Metropolitan Mosquito Control District

Ixodes scapularis Distribution Study Report

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1995 BLACK LEGGED TICK DISTRIBUTION STUDY

Abstract

A black legged tick (*Ixodes scapularis*) distribution study (designed to detect any changes in *I. scapularis* distribution over a many year period) was conducted in the seven county metropolitan area by the Metropolitan Mosquito Control District (MMCD). Small mammal sampling was used to collect ticks from 100 woodlots that have all been sampled since 1990 or 1991. At least one *I. scapularis* was collected from 35 of these sites during 1995. A total of 306 *I. scapularis* were removed from 1406 mammals for an overall season mean of .218 *I. scapularis* per mammal. Most of the *I. scapularis* collections continue to occur north of the Mississippi River in Washington, Anoka, and Ramsey counties, and from Washington county in particular. Townships maintaining the highest 1990-1995 *I. scapularis* per mammal averages (all > .500) include Hugo, New Scandia, May, and Grant townships of Washington county, as well as East Bethel and Linwood townships of Anoka county. Two additional sites were sampled during 1995; one in section 7 of New Market township in Scott county (in response to the collection of one adult female *I. scapularis* by a District employee who was conducting other work in the area), and one in section 19 of West Saint Paul township in Dakota county (Dodge Nature Center- sampled in an attempt to foster improved relations between the Nature Center and the District). *I. scapularis* was not collected from either sampling location through our small mammal sampling efforts. Since we have seen no significant change in where our collections are occurring, we conclude that *I. scapularis* is not noticeably expanding its range at this time.

Introduction

In 1990 the MMCD initiated a Lyme Disease Tick Surveillance Program to determine the distribution and prevalence of *I. scapularis* and *Borrelia burgdorferi* within the Minneapolis- Saint Paul metropolitan area. The 1990 and 1991 studies provided baseline *I. scapularis* distribution data for our area. Most of the ticks were found in Anoka, Washington, and northern Ramsey counties, located north of the Mississippi River. The 1992 study was designed to inspect areas that had not been sampled as intensely in the past, with emphasis on locations south and west of the Mississippi River, but the majority of *I. scapularis* continued to be collected in the northeastern counties.

Since 1993, our distribution study has focused on the re-sampling of 100 sites that have been sampled since 1990 or 1991. We began re-sampling seventy-five of these sites in 1991 to detect any changes in *I. scapularis* distribution over a many year period. These repeat sites were selected from the previous study based on three criteria: representative habitat of an area, locations that were unlikely to be developed, and areas where small mammal collections had been sufficient in the past. An additional twenty-five sites were selected for repeat sampling from Dakota, Hennepin, Scott, and Carver counties in 1992 to increase our data collections south of the Mississippi River. We plan to monitor these sites indefinitely, and will intensify our sampling effort in areas that have shown potential range expansion of *I. scapularis*.

Two additional sites were sampled during 1995 for a total of 102 sites inspected for the season. A District employee who was conducting other work in the area collected one adult female *I. scapularis* from section 7 of New Market township in Scott county early in the year, and section 7 was subsequently sampled in an attempt to determine the extent

to which *I. scapularis* may be established within the section. Dodge Nature Center, section 19 of West Saint Paul township in Dakota county, was sampled in an attempt to foster improved relations between the Nature Center and the District through providing a general risk assessment of this high public use area.

Materials and Methods

Of the 100 repeat sites, 56 are located north of the Mississippi River in Anoka (28 sites), Washington (25 sites), and Ramsey (3 sites) counties. The 44 repeat sites located south of the Mississippi River are distributed throughout the counties of Dakota (15 sites), Hennepin (14 sites), Scott (8 sites), and Carver (7 sites).

Site Selection for Section 7 in Scott County and Section 19 of Dakota County:
Site selection for both the Scott and Dakota county sampling locations occurred non-randomly with the main criterion being the best available wooded and/or brushy habitat deemed to be easily accessible to the sampler. The site selected for sampling in section 7 of Scott county was moved approximately 1/4 mile away from the original adult *I. scapularis* collection area for accessibility reasons, and the Dakota county sampling site was chosen as it contained the the best available wooded habitat within the confines of Dodge Nature Center that provided easy access to the sampler.

Sampling was initiated on April 25, 1995 and ended on October 27, 1995. As in past years, the twenty-seven week study was divided into three nine-week sampling periods, and all sites were sampled for twenty-one trap nights (7 traps x 3 consecutive nights) per period. Weeks of site visitation were randomly selected within each sampling period.

One three-hundred foot transect was established at each sampling location, and Sherman live traps (H. B. Sherman Traps, Inc., Tallahassee, Fla.), baited with peanut butter and oats, were placed along these transects at fifty foot intervals. We euthanized all small mammals caught in the traps, removed any ticks found, and stored the ticks in alcohol for later identification.

Results

1995 Study (Repeat Sites):
We found at least one *I. scapularis* at 35 of 100 sampling sites, with 32 of these positive sites located north of the Mississippi River in Washington (15 sites positive/25 sites sampled), Anoka (16 sites positive/28 sites sampled), and Ramsey (1 site positive/3 sites sampled) counties. Three positive sites were detected south of the river in Dakota county as well.

Overall, 1406 mammals (Figure 1) were inspected: 757 from north of the Mississippi River and 649 from south of the river, and a total of 306 *I. scapularis* (Figure 2) were collected from them. The Washington county sampling locations accounted for 69% (212 (175 larvae; 37 nymphs) /306) of the total *I. scapularis* collected. *I. scapularis* collections were greatest in May (96 larvae; 21 nymphs) and Afton (34 larvae; 7 nymphs) townships. Anoka county collections accounted for an additonal 20% (61/306) of the total (52 larvae; 9 nymphs), with the majority of the collections obtained from Linwood township (29 larvae; 5 nymphs).

The overall season mean number of *I. scapularis* collected per mammal in 1995 was .218 (larvae: .184, nymphs: .034). The mean increases to .598 (larvae: .504, nymphs: .094) when all sites that were negative for *I. scapularis* are excluded. As in past years, the highest average number of *I. scapularis* per mammal was calculated for Washington county, which had a season mean of .688 compared with Anoka county's season mean of .155 overall (see 1995 results in Figure 3). The number of larval *I. scapularis* collected per week peaked during June with a smaller peak occurring during September, while the nymphal peak occurred during late June and early July (the timing of these peaks are dependent on when the highly productive *I. scapularis* sites are sampled).

Compiled 1990-1995 Results (Repeat Sites):
The 1990-1995 season mean number of *I. scapularis* collected per mammal was .220, with the highest averages continuing to occur north of the Mississippi River. Yearly season means for Washington county have consistently been the highest, followed by Anoka county. Averages for Ramsey county have been consistently low, yet greater overall than those occurring south of the river (Figure 3). The 1990-1995 township averages for Hugo, New Scandia, May (Washington county), and East Bethel (Anoka county) townships were found to be > 0.9 *I. scapularis* per mammal, while the averages for Linwood (Anoka county) and Grant (Washington county) townships were > .500 *I. scapularis* per mammal (Figure 4).

I. scapularis status at the 100 repeat sampling locations is shown on Figure 5. *I. scapularis* status has changed at 40 of the sites since 1990 or 1991. In particular, we determined that:

I. scapularis was found all years (+) at 16 sites
I. scapularis was found most years at 15 sites
I. scapularis was found least (but + at least 1 year) at 25 sites
I. scapularis was not found any year (-) at 44 sites

(Note: 1995 results were used to categorize between "most" and "least" as needed.)

Scott and Dakota County Sampling Sites:
Zero *I. scapularis* were collected from a total of 15 small mammals examined overall. A total of 8 small mammals (5 *Peromyscus leucopus*, 2 *Clethrionomys gapperi*, 1 *Tamias striatus*) were inspected from New Market township in Scott county with an additional 6 (5 *P. leucopus*, 1 *T. striatus*) small mammals inspected from Dodge Nature Center in Dakota county.

Discussion
Our results seem to indicate that *I. scapularis* populations are established within northeastern Anoka and northern Washington counties, while remaining low or nonexistent south of the Mississippi River. Given the consistency of our results over the last six years, with greater numbers of *I. scapularis* collected in the northeastern metropolitan area each year, we believe that the greatest Lyme disease risk occurs in the northeastern metropolitan area at this time. While our study was not designed to specifically answer the question of tick establishment, we feel that our relative *I. scapularis* density estimates are accurate enough for a general risk assessment.

Although one adult *I. scapularis* was collected from New Market township in Scott county, it is unknown whether this collection represents possible range expansion or establishment of *I. scapularis* within section 7 of New Market township or is simply an isolated tick record. Moving the sampling location approximately 1/4 mile away from the original adult *I. scapularis* collection area may have impeded our efforts to collect additional ticks since we would have been unable to detect a localized tick population that may exist solely within the original collection area. Insensitivity in our sampling method may have in itself rendered us unable to detect low *I. scapularis* population levels, and the collection of this one adult tick in New Market township may simply reflect the existence of a transient tick population within section 7. We can only say with certainty that we did not detect any additional ticks through our small mammal sampling effort in section 7 during 1995. Regardless of the reason, the existence of this tick within an area where *I. scapularis* has not been found previously is a good reminder that the possibility of encountering a potential vector of Lyme disease exists whenever one passes through *I. scapularis* habitat, and that it remains prudent to follow personal protection measures measures to locate and remove ticks as soon as possible after visiting wooded or brushy areas, just in case.

Continuing Studies:
Continuing studies for 1996 include our multi-year distribution study (repeat sites unchanged from 1993), and our cooperative studies with the University of Minnesota regarding the distribution and prevalence of *B. burgdorferi* in the metropolitan area.

Additional Note:
The Metropolitan Mosquito Control District is undergoing a re-structuring process during 1996. Although the distribution study will be conducted using the same study design as years past, some adjustments to the tactics involved in performing the study will be determined prior to the 1996 sampling season. For this reason, it is unknown at this time whether the District will attempt to re-sample either section 7 of New Market township in Scott county or Dodge Nature Center (section 19 of West Saint Paul township) of Dakota county.

METROPOLITAN MOSQUITO CONTROL DISTRICT: ADDITIONAL UPDATES

PRESENCE/ABSENCE OF ANTIBODIES TO *EHRLICHIA* SPECIES IN METROPOLITAN AREA MAMMALS: a cooperative study with Dr. Barb Greig, DVM U of MN, Saint Paul campus

Overview:

Human ehrlichiosis is a newly discovered bacterial disease thought to be caused by several different species of *Ehrlichia*, with various regional tick vectors suspected in the United States, including *Ixodes scapularis*, the tick vector of Lyme disease. As the Metropolitan Mosquito Control District's distribution study results have previously determined, *I. scapularis* populations appear to be established within portions of the seven-county metropolitan area. Cases of human ehrlichiosis have occurred in Minnesota residents as well. For these reasons, the District was interested in this collaborative effort to assess the potential risk of exposure to ehrlichiosis for metropolitan area residents.

In brief:

During 1995, the small mammals that had been collected for the distribution study were used to obtain blood samples that were analyzed for the presence/absence of antibodies to *Ehrlichia* species. District staff drew the blood samples and provided the mammal collection and mammal identification records. Dr. Greig provided the equipment necessary to perform the study and is performing the laboratory analysis of the samples. Dr. Greig will compile and present her results when they become available.

MISCELLANEOUS TICKS TURNED IN BY MMCD FIELD STAFF: 1995 (27 total)

County:		**Township:**	(# of ticks)	**Species identification:**
Washington	(13 total)	Lake Elmo	(9)	*Ixodes scapularis*
		Grant	(1)	*Ixodes scapularis*
		Lakeland	(1)	*Ixodes scapularis*
		May	(1)	*Ixodes scapularis*
		Forest Lake	(1)	*Amblyomma americanum* (nymph)
Anoka	(9 total)	Ham Lake	(4)	*Ixodes scapularis*
		Blaine	(2)	*Ixodes scapularis*
		Linwood	(1)	*Ixodes scapularis*
		Coon Rapids	(1)	*Ixodes scapularis*
			(1)	*Dermacentor variabilis*
Ramsey	(1 total)	unknown	(1)	*Dermacentor variabilis*
Dakota	(3 total)	Eureka	(1)	*Ixodes scapularis*
		Eagan	(1)	*Dermacentor variabilis*
		unknown	(1)	*Dermacentor variabilis*
* Scott	(1 total)	New Market	(1)	*Ixodes scapularis*
Overall	**(27 total)**		**(22)**	***Ixodes scapularis***
			(4)	***Dermacentor variabilis***
			(1)	***Amblyomma americanum* (nymph)**

* Note: Section 7 was sampled through the collection of small mammals in 1995 in an attempt to determine the extent to which *I. scapularis* may be established within the section. *I. scapularis* had not been collected within New Market township in previous studies.

Figure 1

Small Mammals Collected 1995:
1406 total

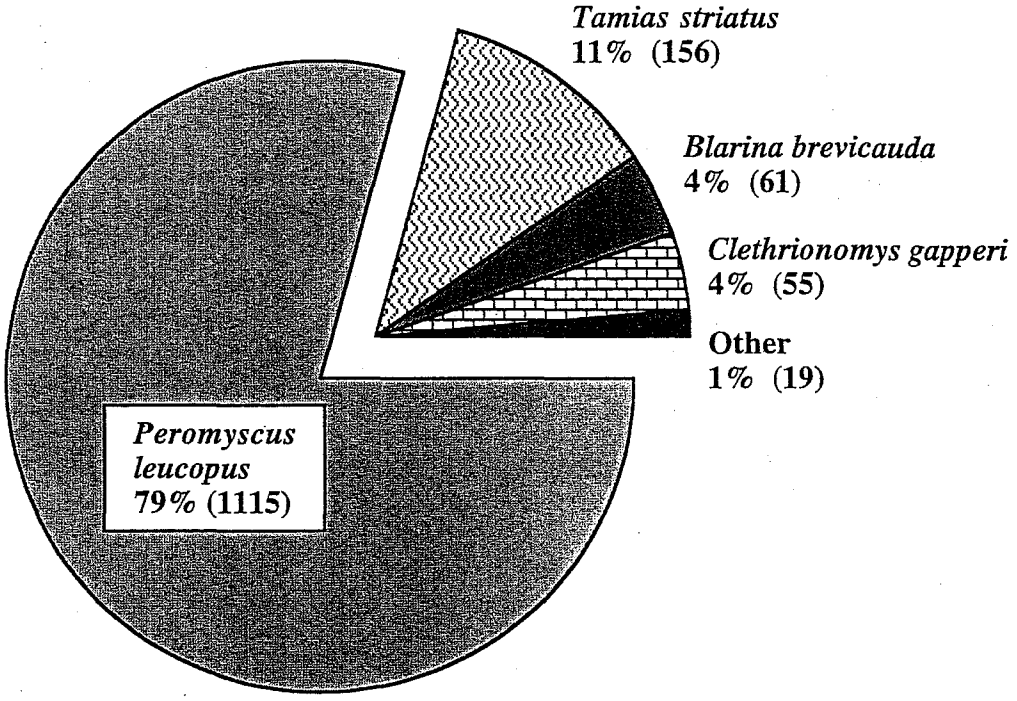
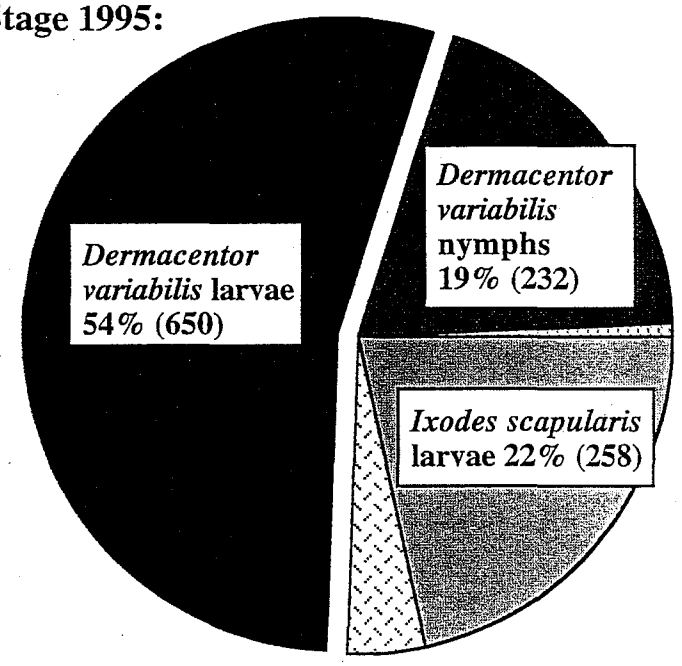


Figure 2

Ticks Collected from Small Mammals by Species and Stage 1995:
1196 total



<1% *Ixodes muris*
7 larvae; 1 nymph

Ixodes scapularis
nymphs 4% (48)

Figure 3

Average Number of *I. scapularis* Collected Per Mammal in Anoka, Washington, and Ramsey Counties: 1990-1995

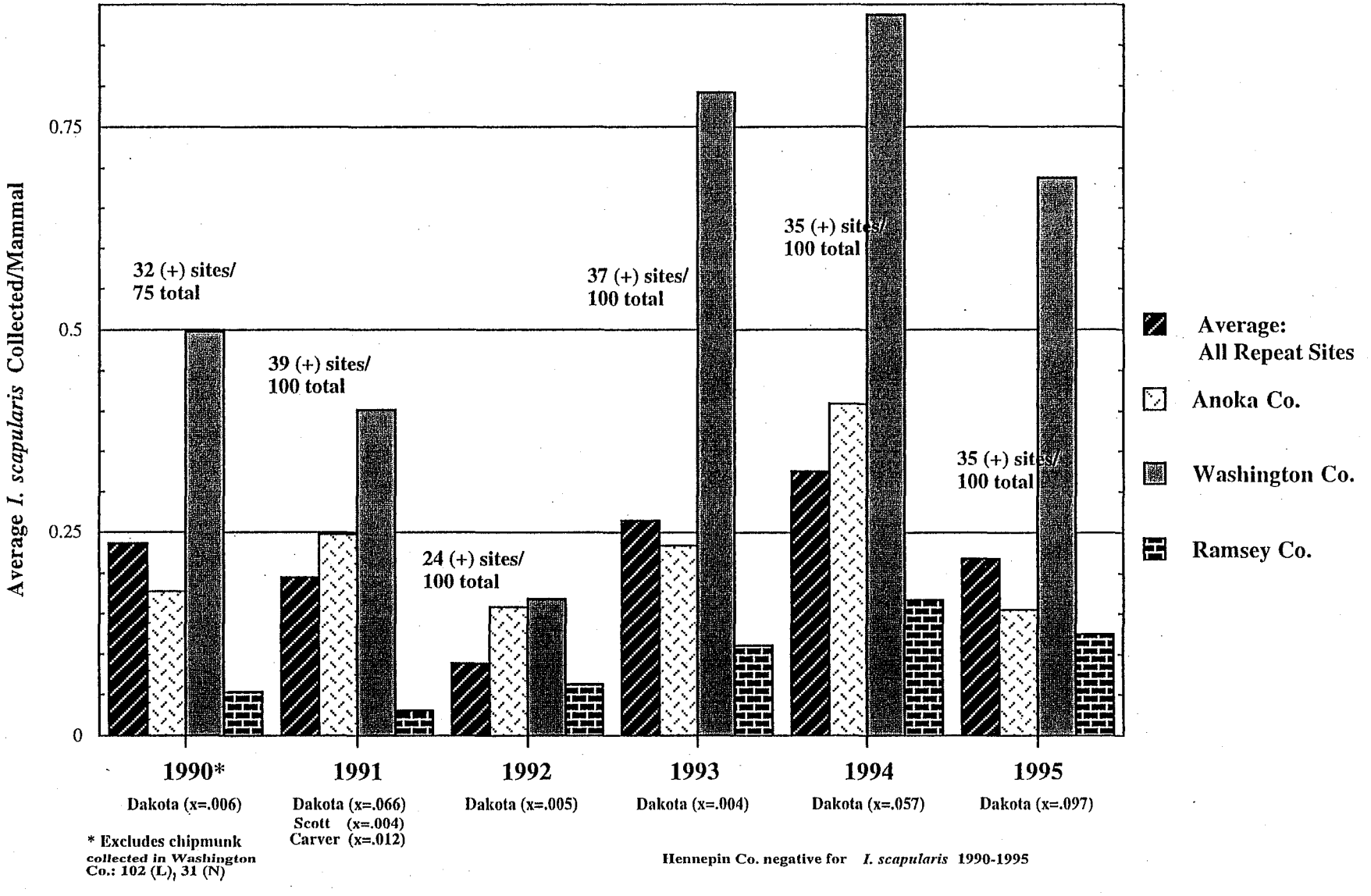
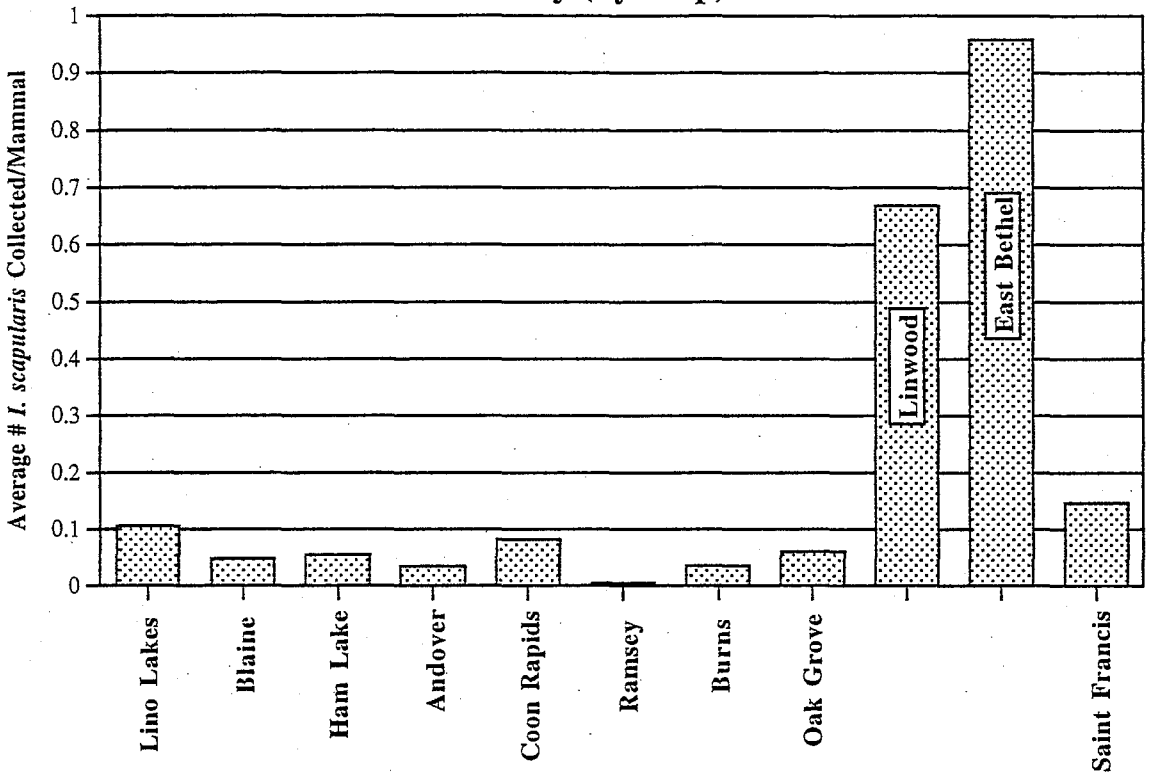
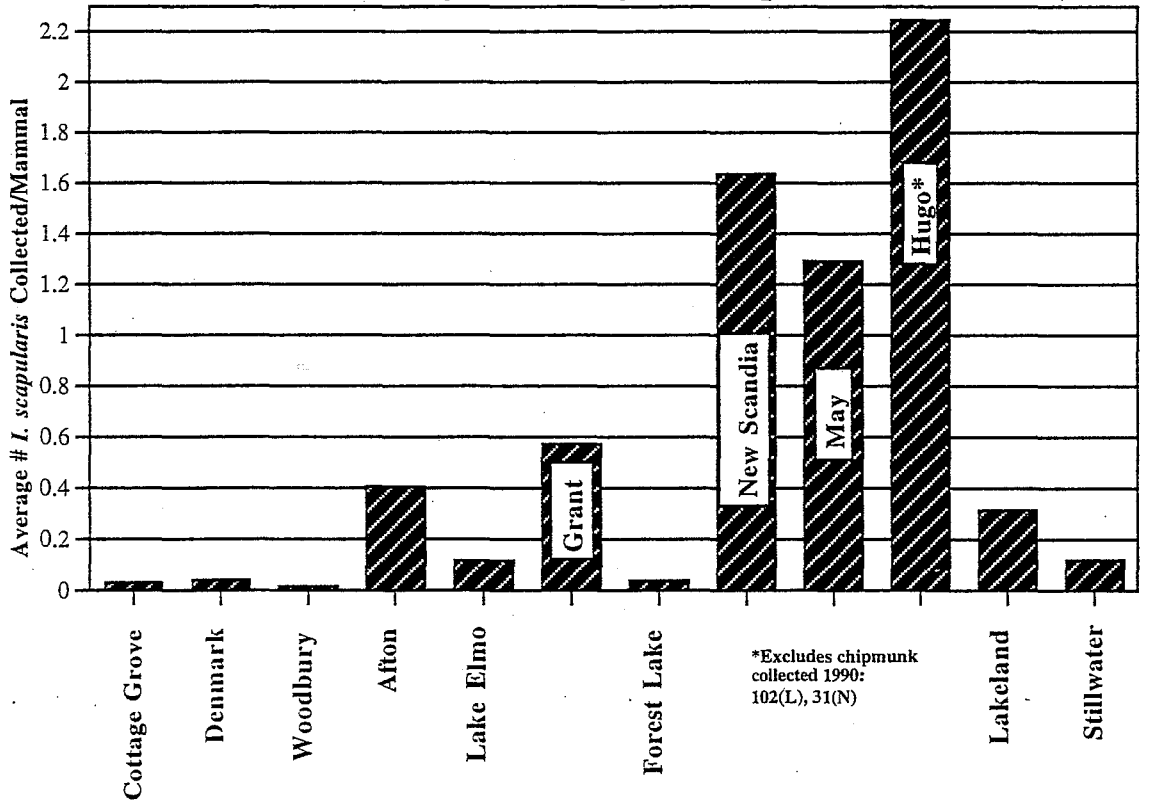


Figure 4

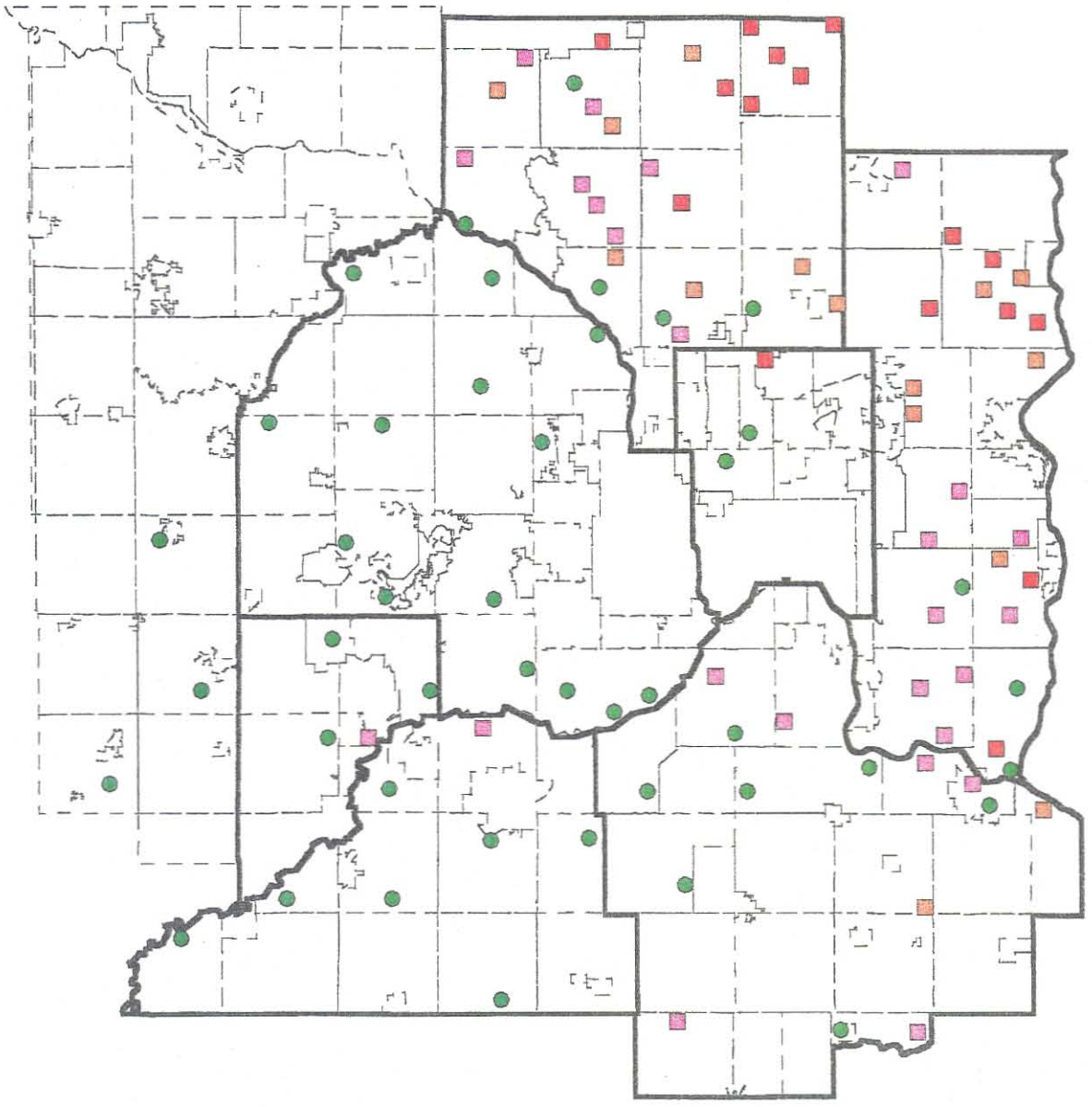
Average Number of *I. scapularis* Collected Per Mammal in Anoka County (by Twp): 1990-1995



Average Number of *I. scapularis* Collected Per Mammal in Washington County (by Twp): 1990-1995



REPEAT SAMPLING LOCATIONS: 1990-1995 Figure 5



Key:

- *I. scapularis was found all years (+)*
- *I. scapularis was found most years*
- *I. scapularis found least (but + at least 1 year)*
- *I. scapularis was not found*