, and 2.2 (SD = 1.3) for the latter. In contrast, Montgomery (1968) reported that all 68 ticks collected from a semi-tame fawn during a 26-day period in July 1964 in Pope County, southern Illinois, were adult *D. variabilis*. Nymphs of *D. variabilis* were not recovered from CONWR fawns; these feed primarily on small

mammals and have not been reported from deer.

Adult ticks were usually attached near the eyes, and were recovered occasionally on the peri-anal region or in the ears; nymphs generally attached near tips of ears. Five (8%) fawns had local inflammation at attachment sites; in only one was the reaction sufficiently severe to cause debilitation. This fawn had 73 adult ticks attached around both eyes; one eye was swollen shut, vision in the other was obstructed by engorged ticks. Open sores and extensive drainage were evident around both eyes. However, 3 wk later swelling was reduced and some tissue healing was evident. The fawn survived through October with no apparent difficulties.

Age proved to be a poor predictor of tick intensity. The linear equation:

$$\begin{aligned} Y (\text{tick intensity}) \\ &= 8.3 + 2.1X (\text{fawn age in days}) \\ & \quad r^2 = 0.11 \end{aligned}$$

described this relationship, suggesting an attachment rate of about two ticks per day. Extremes in tick infestation relative to age included a tick-free 14-day-old fawn, and a 4-day-old individual with 103 ticks. The rates of attachment among four fawns recaptured within 1–4 days of initial capture averaged 9.8 ticks per day (SD = 6.7), a higher figure than was suggested by observed intensities among all fawns. Montgomery (1968) calculated a mean attachment rate of 2.3 ticks per day based on serial collections from the semi-tame fawn previously mentioned.

The weak correlation between age and intensity indicated that there may be other, more important determinants of tick populations on deer. As tick intensities were thought to vary considerably among plant communities, habitat utilization and bed site selection may have influenced infestation levels. Further, tick densities may vary with local deer densities. The extent of maternal grooming may also be important, as dams spent considerable time lick-

ing their offspring. Adults too were often observed mutually grooming, particularly on the backside of ears where ticks concentrated. Hirth (1977) noted that mutual grooming between does on the Welder Refuge in Texas peaked in late-August, coinciding with the apparent peak in populations of *Amblyomma*.

Packed cell volume increased significantly with age ($F = 7.75$; 1,32 df; $P = 0.01$); however, adult tick intensities were not a significant determinant of PCV ($F = 0.10$; 1,32 df; $P = 0.75$) at the levels found on CONWR. Laboratory tests by Barker et al. (1969) showed reduced PCV in fawns infested daily with as few as five adult *A. americanum* per fawn; however, an intravascular protozoan, *Theileria* sp., was found in all tick infested fawns and probably contributed to erythrocyte destruction.

Ticks were not believed to have been directly or indirectly involved in any of 16 mortalities that occurred among radio-collared fawns, and were not considered a serious health problem for fawns on the study area. However, the recognized potential of ticks as debilitating factors and vectors of disease indicated that these parasites could become a more serious threat to fawn survival if favorable environmental conditions precipitated an increase in tick densities.

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