



Rocky Mountain Spotted Fever and Lyme Disease Surveillance Program in Indiana: Final Report, 2001



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Between January 1 and December 31, 2001, 697 ticks were submitted to the Public Health Entomology Laboratory at Ball State University for identification and testing. This number was 326 less than last year's total of 1023. Contributing to the decrease in number of ticks submitted in 2001 was the sharp decline in the number of ticks submitted from Willow Sough Fish and Wildlife Area.

Species Composition

Seven species of ticks were identified among the 697 ticks received in 2001; these are listed in Table 1. Fifty-nine percent (414) of these ticks were identified as the American dog tick, *Dermacentor variabilis* (Say), 19% (132) were identified as the blacklegged tick (deer tick), *Ixodes scapularis* (Say), and 18% (128) were identified as the lone star tick, *Amblyomma americanum* (L.). Together, these three species made up 96% of all the ticks received (Figure 1). The other species collected in 2001 (and the number of specimens received) were the winter tick, *Dermacentor albipictus* (Packard)(12), the brown dog tick, *Rhipicephalus sanguineus* (Latreille) (1), *I. texanus* (Marx) (1), and *I. brunneus* Kock (1). Seven specimens could not be completely identified.

Table 1. Species Composition of Ticks Submitted for Testing in Indiana in 2001

Species	Number	Percentage
<i>Dermacentor variabilis</i>	414	59
<i>Ixodes scapularis</i>	132	19
<i>Amblyomma americanum</i>	128	18
<i>Dermacentor albipictus</i>	12	2
<i>Rhipicephalus sanguineus</i>	1	<1
<i>Ixodes texanus</i>	1	<1
<i>Ixodes dentatus</i>	1	<1
<i>Ixodes brunneus</i>	1	<1
Unidentified ticks	7	<1
Total	697	100

Geographic Distribution

Ticks were submitted from 74 of Indiana's 92 counties. Ticks were also submitted from four other states: Illinois (1), Kentucky (1), Michigan (1), and West Virginia (1). The Indiana counties submitting the greatest number of ticks and the number submitted from each were: Porter (93), Lawrence (46), Dubois (42), Bartholomew (36), Posey (28), Elkhart (22), Delaware (22), and Lake (18). Eighteen counties submitted no ticks in 2001. The distribution by county, of ticks submitted in 2001, is shown in Figure 2.

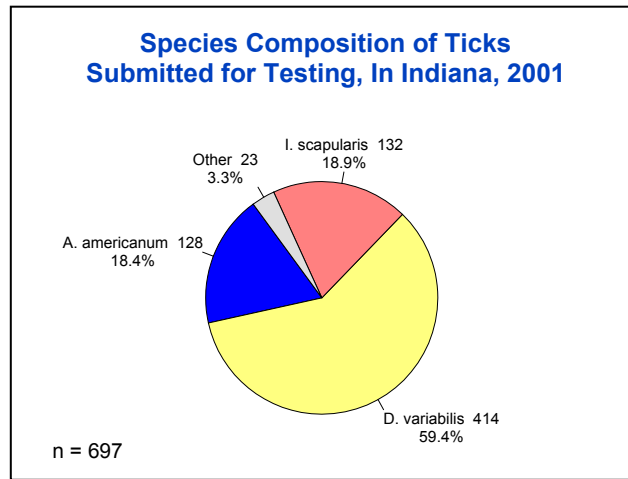
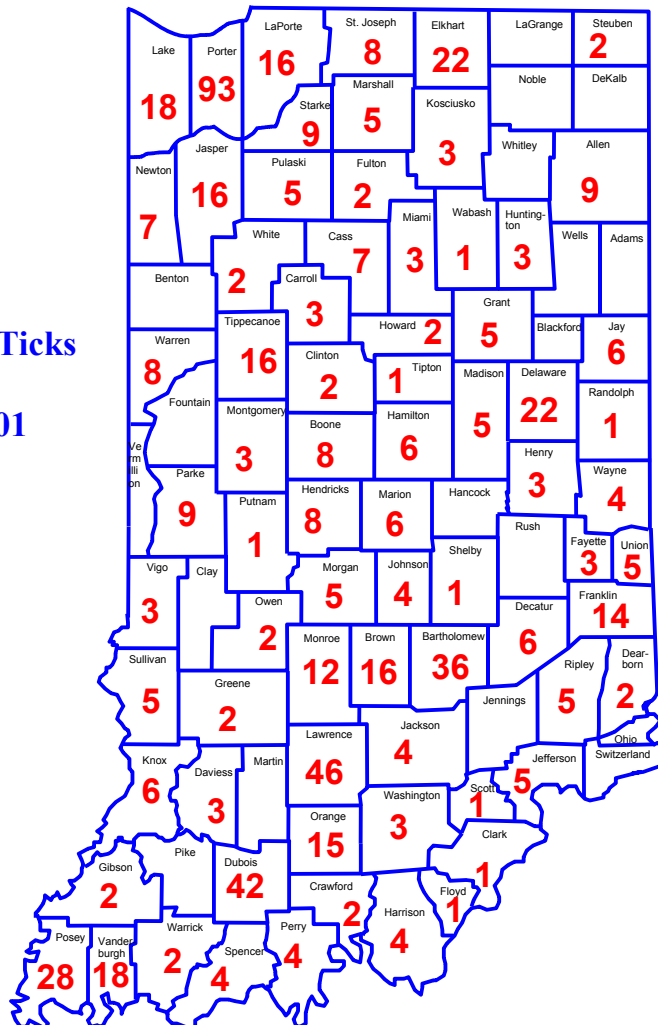


Figure 1. Species Composition of Ticks Submitted for Testing, Indiana, 2001

**Figure 2.
Distribution of Ticks
by County
of Origin, 2001**



Seasonal Distribution

The seasonal distribution for all ticks, by the date of collection, is presented in Table 2. The primary peak in season occurred during the months of May and June, representing *D. variabilis* adults and *A. americanum* adults and nymphs. A secondary peak occurred in October, representing *I. scapularis* adults.

Table 2. Monthly Distribution of Ticks Submitted for Testing, Indiana 2001

Month	Number Received
January	0
February	0
March	4
April	82
May	233
June	92
July	80
August	67
September	16
October	78
November	30
December	15
TOTAL	697

The seasonal distribution of ticks is more meaningful when viewed by species. Figures 3-6 depict the seasonal distributions of three species of public health importance (*D. variabilis*, *A. americanum*, and *I. scapularis*) based upon our records of submissions. As usual, *D. variabilis* populations were high during April through July, with the peak of adult activity in May (Figure 3).

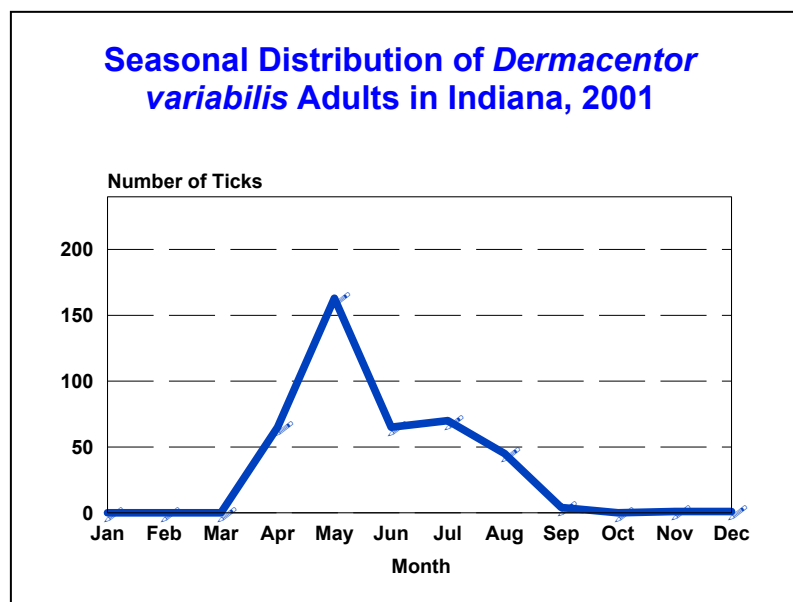


Figure 3.

In 2001, submissions of both adult and nymphal *A. americanum* peaked in May (Figure 4 & 5). There were submissions of *A. americanum* nymphs throughout the summer, with a characteristic second, smaller peak in August (Figure 5).

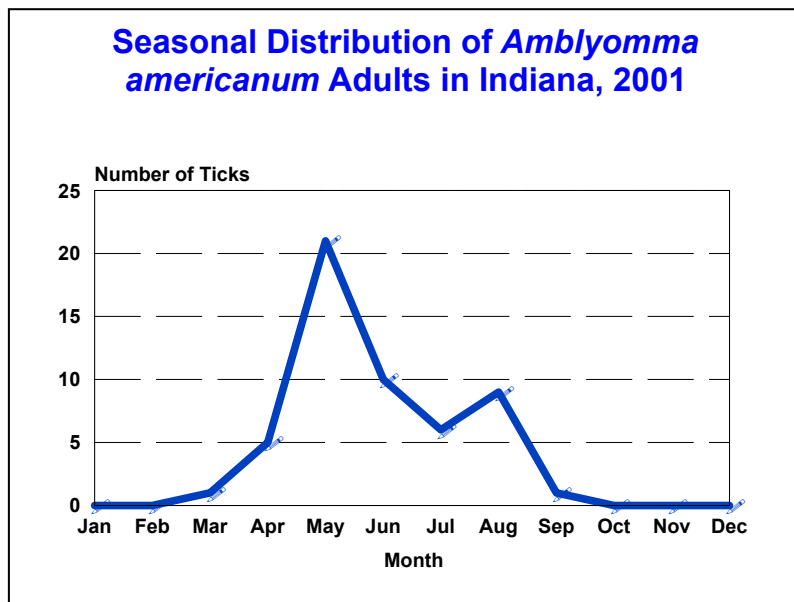


Figure 4.

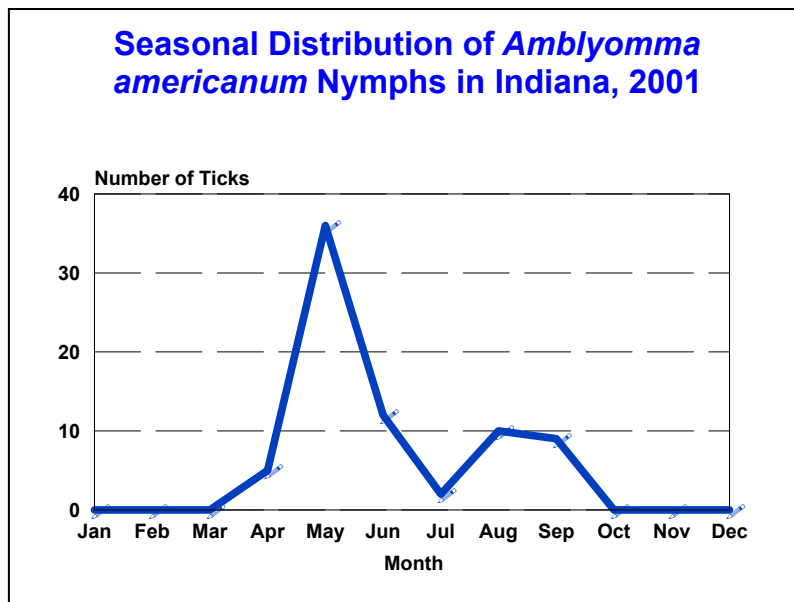


Figure 5.

Two peaks are evident for adult *I. scapularis* in 2001, a small peak in May representing over-wintering adults and a large peak in October representing newly emerged adults (Figure 6). Eight nymphs were submitted, one in April, two in May, three in June, and two in July (Figure 7).

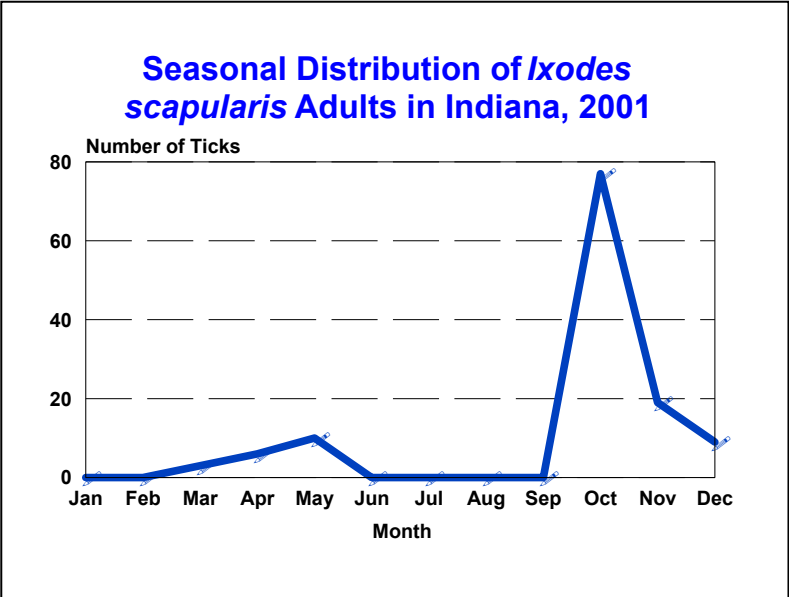


Figure 6.

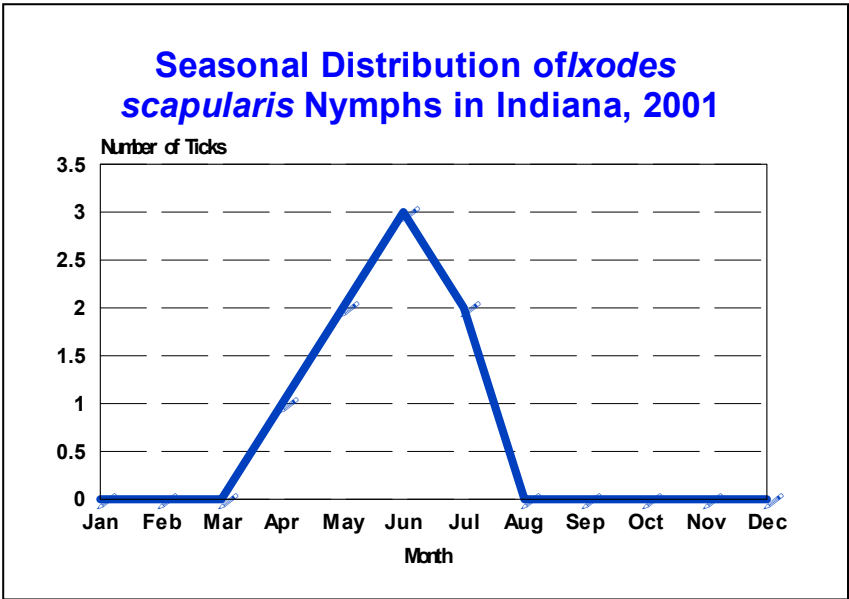


Figure 7.

Hosts

In Figures 8-10, host data are presented for *D. variabilis*, *A. americanum*, and *I. scapularis* respectively. Approximately 89% of *D. variabilis* (Figure 8) and 80% of *A. americanum* (Figure 9) were collected from humans in 2001.

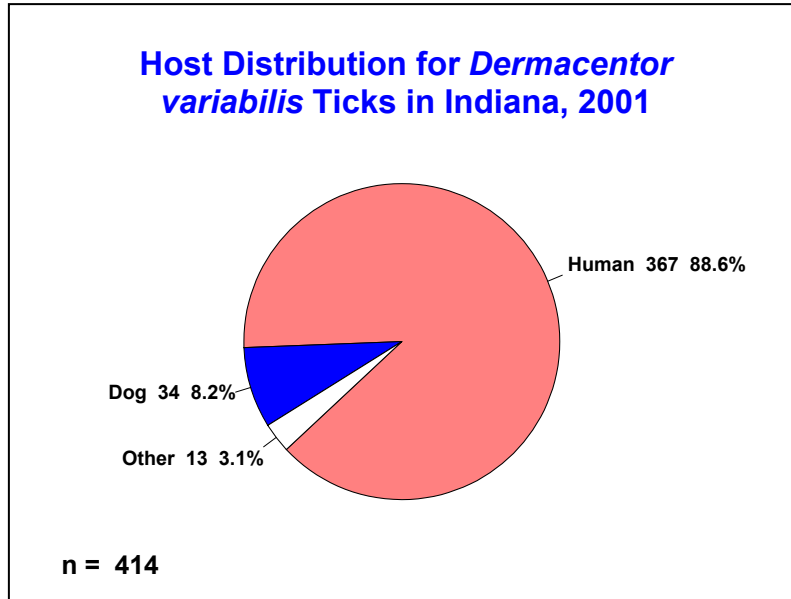


Figure 8.

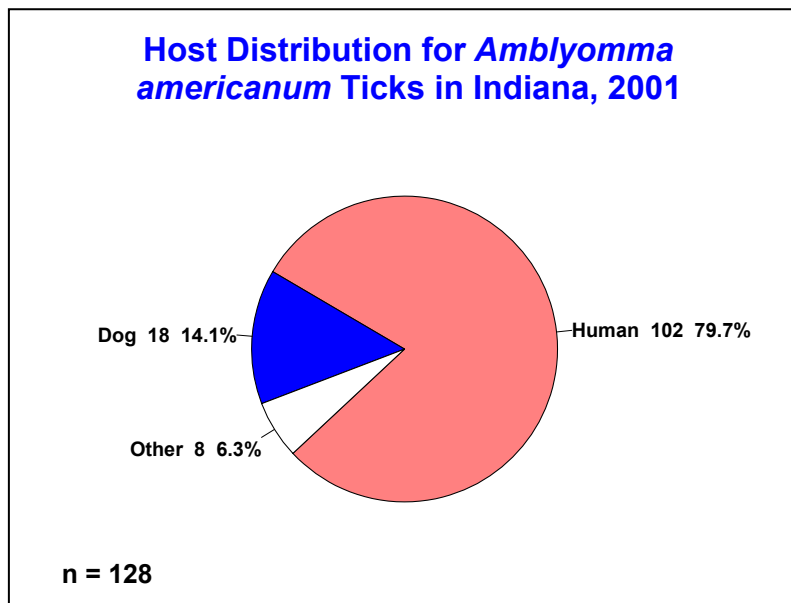


Figure 9.

Approximately 54% percent of *I. scapularis* were collected from dogs, about 23% from deer, and only 20.5% (27 ticks) from humans (Figure 10).

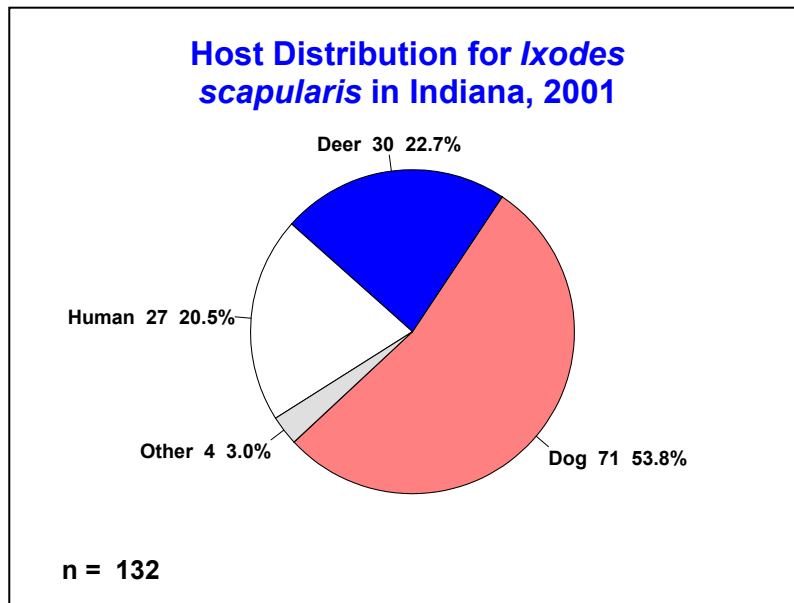


Figure 10.

Testing

A total of 259 *D. variabilis* and 57 *A. americanum* were tested for spotted fever group (SFG) Rickettsiae. Of these, six of the *D. variabilis* ticks and none of the *A. americanum* ticks were positive by the Gimenez screening test. One of the six *D. variabilis*, positive by Gimenez, was positive by immunofluorescence. Nine *I. scapularis* ticks were tested for Lyme disease spirochetes by fluorescent antibody test; one was positive. This was the first time that a tick removed from a human has tested positive for the Lyme disease spirochetes.

Human Cases of Tick-borne Diseases in Indiana, 1970-2000

During 2000, 29 cases of tick-borne diseases were confirmed in Indiana, including 5 cases of RMSF, 23 cases of Lyme disease (LD), and 1 case of human monocytic ehrlichiosis (HME). Case data for 2001 are unavailable. Confirmed human cases of known tick-borne diseases in Indiana for 1970-2000 are presented in Table 3.

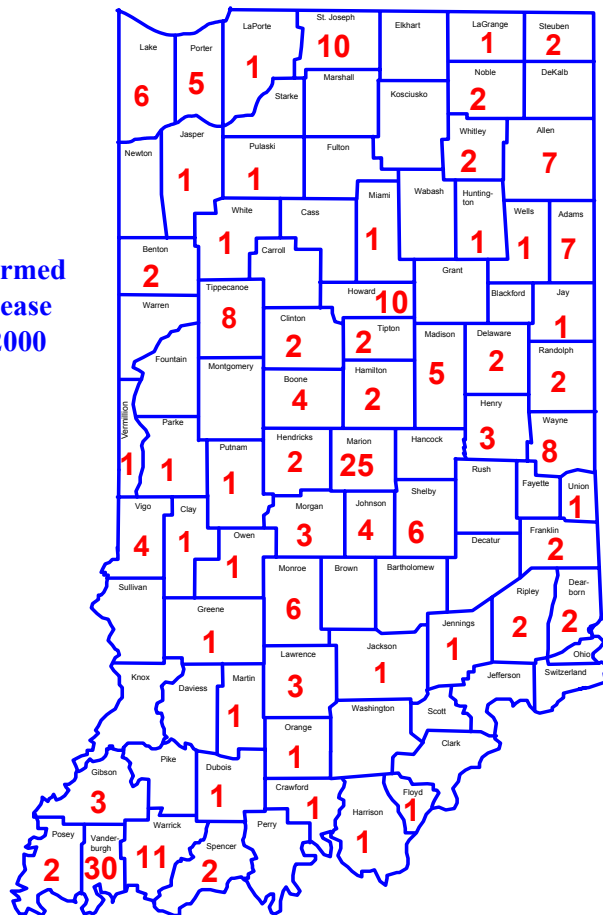
Rocky Mountain spotted fever (RMSF)

Since 1970, 224 confirmed cases of RMSF have been confirmed in Indiana. Although cases have been reported from 60 different counties, more cases have been reported from southern counties than from any other part of the State. Vanderburgh County has reported 46 cases in the past 31 years, far more than any other Indiana County. A significant number of cases has also been confirmed in residents of the northern-most tier of counties, and densely populated, Marion County (Indianapolis). *Dermacentor variabilis*, the primary vector of RMSF, has been recorded from all 92 counties in Indiana. The geographic distribution of cases of RMSF for 1970-2000 is shown in Figure 11.

**Table 3. Confirmed Cases of Three Tick-Borne Diseases,
Indiana, 1970-2000**

Year	RMSF	LD	Ehrlichiosis	
			HME	HGE
1970	6	-		
1971	9	-		
1972	13	-		
1973	6	-		
1974	7	-		
1975	5	-		
1976	8	-		
1977	15	-		
1978	6	-		
1979	7	-		
1980	7	-		
1981	6	-		
1982	16	-		
1983	16	2		
1984	7	0		
1985	4	1		
1986	0	0	-	-
1987	3	4	-	-
1988	4	3	-	-
1989	1	4	-	-
1990	7	15	-	-
1991	13	17	-	-
1992	2	19	-	-
1993	3	32	-	-
1994	8	19	5	-
1995	8	16	3	-
1996	7	15	7	-
1997	1	16	2	-
1998	2	22	1	-
1999	10	13	6	-
2000	5	23	1	-
Total	224	224	25	

Figure 12.
Probable and Confirmed
Cases of Lyme Disease
in Indiana, 1983-2000



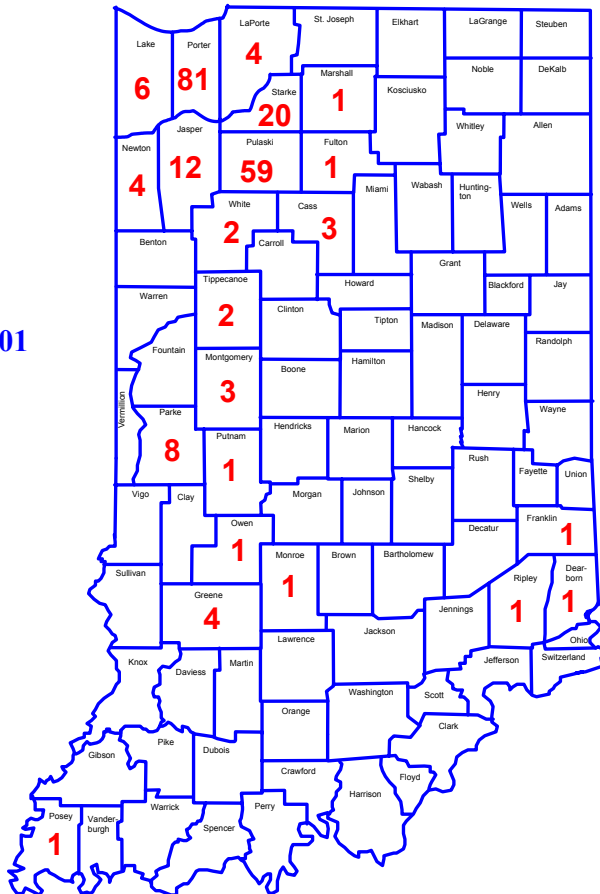
Human monocytic ehrlichiosis (HME)

In 1994, HME was reported in Indiana for the first time and cases of HME have been confirmed in Indiana each year since. As of December 31, 2000, 25 confirmed or probable cases of human HME had been reported (Table 3). The distribution of these cases, with several exceptions, closely follows the southerly distribution of the *A. americanum* tick in Indiana (Figure 13).

In 1986, the known distribution of *A. americanum*, the tick vector of human monocytic ehrlichiosis (HME), was limited to 12 counties primarily in southern Indiana with an occasional record from a northern county (Demaree 1986). There are now records of *A. americanum* from more than 50 counties, and the populations of this species in some southern counties are extremely high.

We have previously reported *E. chaffeensis* infection rates in *A. americanum* ticks collected in southern Indiana (Burket et al. 1998, Steiner et al. 1999 and Irving et al. 2000). The average minimal infection rate observed in our studies ranged from 1.6%–4.9% for positive counties. To correlate the presence of infected ticks with the presence of exposed deer, which serve as a reservoir, we collected dried blood samples collected from hunter-killed deer and tested them for *E. chaffeensis*-reactive antibodies using an indirect immunofluorescent assay. Antibodies were detected in deer from six counties in southern Indiana and the infection rates in these deer ranged from 42%–66% (Steiner et al. 1999, Irving et al. 2000).

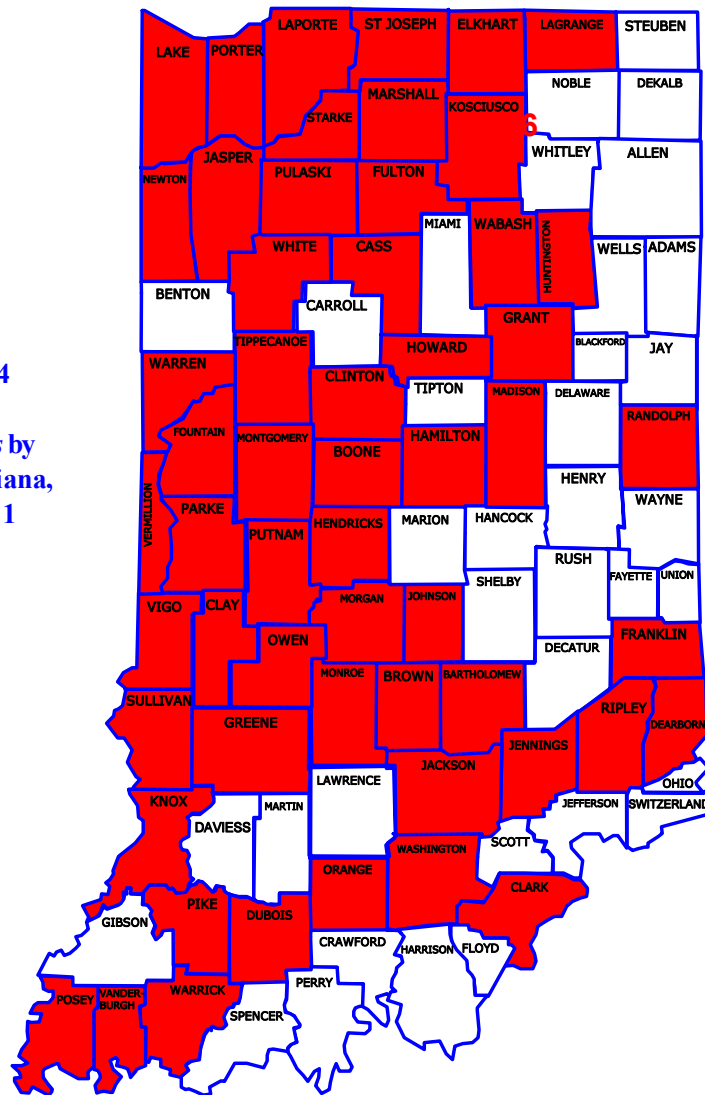
Figure 14.
Collections of
Ixodes scapularis
Ticks in Indiana, 2001



Conclusions

The number of ticks received in 2001 was 326 less than the number received in 2000. Seven species were identified. *Dermacentor variabilis* made up 59% of the total. *Ixodes scapularis* made up 19%, and *A. americanum* made up 18% of the total. The seasonal distributions of the species of primary interest in this report were similar to those of previous years. Rickettsiae were detected in six *D. variabilis* ticks, and one of the six tested positive for SFG Rickettsiae. Nine *I. scapularis* ticks were tested for Lyme disease spirochetes by fluorescent antibody test, and one was positive. *Ixodes scapularis* ticks were discovered in three new counties this year, Putnam, Owen, and Monroe, bringing the total number of counties from which at least one *I. scapularis* tick has been collected to 56 or approximately 61% of the State's counties.

Figure 14
I. scapularis by
 County in Indiana,
 1987-2001



Acknowledgments

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